Government Expenditure and National Income: Causality Tests for Twelve New Members of E.E.

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This study aims to determine the direction of causality between national income and government expenditures for twelve new members of E.E. namely Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Lithuania, Latvia, Malta, Poland, Romania, Slovenia, and Slovakia. Support for the hypothesis that causality runs from government expenditures to national income has been found only in the case of Bulgaria and Cyprus. The results of Granger causality tests indicate that Wagner's law is supported by the data of countries (Cyprus, Poland, and Romania) in our sample.

Key words: *Government Expenditure, National Income, Twelve New Members of E.E, Unit Root, Cointegration, Causality.*
JEL Classification: *C12, C22*

I. Introduction

The examination of the relationship between public expenditure and national income is hardly a new area of exploration in the economics and public finance literature. However, future research work on this area is of paramount important as it is directly related to the modelling

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and assessment of the effectiveness of fiscal policies. Although many researchers have empirically examined the relationship between public expenditure and national income, the results are significantly inconsistent, in particular on the causal link (Islam (2001), Loizides and Vamvoukas (2005), Ergun (2006), Tang (2009), Jamshaid et al. (2010)).

Theoretically, there are two competing school of thought defining this causal relationship. First, Wagner (1890) postulated that public expenditure is an endogenous variable and grows faster than national income. Moreover, public expenditure is a consequence rather than cause of national income. Therefore, Wagner's law viewed that public expenditure plays no role in generating national income, hence the causality direction runs from national income to public expenditure. However, Keynes (1936) argued that public expenditure is an exogenous variable and can be used to generate national income. For this reason, public expenditure is a cause rather than effect of national income. Therefore, the causal relationship should run from public expenditure to national income (Tang 2009).

The nexus between public expenditure and national income has been the focus of many public finance studies both at theoretical and empirical levels**.** The focus has been mainly on two approaches, first, Wagner's law approach (1883), which states that national income causes public expenditure and second, Keynesian approach (1936), which states that public expenditure causes national income. In both approaches the focus is only to the unidirectional causal link between the public expenditure and national income (Jamshaid et al. 2010). Moreover, according to Keynesians, public expenditure is the real tool to boost the economic activities in the economy and also a tool to bring stability in the short run fluctuations in aggregate expenditure (Singh and Sahni, 1984). Furthermore, the role of fiscal policy in boosting the rate of economic growth has also been the part of literature of endogenous growth that government spending directly affecting private production functions (Barro, 1990). In contrast, according to Wagnerians' approach public expenditure growth is a natural consequence of economic growth. The empirical evidences on these views are reported in detail in the studies and the issues related to interpretation of Wagner's Law have been discussed in detail by Peacock and Scott (2000).

We use time series data to examine the direction of causality between government expenditures and national income. We first examine the statistical properties of the data, such as stationarity, and try to determine whether or not there is a long-term relationship between the two variables by using cointegration methods. Then we use the methodology developed by Granger to test two hypotheses. The first hypothesis we test is that the government expenditure is endogenous, an outcome of growth of national income (usually known as Wagner's law). The second hypothesis is that government expenditure is an exogenous factor that can influence national income.

II.Methodology

Unit root tests

Many macroeconomic time series contain unit roots dominated by stochastic trends as developed by Nelson and Plosser (1982). Unit roots are important in examining the stationarity of a time series, because a non-stationary regressor invalidates many standard empirical results. The presence of a stochastic trend is determined by testing the presence of unit roots in time series data. In this study, Augmented Dickey– Fuller (ADF) (1979, 1981) and Phillips-Perron (1988) tests were used to determine the presence of unit roots in the data sets. The ADF test considers several regression equations (autoregressive process of order ϱ) to test for the presence of unit root. The difference between the equations concerns the presence of a deterministic element: drift and linear trend. A sufficient number of lagged first difference terms are added to remove any serial correlation in the residuals. The ADF test is based on the estimate of the following regression:

$$\Delta X_t = \delta_0 + \delta_1 t + \delta_2 X_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta X_{t-i} + u_i \qquad (1)$$

where,

Δ is the first-difference operator

k is lag

Xt, is all model variables at time t.

δ0, δ1, δ2, and αi are being estimated.

ut denotes stochastic error term.

The null and the alternative hypothesis for the existence of unit root in variable Xt is:

H0 : δ2 = 0 Hε : δ2 < 0.

The Phillips-Perron (PP) (1988) test suggests a non-parametric method of controlling for higher order autocorrelation in a series. This test is based on the following first order auto-regressive (AR(1)) process:

Δyt = α + β yt-1 + et (2)

where yt is all model variables,

Δ is the first-difference operator,

α is the constant,

β is the slope and

t is a subscript for time.

The non-parametric correction is made to the t-ratio of β coefficient from equation to account for the autocorrelation of et. This correction is based on an estimate of the spectrum of et at zero frequency that is robust to heteroskedasticity and autocorrelation of unknown form. In this paper, this estimation is based on Bartlett kernel. The optimal bandwidth in the PP equation is selected using the Newey-West (1994) method. Critical values tabulated by MacKinnon (1996) are used in making inferences regarding the time series properties of the variables.

Co-integration tests

Since the variables used in all the cases are non-stationary, I(1), we perform a cointegration test to find out whether a linear combination of these series converge to an equilibrium or not. Two series (variables) are said to be cointegrated if they each are non-stationary, at least I(1), and if their linear combination converges to an equilibrium (Engle and Granger, 1987). This means that cointegrated variables have a long term equilibrium relationship. Johansen and Juselius's (1990) cointegration method was used for cointegration analysis. The cointegration and causality tests were carried out only on the first-difference stationary variables, I(1). Johansen and Juselius, procedure test results are presented in table 2 (the order of lag-length was determined by Schwarz Information Criterion (SIC) and Akaike Information Criterion (AIC).

The tests of co-integration between two variables are based on a VAR approach initiated by Johanson (1988). Suppose for that, that we have a general VAR model with k lags:

$$Xt = A1Xt\text{-}1 + A2Xt\text{-}2 + \ldots + AkXt\text{-}k + BYt + et \quad (3)$$

where

Xt is a non-stationary vector I (1).

Ak are different matrices of coefficients.

Yt is a vector of deterministic terms and finally

et is the vector of innovations.

This VAR specification can be rewritten in first differences as follows:

$$\Delta X_t = \Pi X_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta X_{t-i} + \mathrm{B} Y_t + e_t \qquad (4)$$

where

$$\Pi = \sum_{i=1}^{p} \mathrm{A}_i - I \quad \text{, and} \quad \Gamma_i = -\sum_{j=i+1}^{k} A_j$$

In Granger representation theorem, the matrix Π has a reduced rank r < k, it can be expressed then as CB' (Π = CB'), where C and B are n × r matrices and r is the distinct co-integrating vectors or the number of co-integrating relations. Also, each column of B gives an estimate of the co-integrating vector. The elements of C are the adjustment parameters in the error correction model. The determination of the co-integrating vectors and their number, for a general VAR with n variables and k lags, is described by Johanson (1988).

The number of co-integrating relations, in a VAR with k endogenous variables, varies between 0 and k-1. If there are no co-integrating relations, standard time series analyses such as the (unrestricted) VAR may be applied to the first differences of the data. When there is one cointegrating equation, the resulting equation B'Yt-1 will form the base of the error correction term CB'Yt-1.

Granger Causality tests

In the case of two variables X and Y, the Granger causality approach is different from the common use of the term since it measures precedence and information provided by X in explaining current value of Y. According to this view, Y is said to be granger caused by X if X helps in the prediction of Y or equivalently lagged values of X are statistically significant.

The time series representation of a bivariate VAR for two variables X and Y has the following form:

$$\begin{bmatrix} Y_t \\ X_t \end{bmatrix} = \begin{bmatrix} c_1 \\ c_2 \end{bmatrix} + \begin{bmatrix} \alpha_{11}^1 & \alpha_{12}^1 \\ \alpha_{21}^1 & \alpha_{22}^1 \end{bmatrix} \begin{bmatrix} Y_{t-1} \\ X_{t-1} \end{bmatrix} + \ldots.. + \begin{bmatrix} \alpha_{11}^k & \alpha_{12}^k \\ \alpha_{21}^k & \alpha_{22}^k \end{bmatrix} \begin{bmatrix} Y_{t-k} \\ X_{t-k} \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix} \quad (5)$$

where

aij are the coefficients of the matrices associated to the VAR, the superscripts denote the order of that matrices

Σt = (e1t, e2t)' is a vector of uncorrelated disturbances

c1 and c2 are constants.

This paper uses Granger type causality methodology to determine the causality direction between the two variables we are concerned with in this study. The simplest Granger causality test (Granger, 1969) is:

$$\begin{cases} Y_t = c_1 + \sum_{i=1}^{k} a_{11}^i Y_{t-1} + \sum_{j=1}^{k} a_{12}^i X_{t-1} + e_{1t} \\ X_t = c_2 + \sum_{j=1}^{k} a_{21}^i X_{t-1} + \sum_{i=1}^{k} a_{22}^i Y_{t-1} + e_{2t} \end{cases} \quad (6)$$

Testing for Granger causality between X and Y consists to check the significance of a12 and a22 coefficients. In other words, X does not Granger-cause Y if the vector (Xt-1, Xt-2, …, Xt-k) has no power in forecasting X. Each equation represented by (6) is estimated separately in testing for Granger causality (Since we have the same regressors in the two equations and disturbances are supposed to be uncorrelated. The number of lags used in tests regressions is selected according to Akaike and Schwartz criterion). The null hypothesis tested is X does not Granger-cause Y and Y does not Granger-cause X.

In the error correction model, the relevant error-correction terms (ECt-1) are included in the standard Granger causality procedure after all variables have been made stationary by differencing, which yields equation 7.

$$\begin{bmatrix}\Delta Y_t\\ \Delta X_t\end{bmatrix}=\begin{bmatrix}c_1\\ c_2\end{bmatrix}+\begin{bmatrix}\alpha_{11}^1 & \alpha_{12}^1\\ \alpha_{21}^1 & \alpha_{22}^1\end{bmatrix}\begin{bmatrix}\Delta Y_{t-1}\\ \Delta X_{t-1}\end{bmatrix}+\ldots+\begin{bmatrix}\alpha_{11}^k & \alpha_{12}^k\\ \alpha_{21}^k & \alpha_{22}^k\end{bmatrix}\begin{bmatrix}\Delta Y_{t-k}\\ \Delta X_{t-k}\end{bmatrix}+\begin{bmatrix}\beta_1\\ \beta_2\end{bmatrix}\begin{bmatrix}EC_{t-1}\\ EC_{t-1}\end{bmatrix}+\begin{bmatrix}e_{1t}\\ e_{2t}\end{bmatrix}$$

(7)

where

Δ is first difference operator

t is time subscript

aij are the coefficients of the matrices associated to the VAR, the superscripts denote the order of that matrices

Σt = (e1t, e2t)' is a vector of uncorrelated disturbances

c1 and c2 are constants.

ECt-1 is the error correction term.

Within a system of two equations, equation (7) becomes:

$$\begin{cases}\Delta Y_t = c_1 + \sum_{i=1}^{k} a_{11}^i \Delta Y_{t-1} + \sum_{j=1}^{k} a_{12}^i \Delta X_{t-1} - \beta_1 EC_{t-1} + e_{1t}\\ \Delta X_t = c_2 + \sum_{j=1}^{k} a_{21}^i \Delta X_{t-1} + \sum_{i=1}^{k} a_{22}^i \Delta Y_{t-1} - \beta_2 EC_{t-1} + e_{2t}\end{cases} \quad (8)$$

The independent variables are said to cause the dependent variable if the error correction term (ECt-1) is significant (β1 or β2 are nonzero) or the coefficients of the lagged independent variables (summation of a12 or summation of a22) are jointly significant. However, if the series are not cointegrated, Granger test is carried out without the error correction terms.

III.Data and Empirical Results

The data on annual Gross Domestic Product, Total Government Expenditure, and population of each country come from Eurostat. We use real per capita (GDP), and real per capita government expenditure (GOV), both measured in natural logarithms.

The plots in the appendix indicate that there is an increasing trend in real per capita (LGDP) and real per capita government expenditures (LGOV) for the twelve countries. Also evident from the plots is the positive association between the two variables (correlation coefficients between real per capita GDP and government expenditure for each country over the sample period are 0.9644 (Bulgaria), 0.8078 (Cyprus), 0.8542 (Czech Republic), 0.8805 (Estonia), 0.9405 (Hungary), 0.8768 (Lithuania), 0.9380 (Latvia), 0.9426 (Malta), 0.9356 (Poland), 0.9558 (Romania), 0.6774 (Slovenia), 0.4761 (Slovakia)). Our goal in this section is to find out whether this positive association implies that more government spending causes higher income or higher income leads to more spending. It is also possible that the association between the two variables is not causal in any direction, but just coincidental.

Table 1 reports the test results for the presence of unit root in the two series that we use in this study. The ADF and PP statistics indicate that the series of real per capita (GDP) and real per capita government expenditure (GOV) for twelve countries.

Table 1
Unit Root Tests (ADF and PP)

Country	Variable	ADF Constant	ADF Constant and Time Trend	PP Constant	PP Constant and Time Trend
Bulgaria	LGDP	1.604 (0)	-1.842(3)	2.168(3)	-2.717(2)
	LGOV	0.527 (1)	-2.481 (2)	0.537 (1)	-3.464 (0)*
	ΔLGDP	-3.382(0)**	-4.093(3)*	-4.129(4)**	-3.491(2)*
	ΔLGOV	-6.199 (0)***	-5.969 (0)***	-6.555(2)***	-8.329 (5)***
Cyprus	LGDP	0.738 (2)	-1.110 (3)	0.600 (7)	-1.383 (3)
	LGOV	-0.346 (0)	-2.229 (3)	-0.229 (1)	-1.917 (0)
	ΔLGDP	-0.676 (3)	-3.086 (1)	-3.002 (9)*	-3.035 (9)
	ΔLGOV	-3.094 (0)*	-2.816 (0)	-3.074 (0)*	-2.816 (0)
Czech Republic	LGDP	0.151 (0)	-1.816 (2)	0.151 (0)	-4.503 (5)**
	LGOV	0.679 (3)	-5.903 (2)***	-0.414 (1)	-2.084 (1)
	ΔLGDP	-1.752 (2)	-5.228 (3)**	-3.119 (2)*	-2.574 (2)
	ΔLGOV	-3.446 (2)**	-1.730 (2)	-2.502 (1)	-2.325 (1)
Estonia	LGDP	-0.818 (0)	-0.827 (0)	-0.800 (1)	-1.231 (1)
	LGOV	2.963 (3)	1.621 (3)	6.927 (10)	0.380 (8)
	ΔLGDP	-2.207 (0)	-0.263 (3)	-2.207 (0)	-2.858 (5)
	ΔLGOV	0.556 (3)	-3.189 (0)	-0.906 (9)	-4.750 (9)**
Hungary	LGDP	-1.499 (0)	-2.855 (3)	-1.482 (2)	-1.103 (1)
	LGOV	-2.571 (2)	-1.638(4)	-0.661 (10)	-1.883 (2)
	ΔLGDP	-1.958 (0)	3.087 (3)	-1.958 (0)	-2.361 (2)
	ΔLGOV	-2.799 (0)*	-4.672 (1)**	-3.247 (9)**	-4.290 (7)**
Lithuania	LGDP	0.247 (0)	-3.722 (0)*	0.247 (0)	-3.644 (1)*
	LGOV	4.840 (0)	0.596 (0)	4.395 (1)	1.454 (4)
	ΔLGDP	-3.064 (0)*	-1.876 (2)	-3.227 (2)**	-2.683 (5)
	ΔLGOV	-0.434 (0)	-1.420 (3)	-0.046 (2)	-2.868 (2)
Latvia	LGDP	0.445 (0)	-2.456 (1)	0.445 (0)	-3.328 (4)
	LGOV	1.343 (1)	-2.292 (3)	2.255 (4)	-0.544 (10)

	ΔLGDP	-2.728 (1)	-1.325 (0)	-2.064 (3)	-0.615 (6)
	ΔLGOV	-2.247 (0)	-2.798 (1)	-2.243 (0)	-4.407 (1)**
Malta	LGDP	-7.893 (2)***	-2.035 (2)	-1.063 (2)	-4.253 (1)**
	LGOV	-2.502 (3)	-2.030 (3)	-3.593 (6)**	-3.250 (7)
	ΔLGDP	-1.814 (2)	-16.87 (1)***	-12.35 (9)***	-11.50 (9)***
	ΔLGOV	-3.547 (1)**	-3.350 (3)	-6.930 (9)***	-6.187 (9)***
Poland	LGDP	1.913(0)	-0.752 (0)	3.478 (7)	0.071 (10)
	LGOV	0.958 (0)	-2.190 (0)	2.158 (6)	-2.203 (3)
	ΔLGDP	-1.787 (0)	-3.109 (3)	-1.792 (1)	-6.612 (9)***
	ΔLGOV	-2.456 (0)	-2.945 (0)	-2.503 (4)	-4.514 (9)**
Romania	LGDP	-4.356 (3)**	-0.067 (3)	0.319 (0)	-2.623 (1)
	LGOV	0.320 (2)	-4.539 (3)***	1.387 (1)	-0.566 (1)
	ΔLGDP	-0.410 (3)	-2.338 (3)	-1.904 (2)	-0.652 (6)
	ΔLGOV	-3.718 (3)**	1.026 (3)	-2.390 (2)	-5.151 (1)**
Slovenia	LGDP	-1.054 (2)	-1.982 (3)	-0.820 (2)	-1.695 (0)
	LGOV	-1.004(3)	-4.003 (3)*	-0.295 (2)	1.004 (6)
	ΔLGDP	-1.901 (3)	-3.296 (3)	-3.275 (0)**	-3.050 (0)
	ΔLGOV	-5.067 (3)***	-5.009 (3)**	-1.264 (1)	-0.773 (1)
Slovakia	LGDP	2.246 (0)	-1.809 (1)	2.179 (2)	-5.048 (4)**
	LGOV	-0.390 (0)	-0.079 (0)	-0.498 (1)	0.461 (2)
	ΔLGDP	-2.852 (0)*	-1.500 (3)	-4.234 (5)**	-2.279 (7)
	ΔLGOV	-2.087 (0)	-2.258 (3)	-2.087 (0)	-2.515 (2)

Notes:

*1. ***, ** and * imply significance at the 1%, 5% and 10% level, respectively.*

2.The numbers within brackets followed by ADF statistics represents the lag length of the dependent variable used to obtain white noise residuals.

3.The lag lengths for ADF equation were selected using Akaike Information Criterion (AIC).

4.The numbers within brackets followed by PP statistics represent the bandwidth selected based on Newey West method using Bartlett Kernel.

5.LGDP is the natural logarithm of real per capita GDP.

6.LGOV is the natural logarithm of real per capita total Government expenditure.

The results shown in table 1 suggest that all variables, are first order integrated in the case of Bulgaria, Cyprus, Czech Republic, Malta, Poland, and Slovenia, in the case of Romania both variables are zero order integrated, whereas in the case of Estonia, Hungary, Lithuania, Latvia, and Slovakia variables are not integrated either in their levels or in their first differences. That means that we cannot examine the cointegration of the variables under consideration.

Since the variables in the case of Bulgaria, Cyprus, Czech Republic, Malta, Poland, and Slovenia are first-order integrated I(1), and in the case of Romania zero-order integrated I(0), we perform a cointegration test to find out whether a linear combination of these series converge to an equilibrium or not. Two variables are said to be cointegrated if they each are non-stationary, at least I(1), and if their linear combination converges to an equilibrium. This means that cointegrated variables have a long term equilibrium relationship.

Johansen and Juselius's (1990) cointegration method was used for cointegration analysis. The cointegration and causality tests were carried out only on the stationary variables, I(1) or I(0). The order of lag-length was determined by Schwarz Information Criterion (SIC) and Akaike Information Criterion (AIC). Johansen and Juselius, procedure test results are presented in table 2.

Table 2
Johansen and Juselius's Cointegration Test Results

Null Hypothesis	Trace test	Max-Eigen	5% critical value Trace test	Max-Eigen
Bulgaria (Order VAR = 1)				
r = 0	8.267	7.714	15.41	14.07
r ≤ 1	0.552	0.552	3.76	3.76
Cyprus (Order VAR = 2)				
r = 0	16.898	14.79	15.41	14.07
r ≤ 1	2.104	2.104	3.76	3.76
Czech Republic (Order VAR = 1)				
r = 0	8.584	8.190	15.41	14.07
r ≤ 1	0.394	0.394	3.76	3.76
Malta (Order VAR = 1)				
r = 0	8.095	7.368	15.41	14.07
r ≤ 1	0.727	0.727	3.76	3.76
Poland (Order VAR = 1)				
r = 0	22.008	20.983	15.41	14.07
r ≤ 1	1.025	1.025	3.76	3.76
Slovenia (Order VAR = 1)				
r = 0	11.449	10.853	15.41	14.07
r ≤ 1	0.595	0.595	3.76	3.76

Romania (Order VAR = 1)				
r = 0	25.630	21.270	15.41	14.07
r ≤ 1	3.359	3.359	3.76	3.76

Notes:
1. Critical values derive from Osterwald – Lenum (1992).
2. r denotes the number of cointegrated vectors
3.Akaike and Schwarz criterion are used for the order of VAR model

The test statistics fail to reject the null hypothesis of no cointegrating relation at 5 per cent significance level, in the case of Bulgaria, Czech Republic, Malta, and Slovenia, whereas in the case of Cyprus, Poland, and Romania there is a cointegration vector (See the trace test and the maximal-eigenvalue statistics for cointegration test in Table 2). This indicates that only these three countries there is long run relationship between real per capita national income and real per capita government expenditures over the sample period.

Next, we report the Granger causality test results obtained by vector auto regression (VAR) approach Bulgaria, Czech Republic, Malta, and Slovenia. The VAR regressions do not include error correction terms since we find that the variables are not cointegrated for these countries. Due to the use of annual data, the lag order of VAR 1 is estimated. Results are reported in Table 3.

Table 3
Granger Causality Test Results via VAR

Lag Length of VAR	1
Null Hypothesis	F-Statistic
Bulgaria (VAR = 1)	
ΔLGOV does not Granger Cause ΔLGDP	11.527 (0.011)
ΔLGDP does not Granger Cause ΔLGOV	0.046 (0.835)
Czech Republic (VAR = 1)	

ΔLGOV does not Granger Cause ΔLGDP	0.109 (0.749)
ΔLGDP does not Granger Cause ΔLGOV	2.596 (0.151)
Malta (VAR = 1)	
ΔLGOV does not Granger Cause ΔLGDP	0.000 (0.993)
ΔLGDP does not Granger Cause ΔLGOV	0.033 (0.860)
Slovenia (VAR = 1)	
ΔLGOV does not Granger Cause ΔLGDP	0.003 (0.951)
ΔLGDP does not Granger Cause ΔLGOV	0.749 (0.415)

Notes: Δ is first different operator.
( ) is the p-value

The Wagner's hypothesis is not supported for these countries. There is no evidence supporting the reverse hypothesis for Czech Republic, Malta and Slovenia. However, interestingly, reverse hypothesis is empirically supported by the Bulgaria. Keynesian approach is supported in the case of Bulgaria, which states that public expenditure causes national income, at 1.1 per cent significant level.

Our finding that there is no causality link, one-way or two-way, between government expenditures and national income για τις χώρες Czech Republic, Malta and Slovenia (except for the Bulgaria where the reverse of the Wagner's hypothesis is supported) might be due to the deficiencies in data and methodological problems. It is possible that different components of expenditure affect real income in different ways, but when aggregate expenditure data are used these effects might be difficult to detect.

Since in the case Cyprus, Poland, and Romania the two series converge in the long run, that is LGOV and LGDP are cointegrated, standard Granger causality approach (VAR approach) can not be used to yield approximate results. So we do the Granger test with error correction terms from the cointegrating equations included in a regression that also includes once-differenced variables (ΔLGDP and ΔLGOV). (See equation 7 or 8 for the error correction model.) Results are reported in table 4.

Table 4
Granger Causality Test Results via Error Correction Model

Lag	1		2	
Dependent Variable	Wald Test (F-Statistic)	ECT (t-ratio)	Wald Test (F-Statistic)	ECT (t-ratio)
Cyprus (VAR = 2))				
ΔLGDP			3.450	-1.625 [-3.080]
ΔLGOV			9.437	3.644 [3.281]
Poland (VAR = 1)				
ΔLGDP	1.395	-0.301 [-1.740]		
ΔLGOV	16.996	0.937 [6.291]		
Romania (VAR =1)				
LGDP	2.155	0.161 [0.863]		
LGOV	25.449	0.775 [6.631]		

Notes: ECT stands for error-correction term.
( ) is p-value.
[ ] t - statistics

By the results depicted in table 4 we observe that both Wald tests and t-tests (for error correct term) are found to be significant at 5 per cent level in the case of the three countries. This means that there is evidence of the Wagner's hypothesis for the three countries as well as and the reverse in the case of Cyprus.

IV.Conclusion

The findings of this study may be interpreted in several ways. We start with the Wagner's hypothesis. To detect the hypothesized causal relationship between national income and government expenditures, rate of increase of the latter must be greater than that of the former, so that the share of government expenditures in national income increases over time. However, for some reason, if spending keeps on increasing at a slower pace than the pace national income grows at; hypothesized causal link between the two will be weakened, making it more difficult to detect the link in the data (Ergun, 2006). According to Ansari et al (1997) spending pattern could be smoother because of the debt financing obligations (perhaps to the international bodies), that a government might have.

The objective of the paper is to investigate the causality relation between government expenditures and national income by testing for the Wagner's hypothesis and its reverse (Keynesian approach) for twelve new members of E.E, namely Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Lithuania, Latvia, Malta, Poland, Romania, Slovenia, and Slovakia.

We use Johansen cointegration method to detect a long term relationship between real per capita national income and real per capita government expenditure for twelve new members of E.E, but do not detect any such relationship, except for Cyprus, Poland, and Romania.

The results of Granger causality tests indicate that Wagner's law is supported by the data of countries (Cyprus, Poland, and Romania) in our sample. This means causal link runs from real per capita income to real per capita government expenditure. The Granger causality tests indicate that the reverse hypothesis is supported only by the Bulgaria's and Cyprus data, suggesting that the direction of causality is from government expenditure to national income.

Our findings also indicate that government expenditures do not play a significant role in promoting economic growth in the four countries in our study (the Bulgaria and Cyprus is the exception). This is surprising because it is widely believed that government has played an important role in the development of these countries.

References

Ansari, M., I., Gordon, D. V. and Akuamoah, C. (1997). Keynes Versus Wagner: Public Expenditure and National Income for Three African Countries, Applied Economics, 29, 543-550.

Barro, R.J. (1990). Government Spending in a Simple Model of Endogenous Growth, The Journal of Political Economy, 98(5), 103-125.

Dickey, D.A., and Fuller, W.A.(1979). Distribution for the Estimates for Auto Regressive Time Series with a Unit Root, Journal of the American Statistical Association, 74, 427-431.

Dickey, D.A., and Fuller, W.A. (1981). Likelihood Ratio Statistics for Autoregressive Time Series With a Unit Root, Econometrica, 49, 1057-1072.

Engle, R.F., and Granger C.W.J. (1987). Co-integration and Error Correction: Representation, Estimation and Testing, Econometrica, 55, 251-276.

Ergun, D., (2006). Government Expenditure and National Income: Causality Tests For Five South East Asian Countries, International Business & Economics Research Journal, 5(10), 49-58.

Granger, C. W. J. (1969). Investigating Causal Relations by Econometric Methods and Cross-Spectral Methods, Econometrica, 37, 424-438.

Islam, A., M. (2001). Wagner's Law Revisited: Cointegration and Exogeneity Tests for the USA, Applied Economics Letters, 8, 509-515.

Jamshaid, R, Asim., I., and M. W. Siddiqi (2010). Cointegration-Causality Analysis between Public Expenditures and Economic Growth in Pakistan, European Journal of Social Sciences, 13(4), 556-565.

Johansen, S. (1988). Statistical Analysis of Cointegration Vectors, Journal of Economic Dynamics and Control, 12, 231-254.

Johansen, S. and Juselius, K. (1990). Maximum Likelihood Estimation and Inference on Cointegration with Applications to the Demand for Money, Oxford Bulletin of Economics and Statistics, 52, 169-210.

Keynes, J. M. (1936). The General Theory of Employment, Interest and Money, New York: Harcourt, Brace and Co.

Loizides, J. and Vamvoukas, G. (2005). Government Expenditure and Economic Growth: Evidence from Trivariate Causality Testing, Journal of Applied Economics, 8(1), 125-152.

MacKinnon, J. G. (1991). Critical Values for Cointegration Tests. In Long Run Equilibrium Relationships: Readings in Cointegration, edited by R. F. Engel and C. W.Granger. Oxford: Oxford University Press.

MacKinnon, J. G. (1996). Numerical Distribution Functions for Unit Root and Cointegration Tests, Journal of Applied Econometrics, 11, 601-618.

Nelson, C.R. and Plosser, C.I. (1982). Trends and Random Walks in Macroeconomic Time Series: Some Evidence and Implications, Journal of Monetary Economics 10, 139–162.

Newey, W. and West, K. (1994). Automatic Lag Selection in Covariance Matrix Estimation. Review of Economic Studies, 61, 631-653.

Peacock, A. and Scott, A. (2000). The Curious Attraction of Wagner's Law, Public Choice, 102(1-2), 1-17.

Phillips, P.C.B. and Perron, P. (1988). Testing for a Unit Root in Time Series Regression, Biometrika, 75, 335-346.

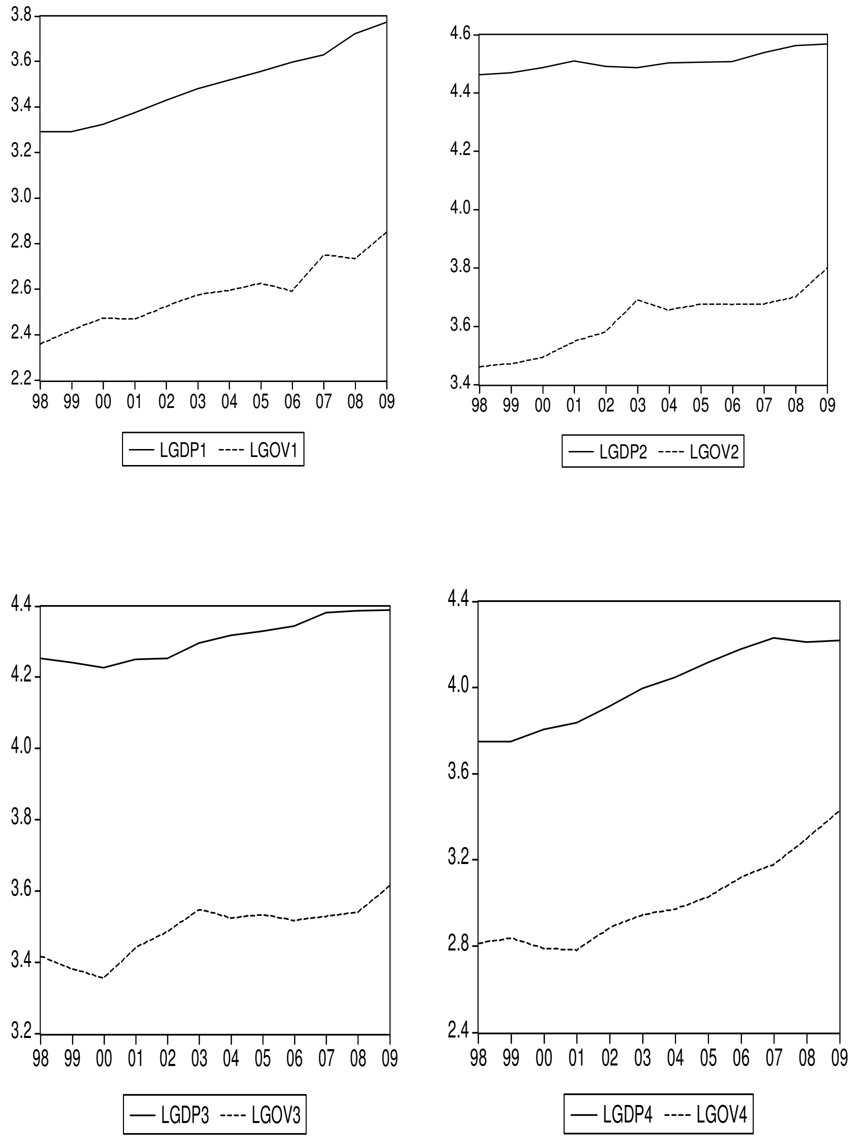
Sims, C.A., J.H. Stock and M.W.Watson (1990). Inference in Linear Time Series Models With Some Unit Roots, Econometrica, 58, 113-144.

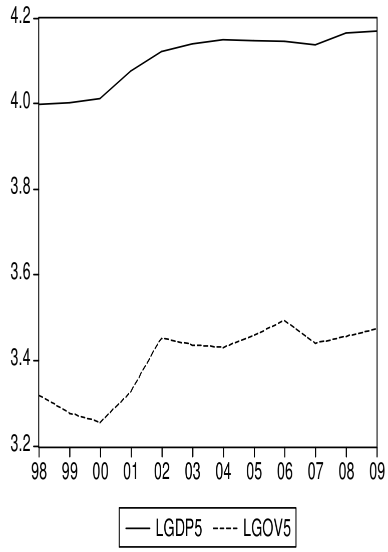
Singh, B. and Sahni, B. S. (1984). Causality Between Public Expenditure and National Income, The Review of Economics and Statistics, 66(4), 630-644.

Tang, C. F. (2009). An Examination of the Government Spending and Economic Growth Nexus for Malaysia Using the Leveraged Bootstrap Simulation Approach, Global Economic Review, 38(2), 215-227.

Wagner, A. (1883). Three Extracts on Public Finance, in R. A. Musgrave and A. T.

APPENDIX 1: Plots of series of real per capita (LGDP) and real per capita government expenditure (LGOV) (in natural logarithm)

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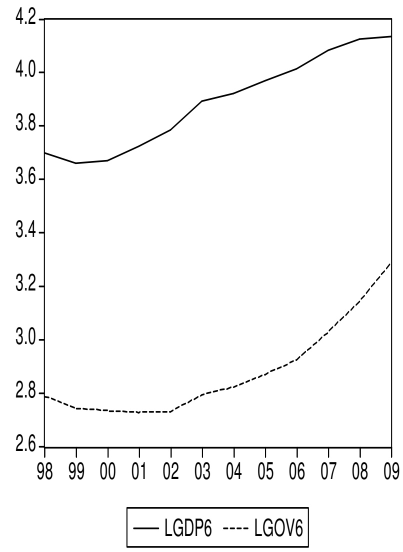
4.0
3.8
3.6
3.4
3.2
98 99 00 01 02 03 04 05 06 07 08 09
LGDP5 ---- LGOV5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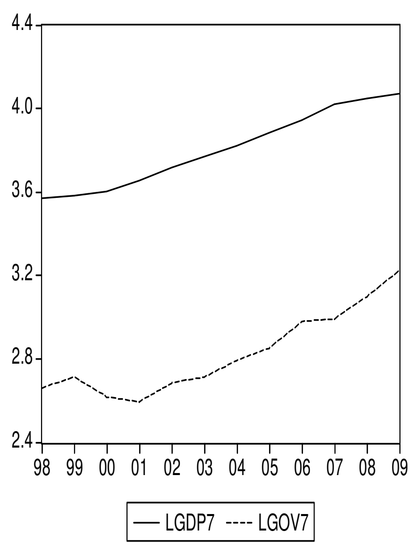
4.0
3.8
3.6
3.4
3.2
3.0
2.8
2.6
98 99 00 01 02 03 04 05 06 07 08 09
LGDP6 ---- LGOV6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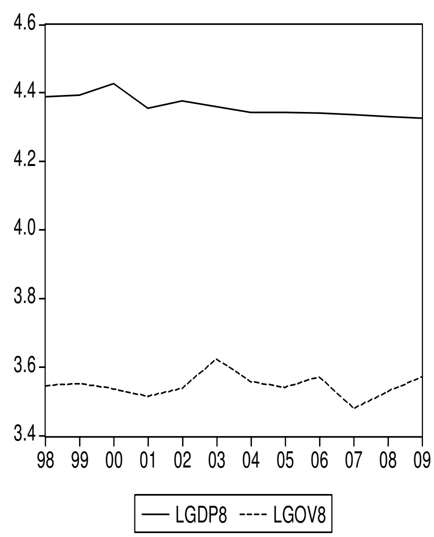
4.0
3.6
3.2
2.8
2.4
98 99 00 01 02 03 04 05 06 07 08 09
LGDP7 ---- LGOV7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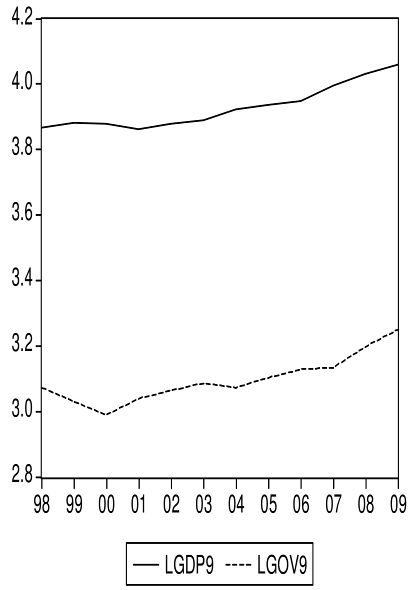
4.4
4.2
4.0
3.8
3.6
3.4
98 99 00 01 02 03 04 05 06 07 08 09
LGDP8 ---- LGOV8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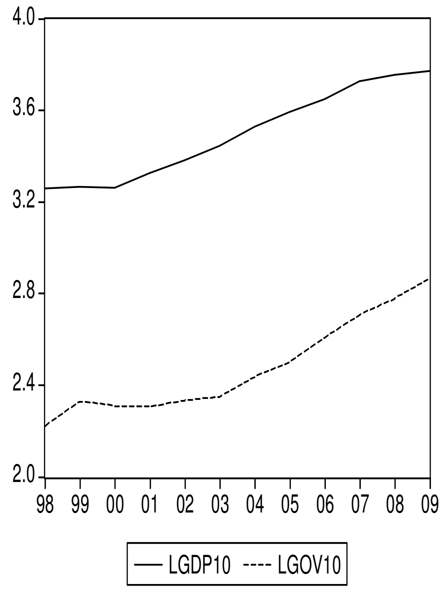
3.8
3.6
3.4
3.2
3.0
2.8
98 99 00 01 02 03 04 05 06 07 08 09
LGDP9 LGOV9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3.2
2.8
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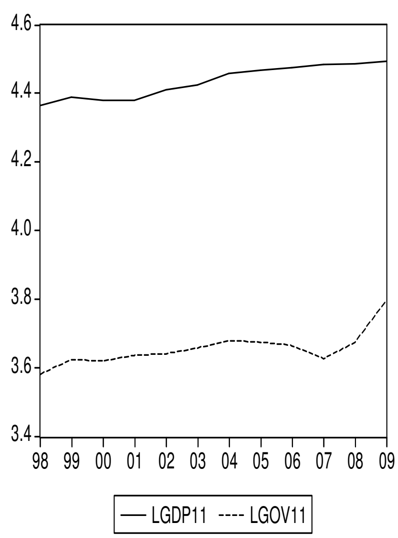
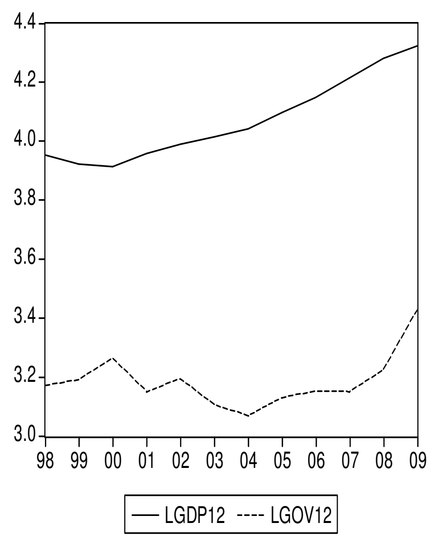
2.0
98 99 00 01 02 03 04 05 06 07 08 09
LGDP10 LGOV10


4.6
4.4
4.2
4.0
3.8
3.6
3.4
98 99 00 01 02 03 04 05 06 07 08 09
LGDP11 LGOV11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4.2
4.0
3.8
3.6
3.4
3.2
3.0
98 99 00 01 02 03 04 05 06 07 08 09
LGDP12 LGOV12