

THE WAGNER'S LAW: TIME SERIES EVIDENCE FOR TURKEY, 1960-2006

WAGNER YASASI: TÜRKİYE ÖRNEĞİ, 1960-2006

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ABSTRACT: In this paper the Wagner's Law for Turkey for the period 1960-2006 is analyzed. Wagner's law investigates whether there is a long run relationship between government expenditures and the gross national product of a country. The paper uses modern time-series econometric techniques to test the validity of law's proposition. Cointegration analysis is used to test the validity of the Wagner's law. Our results suggest that Wagner's law is validated for two formulations using the definition given by Florio & Colutti (2005) according to the elasticity measures for the period under consideration. In this paper the Toda-Yamamoto tests of Granger causality, short and long run properties of the model within an error correction model are examined. Estimated error correction models indicate that the Granger-causality between government expenditures and gross domestic product is bi-directional in the long run.

Keywords : Wagner's law; Government Expenditures; Co-integration; Causality; Turkish Economy

JEL Classification : H50, H62, C51

ÖZET: Bu çalışmada Türkiye için Wagner yasası 1960-2006 arası dönem için araştırılmıştır. Wagner Yasası kamu harcamaları ile milli gelir arasındaki uzun dönemli ilişki olup olmadığını araştırır. Bu çalışmada yasanın geçerliliği modern zaman serisi ekonometrik teknikleri ile test edilmiştir. Wagner Yasası'nın geçerliliğini test etmek için ko-integrasyon analizi kullanılmıştır. Çalışma sonuçlarına göre Florio ve Colutti (2005)'nin belirttiği elastikiyet ölçütlerine göre analiz edilen dönemde Wagner Yasası'nın iki formülasyonuna göre yasa kabul edilmiştir. Bu çalışmada Toda – Yamamoto Granger nedensellik testi, modelin kısa ve uzun dönem özellikleri hata düzeltme modeli çerçevesinde incelenmiştir. Tahmini hata düzeltme modeline göre uzun dönemde kamu harcamaları ve gayri safi yurt içi milli hasıla arasındaki Granger nedensellik çift taraflıdır.

Anahtar Kelimeler: Wagner Yasası; Kamu Harcamaları, Ko-integrasyon; Nedensellik; Türkiye Ekonomisi

1.Introduction

Over the last forty years many studies attempted to explain the relationship between government expenditure and national income. Two major areas of economic analysis handled this relationship differently. Public finance studies considered government expenditure as a behavioral variable. In this Wagnerian view, growth in government expenditure over time is caused by growth in national income. The other approach is encountered in most macroeconomic models. Such studies follow a Keynesian view and treat government expenditure as an exogeneous policy instrument in the determination of national income.

In 1877 Adolph Wagner referred to a "Law of the Increasing Extension of State Activity" (Wagner and Weber, 1977). According to this law as per capita output increases in industrializing nations, the proportion of output devoted to government activities also increases. Mann (1980) states that there are three reasons to expect an expanding scope of public activity. "Firstly, the administrative and protective functions of the state have to expand due to rising complexity of legal relationships and communication. Secondly Wagner argues that the income elasticity of demand for publicly provided goods are greater than unity. Also the state has to provide the necessary capital funds to finance large scale capital expenditures". Wagner states that "there is a complementarity between the growth of the industrial economy and the associated growth in demand for public services" (Peacock & Scott, 2000). Thus, Wagner's law refers to the relationship between government expenditures and gross national product in the long run.

Abizadeh and Gray (1985) tested Wagner's law for the period 1963–1979 for 55 countries and found support for Wagner's law in the richer countries, but not in poorer countries. Chang (2002) tested Wagner's law for three emerging industrialized countries and three industrialized countries and found support for Wagner's law in five of the six countries. However, in a later study, Chang, Liu, and Caudill (2004) tested Wagner's law for three newly industrialized countries in Asia and nine industrialized countries and found only mixed support for the law. Ram (1986) tested Wagner's law for 63 countries over the period 1950–1980 and found little support for the law. Wahab (2004) found at best limited support for Wagner's law in a study of 30 OECD countries, while Kolluri, Panik, and Wahab (2000) found support for Wagner's law in a study of the G7 economies. Afrentiou and Serletis (1996) found no support for Wagner's law in a multi-country study of six European countries using data from the twentieth century.

This paper attempts to test the Wagner's law by trying to explain the growth of government expenditure in terms of growth of gross domestic product in Turkey. The period 1960-2006 is analyzed using cointegration analysis and dynamic single equation framework. In the empirical studies on Wagner's law there are inconsistencies among the results obtained by different authors. Some of these inconsistencies are the result of Wagner's own inexplicit formulation of his hypothesis. Differences in the quality and quantity of data were other reasons. Measure of size of government, test procedure, period examined, econometric specification and the influence of omitted variables also led to inconsistent results in the empirical studies. In this paper an openness measure of the economy and inflation are included in the explanation of the growth of government expenditure besides gross domestic product. We use the newly developed Toda and Yamamoto (1995) Granger causality tests which have never been applied to study the relationship between government expenditures and income for any country.

This paper is organized as follows. Section 2 describes Wagner's law in general. Section 3 provides a review of the studies on Wagner's law using Turkish data. Section 4 provides data analysis and the results obtained. Section 5 includes the conclusion.

2. Studies on Wagner's Law

Wagner's law states that as per capita income increases, public expenditure also increases. The following relationship is postulated:

$$\ln G_t = \alpha + \beta \ln Y_t + \gamma \ln X_t \quad (1)$$

where α denotes constant term, β denotes trend, t denotes time period and G denotes the share of government expenditure in gross national product. Y is per capita gross national product and X is a set of other determining variables. Wagner law posits β to be positive.

The empirical relationship between government expenditures and gross national product has been studied in detail for both developing and developed countries. Mann (1980) in Mexico, Henrekson (1993) in Sweden, Cameron (1978) in cross section of 18 countries, Kolluri, Panik and Wahab (2000) in G7 industrialized countries have found support for Wagner's law for developing countries. These authors represent only a sample from an enormous literature and are chosen because they illustrate a range of econometric techniques and alternative formulations of Wagner's law. On the other hand Wagner and Weber (1977) in cross section of 34 countries, Courakis et al. (1993) Moura-Rouke and Tridimas (1993) in Greece and Portugal found no evidence for Wagner's law for developing countries. Abizadeh and Gray (1985) in pooled time series and cross section of 53 countries, Ram (1987) in cross section of 115 countries and Gandhi (1971) in 25 African countries showed that Wagner's law does not hold for developing countries, however it holds for developed and developing countries taken together.

Table 1. Summary of the diversities in the studies on Wagner's Law

	A	B	C	D	E	F	Data Period
1. Courakis, Moura-Roque and Tridimas (1993)	22, 4	1	1, 2, 3, 4, 5	1	1	1	1958-1985
2. Chletsos and Kollias (1997)	4, 11, 12, 13, 14, 15, 16, 17	1	6	1	2	2	1958-1993
3. Gabriella Legrenzi (2004)	1	1	1, 2, 7, 8, 9, 10	1	3	1	1861-1980
4. Gabriella Legrenzi & Costas Milas (2002)	4	1	1, 11, 12	1	3	3	1959-1996
5. Tsangyao Chang, Wenrong Liu and Steven B. Caudill (2004)	2	1	1, 6	2	4	4	1951-1996
6. Bernardin Akitoby, Benedict Clements, Sanjeev Gupta and Gabriela Inchauste (2005)	2	1	1	2	5	1	1970-2002
7. Chetan Ghate and Paul J.Zak (2002)	2	1	1	1	6	1	1929-2000
8. Tsangyao Chang (2002)	2	1	1	2	7	4	1951-1996
9. Damina Tobin (2004)	2	1	1	1	8	5	1978-2001
10. Bharat R.Kolluri, Michael J.Panik and Mahmoud S.Wahab (2000)	1, 5, 6		1, 13, 14	2	9	6	1960-1993
11. Nadeem A.Burney (2002)	1	3	5, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31	1	10	7	1969/70-1994/1995
12. Mahmoud Wahab (2004)	8	1	6	2	11	8	1950-2000
13. Ferda Halicioğlu (2003)	2	4	6, 32	1	12	9	1960-2000
14. İhsan Günaydin (2000)	2, 23, 4	1, 3	15	1	12	10	1950-1998

Landau (1983) in cross section of 96 countries, Ram (1986) in cross section of 63 countries and Easterly & Rebelo (1993) in cross section of 100 countries analyze the reverse relationship between government expenditures and gross national product. They consider the role of government expenditures in explaining the growth of national income. Ram shows that there is a causal flow from economic development to government expenditures.

A- Measure of G

1. Government expenditures at current prices, 2. Government expenditures at constant prices, 3. Government capital expenditures at constant prices, 4. Per capita total government expenditures, 5. Government consumption expenditures, 6. Government transfer expenditures, 7. The share of government expenditures in gross national product, 8. Government expenditures including expenditure on goods and services, interest payments, subsidies, transfers and capital expenditures, 9. The share of government expenditures in gross domestic product, 10. Government current expenditures, 11. Per capita government consumption expenditures, 12. Per capita government investment expenditures, 13. Per capita government transfer payments, 14. Per capita government civilian expenditure, 15. Per capita government military expenditure, 16. Per capita military spending on equipment, 17. Per capita military spending on wages and salaries, 18. Current government expenditures on goods and services, wages and salaries, other goods and services, 19. Government capital expenditures, 20. Non-interest government current expenditures, 21. Non-interest total government expenditures, 22. Government expenditures plus transfer at constant prices, 23. Government current expenditures

B- Dependent Variable

1. Total government expenditures, 2. Per capita total government expenditures, 3. The share of government expenditures in gross national product, 4. The share of government expenditures in gross domestic product

C- Independent Variables

1. real gdp, 2. Population, 3. permanent income, 4. relative price of public expenditures, 5. deviation of nominal gnp from normal its long run path, 6. real per capita gdp, 7. tax revenues, 8. Tax, 9. the ratio of government expenditures financed by tax, 10. the tax-share on domestic product, 11. bureaucratic power defined as the share of public sector employees in the Italian labour force, 12. institutional factor defined as the ratio of nominal local expenditures to state expenditure, 13. first lag of government expenditures 14. second lag of government expenditures, 15. real per capita gnp, 16. real per capita, government disposable revenues, 17. real per capita government total revenues, 18. real per capita government total revenues, 19. real per capita non-oil GDP, 20. share of non-mining and quarrying in the GDP, 21. share of non-oil value added in the GDP, 22. share of service producing sectors in the GDP, 23. the share of tax revenues in government's disposable revenues, 24. government disposable revenues over GDP, 25. total government revenues over GDP, 26. import over GDP ratio, 27. trade over GDP ratio, 28. the ratio of money supply to GDP, 29. the ratio of total deposits in the banking system to money supply, 30. employment growth in the public sector, 31. population under the age of 15 as a proportion of the total population, 32. the ratio of budget deficit to GDP.

D- Data Source

1. Time Series, 2. Cross Section

E- Country Data

1. Greece and Portugal, 2. Greece, 3. Italy, 4. South Korea, Taiwan, Thailand, Australia, Canada, Japan, New Zealand, USA, the United Kingdom and South Africa, 5. 51 developing countries, 6. US, 7. South Korea, Taiwan, Thailand, Japan, USA and the United Kingdom, 8. China, 9. Canada, France, Germany, Italy, Japan, UK and US, 10. Kuwait, 11. Following OECD countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Greece, Iceland, Ireland, Italy, Japan, Korea, Luxemburg, Mexico, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, UK and US, 12. Turkey.

F- General Specification (including logarithmic forms)

G denotes total government expenditures, gdp is gross domestic product, gnp is the gross national product and N denotes population in the formulations 1. $G=f(GDP)$, 2. $G/N=f(GDP/N)$, 3. $G=f(GDP)$, $G_c=f(GDP)$, $G=f(GDP/N)$, $G/N=f(GDP/N)$, $G/GDP=f(GDP/N)$, $G/GDP=f(GDP)$, 4. $G=f(GDP)$, $G=f(GDP/N)$, $G/N=f(GDP/N)$, $G/GDP=f(GDP/N)$, $G/GDP=f(GDP)$, 5. $G_t=f(GDP_t, G_{t-1})$, 6. $G_t=f(GDP_t, G_{t-1}, G_{t-2})$, 7. $G=f(GDP, Z)$ where Z is the set of other relevant variables, 8. $G=f(GDP, GDP_{bar})$ where GDP_{bar} is the pooled time series/cross sectional mean growth rate, 9. $G=f(GDP/N)$ and $G=f(GDP/N, BDR)$ where BDR is the ratio of ratio of budget deficit to GDP, 10. $G=f(GNP)$, $G=f(GNP/N)$, $G/N=f(GNP/N)$, $G/GNP=f(GNP/N)$, $G/GNP=f(GNP)$

Table 1 shows that empirical tests of Wagner's law for developed and developing countries have produced mixed results which differ considerably from country to country and period to period. Public finance studies, following Wagner, have considered public expenditure as a behavioral variable, similar to private consumption expenditure. On the other hand, macroeconomic models, mainly following Keynes, have treated public expenditure as an exogenous policy instrument designed to correct short-term cyclical fluctuations in aggregate expenditures. In the case of Wagner's law, the causality runs from economic growth to government expenditures, whereas in the case of Keynesian hypothesis, causality runs from government expenditure to economic growth.

3. Studies on Wagner's Law using Turkish Data Set

In this section a brief review of the studies on Wagner's law using Turkish data set is given. Demirbas (1999) investigates statistically the existence of a long-run relationship between government expenditures using data for Turkey over the period 1950-1990. Demirbas tests all six versions of Wagner's Law in the period from 1950 to 1990. Six Versions of Wagner's Law are given as follows:

Table 2. Functional form Versions

1. $G = a + bY$ Peacock-Wiseman [1968]	(1)
2. $C = a + bY$ Pryor [1969]	(2)
3. $G = a + b(Y/P)$ Goffman [1968]	(3)
4. $G/GNP = a + b(Y/P)$ Musgrave [1969]	(4)
5. $G/P = a + b(Y/P)$ Gupta [1967]	(5)
6. $G/Y = a + bY$ "Modified" version of P-W suggested by Mann [1980]	(6)

where Y denotes the logarithm of gross national product, C denotes the logarithm of government consumption expenditures, G shows the logarithm of government

expenditures and P denotes population. Demirbas concludes that there is no long-run relationship between government expenditures and gross national income in Turkey for all six versions of Wagner's Law using data for the period 1950-1990.

Günaydın (2000) tests Wagnerian and Keynesian hypothesis by examining the relationship between national income and government expenditures for Turkey during the 1950-1998 period. Following Keynes, government expenditure is seen as an exogeneous factor used as a policy instrument to influence growth. However, Wagner argues that government expenditure is an endogeneous factor or an outcome of growth in national income. Günaydın shows that the hypothesis of national income causing government expenditure is supported by the data for Turkey. Therefore, Wagner's law is validated. Another result of the study is that budget deficit can be reduced in order to restrict the role of government in Turkey.

Arisoy (2005) use the version of Wagner's formulated by Mann (1980) since this is found to be the simplest version. Mann's formulation shows the relationship between the ratio of government expenditure in gross national product and gross national product. Logarithms of both variables are used. Arisoy finds that there is a long run relationship between total government expenditures and economic growth cointegration according to the Engle and Granger two step cointegration test results. This finding holds for the components of government expenditures as well. Arisoy finds a unidirectional causality (except for total government expenditure) from economic growth to disaggregated public expenditure that total current, investment, transfer expenditures and non-transfer total public expenditures in the long run.

Işık & Alagöz (2005) investigate the validity of Wagner's law using data for the period between 1985 and 2003. They state that government expenditures are necessary not as a direct tool for the sustainable economic growth but as a common catalizor for economic and social development. Therefore, the size of the public sector is quite important in terms of economic growth. They use five different formulations of Wagner's law including Peacock-Wiseman (1961), Gupta (1967), Goffman (1968), Musgrave (1969), Mann (1980) models which are referred to as model 1 to model 5 respectively. Işık & Alagöz find one cointegration relationship for each of Wagner's law formulations. For all models Wagner's law is validated.

Artan & Berber (2004) state that Gwartney, Holcombe and Lawson (1998) quote that the core functions of government are composed of two general categories: (1) activities that protect persons and their property from plunder, and (2) provision of a limited set of goods that for various reasons markets may find it difficult to provide. Artan & Berber argue that the core functions of government can improve economic efficiency and thereby enhance economic growth. Artan & Berber state that Gwartney, Holcombe and Lawson (1998) quote that the core functions of government enhances economic growth. Government expenditures other than core expenditures affect economic growth negatively. Artan & Berber find uni-directional causality from economic growth, investment expenditures, exports and imports to government expenditures. Therefore it is found that these expenditures Granger cause government expenditures, validating Wagner's law.

Uzay (2002) uses a two sector production function in order to analyze the effects of government expenditures on economic growth. It is found that there is a positive relationship between government expenditures and economic growth. Therefore, the

increase in government expenditures accelerates economic growth by preparing suitable conditions for private sector investments. Uzay concludes that the increase in capital accumulation and labor force affect economic growth positively as well. Uzay also finds that the increase in government size delays economic growth by crowding out private investments. The findings of the studies on Wagner's law using Turkish data set are summarized in the following:

- Studies finding no relationship between government expenditures and national income: Demirbaş (1999),
- Studies validating Wagner's law: Günaydın (2000), Arısoy (2005), Işık & Alagöz (2005), Artan & Berber (2004).

4. Data and Empirical Results:

The concept of government expenditures (G) used here is the general budget expenditures measured in real terms (1987 prices). The data of budget expenditures for the period 1960-2006 are taken from Consolidated Budget Summary (Realization) from Prime Ministry State Planning Organization web site. N shows population. The population data is obtained from Prime Ministry of Turkey, State Institute of Statistics website. GDP is the logarithm of gross domestic product deflated using gdp deflator with 1987 base year. The data of gross domestic product and exchange rate are acquired from Central Bank of Turkey. Openness of the economy ($OPENNESS$) is the logarithm of the ratio of the sum of exports and imports over nominal gnp. Data for imports and exports are obtained from table for Foreign Trade according to years from Economic and Social Indicator (1950-2007) from Prime Ministry of Turkey, State Planning Organization. Imports and exports are measured in million US\$ and converted to TL units using the end of period exchange rate. All variables other than inflation are used in natural logarithms. Inflation is measured as the annual percentage change in consumer price index. Inflation variable is used as a proxy for measuring economic uncertainty.

In this section unit roots and cointegration tests for the variables of interest are undertaken and the results are reported. Toda and Yamamoto tests are valid for integrated or cointegrated variables. We examined the stationarity properties of the data series in order to determine the order of integration of the series. For this reason, tests for unit roots are carried out using the Augmented Dickey-Fuller (ADF) tests.

Table 3. ADF Test Statistics

Variables	ADF Test		
	Level		First Difference
	Without Trend ^a	With Trend ^b	Without Trend
<i>GDP</i>	-0.34(0) ^c	-3.02(0)	-6.90*(0)
<i>G</i>	-0.55(0)	-1.67(0)	-7.29*(0)
<i>G/N</i>	-0.70(0)	-1.57(0)	-7.26*(0)
<i>G/GDP</i>	-1.47(0)	-2.40(0)	-9.16*(0)
<i>GDP/N</i>	-0.57(0)	-2.80(0)	-6.92*(0)
<i>OPENNESS</i>	-0.26(1)	-2.94(0)	-8.68*(0)
<i>INFLATION</i>	-2.12(0)	-1.98(0)	-8.33*(0)

^a ADF regressions include an intercept but not a linear trend (See, Pesaran and Pesaran, 1997:53).

^b ADF regressions include both an intercept and a linear trend (See, Pesaran and Pesaran, 1997:53)

^c Numbers in parentheses are the order of augmentations (p) chosen by the Schwarz Bayesian Criterion.

^d An asterisk (*) denotes rejection of the null hypothesis at 95 % critical level (See MacKinnon, 1991)

The ADF test results with a constant term, constant and trend term and first difference specifications are reported in Table 2. The Augmented Dickey –Fuller (1981) ADF test is accepted at the 5 % level for all variables in levels including constant term and constant & trend specifications. ADF test statistics are rejected for all variables using the first difference specification. According to unit root test results all variables are found as integrated of order one.

In the literature it is difficult to define uniquely the relationship between ‘economic growth’ and ‘the growth of government expenditures’. Alternative specifications are used in order to test Wagner’s hypothesis, using various variables to approximate the theoretical variables of ‘state activity’ and ‘economic growth’ Five specifications are predominantly used in the literature, most authors test for the validity of one or more of them. In this paper in order to investigate the relationship between government expenditures and economic activity, we use five versions of Wagner’s law as outlined below. The variables of interest are taken in natural logarithmic form.

Table 4. Formulations of Wagner’s Law Used in the Analyses

1. $G = a + bGDP$	(1)
2. $G/GDP = a + bGDP$	(2)
3. $G = a + b(GDP/N)$	(3)
4. $G/N = a + b(GDP/N)$	(4)
5. $G/GDP = a + b(GDP/N)$	(5)

where G is the total government expenditure, GDP is the gross domestic production and N is the population. According to Florio & Colutti (2005) Wagner’s law is validated in the above models if the elasticity of the independent variable with respect to the to the dependent variable is greater than 1 in models 1, 3 and 4. On the other hand Wagner’s law is validated if this elasticity is greater than zero in models 2 and 5.

Since the variables are identified as integrated of order one (I(1)) according to the unit root test results, we test for cointegration among the variables involved in the five specifications using the Johansen (1988, 1995) maximum likelihood methodology. We define the number of the cointegrating vectors and report the estimated relationships. When we undertake cointegration test in the bivariate case using five different formulations of Wagner’s law, no cointegrating relationship is found between the variables of interest. This finding suggests that there are omitted variables which are not accounted for in the analyses. We extend our explanatory variables using openness of the economy and inflation variable as a proxy for economic uncertainty. Cointegration analysis is undertaken using government expenditures, openness of the economy, inflation and gross domestic product variables.

On implementing the Johansen maximum likelihood cointegration approach, the lag structure of the VAR system is selected on the basis of the minimum of Akaike information criterion (AIC), Schwarz information criterion (SBC), Final Prediction Error (FPE), sequential modified LR test statistic (LR), Hannan-Quinn (HQ) information values obtained using Eviews 5. According to the VAR lag length selection results two dimensional VAR for model 1, three dimensional VAR for model 2, two dimensional VAR for model 3, two dimensional VAR for model 4 and three dimensional VAR for model 5 in order to obtain non-correlated residuals; therefore estimation periods are reduced so as to accommodate the lag structure of the models.

In all of the analyses dummy variables for 1971, 1980, 1994 and 2001 are included. The dummy variables for 1971 and 1980 indicate the political crises in those years. The dummy variables for 1994 and 2001 indicate the economic crisis and the ensuing stabilization program in that year. For 1971 and 1994 impulse dummy variables are used which take 1 in the corresponding year and zero elsewhere. Following Juselius (2001), we include a step (intervention) dummy for 1980 and 2001 in each cointegration system to account for the structural break of these years. The number of cointegrating vectors according to the maximum eigenvalue and trace statistics are reported in Table 3.

Table 5. Cointegration Test Results

Indp. Variable	Model 1	Model 2	Model 3	Model 4	Model 5
	<i>Dep. Var. G</i>	<i>G/GDP</i>	<i>G</i>	<i>G/N</i>	<i>G/GDP</i>
<i>GDP</i>	0.392	0.549**			
<i>GDP/N</i>			0.896	0.159	1.113**
<i>OPENNESS</i>	2.083**	0.095	1.896**	1.895**	0.055
<i>INFLATION</i>	0.042**	0.0017	0.039**	0.035**	0.002
Number of cointegrating Vectors According to Trace	2	2	2	2	3
Number of cointegrating Vectors According to Maximum Eigenvalue	2	1	1	1	1

* indicates statistical significance at 5 % level and ** indicates statistical significance at 1 % level. t test statistics is taken as 1.645 at 5 % level and 2.326 at 1 % level.

Our results suggest that Wagner's law is validated using models 2 and 5 using the definition given by Florio & Colutti (2005) according to the elasticity measures in five different models. A positive relationship is found between total government expenditures and both openness of the economy and inflation variables. Openness of the economy affects government expenditures positively. Beginning from 1980, Turkey's trade system has been liberalized extensively. Exports and imports both have grown rapidly since 1980. Turkish government promoted exports giving incentives and encouraged trade. However it is not possible to expect any positive or negative relationship between openness of the economy and government expenditures. The evidence of cointegration is sufficient to establish a long-run relationship between government expenditure and income. However, support for Wagner's Law necessitates unidirectional causality from income to government expenditure. Therefore cointegration should be seen as a necessary condition for Wagner's Law, but not a sufficient one. Following Keynes, government expenditure is seen as an exogenous factor used as a policy instrument to influence growth. However, Wagner argues that government expenditure is an endogenous factor or an outcome of growth in national income.

We follow Rambaldi and Doran (1996) in formulating the Toda-Yamamoto test of Granger causality. Where d_{max} is the maximum order of integration in the system (in our case, it is one), a $VAR(k + d_{max})$ has to be estimated to use the Wald test for linear restrictions on the parameters of a $VAR(k)$ which has an asymptotic χ^2 distribution. In our case, k is determined to be 2 by using the Akaike Information Criterion (AIC).

In Table 3 we conclude that Wagner's law is valid for models 2 and 5. Focusing on model 2 we fit an error correction model and test Granger causality. By having already

concluding that our variables are cointegrated we have already implicitly concluded that there is a long run causal relationship between them. So the causality being tested for in a VECM by these tests is sometimes called short run Causality tests. Statistical significance of VECM estimates and the results of Toda-Yamato tests of Granger causality are given in Table 4. The optimal lag orders for the lagged differenced terms in each model are determined to be two using AIC. Table 4 summarizes the χ^2 test statistics for zero restrictions on the coefficients of the variables, the corresponding p-values are provided in the parenthesis.

Table 6. Toda-Yamamoto Granger Causality Test for Model 2

Dep. Variable	Lagged Differenced Terms				t statistics
	$\Delta G/GDP$	ΔGDP	$\Delta OPENNESS$	$\Delta INFLATION$	
$\Delta G/GDP$	-	5.26(0.07)	0.45 (0.79)	6.63(0.02)	-2.86**
ΔGDP	3.29(0.19)	-	1.78 (0.408)	2.57(0.275)	-1.92*
$\Delta OPENNESS$	2.037(0.36)	0.69(0.707)	-	0.68(0.71)	0.409
$\Delta INFLATION$	8.06(0.017)	12.64(0.0018)	15.84(0.0004)	-	-3.75**

E.C.T. column display t test for the lagged error correction term, i.e., deviations from the long run cointegration relationship which is summarized in the last column. (***) (** and *) denote significance at 1%, 5% and 10% levels, respectively.

The significance of the lagged error term (ECT) in an equation implies causality from all right hand variables to the corresponding left-hand side variables. Furthermore, the significance of ECT also implies economic endogeneity of the corresponding left-hand side variables in the given model and tells that the rest of the variables are exogenous and therefore not explained by the model. The significance of the χ^2 test shows short-run causality flowing from the corresponding left hand side variable to the variables on the right hand side in the same row.

The t-test for error correction term for the ratio of government expenditures over gdp, gross domestic product, openness and inflation is estimated as -2.86 which is statistically significant at 5 % level. When we regress the differenced gross domestic product on a constant, lagged error correction term we get an estimate of -1.92 for the t statistics which is significant at 10% level. These results indicate that there is a bidirectional Granger-causality between the ratio of government expenditures and gross domestic product. In terms of predictability, this finding supports both Wagnerian and Keynesian approaches. The long run elasticity of the ratio of government expenditures with respect to gross domestic product is estimated as 0.539 as can be seen from Table 3 which is statistically significant. A one percent increase in gross domestic product raises real government expenditures by 0.539%. This finding supports the Wagner Law. Next, we estimated error correction models using first differenced openness and first differenced inflation as dependent variables. For first differenced openness model, the speed of adjustment is not statistically significant. For first differenced inflation model the ECT parameter is statistically significant at 5% level.

In the short run gross domestic product unilaterally causes the ratio of government expenditures as the p-value for the corresponding χ^2 test which is found to be 0.07. Therefore Wagner's law is validated in the short run, however Keynesian approach is not validated. Also, there is bilateral causality between inflation and the ratio of government expenditures. In the short run we found that there is unilateral causality

from openness of the economy to inflation and also from gross domestic product to inflation as well.

Table 7. Toda-Yamamoto Granger Causality Test for Model 5

Dep. Variable	Lagged Differenced Terms				t statistics
	$\Delta G/GDP$	$\Delta GDP/N$	$\Delta OPENNESS$	$\Delta INFLATION$	
$\Delta G/GDP$	-	10.91 (0.012)	1.65(0.64)	7.95(0.0469)	-2.10**
$\Delta GDP/N$	7.59(0.055)	-	4.59 (0.203)	5.80(0.12)	-2.65**
$\Delta OPENNESS$	2.195(0.53)	6.35(0.095)	-	4.57(0.205)	1.80*
$\Delta INFLATION$	5.92(0.115)	36.76(0.000)	16.28(0.001)	-	-4.73**

E.C.T. column display t test for the lagged error correction term, i.e., deviations from the long run cointegration relationship which is summarized in the last column. (***) (** and *) denote significance at 1%, 5% and 10% levels, respectively.

In the analyzes using model 5, the t-test for error correction term for all dependent variables are found to be significant. This implies that there is causality from all right hand variables to the corresponding left-hand side variables in the long run. Therefore these results indicate that there is a bidirectional Granger-causality between the ratio of government expenditures and gross domestic product. Similar to the analyzes of model 2, this finding supports both Wagnerian and Keynesian approaches. In the short run bilaterally per capita gross domestic product causes the ratio of government expenditures and vice versa. Therefore Wagner's law and Keynesian approaches are both validated in the short run. Also, there is unilateral causality from inflation to the ratio of government expenditures. In the short run we found that there is unilateral causality from openness of the economy to inflation and also from per capita gross domestic product to inflation as well.

5. Conclusion

In this paper we attempted to test Wagner's law using time series data of Turkey during 1960 - 2006 period. We considered several specifications commonly employed in the literature for empirical testing of Wagner's law. In the empirical section we first examined order of integration of each series using ADF unit root tests. The existence of common stochastic trends for each specification was tested using Johansen cointegration test procedures. Cointegration analyses are undertaken taking gross domestic product, openness of the economy and inflation as explanatory variables. Our results suggest that Wagner's law is validated using models 2 and 5 using the definition given by Florio & Colutti (2005) according to the elasticity measures.

In model 2 the ratio of government expenditures over gross domestic product is used as independent variable whereas gross domestic product, openness of the economy and inflation are used as independent variables. Estimated error correction models indicate that the Granger-causality between government expenditures and gross domestic product is bi-directional. This finding supports both Wagnerian and Keynesian approaches to government expenditures. In the short run we found that unilaterally gross domestic product causes the ratio of government expenditures. Therefore Wagner's law is validated in the short run, however Keynesian approach is not validated. In model 5 the ratio of government expenditures over gross domestic product is used as independent variable whereas per capita gross domestic product, openness of the economy and inflation are used as independent variables. In the analyzes using model 5, a bidirectional Granger-causality between the ratio of

government expenditures and gross domestic product is found. In contrast to model 2, Wagner's law and Keynesian approaches are both validated in the short run.

The most important finding of this study is the validity of Wagner's law for Turkey in the long run. It can be concluded that public protective and regulative activities are necessary since industrialization and modernization lead to a substitution of public for private activity. In particular, the privatization activities of the recent years necessitate increased public regulation in government expenditures in Turkey. For Turkey success of the fiscal policy used in order to control budget deficit and be able to compete in global markets effectively depends on the relationship between government expenditures and gross national product. Governments should take part in regulating the infrastructure framework of the economy, rather than in the production process.

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