6. Growth of Public Expenditures in Turkey during the 1950-2004 Period: An Econometric Analysis

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Abstract

The share of government expenditures in GDP has displayed steady increase in both developed and developing countries during the 20th century. This observation has led economists to explore the reasons and the underlying mechanism both theoretically and empirically. Several hypotheses on the relationship of public expenditures with income growth, budget deficits and government revenues have been reexamined in the light of recent developments in econometric methods. This study presents results from testing three hypotheses, namely, the Wagner Hypothesis, the Buchanan-Wagner Hypothesis and the Tax-Expenditure Hypothesis, using data from Turkey for the period 1950-2004. In the empirical section we employed time series econometric techniques to analyze long run economic relationships. Several unit root and cointegration tests are utilized to see the robustness of results across different methods.

Keywords: Public expenditures, Wagner Hypothesis, Buchanan-Wagner Hypothesis, Tax-Expenditure Hypothesis, Turkey
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Introduction

Beginning in the second half of the 20th century, economists have started to focus on the reasons of the dramatic increase in public expenditures in both developed and developing countries. As stated by Peacock and Wiseman (1967:12), until the 1950s, public economics theory was only a taxation theory. The growth of the number of studies on public expenditures is closely related to the observation that the share of public expenditures in GNP has risen rapidly in many developed countries. Before the World War I, the share of government expenditures in GDP in main developed

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countries, as average, was only 13 percent. This share has increased to 43-45 percent in 1990s in the same countries (Poot, 2000; Tanzi, 2005:619). The same trend can be observed in the development of the public expenditures in Turkey.

The aim of this paper is to test the validity of the main hypotheses on the long term trend of the public expenditures in Turkey during 1950-2004 period using recently developed time series econometric models. In particular, we explore the validity of hypotheses on public expenditures using several model specifications and test procedures to check the robustness of results.

The paper is organized as follows. The next section provides a concise summary of competing hypotheses and our models associated with public expenditures. An overview of Turkish economy is presented in section 2. Section 3 presents data and empirical results. Finally, summary and concluding remarks are presented in conclusion.

1. The Hypotheses and Models on Public Expenditures

1.1. Hypotheses

We can summarize the main hypotheses on the growth of public expenditures as follows:

The first hypothesis is the *Wagner Law* or *Wagner Hypothesis* which was suggested by German economist Adolph Wagner in 1893. The hypothesis posits that the long run development of public expenditures in developed countries is closely connected with the desire for progress of society and so with economic development; if the economic development increases, it will cause the (demand for) public expenditures to increase more (Wagner, 1967). A different version of the first hypothesis, known as the *Peacock-Wiseman's hypothesis* (as a version of the Wagner's Law) posits that there is a positive relationship between real GDP and public expenditures; however public expenditures display not a linear development but a line of development which includes some broken points that result from extraordinary events such as natural, economic or social crises and wars. In these extraordinary periods government can increase public expenditures easily and it can also finance them by raised tax rates. After the extraordinary period, government does not decrease tax rates and protects the higher level of public expenditures until next unusual event (displacement effect) (Peacock and Wiseman, 1967).[1]

The second hypothesis is known as the *Buchanan-Wagner Hypothesis*. According to this hypothesis, between the 1950s and the 1970s in USA and UK, the cause of the rapid increase in public expenditures was the economic policies that were based on the Keynesian paradigm and the conflict between the norm world of the Keynesian paradigm and the real world of capitalist representative democracy. This hypothesis is

[1] These two versions of hypotheses have been tested in various studies (Ansari, Gordon and Akuamoah, 1997; Biswal, Dhawan, and Lee, 1999; Nagarajan and Spears, 1990; Kolluri, Panik and Wahap, 2000; Burney, 2002; Halıcıoğlu, 2003; Wahap, 2004; Iyare, and Lorde, 2004; Huang, 2006).

based on two assumptions: (i) The invalidity of Ricardian Equivalance Theorem, (ii) The assumption of myopic voter/taxpayer. In short, when government refers to borrowing instead of taxation, this would be perceived as a decrease in the tax-price of public services by citizens, increasing the demand for public services/expenditures (Buchanan and Wagner, 1977; Buchanan, Burton and Wagner, 1978; Shibata and Kimura, 1986; Barro, 1974, 1989; Yay, Yay and Tastan, 2002)

The third hypothesis is t*he tax-expenditure hypothesis* which suggests that the reason for the increase of public expenditures is related to high taxes. There are three versions of this hypothesis that differ in how the direction of causality is interpreted: M. Friedman's tax-expenditure hypothesis, Peacock-Wiseman's expenditure-tax hypothesis and Musgrave-Meltzer's fiscal synchronization hypothesis (Darrat, 1998; Narayan and Narayan, 2006; Bleaney, Gemmel and Kneller, 2001).

1.2. Models

Wagner's Law asserts that there is a positive association between GDP and government expenditures. Several empirical specifications have been proposed to test the Wagner's hypothesis in the literature. The most common of these are

$$\ln G_t = \beta_0 + \beta_1 \ln Y_t + \varepsilon_t , \tag{1}$$

$$\ln(G/Y)_t = \beta_0 + \beta_1 \ln(Y/N)_t + \varepsilon_t , \tag{2}$$

$$\ln(G)_t = \beta_0 + \beta_1 \ln(Y/N)_t + \varepsilon_t , \tag{3}$$

$$\ln(G/N)_t = \beta_0 + \beta_1 \ln(Y/N)_t + \varepsilon_t , \tag{4}$$

where G_t is real government expenditures, Y_t is real income (either GDP or GNP), and N is the population in year *t*. Finding of a long term stable relationship between government expenditure and income together with coefficient estimates $\beta_1 > 1$ in equation (1) and $\beta_1 > 0$ in equations (2)-(3)-(4) and Granger-causality running from income to government expenditures would support the Wagner's law.

The relationship between budget deficits and total government expenditures is explored using the following bivariate frameworks:

$$\ln G_t = \beta_0 + \beta_1 (D/Y)_t + \varepsilon_t , \tag{5}$$

$$\ln(G/Y)_t = \beta_0 + \beta_1 (D/Y)_t + \varepsilon_t , \tag{6}$$

$$\ln(G/N)_t = \beta_0 + \beta_1 \ln(D/N)_t + \varepsilon_t . \tag{7}$$

where *D* is real government deficits. Statistically significant long run levels relationship between government expenditures and budget deficits in equations (5)-(7) and Granger-causality running from budget deficits to government expenditures would support the Buchanan-Wagner hypothesis.

The following models are formulated to see the relationship between government expenditures and government revenues:

$$\ln G_t = \beta_0 + \beta_1 \ln R_t + \varepsilon_t , \tag{8}$$

$$\ln(G/Y)_t = \beta_0 + \beta_1 \ln(R/Y)_t + \varepsilon_t , \tag{9}$$

$$\ln(G/N)_t = \beta_0 + \beta_1 \ln(R/N)_t + \varepsilon_t, \quad (10)$$

where R is total real government revenues. The Tax-Expenditure hypothesis (TEH) requires that government expenditures and revenues are cointegrated and that government revenues help predict (or Granger-cause) government expenditures.

The Wagner's Law postulates a stable long run relationship between government expenditures and income level as stated in equations (1)-(4). Similarly, the Buchanan-Wagner and Tax-Expenditure hypotheses require stable long run relationships between government expenditures and budget deficits and government expenditures and revenues, respectively. However, these variables are potentially integrated of order one (denoted I(1)) individually, that is, they may contain a unit root. As is well-known, running an OLS regression using two individually I(1) variables leads to misleading inferences and known as the spurious regression.[2]

We follow relatively well-established framework in time series econometrics to test the Wagner's and related hypotheses. In the first step of this framework, practitioners usually employ one or more unit root tests to decide whether the series are I(1) or not. If the series are both I(1) then the usual practice is to test if there exists a statistically significant long run relationship between the variables. This is the cointegration test step. Finally, if the series are cointegrated then an Error Correction Model (ECM), which is simply a VAR in first differences in which the cointegration relationship (usually lagged) is added as an additional regressor, would be appropriate. If the error correction term, i.e., deviations from the cointegration relation is excluded from the VAR model in first differences then the model will be mis-specified and OLS will not be consistent. Statistical inference can be based on the final model estimated.

2. An Overview of the Turkish Economy

In this section, we present a brief overview of the nature of economic policies, development strategies and the evolution of public expenditures during 1950-2004 in Turkey. It is a widespread opinion among Turkish economists that the major turning point of the development process in Turkey can be dated as 1980 in which the Economic Stabilization Package was launched. Also known as the *January 24 1980 Decisions*, this was both a stabilization program and a roadmap for a comprehensive liberalization of both real and financial sectors. Thus, it would be useful to examine the economic policy history of Turkey by splitting the period 1950-2004 into two sub-periods: pre-1980 period and post-1980 period.

The period extending from the establishment of the Republic of Turkey to 1980 can be called the *"establishment of the national industries", "modernization process"* or borrowing to Buchanan as *"moral community*" period (Buchanan and Musgrave, 1999:209-11; Buchanan, 2001:187-210).

In this period, even if some liberal development endeavors were seen, these developments (the first one was during 1923-1928 period, and the second one was the Democrat Party years in the 1950s) either stayed in opinion level on a large scale

[2] Even if the two series are independent I(1) one can find a significant relationship in an OLS regression (see Granger and Newbold 1974, Phillips 1986, Hamilton, 1994: ch.18).

or could only be applied in practice for a short period. But at the end of both periods, the share of public sector in economy rose unexpectedly, either due to domestic problems or international conditions.

Although Turkey began its development process with liberal model, owing to negative effects of the World Depression Crisis in 1929, eventually has to adopt *Etatism* which is based on public investments and public controls in the 1930s. From the establishment of the Republic of Turkey to the World War II (that is during one-party period) the main characteristic of the applied economic policies of Turkish governments may be summarized by the principle of “tight money-balanced budget”. This policy was maintained and important public investments were realized along the road of development. This economic policy principle was obtained from the “trial and error” school in the statement of Inönü, the Prime Minister of the time. Although Turkey did not join the war, Turkish people first encountered high inflation during the years of the World War II. In short, as an underdeveloped country, the economic policies were consistent with the classical “tight money-balanced budget” principle until the World War II (Yay, 1990; Tezel, 1982).

After Turkey passed to an era with plural-parties, the Democrat Party years of the 1950s were the first period in the history of the Republic of Turkey during which the demands of society were reflected in policy decisions by means of the political election process. Furthermore, during this period a populist development strategy was pursued by the government. This meant that expanding monetary and fiscal policies without collecting adequate tax revenues from the agriculture sector, the main sector in the economy during this period. While the share of public expenditures in GNP was 17% as average and except one year, budget deficits were permanent throughout the decade (Yay, 2006).

Turkey adopted the planned and import-substitution development strategy in 1963. This strategy was successful during the 1960s as the average growth rate of 6% was realized. In general the target values of public expenditure and tax revenue were not achieved in this period. Although not as high as in the 1950s, budget deficits continued. Turkey entered the inflationary period by the effect of international Oil Crises in the beginning of the second half of the 1970s and abandoned the import-substitution development strategy with a big crisis with huge amounts of foreign debt, balance of payment deficits, high inflation and negative growth rate at the end of the decade. Although budget deficits were sometimes financed by borrowing from the private sector, they were generally financed by the resources of the Central Bank during economic development period of 1950-1980. Thus Turkish experience corroborates Buchanan and Wagner’s statement (1977:142):

“In fact, much of what is ordinarily referred to as ‘public debt’ really represent disguised monetary issue by Central banks.”

The resources of the Central Banks were used especially to subsidize agricultural products and to reduce the deficits of state-owned enterprises. We believe that the first fifty years of Turkey can be called as “moral community” years of the country in institutional and mental point of view with its development strategy relying on import-substitution, self-sufficiency and planning.

The turning/breaking-point of the history of Turkish Economy is the Economic Stabilization Package dated 24 January 1980. We can say that this Stability Package was not only a short-run conjectural stability program but also a long-run structural transformation program: This program, with its composition of being directed to international (goods and financial) markets/export-oriented development strategy and the market-friendly economic policies, has initiated the liberalization period of Turkish Economy. Although the stabilization policies have been applied successfully and important achievements in inflation rate, export and budget deficit targets have been realized during the 1983-1987 period, these policies have not been successful around the end of 1980s due partly to elections. On the other hand, at the beginning of the decade, as a first stage of liberalization, some liberalization and deregulation measures put into practice in domestic markets (i.e., interest rates) and foreign trade and floating-exchange-rate system was accepted. In 1989, Turkey passed unexpectedly to the second stage of liberalization process, the international financial liberalization/integration stage and international capital flows was liberalized.

The 1990s are "lost years" for Turkey. While macroeconomic fundamentals (i.e., inflation, budget deficits) have deteriorated, the liberalization of international capital flows made Turkish financial markets more fragile. In this period, public expenditures and budget deficit displayed rapid increases and their shares in GNP reached 35% and 12%, respectively. The increases were financed by government debts. Turkish Banking System, with its weak and unready structure to international competition, was not able to sustain its functions between government excess debt policy and high international capital flows in the absence of effective regulation. Turkey experienced three most important crises of its history in six years (1994, 2000 and 2001). The shares of public expenditures and budget deficit in GDP were raised to 46% and 17% respectively in 1999-2001 (Yay, Yay, and Tastan, 2002).

We consider that the second period in the capitalistic development process of Turkey (from 1980 to 2000) can be named as the *"moral anarchy"* period. Although Turkey made fast transition to trade liberalization firstly and then rapidly and unexpectedly passed to the international financial liberalization, it neither could repair macroeconomic fundamentals nor could solve structural problems in financial and real sectors. In addition, Turkey never realized the importance of institutional and mental transformation which financial integration requires. As a result, the so-called moral anarchy period has witnessed several economic crises and scandals due to individual and institutional corruption, political instability and lack of supervision over the economic system. The first financial crisis of this period (so-called "banker scandal") in 1982 was the product of unregulated competition among banks and other deposit institutions following the removal of ceilings in deposit rates. In the same period, capital account was fully liberalized without any steps towards regulation of financial markets. Establishing the independence of the Central Bank and comprehensive regulation of the financial sector could only be undertaken after the financial crisis in 2001. In sum, Turkey has become a typical example of the difficulty of transition from *"moral community*" to *"moral order",* and a typical case that the liberalization without institutional, legal and mental infrastructure as necessitated by the moral order would lead to *"moral anarchy*".

3. Data and Empirical Results

We obtained annual data covering the period 1950-2004 for government expenditures (G), nominal GNP (Y), government revenues (R) from State Planning Institution of Turkey.[3] All nominal variables expressed in real terms using GNP deflator with base year 1987. Population (N) is obtained from the Turkish Statistical Institute. Total real government deficit is defined such that a positive value indicates a deficit whereas a negative value indicates a surplus. All variables excluding the deficit variables are expressed in natural logarithms. Figure A1 displays time series plots of final variables used in the empirical section.

Table 1 summarizes the ADF and the GLS-ADF (Elliot *et al*., 1996) unit root tests for both levels and first differences of each series. The lag orders for each test were chosen using the Schwartz' information criterion with maximum lag length set to 10. Table 1 indicates that the null hypothesis of non-stationarity cannot be rejected for the levels of the series. For the first differences, however, unit root null is decisively rejected indicating that each series can be taken as I(1).

Table 1

Unit Root Tests

Levels	ADF	ADF-GLS	1st differences	ADF	ADF-GLS
lnG	-2.7767	-2.7723	∆*lnG*	-9.2050**	-8.1331**
lnY	-2.6787	-1.7282	∆*lnY*	-7.8628**	-2.6929**
lnR	-1.6771	-1.7561	∆*lnR*	-10.5169**	-10.4967**
ln(G/Y)	-2.8299	-2.4351	∆ *ln(G/Y)*	-9.3008**	-2.2496*
ln(Y/N)	-3.4744	-2.5093	∆ *ln(Y/N)*	-8.1345**	-2.7809**
ln(G/N)	-2.5782	-2.5157	∆ *ln(G/N)*	-9.1105**	-8.0178**
D/Y	-3.2415	-2.9879	∆*(D/Y)*	-8.5564**	-6.9890**
D/N	-2.5434	-2.3649	∆*(D/N)*	-7.7292**	-7.0857**
ln(R/Y)	-1.4326	-1.4361	∆*ln(R/Y)*	-10.4821**	-9.7673**
ln(R/N)	-1.4646	-1.6022	∆*ln(R/N)*	-10.3458**	-10.3549**
Critical Values					
1%	-4.1373	-3.7548	1%	-3.5600	-2.6093
5%	-3.4953	-3.1772	5%	-2.9176	-1.9471

Notes: ADF is the Augmented Dickey-Fuller test and ADF-GLS is the Elliott, Rothenberg and Stock's GLS-detrended ADF test. Lag order is chosen automatically using the SIC. Test specifications for the levels include a constant and a trend term whereas first differences include only a constant term in the deterministic part. ** and * denote statistical significance at 1% and 5% levels, respectively.

[3] The data can be retrieved at http://ekutup.dpt.gov.tr/ekonomi/gosterge/tr/1950-06/esg.htm.

Results from unit root tests with structural break using Zivot and Andrews' (1992) endogenous break point selection procedure for model A, B and C are summarized in Table 2. Using asymptotic critical values tabulated by Zivot and Andrews, reproduced here in Table 2, we fail to reject the null hypothesis of unit root against the stationarity around a broken trend or level except for the ratio of real government deficits to income (D/Y) and per capita real government deficits (D/N). Test results indicate that (D/Y) and (D/N) can be assumed stationary around a broken intercept (model A) or around a broken trend (model B). However, the Model C, which allows for structural breaks in both levels and trends may be more appropriate for the variables included in this study. The Zivot and Andrews t statistics are all insignificant for the Model C.

Table 2

Unit Root Tests with Endogenous Break Point Selection

	Model A		Model B		Model C	
Variables	Break Date	Test Statistic	Break Date	Test Statistic	Break Date	Test Statistic
lnG	1980	-4.443 (0)[†]	1989	-3.067 (0)	1981	-4.761 (0)
lnY	1966	-4.149 (0)	1975	-3.899 (0)	1971	-4.082 (0)
lnR	1980	-4.010 (1)	1990	-2.006 (1)	1982	-4.094 (1)
ln(G/Y)	1996	-4.268 (0)	1990	-3.969 (0)	1984	-4.987 (0)
ln(Y/N)	1966	-4.587 (0)	1973	-3.923 (0)	1979	-4.564 (0)
ln(G/N)	1980	-3.911 (0)	1990	-3.202 (0)	1982	-4.706 (0)
D/Y	1996	-5.413** (0)	1990	-4.703* (0)	1988	-4.622 (0)
D/N	1996	-5.343** (0)	1990	-4.246 (0)	1988	-4.108 (0)
ln(R/Y)	1982	-2.637 (1)	1990	-2.580 (1)	1984	-4.543 (1)
ln(R/N)	1980	-3.469 (1)	1990	-2.144 (1)	1982	-4.136 (1)
Critical Values						
1%		-5.34		-4.93		-5.57
5%		-4.80		-4.42		-5.08

Notes: Results are from Zivot and Andrews (1992) unit root tests with endogenous break point selection. Model A allows for a structural break in intercept, Model B allows for a structural break in trend and Model C allows for structural breaks in both intercept and trend.

[†] The number of lagged differenced variables to account for serial correlation in the residuals is shown in parenthesis next to test statistics. Lag order is chosen sequentially using t test.

** and * denote statistical significance using asymptotic critical values at 1% and 5% levels, respectively. Asymptotic critical values are reported from Tables 2-3-4 in Zivot and Andrews (1992, p.256 and p. 257). Note that finite sample critical values would be much larger than asymptotic critical values in absolute value.

Having established that series are all I(1) we proceed to test for common stochastic trends between variables. To this end we employed three cointegration tests, Engle-Granger, Johansen and Pesaran et al.'s bounds tests. Engle-Granger test results are tabulated in Table 3. We used finite sample critical values interpolated from MacKinnon (1996). The EG test results indicate that the null hypothesis of no cointegration is rejected at 5% level for *lnG-ln(Y/N)* (equation 3), *ln(G/Y)-ln(D/Y)* (equation 6) pairs and at 1% level for *lnG-lnR* (equation 8), *ln(G/N)-ln(R/N)* (equation 10) pairs.

Table 3

Engle-Granger Cointegration Test Results

Estimated Relationship	R2	CRDW	ADF
$\ln G_t = -4.37 + 1.43 \ln Y_t + \hat{\varepsilon}_t$	0.96	0.4187	-2.8057
$\ln(G/Y)_t = 2.17 + 0.86 \ln(Y/N)_t + \hat{\varepsilon}_t$	0.71	0.4675	-3.0567
$\ln(G)_t = 17.27 + 2.86 \ln(Y/N)_t + \hat{\varepsilon}_t$	0.96	0.5869	-3.5817*
$\ln(G/N)_t = 2.17 + 1.86 \ln(Y/N)_t + \hat{\varepsilon}_t$	0.92	0.4675	-3.0566
$\ln G_t = 3.71 + 21.94(D/Y)_t + \hat{\varepsilon}_t$	0.70	0.4424	-2.8491
$\ln(G/Y)_t = -1.98 + 8.48(D/Y)_t + \hat{\varepsilon}_t$	0.84	0.9586*	-3.8104*
$\ln(G/N)_t = -6.65 + 857.35(D/N)_t + \hat{\varepsilon}_t$	0.74	0.3421	-2.4280
$\ln G_t = -0.39 + 1.13 \ln R_t + \hat{\varepsilon}_t$	0.99	1.3320**	-5.3754**
$\ln(G/Y)_t = 0.82 + 1.37 \ln(R/Y)_t + \hat{\varepsilon}_t$	0.93	0.8946*	-2.2328
$\ln(G/N)_t = 1.38 + 1.19 \ln(R/N)_t + \hat{\varepsilon}_t$	0.98	1.2677**	-5.0287**
Critical Values:			
1%		1.00	-4.1032
5%		0.78	-3.4495
10%		0.69	-3.1226

Notes: Results are from two-step Engle-Granger cointegration tests. CRDW is the cointegration regression Durbin-Watson statistic and ADF is the augmented Dickey-Fuller test statistic on regression residuals. Critical values for the ADF test are interpolated from MacKinnon (1996) for the sample size 55. Critical values for the CRDW statistic are for the sample size 50 and taken from Engle and Yoo (1987), Table 4, p. 158. ** and * denote statistical significance at 1% and 5% levels, respectively.

Table 4 displays results from Johansen cointegration tests. Both cointegration test regression (VECM) and cointegration relation include a constant term. Since the optimal lag length for the VAR in levels is chosen as one for each bivariate model, test regression does not include lagged differenced variables. Results from Johansen tests agree with the results form Engle-Granger cointegration tests. A stable long run relationship is found between real government expenditures and real income per capita providing partial support for the Wagner Law. There is a stable long run relationship between the ratio of government expenditures to income and the ratio of real budget deficit to income. Also, there is cointegration relationship between real government expenditures and real government revenues for both levels and per capita versions.

To see if the cointegration results are sensitive to the pre-testing problem, we employed bounds testing procedure developed by Pesaran *et al*. (2001). Results are presented in Table 5.

Table 4

Johansen Cointegration Test Results

	Trace Test		Max Eigenvalue Test	
Variable Pairs	$H_0: r = 0$ $H_1: r > 0$	$H_0: r \leq 1$ $H_1: r > 1$	$H_0: r = 0$ $H_1: r = 1$	$H_0: r = 1$ $H_1: r = 2$
$\ln G_t$, $\ln Y_t$	12.3014 (0.1430)	3.1461 (0.0761)	9.1553 (0.2735)	3.1461 (0.0761)
$\ln(G/Y)_t$, $\ln(Y/N)_t$	12.1317 (0.1507)	1.1016 (0.2939)	11.0301 (0.1527)	1.1016 (0.2939)
$\ln G_t$, $\ln(Y/N)_t$	**15.2243** (0.0549)	0.9128 (0.3394)	**14.3115** (0.0491)	0.9128 (0.3394)
$\ln(G/N)_t$, $\ln(Y/N)_t$	12.1317 (0.1507)	1.1016 (0.2939)	11.0301 (0.1527)	1.1016 (0.2939)
$\ln G_t$, $(D/Y)_t$	10.8196 (0.2228)	0.0474 (0.8276)	10.7722 (0.1660)	0.0474 (0.8276)
$\ln(G/Y)_t$, $(D/Y)_t$	**16.4728** (0.0355)	0.4558 (0.4996)	**16.0171** (0.0262)	0.4558 (0.4996)
$\ln(G/N)_t$, $(D/N)_t$	7.3775 (0.5342)	0.0243 (0.8761)	7.3532 (0.4482)	0.0243 (0.8761)
$\ln G_t$, $\ln R_t$	**23.7646** (0.0023)	0.0212 (0.8842)	**23.7434** (0.0012)	0.0212 (0.8842)
$\ln(G/Y)_t$, $\ln(R/Y)_t$	14.6564 (0.0666)	0.5540 (0.4567)	14.1023 (0.0530)	0.5540 (0.4567)
$\ln(G/N)_t$, $\ln(R/N)_t$	**21.3416** (0.0058)	0.0097 (0.9212)	**21.3319** (0.0033)	0.0097 (0.9212)

Notes: Results are from Johansen's cointegration test procedure. Since the optimal VAR lag length is chosen as 1 for each model in levels, the test equation does not include lagged differenced variables. Cointegration relation and VAR test equation both include constant term. P-values (shown in parenthesis) are from MacKinnon *et al*. (1999).

Since we have a relatively small sample size we chose not to use Pesaran et al.'s asymptotic critical values tabulated in their paper. Instead we calculated finite sample critical values for T=55 and k=1 using Monte Carlo simulations for five cases and presented results in Table A1 in the Appendix. For each case finite sample critical value bounds tend to be larger than asymptotic critical value bounds.[4]

[4] For example, for the Case III and k=1 5% lower and upper asymptotic critical value bounds are [4.94, 5.73] (see Pesaran et al., 2001, Table CI(iii), p. 300) whereas finite sample critical value bounds are [5.1374, 6.0523] (see Table A1 in the Appendix) which are, respectively, about 4% and 5.6% larger. Overall, the interval of no decision for the finite sample is about 16% larger than the asymptotic case. Details of the simulations can be found in notes to Table A1.

Table 5

Bounds Test Results

Variables		Case III		Case IV
y	x	F	t	F
$\ln G_t$,	$\ln Y_t$	3.8500	-2.7528	2.8482
$\ln(G/Y)_t$,	$\ln(Y/N)_t$	4.5509	-2.8877	2.9781
$\ln G_t$	$\ln(Y/N)_t$	5.1675*	-3.1578*	3.6815
$\ln(G/N)_t$	$\ln(Y/N)_t$	4.5509	-2.8877	2.9781
$\ln G_t$	$(D/Y)_t$	0.0704	-0.3743	2.6238
$\ln(G/Y)_t$	$(D/Y)_t$	3.9578	-2.7161	4.6620
$\ln(G/N)_t$	$(D/N)_t$	0.4313	-0.8820	2.7392
$\ln G_t$	$\ln R_t$	11.6901***	-4.8344***	10.2268***
$\ln(G/Y)_t$	$\ln(R/Y)_t$	3.2912	-2.5492	10.1379***
$\ln(G/N)_t$	$\ln(R/N)_t$	9.1673***	-4.2810***	10.0236***

Notes: Pesaran *et al*. (2001) bounds test results for the existence of a long run relationship among variables. Case III includes unrestricted intercept and no trend, Case IV includes unrestricted intercept and unrestricted trend. Null hypothesis of no cointegration is rejected at 10% level (*), at 1% level (***).

As can be seen from Figure A1 in the Appendix, variables display more or less steadily rising trends over time indicating that appropriate deterministic specification would be to include intercept and time trends in the test regression. Therefore, we presented the results for Cases III and IV which correspond to the unrestricted intercept-no trend and unrestricted intercept-restricted trend deterministics, respectively. In the Case III we set $\gamma_1 = 0$ (no trend) and test $H_0 : \alpha = \boldsymbol{\beta}' = 0$ and in the Case IV we include a trend in the test regression and test $H_0 : \gamma_1 = \alpha = \boldsymbol{\beta}' = 0$. Also, the lag order of the differenced terms is set to zero as determined by AIC. For lnG-lnY pair the null hypothesis of no cointegration cannot be rejected for both cases. No decision can be made for ln(G/Y)-ln(Y/N) pair as the test statistic falls between 10% critical value bounds. The null hypothesis of no cointegration is rejected at 10% level for the lnG-ln(Y/N) conforming to the findings from Engle-Granger and Johansen cointegration test results. Again, no decision can be made for the per capita version of the Wagner Law as the test statistic falls between the 10% critical value bounds. However, bounds test results indicate that government expenditures and budget deficits do not have stable level relationship for the three different specifications. The F and t test statistic for the ratio of government expenditures to GNP and the ratio of budget deficits to GNP are calculated as 3.9578 and -2.7161 for the Case III, respectively. The F test statistic is insignificant at 10% level whereas the t statistic is between the 10% critical value bounds. If the inference is inconclusive one has to resort to determining individual order of integration of each series which we did above. Recall that we found that individual series are I(1) and the two series are cointegrated using EG and Johansen test procedures. Finally, bounds test results indicate that real government expenditures and real government revenues are cointegrated for the levels and per capita versions.

Overall, results indicate that there is a long run level relationship for one version of the Wagner Law, namely equation (3), in which real government expenditure is included in levels and the real income is included in per capita terms. One version of the government expenditures and budget deficit relationship, equation (6) is found to have a cointegration using EG and Johansen tests for which bounds test gave inconclusive results. And finally two versions of the government expenditures and revenues relationship, equations (8) and (10), we have found common stochastic trends. For these four models, we fit an Error Correction Model and tested the Granger-causality.

ECM parameter estimates, cointegration vectors (normalized with respect to government expenditures) and Granger causality test results are presented in Table 6. The optimal lag orders for the lagged differenced terms in each model are determined to be zero using AIC. The error correction term for government expenditures and per capita income is estimated as -0.1879 which is statistically significant at 1% level. When we regress the differenced per capita income on a constant, lagged error correction term we get an estimate of 0.0538 for the speed of adjustment parameter which is significant at 5% level but economically very small relative to the estimate obtained from the model with government expenditures as the dependent variable. These results indicate that there is a bidirectional Granger-causality between real government expenditures and real per capita income. In terms of predictability, this finding supports both Wagnerian and Keynesian approaches. The long run elasticity of government expenditures with respect to per capita income is estimated as 3.08 which is statistically significant.[5] A one percent increase in real per capita income raises real government expenditures by 3.08%. This finding supports the Wagner Law.

Table 6

Estimation Results from Error Correction Models

Dependent Variable	Constant	E.C.T.	Cointegration Relation
$\Delta\, ln\, G_t$	0.0641*** (0.0155)	-0.1879*** (0.0684)	$e_{t-1} = ln\, G_{t-1} - 18.28 - 3.08\, ln(Y/N)_{t-1}$ (0.161)
$\Delta\, ln(Y/N)_t$	0.0246*** (0.0058)	0.0538** (0.0255)	Granger Causality: Bi-directional
$\Delta\, ln(G/Y)_t$	0.0173 (0.0169)	-0.0701 (0.1082)	$e_{t-1} = ln(G/Y)_{t-1} + 2.04 - 10.11(D/Y)_{t-1}$ (0.925)
$\Delta(D/Y)_t$	0.0012 (0.4683)	0.0465*** (0.0158)	Granger Causality: $ln(G/Y) \Rightarrow (D/Y)$
$\Delta\, ln\, G_t$	0.0641*** (0.0163)	-0.2701 (0.2439)	$e_{t-1} = ln\, G_{t-1} + 0.42 - 1.13\, ln\, R_{t-1}$ (0.013)
$\Delta\, ln\, R_t$	0.0611*** (0.0152)	0.3922* (0.2264)	Granger Causality: $ln\, G \Rightarrow ln\, R$

[5] We used serial correlation corrected estimates in conducting t-tests based on the cointegration relationship. As is well-known residuals from a cointegration model can be serially correlated invalidating classical inference procedures.

Dependent Variable	Constant	E.C.T.	Cointegration Relation
$\Delta\, ln(G/N)_t$	0.0419** (0.0166)	-0.1345 (0.2318)	$e_{t-1} = ln(G/N)_{t-1} - 1.48 - 1.21 ln(R/N)_{t-1}$ (0.025)
$\Delta\, ln(R/N)_t$	0.0389** (0.0151)	0.4461** (0.2107)	Granger Causality: $\ln(G/N) \Rightarrow ln(R/N)$

Notes: Results are from bivariate vector error correction models. Standard errors are given in parentheses. E.C.T. column display coefficient estimates on 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.

Next, we estimated error correction models using $\Delta\, ln(G/Y)_t$ and $\Delta(D/Y)_t$ as dependent variables. For $\Delta\, ln(G/Y)_t$ model, the speed of adjustment is estimated as -0.0701 but statistically not significant. For $\Delta(D/Y)_t$ model the speed of adjustment parameter is estimated as 0.0465 which is statistically significant at 1% level. The ratio of government expenditures to income does not respond to changes in real budget deficits to income ratio. On the other hand, the ratio of real budget deficits to income respond to deviations from the long run cointegration relationship, albeit slowly. These results indicate a long run Granger causality running from government expenditures to budget deficits. This finding does not support the Buchanan-Wagner hypothesis which claims that high budget deficits produce higher levels of spending. Also the long run partial regression coefficient is estimated as 10.11. A 0.01 point increase in (D/Y) leads to 10.11% increase in (G/Y) with an approximate elasticity of 0.31.

Finally, results from error correction models for the tax-expenditure hypothesis indicate that the direction of Granger-causality runs from government expenditures to revenues. This result does not change when we define expenditures and revenues in per capita terms. The estimates of speed of adjustment are -0.2701 and -0.1345 for the levels and per capita specifications of government expenditures but statistically they are not significant. On the other hand, the speed of adjustment parameter estimates from the regression of revenues on a constant and lagged deviations from the long run equilibrium are 0.3922 and 0.3361 which are significant at 10% and 5% levels, respectively. In response to a positive deviation from the long run relationship government expenditures tend to decrease whereas government revenues tend to increase. The long run cointegration relationship indicates that a 1% increase in government revenues lead to 1.13% increase in government expenditures. This elasticity is 1.21% for the per capita version. These finding support the spend-tax hypothesis.

Conclusions

In this paper we attempted to test three well-known hypotheses related to public expenditures using Turkish data: the Wagner hypothesis, the Buchanan-Wagner hypothesis and the Tax-Expenditure hypothesis. The Wagner hypothesis states that public expenditures tend to increase at a higher rate than national income in the long run. In other words, long run elasticity of public expenditures with respect to national income is greater than one. The Buchanan-Wagner hypothesis states that public expenditures tend to increase in response to an increase in budget deficits. According to Tax-Expenditure hypothesis government revenues help predict government expenditures and government expenditure is elastic with respect government revenues.

We considered several specifications commonly employed in the empirical literature for each hypothesis considered. In the empirical section we first examined order of integration of each series using ADF, GLS-ADF and endogenous break point unit root tests. The existence of common stochastic trends for each specification of the respective hypotheses was tested using Engle-Granger, Johansen and Pesaran *et al*. (2001) cointegration test procedures. Then we examined short and long run properties of each model within an error correction model. Results can be summarized as follows:

- The Wagner's Law: government expenditures and GNP are found to be individually I(1) and cointegrated in the long run for one version of the Wagner's Law. Estimated cointegration relationship indicates that government expenditure is elastic with respect to national income. However, *estimated error correction models indicate that the Granger-causality between government expenditures and national income is bi-directional. This finding supports both Wagnerian and Keynesian approaches to government expenditures.*
- The Buchanan-Wagner hypothesis: the ratio of government expenditures to national income and the ratio of budget deficits to national income are found to be cointegrated in the long run. *Estimated error correction models indicate that the long run Granger-causality runs from government expenditures to budget deficits contradicting the Buchanan-Wagner approach*.
- The Tax-Expenditure hypothesis: government expenditures and government revenues are found to be cointegrated for both levels and per capita versions. The cointegration relationship indicates that the long run elasticity of government expenditures with respect to revenues is 1.13 and 1.21 for levels and per capita versions, respectively. However, *long run Granger-causality runs from government expenditures to revenues. This finding supports expenditure-tax hypothesis*.

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Appendix

Table A1 Finite Sample Critical Values of Bounds Test for k=1 and T=55

	F Test					
	0.10		0.05		0.01	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
CASE I	2.4885	3.3597	3.2802	4.2703	5.1357	6.4057
CASE II	3.1712	3.6558	3.8532	4.3954	5.4430	6.1551
CASE III	4.1462	4.9628	5.1374	6.0523	7.4038	8.4679
CASE IV	4.2396	4.7214	5.0265	5.5495	6.9029	7.4771
CASE V	5.7889	6.4662	6.9461	7.6733	9.5753	10.6379
	t-test					
	0.10		0.05		0.01	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
CASE I	-1.6229	-2.2721	-1.9723	-2.6274	-2.6435	-3.3156
CASE III	-2.5695	-2.9316	-2.8917	-3.2864	-3.5359	-3.9435
CASE V	-3.1695	-3.4411	-3.4864	-3.7767	-4.1380	-4.4525

Notes: The simulation setup is as follows. Critical values are based on 50000 Monte Carlo replications of size 55. The values of y_t and x_t are generated from

$y_t = y_{t-1} + \varepsilon_{1t}$ and $x_t = \alpha x_{t-1} + \varepsilon_{2t}$

with $y_0 = x_0 = 0$ where ε_{1t} and ε_{2t} are independent draws from standard normal distribution. When $\alpha = 1$ x_t is I(1) and when $\alpha = 0$ x_t is I(0). Critical value bounds for I(1) and I(0) are obtained by running the following regression and calculating respective F and t statistics:

$\Delta y_t = \gamma_0 + \gamma_1 t + \beta_1 y_{t-1} + \beta_2 x_{t-1} + \varepsilon_t$,

CASE I: no intercept, no trend; set $\gamma_0 = \gamma_1 = 0$ in the regression above and test $H_0 : \beta_1 = \beta_2 = 0$ using F-statistic and test $H_0 : \beta_1 = 0$ using t-statistic.

CASE II: restricted intercept no trend; set $\gamma_1 = 0$ in the regression above and test $H_0 : \gamma_0 = \beta_1 = \beta_2 = 0$ using F-statistic.

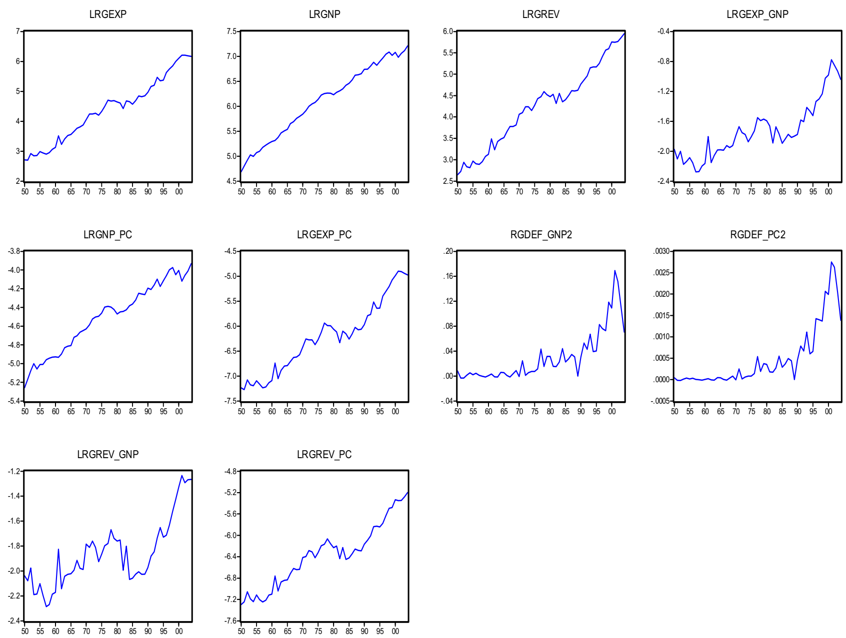
CASE III: unrestricted intercept no trend; set $\gamma_1 = 0$ in the regression above and test $H_0 : \beta_1 = \beta_2 = 0$ using F-statistic and test $H_0 : \beta_1 = 0$ using t-statistic.

CASE IV: unrestricted intercept restricted trend; test $H_0 : \gamma_1 = \beta_1 = \beta_2 = 0$ using F-statistic.

CASE V: unrestricted intercept unrestricted trend; test $H_0 : \beta_1 = \beta_2 = 0$ using F-statistic and test $H_0 : \beta_1 = 0$ using t-statistic.

Figure A1

Time Series Plots of Variables: 1950-2004



Notes: Variable definitions from left to right are as follows (notation used in the text shown in parenthesis): LRGEXP (lnG): natural logarithm of real government expenditures, LRGNP (lnY): natural logarithm of real gross national product, LRGREV (lnR): natural logarithm of real government revenues, LRGEXP_GNP (ln(G/Y)): natural logarithm of the share of real government expenditures to real GNP, LRGNP_PC (ln(Y/N)): natural logarithm of real GNP per capita, LRGEXP_PC (ln(G/N)): natural logarithm of real government expenditures per capita, RGDEF_GNP2 (D/Y): share of the real government deficit in real GNP, RGDEF_PC2 (D/N): real government deficit per capita, LRGREV_GNP (ln(R/Y)): natural logarithm of the share real government revenues in real GNP, LRGREV_PC(ln(R/N)): natural logarithm of real government revenues per capita.