

Research article

Wagner proposition in Nigeria: An econometric analysis

Abiola Ayopo Babajide^a, Funso Abiodun Okunlola^a, Emeka Nwuba^a, Adedoyin Isola Lawal^{b,*}^a Dept of Banking and Finance, Covenant University, Ota, Nigeria^b Dept. of Accounting and Finance, Landmark University, Omu Aran, Nigeria

ARTICLE INFO

Keywords:

Wagner proposition
Government spending
Real GDP
Structural breaks
ARDL
Social sciences
Economics
Public economics
Economic development
Economic growth

ABSTRACT

Succinct exploration of Adolph Wagner's Proposition [WP] 1883 – Peacock and Wiseman 1961 version was put to the validation test in the study. At least, this time, for a quinquaginta octo annis period, representing the life span of Nigeria. Specific suspicion of shocks from data from the world indicator and monetary authority necessitated the adoption of the ADF test with structural breaks, which came out positive at alternating integrating order. This propelled the Autoregressive Distributed Lag ARDL model path having specified the lag selection automatically. Even though the series showed significant association in the short run, and bi-directional causality, the result of the Bound test – F-statistics (calculated) = 3.42 falls below upper Bound $I(0) = 4.68$ and lower bound $I(1) = 5.15$ hence, invalidates the WP position in the long – run in Nigeria. This is an indication that a reduction in non-economically viable and overlapping, funds-straining ministries/departments/agencies (MDA) is indispensable.

1. Introduction

The polarized state of Wagner's Proposition [WP] in the literature today still persists. Often, this polarization stem from linear and non-linear queries at validating various proponents' summation on the subject matter. The law of increasing state as Adolph Wagner calls it has far reaching ends with diverse factions to its proof. Originally, Wagner's thought is hinged on the fact that the level of economic growth or development moves in step-like fashion with state activities. Explicitly, WP, observed, specifically, the industrialized nations as at the time. In his assumption, there are tendencies for state to want to provide such amenities like education, security, health, justice or social services because expanding growth would demand for it hence, there is a need for increased government expenditure. This proposition was hatched around 1883. Ever since the unveiling of this proposition, followers of this view have expressed mixed opinions (Gatsi et al., 2019; Manyeki and Kotosz, 2017; Keho, 2017; Lawal et al., 2020; Asaleye et al., 2020; Lawal et al., 2019; Babajide et al., 2020; Olanrele et al., 2020; Aktan, 2017; Ifeyinwa, Idenyi, Chibuzor & Agbi, 2016; Eze, 2016; Salwindi and Seshamani, 2016; Dahunsi et al., 2019; Moore, 2016; Atasoy and Gur, 2016; Ampah and Kotosz, 2016; Magazzino et al., 2015; Funashima, 2015). Among early versions that propelled dichotomization of WP are that of Peacock and Wiseman (PW) (1961), Musgrave (1969), Gupta (1967), Goffman (1968),

Peacock & Wiseman shared version (1967), among others; each explaining its own version of the proposition based on their scholarly standpoint. However, one common add-in to their summation centres around proving whether WP can be tested in a whole lot of other economic variables such as government consumption expenditure, per capital income, real income among others. If we roll with these assumptions then, it is imperative that we account for all versions of these viewpoints. However, the study seeks to examine PW version of WP owing to the fact that it sees government spending as endogenously derived rather than exogenously specified in Keynesian growth proposition (Antonis, Constantinos & Persefoni, 2016; Li et al., 2020; Oladejo et al., 2020; Manyeki & Kotosz, 2016; Lawal et al., 2020; Lawal, Inegbedion & Ojeka, 2020; Abdur et al., 2012; Inegbedion et al., 2019). Moreso, the monolithic nature of Nigeria economy and strong believe that government spending is sin-quan-non to economic growth and development cannot be ignored. In addition, the study took into cognizance the political shocks experienced historically in the county by applying the structural breaks methodology to its empirical validation having observed scanty use of the method in the literature and, against Ibok and Bassey (2015); Dada & Adewale (2013); Ogbonna (2012), Igahodaro and Oriakhi, 2010, methodology and; because of the length of data, which span the entire country existence (1961–2019). As a result, the study validation of WP in the study is enroute four major sections. Immediately after the

* Corresponding author.

E-mail address: lawal.adedoyin@lmu.edu.ng (A.I. Lawal).<https://doi.org/10.1016/j.heliyon.2020.e04680>

Received 22 May 2020; Received in revised form 21 July 2020; Accepted 6 August 2020

2405-8440/© 2020 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

introduction is the literature review. This is followed by material and methods. Next to this is the result and analysis while, conclusion and recommendation comes at the end.

2. Literature review

2.1. Theoretical discussion

2.1.1. Adolph Wagner's 1883 proposition

The Wagner's Proposition or simply the 'Wagner's Law', was postulated around 19th century in Germany. The necessitating factor was borne out of the fact that Wagner sees, overtime, that the share of government in state affairs is increasing such that, an increased expansion in visible growth brought about reasons to expand responsibility of government in fundamental provisions. This is especially witnessed during war periods, need for industrialization, provision of justice, health, education among others. Salwindi and Seshamani (2016), Okunlola et al. (2015), Magazzino et al. (2015), Antonis, et al. (2012); Abdur et al. (2012), observes that Wagner's Proposition aimed to achieve namely, economic growth, infrastructural development and prevention of private monopolistic tendencies. While this assumption as been adopted, modified or queried in several quarters, it still remains debatable economic phenomenon. This is especially so when discussed in Nigeria's perspective where, records indicate consistent increase in government spending without visible real economic growth (Ogunbiyi and Okunlola, 2015; Okoye et al., 2015).

2.1.2. Wagner' proposition [WP] versions

There are several series of Wagner's propositions in the literature. The essence of this is that there were those with full adoption of this proposition with minor modifications such as Peacock and Wiseman (1961), and those with major modifications such as: Gupta (1967), Musgrave (1969), Goffman (1968) and those with mixed adoption such as Peacock – Wiseman share version.

2.1.3. Peacock and Wiseman [PW] version of WP

The contributory add-in to Wagner's Proposition by Peacock and Wiseman [PW] happened around 1961 in the United Kingdom. It was a study that covered a sixty-five years (1890–1955) period. In the study PW took a leap from the Wagner's Proposition by describing the mannerism in which public (government) expenditure soar. Their proposition did confirm Wagner's assumptions on the need for the rise of government spending. Accordingly, PW observed as at the time that government spending moves in jerk like fashion rather than in smooth continues manner, favouring a post-ante description of budget effects where expenditure increases higher than the rate of growth but >1 degree of elasticity (Gatsi et al., 2019; Atasoy and Gur, 2017; Salwindi and Seshamani, 2016; Mohammad, 2006; Ezirim, 2005). This is expressed as in the methodology as:

$$\ln TGS_t = \varphi_0 + \varphi_1 \ln RGDP_t + \mu_1 \dots \varphi_1 > 1 \quad (1)$$

where $\ln TGS$ is the natural log of total government spending φ_0 , φ_1 is the parameter of the estimate that influences the $\ln RGDP$, natural log of real gross domestic product.

2.1.4. Gupta 1967 version of WP

Unlike PW, that emphasized a government expenditure as a function of deflated gross domestic product, Gupta (1967) simply plot-in the benefits of the former (government spending) over the later (real gross domestic product), by proposing government spending per capital as a reflection real gross domestic product per capital. The implication of this is that government should be able to account for each spending per head based on achieving real growth per head (Moore, 2016; Mohammad, 2006). In other words, this may be expressed as;

$$\ln \left(\frac{TGS}{P} \right)_t = \varphi_0 + \varphi_1 = \ln \left(\frac{RGDP}{P} \right)_t + \mu_1 \dots \varphi_1 > 1 \quad (2)$$

where, $\ln \left(\frac{TGS}{P} \right)_t$ is the total government spending per capital at time t, and $\ln \left(\frac{RGDP}{P} \right)_t$, real gross domestic product per capital at time t., all in their natural log form.

2.1.5. Musgrave 1969 version of WP

The original assumptions of Musgrave came with a lot of mixed reactions regarding his Wagner's proposition assumption (Eze, 2016; Mohammad, 2006). At one point, it was observed that share of government income is a function of government share in the income expenditure. At another level, it is observed that share of government expenditure should be the reason for government increased income, such that the degree of elasticity of government spending parameter in regarding per capital income should be greater than zero (Eze, 2016; Salwindi and Seshamani, 2016). That is;

$$\ln \left(\frac{TGS}{P} \right)_t = \varphi_0 + \varphi_1 = \ln \left(\frac{RGDP}{P} \right)_t + \mu_1 \dots \varphi_1 > 1 \quad (3)$$

2.1.6. Goffman 1968 version of WP

The understanding of Goffman version of WP is that; a time comes in the life of the government where the rate of government expenditure should be lower when growth has reached a certain stage. The essence of this is that government spending would have rising to a level where additional spending in similar areas to boost growth may not be completely necessary for a period. As such, government spending is an impetus to increase output per head (Mohammad, 2006). As such,

$$\ln \left(\frac{GS}{P} \right)_t GS_t = \varphi_0 + \varphi_1 = \ln \left(\frac{RGDP}{P} \right)_t + \mu_1 \dots \varphi_1 > 1 \quad (4)$$

2.1.7. Modified Peacock and Wiseman version of WP

Peacock – Wiseman shared version as often referred to, is the modified version of Peacock and Wiseman version of the Wagner's Proposition by Mann (1980). In his expression, public spending is not in isolation of gross domestic product hence, it is indeed a functional measurement of gross domestic product. As such, public spending is a share of gross domestic product as a function of gross domestic product represented thus;

$$\ln \left(\frac{TGS}{P} \right)_t = \varphi_0 + \varphi_1 RGDP + \mu_1 \dots \varphi_1 > 0 \quad (5)$$

2.2. Wagner's proposition [WP] in Nigeria's context

The country Nigeria has had a visible four republics since its independence in 1960. Alapiki (2005), Brown (2013), Adetoye (2016), explained that the first republic occurred from 1963 – 1966. Second republic occurred from 1979 – 1983. Third republic happened between 1985 – 1993 while, the last republic, which is the fourth republic, started between 1999 when the country returned to civil rule till the present year 2020. Specifically, in the life of the country, Okunlola et al. (2019a, b) observed that the administration of the country has changed hands more than fourteen time since independence. The implication is that each would have had their fair share of spending cum shocks (positive or negative) that would have defined their eras. The country had three regions in its early beginning (Northern, Southern and Eastern region) between colonial period and 1963. In 1963, it became a region of four with the addition of Mid-Western Region in 1963–1967 (Alapiki, 2005). It became a formation of states from 1967 – 1976 having a total of twelve (12) states. Between this period and 1987, another seven (7) states was added to official bring it to nineteen (19). Soon after, additional states were added to make it twenty-one (21) plus the federal capital territory

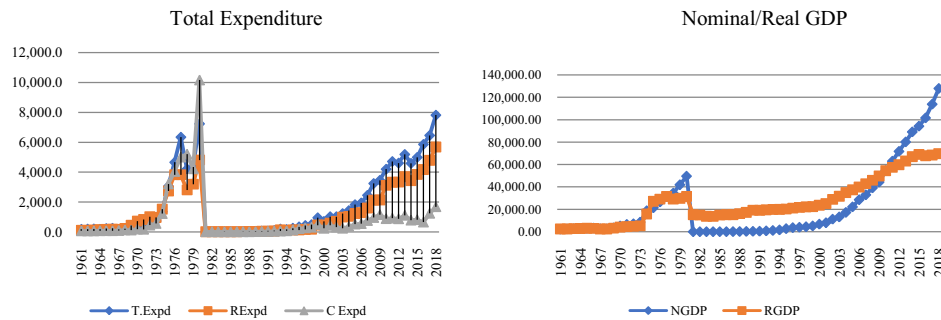


Figure 1. Total expenditure. Nominal/real GDP

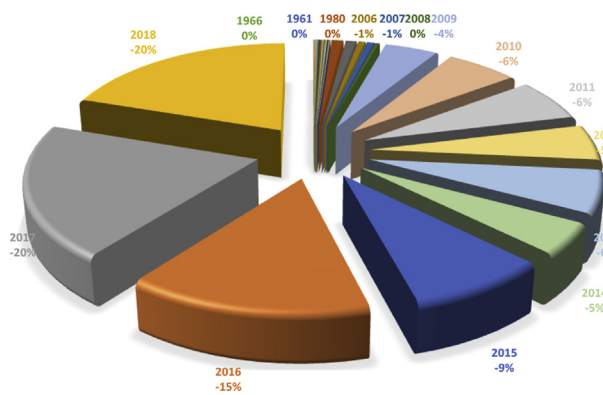


Figure 2. Percentage change in GDP rate.

in 1991. Between 1987 and 1991 more states were added to bring the total to thirty (30) plus the federal capital. In 1996, six (6) more states were created to bring the total today to thirty-six (36) plus the federal capital territory (Adetoye, 2016; Brown, 2013; Alapiki, 2005). Similarly, spending shows an oscillatory trend in the journey of government spending within the period. It enjoyed the euphoria of independence when it grew steadily from 1961 – 1971 at 174million to 444million,

slowing down just four times between the period at 176/173.5/170.2/181.6million in the year 1964/1967/1968/1969 (Central Bank of Nigeria, [CBN], 2009, 2019). In the same period, nominal gross domestic product maintained consistent rise from 2, 361.20 million to 6,650.90 million slowing down just twice in 1967/68. The real gross domestic product also follows this trend peaking at 4715.5 million in 1971 from 2501.2 in 1961. It also showed slow growth in the same period as nominal gross domestic product. In the same vein, government total spending as a percentage of gross domestic product showed upward trend until 1968/69, plunging to negative in 1970 to -8.62. In the first ten years also, percentage change of annual population growth, range between 1.9 and 2.3 percent respectively (World Bank Indicator, 2020). One noticeable event is that the decade that followed 1971 saw upsurge in government spending, which is a demonstration of the need of government to spend more as number of states increased within period from twelve (12) to nineteen (19) and, to twenty – one (21). This is a typical confirmation of WP as supported in Peacock and Wiseman version, which needs validation empirically. In 1981 for instance, government spending was recorded in it billion Naira term, jumping from 444million in 1970 to 11.41billion in 1981. Ironically, negative percentage contribution to gross domestic product characterized this era. For clarity, in 1972, 1975–78, 80–94, the nation witnessed a -0.82 percent, -1.99 to -8.17, respectively and; throughout 1980–1994 at -3.98, reaching -4.08 in 1986 and peaked at -4.43, -6.0 and -5.18 in 1990/91/93 with a minor decline to -3.99 in 1994 (CBN, 2019). All through this era, annual population growth maintained a steady rise from

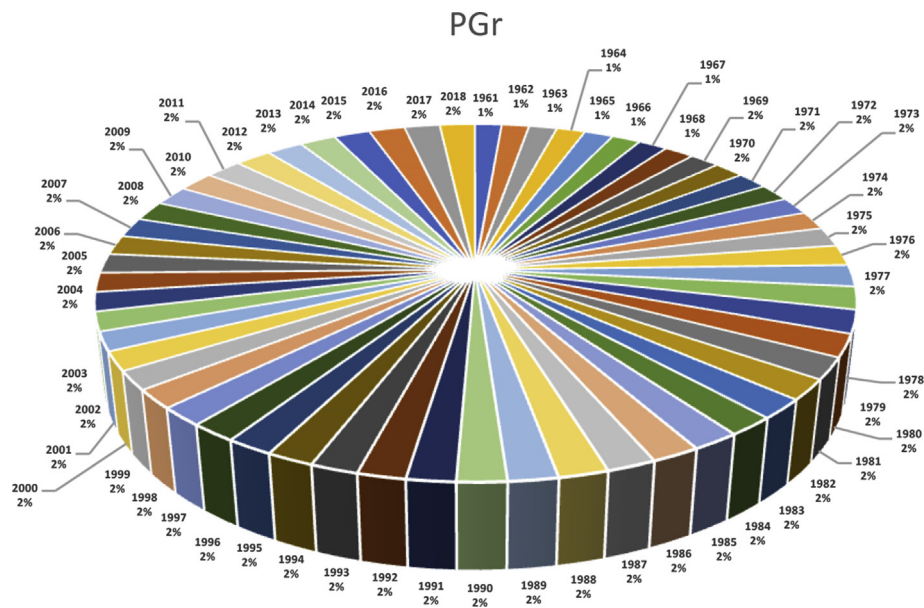


Figure 3. Population growth rate (%).

2.6/2.8/2.9 percent respectively. It will amaze us that total expenditure as a percentage of gross domestic product from this time to 2018 (except in 1995/96) exhibit negative signs, an indication that likely suggest that spending is stimulated through borrowing (Ogunbiyi and Okunlola, 2015; Okoye et al., 2015). Noteworthy also is the fact that the strength (workforce) of Nigeria grew from two hundred and thirteen thousand eight hundred and two (213,802) to two hundred and seven-thousand three hundred and ninety-two (237,392) in just one decade in late eighties and early nineties (Okorie, 2014) (see Figures 1, 2, and 3).

2.3. Some empirical validation of Wagner's proposition

The proof or surmise of Wagner's Propositions has been tested, contested in several quarters among the academia, researchers, development finance experts and the economists alike. No single one of these class had consensus agreement as to whether the law is valid in all contest. Particularly, some like Gatsi et al. (2019); Aktan (2017); Sekantsi and Molapo (2017); Manyeki & Kotosz (2017), Salwindi & Seshamani (2016), Moore (2016), Atasoy and Gur (2016), Eze (2016), Ampah & Kotosz (2016), Anoke, et al. (2016), Barra et al. (2015), Ibok & Bassey (2015), Antonis et al. (2013), Abdur, et al. (2012), Chimobi (2009), Naraya, Nielsen, & Smyth (2008), did country-specific studies and found, in most cases, mixed results. Others like Keho (2017), Kargi (2016), Magazzino, et al. (2015), Funashima (2015), Barra et al. (2015), Facchini (2014), Oxley (1994), Abizadeh and Yousefi (1988), did a country-wide examination yet, reported a mixed outcome. In most cases, some examined all versions of the law, some a mixed of it while others fitted the one peculiar to their quarries. Similarly, majority of the study did use different empirical path in validating their proof. For instance, Facchini (2014), did trend examination of WP at different time intervals and concluded that fifty (50) percent of the twelve countries studied between 1967 – 1992 validated WP in emerging economies while; about forty-seven (47) percent supported this finding within the thirty-two (32) developed countries studied. However, between the year 1967 and 2012, the number of support for WP dropped by about five (5) percent to 46.96 percent in spite of increased in the number of countries studied (66) in emerging countries. Reversely, support for WP increased in the developed countries by similar margin to 50.47 percent in over one hundred and five (105) countries studied (Moore, 2016; Facchini, 2014). Similarly, in 2003 and 2016, Antonis et al. (2003) and Atasoy (2016) validated WP in Greece and China using Autoregressive distributed lag (ARDL) methodology and found WP to be statistical significant in their respective countries. Whereas, Gatsi, t al. (2019) and Abdur et al. (2012), found no long-run relationship using ARDL and, cointegration and granger causality test respectively for Ghana and Pakistan. Chimobi (2009) and Babatunde (2011) invalidate WP in Nigeria. The duo sees no long-run relationship between government spending and national income but confirm a bi-directional causality. This outcome is inverse of Alimi (2013), Eze (2016), Adedokun & Olaniyi (2017) of the same country. In Turkey, Kucukkale and Yamak (2012) use of cointegration and causality test to validate whether public expenditure and economic growth proposition n WP is valid reports a bidirectional relationship in their outcome.

3. Material and method

While there are diverse multi-operational approaches to interpreting and deciding Wagner's hypothesis (WH), most scholars simply fit-in that which is more peculiar to their economic queries at hand. This study is not an exception. This is not to say that other explanatory propositions are not valid in their reverse influence. While, for instance, Collin Clerk - Critical-Limit Hypothesis (1943), Musgrave (1969), Peacock and Wiseman (PW) (1961), Gupta (1967), Goffman (1968), and Brennan and Buchanan – Leviathan Hypothesis (1980), are among the most debated version of Wagner's

Proposition, the study fit-in Peacock & Wiseman version based on its applicability on emerging economies like Nigeria and the country's government visible expanding size cum increased spending with the inherent notion to spur growth. For clarification, the study fit-in a trajectory total government time spending [TGS] on extant real gross domestic product (RGDP). This study slightly modified Anoke, Odo, Chukwu & Agbi (2017) transposition methodology by adopting WH - Peacock & Wiseman proposition without dilution. This is as corroborated in the works of Manyeki & Kotosz (2017) and Jaen-Garcia (2017). In this regard, TGS is the sum total of government spending on all activities and, are in their natural log form on the left hand side while, real gross domestic product is on the right-hand of the model. Data culled from the apex monetary authority releases for a quinquaginta octo annis (i.e. 1960 - 2018) period is put to the validation test. The interest of the study is to x-ray TGS on RGDP based on WH – PW proposition in the long run. However, to avoid spurious regression, it is needful to examine the outcome of the order of integration of the series. Traditionally, Augmented Dickey Fuller [ADF] is used to diagnose the order of integration of the series, which is a conventional practice to equilibrate economic variables prior use. The outcome of the ADF immediately informs the path enroute the study forecast. However, because of data length, structural breaks unit root test will be used (Bai and Peron, 2003). The essence of the breaks is because of possible disruptions such as in economic activities, inflation, currency fluctuation, political instability and global influence. Also, autoregressive distributed lag (ARDL) model is specified for the long run validation purpose. Similarly, because TGS is endogenously derived, the direction of causality with RGDP will be considered.

Model specified

In its general form of WH – Peacock and Wiseman model, the study specified as follows:

$$\ln\Psi_t = f(\xi_t) + \mu_t \quad (6)$$

When transformed, it becomes

$$\ln TGS_t = f(\ln RGDP_t) \quad (7)$$

Where, $\ln TGS$ is the natural log of total government spending (cumulative of $r + c$ in administration, social and community services, economic services and transfers). And $\ln RGDP$, is real gross domestic product (deflated).

If explicitly transformed in its econometrics form and fit-in Peacock and Wiseman model, it becomes

$$\ln TGS_t = \phi_1 + \phi_2 \ln RGDP_t + \mu_t \quad (8)$$

Where Eq. (3) is as in Eq. (2) at time t , $\phi_{1,2}$ is the intercept and, μ_t is the error term.

Subsequently, the ARDL model is specified as (ρ, ϕ_1, ϕ_2) as in Eq. (8), we specified thus;

$$ARDL: \Delta\rho_t = \eta_0 + \sum_{i=1}^n \eta_i \Delta\rho_t - 1 + \sum_{i=1}^n \delta_i \Delta\xi_t - i + \phi_1 \rho_{t-1} + \phi_2 \xi_{t-1} + \mu_t \quad (9)$$

That is,

$$\ln TGS_t = \eta_{01} + \sum_{i=1}^p \eta_{1i} \ln TGS_{t-i} - 1 + \sum_{i=0}^{q1} \eta_{2i} \ln RGDP_{t-i} - 1 + \mu_{1t} \quad (10)$$

$$\ln RGDP_t = \eta_{02} + \sum_{i=1}^p \eta_{1i} \ln RGDP_{t-i} - 1 + \sum_{i=0}^{q1} \eta_{2i} \ln TGS_{t-i} - 1 + \mu_{2t} \quad (11)$$

Where: $\sum_{i=1}^n \delta_i \Delta\xi_t - 1 + \sum_{i=0}^n \eta_i \Delta\xi_t - i$ is the short run model and $M_1 \mathcal{J}_{t-1} + M_n \mathcal{J}_{t-1}$ represents the long run model expectation. That is, $\delta_1 \dots \eta_1$ represents the short-run coefficients in the model; while $M_1 \dots M_n$, represents the Autoregressive distributed lag model long-run coefficients and μ_t is stochastic term.

Table 1. Augmented dickey fuller test result.

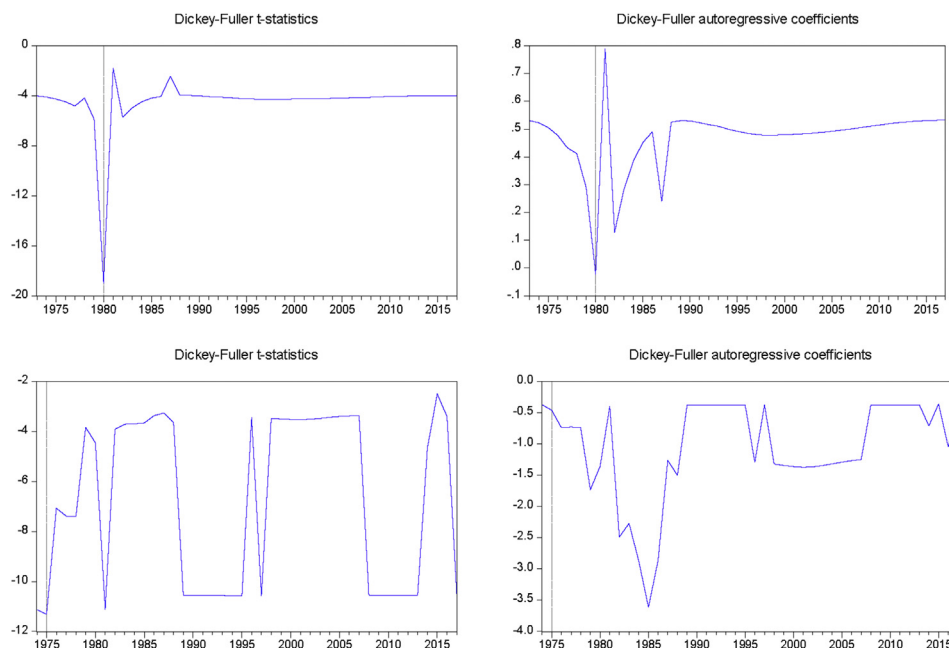
First Difference Testing				
Series	Critical Values	t-Statistic	Prob	Order
D(lnGTS)	1% = -4.130526 5% = -3.492149 10% = -3.174802	-11.01797	0.0000	I(1)
D(lnRGDP)	1% = -4.130526 5% = -3.492149 10% = -3.174802	-10.75725	0.0000	1(1)

Source: Author's (2020) Eview Output.

Table 2. Unit root test (with structural breaks) result.

Series	Break Date: 1980. Break Selection: Min. ADF [t-statistic] Break Trend/Specification: T&I/I Break Type: Innovational Outlier. Maxlag: 10			
	Critical Values	t-Statistic	Prob	Order
D(lnGTS)	1% = -5.347598 5% = -4.859812 10% = -4.607324	-18.95745	0.01	I(0)
D(lnRGDP)	Break Date: 1975. Break Selection: Min. ADF [t-statistic] Break Trend/Specification: T&I/I Break Type: Innovational Outlier. Maxlag: 10			
	1% = -5.347598 5% = -4.859812 10% = -4.607324	-11.31684	0.01	I(1)

Source: Author's (2020) Eview Output.

**Figure 4.** Structural break points.

4. Results and analysis

4.1. Unit root test (without structural breaks) result

The unit root is conducted under Augmented Dickey Fuller assumptions of variables having unit roots properties which need to be accounted for prior estimation. The study utilizes the unit root function (see Table 1);

$$\Delta Y_t = \phi_1 + \phi_{2t} + \xi Y_{t-1} + \alpha_i + \mu_t \quad (12)$$

Where: ΔY_t is the constant forecast value, ϕ_1 , is the intercept, ϕ_{2t} is the trend, ξY_{t-1} , takes a position of if $|\xi| \geq 1$ or $|\xi| < 1$ the non-stationarity series and variance influences Y in time and trend, μ_t , is the white noise.

Having conducted the unit root test, the result was accepted at order. However, after first difference the null hypothesis of the series was rejected. By implication, log government total spending (lnGTS) and log real gross domestic product (lnRGDP) are stationary at I(1). In most cases whenever series display this form of output, the next step is to perform a long run relationship between them. Hitherto, because of the suspicion of

Table 3. Bai – Perron multiple breaks determination result.

Schwarz criterion selected breaks:				2	
LWZ criterion selected breaks:				2	
Breaks	# of Coefs.	Sum of Sq. Resids.	Log-L	Schwarz* Criterion	LWZ* Criterion
0	2	251.6619	-124.8601	1.607659	1.698294
1	5	170.7404	-113.6098	1.429739	1.658749
2	8	102.7616	-98.88553	1.132030	1.502624
3	11	89.82273	-94.98289	1.207479	1.723264
4	14	84.33928	-93.15617	1.354512	2.019570
5	17	83.53629	-92.87874	1.554968	2.373959
* Minimum information criterion values displayed with shading					
Estimated break dates:					
1: 1981					
2: 1975, 2002					
3: 1969, 1977, 2002					
4: 1969, 1977, 1999, 2011					
5: 1969, 1981, 1992, 2000, 2011					

Source: Author's (2020) Eview Output.

likely structural breaks in the variables owing to length of the data, and to avoid spurious estimation, the study performed a structural break unit root testing of the series. Structural breaks tells us of the significant event that can positively or negatively affect economic function such as: economic disruptions, inflation, currency fluctuation, external impacts, and many more, considered critical in the economic progress (Jaen-Gracia, 2018; Aliu, 2016; Bai & Perron, 2003; Chow, Ctsomitis & Kwan, 2002; Zivot and Andrews, 1992) (see Table 2 and Figure 4).

Abintio, an event in time occurs possibly when set date can be exactly identified or, may have been forgotten. In the event of this, identifying a possible structural breaks date can be done in two ways. First, when a set date can be exactly identified, then this can be plot into the structural modeling for execution. Otherwise, set time or date can be automatically generated in the event of uncertain date(s) (Bai and Perron, 2003; Chow et al., 2002). The study utilizes the automatic system structural breaks identifier as show in the table and corresponding graph above. The automatic selection leaves no room for erroneous guesses of shock dates or time. From the table, the study selected a min ADF t-statistic break with trend/intercept and intercept (T&I/I) criteria. The essence is to identify in the life of the series breaks and the minimum number of possible breaks in trends and intercept plus their innovation outlier in the activities of government spending cum economic growth. Unlike the result of the ADF without breaks where series become stationary at same level, that is at 1(I), suggesting a possible long run estimation between the series; that of Augmented Dickey Fuller (ADF) with structural breaks report otherwise. Specifically, the series became stationary at different order of breaks. That is, lnGTS at I(0), and LnRGDP, at I(1). Also, the output demonstrates clearly the presence of more than one structural break on different dates (1980 and 1975). This is also pointed out in the Dickey Fuller statistics graph (i.e. 1980 and 1975). This clearly was the arguments of Bai and Perron (2003) on possible expansion of Chow et al. (2002) proposition, that variables should not be for arbitrary selection for further empirical testing when possible shocks that could lead to

spurious estimation as not been established. One clear understanding of this is the fact that stationarity test often tends to erroneously identify time processes in series which could lead to low power asymptotically when shocks are not properly identified. This brings the study to further confirm the multiple shocks in the series by utilizing the Bai and Perron (2003) or Chow et al. (2002) test. Worthy of note is the fact that shocks are determined endogenously or exogenously depending on study's aim (Aliu, 2016). The former compel on it a singular effect in time and so is the latter. However, based on the hue and cry that government spending in Nigeria is shielded in secrecy, it becomes imperative that the breaks are examined both ways.

4.1.1. Bai-Perron multiple structural breaks test determination

Having identified the presence of structural breaks in the series through the Augmented Dickey Fuller structural breaks test, the study went ahead to determine the number of breaks as opined in Perron (2018), and Bai and Perron (2003) arguments for appropriateness. Thus, Bai-Perron test is given as (see Table 3);

$$\Psi_p = \pi_p' \xi + \chi_p' \lambda_r + \mu_p \quad p = P_{r-1} + 1, \dots, P_r \quad (14)$$

Where: Ψ_t is the endogenous variable, $r = 1, \dots, m+1$ representing numbers of breaks (i.e. $P_1, \dots, P_m$), π_p and χ_p represents vectors of covariates of the exogenous variable, ξ/λ_r vectors corresponding coefficients, μ_p is the error term.

Again, as proof of the presence of structural breaks occasion by the study guesses, the Bai-Perron test was conducted. Accordingly, the $M + 1$ (0 to M) global information criteria was selected as a decision for the estimation. The essence of the selection is based on the fact that it is believed to be a consistent estimator of the true number of breaks, because it takes into account global shocks on internal affairs and it is a modified version of Schwarz* criterion in Liu, Wu, & Zidek (LWZ) (1997) (Bai and Perron, 2003; Aliu, 2016; Clemente, 2017; Perron, 2018, Casini and Perron, 2018). From the table, five (5) structural break dates were

Table 4. Chow breakpoint test result.

F-statistic	12.10824	Prob. F(6,50)	0.0000
Log likelihood ratio	52.04382	Prob. Chi-Square(6)	0.0000
Wald Statistic	72.64945	Prob. Chi-Square(6)	0.0000

Source: Authors' computation (2020), Eview output.

Table 5. OLS result with dummy variable.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNRGDP	2.449607	0.750266	3.264986	0.0019
DUM	15.21697	7.998176	1.902556	0.0625
LNDGTS	1.000607	0.135228	7.399396	0.0000
LNRGDP	-2.450605	0.934210	-2.623184	0.0114
C	-15.20947	6.173640	-2.463615	0.0170

Source: Author's computation (2020), Eview output.

Table 6. Breusch-Godfrey serial correlation LM test.

F-statistic	0.728663	Prob. F(1,50)	0.3974
Obs*R-squared	0.804380	Prob. Chi-Square(1)	0.3698

Source: Author's computation (2020), Eview output.

Table 7. Lag selection criteria.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-182.6309	NA	3.638089	6.967204	7.041554	6.995795
1	-141.7736	77.08924*	0.905607	5.576362	5.799414*	5.662137*
2	-136.9899	8.664794	0.879995*	5.546789*	5.918542	5.689747
3	-135.4258	2.715039	0.966630	5.638710	6.159164	5.838852
4	-134.5246	1.496418	1.090388	5.755644	6.424799	6.012969
5	-133.7686	1.198100	1.239298	5.878061	6.695918	6.192569

Since it is not appropriate for lag length to be arbitrarily selected then, it must be systematic and automatically selected. From the table, the final prediction error [FPE], Akaike information criterion (AIC), Schwarz information criterion (SC) and Hannan-Quinn information criterion (HQ) are available for systematic and automatic selection by the system through the vector autoregressive (VAR) unrestricted method. However, the system selected lag 1 (SC/HQ), having been the most common to all selection criterion. The asterisk represents the significant at 10% level.

estimated. The implication is that government spending reflects global shocks to possibly economic disruptions, currency exchange value, inflation, political, or income. However, both Schwarz and LWZ select a corresponding two (2) years structural break of 1975 and 2002, with automatic highlight in the table above. Further argument in favour of LWZ selection is based on the assumption that it performs better in the absence of serial correlation. However, the Chow test may be used to further proof presence of breaks in the series.

4.1.2. Chow test

Recall we mentioned earlier that the structural shocks may be performed manually or automatically. What the later does is to review possible dates that will be imputed into the system for confirmation of exact break dates. In order words, having determined the shocks in the life of the series from the ADF structural breaks testing and that of Bai-Perron multiples break dates, the study only needed to fit-in these dates into Chow break test to further confirm the existence or otherwise of the shocks. Again, from the table and the break dates, the F-statistic further confirm the existence of major shocks between government total

spending and real gross domestic product for the period in review. As show, since the probability = 0.000 is less than 0.05 percent level of significant, the null hypothesis of no shocks at specified breakpoints in the series for the period in review is rejected hence, the Chow test further confirm the existence of structural breaks in the study (see Table 4).

4.1.3. Model diagnostic process

Since the confirmation of structural shocks has been established in time, it is essential that the model is put to a diagnostic testing for possible model fitness to avoid spurious result in the end. In the build up to this, a dummy variable is included in Eq. (3) to represents the number of breaks as below. This uses the ordinary least square method for its determination.

$$\ln TGS_t = \varphi_1 + \varphi_2 \ln RGDP_t + \Phi \delta_1 p + \gamma \delta_2 p + \mu_t \quad (15)$$

where: δ_1, δ_2 represents the number of shocks in its breaking time.

4.1.4. OLS result with dummy variable

Having determined the shocked dates as inserted into the system, it shows that in spite of the products of the shocks, government total

Table 8. ARDL outcome (overparameterized).

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.683160	2.846899	-0.591226	0.5570
D(LNGTS(-1))	-0.224314	0.141152	-1.589164	0.1182
D(LNRGDP(-1))	0.446310	0.567831	0.785991	0.4355
LNGTS(-1)	-0.369503	0.142678	-2.589765	0.0125
LNRGDP(-1)	0.405199	0.333873	1.213635	0.2305

Source: Authors' (2020) computation from E-view.

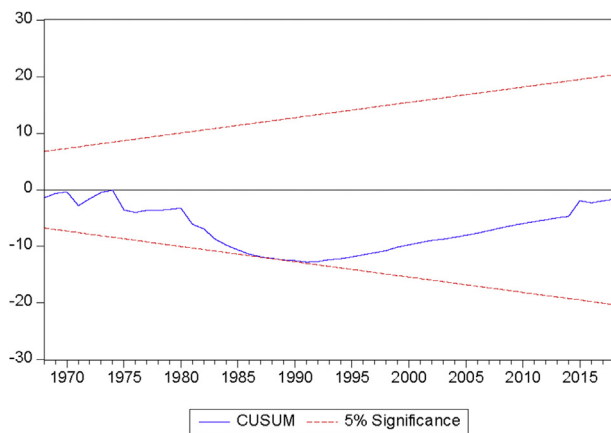


Figure 5. Model diagnostic.

spending is statistically significant in explaining real gross domestic products and vice versa. Possible explanation to this effect is that the disturbances witness under the period in review has been positive. However, the study went further to determine the stability of this output by diagnosing for possible serial correlation using the Breusch-Godfrey LM test serial correlation test as below (see Table 5).

4.1.5. Serial correlation

Usually, Breusch-Godfrey serial correlation proposition is stated in its null form. That is, there is no serial correlation in the model. By implication, this is judged against its 0.05 percent level of significance. Thus, if the outcome falls below the rejection region (<0), the null hypothesis is rejected; otherwise it is not when it is greater than (>0). From the serial correlation table, the corresponding probability of the F-statistic shows = 0.3974 hence greater than 0.05 percent level, thus, the null hypothesis is not rejected. By implication, there is no serial correlation in the model and t is normally specified. It is noteworthy to recall that the essence of study rest upon determining whether a long run relationship exists between government total spending (GTS) and real gross domestic product (RGDP) for the period under review. Also, recall that since, spurious analysis may be inevitable, it became pertinent to check for the existence of shocks in the life of the series especially, considering the fact that the country has been a mono/export driven economy that is susceptible to global dictates for a long time. Hence, the presence of these shocks influencing spending trend may be inevitable. In order words, having this notion, they study adopted the Augmented Dickey Fuller (ADF) test structural breaks to determine the presence or absence of shocks in the series. The result shows the existence of structural breaks in both variables. This result was further confirmed by Bai & Perron and Chow test leading the study to specify an autoregressive distributed lag model ARDL (see Eq. (4)) to confirm or disprove the existence of long run relationship between government total spending and real gross domestic product in Nigeria for the period in review (see Table 6).

In determining an ARDL model, the study determined appropriate lag length of the series using the lag length selection criterion. The result is hereunder presented (see Table 7).

4.1.6. ARDL model result

To determine the existence of a short run and long run relationship between the variables, the ARDL regression was performed with their respective optimal lag selected automatically. This is based on the outcome of the order of integration displayed in Table 2. However, from the result in the table above (8), five coefficients with their respective probabilities report were identified. That is, $c_1, c_2, \dots, c_5$; where, $c_1, \dots, c_3$, is the short run coefficient and c_4, c_5 , is the long run coefficient in their individual form respectively. Specifically, all the series in the short run, that is c_2, c_3 $D(\ln GTS(-1))$ and $D(\ln RGDP(-1))$ and their respective probabilities: prob = 0.1182 and 0.4355 indicate absence of statistically insignificant relationship between the variables in the short run. That is, having being above the 0.05 percent significant level hence, it is insignificant. In essence, economic growth in the short-term do not reflect government spending and suggest possible uni-directional movement. That is, economic growth is not a reflection of government spending in the country. What this suggest is that there are arbitrary economic expansion in overlapping ministries, departments and agencies (MDA) which creates a choking-effect and unreflective of government spending. Conversely, in the long run as indicated by c_4, c_5 , that is $\ln GTS(-1)$ and $\ln RGDP(-1)$, $\ln GTS(-1)$ is statistically significant at 0.012, while $\ln RGDP(-1)$ is not. This reflect the short-run outcome where it shows that though, government is expanding arbitrarily, but the expansion do not reflect increase in spending. Thus, we say, $\ln GTS(-1)$ is not a probable cause of $\ln RGDP(-1)$. However, $\ln RGDP(-1)$ report from the table shows that it is statistically insignificant in the long run, individually. That is, it indicates a probability = 0.2305 and it is above 0.05 percent hence, the null is not rejected. What this outcome simply says is that real gross domestic product does not explain government total spending in the long run individually. In order words, having confirmed the absence of no serial correlation earlier, the study proceeded to diagnosed possible outbound from the bound line by performing a model diagnostic. It also performs Granger causality test and the Wald test in order to jointly confirm the statistically significant relationship of the variables and cause of direction between the two (see Table 8).

Again, it is essential that the study is diagnosed of possible error that could lead to false estimation. The study did this by confirming the cumulative sum test using the recursive estimate. As a role, whenever, the inbound blue line is outbound, that is, when it falls outside the red line, it means there is the possibility of model error otherwise, if within the red, it means the model is stable. As can be seen from the model graph, the line falls within the bound line hence, the model is diagnosed to be stable. The study thus proceeded to test the residual of the estimate using the Wald test (see Figure 5).

The Granger causality test is used to further confirm the directional relationship between the series. As WP opined, government expansion necessitates increased spending or vice-versa (Adedokun and Olaniyi, 2017). Thus, the two are complementary. From the table, the null

Table 9. Granger causality test.

Null Hypothesis:	Obs	F-Statistic	Prob.
LNGTS does not Granger Cause LNRGDP	54	0.00087	0.0000
LNRGDP does not Granger Cause LNGTS		0.000440	0.0000

Table 10. Bound test.

Test Statistic	Value	df	Probability
F-statistic	3.420963	(2, 51)	0.0404
Chi-square	6.841926	2	0.0327

hypothesis that government spending does not granger cause real gross domestic product is not true. Similarly, that economic growth does not granger cause spending is also not true judging by the corresponding probabilities of 0.000, respectively. By implication, a bidirectional relationship subsists between this two. This finding thus support Santos (2–13) and Adedokun, & Olaniyi (2017) (see Table 9).

4.1.7. Bound testing wald test

Again, recall the overparameterized outcome showed the individual significance of the variables both in the short run and in the long run. However, to test jointly their statistically significant relationship, the study indeed checked whether the coefficient c_4 , c_5 are indeed = 0 using the Wald test. However, unlike model stability where its corresponding F-statistical probability can be chosen arbitrarily, Wald testing is not available for arbitrary selection (Pesaran and Shin, 1999; Pesaran et al., 2001). Accordingly, the Bound table is applied to see the difference in calculated value and the tabulated value based on information selection criterion used in the augmented dickey fuller process. This is to confirm the long – run cause and effect impact of the series. From the result, since the upper and lower bound of the tabulated (F-statistic) is = $I(0) = 4.68$ and $I(1) = 5.15$ respectively, and that of the F- calculated is = 3.42. It then means that since, 3.42 falls below the lower bound $I(0)$, we can conclude that there is statistically insignificant relationship between real gross domestic product and government total spending in Nigeria for the period in review. This invalidate Adedokun & Olaniyi (2017) summation of significant cause between government expenditure and growth of WP proposition. By implication, a long run cointegration does not exist between real gross domestic product and government total spending. This outcome negates the Wagner's Hypothesis that spending spur growth and we conclude in this study that WH is not valid for Nigeria. This result corroborate that of MATIK in Kargi (2016), Moore (2016), Gatsi, et al. (2019) and Babatunde (2011) (see Table 10).

5. Conclusion

Succinct exploration of how government total spending trajectory impacts on real gross domestic product in Nigeria as opined in Wagner's Proposition/Peacock – Wiseman version was put to validation test in the study. The succinct exploration propelled a paradigm shift whereby the study examined in totality the life and age in the country's government practices/activities in relations with economic growth aspirations. Specifically, the study accounted for possible shocks or disturbances (such as inflation, economic disruptions, currency up/down swing, political instability, global influences, among others), that could, otherwise, not have been treated in full fledge in the life and age of the country by other scholars. In conclusion, because of the presence of structural shocks, leading to step-by-step econometric identification of possible contribution of government spending on growth (as proposed in Wagner's Proposition), results, as displayed between autoregressive distributed lag (ARDL) but confirmed with WALD test is explained. While the later affirmed the presence of significant relationship between spending in the long – term, that is, c_4 c_5 , in $\ln GTS(-1)$ and $\ln RGD(-1)$, $\ln GTS(-1)$ at 0.012, the latter invalidate this conclusion at lower bund of F- calculated = 3.42 of $I(0) = 4.68$ and $I(1) = 5.15$ table, even though a bi-directional causality result is found. This conclusion corroborates that of Chimobi (2009) and Babatunde (2011). With this, the study concludes that, economic growth is not a reflection of government spending in Nigeria. Hence, WP – Peacock and Wiseman version, in this case, does not hold.

5.1. Recommendations

Even though the Granger causality results report bi-directional relationship between economic growth and government spending, it is strongly advised that a possible reduction in non-economically viable and overlapping funds-straining ministries/departments/agencies

(MDA) is essential as reported by the Bounds result. At least for visible growth – spending balance. Also, reason for growth plan must be spending-tied, automated and technologically driven. Similarly, spending-execution cum economic growth - performance [SEE-GP] must be tied with a benchmark upon which each MDA's and administration will be judged.

Declarations

Author contribution statement

A.A. Babajide: Conceived and designed the experiments; Contributed reagents, materials, analysis tools or data; Wrote the paper.

F.A. Okunlola: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

E.Nwuba and A. Lawal: Performed the experiments; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Funding statement

We will like to appreciate the Management of Covenant University, Ota, Nigeria for providing the Article Processing Fee to support the Open Access policy for this work.

Competing interest statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

References

- Abdur, R., Abdul, Q., Khair-uz, Z., 2012. Relationship between public expenditure and national income: an empirical investigation of Wagner's Law in case of Pakistan. *Acad. Res. Int.* 2 (2).
- Abizadeh, S., Yousefi, M., 1988. An empirical reex- amination of Wagner's law. *Econ. Lett.* 26, 169–173.
- Adedokun, A., Olaniyi, C.O., 2017. Nigeria economic recess versus wagner's law and keynesian proposition. *Int. J. Econom. Manag. Sci.* 6 (3), 424.
- Adetoye, D., 2016. Ethnicity and state creation in Nigeria: exploring the nexus between the babel of tongues and institutionalization. *Int. J. Econom. Com. Manag.* 4 (4).
- Aktan, C.C., 2017. Why does government grow? The sources of government growth from public choice perspective. *Int. J. Econ. Finance Stud.* 9 (1).
- Alapiki, H.E., 2005. State creation in Nigeria: failed approaches to national integration and local autonomy. *Afr. Stud. Rev.* 48 (3), 49–65.
- Alimi, R.S., 2013. Testing augmented Wagner's law for Nigeria based on cointegration and error-correction modelling techniques. In: *Munich Personal RePEc Archive (MPRA)*, Paper No. 52319.
- Aliu, A.J., 2016. Fiscal sustainability in the presence of structural breaks: does overconfidence on resources exports hurt government's ability to finance debt? Evidence from Nigeria. *Cogent Econom. Finan.* 4 (1).
- Ampah, I.K., Kotosz, B., 2016. Wagner versus Keynes: the causal nexus between government expenditure and economic growth: an empirical study of Burkina Faso. *J. Heterodox Econom.* 3 (2), 74–101.
- Anoke, C.I., Idenyi, O.S., Chibuzor, C.B., Agbi, P.E., 2016. Testing the applicability of Wagner's law in Nigeria. *J. Res. Bus. Manag.* 4 (6), 33–45.
- Antonis, A., Constantinos, K., Persefoni, T., 2013. Wagner's law versus keynesian hypothesis: evidence from pre-WWII Greece. *Panoeconomicus* 63 (1), 45–60.
- Atasoy, B.S., Gur, T.H., 2016. Does the Wagner's hypothesis hold for China? Evidence from static and dynamic analyses. *Panoeconomicus* 63 (1), 45–60.
- Asaleye, A.J., Alege, P.O., Lawal, A.L., Popoola, P.O., Ogunidipe, A.A., 2020. Cash Crops Financing, Agricultural Performance and Sustainability: Evidence from Nigeria African Journal of Economic and Management Studies.
- Babajide, A., Lawal, A., Asaleye, A., Okafor, T., Osuma, G., 2020. Financial stability and entrepreneurship development in sub-Sahara Africa: implications for sustainable development goals. *Cogent Soc. Sci.* 6, 1798330.
- Babatunde, M.A., 2011. A bound testing analysis of Wagner's law in Nigeria: 1970–2006. *Appl. Econ.* 43, 2843–2850.
- Barra, C., Bimonte, G., Spennati, P., 2015. Did fiscal institution affect Wagner's law in Italy during 1951–2009 period? An empirical analysis. *Appl. Econ.* 47 (59), 6409–6424.
- Brown, G.M., 2013. Nigerian political system: an analysis. *Int. J. Humanit. Soc. Sci.* 3 (10), 172–179.
- Central Bank of Nigeria, 2009. *Statistical Bulletin Anniversary Edition*.

- Central Bank of Nigeria, 2019. Statistical Bulletin 2019.
- Chimobi, O.P., 2009. Government expenditure and national income: a causality test for Nigeria. *Eur. J. Econ. Polit. Stud.* 2, 1–11.
- Clemente, J., 2017. Structural breaks, inflation and interest rates: evidence from the G7 Countries. *Econometrics* 5 (11).
- Dahunsi, S.O., Osueke, C.C., Olayanju, T.M.A., Lawal, A.I., 2019a. Co-digestion of Theobroma cacao (Cocoa) pod husk and poultry manure for energy generation: effects of pretreatment methods. *Bioresour. Technol.* 283, 229–245.
- Eze, T.C., 2016. Re-examination of Wagner's Hypothesis: implication for the dwindling oil revenue in Nigerian Economy. *Asian Dev. Pol. Rev.* 4 (3), 74–90.
- Facchini, F., 2014. The determinants of public spending: a survey in a mythological Perspective. *Munich Personal RePEc Arch.* 53006, 1–65.
- Funashima, Y., 2015. Wagner's law versus displacement effect. In: *Munich Personal RePEc Archive MPRA Paper No. 68390*.
- Gatsi, J.G., Appiah, M.O., Gyan, J.A., 2019. A test of Wagner's hypothesis for the Ghanaian economy. *Cogent Bus. Manag.* 6 (1), 1647773.
- Goffman, L.J., 1968. On the empirical testing of wagner's law: a technical note. *Public Financ.* 23 (3), 359–364.
- Gupta, S., 1967. Public expenditure and economic growth. a time series analysis. *Public Financ.* 22 (4), 423–461.
- Ibok, O.W., Bassey, N.E., 2015. Wagner's Law revisited: the case of Nigerian Agricultural sector (1961–2012). *Int. J. Food Agric. Econ.* 2 (3), 19–32.
- Inegbedion, H., Obadiaru, E.D., Obasaju, O.B., Asaleye, A.J., Lawal, A.I., 2019. Financing agriculture in Nigeria through agricultural extension services of agricultural development programmes (ADPs). F1000 Res.
- Kargi, B., 2016. Is Wagner's Law applicable for fast growing economies? BRICS and MATIK Countries. *Timisoara J. Econ. Bus.* 9 (1), 1–15.
- Keho, Y., 2017. Threshold cointegration, asymmetric causality and Wagner's law: the African Experience Revisited. *Int. J. Econ. Finance* 9 (5).
- Kucukkale, Y., Yamak, R., 2012. Cointegration, causality and Wagner's law with disaggregated data: evidence from Turkey, 1968–2004. In: *Munich Personal RePEc Archive (MPRA) Paper No. 36894*.
- Lawal, A.I., Ozturk, I., Olanipekun, I.O., Asaleye, A.J., 2020a. Examining the linkages between electricity consumption and economic growth in African economies. *Energy*.
- Lawal, A.I., Omoju, O.E., Babajide, A.A., Asaleye, A.J., 2019b. Testing Mean-reversion in agricultural commodity prices: evidence from wavelet analysis. *J. Int. Stud.* 12 (4), 100–114.
- Lawal, A.I., Oseni, E., Babajide, A.A., Lawal-Adedoyin, B., Bonetipin, F., 2020b. The impact of International Financial Reporting Standard (IFRS) adoption on key financial ratios in Nigeria. *Hum. Soc. Sci. Rev.* 8 (4), 289–300 eISSN: 2395-6518, 2020.
- Li, J., Omoju, O.E., Zhang, J., Ikhide, E.E., Lu, G., Lawal, A.I., Ozue, V.A., 2020. Does intellectual property rights protection constitute a barrier to renewable energy? an econometric analysis. *Natl. Inst. Econ. Rev.* No. 251 February 2020.
- Magazzino, C., Giolli, L., Mele, M., 2015. Wagner's law and Peacock and wiseman's displacement effect in European union countries: a panel data study. *Int. J. Econ. Financ. Issues* 5 (3), 812–819.
- Mann, A.J., 1980. Wagner's law: an econometric test for Mexico, 1925–76. *Nat. Tax J.* 33 (2), 189–201.
- Manyeki, J.K., Kotosz, B., 2017. Empirical analysis of the Wagner Hypothesis of government expenditure growth in Kenya: ARDL modeling Approach. *Club Econom. Miskolc' TMP* 13 (2), 45–57.
- Moore, S., 2016. Wagner in Ireland: an econometric analysis. *Econ. Soc. Rev.* 47 (1), 69–103.
- Mohammad, A.M., 2006. A Theoretical and Empirical Analysis of the Wagner Hypothesis of Public Expenditure Growth. University of Western, Sydney. Ph.D Thesis.
- Musgrave, R.A., 1969. Fiscal Systems. Yale University Press, London.
- Narayan, P.K., Nielsen, I., Smyth, R., 2008. Panel data, cointegration, causality and Wagner's law: empirical evidence from Chinese provinces. *China Econ. Rev.* 19, 297–307.
- Ogunbiyi, S.S., Okunlola, F.A., 2015. External debt and the capital accumulation of Nigeria: a Co-integration approach (1980 - 2012). *Res. J. Finance Account.* 6 (11), 182–191.
- Okoye, L.U., Modebe, N.J., Erin, O.A., Evbuomwan, G.O., 2015. Effect of external debt on economic growth: evidence from Nigeria. In: *Sustainable Economic Growth, Education Excellence, and Innovation Management through Vision 2020*.
- Okorie, C.O., 2014. A survey of public service reforms in Nigeria: 1999–2013. *Int. J. Humanit. Soc. Sci.* 4 (10).
- Okunlola, F.A., Ajala, A.O., Odesaya, T.A., 2015. Infrastructure dilemma and alternative funding: evidence from Nigeria. *Adv. Multidisc. Sci. Res. J.* 1 (2).
- Okunlola, F.A., Godswill, G.O., Omankhanlen, E.A., 2019b. Agricultural finance and economic growth evidence from Nigeria. In: *Accepted: Verslas: Teorija IR Praktika/ Business: Theory and Practice*, 20, pp. 417–425.
- Okunlola, F.A., Osuma, G.O., Omankhanlen, E.A., 2019a. Has Nigerian Agricultural output spurred economic growth: the financing gap model using stepwise regression? *Invest. Manag. Financ. Innovat.* 16 (3), 155–166.
- Oladejo, O.S., Dahunsi, S.O., Adesulu-Dahunsi, A.T., Ojo, S.O., Lawal, A.I., Idowu, E.O., Olanipekun, A.A., Ibikunle, R.A., Osueke, C.O., Ajayi, O.E., Osueke, N., Evbuomwan, I., 2020. Energy generation from anaerobic Co-digestion of food waste. *Cow Dung Piggery Dung Bioresour. Technol.* 313, 123694.
- Olanrele, I.A., Lawal, A.I., Dahunsi, O.S., Babajide, A.A., IseOlorunkanmi, J.O., 2020. The impact of access to electricity on education and health sectors in Nigeria's rural communities. *Entrep. Sustain. Issues* 7 (4), 3016–3035.
- Oxley, L., 1994. Cointegration causality and wagner's law: a test for britain 1870–1913. *Scot. J. Polit. Econ.* 41, 286–298.
- Perron, P., 2018. Unit roots and structural breaks. *Econometrics. Special issues* accessed from.
- Pesaran, M.H., Shin, Y., 1999. An Autoregressive Distributed lag modeling approach to cointegration analysis. In: *Econometrics and Economic Theory in the 20th century: the Ragnar Frisch Centennial Symposium*. Cambridge University Press.
- Peacock, A.T., Wiseman, J., 1961. The Growth of Public Expenditure in the United Kingdom. NBER and Princeton: Princeton University Press, Cambridge.
- Peacock, A.T., Wiseman, J., 1967. The Growth of Public Expenditure in the United Kingdom, New ed. George Allen & Unwin Ltd, London.
- Pesaran, M.H., Shin, Y., Smith, R.J., 2001. Bound testing approaches to the analysis of level relationships. *J. Appl. Econom.* 16, 289–326.
- Salwindi, N., Seshamani, V., 2016. The relevance of Wagner's Law in Zambia. *Int. Rev. Res. Emarg. Mark. Glob. Econom.* 2 (2).
- Sekantsi, L.S., Molapo, S.S., 2017. Testing validity of Wagner's law in Lesotho. *Rev. Econom. Bus. Stud.* 10 (1), 75–102.