

Empirical Investigation of the Dynamic Relationship between Government Expenditure and Economic Growth in Sri Lanka

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Abstract

This study examines the long run dynamic relationship between government expenditures and economic growth for Sri Lankan economy during the period from 1977-2009. The study tests the validity of the Keynesian view and Wagner's law in the case of Sri Lankan economy. The empirical evidence has been acquired through the co-integration, error correction model and the Granger causality tests. The empirical findings clearly suggest that there is a statistically significant positive long run relationship between government expenditure and economic growth in Sri Lanka during the sample period. The Granger causality test shows that causality runs from government expenditure to economic growth and vice versa, the relationship is positive and statistically significant. The empirical results of this study support the Keynesian view and Wagnerian law and the direction of causality is valid for Sri Lankan economy during the study period. These results have important policy implications for both domestic policy makers and the development partners working in Sri Lanka.

Keywords: Economic Growth, Government expenditure, Co integration, Wagnerian law, Granger Causality test.

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Introduction

There are two propositions on the relationship between public sector expenditure and national income. These two propositions are Wagner's law and Keynesian hypothesis. According to Wagner (1883) when the economic activity grows there is a tendency for the government activities to increase in long-run. According to Keynesian hypothesis, government spending is an exogenous policy instrument that causes changes in aggregate level of real output in the short-run thereby increases economic growth.

The majority of empirical analyses of the impact of government expenditure on long-run economic growth used cross-section analysis (Abizadeh and Gray 1985, Chen et al 2003, Al-faris 2002, Ram 1986a, 1986b). The most common results highlight that government expenditure is detrimental to economic growth. However, the cross-country growth regression does not capture the dynamics of the relationship between these two variables and disregard country-specific factors. Therefore, as Henrekson (1992) states, a test of Wagner's Law should focus on the time series behavior of public expenditure in a country for as long a time period as possible, rather than on a cross-section of countries at different income levels. Another shortcoming of these studies is that those researchers interpreted a significant coefficient of the measure of government expenditure as a confirmation of causality

from government spending to economic growth (only the Keynesian view), but this equation can be equally compatible with the Keynesian view or with Wagner's law (causality from growth to government expenditure) as well as a bi-directional causality between the two variables. Typical growth regression provides no insights into the direction of causality, but rather focuses on relationship between these two variables. Recently some empirical studies have begun testing for the bi-directional causality by using time series data, but focused mainly on developed countries. Little attention has been taken in the empirical analyses on the testing for the bi-directional causality between government expenditure and economic growth with respect to developing countries. In Sri Lankan context there is no study, which analyzes the Wagner's Law using the standard econometrics techniques of co-integration and causality.

Theory

Wagner's Law which is also called as "the Law of Rising public Expenditure states that growth in economic activity causes an increase in government activities, which in turn raises public expenditure. The Law postulates that (i) an increase in national income of a country leads to a growth in public expenditure; (ii) the extension of the functions of the state leads to an increase in public expenditure on administration and regulation of the economy; and (iii) the rise

in public expenditure will be more than proportional to the increase in the national income and will thus result in a relative expansion of the public sector. Wagner's Law basically examines the long-term trends in public expenditure and economic growth leads to greater public sector expansion.

Wagner further recognized three functions of the government:

- (i) Providing administration and protection ;
- (ii) Ensuring stability ;and
- (iii) Providing for the economic and social welfare of society as a whole

According to Wagner's, public expenditure on the first of these would grow because the increasing division of labor would lead to the breakdown of mutual relationship, requiring the state to take over functions previously carried out by families and local communities. In this way, public administration would become more centralized and administrative units larger. Moreover, Wagner assumed that private sector monopolies would not adequately take into account the social needs of society as a whole. Finally, government would need to expand to provide for the economic and social welfare of society as a whole such as education and health care, which Wagner saw as not open to economic evaluation. A

number of time series empirical studies have in the past found support for Wagner's law. These, however might not be reliable because they did not employ co integration tests to establish stationarity in the relevant variables.

In contrast to Wagner's law there is another approach, which is associated with Keynesian macroeconomic models. According to Keynes, public expenditure is seen as an exogenous factor, which can be used as a policy instrument. In traditional Keynesian theory fiscal policy is an important tool for manipulation of short-run demand.

Analytical Frame work

The theoretical relationship between public sector expenditure and economic growth is well-documented in the literature and therefore it will only be briefly discussed here. There are six broad versions of Wagner's Law, which define the relationship between economic growth and public expenditure. In the all six, some variant of the measure of national income explains alternate measures of public sector expenditure. The causation, however, could be in the reverse direction in each of these six models. There is no objective criterion to decide which of the six version is the most suitable and convincing test of the Law Therefore, we will need to consider and test all six version of the Law. The six versions of the model are follows:

$$\begin{aligned}
 LTE &= f(LGDP) \\
 LCE &= f(LGDP) \\
 LTE &= f\left[L\left[\frac{GDP}{N}\right]\right] \\
 L\left[\frac{TE}{GDP}\right] &= f\left[L\left(\frac{GDP}{N}\right)\right] \\
 L\left[\frac{TE}{N}\right] &= f\left[L\left(\frac{GDP}{N}\right)\right] \\
 L\left[\frac{TE}{GDP}\right] &= f(LGDP)
 \end{aligned}$$

Where LTE is the logarithm of real total government expenditure, LCE is the logarithm of real government consumption expenditure, LGDP is the logarithm of real gross domestic product (GDPN) is the logarithm of per capita gross domestic product, L(TE/GDP) is the logarithm of the ratio of real total government expenditure to real gross national product and L(TEN) is the logarithm of per capita real total government expenditure. N is population size.

The first version of the models, which is total public sector expenditure as a function of national income (GDP) was adopted by Peacock-Wiseman to test the Wagner's law. Pryor in 1968 developed the second version of the Law, which states that the consumption component of public sector expenditure increase with the rise in national income (see model II). Gofman (1968) and Mann (1980), however, define the law as increase in total public sector expenditure due to rise in per

capita national income. That was the third version of the model (see model III). The fourth version of the model was tested by Murthy(1993) and Ram (1986). The version indicates that growth in per capita income leads to rise in the share of total public expenditure in national income (see model IV). The fifth version of the model (see model V), which is per capita total public sector expenditure rising with per capita national income, was tested by Gupta (1967). Meanwhile, Mann(1980) defined the law as rise in the share of total public sector expenditure in the national income as a result of growth in national income, and tested for validity of the law.

As mentioned above, the major shortcoming of the empirical studies on the Wagner's Law is that many of the studies were carried out without testing the properties of time series data for stationarity. Therefore, they lead suspicious to possible causes of spurious regression. To examine the stationary properties of the Sri Lankan data the unit root test will be used. Existence of unit roots in a series denotes non-stationary.

In order to establish the order of integration in the data set, Augmented Dickey Fuller (ADF) test is employed. If a pair of I(1) variables are co integrated, one then proceeds to build an error correction model(ECM) in order to capture the short-run and long-run causal relationship between two series. As noted above, to eliminate methodological shortcoming of early studies, this study

will employ co integration and causality analysis.

Methodology

To examine the dynamic linkage between public sector expenditure and economic growth, we employ the co integration, error correction model and the Granger causality test. This enables us to search the relationship between public sector expenditure and economic growth both in the short-run and long-run.

Co integration Method

The first one examine the short-run and long- run relationship between public sector expenditure and economic growth by applying the Engle -Granger (1987) two stage co -integration procedure and the associated Error Correction Model (ECM). In the first stage, to test for the unit roots of concerned time series variable, two most popular techniques have been used: the Augmented Dickey -Fuller (ADF,1981) test and the Phillips -Perron (PP,1988) test. These tests have been performed in the level form as well as in the first difference form to study the order of integration of government expenditure and GDP.

To determine the non- stationary property of these two time series variables both in the levels and in the first difference, at first, the relevant ADF test has been employed with time trend. The ADF test is a

modification over the DF test and lagged values of the dependent variables are added in the estimation of equation (i) which is formed as follows :

$$\Delta Y_t = \alpha + (\rho - 1)Y_{t-1} + \gamma X + \delta \Delta Y_{t-1} + u_{1t} \quad (i)$$

Since it is widely believed that ADF test does not consider the case of heteroscedasticity and non-normality frequently revealed in raw data of economic time series variables, the PP test for unit root has been used in the empirical analysis. More over, it has an advantage over the ADF test when the concerned time series has serial correlation and there is a structural break. Therefore, the PP test provides robust estimates over the ADF test and is based on the following form of equation:

$$\Delta Y_t = \Phi + (\rho - 1)Y_{t-1} + \gamma \left(t - \frac{T}{2}\right) + \psi \Delta Y_{t-1} + u_{2t} \quad (ii)$$

The appropriate critical values of the *t* -*Statistics* for the null hypothesis of non - stationary are given by Mackinnon (1991).

Co integration means that despite being individually non stationary, a linear combination of two or more time series can be stationary. Co integration of two or more time series suggests that there is a long-run, or equilibrium, relationship between them. If the two times series are integrated of the same order then the estimation of the following co - integration regression has

been considered :

$$TE_t^* = \beta_1 + \beta_2 GDP_t^* + U_t \quad (i)$$

Where, TE_t^* = log of total public expenditure, GDP_t^* = log of Gross domestic product, and \hat{u} is the estimated residuals.

$$\hat{U} = TE_t^* - \hat{\beta}_1 - \hat{\beta}_2 GDP_t^* \quad (ii)$$

The ADF and PP unit root tests have been employed for residuals of equations (ii) i.e. \hat{u}_t . When residuals are found to be integrated of order zero, $\hat{U}_t = I(0)$, then it can be concluded that the two series, TE_t^* , and GDP_t^* , are co-integrated. This implies

$$\Delta TE_t = \alpha + \sum_{i=1}^m b_i \Delta TE_{t-i} + c_0 \Delta GDP_t + \sum_{j=0}^n c_j \Delta GDP_{t-j} + d ECT_{t-1} + \varepsilon_t$$

the existence of a stable long-run relationship between public sector expenditure and GDP. If the series are co-integrated then there must be an error correction process.

In the second stage, the Error Correction Model (ECM) is employed to see whether the economy is approaching equilibrium in the long-run or not and the short-run dynamics of the co-integrated time series variable. The ECM is internally consistent if the two time series variable are co-

integrated of the same order or if they are stationary (Greene, 2003:654)

Where, Δ stands for the first difference operator, d is the error correction term, ε_t is the random disturbance term, and m and n are the number of lag lengths determined by the Akaike's information criterion (AIC). Here i begins at one and j begins at zero in order for the series to be related within a structural ECM (Engle and Yoo,1991), Finally $0 \leq d \leq 1$, should hold for the series to converge to the long run equilibrium relation. According to this approach, to this approach, three lags of both the explanatory and dependent variables and one lag of the residual from

the co-integrating regression have been included. Subsequently, the insignificant variables were dropped in order to get the most parsimonious model (Hendry,1979,1995) It is important to mention that the error correction terms (i.e) which are the residual series of the co-integrating variables for TE and GDP measures deviations of these series from the long-run equilibrium relations (Mallik and Chowdhury)

Granger's Causality Test

Granger causality test states that if TE and GDP are two time series variable and if past values of a variable TE significantly contribute to forecast the value of another variable GDP, then TE is said to Granger cause GDP and vice versa. The test involves with the following :

$$TE_t = \gamma_0 \sum_{i=1}^n \alpha_i GDP_{t-i} + \sum_{j=1}^n \beta_j TE_{t-j} + u_{1t}$$

$$GDP_t = \gamma_1 \sum_{i=1}^n \lambda_i GDP_{t-i} + \sum_{j=1}^n \delta_j TE_{t-j} + u_{2t}$$

Where TE and GDP, public sector expenditure and economic growth to be tested , and U_{1t} and U_{2t} are mutually uncorrelated white noise errors, and t denote the time period . Equation(1) postulates that current TE is related to past values of TE as well as to past values of past GDP. Similarly , equation (2) postulates that GDP is related to past values of GDP as well as related to past values of TE . The null hypothesis for equation (1) is that there is no causation from TE to GDP, thus the coefficient on the lagged TE not significant ,

$$\sum_{j=1}^n \beta_j = 0$$

Similarly, the null hypothesis for equation (2) is that there is no causation from GDP

to TE, thus the coefficients of lagged GDP are not significant,

$$\sum_{i=1}^n \alpha_i = 0$$

Three possible conclusion that can be addressed from such an analysis include unidirectional causality, bi-directional causality, and are independent to each other.

Data

The data used in this study are obtained from Annual reports, Central Bank Sri Lanka. The variables used in this study are total public expenditure, Public consumption, and gross national product. All variables are in real terms. The study period is 1977 to 2009.

The Empirical Results

Table 1: Test for Unit Roots for the Variables Using the ADF with trend and intercept.

Variables	Level	First Difference
LGDP	-3.26	-5.54*
LTE	-3.24	-5.63*
LCE	-3.20	-5.83*
LGDP/N	-3.29	-5.52*
LTEN	-3.03	-3.65*
LTE/GDP	-3.42	-4.64*

Note * denotes 5% level of significance based on the MacKinnon critical values.

Empirical results (Table 1) shows that all the series are integrated of order one (I(1)). variables are stationary in first difference. and become stationary after differencing once. The results for unit root tests show that all once.

Table 2: Engel-Granger Residual Based on Co-integration Test Results

Variables	Co integration Equation	No of Lags	ADF Test for the Residuals of the Model	Decision
LTE, LGDP	$LTE = -0.179 + 0.9237LGDP$	-3.26	-3.97*	I(0)
LCE, LGDP	$LCE = -0.69 + 0.998LGDP$	-3.24	-2.20	I(1)
LTE, GDP/N	$LTE = 3.73 + 0.0077GDP/N$	-3.20	-3.54*	I(0)
L(TE/GDP), LGDP/N	$L(TE/GDP) = 0.50 + 0.080LGDP/N$	-3.29	-3.98*	I(0)
LTEN, LGDP/N	$LTEN = 0.007 + 3.73LGDP/N$	-3.03	-3.65*	I(0)
L(TE/GNP), LGDP	$L(TE/GNP) = 0.17 + 0.076LGDP$	-3.42	-3.73*	I(0)

Note : The numbers in the parenthesis are standard-error.* denotes rejection of null hypothesis at the 5% level significance.

The results of Engle-Granger residuals based on co-integration test are presented in Table 2. Results show that the residual of six versions of the Wagner's Law regression models shown in Table 2 for stationary at the 5% level of significance. Therefore, we

concluded that the two series, TE and GDP variables are co integrated and thus a valid and stable long-run relationship exists between them which is indeed a clear proof for the existence of an long -run equilibrium.,

Table 3: The Engle Granger Causality Test

Wagner's Law	Null Hypothesis	Lags	F-Statistics	Decision
1	GDP does not cause TE,	1	18.422*	Reject
	TE does not cause GDP		12.168*	Reject
2	GDP dose not cause CE	1	6.909*	Reject
	CE dose not cause GDP		5.961	Do not Reject
3	GDP/N does not cause TE, TE does not cause GDP/N	1	34.417* 12.7439*	Reject Reject
4	GDP/N does not cause TE/GNP,TE/GNP does not cause GNP/N	1	0.29980	Do not reject
			17.4707*	Reject
			7.3427*	Reject
5	GDP/N does not cause TE/N, TE/N does not cause GDP/N	1	6.768*	Reject
			37.6833*	Reject
6	GDP does not cause TE/GDP, TE/GDP does not cause GDP	1	12.1688*	Reject

Note : * denotes rejection of null hypothesis at the 5% significance level .

We used the Engel – Granger method as alternative techniques to see the direction of causality as the last step. Results of the causality test are reported in the table 3. These results suggest that There is evidence to support both Wagner’s Law of its five version except one (Model 2) and Keynesian hypothesis. The direction of causality is from GDP to TE and vice versa, since the estimated F value is significant the 5% percent level . On the basis of the results given in Table 3 we found that there is long –run relationship between public expenditure and there exists causality in both direction between GDP and public expenditure

Conclusion

This study investigates the existence of a long-run relationship between public expenditure and GDP using data for Sri Lanka during 1977-2009. Evidence of co integration is only sufficient to establish a long-run relationship between public expenditure and income as suggested by Wagner(1883). However, to support Wagner’s law it would require unidirectional causality from income to public expenditure. Therefore co-integration should be seen as a necessary condition for wagner’s law but not sufficient. Hence, conditional on co-integration results, it is necessary to look at the causality properties of the models. This study found that there is a empirical support both for the Wagner’s Law and Keynesian hypothesis.

First we looked at the time series properties of the data, the existence of unit roots. The study found that both the government expenditure and GDP variables were non-stationary in levels, but stationary in first differences. Accordingly, the data are integrated of order one I(1). Then we apply co-integration test to six version of Wagner’s Law. According to the results, there is a co integration relationship between the government expenditure and national income. Accordingly, we could find a long-run relationship between government expenditure and GDP of the five version of Wagner’s law except model 2.

The empirical findings of this study suggest that the growth of public expenditure in Sri Lanka is determined by economic growth as Wagner’s law indicates. Public expenditure is the outcome of many decisions in the light of changing economic circumstances. It is shaped by decisions about how public expenditure should be distributed among competing groups; for example whether geographically concentrated or aggregated in organized interests. The core functions of the government are also vitally important. Therefore, pressure groups and interest group behavior, political processes etc. may be considered as possible explanatory variables for the increase in the size of government expenditure.

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