Testing Wagner's Law for The Gambia, 1977-2013

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Abstract: Wagner's law relates the positive nexus between public spending and economic activity, where greater economic activity leads to increased public spending. This paper examines the validity of this hypothesis for The Gambia for the period 1977-2013. Using econometric techniques of ARDL bounds test, Johansen and Juselius (1990) multivariate cointegration test, Granger causality and Toda and Yamamota (1995) Granger non-causality tests, the findings show validity for Wagner's law for The Gambia. Therefore, the government of the Gambia should channel it's expenditures toward the productive sectors of economy so as to promote economic growth in the country.

Keywords: Wagner's law, Bounds test, The Gambia, Granger causality.

1. Introduction

While empirical studies on the role of public spending on economic growth surged in the post-war period, the theoretical literature dates back to earlier pre-war period. Keynes in his General Theory of Employment, Interest and Money (1936) believes that public spending determine economics growth and can be used as a stabilization policy instrument. Hence, in a recession it will be wise for the government to pay men to dig and bury a ditch in an effort to fight the economic downturn. Therefore, in the Keynesian view causality runs from government expenditure to economic growth.

Adolf Wagner, however, has a different view. In 1893 Adolf Wagner's propound his famous “law of increasing expansion of public, and particularly state, activities” in Grundlegung der politischen Ökonomie. He postulated that as an economy grows, so does the size of the public sector in an even increasing manner. According to his view economic growth triggers expansion of the public sector. Therefore, causality in Wagnerian case is supposed to run from economic growth to government expenditure. But Wagner’s law rests on three pillars for its validity (Henrekson, 1993; Halicioglu, 2000; Moore, 2016). First, the process of industrialization brings with it increased demand for public services which leads to the replacement of the private sector by the government, especially in key areas of protection and regulatory activities. Second, because the demand for 'cultural and welfare' goods are income inelastic, higher real income from growth boost the demand for these goods and therefore government expenditure. Finally, on efficiency grounds government needs to replace natural monopolies in the process of development as technology progresses. Financing requirements of certain public infrastructure projects may be too high that the private sector cannot efficiently fund them.

However, this pillar rest on the following conditions (Jaen-garcia . M, 2011)

- increasing national income and overall welfare, and per capita income
- The important role technological progress
- Democracy and constitutional state, where people participate in political and financial decisions

This papers attempts to test the validity of Wagner’s law for The Gambia for the period 1977-2013 using econometric techniques of cointegration and granger causality test. This paper contributes to the literature in providing the first evidence on the validity of Wager's for The Gambia that employs bound testing approach for the period under study. The rest of the paper is divided as follows: the analytical framework is presented in section 2 before the literature review in section 3. Sections 4 and 5 present the econometric methodology and empirical results respectively. The final section has the conclusion and recommendations.

2. The Analytical Framework

Because Wagner himself was not specific on the measure of public spending and economic activity, empirical researchers have attempted different interpretations of the law (Babatunde M. A, 2006). For example, Peacock-Wiseman (1961) saw the law as relating real government expenditure to real GDP. Mann (1980) revised this view of Peacock-Wiseman and relates government expenditure as a percentage of GDP to real GDP. Goffman (1968), Gupta (1967) and Musgrave (1969) interpret economic activity in terms of per capita real income. While Goffman (1968) consider real GDP and per capita income relation, Gupta (1967) find content by interpreting the law in terms of per capita government spending and per capita real income. Finally, for Musgrave (1969) government size- given as government as percentage of GDP- and real income per capita relation explains Wagner's law.

In some studies all versions are tested (see Verma and Arora, 2010; Babatunde, 2006) while in others only a single version is employed, usually the Musgrave (1969) interpretation of the law (Henrekson, 1993; Halicioglu, 2000; Moore 20016). This paper tests the validity of Wagner's law for all five versions for The Gambia from 1977 to 2013. The functional forms corresponding to the various interpretations are given below.

$$GE = f(GDP) \qquad Peacock - Wiseman\ (19611) \qquad (1)$$

$$\frac{GE}{GDP} = f(GDP) \qquad Mann\ (1980) \qquad (2)$$

$$GE = f(GDP/N) \qquad Goffman\ (1968) \qquad (3)$$

$$\frac{GE}{N} = f\left(\frac{GDP}{N}\right) \qquad Gupta\ (1967) \qquad (4)$$

$$\frac{GE}{GDP} = f\left(\frac{GDP}{N}\right) \qquad Musgrave\ (1969) \qquad (5)$$

3. Literature Review

A careful study of the empirical literature on government expenditure and growth reveals that great work has been done in this area. Therefore, in this section a brief review of the empirical literature is presented. From a broader perspective, earlier studies on Wagner's law concerned themselves with the appropriate interpretation of the law culminating into the five most famous versions presented above (see Peacock-Wiseman, 1961; Mann, 1980; Goffman, 1968; Gupta, 1967; and Musgrave, 1969). Later studies would test the empirical validity of the law mainly utilizing one or all of the above specifications. Perhaps the first use of modern time series econometric methods of unit root and cointegration was applied by Henrekson (1993) and since then numerous studies for different economies have been conducted. Table 1 gives summary table of various studies according to period, econometric method and results.

A notable pattern is that most studies, and especially those that employ recent autoregressive distributed lag (ARDL) bounds testing approach, seem to show validity for Wagner's law. According to Durevall and Henrekson (2011) review of the literature about 65 % and 35% of evidences show validity and rejection for Wagner's respectively. For example, Babatunde, M. A, (2006) for Nigeria and Afzal, M and Abbas, Q (2010) found no evidence for the validity of Wagner's law despite using different cointegration and causality techniques. On the other hand, Kumar et al (2009) for New Zealand, Henrekson (1993) for Sweden from1861 to 1988, Halicioglu, F (2003) for Turkey, Pahlavani, Abed and Pourshabi (2011) for Iran, Anotmis, A (2013) for pre-WWII Greece and Moore (2016) for 1970-2012 Ireland all found evidence for Wagner's law.

In Africa evidence for Wagner's law from single country studies can be found in Menyah, K and Wolde-Rufael, Y (2013) for Ethiopia during 1950-2007, Odhiambo, N M (2015) for South Africa, and Ibok and Bassey (2012) for agricultural sector of Nigeria for the period 1961 – 2012. All papers employed cointegration and causality techniques. Similarly, Keho (2015) find support for Wagner's law in Cameroon, Ghana and Nigeria from a group of ten African countries. The author used a frequency domain causality analysis. Biyase, M and Zwane, T

(2015) studied a panel of 30 African countries using panel data techniques and found evidence in support for Wagner's law for the from 1995 to 2005.

Similarly, several panel country studies have been conducted in an urged to test Wagner's law. In the European Union area, Karagianni, Pempetzoglou and Strikou (2002) employed Engle-Granger and Johansen cointegration techniques in conjunction with Granger causality for 15 individual EU countries. The study shows validity for only Finland and Italy for the period 1949-1998. Perhaps the most interesting studies on Wagner's law for the EU area is Magazzino, C (2012). Dividing the regions into 'poor' and 'rich' and using panel GMM in addition to time series analysis for individual 27 EU countries, Magazzino, C (2012) validates Wagner's law for both groups, casting doubt on the view that Wagner's law is a developed country phenomenon.

Panel unit root and cointegration techniques are employed in the literature by Jaen-Garcia, (2011) for Spain's regions and Narayan et al (2006) for Chinese provinces. While Narayan find mixed results, Jaen-Garcia, (2011) find support for the law for both static (FMOLS and DOLS) and dynamic (PMGE) panels. Recent evidences in support for Wagner's law are documented elsewhere: Bojanic, A. (2013) for Bolivia from 1940 to 2010, Permane, Y.H., Wike, G.S. (2014) for Indonesia, and Verma and Arora (2010) for India for the period 1950-2007.

Table I: Summary Empirical Results on Wagner's Law

Author(s) and Date	Data	Method	Countries	Validity		Year
Henrekson (1993)	TS	OLS	Sweden	✓		1861-1990
Kumar et al (2009)	TS	ARDL, E-G, FMOLS	New Zealand	✓		1960-2007
Halicioglu (2003)	TS	J-J and T-Y	Turkey	✓		1960-2000
Verma and Arora (2010)	TS	J-J and G.C test	India	✓		1950-2007
Keho (2015)	TS	Frequency Domain Causality	10 African Countries	✓	(Three)	1965-2013
Karagianni, Pempetzoglou and Strikou (2002)	TS	J-J and G.C test	EU-15	✓	(2 countries)	1949 - 1998

Anotmis, A (2013)	TS	ARDL and G. C test	Greece	✓		1833-1938
Jaen-garcia, M (2011)	PD	FMOLS, DOLS, PMGE	Spain	✓		1984 -2003
Bojanic, A. (2013)	TS	J-J and G.C test	Bolivia	✓		1940 - 2010
Afzal, M and Abbas, Q (2010)	TS	J-J and G.C test	Pakistan		No	1960 - 2007
Pahlavani, Abed and Pourshabi (2011)	TS	ARDL and T-Y	Iran	✓		1960 - 2008
Babatunde, M. A (2006)	TS	ARDL and T-Y	Nigeria		No	1970 -2006
Ibok and Bassey (2012)	TS	J-J and G.C test	Nigeria	✓		1961 – 2012
Menyah, K & Wolde-Rufael Y. (2013)	TS	ARDL and T-Y	Ethiopia	✓		1950 -2007
Permane, Y.H. & Wike, G.S. (2014)	TS	ARDL	Indonesia	✓		1999-2011
Moore, S. (2016)	TS	ARDL	Ireland	✓		1970-2012
Biyase, M. & Zwane, T. (2015)	PD	Pooled OLS, FE and RE	30 Afri. Countries	✓	(3)	1990-2005

* *TS, PD, FMOLS, FE, T-Y, G.C, PMGE, ARDL, OLS, J-J AND E-G refers to time series, panel data, fully modified ordinary least squares, Toda and Yamamoto causality, Granger causality, panel mean group estimator, autoregressive distributed lag, ordinary least square, Johansen and Juselius multivariate cointegration technique and Engle and Granger respectively.*

4. Model and Econometric Methodology

4.1 The Models and Data

In line with the literature, this paper estimates a long run relationship between public expenditure and economic growth as given below, where lowercase letters represent natural logarithms. The specifications for the models above are given below.

$$ge_t = a_0 + a_1 y_t + \epsilon_t \tag{6a}$$

$$gey_t = b_0 + b_1 y_t + \mu_t \tag{6b}$$

$$ge_t = c_0 + c_1 py_t + \Omega_t \tag{6c}$$

$$pge_t = d_0 + d_1 py_t + \psi_t \tag{6d}$$

$$gey_t = e_0 + e_1 py_t + \omega_t \tag{6e}$$

where gey_t is government expenditure as a percentage of GDP, py_t is the real output per capita y_t is real output, ge_t is government expenditure, pge_t is per capita government expenditure and ϵ_t , v_t , μ_t, Ω_t, ψ_t, and ω_t are the classical error terms for the various specifications. Peacock and Scout (2000) interpret that the long run evolution of public spending and growth in economic activity is what Wagner had in line. Therefore, the establishment of cointegration in the above relations will count as evidence of the law. However, in the strict sense the coefficient of the long run parameters of economic growth should carry a positive sign to be indicative of the validity of Wagner's law. Specifically, Wagnerian hypothesis is valid when $a_{1,}c_1, d_1 > 1$ or $b_1, e_1 > 0$ (see Menyah, K & Wolde-Rufael Y, 2013 and Bojanic, A. 2013).

4.2 The Econometric Methodology

According to econometric theory, the long run relationship depicted (6a-e) can be estimated through the inclusion of short run dynamics adjustments terms. Engle-Granger (1987) does this by expressing (6e) in an error correction format as can be seen below.

$$\Delta gey_t = b_0 + \sum_{i=1}^{m1} b_{1t}\Delta gey_{t-i} + \sum_{i=1}^{m2} b_{2t}\Delta py_{t-i} + \gamma\varepsilon_{t-1} + \mu_t \qquad (7)$$

where Δ represent change, γ is the parameter for the speed of adjustment, mi show the number of lags, and ε_{t-1} is the lagged errors correction term , derived from the residuals of (6e). However, this Engle-Granger representation requires all variables to be integrated of order one [I (1)] and the error correction term of order zero [I (0)] to establish cointegration. Advance in econometrics by Pesaran et al (2001) shows that the Engle-Granger two steps can be combined into one, where the level of integration does not matter as long as one can avoid 1(2) variables. This procedure is called autoregressive distributed lag (ARDL) approach. It replaces the error correction term in (7) with its equivalent in (6e). Equation 8 shows the ARDL specification of (6e).

$$\Delta gey_t = c_0 + \sum_{i=1}^{n1} c_{1t}\Delta gey_{t-i} + \sum_{i=1}^{n2} c_{2t}\Delta py_{t-i} + c_3 gey_{t-1} + c_4 py_{t-1} + v_t \qquad (8)$$

The ARDL approach to cointegration, also called the bound testing approach, has superior advantages when compared to other methods. Firstly, it avoids endogeneity problem and the inability to do hypothesis testing on the long run relationship associated with Engle-Granger two-step procedure. Secondly, the approach returns the short and long run coefficients concurrently. Thirdly, as indicated above, the procedure is used to established relationship between series in levels irrespective of whether they are purely I(0), I(1) or mutually integrated. Finally, Naragan (2005) shows that ARDL approach has better small sample properties when compared to multivariate technique of cointegration. However, any I (2) variable must be avoided.

Bound testing approach to long run relationship involves estimating (8), from which a joint test of restriction is performed on the long run coefficients c_3 and c_4 using F-statistic. The null hypothesis favors no cointegration (H_0: c_3 = c_4=0), while the alternative hypothesis favors cointegration (H_1: $c_3 \neq c_4 \neq 0$). The test follows a non-standard distributed, so Pesaran et al (2001) provides asymptotic critical values for upper and lower bound. For decision making purposes, the computed F-statistics is compared to the bounds such that if the F-statistics falls below the lower bound, the null hypothesis cannot be rejected. If the F-statistics falls above the upper bound, then we reject the null of no cointegration.

The short run effects are inferred from the coefficients of the difference terms in (8), while the long run effects are derived from the coefficients of lagged independent variables normalized on the estimate of lagged dependent variable.

After establishing a long run relationship, the ARDL approach estimates the error correction model using appropriate lags as advised by the information criteria of AIC, SBC, Hanan Queen, or Adjusted R-square. The error correction term is derived by replacing the lagged level variables in (8) with EC_{t-1} as shown below in equation (9).

$$\Delta gey_t = d_0 + \sum_{i=1}^{p1} d_{1t} \Delta gey_{t-i} + \sum_{i=1}^{p2} d_{2t} \Delta py_{t-i} + \lambda EC_{t-1} + \mu_t \qquad (9)$$

The coefficient on the error correction term is indicative of the speed of adjustment following a disturbance as well as an indicator for cointegration once the F-test fails. In Bahmani-Oskooee and Goswami (2003), it is argued that the F-test result can be very sensitive to the choice of the lags included in (8). Therefore, Bahmani-Oskooee and Ardalani (2006) shows that the error correction representation can be used as an alternative evidence to established cointegration when λ is negative and significant. Kremers et al (1992) and Banerjee et al (1998) also show that a negative significant EC_{t-1} is another evidence for cointgeration in Engle-Granger framework.

Johansen and Juselius's (1990) multivariate cointegration technique is used for robustness test of the ARDL results. This techniques is based on an unrestricted VAR of the form

$$Z_t = \pi_t + \sum_{i=1}^{k} \Gamma_i \, Z_{t-i} + \mu_t$$

where is $Z_t = [gey_{t,}, py_t]$ is a vector of non-stationary endogenous variables, π_t is a matrix of constants and Γ_i is a vector of coefficients. The lag length and residual vector are k and μ_t respectively. Decision about cointegration is based on the rank of Γ_i matrix, which can be found by maximum Eigen value and trace tests. The optimal lag length for the VAR above is based on AIC and SBC information criteria. According to Cheung and Lai (1993) critical values of Johansen and Juselius (1990) for small samples need to be scaled by a factor

$$SF = T(T - nk)$$

where T is the number of observations, n is thenumber of variables in the system, and k is the lag length.

Standard Granger causality analysis has been criticized for the possibility of making incorrect inference and that in some cases it suffers from nuisance parameter dependency asymptotically. Toda and Yamamoto (1995) Granger non-causality approach is simple and avoids these shortcomings. It estimates an augmented VAR which guarantees asymptotic distribution of the modified Wald statistic even if there is cointegration. It is based on a $(k + dmax)th$ order VAR in levels, where k is the number of optimal lags advised by lag selection criteria and $dmax$ is the maximum level of integration in the series. The procedure is valid as long as k is greater than or equal to $dmax$ and it does not matter whether the series are integrated or stationary, cointgerated or not (Babatunde, M. A. 2006). The Wald test is Chi-square distributed with the degree of freedom equal to the number of restrictions. Considering the Musgrave (1969) version, Toda and Yamamoto procedure can be illustrated by the following system.

$$gey_t = e_0 + \sum_{i=1}^{k+\text{dmax}} e_{1t} gey_{t-i} + \sum_{i=1}^{k+\text{dmax}} e_{2t} py_{t-i} + \mu_t \qquad (10a)$$

$$py_t = f_0 + \sum_{i=1}^{k+\text{dmax}} f_{1t} py_{t-i} + \sum_{i=1}^{k+\text{dmax}} f_{2t} gey_{t-i} + \mu_t \qquad (10b)$$

Decision on causality is based on the joint significance of e_{2t} and f_{2t} for $i = 1, .., k$. The joint significance of e_{2t} parameters mean causality runs from growth to public spending and the other way round if f_{2t} are jointly significant.

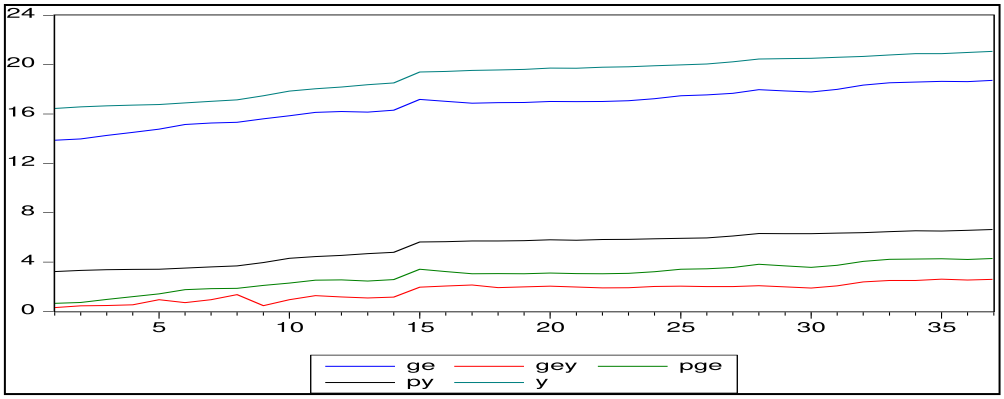
5. Empirical Results

In all, there are five variables, namely: real government expenditure (ge), real GDP(y), real GDP per capita(py), government expenditure as percentage of GDP (gey) and real government spending per capita(pge). All variables are left-skewed but normality assumption cannot be rejected for all variables**.** Results are shown in table 1 below. The probability values for Jargue-Bera are too high to reject normality at 5% level of significance and even at 10% also.

	py	pge	gey	ge	y
Mean	5.249753	2.888756	1.65443	16.74022	19.10122
Median	5.736252	3.064276	1.963289	17.01089	19.61544
Maximum	6.641688	4.289048	2.617747	18.72883	21.08147
Minimum	3.229355	0.654505	0.315851	13.87549	16.45034
Std. Dev.	1.166443	1.03063	0.696687	1.38923	1.524944
Skewness	-0.56568	-0.60101	-0.51572	-0.47876	-0.48393
Kurtosis	1.769687	2.490631	1.999822	2.295677	1.784393
Jarque-Bera	4.306896	2.627456	3.182344	2.178227	3.722264
Probability	0.116083	0.268816	0.203687	0.336515	0.155497

Figure 1 plots the graphs of the time series variables, and clearly all variables show intercept and trend. All variables have been rising during the sample period, with real government spending closely moving with real government expenditure as shown in the upper part of figure 1. Similarly, the per capita GDP and per capita government spending are closely related in the lower part of the graph. A graphical inspection would also reveal that structural shifts or breaks do not seem to be problem in our data.

Figure 1: Trends



Hence, stationarity test with a constant and trend model is preferred over a constant or none. Augmented Dickey-Fuller test for stationarity improves over the Dickey-Fuller by including the autoregressive terms to account for autocorrelation in the errors. Phillips-Perron's method of unit root test results is also produce for robustness.

Table 2: Unit Root Test Results

ADF test statistics			PP test statistic	
Variable	Level	1st Difference	Level	1st Difference
ge	-2.30(0.42)	-5.72 (0.00)*	-2.31 (0.51)	-6.86 (0.00)*
pge	-2.43 (0.38)	-5.80 (0.00)*	-2.32 (0.41)	-7.97 (0.00)*
y	-0.85 (0.95)	-5.29 (0.00)*	-0.93 (0.94)	-5.29 (0.00)*
gey	-3.25 (0.09)	-7.49 (0.00)*	-3.14 (0.11)	-9.74 (0.00)*
py	-0.91 (0.94)	-5.40 (0.00)*	-0.91 (0.94)	-5.40 (0.00)*

Note * indicates stationarity at 1% level of significance.

In table 2 above the results of stationarity test is shown, where both ADF and Philip-Perron's unit root test for a model with constant and trend are employed. The probability values (p-values) for our variables in level are higher than 0.05 for both ADF and PP stationarity test. However, they become smaller than 0.05 when differenced. Hence, it can be said that all five variables are integrated of order one.

In the next stage of the investigation, this paper estimates an unrestricted autoregressive distributed lag model (ARDL). Bounds test is then conducted to make inference about the long run relationship between public expenditure and economic growth. Equation (7) is estimated using Eviews 9 and the result is shown in Table 3.

Table 3: ARDL approach to cointegration summary results

Long run Model						Short-Run Model Diagnostics[c]			
	Order of ARDL [a]	F-statistics [b]	Long run slope	EC_{t-1}	Adj-R^2	X^2_{sc}	X^2_{FF}	X^2_{N}	X^2_{H}
1	AIC (2, 2)	4.18	0.81*	-0.21 *	0.99	1.63	5.44*	1.26	2.76
2	SBC(1,0)	10.54*	0.42 *	-0.75*	0.90	0.57	0.33	4.97	5.58
3	AIC (2, 2)	2.55	0.96*	-0.12	0.99	2.82	5.40*	0.91	2.44
4	AIC (2, 2)	4.81	0.75*	-0.22*	0.98	1.60	3.90*	1.29	2.86
5	AIC (1, 0)	10.31*	0.55 *	-0.74*	0.90	0.49	1.74	5.27	6.99*

[a] the order is selected based on the AIC or SBC which ever chooses the smallest model

[b] the F statistics is the computed F-value and * and ** refer to 1% and 5% level of significance. X^2_{sc}, X^2_{FF}, X^2_{N}, X^2_{H} represent B-G test statistics for serial correlation, Ramsey's RESET test for functional misspecification, J-B test for Normality, and B-P-G LM heteroskedasticity test respectively.

While F-statistics is greater than the upper bound- hence showing cointgeration- in only two versions, results based on the EC_{t-1} indicate long run relationship for all versions except version 6c. This is evidence for Wagner's law when interpreted according to Peacock and Scout (2000) understanding. The long run coefficients are of the expected positive signs for all versions indicating that Wagner's does hold for the Gambia.

Model diagnostics show that model 6e has heteroskedasticity problem which was taken care of by correcting for robust standard errors. Model 1, 3 and 4 indicate misspecification problem based on the LM RESET test at 5%. This problem is likely due to the fact that we have only one explanatory variable. Moreover, the F-version for model 4 indicates no misspecification at 5%. The best models are 2 and 5, which explains the popularity of Musgrave (1969) model in empirical studies of Wagner's law. This result lends credit to the notion that government expenditure as percentage of GDP is the best measure of government size. Hence, Granger causality analysis is carried out on Musgrave (1969) and Mann (1980) versions only.

Table 4: Optimal lag selection

Model	Lag	AIC	SC	HQ
5	1	-0.956463*	-0.776891*	-0.895224*
	2	-0.76478	-0.40564	-0.642306
	3	-0.67314	-0.13442	-0.48942
2	Lag	AIC	SC	HQ
	1	-0.826272*	-0.646700*	-0.765033*
	2	-0.68963	-0.33049	-0.567153
	3	-0.63575	-0.09704	-0.452033

To estimate long run elasticities from Johansen and Juselius (1995) multivariate cointegration procedure, lag order selections results are presented in table 4. All models indicate an optimal lag of 1 according to all three reported selection criteria.

Results of Johansen and Juselius (1990) cointegration test and the estimated long run coefficients therefrom are shown in 5. The trace and maximum Eigen value test statistics indicate only one cointegration relationship in both models 5 and 2. For null hypothesis of atleast one cointegration relationship, the maximum Eigen-value statistics and the trace statistic are sufficiently high that even after controlling for the scaling factor in small samples proposed by Cheung and Lai (1993), cointegration hypothesis cannot be rejected. This is further shown by p-values falling within the 1% range. However, the second null hypothesis of atleast two co-integrating vector is not supported by the trace and maximum Eigen value statistics.

Table 5: Johansen and Juselius co-integration tests and results

Model	Null	Alternative	Max-Eigen stats	P-value	Trace-stats	P-value
5	r= 0	r= 1	17.51777	0.0148 *	19.58741	0.0114 *
	r ≤ 1	r= 2	2.069635	0.2	2.069635	0.1503
2	Null	Alternative	Max-Eigen stats	P-value	Trace-stats	P-value
	r= 0	r= 1	17.79868	0.0133*	19.86076	0.0103 *
	r ≤ 1	r= 2	2.062082	0.2	2.062082	0.151

*shows significance at 5%

For null hypothesis of atleast one cointegration relationship, the maximum Eigen-value statistics and the trace statistic are sufficiently high that even after controlling for the scaling factor in small samples proposed by Cheung and Lai (1993), cannot be rejected.

This is further shown by p-values within the 1% range. However, second null hypothesis of atleast two co-integrating vector is not supported by the trace and maximum Eigen value statistics.

The normalized long run elasticities are estimated and given in table 6. Accordingly, the elasticities are 0.54 and 0.41 for the Musgrave (1969) and Goffman (1968) versions. They are all highly significant and within the range for the validity of the law, which confirms the bounds test result.

Table 6: Long run coefficients

Model 5	gey	$constant$	py
coefficient	-1	-1.21*	0.545203*
Model 2	gey	$constant$	y
coefficient	-1	-6.28*	0.415332*

*shows significance at 5%

In the final analysis, granger causality is carried out to test the direction of causality between government expenditure and growth. Long run causality is given by the negative and statistical significance of γ in each equation, and the short run causality from economic growth to government expenditure is shown by the joint significance of the b_{2t} parameters. The results are given below. Lag order selection result show that optimal lag of 1 is most appropriate according to all criteria.

Table 4: Granger causality results

Dependent variable	F-statistics (probability)		
Model 5	Δgey_t	Δpy_t	ECM_{t-1}
Δgey_t	-	0.1473 [0.51]	-0.7905 [- 4.60]*
Δpy_t	-0.1057 [-0.80]	-	-0.0039 [-0.04]

Note * indicates stationarity at 1% level of significance.

Dependent variable	F-statistics (probability)		
Model 2	Δgey_t	Δy_t	ECM_{t-1}
Δgey_t	-	-0.0928 [-0.69]	-0.8072 [-3.56]*
Δy_t	0.1937 [0.70]	-	0.0148 [0.20]

Note * indicates stationarity at 1% level of significance.

In the table, t-statistics are given in parenthesis next to the coefficients. LR and SR are the long run and short run causality results. The table indicates that sufficiently high t-values exist for long run causality from economic growth to public spending in both model 2 and 5. The asterisks show that we cannot reject the null of granger causality for these two cases at even 1% level of significance. However, causality from government expenditure to growth hypothesis is not supported in the short run and the long run due to low t-values in the table. Therefore, the results indicate support for Wagner's law in the long run.

For robustness analysis, Granger non-causality test of Toda and Yamamoto (1995) is carried out as specified in (10a-b) and results are shown in table 5 below. From the unit root table, the maximum order of integration is 1 ($dmax = 1$). Similarly, the lag selection criteria results are shown optimal lags for models 1, 3 and 4 is 3 and for models 2 and 5 is 1.

Table 5: Toda and Yamamoto (1995) Granger non-causality Test Result

Model	Dependent Variable	Chi-sq	Df	Prob.
1	gey	5.711958	3	0.1265
	y	1.948278	3	0.5832
2	gey	3.517046	1	0.0607***
	y	1.808128	1	0.1787
3	ge	6.809188	3	0.0782***
	py	2.384303	3	0.4966
4	pge	5.311611	3	0.1504
	py	1.936484	3	0.5857
5	gey	4.030566	1	0.0447**
	py	1.334373	1	0.248

** and *** refer to 5% and 10% level of significance

The causality test results show that unidirectional causality from economic growth variables to public spending in three models at 10% level of significance and only in one model is 5% level of significance. In all other models causality test results cannot reject the null hypothesis of no causality at 10% significance level. Hence, it can be concluded that Wagner's law is validated for three out of five models for Gambia for the period 1977-2013 based on the causality analysis. Again, robustness test based on causality analysis show that Granger causality results do not differ from Toda and Yamamoto (1995) Granger non-causality test results.

6. Concluding Remarks

This paper investigates the validity of Wagner's law for The Gambia for the period 1977 to 2013 using a host of econometric techniques. Cointegration techniques of ARDL and Johansen and Juselius (1990) are used to unveil the long run relationship between the variables as well as estimate the long run elasticities in the various models. Causality methods of Granger (1987) and Toda and Yamamoto (1995) are also employed to investigate the direction of causality between government expenditure and economic growth for The Gambia. The findings from cointegration, elasticities and causality analysis lend support to Wagner's law that increasing public spending results from greater economic prosperity in The Gambia during 1977-2013. These results are in line with the greater percentage of the empirical literature on Wagner's laws as shown in Durevall and Henrekson (2011) that around 65 % and 35% of the evidences show validity and rejection for Wagner's respectively.

The corollary to this is the rejection of the Keynesian hypothesis that public spending causes economic growth as shown by granger causality result. What has this to say about macroeconomic policy in Gambia? Authorities should channel more investment into the productive sector of the economy, improve the revenue based through enhancing efficiency in tax collections to minimize the crowding out effect of government spending. Market friendly policies that seek to improve the overall standard of living should be pursued in a way that the private sector is made the focal point.

7. Reference

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