Cointegration, causality and Wagner's law with disaggregated data: evidence from Turkey, 1968-2004

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Abstract

Recent developments in time series analysis have encouraged the economists to re-examine their findings about the Wagner's Law. That is why, the aggregation in public expenditures may lead some contradictions, disaggregated analyses should perform to have more consistent results. In this paper, the cointegration and causal relationships have re-examined between public expenditure and economic growth by using disaggregated annual data over the period of 1968-2004 for Turkish economy. Obtained results show that there is no common trend between these variables in the long-run. In the short-run, however, there is a strong and bidirectional causal relationship between public investment expenditures and economic growth.

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Abstract

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1. Introduction

In the public finance literature, the hypothesis that there is a long-run tendency for the government expenditure to rise relative to national income is known as Wagner's Law. The hypothesis has been tested on numerous studies (see, for example, Wagner and Weber [1977], Mann [1980], Heller [1981], Yaser and Rajan [1985], Abizadeh and Yousefi [1988], Murthy [1993], Courakis et al. [1993], Oxley [1994], Chletsos and Kollias [1997], Jackson et al. [1998], Asseery et al. [1999], Morley and Perdikis [2000], Ashipala and Haimbodi [2003], Tobin [2005], Jiranyakul [2007], Narayan et al. [2008], Liu et al. [2008]).

There are also a few studies to test the hypothesis for Turkish case (see, for example, Yamak and Kucukkale [1997], Demirbas [1999], Yamak and Yamak [2001], Halicioglu [2003], Cavusoglu [2005], Arisoy [2005]). These studies found a significant statistical association between growth rate of government expenditure and economic growth. Such findings have been used to support the validity of the law. In all these studies, however, the data set has been composed by using the aggregate public expenditure series. Because of aggregation problem, the obtained results in these studies are critical to the validity of the hypothesis. Moreover, there is a growing controversy in empirical literature about using aggregated or disaggregated data.

For example, Granger and Siklos (1995) have denoted that temporal aggregation may lead "*demodulation cointegration*". In a recent study, Granger (1987) has proved that generating process of aggregated variables is largely determined by the common factors in the generating mechanisms of disaggregated variables, and a component of aggregated variable has not to be have the same mechanism with the other components' mechanisms. Additionally, Granger (1988) has reported that if any component of aggregated variable contains a unit root, then aggregated variable has to be contains a unit root. Let's suppose that an aggregated variable is I(1) and this variable has three components. In this case, researcher can not determine which component has lead to aggregated variable be I(1). So, further analysis may not be enough sensitive to investigate which component lead to occur a potential causal relation. Gulasekaran (2002) has also denoted the distortionary effects of aggregation on causal relations. Granger (1969) supposed decomposition (or disaggregating) in order to eliminate this problem. Pesaran et al. (1989) has dealed also aggregation problem and strongly preferred to use disaggregated data.

In this paper, the cointegration and causal relationships will re-examine between public expenditure and economic growth by using disaggregated annual data over the period of 1968-2004. Public expenditures have been functionally disaggregated as current expenditures, investment expenditures, transfer expenditures, and military expenditures. The data has been deflated by using related GNP deflators. ADF test method has been used to perform the stationarity tests. While cointegrating relations have investigated by using Johansen-Juselius Cointegration Test, the causal relations have examined by using the Granger Causality Tests.

2. Methodology and Data

There are five different specifications used widely in the literature to test the Wagner's Law. Dependent and independent variables in these specifications can be different from each other according to interpretation of the law. These specifications are as follows:

Model 1: $\log RGE_t = \beta_0 + \beta_1 \log RGNP_t + \varepsilon_t$

Model 2: $\log RGE_t = \beta_0 + \beta_1 \log RGNPPC_t + \varepsilon_t$

Model 3: $\log SRGE_t = \beta_0 + \beta_1 \log RGNPPC_t + \varepsilon_t$

Model 4: $\log RGEPC_t = \beta_0 + \beta_1 \log RGNPPC_t + \varepsilon_t$

Model 5: $\log SRGE_t = \beta_0 + \beta_1 \log RGNP_t + \varepsilon_t$

Model 1 is known as Peacock and Wiseman (1961) test version. This version claims that the Real Government Expenditures (RGE_t) is a function of Real Gross National Product

($RGNP_t$). In this version, the higher real gross national product may lead the higher real government expenditures. Validity of the law depends on the income elasticity of the real government expenditures. If this elasticity is greater than 1, the law is valid. In all other circumstances, the law is not to be valid.

According to Goffman (1968), the validity of the law depends on the income elasticity of real government expenditures is greater than 1. In Model 2; RGE_t is the real government expenditures at time t, and $RGNPPC_t$ is real gross national product per capita at time t.

In Model 3, the Musgrave (1969) test version can be seen. Musgrave asserts that the validity of the Wagner's Law depends on the elasticity of the share of the government expenditures in total economic activity to real income per capita is greater than zero. In Model 3, $SRGE_t$ is the share of real government expenditures in total economic activity at time t.

Michas (1975) Test Version is as seen in Model 4. According to Michas, if the elasticity of the real government expenditures per capita to real income per capita is greater than 1, the law is valid. In other circumstances there would not to be sufficient proof for the validity of the law.

Model 5 is the advanced version of the Peacock and Wiseman version in the Model 1. Authors acclaim that being the elasticity of the share of the real government expenditures in total economic activity to real income is greater than zero is sufficient to put forward the validity of the law.

Each of the five models above described has been separately used in this paper with aggregated and disaggregated data.

In cointegration and causality analysis, stationarity tests must be performed for each of the variables. There have been a variety of proposed methods for implementing stationarity tests (for example, Dickey and Fuller, 1979; Sargan and Bhargava, 1983; Phillips and Perron, 1988; Zivot and Andrews, 1992; among the others) and each has been widely used in the applied economics literature. However, there is a growing consensus that the stationarity test procedure (hereafter ADF) due to Dickey and Fuller (1979) has superior small sample properties compared to its alternatives. Therefore, in this study, ADF test procedure was employed for implementing stationarity tests. The ADF test procedure requires to run the following regression for both level and first difference of each variable, separately. If necessary, the ADF regression can be run for the higher levels of the variables.

$$\Delta LX_t = \alpha + \gamma Trend + \Phi LX_{t-1} + \sum_{i=1}^{m} \delta_i \Delta LX_{t-i} + w_i \quad (1)$$

where LX is the logarithmic form of the variable in question, α and t are a constant term and a time trend, respectively, "Δ" is the first difference operator, w is the white noise residual and m is the lagged values of ΔLX_t that are included to allow for serial correlation in the residuals. In the context of the ADF test, a test for nonstationarity of the series, LX, amounts to a t-test of Φ=0. The alternative hypothesis of stationarity requires that Φ be significant negative. If the absolute value of the computed t-statistic for Φ exceeds the absolute critical value given in MacKinnon (1990), then the null hypothesis that the log level of X series is not stationary must be rejected against its alternative. If, on the other hand, it is less than the critical value, it is concluded that the logarithmic level of X, that is LX, is nonstationary. In this case, the same regression must be repeated for the first difference of the logarithmic value of the series. In estimating ADF regressions, the number of own lags of dependent variable (m) was chosen using the "Schwartz Information Criterion" (SIC).

If the series under consideration turn out to be integrated of the same order, it is possible to proceed by testing for cointegration relationships between the integrated variables. In this paper cointegration tests were carried by means of the methods developed by Engel and Granger (1987), Johansen (1988), and Johansen and Juselius (1990). Engle and Granger cointegration test (hereafter EG) supposed a two step estimation procedure. If the unit root tests indicate that both of the variables in consideration are I(1), the long-run equilibrium relationship can be estimate by using the equation (2).

$$LY_t = \beta_0 + \beta_1 LX_t + \varepsilon_t \qquad (2)$$

The second step in EG Test is to determine if these variables are cointegrated or not. If the residual series obtained from the equation (2), $\hat{\varepsilon}_t$, are found to be stationary, the LY_t and LX_t sequences are cointegrated CI(1,1). If the residual series are not to be stationary, the variables in consideration are not cointegrated.

The Johansen method applies the maximum likelihood procedure to determine the presence of cointegrating vectors in nonstationary time series as a vector autoregressive (VAR):

$$\Delta Z_t = C + \sum_{i=1}^{K} \Gamma_i \Delta Z_{t-i} + \Pi Z_{t-1} + \eta_t \qquad (3)$$

where Z_t is a vector of nonstationary (in log levels) variables and C is the constant term. The information on the coefficient matrix between the levels of the series Π is decomposed as $\Pi = \alpha\beta'$ where the relevant elements of the α matrix are adjustment coefficients and the β matrix contains the cointegrating vectors. Johansen and Juselius (1990) specify two likelihood ratio test statistics to test for the number of cointegrating vectors. The first likelihood ratio statistics for the null of exactly r cointegrating vectors against the alternative of r+1 vectors is the maximum eigenvalue statistic. The second statistic for the hypothesis of at most r cointegrating vectors against the alternative is the trace statistic. Critical values for both test statistics are tabulated in Johansen and Juselius (1990). The number of lags applied in the cointegration test are based on the information provided by the multivariate generalization of the AIC[1].

If the time series integrated of order one are not cointegrated, the relationships set up in Model (1, 2, 3, 4, 5) are estimated by utilizing the first differences of the series. On the other hand, there are two approaches in using of cointegrated nonstationary data. One is to estimate the model in terms of the levels of variables, without modeling the cointegrating relationships. An alternative to this approach is to estimate the model in the first differences with the addition of cointegrating terms (Vector Error Correction approach). In this study, the second approach has been followed. A typical VEC model is as seen in equation 4.

$$\begin{aligned} \Delta LX_t &= \beta_0 + \beta_1\varepsilon_{t-1} + \sum_{j=1}^{k}\beta_{2j}\Delta LX_{t-j} + \sum_{j=1}^{k}\beta_{3j}\Delta LY_{t-j} + \tau_t \\ \Delta LY_t &= \alpha_0 + \alpha_1\varepsilon_{t-1} + \sum_{j=1}^{k}\alpha_{2j}\Delta LY_{t-j} + \sum_{j=1}^{k}\alpha_{3j}\Delta LX_{t-j} + \omega_t \end{aligned} \tag{4}$$

where at least one of β_0 or α_0 is non zero and τ_t and ω_t are white noise errors. The error correction term, ε_{t-1}, can be obtained by regressing *LX* on *LY* or *LY* on *LX*. The optimal lag length *k* is determined using one of the model selection criteria, for example Schwartz Information Criterion (SIC). The variable LX is deemed to cause LY if β_{3j} are significant as a group based on conventional F tests and/or β_1 is statistically different from zero. Similarly, *LY* is deemed to cause *LX* if α_{3j} are significant as a group and/or α_1 is statistically different from zero. In traditional tests for causality, the error correction terms can be omitted from

[1] The multivariate generalization of the AIC is AIC = Tlog|Σ|+2N. Where |Σ| is determinant of the covariance matrix of the residuals and N is total number of parameters estimated in all equations.

equations. But this omission is valid only if the two time series under question are not cointegrated.

The data used in this study have come from different sources. Aggregate government expenditure and its disaggregated components have collected from the web site of "The Central Bank of the Republic of Turkey – Electronic Data Delivery System" (www.tcmb.gov.tr). Defense Spending has come from the various issues of the "Annual Report" of "Republic of Turkey Ministry of Finance" and "NATO-Russia Compendium of Financial and Economic Data Relating to Defense – 2007". All variables have been deflated by using the GNP Deflator (1987=100).

3. Empirical Results

Table 1 and 2 present the ADF test results for the log levels as well as the first (logged) differences of the series, respectively.

Table 1: ADF Unit Root Test for the Level of the Series

Variable	**Without Trend**		**With Trend**	
	Optimal Lag Length	**ADF Test Statistics**	**Optimal Lag Length**	**ADF Test Statistics**
	Reel GNP Series			
LRGNP	0	-0.902365	0	-2.692858
LRGNP-PC	0	-0.915109	0	-2.739730
	Reel Public Expenditures Series			
LRTOTEX	0	-0.809569	0	-1.957266
LRCUREX	0	-1.381681	0	-1.654661
LRINVEX	0	-1.274356	0	-1.339084
LRTRANEX	0	-0.994245	0	-2.437154
LMILEX	0	-2.443728	0	-2.230448
	Reel Public Expenditures Series Per Capita			
LRTOTEX-PC	0	-0.883556	0	-1.832200
LRCUREX-PC	0	-1.540948	0	-1.662815
LRINVEX-PC	0	-1.597236	0	-1.278546
LRTRANEX-PC	0	-1.070827	0	-2.285820
LMILEX-PC	0	-0.825397	0	-1.483969
	Share of Reel Public Expenditures Series in Total Economic Activity			
LSRTOTEX	0	-1.173740	0	-1.856332
LSRCUREX	0	-1.942134	0	-1.818765
LSRINVEX	0	-1.463714	0	-1.030186
LSRTRANEX	0	-1.276398	0	-2.269248
LSMILEX	0	-1.069615	0	-2.043381

Note: Optimal lag lengths were chosen by using Scwartz Information Criterion. Maximum lag length is 5. MacKinnon Critical Values are -3.626784 at 1%, -2.945842 at 5% and -2.611531 at 10% for the unit root test without trend. MacKinnon Critical Values for the unit root test with trend are -4.234972 at 1%, -3.540328 at 5% and -3.202445 at 10% significance level, respectively.

Table 2: ADF Unit Root Test for the First Differences of the Series

Variable	**Without Trend**		**With Trend**	
	Optimal Lag Length	**ADF Test Statistics**	**Optimal Lag Length**	**ADF Test Statistics**
	Reel GNP Series			
LRGNP	0	-6.506223[a]	0	-6.485358[a]
LRGNP-PC	0	-5.925209[a]	0	-5.836321[a]
	Reel Public Expenditures Series			
LRTOTEX	0	-5.750850[a]	0	-5.664340[a]
LRCUREX	0	-4.266912[a]	0	-4.284542[a]
LRINVEX	0	-4.119909[a]	0	-3.998605[b]
LRTRANEX	0	-6.614930[a]	0	-6.519576[a]
LMILEX	0	-5.621876[a]	0	-5.781725[a]
	Reel Public Expenditures Series Per Capita			
LRTOTEX-PC	0	-5.719193[a]	0	-5.625896[a]
LRCUREX-PC	0	-4.318352[a]	0	-4.300815[a]
LRINVEX-PC	0	-4.084288[a]	0	-3.979162[b]
LRTRANEX-PC	0	-6.583120[a]	0	-6.482771[a]
LMILEX-PC	0	-5.635707[a]	0	-5.637714[a]
	Share of Reel Public Expenditures Series in Total Economic Activity			
LSRTOTEX	0	-5.886287[a]	0	-5.780346[a]
LSRCUREX	0	-4.402606[a]	0	-4.336477[a]
LSRINVEX	0	-4.134196[a]	0	-4.054385[b]
LSRTRANEX	0	-6.630590[a]	0	-6.525332[a]
LSMILEX	0	-5.665682[a]	0	-5.736352[a]

Note: Optimal lag lengths were chosen by using Scwartz Information Criterion. Maximum lag length is 5. MacKinnon Critical Values are -3.632900 at 1%, -2.948404 at 5% and -2.612874 at 10% for the unit root test without trend. MacKinnon Critical Values for the unit root test with trend are -4.243644 at 1%, -3.544284 at 5% and -3.204699 at 10% significance level. a and b denotes that the test statistics is significant at 1% and 5% percent significance level, respectively.

The third and the fifth columns in Table 1 and 2 record the ADF-t statistics for the levels and first differences of the variables. Critical values are given at the bottom of the tables. Obtained results show that all variables in question are stationary in their first logged differences. Thus, the evidence suggests that first differencing of the variables appears to be sufficient to achieve stationarity.

Table 3: Engle-Granger Cointegration Test Results

Dependent Variable	Independent Variable	Elasticity Parameter	ADF-t Statistics of Residuals
Model 1 (Peacock-Wiseman)			
LRTOTEX	**LRGNP**	1.601815[a] (+)	-1.896749 (0)
LRCUREX		1.188807[a] (+)	-1.941347 (0)
LRINVEX		0.213320	-1.426484 (0)
LRTRANEX		1.973970[a] (+)	-2.228878 (0)
LMILEX		0.691496[a]	-2.144437 (0)
Model 2 (Goffman)			
LRTOTEX	**RGNP-PC**	3.337001[a] (+)	-2.331850 (0)
LRCUREX		2.509937[a] (+)	-3.371609 (2)[b]
LRINVEX		0.463501	-1.376003 (0)
LRTRANEX		4.093737[a] (+)	-2.523900 (0)
LMILEX		1.425194[a] (+)	-2.160052 (0)
Model 3 (Musgrave)			
LSRTOTEX	**RGNP-PC**	1.245334[a] (+)	-2.068430 (0)
LSRCUREX		0.418270[a] (+)	-2.019718 (0)
LSRINVEX		-1.628166[a]	-1.632965 (0)
LSRTRANEX		2.002070[a] (+)	-2.393388 (0)
LSMILEX		-0.666473[a]	-2.195681 (0)
Model 4 (Michas)			
LRTOTEX-PC	**RGNP-PC**	2.245334[a] (+)	-2.068430 (0)
LRCUREX-PC		1.418270[a] (+)	-2.019718 (0)
LRINVEX-PC		-0.628166[c]	-1.632965 (0)
LRTRANEX-PC		3.002070[a] (+)	-2.393388 (0)
LMILEX-PC		-0.141621[a]	-2.507937 (0)
Model 5 (Peacock-Wiseman)			
LSRTOTEX	**RGNP**	0.601815[a] (+)	-1.896749 (0)
LSRCUREX		0.188807[a] (+)	-1.941347 (0)
LSRINVEX		-0.786680[a]	-1.426484 (0)
LSRTRANEX		0.973970[a] (+)	-2.228878 (0)
LSMILEX		-0.308504[a]	-2.144437 (0)

Note: a, b and c denotes the parameter is significant at 1%, %5 and 10% respectively. (+) indicates that the law is valid in conventional wisdom. Numbers in parenthesis show the optimal lag length which determined by using the Scwartz Information Criterion. ADF critical values are -3.626784 at 1%, -2.945842 at 5% and -2.611531 at 10%, respectively.

Table 3 reports the Engle-Granger Cointegration Test results. The numbers in the third column in Table 3 are the estimated β_1 parameters in the models 1-5. According to these estimated elasticity parameters, the Wagner's Law is valid for total government expenditures, current expenditures and transfer expenditures in conventional wisdom. Although the estimated parameters are statistically significant, the law is not valid for investment expenditures and military expenditures.

The last column in Table 3 reports the ADF-t statistics of the residuals. All of the values in this column (except one) indicate that there is no long-run relationship between public expenditure and economic growth. Engle-Granger test results do not support the idea that public expenditures and national income share the same trend in the long-run.

Johansen-Juselius cointegration test results are reported in Table 4.

Table 4: Johansen-Juselius Cointegration Test Results VAR(2)
(linear deterministic trend in the data)

Dependent Variable	**Independent Variable**	**Likelihood Ratio (H_0: None)** 5% cv = 15.41 1% cv = 20.04	**Likelihood Ratio (H_0: At most 1)** 5% cv = 3.76 1% cv = 6.65
Model 1 (Peacock-Wiseman)			
LRTOTEX	**RGNP**	7.428178	0.675166
LRCUREX		8.099952	0.542834
LRINVEX		4.849237	1.621380
LRTRANEX		9.697490	0.654870
LMILEX		9.444612	0.201128
Model 2 (Goffman)			
LRTOTEX	**RGNP-PC**	14.19239	0.273736
LRCUREX		14.30209	0.773355
LRINVEX		4.547179	1.435355
LRTRANEX		15.58126[b]	0.269924
LMILEX		9.161719	0.629920
Model 3 (Musgrave)			
LSRTOTEX	**RGNP-PC**	9.694306	0.385285
LSRCUREX		7.889215	0.612062
LSRINVEX		6.405922	1.709175
LSRTRANEX		12.79362	0.362982
LSMILEX		9.039615	0.190274
Model 4 (Michas)			
LRTOTEX-PC	**RGNP-PC**	9.694306	0.385285
LRCUREX-PC		7.889215	0.612062
LRINVEX-PC		6.405922	1.709175
LRTRANEX-PC		12.79362	0.362982
LMILEX-PC		9.039615	0.190274
Model 5 (Peacock-Wiseman)			
LSRTOTEX	**RGNP**	7.428178	0.675166
LSRCUREX		8.099952	0.542834
LSRINVEX		4.849237	1.621380
LSRTRANEX		9.697490	0.654870
LSMILEX		9.444612	0.201128

Note: b denotes the parameter is significant at %5.

Johansen-Juselius cointegration test results have approved the Engle-Granger cointegration test results. Either aggregated or disaggregated public expenditures series are not cointegrated with economic growth. In other words, aggregated or disaggregated public expenditures series and the economic growth are not linked in a common long-term equilibrium. The nonexistence of the cointegration between the variables in question suggests that the causality test must proceed in traditional framework with the error correction term omitted. Causality test results are reported in Table 5.

Table 5: Granger Causality Test Results

Dependent Variable	Independent Variable	F-Test
Model 1 (Peacock-Wiseman)		
ΔLRTOTEX (1)	**ΔLRGNP (1)**	1.27416
ΔLRCUREX (1)	**ΔLRGNP (3)**	1.30816
ΔLRINVEX (1)	**ΔLRGNP (3)**	2.48383[c]
ΔLRTRANEX (1)	**ΔLRGNP (1)**	2.31672
ΔLMILEX (1)	**ΔLRGNP (1)**	0.00174
ΔLRGNP (1)	**ΔLRTOTEX (3)**	2.04525
ΔLRGNP (1)	**ΔLRCUREX (2)**	2.04824
ΔLRGNP (1)	**ΔLRINVEX (4)**	2.37728[c]
ΔLRGNP (1)	**ΔLRTRANEX (3)**	1.84979
ΔLRGNP (1)	**ΔLMILEX (4)**	2.09293
Model 2 (Goffman)		
ΔLRTOTEX (1)	**ΔLRGNP-PC (1)**	1.22175
ΔLRCUREX (1)	**ΔLRGNP-PC (1)**	0.02127
ΔLRINVEX (1)	**ΔLRGNP-PC (3)**	2.24695[c]
ΔLRTRANEX (1)	**ΔLRGNP-PC (1)**	2.13711
ΔLMILEX (1)	**ΔLRGNP-PC (1)**	0.00169
ΔLRGNP-PC (4)	**ΔLRTOTEX (2)**	1.48988
ΔLRGNP-PC (4)	**ΔLRCUREX (2)**	1.70218
ΔLRGNP-PC (4)	**ΔLRINVEX (2)**	4.87898[b]
ΔLRGNP-PC (4)	**ΔLRTRANEX (2)**	1.21963
ΔLRGNP-PC (4)	**ΔLMILEX (4)**	1.35658
Model 3 (Musgrave)		
ΔLSRTOTEX (1)	**ΔLRGNP-PC (4)**	2.23728[c]
ΔLSRCUREX (1)	**ΔLRGNP-PC (5)**	1.88021
ΔLSRINVEX (1)	**ΔLRGNP-PC (3)**	2.38214[c]
ΔLSRTRANEX (1)	**ΔLRGNP-PC (4)**	2.11114
ΔLSMILEX (1)	**ΔLRGNP-PC (1)**	0.07077
ΔLRGNP-PC (4)	**ΔLSRTOTEX (2)**	1.65358
ΔLRGNP-PC (4)	**ΔLSRCUREX (2)**	1.93071
ΔLRGNP-PC (4)	**ΔLSRINVEX (2)**	5.10746[b]
ΔLRGNP-PC (4)	**ΔLSRTRANEX (2)**	1.27972
ΔLRGNP-PC (4)	**ΔLSMILEX (4)**	1.62300

Note: b and c denote the parameters are significant at %5 and %10, respectively.

Table 5: (Continue)

Model 4 (Michas)		
ΔLRTOTEX-PC (1)	**ΔLRGNP-PC (1)**	1.45567
ΔLRCUREX-PC (1)	**ΔLRGNP-PC (1)**	0.06608
ΔLRINVEX-PC (1)	**ΔLRGNP-PC (3)**	2.34462[c]
ΔLRTRANEX-PC (1)	**ΔLRGNP-PC (1)**	2.42200
ΔLMILEX-PC (1)	**ΔLRGNP-PC (1)**	0.01990
ΔLRGNP-PC (4)	**ΔLRTOTEX-PC (2)**	1.65358
ΔLRGNP-PC (4)	**ΔLRCUREX-PC (2)**	1.93071
ΔLRGNP-PC (4)	**ΔLRINVEX-PC (2)**	5.10746[b]
ΔLRGNP-PC (4)	**ΔLRTRANEX-PC (2)**	1.27972
ΔRGNP-PC (4)	**ΔLMILEX-PC (4)**	1.62300
Model 5 (Peacock-Wiseman)		
ΔLSRTOTEX (1)	**ΔLRGNP (1)**	1.75715
ΔLSRCUREX (1)	**ΔLRGNP (3)**	1.74853
ΔLSRINVEX (1)	**ΔLRGNP (3)**	2.69599[c]
ΔLSRTRANEX (1)	**ΔLRGNP (1)**	1.96529
ΔLSMILEX (1)	**ΔLRGNP (1)**	0.08293
ΔLRGNP (1)	**ΔLSRTOTEX (3)**	2.32620[c]
ΔLRGNP (1)	**ΔLSRCUREX (2)**	2.56761[c]
ΔLRGNP (1)	**ΔLSRINVEX (2)**	3.06960[c]
ΔLRGNP (1)	**ΔLSRTRANEX (3)**	1.93507
ΔLRGNP (1)	**ΔLSMILEX (1)**	0.09784

Note: b and c denote the parameters are significant at %5 and %10, respectively.

As seen from the Table 5, there is a strong bidirectional causality between public investment expenditures and economic growth for all of the versions of the Law. Some of the versions, for example Musgrave Test Version, support a few unidirectional causalities between the variables. But, we can conclude that there is only one causal relationship between investment expenditures and economic growth, by taking care of all models as a whole.

4. Conclusions

One of the main subjects debated by researchers in the public finance literature is whether the public expenditures accelerate the economic growth or *vice versa*. This question has answered by Wagner’s pioneering study. Due to Wagner, there is a long-run tendency for the government expenditure to rise relative to national income. This hypothesis is known as Wagner’s Law. On the other hand, the main criticism of government intervention for allocating resources is that it is not effective as much as market forces do. Because of this, it is very important how the government distributes its expenditures in different channels. If the government would distribute own expenditures in the right channels, the total economic activity could accelerate. That completely is about the amounts of the components of aggregate public expenditures. How much investment expenditures or current expenditures should do in order to build a correct design? To find an answer for this question, a disaggregated analysis should do for the Wagner's Law.

On the other hand, there are some econometrics requirements for disaggregation. For example, Granger and Siklos (1995) have denoted that temporal aggregation may lead "*demodulation cointegration*". Granger (1987) has also proved that generating of aggregated variables is largely determined by the common factors in the generating mechanisms of disaggregated variables, and a component of aggregated variable has not to be have the same mechanism with the other components' mechanisms. And Gulasekaran (2002) has denoted "*the distortionary effects*" of aggregation on causal relations, etc.

In this paper, the cointegration and causal relationships have examined between public expenditures and economic growth by using disaggregated annual data over the period of 1968-2004. Public expenditures have been functionally divided as current expenditures, investment expenditures, transfer expenditures and military expenditures.

Obtained results from stationarity and cointegration tests indicated that the Wagner's Law is valid for Turkey in traditional approach (or conventional wisdom). There is absolutely not a long-term relationship between public expenditures and economic growth. This finding indicated that public expenditures and economic growth in Turkish economy follow the different long-term trends. Even all of the variables used in this study are $I(1)$, they are not cointegrated with each other.

Causality test results are not different so much from cointegration test results. Except a few and weak unidirectional causal relations, there is only one bidirectional and strong relationship between public investment expenditures and economic growth. This result suggests that if the policy makers' target is sustainable and fast economic growth, so they have to care about public investment expenditures. The results strongly put forward that higher public investment expenditures accelerate the economic growth in the short-run.

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