

## **TESTING WAGNER'S LAW FOR MACEDONIA: EVIDENCE FROM CAUSALITY ANALYSIS**

UDC:330.354:336.5]:303.724(497.7)  
(Original scientific paper)

**Jehona Musliu, Besa Xhaferi, Asllan Musliu**

University of Tetova, Faculty of Economics, Macedonia  
Contact e-mail: jehona.musliu@unite.edu.mk

---

### **Abstract**

The increasing trend of government expenditure calls for research on impact of public finance policies on growth. Two competing views on relationship between expenditure and economic growth, namely Wagner's Law and Keynesian approach, and empirical evidence in favor for each of them increased the interest of researches to examine theoretically and empirically for different countries. The purpose of this study is to analyze the relationship between expenditure and economic growth in Macedonia and provide evidence for one of these competing views.

The methodology used is co-integration, causality and error correction model. This methodology is employed for quarterly data on Macedonia for the period 2005-2015. The data are obtained from State Statistical Office of Republic of Macedonia and from National Bank of Republic of Macedonia. Causality between government expenditures and economic growth was examined using the Granger causality test. The result suggests that output measures Granger cause expenditure thereby providing evidence supporting Wagner's Law. Policymakers should be careful about adopting public spending as a policy tool to stimulate the economy.

**Keywords:** Government Expenditure, Economic Growth, Granger Causality

---

### **INTRODUCTION**

The increasing trend of government expenditures awakened a huge interest of studies on public finance policies and their impact on growth. The evidence is on country level (Muhlis and Hakan (2003); Jamshaid et al, (2010); Omoke (2009)), group of countries (Loughbenga and Owoye (2007)); Ergun and Tuck, (2006), Wu et al, (2010)); testing univariate causality in order to find evidence in favor of one of the theoretical frameworks on public finance. The theoretical ground is grouped in two main conflicting views on the relationship between growths and expenditure namely the Wagner hypothesis (1883) and the Keynesian Hypothesis (1936). The main objective of this paper is to provide evidence in favor of Wagner hypothesis or/and Keynesian hypothesis for Macedonia for the time period 2005-2015.

The relationship between government spending and national output is important for many issues

The paper is organized in five sections. Section two focuses on literature review. The third section discusses data sources and the research methodology employed. The fourth and fifth sections present the results, conclusion and recommendations.

## LITERATURE REVIEW

The nexus between government expenditure and economic growth is objective of studies both theoretically and empirically

There is no consensus in the literature whether Wagner Law holds only for developed countries or also developing countries, whether government expenditures could have positive or negative effect on growth. There is no general conclusion but sample specific results.

The Wagner Law states that, during the process of economic development, government economic activity compared to private economic activity increases. Thus, higher levels of economic growth require higher levels of public expenditures.

In general, 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).

So, we have the following viewpoints (Magazzino, 2012):

- **Neutrality hypothesis**, when there is no causality between GDP and public spending. This hypothesis is documented by Demirbas (1999), Bagdigen & Centitas (2003), Huang (2006), Sinha (2007), Chimobi (2009), and Afzal & Abbas (2010).
- **Feedback hypothesis**, when there is a bi – directional causality between economic growth and government expenditure. This viewpoint is documented by Singh & Sahni (1984), Thornton (1999), wan (2002), Abu-Bader & Abu-Qarn(2003), Dritsakis & Adamopoulos(2004), Iyare & Lorde(2004), Halicioglu(2005), Narayan, Nielsen & Smyth (2008), Ziramba (2009), Ghorbani & Zarea (2009), Yay & Tastan (2009),etc.
- **Wagnerian Hypothesis**, the unidirectional causality running from GDP to public spending, supported empirically by Oxley (1994), Ahsan, Kwan & Sahni (1996), Ansari (1997), Thornton (1999), Muhlis and Hakan (2003), Javed & Sahinoz (2005), Akitobu et al (2006), Ansari et al. (2009), Jamshaid et al (2010) Abdullah & Maamor (2010), Wu et al (2010), Kunu & Hopoglu(2015) etc.
- **Keynesian hypothesis**, if there is unidirectional causality running from public spending to GDP. This hypothesis is in line with empirical findings in studies by Iare & Lorde (2004), Dogan & Tang (2006), Babatunde (2007), Govindaraju et al. (2010), etc.

Kunu and Hopoglu (2015) find short run relationship between current spending and real GDP for data sample of Turkey (1990-2012) using ECM estimation. They find evidence in contrast to Keynesian hypothesis.

Javed and Sahinoz (2005) perform causality tests on economic growth, government expenditure and money supply on quarterly data for Turkey and find unidirectional positive causality from economic growth to expenditure.

Sevitenyi (2012) find empirical evidence in favor of Keynesian hypothesis for data on Nigerian economy for the time period (1961-2009). Medhi (2014) find evidence using VEC in favor of Wagner Law for the case of India (1974-2010).

As conclusion from the literature review, the hypothesis regarding the relationship between government expenditures and economic growth has no discernible pattern among countries,

in terms of whether developed or developing. The results estimation obtained are sensitive to the nature of the data utilized as well as the estimation approach.

### RESEARCH METHODOLOGY AND DATA

The objective of this section is to examine the presence of interdependence and directions of causality between government expenditure and economic growth in the case of Macedonia. This examination is based on secondary data for the period 2005-2015. The data are obtained from State Statistical Office of Republic of Macedonia and from National Bank of Republic of Macedonia. Using co-integration and Vector Error Correction Model (VECM) we investigate the long run as well as the short run relationship between economic growth and government expenditure.

From the Wagner's hypothesis we can conclude that there is a correlation between government expenditure and real GDP where Government Expenditure (GExp) is a function of Real GDP. If income increases the real government expenditure increases.

The econometric model is specified as follows:

$$GExp_t = \alpha_0 + \alpha_1 GDP_t + e_t \dots\dots\dots (1)$$

Where,  $\alpha_0$  and  $\alpha_1$  are parameters and  $\alpha_1 > 1$  so as to prove Wagner's Law,  $e_t$  is the error term

The Augmented Dickey-Fuller (ADF) (Dickey & Fuller, 1981) test is used to determine the stationary of time series. If the time series data is non-stationary the method of last squares is spurious, also if the data is not stationary the value R-squared is high which make difficult to determine relationship between series through the ECM, it's necessary to verify if the two series are co-integrated. Two or more series are said to be co-integrated if they share a common trend. The Johansen and Juselius procedure is performed to examine the co – integration relationship. Two test statistics are suggested to determine the number of co-integrated vectors, the trace test and the maximum eigenvalues test.

The trace test ( $\lambda_{trace}$ ) is defined as:

$$Trace = -T \sum_{i=r+1}^n \log(\lambda_i) \dots\dots\dots (2)$$

Where the null hypothesis is that the number of co-integration vectors is  $\leq r$  against the alternative hypothesis that the number of co-integration vector = r.

The maximum eigenvalues test ( $\lambda_{max}$ ) is defined as:

$$\lambda_{max} = -T \log(1 - \lambda_i) \dots\dots\dots (3)$$

Which tests the null hypothesis that the number of co-integration vectors = r against the alternative that they are r+1.

After the results from co-integration, is examined the Granger causality between economic Growth and government expenditure within VECM. The statement Government Expenditures Granger causes Economic growth or vice versa, represents how much of the current government expenditure and economic growth can be explained by the past values, and whether adding lagged values can improve the explanation. The causality relationship can be evaluated by estimating the following two regressions:

$$\Delta GExp_t = \beta_0 + \sum_{i=1}^m \beta_{1i} \Delta GExp_{t-i} + \sum_{i=1}^n \beta_{2i} \Delta GDP_{t-i} + \varepsilon_i \dots\dots\dots (4)$$

$$\Delta GDP_t = \beta_0 + \sum_{i=1}^n \beta_{1i} \Delta GDP_{t-i} + \sum_{i=1}^m \beta_{2i} \Delta GExp_{t-i} + \varepsilon_i \dots\dots\dots (5)$$

The null hypothesis that GDP does not granger cause GExp in regression (4) and that GExp does not granger cause GDP in regression (5), can be tested through the implementation of a F-test for the joint significance of the coefficients.

When the variables in a VAR system are co-integrated, we can use VECM in order to assess the direction of Granger causality and to estimate the speed of adjustment to the deviation from the long- run equilibrium between Government expenditures and Economic growth.

The VECM is based on the following equations:

$$\Delta GExp_t = \beta_0 + \sum_{i=1}^m \beta_{1i} \Delta GExp_{t-1} + \sum_{i=1}^n \beta_{2i} \Delta GDP_{t-1} + \beta_3 \eta_{t-1} + \varepsilon_i \dots\dots (6)$$

$$\Delta GDP_t = \beta_0 + \sum_{i=1}^m \beta_{1i} \Delta GDP_{t-1} + \sum_{i=1}^n \beta_{2i} \Delta GExp_{t-1} + \beta_3 \mu_{t-1} + \varepsilon_i \dots\dots\dots (7)$$

Where  $(\eta_{t-1})$  and  $(\mu_{t-1})$  represent the error correction term lagged residuals from the co-integration relations. The VECM error correction terms indicate the speed of the short run adjustments toward the long run equilibrium.

The VECM allow examining the short run as well as long run causality between government expenditure and economic growth. So, the short run causality is based on a standard F-test statistics and the long run causality is based on a standard t-test. If the coefficients of the error correction terms are negative and statistically significant, we conclude for existing long run causality

## EMPIRICAL ANALYSIS AND DISCUSSIONS

In this section, first we discuss the results of unit root test with the output of ADF test.

The result show that all variables are stationary after the first difference respectively they are integrated of order one I (1).

Unit root test is performed to check for stationary and we find that level variables are non-stationary, and stationary at the first differences. The order of lag-length was determined by Schwarz Information Criterion (SIC) and Akaike Information Criteria (AIC) and it results for our model is suggested two lags. Granger Causality (1969) methodology is employed for empirical evidence.

The table presents Augmented Dickey-Fuller unit root test for each variable to test the hypothesis  $H_0: \beta = 0$  (presence of the unit root) against  $H_1: \beta \neq 0$  (not presence of the unit root) because in order to use VECM, variables should be stationary in order to avoid spurious results.

Table 1-1: Results of ADF test (level)

ADF	Level (constant)		Level (constant, Linear Trend)		Level	
GDP	-1.12	0.697	-2.33	0.41	4.85	1.000
EXPEND	-0.58	0.86	-1.69	0.737	3.02	0.999

\*\*\* Significant at 1% level    \*\* significant at 5% level    \* significant at 10% level

Table 1-2: Results of ADF test (first difference)

ADF	FIRST difference (constant)		FIRST difference (constant, Linear Trend)		FIRST difference	
	T statistic	P value	T statistic	P VALUE	T STATISTIC	P VALUE
DGDP	-13.46	0.00	-13.35	0.00 ***	-1.64	0.094 *
DEXPEND	-11.43	0.00	-11.25	0.00 ***	-3.53	0.000 ***

\*\*\* Significant at 1% level    \*\* significant at 5% level    \* significant at 10% level

Given the results from this testing approach we conclude that the government expenditure and economic growth series are non-stationary in levels and stationary in first difference. Since the first difference series are stationary, we continue to examine the existence of co-integration through Johansen-Juselius procedure.

Co-integration results are also elaborated as following:

Table 2-1: Co-integration test (trace test)

Null hypothesis	Trace statistic (p values)	5% critical value (trace)
$r=0$	18.2 (0.019)	15.49
$r=1$	1.723(0.189)	3.84

Table 2-2: Co-integration test (maximum eigenvalues test)

Null hypothesis	Max-Eigen statistic (p values)	5% critical value (trace)
$r=0$	16.48 (0.0219)	14.26
$r=1$	1.723 (0.189)	3.84

Both tests (Trace test and Max-Eigenvalue test) indicate that there is one co-integration equation between GDP and government expenses which suggest that there may be a long run relationship between them.

In VECM model estimation error term is negative and is significant only for expenditure suggesting unidirectional causality. In order to have long-run stable equilibrium the error correction term should be negative and significant (Johansen, 1988).

Table 3: Vector error correction model

REGRESSION	DGEXP	DGDP
CONSTANT	925.91 (1.56)	1550.148 (2.24)
ECT-1	-1.3 (-3.34)	-0.007 (-0.017)
DGEXP-1	-0.16 (-0.57)	-0.56 (-1.69)
DGEXP -2	-0.12 (-0.62)	-0.30 (-1.37)
DGDP-1	-0.38 (-1.33)	-0.41 (-1.25)
DGP-2	0.14 (0.71)	-0.07 (-0.29)
$R^2$	0.67	0.5
SE	3492.5	4093.84

The co-integration analysis suggests that there exists a long-run relationship between government expenditures and economic growth. But in order to determine the short run, granger causality test was performed. The granger causality test result is presented in Table 4.

Table 4: Granger causality test

Independent variable	Dependent variable	DGEXP	DGDP
DGDP		7.76 (0.0207)	
DGEXP			2.9964 (0.2271)

As shown in the table, the estimation suggests that GDP granger causes GEXP (with 5 % level of significance,  $p = 0.0207$ ); but GEXP do not cause granger GDP ( $p = 0.2271$ ).

The test result shows a uni-directional relationship running from GDP to government expenditure for the case of Macedonia for the time period 2005-2015. This is in line with the Wagner's theory. Our findings indicate that government expenditure, in short run, may not have significant role in promoting economic growth.

### CONCLUSION

In this study we have examined the validity of Wagner's Law for Macedonia over the period 2005-2015. In the empirical section we first examined order of integration of each series using ADF unit root test. The existence of common stochastic trends for each specification was tested using Johansen – Juselius co-integration test procedures. Then, we examined causality through Granger causality approach within VECM.

This paper contributes to the empirical literature on the debate about the validity of the Wagner's Law by using time series data from Macedonia. The results clearly support the Wagner's hypothesis in the context of Macedonia for the period considered. The growth of per capita GDP has unidirectional relationship with government expenditure.

In the short run, the implication from this study is that expenditure is not an important tool for achieving growth rate for Macedonia. So, in other words, the Keynesian theory that increases in government spending result in increases in GDP is not supported by the data from Macedonia. The results follow that although government spending is increasing in Macedonia, it has failed to provide necessary impetus to improve economic growth. Rise in unproductive expenditures makes fewer resources available for productive expenditures and also reduces private investment. Macedonia is a country with high level of corruption and low level of transparency in different areas which causes inefficient allocation of government expenditures. The country needs immediately to initiate expenditure reform measures to reorient spending to productive government expenditures. Doing this measures about public spending will be improved the quality and efficiency of government expenditures so that overall development of the country can be accelerated.

To improve the study findings and to provide more concise conclusion/recommendation for policymakers, further research might include the disaggregate data for government expenditures to compare the impact of each component of government expenditure in economic growth or vice versa.

**REFERENCES**

1. Abu-Bader, S. and Abu-Qarn A.S (2003). "Government expenditures, military spending and economic growth: causality evidence from Egypt, Israel, and Syria", *Journal of Policy Model* 25(6-7):567-583.
2. Bağdigen, Muhlis & Çetintaş, Hakan, 2003. "Causality between Public Expenditure and Economic Growth: The Turkish Case," MPRA Paper 8576, University Library of Munich, Germany, revised 07 Dec 2003.
3. Balassone, F., Francese, M., Pace, A. (2011, October). Public debt and economic growth in Italy (Economic History Working Papers No. 11). Bank of Italy.
4. Chang, T., W. Liu and S. Caudill (2004). "A re-examination of Wagner's Law for ten countries based on cointegration and error-correction modeling techniques", *Applied Financial Economics*, 14: 577-589.
5. Magazzino, C. (2012) Wagner versus Keynes: Public spending and national income in Italy. *Journal of Policy Modeling* 34, 890-905
6. Masih, R. and Masih, A.M. (1996). "Macroeconomic Activity Dynamics and Granger Causality: New evidence from a Small Developing Economy Based on a Vector Error-Correction Modelling Analysis", *Economic Modelling*, 13:407-426. Musgrave, R.A., (1969). *Fiscal Systems*, Yale University Press, New Haven and London.
7. Medhi, K. (2014). An Empirical Investigation of the Causality between Government Expenditure and Economic Growth in India during 1974-2010.
8. Mutuku, C.M & Kimani, D.K (2012). "Investigating Wagner's law: Cointegration and Granger Causality Tests for Kenya", *Current Research Journal of Economic Theory*, 4(2) 43-52
9. Omoke, P., (2009). "Government expenditure and national income: A Causality test for Nigeria", *European Journal of Economics and Political Studies*, 2(2): 1-11.
10. Rana, R. (2014). Government Expenditure and Economic Growth in Bangladesh: An Empirical Study. 2. 271-278.
11. Rehman, J. (2010). Cointegration-Causality Analysis between Public Expenditure and Economic Growth in Pakistan. *European Journal of Social Sciences*. 13. 556-565.
12. Wagner, A., (1883). Three Extracts on Public Finance. In: Musgrave, R.A. and A.T. Peacock, (Eds.), 1958, *Classics in the Theory of Public Finance*. Macmillan, London.