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Empirical Verification of Wagner's Law In Ethiopia

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Abstract
The aim of this study was to investigate the relationship between economic growth and government expenditure in Ethiopia. Using annual data from 1974 to 2009 and Engel-Granger cointegration method six versions of Wagner's Law were tested. The result shows that only the Peacock and Wiseman (1961) version which relates real government expenditure with real GDP support the law. Further, a unidirectional causality was observed from economic growth to government consumption expenditure.

1. Introduction

In his classical economic theory Adolf Wagner predicted that government expenditure will increase at a faster rate than the growth of the economy usually measured by the growth of gross domestic product (GDP).Due to an increase in the need and complexity of social, administrative and welfare issues the share of GDP devoted to government expenditure should increase over time. This tells us that the direction of causation moves from economic growth to government expenditure.

Keynes on the other hand argued that fiscal stimulus is required to boost aggregated demand and economic growth, especially in time of economic downturn. This implies that the direction of causation is from government spending to economic growth unlike Wagner's postulation that government spending is an endogenous variable and grows faster than income growth. According to Wagner government spending is a consequence rather than cause of economic growth. But for Keynes government expenditure is an exogenous variable that can be used to boost economic growth.

This relationship between government spending and economic growth has been an enduring issue in economics and public finance literature's both at theoretical and empirical levels for the last two centuries. A number of previous studies have empirically examined the Wagner's law (the law of increasing public expenditure) and have given conflicting results that differ from country to country. For example, the studies by Gupta (1967), Goffman and Mahar (1971) and Bird (1971) supported the law. But studies by Wagner and Weber (1977) and Ram (1986) negated the validity of Wagner's inference. In case of Nigeria, for the period 1970-2001, Olomola (2004) confirm the empirical validity of Wagner's hypothesis both in the short run and in the long-run. But a study by Babatunde (2008) on a group of four countries including Nigeria for the period 1970-2005 did not find any empirical support for this law.

Generally speaking most of the existing empirical studies suggest that public expenditure could be an endogenous factor that promotes economic growth in developing countries if it involves public investment in infrastructure, but could have a negative effect if it involves only government consumption.

Due to their differences in ether the specification of the model or the measurement of government expenditures and the selection of samples previous studies have not reached a consensus on the relationship between government spending and economic growth (Wu et al; 2010; Gadinabokao and Daw,2013).

As Henrekson (1992) quoted by S. Verma and R. Arora (2010) pointed out, the test of Wagner's law should focus on time series behavior of public expenditure in a country for as long the time period as possible rather than on a cross-section of countries at different income levels. Therefore, the present study attempts to test the validity of Wagner's law in case of Ethiopia using time series data spanning over the period 1974-2009 and six different versions of the law tested by different authors at different time.

1.1 Hypotheses of the study

- Government spending is a consequence rather than cause of economic growth
- There is bi directional causation from government expenditure to economic growth and from economic growth to government expenditure.
- In the long run government expenditure may increase faster than economic growth but not in the short run model.

2. Overview of the Ethiopian Economy

The previous economic performance of Ethiopia was highly correlated with conflict and the political processes that accompany. Between 1974/75 and 1989/90, growth decelerated to 2.3 percent (-0.4 percent in per capita terms). Growth was also extremely irregular given its dependence on the agricultural sector, which is vulnerable to the vagaries of nature. The average growth of real GDP over the period spanning between 1975/76 and

1991/92 was 4.54 percent. This magnitude increased substantially from -0.24 percent in 1975 /76 to 11.2 percent in 2010/11 (A.Geda, 2003).

Similarly, the percentage contributions of agriculture, industry and service value added to GDP between 1975 and 2010 averaged 51.7, 11.9 and 36.7 percepts respectively. This shows that agriculture remains the dominant sector of the economy while the contribution of the service sector is also significantly high.

Between 1974 and 2002 both current and capital government expenditures were raising. But after 2002 capital expenditure continued to rise at a slow pace, whereas total expenditure continued to decline up to 2008 mainly due to the accompanied sharp decline in current expenditure in the same period. From this we can deduce that the fall in current government expenditure was in excess of the rise in capital expenditure in that time so that it exerted a downward pressure on gross government expenditure. Nevertheless, after 2008 the trend of total government expenditure began to follow the path of capital expenditure mainly due to the dramatic shift of the current government towards huge capital expenditures in recent years.

Table 2.1 Gross Tax Revenue and Government Expenditure (%GDP)

Fiscal Year	Gross Tax revenue(%GDP)	Government Expenditure (%GDP)		
		Total Expenditure	Current Expenditure	Capital expenditure
1975/1976	5.59	10.78	8.20	2.58
1980/1981	8.69	14.56	11.33	3.22
1985/1986	9.26	20.1	12.79	7.27
1990/1991	6.88	16.27	12.2	4.07
1995/1996	8.54	18.45	10.11	6.45
2000/2001	10.87	23.21	17.38	7.79
2005/2006	10.76	22.35	11.65	10.67
2010/2011	11.54	18.35	7.93	10.81

Source: author's computation based on NBE's data

Table 2.1 illustrates a comparison between gross tax revenue and government expenditure. The data reveal that tax revenue as a percentage of GDP is by far lower than current expenditure. Here one thing important to recognize is also the magnitude of current expenditure, which exceeds capital expenditure. This is the revealed phenomenon of most developing countries.

3. Methodology of the study

3.1 Data Source

In order to examine the stated objectives and to test the empirical validity of the hypotheses of the present study the required time serious data on total tax revenue, direct tax revenue, domestic indirect tax revenue, foreign trade tax revenue, GDP, Service value and industry value added, import, budget deficit and official development assistance domestic product, were collected from the central statistical authority of Ethiopia (CSA), Ministry of finance and economic development of Ethiopia (MOFED), from the African Development Indicators, various publications of the World Bank, IMF and national bank of Ethiopia for the period from 1974 to 2010.

3.2 Model specification

As pointed out by Dutt and Ghosh (1997), Wagner did not present his Law in a mathematical form and he was not explicit in the formulation of his hypothesis. Therefore, over the years, different mathematical forms have been applied by the authors. There are at least six different versions of the Law. Six different versions of Wagner's Law are adapted from the following researchers.

Peacock and Wiseman (1961)

$$LRGE_t = \beta_0 + \beta_1 LRGDP_t + \epsilon_t \quad (1)$$

Gupta (1967)

$$LRGEPO_t = \beta_0 + \beta_1 LRGDPPO_t + \epsilon_t \quad (2)$$

Goffman

$$LRGE_t = \beta_0 + \beta_1 LRGDPPO_t + \epsilon_t \quad (3)$$

Prayer (1969)

$$LRGC_t = \beta_0 + \beta_1 LRGDP_t + \epsilon_t \quad (4)$$

Musgrave (1969)

$$LNGENGDP_t = \beta_0 + \beta_1 LRGDPPO_t + \epsilon_t \quad (5)$$

Mann (1980)

$$LNGENGDP_t = \beta_0 + \beta_1 LRGDP_t + \epsilon_t \quad (6)$$

Where, LRGE is the logarithm of real government expenditures, LGC is the logarithm of real government consumption expenditure; LRGEGDP is the logarithm of the share of government spending in total output, LRGDPPO is the logarithm of the per capita real output, LRGEPO is the logarithm of the per capita real government expenditures ,LGDP is the logarithm of real GDP.

3.2.1 Short run Models

Since the Engel- Granger cointegration test support cointegration between LRGE and LRGDP for the first model and all the remaining five versions have respective cointegration. The error correction term can be derived from the long run model as

$$ECM_{t-1} = LRGE_t - \beta_0 - \beta_1 LRGDP_t$$

Then we can formulate the short run model including the error correction term on the right hand side of each equation.

$$DLRGE_t = \beta_0 + \beta_K \sum_{I=1}^{k-1} DLRGE_{t\_1} + \beta_K \sum_{I=0}^{k} DLRGDP_{t\_1} + \delta_1 ECM1_{t-1} + \upsilon_t \quad (7)$$

Where D- represents difference, t-1-represents lag, LRGE- represents the natural logarithm of real government expenditure and LRGDP is the natural logarithm of real GDP.

$$DLRGEPO_t = \beta_0 + \beta_K \sum_{I=1}^{k-1} DLRGEPO_{t\_1} + \beta_K \sum_{I=0}^{k} DLRGDPPO_{t\_1} + \delta_2 ECM2_{t-1} + \upsilon_t \quad (8)$$

Where D- represents difference, t-1-represents lag, LRGEPO- represents the natural logarithm of the ratio of real government expenditure to population and LRGDPPO is the natural logarithm of the ratio of real GDP to population.

$$DLRGE_t = \beta_0 + \beta_K \sum_{I=1}^{k-1} DLRGE_{t\_1} + \beta_K \sum_{I=0}^{k} DLRGDPPO_{t\_1} + \delta_3 ECM3_{t-1} + \upsilon_t \quad (9)$$

Where D- represents difference, t-1-represents lag, LRGEPO- represents the natural logarithm of real government expenditure and LRGDPPO is the natural logarithm of the ratio of real GDP to population.

$$DLRGC_t = \beta_0 + \beta_K \sum_{I=1}^{k-1} DLRGC_{t\_1} + \beta_K \sum_{I=0}^{k} DLRGDP_{t\_1} + \delta_4 ECM4_{t-1} + \upsilon_t \quad (10)$$

Where D- represents difference, t-1-represents lag , LRGC- represents the natural logarithm of real government consumption expenditure and LRGDP is the natural logarithm real GDP.

$$DLNGENGDP_t = \beta_0 + \beta_K \sum_{I=1}^{k-1} DLNGENGDP_{t\_1} + \beta_K \sum_{I=0}^{k} DLRGDPPO_{t\_1} + \delta_5 ECM5_{t-1} + \upsilon_t \quad (11)$$

Where D- represents difference, t-1-represents lag, LNGENGDP- represents the natural logarithm of the ratio of nominal government expenditure to nominal GDP and LRGDPPO is the natural logarithm of the ratio of real GDP to population.

$$DLNGENGDP_t = \beta_0 + \beta_K \sum_{I=1}^{k-1} DLNGENGDP_{t\_1} + \beta_K \sum_{I=0}^{k} DLRGDP_{t\_1} + \delta_6 ECM6_{t-1} + \upsilon_t \quad (12)$$

Where D- represents difference, t-1-represents lag, LNGENGDP- represents the natural logarithm of the ratio of nominal government expenditure to nominal GDP and LRGDP is the natural logarithm of real GDP.

3.2.2 Granger Causality Test

The directions of the causality relationship between public spending and aggregate income could be categorized into four types, each of which has important implications for economic policy (Peacock & Scott, 2000). In fact, we can have (Ibok and Bassey, 2012):

- Wagnerian hypothesis: the unidirectional causality running from GDP to public spending. This hypothesis had empirical supports in Sideris (2007), Kalam and Aziz (2009), and Abdullah and Maamor (2010).
- Neutrality hypothesis- if no causality exists between GDP and public spending. It implies that the two economic variables are not correlated. The absence of Granger-causality supports the neutrality hypothesis, as documented by Sinha (2007), Chimobi (2009), and Afzal and Abbas (2010).

- Keynesian hypothesis: the unidirectional causality running from public spending to GDP. This hypothesis is in line with empirical findings in Dogan and Tang (2006), Babatunde (2007), and Govindaraju et al. (2010).
- Feedback hypothesis: if there exist bi-directional causality flows between GDP and public spending. The feedback hypothesis is documented by Narayan, Nielsen, and Smyth (2008), Ziramba (2009), Ghorbani and Zarea (2009), and Yay and Tastan (2009).

4. Result and discussion

4.1 Unit root test

For ordinary list square estimation in general to be valid, the error term must be time-invariant, that is, stationary (Salvatore, 245). Standard practice in the time series literature obliges researchers to check for unit roots in each series before estimating any equation. If there is a unit root, then that particular series is considered to be non-stationary. Moreover, estimation based on non-stationary variables may lead to spurious results which produce high R^2 and t-statistics, but without any coherent economic meaning (Granger and Newbold, 1974). Hence, in accordance with standard practice, in this study various time series tests will be performed such as unit root test and co-integration test. Traditionally, Augmented Dickey fuller (ADF) and Phillis parron (PP) tests are used to assess the order of integration of the variables. Uniform outcomes of both tests are necessary for the final conclusion about the stationarity properties of each series. Usually, all variables are tested with a linear trend and/or intercept or none

Table 1 Unit root test at level

Variables		Test statistics			
		ADF Test		PP Test	
		Constant	Constant + Trend	Constant	Constant + Trend
LRGE		-0.756190	-2.607886	-0.692484	-2.289687
LRGEPO		-1.250080	-2.327674	-1.081444	-2.014109
LRGDP		2.018810	-0.234762	3.784654	0.386690
LNGE		0.616841	-1.508930	0.678547	-1.568600
LNGDP		2.122853	0.261286	2.715694	0.660887
LNGENGDP		-2.480161	-2.380654	-2.390783	-2.026183
LRGDPPO		-0.338294	-0.732393	-0.305974	-0.435938
LRGCE		-1.742777	-2.874743	-1.581823	-2.435624
Critical values:					
1%	5%	-3.6353	-4.2505	-3.6289	-4.2412
	10%	-2.9499	-3.5468	-2.9472	-3.5426
		-2.6133	-3.2056	-2.6118	-3.2032

Table 1 above shows that the entire variables are non-stationary at level. Hence according to the customary practice in applied times series analysis we need to take the difference of the variables until it become stationary.

Table 2 Unit root test at first difference

Variables		**Test statistics**			
		ADF Test		PP Test	
		Constant	Constant +Trend	Constant	Constant + Trend
DLRGE		-6.419749	-6.305140	-8.456341	-8.283364
DLRGEPO		-5.878459	-5.774877	-7.880544	-7.725079
DLRGDP		-9.593667	-9.438792	-9.841569	-9.661979
DLNGE		-7.108795	-7.066877	-11.61089	-11.51397
DLNGDP		-5.489720	-5.429436	-11.22128	-11.37481
DLNGENGDP		-6.462454	-6.335835	-9.481839	-9.276542
DLRGDPPO		-5.764659	-5.668966	-10.52996	-10.35575
DLRGCE		-5.246057	-5.157171	-9.353802	-9.161255
Critical values:					
	1%	-3.6496	-4.2712	-3.6422	-4.2605
	5%	-2.9558	-3.5562	-2.9527	-3.5514
	10%	-2.6164	-3.2109	-2.6148	-3.2081

Table 2.2 shows that all of the variables are stationary after first differencing as the computed ADF and PP t-values are greater than the critical values (in absolute terms) at both 1% and 5% level of significance. Thus, we conclude that all of our variables are integrated of order one or I (1) series.

As the two step cointegration test proposed by Engel and Granger (1987) required we need to estimate the six different versions of Wagner's law using OLS technique and test the stationarity of the associated residuals. The results show that the residuals generated from the six different equations (versions) are stationary and do not have a unit root. This implies that all versions of the Wagner law models have long run relationship with respect to its explanatory variables.

4.2 Long Run Elasticity Coefficients

Table 3 Long Run Coefficients
Method: Ordinary Least Square
Sample Period: 1974-2009

Model I	Dependent variable	Independent variables	Coefficients	Stand. Error	t-value Prob.
	LRGE	Constant	-5.47183	1.071534	-5.1065 0.000
		LRGDP	1.34329	0.097783	13.737 0.000
Model II	LRGEPO	Constant	-0.77026	1.481709	-0.5198 0.6065
		RGDPPO	0.866244	0.210262	4.1198 0.0002
Model III	LRGE	Constant	2.286035	3.04264	0.751 0.4576
		LRGDPPO	0.98708	0.431767	2.286 0.0286
Model IV	LRGCE	Constant	1.319602	1.027298	1.285 0.2076
		LRGDP	0.693349	0.093746	7.396 0.00
Model V	LNGENGDP	Constant	-0.77026	1.481709	-0.5198 0.6065
		LRGDPPO	-0.133756	0.210262	-0.6361 0.5289
Model VI	LNGENGDP	Constant	-5.47183	1.071533	-5.1065 0.00
		LRGDP	0.34329	0.097783	3.51 0.0013

Table 3 above shows that among the estimated long-run elasticity coefficients only the first version support Wagner’s prediction in Ethiopia. A unit increase in real GDP results 1.34 units increase in real government expenditure. All the remaining versions failed to support the law.

4.3 Short Run Elasticity Coefficients

Table 4 Short Run Coefficients
Method: Ordinary Least Square
Sample Period: 1977-2009 (Adjusted for lags)

Model I	Dependent variable	Independent variables	Coefficients	Stand. Error	t-value Prob.
	DLRGE	Constant	0.05157553	0.02606	1.97 0.0577
		DLRGE$_{-1}$	0.246709	0.1894	1.30 0.2022
		DLRGDP	-0.120182	0.3735	-0.322 0.7498
		ECM$_{t-1}$	0.0232959	0.02308	1.01 0.3208
Model II	DLRGEPO	DLRGEPO$_{-1}$	0.197782	0.1895	1.04 0.3051
		RGDPPO$_{-1}$	0.207437	0.2925	0.709 0.4836
		ECM$_{t-1}$	-0.161318	0.09187	-1.76 0.0893
Model III	DLRGE	Constant	0.0114979	0.01598	0.719 0.4775
		DLRGE$_{-1}$	-0.433039	0.1128	-0.384 0.7038
		DLRGDPPO$_{-1}$	0.147439	0.1800	0.819 0.4191
		ECM$_{t-1}$	0.0463407	0.02991	1.55 0.1318
Model IV	DLRGCE	Constant	0.0369934	0.03213	1.15 0.2587
		DLRGCE$_{-1}$	0.358412	0.1825	1.96 0.0589
		DLRGDP$_{-1}$	-0.321049	0.4556	-0.705 0.4865
		ECM$_{t-1}$	-0.0419883	0.1386	-3.03 0.0050
Model V	DLNGENGDP	Constant	0.0132786	0.02062	0.664 0.5244
		DLNGENGDP$_{-1}$	0.237455	0.1693	1.40 0.1711
		DLRGDPPO$_{-1}$	0.243374	0.2479	0.982 0.3342
		ECM$_{t-1}$	-0.206002	0.08206	-2.51 0.0177
Model VI	DLNGENGDP	Constant	0.0197676	0.01413	2.49 0.0184
		DLNGENGDP$_{-1}$	-0.0119151	0.1005	-0.119 0.9064
		DLRGDP$_{-1}$	0.170535	0.1841	0.926 0.3617
		ECM$_{t-1}$	0.00849071	0.05884	0.144 0.8862

Table 4 represents the short run elasticity coefficients derived from the six versions of Wagner Law. The results clearly show that none of the six versions support the hypothesis that expects government expenditure to increase at a faster rate than the growth of the economy. The next section shows the direction of causality.

4.4 Engle Granger Causality Test
Table 5 Bi-variate Causality Test
Sample: 1974 2009
Lags: 2

Direction of causality	F-Statistic	Probability
LRGDP does not Granger Cause LRGE	1.87870	0.17092
LRGE does not Granger Cause LRGDP	0.10340	0.90209
LRGDPPO does not Granger Cause LRGEPO	0.91299	0.41255
LRGEPO does not Granger Cause LRGDPPO	0.27443	0.76196
LRGDPPO does not Granger Cause LRGE	1.49311	0.24144
LRGE does not Granger Cause LRGDPPO	1.20447	0.31441
LRGDP does not Granger Cause LRGCE	2.90674	0.07070
LRGCE does not Granger Cause LRGDP	0.33465	0.71831
LRGDPPO does not Granger Cause LNGENGDP	0.38593	0.68326
LNGENGDP does not Granger Cause LRGDPPO	0.27443	0.76196
LRGDP does not Granger Cause LNGENGDP	0.14337	0.86704
LRGDP does not Granger Cause LNGENGDP	0.10340	0.90210

Based on the Probability values reported in the table 5 above, except the hypothesis that LRGDP does not Granger Cause LRGCE the hypothesis all the given causalities in all versions cannot be rejected. At 10 percent level of significance we can say that Granger causality runs one way, from LRGDP to LRGCE, but not the other way. This hypothesis of Wagner which indicates unidirectional causality running from GDP to public spending had empirical supports in Sideris (2007), Kalam and Aziz (2009), and Abdullah and Maamor (2010).

5. Conclusion

In this study, the researcher examined the relationship between government expenditure and economic growth (Wagner's law) for Ethiopia through Engel- Granger co-integration approach over the period 1974-2009 using time series data. The estimation was based on six common ways of specification to prove the validity of the law adopted by different scholars at different time. The result shows that only the Peacock and Wiseman (1961) version which relates real government expenditure with real GDP support Wagner's Law. Moreover, Granger causality runs one way from LRGDP to LRGCE, but not the other way which supports Wagner's prediction and refutes the neutrality hypothesis which expects no causality to exists between GDP and public spending empirically supported by Sinha (2007), Chimobi (2009), and Afzal and Abbas (2010).

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References

[1] Albert and Garis, Ton (2009): Wagners Law And Social Welfare: The Case of The Kingdom of Saudi Arabia Wijeweera, Applied Econometrics and International Development
[2] Andreas Bergh and Magnus Henrekson(2011): Government Size and Growth: A Survey and Interpretation of the Evidence, IFN Working Paper No. 858.
[3] Arusha V. Cooray(2009): Government expenditure, governance and economic growth, University of Wollongong Research Online.
[4] Jan Kuckuck (2012): Testing Wagner's Law at Diverent Stages of Economic Development - A Historical Analysis of Five Western European Countries, Institute of Empirical Economic Research, Osnabrueck University,Germany.
[5] M. Adetunji Babatunde (-):A Bound Testing Analysis Of Wagners Law In Nigeria: 1970-2006
[6] Matthew Abiodun Dada and Oguntegbe Abraham Adewale (2013): Is Wagners Law A Myth or A Reality? Empirical evidence from Nigeria, international Journal of Development and Economic Sustainability Vol.1, No.1, pp.123-137
[7] Mohammad Afzal and Qaisar Abbas (2010):Wagners law in Pakistan: Another look, Journal of Economics and International Finance Vol. 2(1) pp. 012-019
[8] Otu William Ibok ,Nsikan Edet Bassey: Wagners Law Revisited: The Case of Nigerian Agricultural Sector (1961 2012) ,International Journal of Food and Agricultural Economics,ISSN 2147-8988 ,Vol. 2 No. 3 pp. 19-32 .
[9] Randall W. Eberts and Timothy J. Gronberg (1992): Wagner's Hypothesis: A Local Perspective
[10] Satish Verma and Rahul Arora (2010): Does the Indian Economy Support Wagners Law? An Econometric Analysis Eurasian Journal of Business and Economics, 3 (5), 77-91