The Relationship Between Public Expenditures and Economic Growth in the Scope of Economic Classification: The Case of Turkiye

Ali Balkı[1]
Afyon Kocatepe University, Faculty of Economics and Administrative Sciences

Serkan Göksu[2]
Afyon Kocatepe University, Dinar School of Applied Sciences

Received: 25 September 2022; Accepted: 05 March 2023.

Summary

The relationship between public expenditures and economic growth is a constantly debated topic among researchers. There are five main models used to test Wagner's Law. This study aims to test Wagner's Law for Turkiye's public expenditure and expenditure types within the scope of economic classification by using all models in the literature. We tested the validity of Wagner's Law in the Turkiye case using the ARDL method applied for the years 1950–2020. Study findings prove that Wagner's Law is valid in Turkiye using the Mann and Peacock models for public expenditure. In addition, the findings support Wagner's Law only in transfer expenditures among sub-components. These findings point out that public expenditure, which increases more than gross domestic product, is dominated by transfer expenditures. The fact that social transfers account for approximately 75% of transfer expenditures in the last decade demonstrates that Turkiye prioritizes the social state function.

Keywords: Wagner's Law, Public Expenditure, Economic Classification, Economic Growth, Social State.

JEL: E60, H50, O40, C32

[1] abalki@aku.edu.tr (Corresponding Author)
[2] sgoksu@aku.edu.tr

Introduction

The expenditures made by the public sector to fulfill its functions are continuously increasing. There are many theories to explain the increase in public expenditure. One of these theories is Wagner's Law. This theory claims a long-run relationship between public expenditure and gross domestic product (GDP). According to Adolf Wagner (1883), while countries' GDP increases in the long run, public expenditures increase more than GDP. Increasing public expenditure means boosting the public sector's share in the economy. The excessive expansion of the public sector makes it difficult to ensure efficiency in using public resources. In countries like Turkiye, which are not rich in natural resources and finance public expenditures to gigantic proportions with taxes, the effective use of public resources is essential. In this context, determining which expenditure types caused the increase in public expenditures will increase resource use efficiency and guide policymakers. Starting from this point, which is the primary motivation for the study, we used the disaggregated data within the scope of economic classification to determine which expenditure components caused the increase in public expenditures.

A few studies in the literature test the validity of Wagner's Law in terms of expenditure types within the scope of the economic classification. These studies (Michael Chletsos and Christos Kollias 1997; Bagala Biswal, Urvashi Dhawan, and Hooi-Yean Lee 1999; Cosimo Magazzino 2012; Mutiu Abimbola Oyinlola and Olusijibomi Akinnibosun 2013; Chandana Aluthge, Adamu Jibir, and Musa Abdu 2021) usually test Wagner's Law in one or two models. The study's originality is that no study in the literature tests all versions of Wagner's Law in the same study regarding all expenditure types according to the economic classification. Based on this gap in the international literature, the study aims to test Wagner's Law for Turkiye, covering all types of expenditures and all models within the scope of economic classification between 1950 and 2020. In this context, the study sections are as follows: Section 1 presents the theoretical background and examines the relevant empirical literature. Section 2 includes the data set, model, and method used in the study. Section 3 consists of the findings obtained as a result of the analysis. Section 4 presents policy recommendations by discussing the similarities and differences of empirical findings with those in the literature.

1. Theoretical Background and Literature Review

The relationship between the increase in public expenditures and economic growth has been the subject of many studies since Wagner (1883). Approaches to explain this relationship can be classified into two main groups. The first approach is the Wagner Law, which links the increase in public expenditure to the increase in GDP. The second approach is the Keynesian approach, which argues that some of the increase in GDP is due to increased public expenditure (Emmanuel Ziramba 2008). With economic development, private expenditures of individuals increase with the effect of industrialization and urbanization. In addition, the increase in social needs causes an increase in the activities of the state. The increase in the activities of the state means an increase in the financial requirements of the public. Thus, there is a long-run relationship between economic development and increased public expenditures. The direction of the relationship is from economic development to public expenditures (Wagner 1883). According to Wagner's Law, the share of the public sector in the national economy increases in absolute and relative terms in the long run (Alan T. Peacock and Alex Scott 2000). Alan T. Peacock and Jack Wiseman (1961) stated that public expenditures increased, especially during extraordinary periods such as war, and did not return to their previous level when the extraordinary period ended. In this model, which is one of the most frequently used models in the literature, for Wagner's Law to be valid, the real increase in public expenditures must be more than the real increase in GDP. The validity conditions of Wagner's Law in the other four models in the literature are as follows: In the model developed by Irving J. Goffman (1968), the real increase in public expenditures should be greater than the increase in per capita GDP. In the Shibshankar P. Gupta (1967) model, the increase in public expenditure per capita should be greater than the GDP per capita. In the model developed by Arthur J. Mann (1980), the increase in the share of public expenditures in GDP should be larger than the real increase in GDP. In the Richard A. Musgrave (1969) model, the increase in the share of public expenditures in GDP should be greater than the increase in per capita GDP. We explained the functional forms of all models in the second part of the study.

The Keynesian approach argues that, unlike Wagner's Law, boosts in public expenditure cause an increase in GDP. Therefore, in the Keynesian approach, the direction of the relationship is from the increase in public expenditures to the increase in GDP (Magazzino 2012). John M. Keynes (1936) states that public expenditures should be used as a fiscal policy tool, especially during recession periods. The increase in public expenditure will help increase GDP by triggering aggregate demand. In this context, the Keynesian approach was the dominant understanding in economic policies until the 1970s. The public choice theory, which emerged as a critique of the Keynesian approach, claims that public expenditures increase more than necessary due to the state's economic intervention. According to this theory, the increase in public expenditures is for the reason that actors in the public sector, such as politicians and voters, are trying to maximize their benefits (James M. Buchanan 1975).

Studies such as Mann (1980), Les Oxley (1994), Syed M. Ahsan, Andy C. C. Kwan and Balbir S. Sahni (1996), John Thornton (1999), Anisul M. Islam (2001), Sunday O. Iyare and Troy Lorde (2004), Dimitrios Sideris (2007), Serena Lamartina and Andrea Zaghini (2010), Saten Kumar, Don J. Webber, and Scott Fargher (2012), Cristian Barra, Giovanna Bimonte and Pietro Spennati (2015), and Manuchehr Irandoust (2019) were carried out to test Wagner's Law and accepted the Wagner's Law in terms of the countries and periods they examined. On the other hand, studies such as Magnus Henrekson (1993), Anthony S. Courakis, Fatima Moura-Roque, and George Tridimas (1993), Trish Kelly (1997), Nadeem A. Burney (2002), Chiung-Ju Huang (2006), Dipendra Sinha (2007), Omoke P. Chimobi (2009), Musibau A. Babatunde (2011), and Kari Grenade and Allan Wright (2014) rejected Wagner's Law.

Studies testing Wagner's Law for Turkiye generally preferred time series analysis. We present some of these studies in Table 1. Nebiye Yamak and Yakup Kucukkale (1997), Ihsan Gunaydin (2000), Muammer Simsek (2004), Hassan Mohammadi, Murat Cak, and Demet Cak (2008), Deniz Aytac and Mehmet C. Guran (2010), Omer F. Altunc (2011), Esra Kabaklarli and Perihan H. Er (2014), Suleyman

Uluturk, Servet Akyol, and Mehmet Mert (2016), Raif Cergibozan, Emre Cevik, and Caner Demir (2017), Ihsan C. Demir and Ali Balki (2019), and Ersin N. Sagdic, Mahmut U. Sasmaz, and Guner Tuncer (2020) provide empirical evidence that Wagner's Law is valid for the periods they examined. On the other hand, Suleyman Uluturk (1998), Safa Demirbas (1999), Muhlis Bagdigen and Hakan Cetintas (2003), A. Tarkan Cavusoglu (2005), Selim Basar et al. (2009), Ekrem Gul and Hakan Yavuz (2011), Kadir Tuna (2013), Cebrail Telek and Ali Telek (2016) could not obtain any evidence of the validity of Wagner's Law for the examined periods.

Table 1. Some Studies Testing Wagner's Law for Turkiye

Study	Period	Method	Wagner's Law Support
Yamak and Kucukkale (1997)	1950–1994	Time series (cointegration, causality)	Yes
Uluturk (1998)	1963–1993	Time series (cointegration)	No
Demirbas (1999)	1950–1990	Time series (cointegration, causality)	No
Gunaydin (2000)	1950–1998	Time series (cointegration, causality)	Yes
Bagdigen and Cetintas (2003)	1965–2000	Time series (cointegration, causality)	No
Simsek (2004)	1965–2002	Time series (cointegration, causality)	Yes
Cavusoglu (2005)	1923–2003 1950–2003	Time series (bounds test)	No
Mohammadi, Cak, and Cak (2008)	1950–2005	Time series (bounds test)	Yes
Basar et al. (2009)	1975–2005	Time series (bounds test)	No
Aytac and Guran (2010)	1987–2005	Time series (causality)	Yes
Altunc (2011)	1960–2009	Time series (bounds test, causality)	Yes
Gul and Yavuz (2011)	1963–2008	Time series (cointegration, causality)	No
Tuna (2013)	1961–2012	Time series (causality)	No
Kabaklarli and Er (2014)	1930–2012	Time series (bounds test, causality)	Yes
Uluturk, Akyol, and Mert (2016)	1980–2014	Time series (bounds test)	Yes
Telek and Telek (2016)	1998–2015	Time series (causality)	No
Cergibozan,Cevik, and Demir (2017)	1960–2015	Time series (bounds test)	Yes
Demir and Balki (2019)	1960–2016	Time series (bounds test, causality)	Yes
Sagdic, Sasmaz, and Tuncer (2020)	1992–2013	Time series (cointegration, causality)	Yes

Source: Authors' compilation.

The studies in Table 1 test Wagner's Law by considering public expenditure. In addition, some studies test Wagner's Law regarding some sub-components of public expenditures in the Turkiye case (Ibrahim Arisoy 2005; Bilge Koksel Tan, Merter Mert, and Zeynel A. Ozdemir 2010; Gul and Yavuz 2010; Asuman Oktayer and Nagihan Oktayer 2013; Mensure Kolcak, Ali Y. Kalabak, and Handan Boran 2015; Murat Cetinkaya, Ahmet T. Cetinkaya, and Emre Aksoy 2017; Hale Akbulut 2017; Philip Arestis, Huseyin Sen, and Ayse Kaya 2021). Arısoy (2005) provides evidence that Wagner's Law is valid between 1950 and 2003, particularly for the government's current, investment, and transfer expenditures, apart from public expenditures. Koksel Tan, Mert, and Ozdemir (2010) examined the relationship between education expenditures, health expenditures, infrastructure (energy and transportation) expenditures, and GDP in the years 1969–2003 with the Granger Causality Test. Although they found the Wagner's Law valid for education expenditures, they concluded that the Wagner's Law was not valid for health and infrastructure expenditures. With the cointegration analysis, Gul and Yavuz (2010) determined that Wagner's Law is valid for the years 1996–2008 regarding current, investment, and transfer expenditures. Oktayer and Oktayer (2013) tested the relationship between non-interest public expenditures and economic growth for the years 1950–2010 with the ARDL bounds test. When the researchers added the inflation rate as a control variable to the model, they found that Wagner's Law was valid. Kolcak, Kalabak, and Boran (2015) found Wagner's Law valid for current expenditures with the Granger Causality Test in 1984–2014. Cetinkaya, Cetinkaya, and Aksoy (2017) examined the relationship between military expenditures and economic growth using the ARDL bound test and concluded that Wagner's Law is valid in the long run (1960–2014) for military expenditures. Akbulut (2017) examined the relationship between the expenditures of local governments and economic growth using Pesaran, Shin, and Smith's bounds test approach and error correction model, and concluded that Wagner's Law is valid in the long run (2007–2015) for the expenditures of local governments. Arestis, Sen, and Kaya (2021), within the scope of functional classification, tested Wagner's Law for each public expenditure, such as education, health, and military expenditures for the years 2006–2019. They could not obtain evidence of the validity of Wagner's Law in the analysis using the Granger Causality Test.

2. Empirical Approach

2.1. Data

This study aims to test the validity of Wagner's Law in Turkiye by considering all sub-components of public expenditures according to economic classification. The models' variables and the data source are in Table 2. We used annual data in the study, and the data used cover the years 1950–2020. We started the review period in 1950 because Turkiye fully entered the multi-party period on this date. From 1950 until the Turkish economy opened up in 1980, the share of public expenditures in GDP was an average of 17.25%. Current expenditures had the highest share of public expenditures from 1950 to 1980 (an average of 51.32%). From 1950 to the 1970s, the share of investment expenditures in public expenditures was higher than the share of transfer expenditures. The closed Turkish economy was trying to grow these shares through public investments. Although there were fluctuations in the share of public expenditures in GDP until the economic crisis in 2001, there was an increasing trend. In 2001, this ratio reached its highest level (32.59%). Except for 2009, the share of public expenditures in GDP has generally decreased since 2001. In the last ten years, the average has been 22.18%. Investment expenditures have had a minor share in public expenditures since 1970 (an average of 13.45%). From 1981 to 1992, the shares of current and transfer expenditures were close to each other within public expenditures. Since 1993, transfer expenditures have always been higher than current expenditures. In 2001, when the economic crisis occurred, the difference between transfer and current expenditures was at its highest level. In the last decade, the share of transfer expenditures within public expenditures has averaged at 55.05%. In comparison, the share of current expenditures has been an average of 33.59% (see Figures A1 and A2). We realized all the variables used in the analysis using the GDP deflator and then took their logarithms to converge the extreme values of GDP, public expenditure, current expenditure, public investment expenditure, and transfer expenditure. Other variables are not logarithmic as they are proportional expressions.

Table 2. Definitions of Variables

Variable symbol	Description
Y	Natural logarithm of real gross domestic product (GDP)
G	Natural logarithm of real public expenditures
C	Natural logarithm of real current expenditures
I	Natural logarithm of real public investment expenditures
TR	Natural logarithm of real transfer expenditures
Y/P	Real gross domestic product (GDP) / Population
G/P	Real public expenditures / Population
C/P	Real current expenditures / Population
I/P	Real public investment expenditures / Population
TR/P	Real transfer expenditures / Population
G/Y	Real public expenditures / Real GDP
C/Y	Real current expenditures / Real GDP
I/Y	Real public investment expenditures / Real GDP
TR/Y	Real transfer expenditures / Real GDP

Source: All variables are provided from "Republic of Turkiye Ministry of Treasury and Finance" https://en.hmb.gov.tr/

Within the scope of the analysis, first, the data's descriptive statistics and correlation matrix are in Appendix Table A1. The standard deviation, which represents the volatility in the variables, has the highest fluctuation in Y/P, TR/P, and G/P among the variables. According to the skewness statistics, although the proportional variables are positively skewed, other variables are negatively skewed. In addition, the G/Y, C/Y, and I/P are more pointed than the normal distribution, and the remaining variables are flatter than the normal distribution. According to the Jargue-Bera test statistical values, these series do not have a normal distribution since the Y/P, G/P, C/P, I/P, TR/P, and C/Y Jargue-Bera probability values are less than 0.05. In contrast, other variables have a normal distribution because Jarque-Bera probability values are more significant than 0.05. In addition, compared to other variables, there is a weaker and negative correlation between G/P, C/Y, and I/Y variables. Moreover, there is a robust and positive relationship between all remaining variables and Y.

2.2. Models

Wagner's Law is a hypothesis based on the existence of a long-run relationship between public expenditures and GDP. Many studies in the literature on Wagner's Law have tested this hypothesis between public expenditures and GDP in at least five different models (Henrekson 1993; Tsangyao Chang 2002; Massimo Florio and Sara Colautti 2005; Ziramba 2008; Huang 2006; Babatunde 2011; etc.). These five basic models are in Table 4, and these models are based on the work of researchers Goffman (1968), Gupta (1967), Mann (1980), Musgrave (1969), Peacock and Wiseman (1961), who examined the relationship between public expenditure and economic growth. The literature has many empirical studies that test the validity of these models for different country/country groups. However, no study has been found that tests the sub-expenditure types in Wagner's Law economic classification using all models. This study is designed to fill this gap in the literature. The models created for the validity of Wagner's Law in Turkiye and the expected values of the β coefficient, which express the coefficient of the independent variable in these models, are given in Table 3.

Table 3. Models Adapted to Public Expenditure Sub-components.

Models	Functional Structure	Expected value	Model Number
Goffman–Public Expenditure Model	G=α+β(Y/P)	β>1	Model 1
Goffman-Current Expenditure Model	C=α+β(Y/P)	β>1	Model 2
Goffman-Investment Expenditure Model	I=α+β(Y/P)	β>1	Model 3
Goffman-Transfer Expenditure Model	TR=α+β(Y/P)	β>1	Model 4
Gupta–Public Expenditure Model	G/P=α+β(Y/P)	β>1	Model 5
Gupta-Current Expenditure Model	C/P=α+β(Y/P)	β>1	Model 6
Gupta-Investment Expenditure Model	I/P=α+β(Y/P)	β>1	Model 7
Gupta-Transfer Expenditure Model	TR/P=α+β(Y/P)	β>1	Model 8
Mann–Public Expenditure Model	G/Y=α+β(Y)	β>0	Model 9
Mann-Current Expenditure Model	C/Y=α+β(Y)	β>0	Model 10
Mann-Investment Expenditure Model	I/Y=α+β(Y)	β>0	Model 11
Mann-Transfer Expenditure Model	TR/Y=α+β(Y)	β>0	Model 12
Musgrave–Public Expenditure Model	G/Y=α+β(Y/P)	β>0	Model 13
Musgrave-Current Expenditure Model	C/Y=α+β(Y/P)	β>0	Model 14
Musgrave-Investment Expenditure Model	I/Y=α+β(Y/P)	β>0	Model 15
Musgrave-Transfer Expenditure Model	TR/Y=α+β(Y/P)	β>0	Model 16
Peacock–Public Expenditure Model	G=α+β(Y)	β>1	Model 17
Peacock-Current Expenditure Model	C=α+β(Y)	β>1	Model 18
Peacock-Investment Expenditure Model	I=α+β(Y)	β>1	Model 19
Peacock-Transfer Expenditure Model	TR=α+β(Y)	β>1	Model 20

First, we created five main models for the Goffman, Gupta, Mann, Musgrave, and Peacock models in the Turkiye case. Then, 15 more models were created by adapting each basic model to public sub-expenditures (current, investment, and transfer expenditures). A total of 20 models, including all sub-expenditure types, particularly public expenditure, were analyzed and reported.

2.3. Methodology

In this study, the validity of Wagner's Law was tested for the Turkiye case with the ARDL bounds test developed by M. Hashem Pesaran, Yongcheol Shin, and Richard J. Smith (2001), public expenditure and public expenditure sub-components adapted to the Goffman, Gupta, Mann, Musgrave, and Peacock models. Compared to other traditional cointegration approaches such as Robert F. Engle and Clive W. J. Granger (1987), Søren Johansen and Katarina Juselius (1990), Peter C. B. Phillips and Bruce E. Hansen (1990), the ARDL bounds test approach is more flexible regarding stationarity properties. This approach is more suitable for variables I(1) or I(0), or I(1)/I(0) (Shahbaz, Khan, and Tahir 2013). In other words, I(2) should not be among the variables in the model (Selcuk Akcay 2022). The unrestricted error correction model (UECM) equations for each model created for the Turkiye case within the scope of the study are given below.

The UECM equations of the Goffman model are below.

$$\Delta G_t = \beta_0 + \sum_{i=1}^{p} \beta_i \Delta G_{t-i} + \sum_{j=0}^{r} \beta_j \Delta Y/P_{t-j} + \alpha_1 G_{t-1} + \alpha_2 Y/P_{t-1} + \varepsilon_i \quad (1)$$

$$\Delta C_t = \beta_0 + \sum_{i=1}^{p} \beta_i \Delta C_{t-i} + \sum_{j=0}^{r} \beta_j \Delta Y/P_{t-j} + \alpha_1 C_{t-1} + \alpha_2 Y/P_{t-1} + \varepsilon_i \quad (2)$$

$$\Delta I_t = \beta_0 + \sum_{i=1}^{p} \beta_i \Delta I_{t-i} + \sum_{j=0}^{r} \beta_j \Delta Y/P_{t-j} + \alpha_1 I_{t-1} + \alpha_2 Y/P_{t-1} + \varepsilon_i \quad (3)$$

$$\Delta TR_t = \beta_0 + \sum_{i=1}^{p} \beta_i \, \Delta TR_{t-i} + \sum_{j=0}^{r} \beta_j \, \Delta Y/P_{t-j} + \alpha_1 \, TR_{t-1} + \alpha_2 \, Y/P_{t-1} + \varepsilon_i \quad (4)$$

The UECM equations of the Gupta model are below.

$$\Delta G/P_t = \beta_0 + \sum_{i=1}^{p} \beta_i \, \Delta G/P_{t-i} + \sum_{j=0}^{r} \beta_j \, \Delta Y/P_{t-j} + \alpha_1 \, G/P_{t-1} + \alpha_2 \, Y/P_{t-1} + \varepsilon_i \quad (5)$$

$$\Delta C/P_t = \beta_0 + \sum_{i=1}^{p} \beta_i \, \Delta C/P_{t-i} + \sum_{j=0}^{r} \beta_j \, \Delta Y/P_{t-j} + \alpha_1 \, C/P_{t-1} + \alpha_2 \, Y/P_{t-1} + \varepsilon_i \quad (6)$$

$$\Delta I/P_t = \beta_0 + \sum_{i=1}^{p} \beta_i \, \Delta I/P_{t-i} + \sum_{j=0}^{r} \beta_j \, \Delta Y/P_{t-j} + \alpha_1 \, I/P_{t-1} + \alpha_2 \, Y/P_{t-1} + \varepsilon_i \quad (7)$$

$$\Delta TR/P_t = \beta_0 + \sum_{i=1}^{p} \beta_i \, \Delta TR/P_{t-i} + \sum_{j=0}^{r} \beta_j \, \Delta Y/P_{t-j} + \alpha_1 \, TR/P_{t-1} + \alpha_2 \, Y/P_{t-1} + \varepsilon_i \quad (8)$$

The UECM equations of the Mann model are below.

$$\Delta G/Y_t = \beta_0 + \sum_{i=1}^{p} \beta_i \, \Delta G/Y_{t-i} + \sum_{j=0}^{r} \beta_j \, \Delta Y_{t-j} + \alpha_1 \, G/Y_{t-1} + \alpha_2 \, Y_{t-1} + \varepsilon_i \quad (9)$$

$$\Delta C/Y_t = \beta_0 + \sum_{i=1}^{p} \beta_i \, \Delta C/Y_{t-i} + \sum_{j=0}^{r} \beta_j \, \Delta Y_{t-j} + \alpha_1 \, C/Y_{t-1} + \alpha_2 \, Y_{t-1} + \varepsilon_i \quad (10)$$

$$\Delta I/Y_t = \beta_0 + \sum_{i=1}^{p} \beta_i \, \Delta I/Y_{t-i} + \sum_{j=0}^{r} \beta_j \, \Delta Y_{t-j} + \alpha_1 \, I/Y_{t-1} + \alpha_2 \, Y_{t-1} + \varepsilon_i \quad (11)$$

$$\Delta TR/Y_t = \beta_0 + \sum_{i=1}^{p} \beta_i \, \Delta TR/Y_{t-i} + \sum_{j=0}^{r} \beta_j \, \Delta Y_{t-j} + \alpha_1 \, TR/Y_{t-1} + \alpha_2 \, Y_{t-1} + \varepsilon_i \quad (12)$$

The UECM equations of the Musgrave model are below.

$$\Delta G/Y_t = \beta_0 + \sum_{i=1}^{p} \beta_i \, \Delta G/Y_{t-i} + \sum_{j=0}^{r} \beta_j \, \Delta Y/P_{t-j} + \alpha_1 \, G/Y_{t-1} + \alpha_2 \, Y/P_{t-1} + \varepsilon_i \quad (13)$$

$$\Delta C/Y_t = \beta_0 + \sum_{i=1}^{p} \beta_i \, \Delta C/Y_{t-i} + \sum_{j=0}^{r} \beta_j \, \Delta Y/P_{t-j} + \alpha_1 \, C/Y_{t-1} + \alpha_2 \, Y/P_{t-1} + \varepsilon_i \quad (14)$$

$$\Delta I/Y_t = \beta_0 + \sum_{i=1}^{p} \beta_i \, \Delta I/Y_{t-i} + \sum_{j=0}^{r} \beta_j \, \Delta Y/P_{t-j} + \alpha_1 \, I/Y_{t-1} + \alpha_2 \, Y/P_{t-1} + \varepsilon_i \quad (15)$$

$$\Delta TR/Y_t = \beta_0 + \sum_{i=1}^{p} \beta_i \, \Delta TR/Y_{t-i} + \sum_{j=0}^{r} \beta_j \, \Delta Y/P_{t-j} + \alpha_1 \, TR/Y_{t-1} + \alpha_2 \, Y/P_{t-1} + \varepsilon_i \quad (16)$$

The UECM equations of the Peacock model are below.

$$\Delta G_t = \beta_0 + \sum_{i=1}^{p} \beta_i \, \Delta G_{t-i} + \sum_{j=0}^{r} \beta_j \, \Delta Y_{t-j} + \alpha_1 \, G_{t-1} + \alpha_2 \, Y_{t-1} + \varepsilon_i \quad (17)$$

$$\Delta C_t = \beta_0 + \sum_{i=1}^{p} \beta_i \, \Delta C_{t-i} + \sum_{j=0}^{r} \beta_j \, \Delta Y_{t-j} + \alpha_1 \, C_{t-1} + \alpha_2 \, Y_{t-1} + \varepsilon_i \quad (18)$$

$$\Delta I_t = \beta_0 + \sum_{i=1}^{p} \beta_i \, \Delta I_{t-i} + \sum_{j=0}^{r} \beta_j \, \Delta Y_{t-j} + \alpha_1 \, I_{t-1} + \alpha_2 \, Y_{t-1} + \varepsilon_i \quad (19)$$

$$\Delta TR_t = \beta_0 + \sum_{i=1}^{p} \beta_i \, \Delta TR_{t-i} + \sum_{j=0}^{r} \beta_j \, \Delta Y_{t-j} + \alpha_1 \, TR_{t-1} + \alpha_2 \, Y_{t-1} + \varepsilon_i \quad (20)$$

Where “Δ” is the first difference; "ε_i" is the error term; “p and r” are the lag orders; "β_0" is the constant; "β_i" and "β_j" are coefficients of the short-run impacts; "α_1" and "α_2" are coefficients of the long-run impacts. Due to annual data, the maximum lag length was chosen as two (2). Akaike info criteria (AIC) were considered in determining the optimum lag lengths (“p and r”) of the coefficients. The F_{PSS} and the t_{BDM} bounds tests will detect the cointegration process. The null and alternative hypotheses of this test are: $H_0 = \alpha_1 = \alpha_2 = 0$ and $H_A = \alpha_1 \neq \alpha_2 \neq 0$. The F_{PSS} and the t_{BDM} bounds tests statistics are compared with lower and upper bound critical values calculated by Pesaran, Shin, and Smith (2001) and for a limited sample by Paresh K. Narayan (2005). If the test statistics obtained are greater than the upper-bound critical values (absolute value), the null hypotheses of these tests are rejected, meaning that the variables in the models move together in the long run. After calculating the long-term coefficients, the short-term coefficients and the coefficient of the ECT are estimated by the error correction model (ECM).

The ECM equations of the Goffman model are below.

$$\Delta G_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i \, \Delta G_{t-i} + \sum_{j=0}^{r} \gamma_j \, \Delta Y/P_{t-j} + \vartheta \, ECT_{t-1} + \mu_i \tag{21}$$

$$\Delta C_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i \, \Delta C_{t-i} + \sum_{j=0}^{r} \gamma_j \, \Delta Y/P_{t-j} + \vartheta \, ECT_{t-1} + \mu_i \tag{22}$$

$$\Delta I_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i \, \Delta I_{t-i} + \sum_{j=0}^{r} \gamma_j \, \Delta Y/P_{t-j} + \vartheta \, ECT_{t-1} + \mu_i \tag{23}$$

$$\Delta TR_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i \, \Delta TR_{t-i} + \sum_{j=0}^{r} \gamma_j \, \Delta Y/P_{t-j} + \vartheta \, ECT_{t-1} + \mu_i \tag{24}$$

The ECM equations of the Gupta model are below.

$$\Delta G/P_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i \, \Delta G/P_{t-i} + \sum_{j=0}^{r} \gamma_j \, \Delta Y/P_{t-j} + \vartheta \, ECT_{t-1} + \mu_i \tag{25}$$

$$\Delta C/P_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i \, \Delta C/P_{t-i} + \sum_{j=0}^{r} \gamma_j \, \Delta Y/P_{t-j} + \vartheta \, ECT_{t-1} + \mu_i \tag{26}$$

$$\Delta I/P_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i \, \Delta I/P_{t-i} + \sum_{j=0}^{r} \gamma_j \, \Delta Y/P_{t-j} + \vartheta \, ECT_{t-1} + \mu_i \tag{27}$$

$$\Delta TR/P_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i \, \Delta TR/P_{t-i} + \sum_{j=0}^{r} \gamma_j \, \Delta Y/P_{t-j} + \vartheta \, ECT_{t-1} + \mu_i \tag{28}$$

The ECM equations of the Mann model are below.

$$\Delta G/Y_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i \, \Delta G/Y_{t-i} + \sum_{j=0}^{r} \gamma_j \, \Delta Y_{t-j} + \vartheta \, ECT_{t-1} + \mu_i \tag{29}$$

$$\Delta C/Y_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i \, \Delta C/Y_{t-i} + \sum_{j=0}^{r} \gamma_j \, \Delta Y_{t-j} + \vartheta \, ECT_{t-1} + \mu_i \tag{30}$$

$$\Delta I/Y_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i \, \Delta I/Y_{t-i} + \sum_{j=0}^{r} \gamma_j \, \Delta Y_{t-j} + \vartheta \, ECT_{t-1} + \mu_i \tag{31}$$

$$\Delta TR/Y_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i \, \Delta TR/Y_{t-i} + \sum_{j=0}^{r} \gamma_j \, \Delta Y_{t-j} + \vartheta \, ECT_{t-1} + \mu_i \tag{32}$$

The ECM equations of the Musgrave model are below.

$$\Delta G/Y_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i \, \Delta G/Y_{t-i} + \sum_{j=0}^{r} \gamma_j \, \Delta Y/P_{t-j} + \vartheta \, ECT_{t-1} + \mu_i \tag{33}$$

$$\Delta C/Y_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i \, \Delta C/Y_{t-i} + \sum_{j=0}^{r} \gamma_j \, \Delta Y/P_{t-j} + \vartheta \, ECT_{t-1} + \mu_i \tag{34}$$

$$\Delta I/Y_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i \, \Delta I/Y_{t-i} + \sum_{j=0}^{r} \gamma_j \, \Delta Y/P_{t-j} + \vartheta \, ECT_{t-1} + \mu_i \tag{35}$$

$$\Delta TR/Y_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i \, \Delta TR/Y_{t-i} + \sum_{j=0}^{r} \gamma_j \, \Delta Y/P_{t-j} + \vartheta \, ECT_{t-1} + \mu_i \tag{36}$$

The ECM equations of the Peacock model are below.

$$\Delta G_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i \, \Delta G_{t-i} + \sum_{j=0}^{r} \gamma_j \, \Delta Y_{t-j} + \vartheta \, ECT_{t-1} + \mu_i \tag{37}$$

$$\Delta C_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i \, \Delta C_{t-i} + \sum_{j=0}^{r} \gamma_j \, \Delta Y_{t-j} + \vartheta \, ECT_{t-1} + \mu_i \tag{38}$$

$$\Delta I_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i \, \Delta I_{t-i} + \sum_{j=0}^{r} \gamma_j \, \Delta Y_{t-j} + \vartheta \, ECT_{t-1} + \mu_i \tag{39}$$

$$\Delta TR_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i \, \Delta TR_{t-i} + \sum_{j=0}^{r} \gamma_j \, \Delta Y_{t-j} + \vartheta \, ECT_{t-1} + \mu_i \tag{40}$$

Where “Δ” is the first difference; "μ_i" is the error term; “p and r” are the lag orders; "γ_0" is the constant; "γ_i" and "γ_j" are coefficients of the short-run; ECT_{t-1} is error correction term and "ϑ” indicates how much of an imbalance that may occur in the short term will be corrected in the long term. The ECT coefficient is expected to be negative and the probability value less than 0.05.

3. Empirical Findings

First, Augmented Dickey-Fuller (ADF; David A. Dickey and Wayne A. Fuller 1979) and Phillips-Perron (PP; Peter C. B. Phillips and Pierre Perron 1988) unit root tests, frequently used in the literature, were used to determine the stationarity levels of the variables. The null hypothesis of these tests is that "the series is not stationary and contains a unit root". According to the ADF and PP test results in Appendix Table A2, the second difference between the variables is that no variable is stationary in I(2), and the variables are stationary at different levels. Second, we also obtained the results supporting the conventional unit root test results in the Junsoo Lee and Mark C. Strazicich (2003) LS unit root test, which considers structural breaks (See Appendix Table A3). Thus, we can examine whether the variables act together by the ARDL cointegration approach.

Table 4 shows the Goffman, Gupta, Mann, Musgrave, and Peacock equations for the main versions of Wagner's Law, the expected sign values of the coefficients of the independent variables, the ARDL bounds test results, the predicted values of the short- and long-term coefficients, and the diagnostic test results.

Table 4. Estimation results for the main models of Wagner's Law

Models	Model 1	Model 5	Model 9	Model 13	Model 17
Model names	Goffman	Gupta	Mann	Musgrave	Peacock
Equations	G=α+β(Y/P)	G/P=α+β(Y/P)	G/Y=α+β(Y)	G/Y=α+β(Y/P)	G=α+β(Y)
Expect	β>1	β>1	β>0	β>0	β>1
impact	ARDL (1, 0)	ARDL (2, 0)	ARDL (1, 1)	ARDL (1, 1)	ARDL (1, 0)
F_{PSS}	10.46697***	2.099987	7.346089***	5.147347**	14.98817***
	Cointegration	No Cointegration	Cointegration	Cointegration	Cointegration
t_{BDM}	-0.209712	-1.359442	-2.743728**	-1.799102	-3.097097**
	No Cointegration	No Cointegration	Cointegration	No Cointegration	Cointegration
β_L	-0.004996β<0	-6.66E+08 β<0	0.02218 β>0	0.001034 β>0	1.11589 β>1
	[0.9687]	[0.9429]	[0.0306]	[0.0439]	[0.0000]
β_S			-0.158183	-0.002256	
			[0.0000]	[0.0000]	
ECT_{t-1}	-0.004256	-0.032684	-0.188480	-0.112236	-0.201738
	[0.0000]	[0.0132]	[0.0000]	[0.0002]	[0.0000]
Diagnostic	Model 1	Model 5	Model 9	Model 13	Model 17
$X^2_{NORM(JB)}$	0.235969	21.87417	4.723011	4.681017	0.869149
	[0.8887]	[0.000]	[0.0943]	[0.0958]	[0.6475]
$X^2_{SC(BG\ LM)}$	0.269473	0.290195	1.024513	1.536981	1.106149
	[0.8739]	[0.8649]	[0.5991]	[0.4637]	[0.5752]
$X^2_{FF(RAMSEY)}$	3.011336	0.872394	0.416931	0.087243	1.048143
	[0.0874]	[0.3538]	[0.5207]	[0.7687]	[0.3097]
$X^2_{HET(BPG)}$	9.123114	46.83623	6.018352	4.289990	0.588471
	[0.0104]	[0.0000]	[0.1107]	[0.2318]	[0.7451]
$X^2_{HET(ARCH)}$	3.721196	14.67943	0.433831	0.524863	0.796738
	[0.0537]	[0.0001]	[0.5101]	[0.4688]	[0.3721]
CUSUM	Stable	Stable	Stable	Stable	Stable
CUSUM Sq.	Stable	Unstable	Stable	Stable	Stable

Notes: We specified the maximum lag length as 2 for all models and used Akaike info criteria (AIC) to select the optimum lag lengths for the variables. We obtained the critical values of the F_{PSS} and t_{BDM} (lower and upper bound) from the study of Pesaran et al. (2001). $X^2_{SC(BG\ LM)}$: Serial correlation; $X^2_{NORM(JB)}$: Normality; $X^2_{FF(RAMSEY)}$: Functional form; $X^2_{HET(BPG)}$ and $X^2_{HET(ARCH)}$: Heteroscedasticity; *** p<0.01; ** p<0.05; *p<0.10; β_L: Long-run coefficient; β_S: Short-run coefficient. (These explanations are valid in tables 5–9.)

The F_{PSS} statistical value of the Goffman model is calculated as (10.47). This value is greater than the bound values. Therefore, there is cointegration between public expenditure and per capita income at the 1% significance level (H_0: reject). This result is interpreted as public expenditures and per capita income moving together in the long run. For the Gofman model to be valid for Turkiye, the coefficient of the per capita income variable, the independent variable in the model, is expected to be greater than one (β>1). However, the coefficient of the per capita income variable is negative and statistically insignificant in the long run. In addition, according to the t_{BDM} test, there is no cointegration relationship between the variables. These results are interpreted in the Goffman model as Wagner's Law (specific to public expenditure) is not valid for Turkiye. The short-term ECT coefficient is negative (−) and statistically significant. The error correction coefficient value is approximately −0.005, which means that 0.5% of a deviation from the balance that will occur in the short term will be corrected in the long term. According to the diagnostic test results of the estimated model, ARDL analysis parameters are stable, and the short and long-term coefficients are reliable. In addition, since the cumulative sum of consecutive errors (CUSUM) and cumulative sum of squares (CUSUMSQ) do not exceed the 95% confidence limit, the parameters in the Goffman model are stable (See Appendix Figure A3).

F_{PSS} and t_{BDS} statistical values of the Gupta model are (2.10) and (−0.20), respectively. Therefore, there is no cointegration relationship between per capita public expenditure and per capita income (H_0: accept). This result shows that per capita public expenditure and per capita income do not move together in the long run. With this result, the coefficient of the per capita income variable, the independent variable in the model, is both negative and statistically meaningless and can be interpreted as Wagner's Law is not valid for Turkiye in the Gupta model. In addition, there are various problems such as normality, heteroscedasticity, and instability according to diagnostic test results. In addition, since the cumulative sum of consecutive errors (CUSUM) does not exceed the 95% confidence limit and the cumulative sum of squares (CUSUMSQ) exceeds the 95% confidence limit, it can be said that the parameters in the Gupta model are unstable (See Appendix Figure A4).

The ARDL bounds F_{PSS} statistical values of Mann, Musgrave, and Peacock models are (7.35), (5.15), and (14.99), respectively. There is cointegration at the 1% significance level for Mann and Peacock models and a 5% significance level for the Musgrave model (H_0: reject). However, although there are supportive results for the Mann and Peacock models in the t_{BDM} test, it is contradictory for the Musgrave model. In addition, the coefficient values that the independent variables in the models must have in order for the models to be valid are ($\beta>0$) in the Mann and Musgrave models and ($\beta>1$) in the Peacock model. The coefficients of the independent variables in the Mann and Peacock models are appropriate and statistically significant, therefore Wagner's Law is valid for Turkiye.

The long-run coefficients of the Mann and Musgrave models are 0.02 and 0.001, respectively. These results mean that if GDP increases (decreases) by 1% in the Mann model, the share of public expenditure in GDP increases (decreases) by 0.02%. In the Musgrave model, a 1% increase (decrease) in real GDP per capita increases (decreases) the share of public expenditures in GDP by 0.001%. The long-run coefficient of the Peacock model is 1.11, and if GDP increases (decreases) by 1%, public expenditure increases (decreases) by 1.11%. This result can be interpreted as public expenditures increasing more than GDP. Also, the ECT coefficients for Mann, Musgrave, and Peacock models are (−0.19), (−0.11), and (−0.20), respectively. These results can be interpreted as a deviation from equilibrium which will occur in the short term; 19% in the Mann model, 11% in the Musgrave model, and 20% in the Peacock model will improve in the long term.

According to the diagnostic test results, these three models (9, 13, and 17) have no autocorrelation and heteroscedasticity. The model's functional form is defined correctly and assumes normality. In addition, since CUSUM and CUSUMSQ do not exceed the 95% confidence limit, the parameters in Mann, Musgrave, and Peacock models are stable (See Appendix Figure A5–A7). These results can be interpreted as the estimated short and long-term coefficients of the established models being reliable.

First, we adapt the sub-components of public expenditure to the Goffman main equation. The equations created for the Goffman model sub-components, the expected coefficients of the independent variables, the ARDL bounds test results, the estimation values of the short and long-term coefficients, and the diagnostic test results are in Table 5. Models 2, 3, and 4 are modified versions of the Goffman model into the current, investment, and transfer expenditure sub-components. The ARDL bounds F_{PSS} statistical values of the Goffman-current expenditure, Goffman-investment expenditure, and Goffman-transfer expenditure models are (6.93), (6.63), and (6.07), respectively. Cointegration is at the 1% significance level for these three models (H_0: reject). Nevertheless, except for the Goffman-investment expenditure version, the t_{BDM} test contradicts the other two versions. In addition to the cointegration relationship that exists in Goffman sub-models (Models 2, 3, and 4), in order for these models to be valid in the Turkiye case, the coefficient value of the independent variable Y/P in the models must be greater than one (β>1).

Table 5. Goffman Models: According to Sub-components of Public Expenditures

Models	Model 2	Model 3	Model 4
Model names	Goffman-Current Expenditure	Goffman-Investment Expenditure	Goffman-Transfer Expenditure
Equations	C=α+β(Y/P)	I=α+β(Y/P)	TR=α+β(Y/P)
Expected impact	β>1	β>1	β>1
	ARDL (1, 0)	ARDL (1, 0)	ARDL (1, 0)
F_{PSS}	6.932157***	6.632671***	6.075826 ***
	Cointegration	Cointegration	Cointegration
t_{BDM}	-0.333265	-3.183426**	-0.182239
	No Cointegration	Cointegration	No Cointegration
β_L	0.016875 β>0	0.011631 β>0	-0.023492 β<0
	[0.4200]	[0.0000]	[0.9339]
ECT_{t-1}	-0.008866	-0.121570	-0.003991
	[0.0000]	[0.0000]	[0.0001]
Diagnostic tests	Model 2	Model 3	Model 4
$X^2_{NORM(JB)}$	0.091219	2.981824	5.174155
	[0.9554]	[0.2252]	[0.0752]
$X^2_{SC(BG\ LM)}$	0.640522	6.415470	2.131364
	[0.7260]	[0.0404]	[0.3445]
$X^2_{FF(RAMSEY)}$	3.926301	2.561293	4.007905
	[0.0517]	[0.1143]	[0.0494]
$X^2_{HET(BPG)}$	8.704656	2.879973	6.744636
	[0.0129]	[0.2369]	[0.0343]
$X^2_{HET(ARCH)}$	0.256668	12.38347	0.002090
	[0.6124]	[0.0004]	[0.9635]
CUSUM	Stable	Stable	Stable
CUSUM of Sq.	Stable	Stable	Stable

Notes: Please see the notes in table 4.

The long-term coefficient value of Y/P, which is the independent variable in the Goffman-current expenditure model (Model 2), is less than one (β<1) and statistically insignificant. The long-term coefficient value of Y/P, which is the independent variable in the Goffman-investment expenditure model (Model 3), is less than one (β<1) and statistically significant. In the Goffman-transfer expenditure model (Model 4), the long-term coefficient value of Y/P, which is the independent variable, is less than zero (β<0) and statistically insignificant. For the statistically significant Goffman-current expenditure and Goffman-investment expenditure models, as Y/P increases, in the long run, C and I increase. However, the C and I variables increase less than in Y/P. As a result, although the variables in the Goffman-investment expenditure model are cointegrated, considering the direction and size of the coefficients, it is seen that

Wagner's Law is not valid for all sub-components of public expenditures in the Turkiye sample. In addition, these models' ECT coefficients are statistically significant.

The diagnostic test results show that these three models (2, 3, and 4) have no autocorrelation and heteroscedasticity. The model's functional form is defined correctly. The Goffman-investment expenditure model is suitable for normal distribution, and other models are not suitable for normal distribution. In addition, since CUSUM and CUSUMSQ do not exceed the 95% confidence limit, the parameters in these three models are stable (See Appendix Figure A8–A10). These results can be interpreted as the estimated short and long-term coefficients of the established models being reliable.

Second, we adapt the sub-components of public expenditure to the Gupta main equation. The equations created for the sub-components of the Gupta model, the expected values of the coefficients of the independent variables, the ARDL bounds test results, the estimation values of the short and long-term coefficients, and the diagnostic test results are in Table 6. Models 6, 7, and 8 are modified versions of the Gupta model into the current, investment, and transfer expenditure sub-components. The ARDL bounds F_{PSS} statistical values of the Gupta-current expenditure, Gupta-investment expenditure, and Gupta-transfer expenditure models are (10.63), (3.21), and (4.56), respectively. Cointegration exists at the significance level of 1% for the Gupta-current expenditure model, 5% for the Gupta-transfer expenditure model, and 10% for the Gupta-investment expenditure model (H_0: reject). Nonetheless, according to the t_{BDM} test, there is no cointegration in the Gupta-Transfer Expenditure model. In addition to the cointegration relationship that exists in Gupta sub-models (6 and 8), in order for these models to be valid in the Turkiye case, the coefficient value of the independent variable Y/P in the models must be greater than one (β>1).

Table 6. Gupta Models: According to Sub-components of Public Expenditures

Models	Model 6	Model 7	Model 8
Model names	Gupta- Current Expenditure	Gupta-Investment Expenditure	Gupta- Transfer Expenditure
Equations	C/P=α+β(Y/P)	I/P=α+β(Y/P)	TR/P=α+β(Y/P)
Expected impact	β>1	β>1	β>1
	ARDL (1, 0)	ARDL (1, 0)	ARDL (2, 1)
F_{PSS}	10.63426***	3.212614*	4.559993**
	Cointegration	Cointegration	Cointegration
t_{BDM}	-3.140782**	-2.708908*	-2.144391
	Cointegration	Cointegration	No Cointegration
β_L	0.080568 β>0	0.017328 β>0	0.187238 β>0
	[0.0000]	[0.0000]	[0.0000]
β_S			0.250817
			[0.0250]
ECT_{t-1}	-0.246586	-0.168748	-0.112696
	[0.0000]	[0.0024]	[0.0004]
Diagnostic tests	Model 6	Model 7	Model 8
$X^2_{NORM(JB)}$	1.039218	11.50082	13.06855
	[0.5948]	[0.0032]	[0.0014]
$X^2_{SC(BG\ LM)}$	0.495917	1.984653	2.194521
	[0.7804]	[0.3707]	[0.3338]
$X^2_{FF(RAMSEY)}$	1.796820	0.271376	2.316709
	[0.1847]	[0.6042]	[0.1330]
$X^2_{HET(BPG)}$	8.987279	18.98778	18.48832
	[0.0112]	[0.0001	[0.0010]

$X^2_{HET(ARCH)}$	1.429137 [0.2319]	1.415575 [0.2341]	0.715162 [0.3977]
CUSUM	Stable	Stable	Stable
CUSUM of Sq.	Unstable	Unstable	Unstable

Notes: Please see the notes in table 4.

The long-term coefficient values of Y/P, which is the independent variable in the current, investment, and transfer expenditure models of the Gupta model (6, 7, and 8), are less than one ($\beta<1$) but greater than zero ($\beta>0$) and statistically significant.

Thus, as Y/P increases for Gupta sub-models, C/P, I/P, and TR/P increase in the long run. However, the C/P, I/P, and TR/P increase is less than in Y/P. As a result, although these three models are cointegrated at various levels of significance, considering the size of the coefficients, Wagner's Law is not valid for Turkiye in terms of public expenditure sub-components. In addition, these models' ECT coefficients are statistically significant.

According to the diagnostic test results, these three models (6, 7, and 8) have no autocorrelation. The model's functional form is defined correctly. Although all models have heteroscedasticity problems according to the Breusch-Pagan-Godfrey test, there is no problem according to the ARCH test. The Gupta-current expenditure model is suitable for normal distribution, but the Gupta investment and transfer expenditure models are not suitable for normal distribution. In addition, although CUSUM does not exceed the 95% confidence limit, CUSUMSQ exceeds (See Appendix Figure A11–A13). These results can be interpreted as the estimated short and long-term coefficients of the established models' unreliability.

Third, we adapt the sub-components of public expenditure to the Mann main equation. The equations created for the sub-components of the Mann model, the expected values of the coefficients of the independent variables, the ARDL bounds test results, the estimation values of the short and long-term coefficients, and the diagnostic test results are in Table 7. Models 10, 11, and 12 are modified versions of the Mann model into the current, investment, and transfer expenditure sub-components. The ARDL bounds F_{PSS} statistical values of the Mann-current expenditure, Mann-investment expenditure, and Mann-transfer expenditure models are (7.62), (4.11), and (4.41), respectively. Cointegration exists at the significance level of 1% for the Mann-current expenditure model, 5% for the Mann-transfer expenditure model and Mann-investment expenditure model (H_0: reject). The t_{BDM} test supports these results in all versions of the Mann model sub-components. In addition to the cointegration relationship that exists in Mann sub-models (10, 11, and 12), in order for these models to be valid in the Turkiye case, the coefficient value of the independent variable Y in the models must be greater than zero ($\beta>0$).

Table 7. Mann Models: According to Sub-components of Public Expenditures

Models	Model 10	Model 11	Model 12
Model names	Mann-Current Expenditure	Mann-Investment Expenditure	Mann- Transfer Expenditure
Equations	$C/Y=\alpha+\beta(Y)$	$I/Y=\alpha+\beta(Y)$	$TR/Y=\alpha+\beta(Y)$
Expected impact	$\beta>0$	$\beta>0$	$\beta>0$
	ARDL (2, 1)	ARDL (1, 1)	ARDL (1, 1)
F_{PSS}	7.621153 ***	4.113016 **	4.414219 **

	Cointegration	Cointegration	Cointegration
t_{BDM}	-3.376215**	-3.117918**	-2.739319**
	Cointegration	Cointegration	Cointegration
β_L	-0.003842 β<0	-0.010495 β<0	0.033548 β>0
	[0.1718]	[0.0001]	[0.0038]
β_S	-0.064177	-0.018455	-0.077508
	[0.0000]	[0.0032]	[0.0004]
ECT_{t-1}	-0.268867	-0.188586	-0.132555
	[0.0000]	[0.0007]	[0.0005]
Diagnostic tests	Model 10	Model 11	Model 12
$X^2_{NORM(JB)}$	0.507105	9.884464	29.04585
	[0776039]	[0.0071]	[0.0000]
$X^2_{SC(BG LM)}$	0.390756	2.206609	2.967811
	[0.8225]	[0.3318]	[0.2268]
$X^2_{FF(RAMSEY)}$	1.716497	0.151473	0.217273
	[0.1949]	[0.6984]	[0.6427]
$X^2_{HET(BPG)}$	2.450157	1.775215	15.74308
	[0.0549]	[0.1605]	[0.0013]
$X^2_{HET(ARCH)}$	0.000119	7.689063	0.063160
	[0.9913]	[0.0056]	[0.8016]
CUSUM	Stable	Stable	Stable
CUSUM of Sq.	Unstable	Unstable	Unstable

Notes: Please see the notes in table 4.

The Mann-transfer expenditure (Model 12) model is cointegrated, and the coefficient value of the independent variable Y is positive and statistically significant. Therefore, for the Mann-transfer expenditure model, Wagner's Law is valid in the Turkiye case. The long-run coefficient of the Mann-transfer expenditure model is 0.003. This result can be interpreted as if Y increases (decreases) by 1% and the share of transfer expenditures in GDP increases (decreases) by 0.003%. However, the coefficient values of the independent variable Y in Models 10 and 11 are negative (β<0). Although the variables in Mann-current expenditure and Mann-investment expenditure models are cointegrated, Wagner's Law is not valid for Turkiye in these models since the coefficients are negative in terms of direction. Although the short-run coefficients are statistically significant, they are negative in all Mann submodels. Therefore, in these models, Wagner's Law is not valid for Turkiye in the short run. The ECT coefficients are statistically significant and are of (-0.26), (-0.18), and (-0.13) types for the Mann-current expenditure, Mann-investment expenditure, and Mann-transfer expenditure models, respectively. These results can be interpreted as the deviation from the balance which will occur in the short term will improve in the long term by 26% in the Mann-current expenditure model, 18% in the Mann-investment expenditure model, and 13% in the Mann-transfer expenditure model.

According to the diagnostic test results, these three models (10, 11, and 12) have no autocorrelation and heteroscedasticity. The model's functional form is defined correctly. The Mann-current expenditure model is suitable for normal distribution, and other models are not suitable for normal distribution. Also, CUSUMs do not exceed the 95% confidence limit, whereas CUSUMSQs slightly exceed all models (See Appendix Figure A14–A16). These results can be interpreted as the estimated short and long-term coefficients of the generally established models are reliable.

Fourth, we adapt the sub-components of public expenditure to the Musgrave main equation. The equations created for the sub-components of the Musgrave model, the expected values of the coefficients of the independent variables, the ARDL bounds test results, the estimation values of the short and long-term coefficients, and the diagnostic test results are in Table 8. Models 14, 15, and 16 are modified versions of the Musgrave model into the current, investment, and transfer expenditure sub-components. The ARDL bounds F_{PSS} statistical values of the Musgrave-current expenditure, Musgrave-investment expenditure, and Musgrave-transfer expenditure models are (7.07), (1.96), and (3.83), respectively. Cointegration exists at the significance level of 1% for the Musgrave-current expenditure model and 5% for the Musgrave-transfer expenditure model (H_0: reject). However, in the Musgrave-investment expenditure model, there is no cointegration relationship. The t_{BDM} test results parallel other models, except for Musgrave-transfer expenditure.

Table 8. Musgrave Models: According to Sub-components of Public Expenditures

Models	Model 14	Model 15	Model 16
Model names	Musgrave- Current Expenditure	Musgrave-Investment Expenditure	Musgrave- Transfer Expenditure
Equations	C/Y=α+β(Y/P)	I/Y=α+β(Y/P)	TR/Y=α+β(Y/P)
Expected impact	β>0	β>0	β>0
	ARDL (2, 1)	ARDL (1, 1)	ARDL (1, 1)
F_{PSS}	7.068534 ***	1.962337	3.829138**
	Cointegration	No Cointegration	Cointegration
t_{BDM}	-3.772478***	-2.372001	-0.993432
	Cointegration	No Cointegration	No Cointegration
β_L	2.24E-05 β>0	-0.000133 β<0	0.001433 β>0
	[0.7086]	[0.0554]	[0.1816]
β_S	-0.000733	-0.000175	-0.001409
	[0.0000]	[0.0469]	[0.0000]
ECT_{t-1}	-0.298118	-0.143518	-0.045248
	[0.0000]	[0.0164]	[0.0010]
Diagnostic tests	Model 14	Model 15	Model 16
$X^2_{NORM(JB)}$	0.406746	6.001766	32.05493
	[0.8160]	[0.0498]	[0.0000]
$X^2_{SC(BG\ LM)}$	1.280132	1.427063	2.463994
	[0.5273]	[0.4899]	[0.2917]
$X^2_{FF(RAMSEY)}$	0.493550	0.585002	0.598358
	[0.4849]	[0.4471]	[0.4420]
$X^2_{HET(BPG)}$	8.639659	5.854217	7.958754
	[0.1235]	[0.1189]	[0.0469]
$X^2_{HET(ARCH)}$	0.126239	3.269165	0.011566
	[0.7224]	[0.0706]	[0.9144]
CUSUM	Stable	Stable	Stable
CUSUM of Sq.	Unstable	Stable	Unstable

Notes: Please see the notes in table 4.

In addition to the cointegration relationship that exists in Musgrave sub-models (14, 15, and 16), in order for these models to be valid in the Turkiye case, the coefficient value of the independent variable Y/P in the models must be greater than zero (β>0). Musgrave-current expenditure and Musgrave-transfer expenditure models (14 and 16) are cointegrated, and the independent variable Y/P estimated coefficient value is positive. However, this result is not statistically significant. In the Musgrave-investment expenditure model (Model 15), the long-term coefficient value of the independent variable Y/P is negative (β<0). Although Musgrave-current expenditure and Musgrave-transfer expenditure models are cointegrated and positive in terms of the direction of the coefficients, Wagner's Law is not valid for Turkiye since the long-term coefficients of these models are not statistically significant. In addition, since there is no cointegration relationship in the Musgrave-investment expenditure model, Wagner's Law is invalid in this model.

Although the short-run coefficients of the Musgrave submodels are statistically significant, they are negative. These results show that Wagner's Law is not valid for Turkiye in the short run in all Musgrave submodels. In addition, the ECT coefficients for the statistically significant Musgrave-current expenditure, Musgrave-investment expenditure, and Musgrave-transfer expenditure models are (-0.30), (-0.14), and (-0.04), respectively. These results show that the deviation from an equilibrium that may occur in the short term will be corrected in the long term by 30% for the Musgrave-current expenditure model, 14% for the Musgrave-investment expenditure model, and 4% for the Musgrave-transfer expenditure model. According to the diagnostic test results, these three models (14, 15, and 16) have no autocorrelation and heteroscedasticity. The model's functional form is defined correctly. The Musgrave-current expenditure and Musgrave-investment expenditure model are suitable for normal distribution, and other model is not suitable for normal distribution. Also, CUSUMs do not exceed the 95% confidence limit, whereas CUSUMSQs slightly exceed all models (See Appendix Figure A17A19). These results can be interpreted as the estimated short and long-term coefficients of the generally established models are reliable.

Fifth, we adapt the sub-components of public expenditure to the Peacock main equation. The equations created for the sub-components of the Peacock model, the expected values of the coefficients of the independent variables, the ARDL bounds test results, the estimation values of the short and long-term coefficients, and the diagnostic test results are in Table 9. Models 18, 19, and 20 are modified versions of the Peacock model into the current, investment, and transfer expenditure sub-components. The ARDL bounds F_{PSS} statistical values of the Peacock-current expenditure, Peacock-investment expenditure, and Peacock-transfer expenditure models are (9.01), (6.98) and (9.02), respectively. Cointegration exists at the significance level of 1% for all the Peacock sub-model (H_0: reject). The t_{BDM} test also strongly supports these results.

Table 9. Peacock Models: According to Sub-components of Public Expenditures

Models	Model 18	Model 19	Model 20
Model names	Peacock-Current Expenditure	Peacock-Investment Expenditure	Peacock-Transfer Expenditure
Equations	C=α+β(Y)	I=α+β(Y)	TR=α+β(Y)
Expected impact	β>1	β>1	β>1
	ARDL (2, 0)	ARDL (1, 0)	ARDL (1, 0)
F_{PSS}	9.007339***	6.980538***	9.024114***
	Cointegration	Cointegration	Cointegration
t_{BDM}	-3.349008**	-3.182978**	-2.721673**
	Cointegration	Cointegration	Cointegration
β_L	0.956771 β>0	0.644123 β>0	1.479256 β>1
	[0.0000]	[0.0000]	[0.0000]
ECT_{t-1}	-0.251482	-0.181872	-0.159617
	[0.0000]	[0.0000]	[0.0000]
Diagnostic tests	Model 18	Model 19	Model 20

$X^2_{NORM(JB)}$	1.145868	12.41966	5.718283
	[0.5639]	[0.0020]	[0,0573]
$X^2_{SC(BG\ LM)}$	0.197840	4.293784	3.108778
	[0.9058]	[0.1168]	[0.2113]
$X^2_{FF(RAMSEY)}$	0.000276	0.233686	4.854709
	[0.9868]	[0.6304]	[0.0311]
$X^2_{HET(BPG)}$	3.471878	0.624459	0.105349
	[0.3244]	[0.7318]	[0.9487]
$X^2_{HET(ARCH)}$	0.564018	11.80275	0.016695
	[0.4526]	[0.0006]	[0.8972]
CUSUM	Stable	Stable	Stable
CUSUM of Sq.	Unstable	Stable	Stable

Notes: Please see the notes in table 4.

In addition to the cointegration relationship that exists in Peacock sub-models (18, 19, and 20), in order for these models to be valid in the Turkiye case, the coefficient value of the independent variable Y in the models must be greater than one ($\beta>1$). Peacock-transfer expenditure models (Model 20) are cointegrated, and the independent variable Y estimated coefficient value is positive, so Wagner's Law is not valid for Turkiye. In the Peacock-current expenditure and Peacock-investment expenditure models, the long-term coefficient values of the independent variable are positive and statistically significant, but are below 1. Therefore, in Wagner's Law, these models (Models 18 and 19) are invalid for Turkiye.

The long-term coefficient values of the Peacock-current expenditure, Peacock-investment expenditure, and Peacock-transfer expenditure models are (0.96), (0.64), and (1.48), respectively. Accordingly, if GDP increases (decreases) by 1%; current expenditures by 0.96%, investment expenditures by 0.64%, and transfer expenditures by 1.48% increase (decrease), respectively. This result means that transfer expenditures in Turkiye increase more than GDP, current expenditures increase approximately as much as GDP, and investment expenditures increase less than GDP. In addition, the ECT coefficients are statistically significant, and for the Peacock-current expenditure, Peacock-investment expenditure, and Peacock-transfer expenditure models are (-0.25), (-0.18), and (-0.16), respectively. These results show that the deviation from an equilibrium that may occur in the short term will be corrected in the long term by 25% for the Peacock-current expenditure model, 18% for the Peacock-investment expenditure model, and 16% for the Peacock-transfer expenditure model.

According to the diagnostic test results, these three models (18, 19, and 20) have no autocorrelation and heteroscedasticity. The model's functional form is defined correctly. The Peacock-current expenditure and Peacock-transfer expenditure models are suitable for normal distribution, and another model is not suitable for normal distribution. For the Peacock-investment and Peacock-transfer expenditure models, CUSUM and CUSUMSQ do not exceed the 95% confidence limit. The CUSUM is stable in the Peacock-current expenditure model, but the CUSUMSQ of consecutive errors slightly overflow at the 95% confidence limit (See Appendix Figure A20–A22). These results can be interpreted as the estimated short and long-term coefficients of the generally established models being reliable. A summary of the findings from all analysis is in Table 10.

Table 10. Analysis Results Summary

Models	Goffman Model	Gupta Model	Mann Model	Musgrave Model	Peacock Model
General Public Expenditure	X	X	✓	X	✓
Current Expenditure	X	X	X	X	X
Investment Expenditure	X	X	X	X	X
Transfer Expenditure	X	X	✓	X	✓

Notes: ✓: Supports Wagner's Law; X: Doesn't support Wagner's Law.

4. Conclusions

This study examines the validity of Wagner's Law for the Turkiye case on a 71-year data set for the 1950–2020 period. Unlike other studies, it tests all models in the literature by adapting the sub-components of public expenditures (current, investment, and transfer expenditure) within the scope of the economic classification. First of all, the variables are realized with the GDP deflator in order to eliminate price movements. Then, GDP, public expenditure, current expenditure, investment expenditure, and transfer expenditure variables, which are out of proportional variables, are included in the analysis in the logarithmic form to allow the analysis findings to be interpreted as percentages and to converge their extreme values. The analysis part of the study first presents descriptive statistics and a correlation matrix of variables. To know which method to use next, we apply ADF PP and LS unit root tests, and determine which order the variables are stationary. Then, the possible cointegration relationship between the variables in the model is investigated by the ARDL method, short and long-term coefficients are estimated, and the established model is tested with various diagnostic tests, whether it is structurally stable and smooth. Pesaran, Shin, and Smith (2001) stated that two possible degenerate situations might occur in the ARDL bounds test approach. McNown, Sam, and Goh (2018) highlighted similar weaknesses and recommended the bootstrap ARDL procedure. However, the fact that the dependent variables in our study were I(1) ruled out degenerate case #1. To rule out degenerate case #2, we applied not only the F_{PSS} test but also the t_{BDM} test, which considers the dependent variable's first lagged value. We considered the F_{PSS}, t_{BDM}, and the coefficients' significance in the models' validity. In addition, we did not apply the bootstrap ARDL procedure because all the variables we used in the study were stationary in the first lag. The study includes some limitations in terms of scope and method. First of all, it should be noted that the findings are valid only in the Turkiye sample. Other significant limitations are that no control variables are added to the models to preserve the originality of the models and that it does not consider possible asymmetrical relationships.

The study's empirical results strongly support (in the Mann and Peacock models) that Wagner's Law is valid for public expenditure in the Turkiye case. In this respect, the study contributes to the literature, starting with Wagner (1883) and continuing with Mann (1980), Oxley (1994), Yamak and Kucukkale (1997), Islam (2001), Iyare and Lorde (2004), Mohammadi, Cak, and Cak (2008), Kumar, Webber, and Fargher (2012), Cergibozan, Cevik, and Demir (2017), Sagdic, Sasmaz, and Tuncer (2020). In addition, this result shows that in the long run, GDP has increased, but public expenditures have increased more than GDP. Increasing public expenditures more than GDP means increasing the share of the public sector in the economy. In order to use public resources effectively, it is necessary to identify the sub-component or components of public expenditure that dominate the increase in public expenditures. Most studies (Uluturk 1998, Gunaydin 2000, Cavusoglu 2005, Aytac and Guran 2010, Kabaklarli and Er 2014, Telek and Telek 2016) test Wagner's Law for public expenditure but do not examine expenditure types/components. From this point of view, we tested Wagner's Law in the case of Turkiye for all expenditure types/components within the scope of the economic classification.

The analysis results for the types of expenditures within the scope of the economic classification show that Wagner's Law is valid only for the transfer expenditure for the Turkiye cases. It does not prove that Wagner's Law applies to current and investment expenditures. These results differ from the results obtained from the studies of Arısoy (2005), Gul and Yavuz (2010), Kolcak, Kalabak, and Boran (2015) in terms of current expenditures. In terms of investment expenditures, it is similar to Kolcak, Kalabak, and Boran (2015), which differs from the results of Arısoy (2005) and Gul and Yavuz (2010) studies. For transfer expenditures, it differs from the results of the study of Kolcak, Kalabak, and Boran (2015) in parallel with the results obtained from the studies of Arısoy (2005) and Gul and Yavuz (2010) (See Appendix Table A4). Arısoy (2005), Gul and Yavuz (2010), Kolcak, Kalabak, and Boran (2015) used only one model (Mann, Peacock, and Peacock models, respectively) while testing Wagner's Law within the scope of the economic classification. In this study, applying all models in the literature (Goffman, Gupta, Mann, Musgrave, and Peacock models) to public expenditure sub-components/types and the ARDL bounds test is the original value of the study.

According to the study, we have determined that Wagner's Law validates the Turkiye case public expenditure and transfer expenditures among the public expenditure components/types. This finding indicates that while GDP increases, in the long run, public expenditures increase more than GDP, which is dominated by transfer expenditures. According to our calculations, transfer expenditures accounted for approximately 55% of public expenditures in the last ten years. This calculation supports the empirical result we found on the validity of Wagner's Law in transfer expenditures. Again, in the last ten-year period, approximately 75% of transfer expenditures are made up of social transfers, indicating that Turkiye prioritizes the social state function rather than the efficient use of public resources. At the same time, these findings indicate that the behaviors of politicians and voters, which Buchanan (1975) expressed in his theory of public choice, to maximize their benefits can be effective. Politicians aim to come into power with the highest vote in the next elections. On the other hand, voters prefer to vote for politicians who maximize their benefits rather than social ones. These factors show that the political power representing the government can make expenditures to win the vote of the majority of the society while preparing the state budget. The expenditures that will satisfy the voters most within the scope of the public choice theory are social transfers that directly increase their incomes.

Social transfers can aid economic development in developing countries such as Turkiye. However, if these countries have not reached a stable economic growth trend, they should not ignore economic growth. In this context, Turkiye should reduce the share of social transfers and instead focus on economic transfers that contribute to economic growth. Each underdeveloped or developing country should identify the reason for the increase in public expenditures and plan its future expenditures accordingly. It is of vital importance for the effective use of public resources. In this study, we have analyzed only three expenditure types within the scope of the economic classification. Analyzing the increase in public expenditures in terms of expenditure components within the scope of functional classification (such as education, health, and defense) will also guide policymakers to a great extent. In addition, this study sheds light on further studies that with expenditure types instead of general public expenditures can produce more effective results.

References

Ahsan, Syed M., Andy C. C. Kwan, and Balbir S. Sahni. 1996. "Cointegration and Wagner's Hypothesis: Time Series Evidence for Canada." *Applied Economics,* 28(8): 1055-1058. http://dx.doi.org/10.1080/000368496328182

Akbulut, Hale. 2017. "The Relationship between Economic Development and State Spendings: The Case of Turkey in 2007:1-2015:3 Quarter." *Journal of Administrative Sciences*, 15(29): 9-23.

Akcay, Selcuk. 2022. "Remittances and Income Inequality in the Philippines." *Asian-Pacific Economic Literature,* 36(1): 30-47. https://doi.org/10.1111/apel.12346

Altunc, Omer F. 2011. "The Relationship Between Public Expenditures and Economic Growth: Empirical Evidence For Turkey." *Yönetim ve Ekonomi Dergisi,* 18(2): 145-157.

Aluthge, Chandana, Adamu Jibir, and Musa Abdu. 2021. "Impact of Government Expenditure on Economic Growth in Nigeria, 1970-2019." *CBN Journal of Applied Statistics,* 12(1): 139-174. https://doi.org/10.33429/Cjas.12121.6/6

Arestis, Philip, Huseyin Sen, and Ayse Kaya. 2021. "On the Linkage between Government Expenditure and Output: Empirics of the Keynesian View versus Wagner's Law." *Economic Change and Restructuring*, 54: 265-303. https://doi.org/10.1007/s10644-020-09284-7

Arisoy, Ibrahim. 2005. "Wagner ve Keynes Hipotezleri Çerçevesinde Türkiye'de Kamu Harcamaları ve Ekonomik Büyüme İlişkisi." *Ç.Ü. Sosyal Bilimler Enstitüsü Dergisi,* 14(2): 63-80.

Aytac, Deniz, and Mehmet C. Guran. 2010. "Does The Composition of Government Expenditure Effect on Economic Growth? An Analysis for Turkish Economy." *Sosyoekonomi,* 13(2): 129-152.

Babatunde, Musibau A. 2011. "A Bound Testing Analysis of Wagner's Law in Nigeria: 1970-2006." *Applied Economics,* 43(21): 2843-2850. https://doi.org/10.1080/00036840903425012

Bagdigen, Muhlis, and Hakan Cetintas. 2003. "Causality between Public Expenditure and Economic Growth: The Turkish Case." *Journal of Economic and Social Research,* 6(1): 53-72.

Barra, Cristian, Giovanna Bimonte, and Pietro Spennati. 2015. "Did Fiscal Institutions Affect Wagner's Law in Italy during 1951-2009 Period? An Empirical Analysis." *Applied Economics,* 47(59): 6409-6424. https://doi.org/10.1080/00036846.2015.1071475

Basar, Selim, Hayati Aksu, M. Sinan Temurlenk, and Ozgur Polat. 2009. "Government Spending and Economic Growth Relationship in Turkey: A Bound Testing Approach." *Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi,* 13(1): 301-314.

Biswal, Bagala, Urvashi Dhawan, and Hooi-Yean Lee. 1999. "Testing Wagner versus Keynes Using Disaggregated Public Expenditure Data for Canada." *Applied Economics*, 31(10): 1283-1291. https://doi.org/10.1080/000368499323490

Buchanan, James M. 1975. "Public Finance and Public Choice." *National Tax Journal,* 28(4): 383-394.

Burney, Nadeem A. 2002. "Wagner's Hypothesis: Evidence from Kuwait using Cointegration Tests." *Applied Economics,* 34(1): 49-57. https://doi.org/10.1080/00036840010027540

Cavusoglu, A. Tarkan. 2005. "Testing the Validity of Wagner's Law in Turkey: The Bounds Testing Approach." *Ankara University Faculty of Political Science Journal,* 60(1): 73-88.

Cergibozan, Raif, Emre Cevik, and Caner Demir. 2017. "Testing the Wagner's Law for Turkish Economy: Some Findings from Time Series Data." *Finans Politik & Ekonomik Yorumlar,* 625(54): 75-90.

Cetinkaya, Murat, Ahmet T. Cetinkaya, and Emre Aksoy. 2017. "The Relation between Public Expenditures Specific to Military Spendings and Economic Growth." *The Journal of Social Economic Research,* 33(17): 210-225.

Chang, Tsangyao. 2002. "An Econometric Test of Wagner's Law for Six Countries Based on Cointegration and Error-Correction Modelling Techniques." *Applied Economics,* 34(9): 1157-1169. https://doi.org/10.1080/00036840110074132

Chimobi, Omoke P. 2009. "Government Expenditure and National Income: A Causality Test for Nigeria." *European Journal of Economic and Political Studies,* 2(2): 1-12.

Chletsos, Michael, and Christos Kollias. 1997. "Testing Wagner's Law Using Disaggregated Public Expenditure Data in the Case of Greece: 1958-93." *Applied Economics,* 29(3): 371-377. https://doi.org/10.1080/000368497327155

Courakis, Anthony S., Fatima Moura-Roque, and George Tridimas. 1993. "Public Expenditure Growth in Greece and Portugal: Wagner's Law and Beyond." *Applied Economics,* 25(1): 125-134. https://doi.org/10.1080/00036849300000121

Demir, Ihsan C., and Ali Balki. 2019. "Testing the Wagner Law in Turkey: 1960-2016 Period Analysis." *Vergi Raporu,* 234(3): 11-27

Demirbas, Safa. 1999. "Cointegration Analysis-Causality Testing and Wagner's Law: The Case of Turkey, 1950-1990." University of Leicester, School of Business Discussion Paper in Economics 99/3.

Dickey, David A., and Wayne A. Fuller. 1979. "Distribution of the Estimators for Autoregressive Time Series with a Unit Root." *Journal of the American Statistical Association,* 74(366): 427-431. https://doi.org/10.1080/01621459.1979.10482531

Engle, Robert F., and Clive W. J. Granger. 1987. "Co-Integration and Error Correction: Representation, Estimation, and Testing." *Econometrica,* 55(2): 251-276. https://doi.org/10.2307/1913236

Florio, Massimo, and Sara Colautti. 2005. "A Logistic Growth Theory of Public Expenditures: A Study of Five Countries over 100 Years." *Public Choice,* 122: 355-393. https://doi.org/10.1007/s11127-005-3900-y

Goffman, Irving J. 1968. "On the Empirical Testing of Wagner's Law: A Technical Note." *Public Finance,* 3(3): 359-364.

Grenade, Kari, and Allan Wright. 2014. "Public Spending in Selected Caribbean Countries: Testing Wagner's Law and the Ratchet Hypothesis." *Public Finance Review,* 42(4): 487-510. https://doi.org/10.1177/1091142113499395

Gul, Ekrem, and Hakan Yavuz. 2010. " The Relationship Between Public Expenditure and Economic Growth in Turkey and the New Members of the EU: The Period of 1996-2008." *Maliye Dergisi,* 158: 164-178.

Gul, Ekrem, and Hakan Yavuz. 2011. "The Causal Relationship between Public Expenditure and Economic Growth in Turkey: 1963-2008 Period." *Maliye Dergisi,* 160: 72-85.

Gunaydin, Ihsan. 2000. "Türkiye İçin Wagner ve Keynes Hipotezlerinin Testi." *İktisat İşletme ve Finans Dergisi,* 175: 70-86.

Gupta, Shibshankar P. 1967. "Public Expenditure and Economic Growth: A Time Series Analysis." *Public Finance,* 22(4): 423-461.

Henrekson, Magnus. 1993. "Wagner's Law-A Spurious Relationship." *Public Finance,* 48(3): 406-415.

Huang, Chiung-Ju. 2006. "Government Expenditures in China and Taiwan: Do They Follow Wagner's Law?" *Journal of Economic Development,* 31(2): 139-148.

Irandoust, Manuchehr. 2019. " Wagner on Government Spending and National Income: A New Look at an Old Relationship." *Journal of Policy Modeling,* 41(4): 636-646. https://doi.org/10.1016/j.jpolmod.2019.02.003

Islam, Anisul M. 2001. "Wagner's Law Revisited: Cointegration and Exogeneity Tests for the USA." *Applied Economics,* 8(8): 509-515. http://dx.doi.org/10.1080/13504850010018743

Iyare, Sunday O., and Troy Lorde. 2004. "Co-integration, Causality and Wagner's Law: Tests for Selected Caribbean Countries." *Applied Economics Letters,* 11(13): 815-825. https://doi.org/10.1080/1350485042000254881

Johansen, Søren, and Katarina Juselius. 1990. "Maximum Likelihood Estimation and Inference on Cointegration - with Appucations to the Demand for Money." *Oxford Bulletin of Economics and Statistics,* 52(2): 169-210.

Kabaklarli, Esra, and Perihan H. Er. 2014. "The Analysis of Effect of Public Expenditures on Economic Growth in Turkey through Bound Testing Approach." *Maliye Dergisi,* 166: 268-285.

Kelly, Trish. 1997. "Public Expenditures and Growth." *The Journal of Development Studies,* 34(1): 60-84. https://doi.org/10.1080/00220389708422503

Keynes, John M. 1936. *The General Theory of Employment, Interest and Money.* London: Palgrave Macmillan.

Koksel Tan, Bilge, Merter Mert, and Zeynel A. Ozdemir. (2010). "A look at on the Relationship between the Public Investments and Economic Growth: Turkey, 1969-2003." *Dokuz Eylül Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi,* 25(1): 25-39.

Kolcak, Mensure, Ali Y. Kalabak, and Handan Boran. 2015. "An Empirical Analysis about the Relation between Public Expenditures and Economic Growth: 1984-2014 Turkey Example." *Econworld2015,* Torino, Italy.

Kumar, Saten, Don J. Webber, and Scott Fargher. 2012. "Wagner's Law Revisited: Cointegration and Causality Tests for New Zealand." *Applied Economics,* 44(5): 607-616. https://doi.org/10.1080/00036846.2010.511994

Lamartina, Serena, and Andrea Zaghini. 2008. "Increasing Public Expenditures: Wagner's Law in OECD Countries." *Center for Financial Studies Working Paper* 13.

Lee, Junsoo, and Mark C. Strazicich. 2003. "Minimum Lagrange multiplier unit root test with two structural breaks." *Review of Economic Statistics,* 85(4): 1082-1089. https://doi.org/10.1162/003465303772815961

Magazzino, Cosimo. 2012. "Wagner versus Keynes: Public Spending and National Income in Italy." *Journal of Policy Modeling,* 34(6): 890-905. https://doi.org/10.1016/j.jpolmod.2012.05.012

Mann, Arthur J. 1980. "Wagner's Law: An Econometric Test for Mexico, 1925-1976." *National Tax Journal*, 33(2): 189-201. https://doi.org/10.1086/NTJ41862301

McNown, Robert, Chung Yan Sam, and Soo Khoon Goh. 2018. "Bootstrapping the autoregressive distributed lag test for cointegration. " *Applied Economics,* 50(13): 1509-1521. https://doi.org/10.1080/00036846.2017.1366643

Mohammadi, Hassan, Murat Cak, and Demet Cak. 2008. "Wagner's Hypothesis New Evidence from Turkey Using the Bounds Testing Approach." *Journal of Economic Studies,* 35(1): 94-106. http://dx.doi.org/10.1108/01443580810844442

Musgrave, Richard A. 1969. *Fiscal Systems.* New Haven: Yale University Press.

Narayan, Paresh K. 2005. "The Saving and Investment Nexus for China: Evidence from Cointegration Tests." *Applied Economics,* 37(17): 1979-1990. https://doi.org/10.1080/00036840500278103

Oktayer, Asuman, and Nagihan Oktayer. 2013. "Testing Wagner's Law for Turkey: Evidence from a Trivariate Causality Analysis." *Prague Economic Papers,* 22(2): 284-301. http://dx.doi.org/10.18267/j.pep.452

Oxley, Les. 1994. "Cointegration, Causality and Wagner's Law: A Test for Britain 1870-1913." *Scottish Journal of Political Economy,* 41(3): 286-298. http://dx.doi.org/10.1111/j.1467-9485.1994.tb01127.x

Oyinlola, Mutiu Abimbola, and Olusijibomi Akinnibosun. 2013. "Public Expenditure and Economic Growth nexus: Further Evidence from Nigeria." *Journal of Economics and International Finance,* 5(4): 146-154. https://doi.org/10.5897/JEIF2013.0489

Peacock, Alan T., and Alex Scott. 2000. "The Curious Attraction of Wagner's Law." *Public Choice,* 102(1/2): 1-17.

Peacock, Alan T., and Jack Wiseman. 1961. *The Growth of Public Expenditure in the United Kingdom.* Princeton: Princeton University Press.

Pesaran, M. Hashem, Yongcheol Shin, and Richard J. Smith. 2001. "Bounds Testing Approaches to the Analysis of Level Relationships." *Journal of Applied Econometrics,* 16(3): 289-326. https://doi.org/10.1002/jae.616

Phillips, Peter C. B., and Bruce E. Hansen. 1990. "Statistical Inference in Instrumental Variables Regression with I(1) Processes." *The Review of Economic Studies*, 57(1): 99-125. https://doi.org/10.2307/2297545

Phillips, Peter C. B., and Pierre Perron. 1988. "Testing for a Unit Root in Time Series Regression." *Biometrika*, 75(2): 335-346. https://doi.org/10.1093/biomet/75.2.335

Sagdic, Ersin N., Mahmut U. Sasmaz, and Guner Tuncer. 2020. "Wagner versus Keynes: Empirical Evidence from Turkey's Provinces." *Panoeconomicus,* 67(5): 657-674. https://dx.doi.org/10.2298/PAN170531001S

Shahbaz, Muhammad, Saleheen Khan, and Mohammad I. Tahir. 2013. "The Dynamic Links between Energy Consumption, Economic Growth, Financial Development and Trade in China: Fresh Evidence from Multivariate Framework Analysis." *Energy Economics,* 40: 8-21. https://doi.org/10.1016/j.eneco.2013.06.006

Sideris, Dimitrios. 2007. "Wagner's Law in 19th Century Greece: A Cointegration and Causality Analysis." Bank of Greece Working Paper 64.

Simsek, Muammer. 2004. "Türkiye'de Kamu Harcamaları ve Ekonomik Büyüme." *Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi,* 18(1): 37-52.

Sinha, Dipendra. 2007. "Does the Wagner's Law hold for Thailand? A Time Series Study." Munich Personal RePEc Archive Working Paper 2560.

Telek, Cebrail ve Ali Telek. 2016. "The Relation Between Public Expenditures And Economic Growth: The Term Of 1998-2015 Analysis Of The Turkish Economy." *Int. Journal of Management Economics and Business,* 6: 628-642.

Thornton, John. 1999. "Cointegration, Causality and Wagner's Law in 19th Century Europe." *Applied Economics Letters,* 6(7): 413-416. http://dx.doi.org/10.1080/135048599352916

Tuna, Kadir. 2013. "Testing the Validity of Wagner's Law in Turkey." *İşletme ve İktisat Çalışmaları Dergisi,* 1(3): 54-57.

Uluturk, Suleyman. 1998. *Türkiye'de Planlı Dönemde Kamu Harcamalarının Gelişimi ve Devletin Ekonomideki Rolü.* Ankara: Akçağ Yayınları.

Uluturk, Suleyman, Servet Akyol, and Mehmet Mert. 2016. "Testing Wagner's Law for Turkey: ARDL Analysis for 1980-2014 Period." *Akdeniz Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi,* 16(34): 18-44.

Wagner, Adolph. 1883. *Finanzwissenschaft.* Leipzig: C. F. Winter.

Yamak, Nebiye, and Yakup Kucukkale. 1997. "The Relationship between Public Expenditure and Economic Growth in Turkey." *İktisat İşletme ve Finans Dergisi,* 131: 5-14. https://doi.org/10.3848/iif.1997.131.1596

Ziramba, Emmanuel. 2018. "Wagner's Law: An Econometric Test for South Africa, 1960-2006." *South African Journal of Economics,* 76(4): 596-606. https://doi.org/10.1111/j.1813-6982.2008.00218.x

Appendix

Figure A1. Share of Public Expenditures in GDP for 1950-2020 (%)

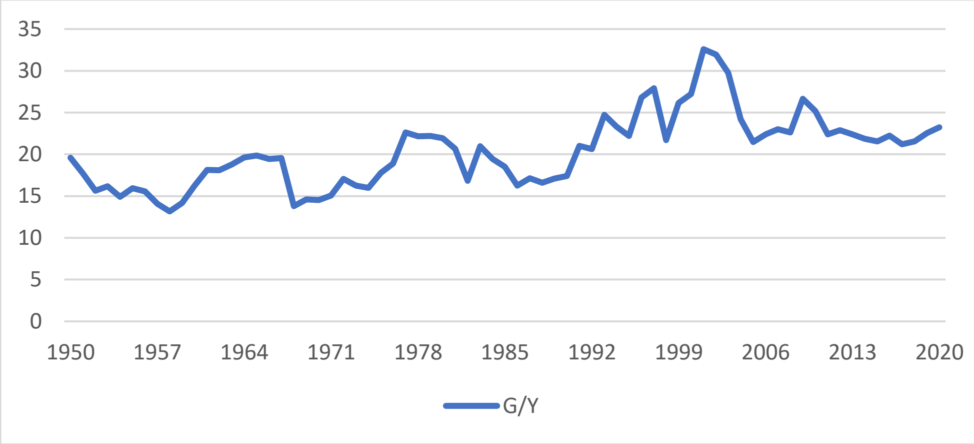

Figure A2. Development of Public Expenditures in 1950-2020 (%)

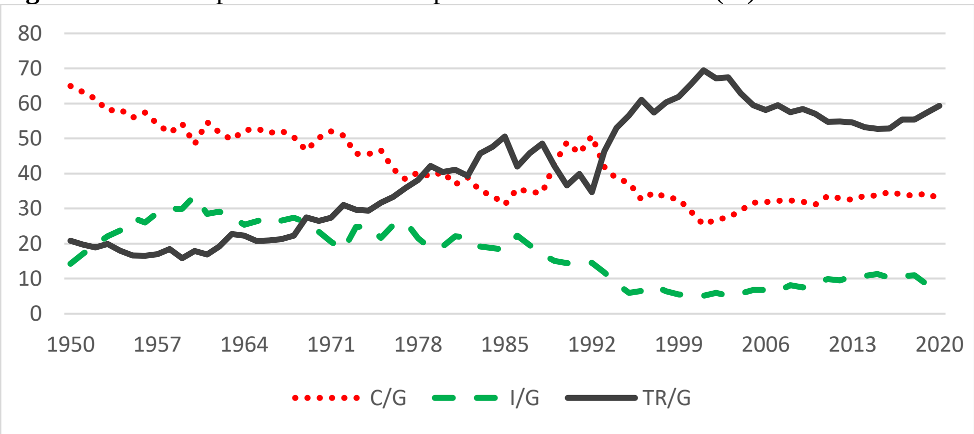

Table A1. Summary Statistics and Correlation Matrix

	Y	C	G	I	TR	Y/P	G/P	C/P	I/P	TR/P	G/Y	C/Y	I/Y	TR/Y
Mean	21.76870	19.25314	20.15472	18.23413	19.16252	80.82367	6.41E+11	6.324376	2.048997	9.322039	0.203369	0.081854	0.031712	0.088854
Median	21.76468	19.09815	20.08572	18.37635	19.31330	56.31874	4.23E+10	4.460230	1.803706	4.928278	0.206150	0.078499	0.030847	0.083837
Maximum	23.61601	21.04036	22.15616	19.83833	21.63378	216.3782	2.25E+12	16.61267	5.070083	29.80859	0.325880	0.127232	0.059280	0.226402
Minimum	19.62188	17.47399	17.99117	16.04263	16.31384	15.97593	14979163	1.493488	0.445672	0.501719	0.131652	0.057211	0.013268	0.022448
Std. Dev.	1.175375	1.117259	1.325862	0.908880	1.772874	59.84249	7.84E+11	4.421487	1.108690	9.275872	0.042832	0.013386	0.012549	0.051200
Skewness	-0.125258	-0.055355	-0.130548	-0.325624	-0.244714	0.934982	0.638681	0.849733	1.128318	0.695435	0.623111	0.690814	0.288422	0.575097
Kurtosis	1.878838	1.779946	1.746443	2.701379	1.698492	2.672753	1.762376	2.507846	3.641024	1.874838	3.240747	3.745919	2.025044	2.590083
Jarque-Bera	3.904296	4.439835	4.850418	1.518507	5.719826	10.66142	9.358298	9.260769	16.28064	9.468177	4.765955	7.293157	3.796393	4.410806
Probability	0.141969	0.108618	0.088460	0.468016	0.057274	0.004841	0.009287	0.009751	0.000292	0.008790	0.092275	0.026080	0.149839	0.110206
Sum	1545.578	1366.973	1430.985	1294.623	1360.539	5738.481	4.55E+13	449.0307	145.4788	661.8647	14.43923	5.811662	2.251554	6.308610
Sum Sq. Dev.	96.70537	87.37875	123.0536	57.82445	220.0157	250678.7	4.31E+25	1368.469	86.04356	6022.926	0.128419	0.012543	0.011024	0.183499
Observations	71	71	71	71	71	71	71	71	71	71	71	71	71	71

Correlation	Y	C	G	I	TR	Y/P	G/P	C/P	I/P	TR/P	G/Y	C/Y	I/Y	TR/Y
Y	1.000000													
C	0.991539	1.000000												
G	0.993525	0.995433	1.000000											
I	0.949777	0.935229	0.935880	1.000000										
TR	0.987151	0.986354	0.996276	0.920932	1.000000									
Y/P	0.926597	0.925656	0.912793	0.875643	0.884628	1.000000								
G/P	-0.878902	-0.859759	-0.882100	-0.838147	-0.899308	-0.701440	1.000000							
C/P	0.922534	0.938899	0.920481	0.866280	0.890837	0.988151	-0.699329	1.000000						
I/P	0.796997	0.787950	0.771101	0.899942	0.734843	0.865066	-0.592993	0.845861	1.000000					
TR/P	0.907358	0.917508	0.920574	0.807594	0.903696	0.951784	-0.713513	0.959313	0.732479	1.000000				
G/Y	0.662129	0.719370	0.741756	0.566089	0.755542	0.558700	-0.637561	0.632882	0.368967	0.742161	1.000000			
C/Y	-0.448563	-0.329624	-0.374897	-0.473622	-0.388392	-0.368970	0.465848	-0.251704	-0.374289	-0.289151	0.130751	1.000000		
I/Y	-0.733377	-0.736551	-0.735433	-0.492456	-0.749971	-0.694339	0.637526	-0.700416	-0.307634	-0.764407	-0.560089	0.252832	1.000000	
TR/Y	0.828086	0.845840	0.876450	0.697230	0.896164	0.708614	-0.795684	0.742455	0.461588	0.860171	0.927472	-0.203805	-0.761164	1.000000

Data Souce: Republic of Turkiye Ministry of Treasury and Finance https://en.hmb.gov.tr/

Table A2. Unit Root Tests

		Y	G	C	I	TR	Y/P	G/P	C/P	I/P	TR/P	G/Y	C/Y	I/Y	TR/Y
								PP test at level							
C	t-Statistic	-1.2740	-0.6319	-0.1544	-2.1147	-0.6785	3.3688	-1.9649	2.0266	-0.9833	0.9070	-2.1639	-4.3102	-1.3393	-1.3029
	Prob.	0.6373	0.8560	0.9385	0.2397	0.8449	1.0000	0.3015	0.9999	0.7550	0.9951	0.2212	**0.0009*** **	0.6068	0.6239
C&T	t-Statistic	-2.6355	-2.2354	-3.1287	-2.8079	-1.8755	-0.2840	-1.3391	-1.1016	-1.8365	-1.6448	-3.3144	-4.2930	-3.0185	-2.3359
	Prob.	0.2664	0.4628	0.1079	0.1995	0.6566	0.9897	0.8698	0.9212	0.6763	0.7648	**0.0724***	**0.0056*** **	0.1347	0.4094
No C&T	t-Statistic	7.3883	5.6966	4.4534	3.0126	4.2302	6.9920	-2.8161	-1.1016	-1.8365	-1.6448	-0.1167	-1.2908	-0.6998	0.0156
	Prob.	1.0000	1.0000	1.0000	0.9992	1.0000	1.0000	**0.0055*** **	0.9212	0.6763	0.7648	0.6400	0.1799	0.4102	0.6844
								PP at first difference							
		ΔY	**ΔG**	**ΔC**	**ΔI**	**ΔTR**	**ΔY/P**	**ΔG/P**	**ΔC/P**	**ΔI/P**	**ΔTR/P**	**ΔG/Y**	**ΔC/Y**	**ΔI/Y**	**ΔTR/Y**
C	t-Statistic	-8.9723	-8.6538	-7.6036	-7.7910	-9.4078	-7.9120	-6.4613	-7.1872	-7.9741	-6.4396	-8.9893	-8.4817	-8.3516	-8.0175
	Prob.	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	0.0000***	0.0000***	0.0000***	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **
C&T	t-Statistic	-8.9878	-8.6191	-7.5432	-7.8483	-9.3868	-9.1958	-6.6164	-7.7292	-7.9186	-6.6611	-8.9085	-8.4556	-8.3569	-7.9545
	Prob.	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	0.0000***	0.0000***	0.0000***	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **
No C&T	t-Statistic	-6.0676	-6.5444	-6.2818	-7.0705	-7.9484	-6.7468	-6.1974	-6.4420	-7.8218	-5.9905	-9.0421	-8.5192	-8.4037	-8.0028
	Prob.	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	0.0000***	0.0000***	0.0000***	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **
Decision		**I(1)**	**I(1)**	**I(1)**	**I(1)**	**I(1)**	**I(1)**	**I(1)**	**I(1)**	**I(1)**	**I(1)**	**I(1)**	**I(0)/I(1)**	**I(1)**	**I(1)**
								ADF test at level							
		Y	**G**	**C**	**I**	**TR**	**Y/P**	**G/P**	**C/P**	**I/P**	**TR/P**	**G/Y**	**C/Y**	**I/Y**	**TR/Y**
C	t-Statistic	-1.1474	-0.6319	-0.1373	-1.7672	-0.6786	3.2381	-1.8452	1.9922	-0.9530	1.3213	-2.1605	-4.2501	-1.3971	-1.2506
	Prob.	0.6924	0.8560	0.9406	0.3935	0.8448	1.0000	0.3560	0.9998	0.7654	0.9986	0.2224	**0.0011*** **	0.5790	0.6479
C&T	t-Statistic	-2.6355	-2.0795	-3.0991	-2.4342	-1.7012	-0.6299	-1.9600	-1.0581	-1.8365	-1.3638	-3.2497	-4.1833	-3.0420	-2.3359
	Prob.	0.2664	0.5478	0.1147	0.3592	0.7404	0.9739	0.6120	0.9283	0.6763	0.8630	**0.0834***	**0.0078*** **	0.1286	0.4094
No C&T	t-Statistic	6.6731	5.5575	4.5916	2.8629	4.1608	4.5886	-2.5335	4.0846	0.7569	2.9376	-0.2421	-1.2908	-0.7318	0.0290
	Prob.	1.0000	1.0000	1.0000	0.9988	1.0000	1.0000	**0.0119** **	1.0000	0.8752	0.9991	0.5955	0.1799	0.3960	0.6887
								ADF at first difference							
		ΔY	**ΔG**	**ΔC**	**ΔI**	**ΔTR**	**ΔY/P**	**ΔG/P**	**ΔC/P**	**ΔI/P**	**ΔTR/P**	**ΔG/Y**	**ΔC/Y**	**ΔI/Y**	**ΔTR/Y**
C	t-Statistic	-8.9012	-8.6530	-7.6051	-7.1520	-9.4798	-7.9120	-6.4443	-7.2068	-7.9746	-6.3658	-8.7546	-8.4725	-6.8829	-8.0189
	Prob.	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **
C&T	t-Statistic	-8.9098	-8.6180	-7.5448	-7.2219	-9.4536	-5.8808	-6.6222	-7.7544	-7.9221	-6.6446	-8.6883	-8.4490	-6.9025	-7.9598
	0.0000***	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **
No C&T	t-Statistic	-1.3871	-1.4075	-2.9264	-6.1581	-2.7187	-3.6910	-3.4349	-6.3182	-7.8341	-5.8466	-8.8092	-8.5082	-6.9215	-8.0056
	Prob.	**0.1523**	**0.1469**	**0.0040*** **	**0.0000*** **	**0.0072*** **	**0.0004*** **	**0.0008*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **	**0.0000*** **
Decision		**I(1)**	**I(1)**	**I(1)**	**I(1)**	**I(1)**	**I(1)**	**I(1)**	**I(1)**	**I(1)**	**I(1)**	**I(1)**	**I(0)/I(1)**	**I(1)**	**I(1)**

Table A3. Lee and Strazicich (LS) Unit-root Test

Variables	Level			First difference			Decision
	Lag	Break Years	t-statistic	Lag	Break Years	t-statistic	
Y	2	1967-1996	-5.49302	0	1956-1960	-8.86673***	I(1)
C	3	1972-1996	-4.33255	4	1959-1986	-7.77985***	I(1)
G	4	1976-1996	-4.03423	0	1956-1960	-8.86297***	I(1)
I	1	1980-2006	-5.26885	1	1982-2006	-8.28112***	I(1)
TR	4	1967-2009	-3.72636	0	1956-1960	-9.85174***	I(1)
Y/P	2	1996-2009	-6.39120	2	1996-2001	-8.57463***	I(1)
C/P	3	1972-1982	-4.86115	4	1975-1986	-7.24301***	I(1)
I/P	1	1980-2006	-4.81423	1	1991-2012	-8.41434***	I(1)
TR/P	2	1994-2007	-5.71035	4	1993-2001	-8.16703***	I(1)
G/Y	2	1995-2008	-4.85053	0	1956-1961	-8.72272***	I(1)
C/Y	3	1964-1990	-4.51936	3	1965-1974	-6.61570**	I(1)
I/Y	4	1958-1994	-4.17886	1	1966-1973	-8.36128***	I(1)
TR/Y	2	1995-2007	-5.67858	4	1994-2006	-8.16688***	I(1)

(**) Significant at the 5%" (***) Significant at the 1%.

Table A4. Studies Testing Wagner's Law for Turkiye in the Scope of Economic Classification.

Study	Current expenditure	Investment expenditure	Transfer expenditure
Arısoy (2005)	✓	✓	✓
Gul and Yavuz (2010)	✓	✓	✓
Kolcak, Kalabak, and Boran (2015)	✓	X	X
This Study	X	X	✓

Notes: ✓: Supports Wagner's Law; X: Doesn't support Wagner's Law.

Figure A3. Model 1:Goffman main model plots of CUSUM and CUSUMSQ tests.

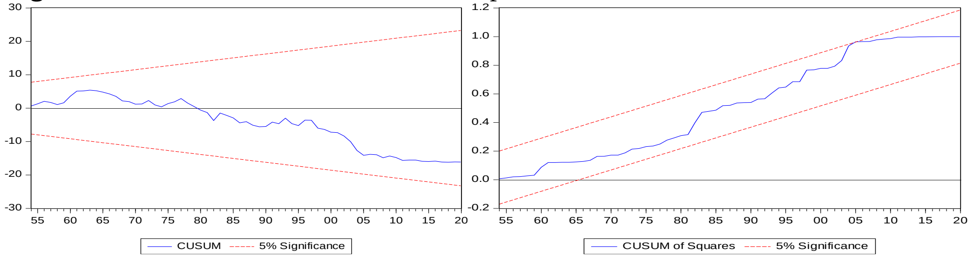

Figure A4. Model 5: Gupta main model plots of CUSUM and CUSUMSQ tests.

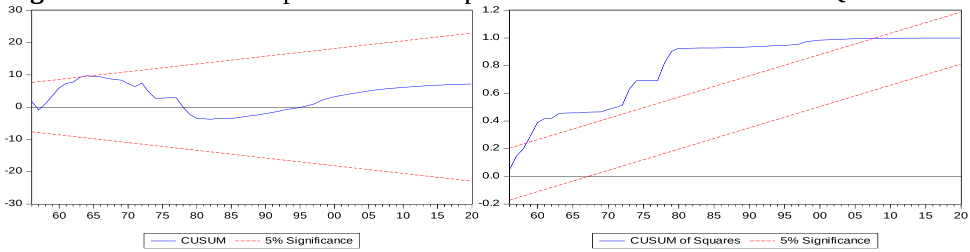

Figure A5. Model 9: Mann main model plots of CUSUM and CUSUMSQ tests.

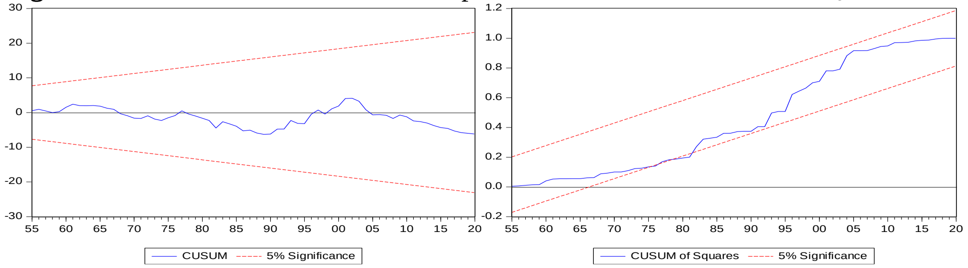

Figure A6. Model 13: Musgrave main model plots of CUSUM and CUSUMSQ tests.

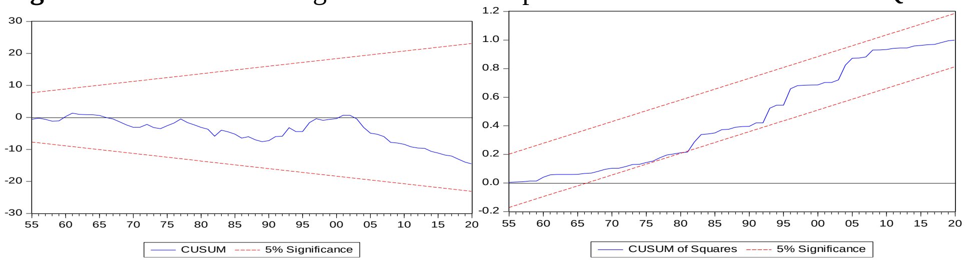

Figure A7. Model 17: Peacock main model plots of CUSUM and CUSUMSQ test.

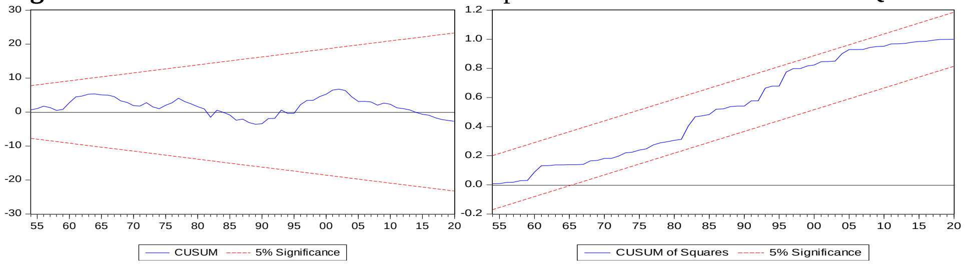

Figure A8. Model 2: Goffman current expenditure CUSUM and CUSUMSQ tests.

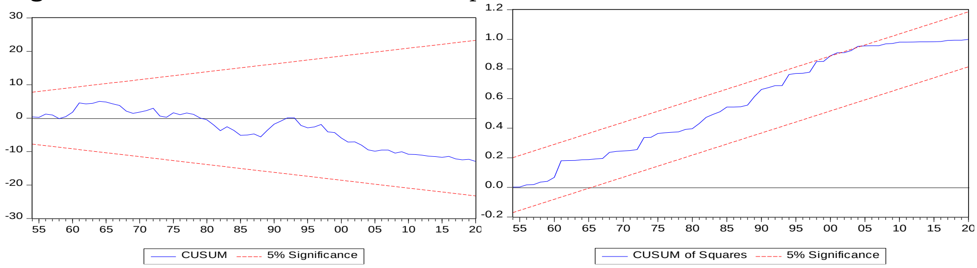

Figure A9. Model 3: Goffman investment expenditure CUSUM and CUSUMSQ tests.

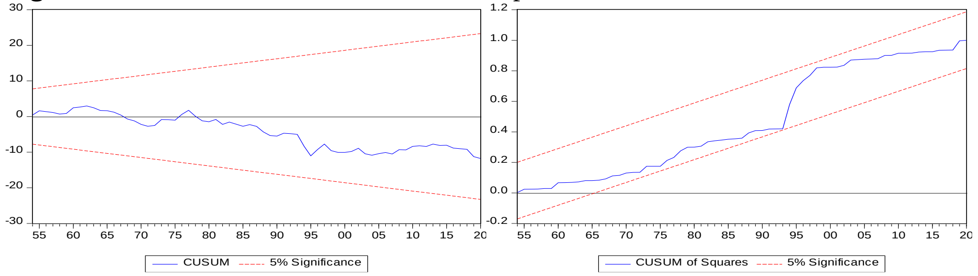

Figure A10. Model 4: Goffman transfer expenditure CUSUM and CUSUMSQ tests.

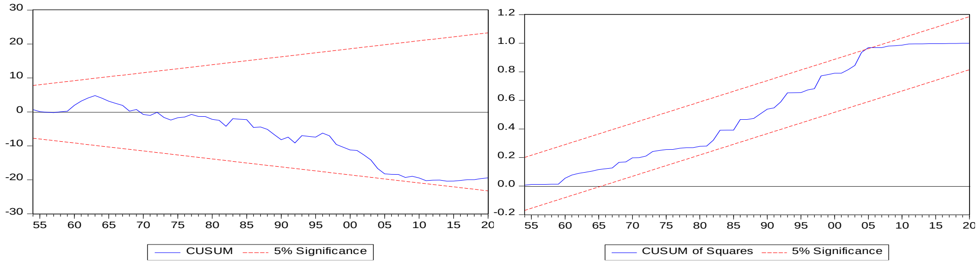

Figure A11. Model 6: Gupta current expenditure CUSUM and CUSUMSQ tests.

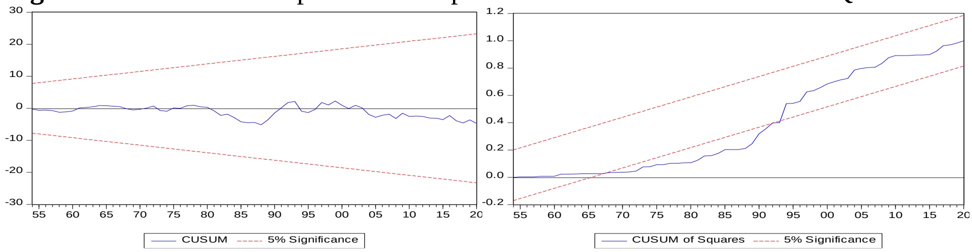

Figure A12. Model 7: Gupta investment expenditure CUSUM and CUSUMSQ tests.

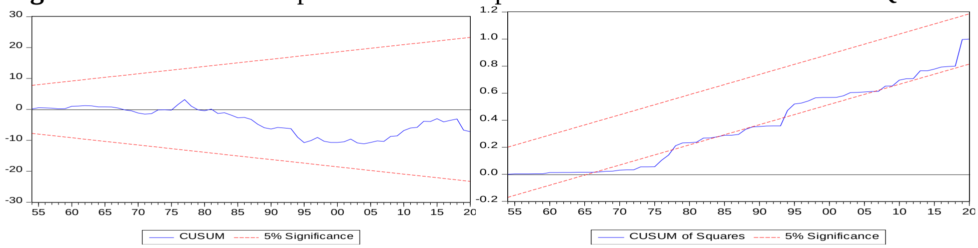

Figure A13. Model 8: Gupta transfer expenditure CUSUM and CUSUMSQ tests.

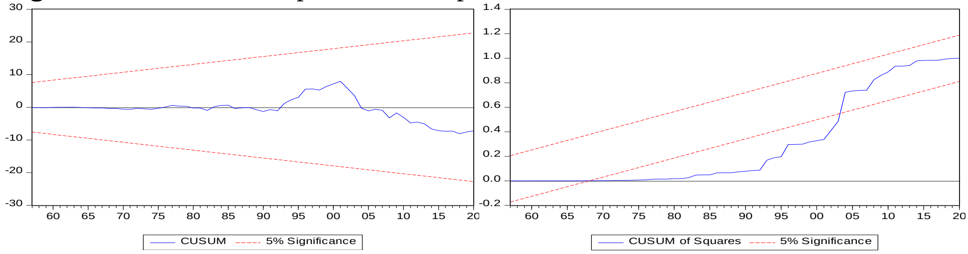

Figure A14. Model 10: Mann current expenditure CUSUM and CUSUMSQ tests.

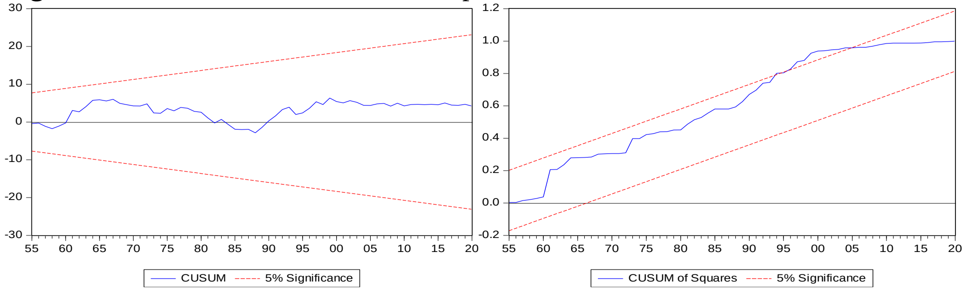

Figure A15. Model 11: Mann investment expenditure CUSUM and CUSUMSQ tests.

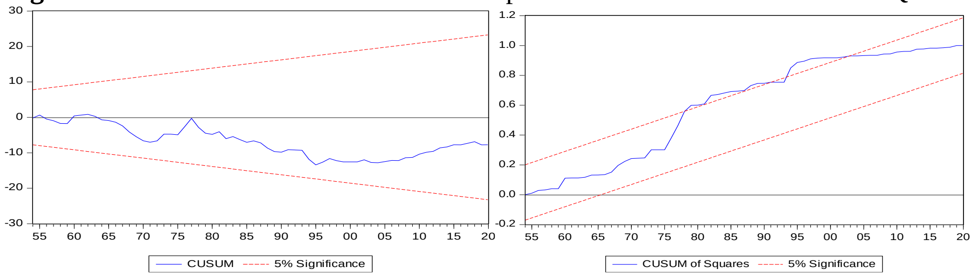

Figure A16. Model 12: Mann transfer expenditure CUSUM and CUSUMSQ tests.

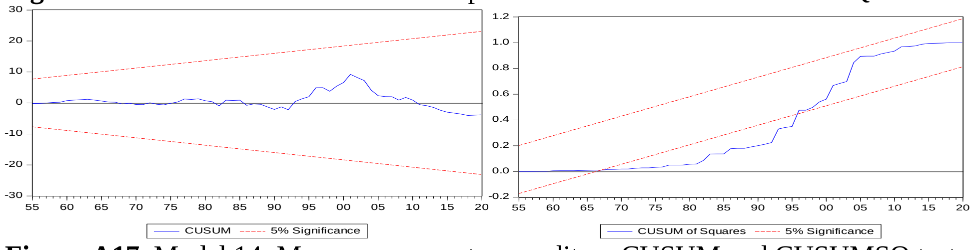

Figure A17. Model 14: Musgrave current expenditure CUSUM and CUSUMSQ tests.

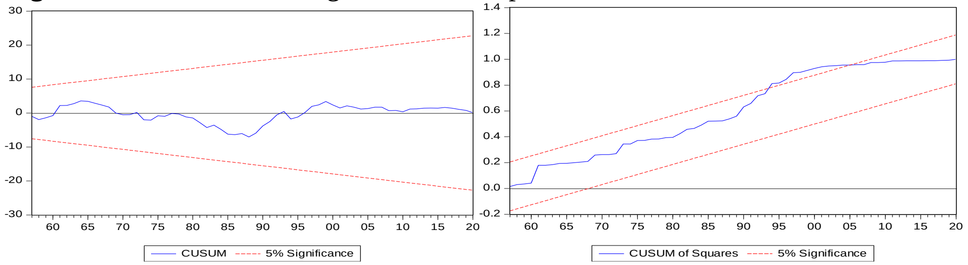

Figure A18. Model 15:Musgrave investment expenditure CUSUM and CUSUMSQ test

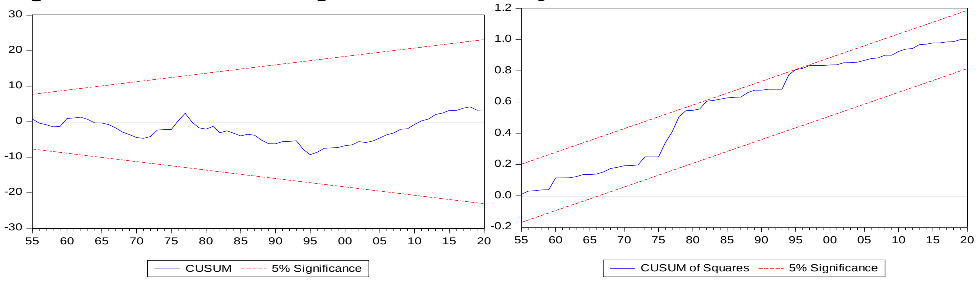

Figure A19. Model 16: Musgrave transfer expenditure CUSUM and CUSUMSQ tests.

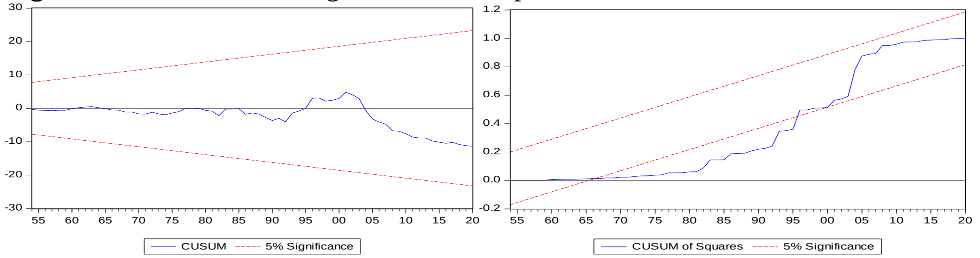

Figure A20. Model 18: Peacock current expenditure CUSUM and CUSUMSQ tests.

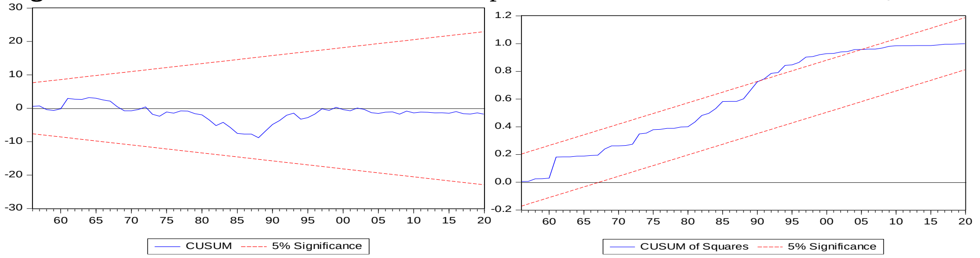

Figure A21. Model 19: Peacock investment expenditure CUSUM and CUSUMSQ tests.

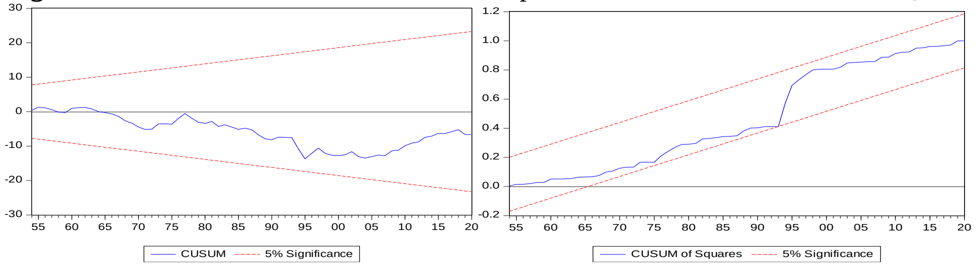

Figure A22. Model 20: Peacock transfer expenditure CUSUM and CUSUMSQ tests.