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Wagner versus Keynes: Empirical Evidence from Turkey's Provinces

Summary: Wagner's law and Keynes' hypothesis has long been debated in economics. In this paper, we test the income-expenditure hypothesis for eighty-one of Turkey's provinces for the period 1992 to 2013 using panel data analysis. For this purpose, the validity of these hypotheses is tested by applying recent panel cointegration and causality techniques, allowing for cross-sectional dependence and heterogeneity between regions. Under the presence of cross-sectional dependence and heterogeneity, the level of integration of the variables was tested by means of the cross-sectionally augmented Dickey-Fuller test, the presence of long-run relationship of the variables was tested with the Westerlund-Edgerton Lagrange multiplier bootstrap test, long-run cointegration coefficients were estimated with the Eberhardt-Bond panel augmented mean group method, and finally causality relationship was defined by the Dumitrescu-Hurlin test. The results of this study provide strong support for the validity of Wagner's law and Keynes' hypothesis for Turkey.

Key words: Wagner's Law, Public expenditures, Economic growth, Cointegration, Granger causality.

JEL: C23, E60, E62, H50, H72.

The size of the public sector is one of the most important issues that have been debated not only by countries but also in terms of economics. On the contrary, economic growth, which has an important area of research and application in economics, has been pivotal in this fundamental issue. From this point of view, the relationship between public expenditure and economic growth is tested with two basic approaches. These approaches are "Wagner's law" and "Keynes' hypothesis". Considering public expenditure with regard to the public sector, it has several direct and indirect effects on economic growth. Besides, economic growth and public expenditure appear as two important factors affecting each other. For instance, in spite of increasing economic development, increasing public spending and/or decreasing public revenues may lead to budget deficits. As mentioned in this situation, it is necessary to determine where the problem of increasing public expenditure occurs, because it should be taken into consideration that populist and ideological policies of governments can affect this process. As a matter of fact, the efficiency of fiscal policies along with monetary policy stands out in developing countries faced with public sector deficits, such as Turkey. With this aim, Wagner's law and Keynes' hypothesis is tested with different country samples and time trends in the literature.

The originality of this paper is to examine Wagner's law and Keynes' hypothesis using regional data for Turkey. With this aim, the paper is organized as follows. Section 1 provides an overview of the empirical literature. Section 2 presents the data definitions, sources, and regional trends of public expenditure and economic growth in Turkey. In Section 3, econometric methodology and empirical results are presented. In the conclusion, results and policy suggestions are discussed.

1. Literature Review and Theoretical Framework

Classic economic theory was dominant in the world until the Great Depression began in 1929. The view that "supply creates its own demand" - borrowing from Say's Law - was effectively challenged with the 1929 stock market crash, which helped start the Great Depression that would then stretch throughout decade in the 1930s. The validity of the understanding of neutral state that only fulfilled the duties, such as justice, diplomacy, and security, began to be questioned on economic grounds. On the contrary, the opinion of using fiscal policy tools, such as government spending and taxes, to influence aggregate demand was suggested by John Maynard Keynes (1936). According to the Keynesian economic view, the most important result of the increase in public expenditures is that it increases the national income through multiplier mechanism. Accordingly, public expenditures and other financial policy tools became important again to bring the economy out of recession. Contrary to the Keynesian view, German economist, Adolph Wagner (1883), argued that the increase in public expenditures resulted from the economic growth. In other words, Wagner considered the public expenditures as a result, and not as a reason.

The reasons of increase in public expenditures were brought up to the agenda as a result of economic development. According to the Wagner's perspective, these reasons as a function of the economic development can be listed as industrialization, modernization, rapid urbanization, social and cultural developments, education, increase in health services, developments and changes in technology, large-scale and monopoly infrastructure expenditures, and so on. The reasons for the increase in public expenditures have been discussed, until today, for many years after Wagner by many economists, such as Richard A. Musgrave, Francesco Nitti, Solomon Fabricant, David J. Pyle, Henry Carter Adams, Alan T. Peacock, Jack Wiseman, William Baumol, Colin Clark, Thomas Hobbes, Arthur C. Pigou, Hugh Dalton, James Buchanan, Gordon Tullock, Anthony Downs, and William Niskanen. For this purpose, it is the essence of this study to determine whether the public expenditures are the economic reasons or the results within the frame of these two basic views and make economic recommendations.

Wagner is the first scholar to propose a positive correlation between the level of economic development and the scope of government (Magnus Henrekson 1993). At the end of the 19th century, in his proposition well known as Wagner's law, Wagner suggested that an expansion of a country's level of economic development leads to an increase in its relative size of public sector (Henrekson 1993; Asuman Oktayer and Nagihan Oktayer 2013). Basically, Wagner's law is stated as an increase of the size of public sector as a result of economic growth. It is concluded from Wagner's law that government expansion does indicate not only quantitative expansion of publicly

provided goods and services but also qualitatively increases (Muhlis Bagdigen and Hakan Cetintas 2003).

Wagner (1883) argued that economic development leads to an increase in government spending, which involves both a relative as well as an absolute expansion of public sector activities. This statement suggests that long-term elasticity of these variables is superior to the unit which is more than the proportional increase of public sector with respect to economic growth. According to the Wagner's law, there are three dimensions of economic development that increase public activities. First, industrialization and modernization would lead to a substitution of public for private activity (Richard M. Bird 1971; Henrekson 1993). Second, the growth in real income would increase the income-elastic cultural and welfare expenditure (Bird 1971; Henrekson 1993). Finally, developments and changes in technology require governments to take over the management of natural monopolies to enhance economic efficiency (Bird 1971; Henrekson 1993). The main reason for this situation is that the validity of Wagner's law is based on a long-term tendency for increasing expansion of public activities that will indeed be demanded by the public as incomes rise over time.

With the Keynesian approach, the relationship between public expenditure and economic growth concentrates on the effect of public expenditure on economic growth in recession periods. Keynes (1936) supposes that public expenditure is an exogenous fiscal policy tool that influences economic growth and prevents cyclical fluctuations. According to this hypothesis, it is assumed that public expenditure, such as education, health, and infrastructure, creates a positive externality by causing an expansion of economic growth. As a matter of fact, in parallel with the Keynesian approach, the efficiency of fiscal policies maintains to reduce short-term cyclical fluctuations as an important fiscal policy tool. Starting from this point of view, many developing countries prefer the size of public sector to promote growth and economic development. However, this view has been criticized with the reasons such as bureaucracy quality, corruption, and resource use inefficiency.

Various studies tried to investigate the relationship between public expenditure and economic growth for different periods and economies. Test techniques and results differ with respect to the countries under investigation, econometric approach, period, and variables undertaken. It can be generally stated that empirical studies that examined Wagner's law and Keynes' hypothesis concentrates on causality and co-integration analyses. Some studies have found support for Wagner's law (Rati Ram 1986, 1987; Les Oxley 1994; Syed M. Ahsan, Andy C. C. Kwan, and Balbir S. Sahni 1996; Micheal Chletsos and Christos Kollias 1997; John Thornton 1999; Anisul M. Islam 2001; Abdallah F. Al-Faris 2002; Tsangyao Chang 2002; Dimitrios Sideris 2007; Saten Kumar 2009; Kojo Menyah and Yemane Wolde-Rufael 2012; Christoph Priesmeier and Gerrit B. Koester 2012; Antoniou Antonis, Katrakilidis Constantinos, and Tsaliki Persefoni 2013; Hiroshi Ono 2014; Cristian Barra, Giovanna Bimonte, and Pietro Spennati 2015; Burak Sencer Atasoy and Timur Han Gür 2016; Stephen Moore 2016; Dimitrios Paparas and Andreea Stoian 2016; Yoshito Funashima 2017; Mustapha Jobarteh 2017). On the contrary, Ergun Dogan and Tuck Cheong Tang (2006), Cosimo Magazzino (2012a) and Isaac Sanchez-Juarez, Rosa M. Garcia Almada, and Hector Barajas Bustillos (2016) have found support for Keynes' hypothesis

in their examinations. Besides the studies supporting Wagner's law or Keynes' hypothesis in the literature, some studies such as Nikoloas Dritsakis and Antonis Adamopoulos (2004), Sunday Osaretin Iyare and Troy Lorde (2004), Paresh Kumar Narayan, Ingrid Nielsen, and Russell Smyth (2008), Muthi Samudram, Mahendhiran Nair, and Santha Vaithilingam (2009), Turan Yay and Huseyin Tastan (2009), Stella Karagianni, Mari Pempetzoglou, and Sultana Strikou (2011), Jan Kuckuck (2012), Magazzino (2012b, 2014), Matthew Abiodun Dada and Oguntegbe Abraham Adewale (2013), Metin Bayrak and Ömer Esen (2014), Magazzino, Lorenzo Giolli, and Marco Mele (2015) have found support for both hypotheses. Studies conducted by Anthony S. Courakis, Fatima Moura-Roque, and George Tridimas (1993), Henrekson (1993), John Ashworth (1994), Panos C. Afrentiou and Apostolos Serletis (1996), and M. I. Ansari, Daniel V. Gordon and C. Akuamoah (1997), M. Adetunji Babatunde (2011), Dick Durevall and Henrekson (2011) have a little or no found for both hypotheses. Apart from these findings, Robert J. Barro's (1991) study based on 98 countries over the period 1960 to 1985 found a statistically negative relationship between government consumption and economic growth.

There are a number of empirical studies of Wagner's law based on the Turkish case. Previous studies of the law with the Turkish case have resulted in mixed evidence and many studies that tested the validity of these hypotheses with the data of the Turkey case used time series analysis As presented in Table 1, some studies conducted by Hassan Mohammadi, Murat Cak, and Demet Cak (2008), Yakup Kucukkale and Rahmi Yamak (2012), Esra Kabaklarlı and Perihan Hazal Er (2014), Seda Bayrakdar, Selim Demez, and Mustafa Yapar (2015), Hale Akbulut (2017) and Raif Cergibozan, Emre Cevik, and Caner Demir (2017) produced evidence in favor of Wagner's law. On the contrary, Ekrem Gul and Hakan Yavuz (2011) have found support for Keynes' hypothesis in their examination. Studies such as Yay and Tastan (2009), Ozlem Tasseven (2011) and Gizem Uzuner, Festus Victor Bekun, and Seyi Saint Akadiri (2017)

Table 1 Some Studies on Wagner's Law for Turkey

Study-Author	Period	Method	I	II	III	IV
Demirbas (1999)	1950-1990 (A)	Time-series (cointegration, causality)				✓
Bagdigen and Cetintas (2003)	1965-2000 (A)	Time-series (cointegration, causality)				✓
Halicioğlu (2003)	1960-2000 (A)	Time-series (cointegration, causality)				✓
Cavusoglu (2005)	1923-2003 (A) 1950-2003	Time-series (bound test)				✓
Mohammadi, Cak, and Cak (2008)	1951-2005 (A)	Time-series (bound test)	✓			
Yay and Tastan (2009)	1950-2004 (A)	Time-series (cointegration)			✓	
Tasseven (2011)	1960-2006 (A)	Time-series (cointegration, causality)			✓	
Gul and Yavuz (2011)	1963-2008 (A)	Time-series (cointegration, causality)		✓		
Kucukkale and Yamak (2012)	1968-2004 (A)	Time-series (cointegration, causality)	✓			
Oktayer and Oktayer (2013)	1950-2010 (A)	Time-series (cointegration)				✓
Tuna (2013)	1961-2012 (A)	Time-series (causality)				✓
Ulucak and Ulucak (2014)	1950-2011 (A)	Time-series (causality)				✓
Kabaklarlı and Er (2014)	1930-2012 (A)	Time-series (bound test)	✓			
Bayrakdar, Demez, and Yapar (2015)	1998-2014 (Q)	Time-series (cointegration, causality)	✓			
Uzuner, Bekun, and Akadiri (2017)	1975-2014 (A)	Time-series (cointegration, causality)				✓
Cergibozan, Cevik, and Demir (2017)	1960-2015 (A)	Time-series (bound test)	✓			
Akbulut (2017)	2007-2015 (Q)	Time-series (bound test)	✓			

Notes: I: Wagnerian support, II: Keynesian support, III: support both, IV: do not support both, A: annual data, M: monthly data Q: quarterly data.

Source: Authors' compilation.

have found mixed results. Several other studies conducted by Safa Demirbas (1999), Bagdigen and Cetintas (2003), Ferda Halicioglu (2003), A. Tarkan Cavusoglu (2005), Oktayer and Oktayer (2013), Kadir Tuna (2013) and Recep Ulucak and Zubeyde S. Ulucak (2014) did not find any evidence for both hypotheses.

As the literature is reviewed, only few studies examined Wagner's law and Keynes' hypothesis at the regional level. In this study, Wagner's law and Keynes' hypothesis is investigated at the sub-national level in Turkey. Narayan, Nielsen, and Symth (2008), Narayan, Arti Prasad, and Baljeet Singh (2008) and Seema Narayan, Badri Narayan Rath, and Narayan (2012) discussed the motivation with details for why one should test Wagner's law at the sub-national level (Narayan, Rath, and Narayan 2012). Few studies have analyzed Wagner's law at the sub-national level. Sohrab Abizadeh and Mahmood Yousefi (1988) tested Wagner's law for the period of 1950 to 1984 for 10 states of the United States and have find evidence in favor of Wagner's law. Narayan, Prasad, and Singh (2008) tested Wagner's law from the sub-national data of China's central and western provinces over the period 1952 to 2003. They reported mixed evidence in support of Wagner's law for China's central and western provinces but no support for Wagner's law for the full panel of provinces or for the panel of China's eastern provinces. Manuel Jaen-Garcia (2011) tested the validity of Wagner's law for 17 Autonomous Regions of Spain over the period 1984 to 2003 and has find evidence in favor of Wagner's law. Narayan, Rath, and Narayan (2012) used a panel unit root, panel cointegration, and panel-granger analysis to verify Wagner's law for 15 Indian states. Their results showed evidence in support of Wagner's law. Funashima and Kazuki Hiraga (2016) examined the Wagner's law for U.S. and German States. For the U.S. states, the data cover the period from 1977 to 2010. For the German states, the cover the period from 1975 to 2010. Their results provide support for Wagner's law in the U.S. states, but no support in the German states.

2. Data and Regional Trend of Public Expenditure and Economic Growth in Turkey

Wagner's law was tested empirically for different economies in the literature. In these analyses, the validity of Wagner's law is based on the assessment of the elasticity of public expenditure to income (Oktayer and Oktayer 2013). If the elasticity of economic growth with respect to public expenditure is superior to the unit and the coefficient sign is positive, the relationship between the two variables is consistent with Wagner's law and *vice versa* (Oktayer and Oktayer 2013). According to Wagner's law, public expenditure or government expenditure is seen an endogenous variable and an output of economic growth. On the contrary, the causality and the relationship in Keynes' hypothesis run from public expenditure to economic growth. As there has been no consistent view on the functional form describing Wagner's law, the most common forms of the law cited in the literature are shown Table 2 (Halicioglu 2003):

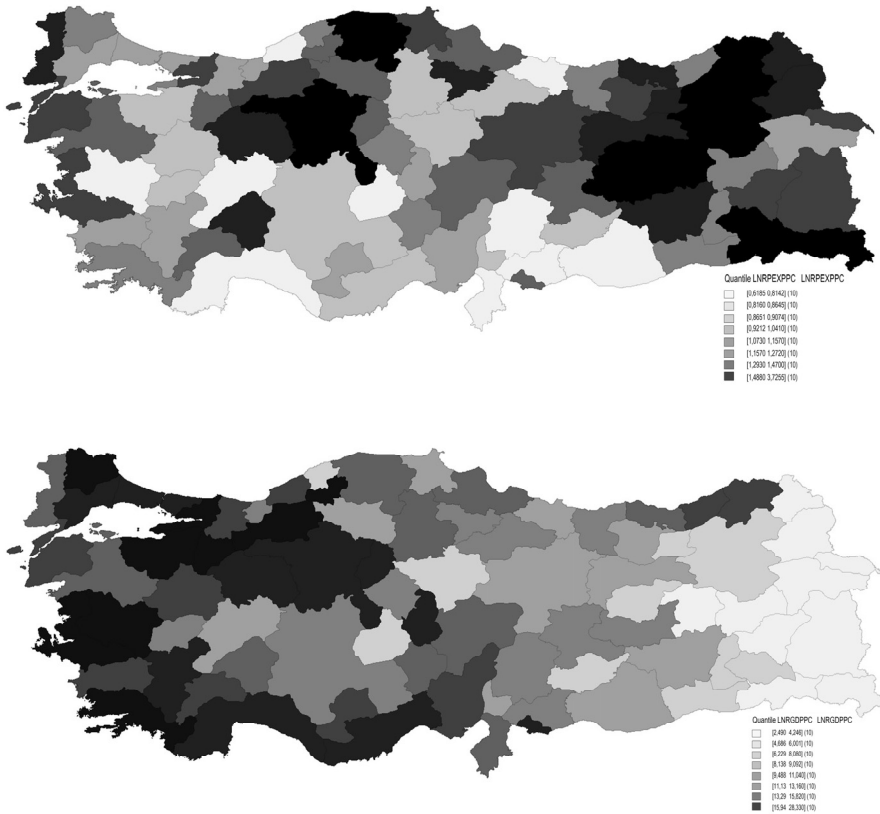
Table 2 Versions of Wagner’s Law

$GE = f(Y)$	Alan T. Peacock and Jack Wiseman (1961)
$GCE = f(Y)$	Frederic L. Pryor (1968)
$GE/Y = f(Y)$	Arthur J. Mann (1980)
$GE = f(Y/P)$	Irving J. Goffman (1968)
$GE/P = f(Y/P)$	Gupta (1967)
$GE/Y = f(Y/P)$	Musgrave (1969)

Notes: GE stands for real government expenditure, Y real GDP, CGE real public consumption, P population.

Source: Authors’ compilation.

This study examines the relationship between public expenditure and economic growth for 81 provinces of Turkey over the period 1992 to 2013. Although there are at least six versions of Wagner’s law in the literature, this study adopted the Shibshankar P. Gupta (1967) version of Wagner’s law. In this version of Wagner’s law, real *per capita* government expenditure is modeled as a function of real “*per capita*” output. The main reason why we follow this method is that, in the regional studies of



Source: Authors’ compilation.

Figure 1 Spatial Distribution of per capita Public Expenditure and per capita National Income, 1992-2013

developing countries such as Turkey, robust results can be obtained with the variables as ratios of gross domestic product (GDP) and *per capita*. As a matter of fact, considering the cumulative value of GDP and public expenditure, it is seen that the data seem to be at high rates in Turkey's metropolises such as Istanbul, Ankara, and Izmir. Also, it may cause the specification error and biased estimates in econometric analysis. The data used in this analysis cover 81 provinces of Turkey for the period 1992 to 2013. Public expenditure data are taken from the Ministry of Finance Public Accounts General Directorate (2017)¹. GDP data are obtained from the Economic Policy Research Foundation of Turkey (2016)². All values are deflated by the GDP deflator (2003 = 100) provided by the World Bank (2017)³. Population data are gathered from the Turkish Statistical Institute (2017)⁴. All variables are used in natural logarithms. The spatial distributions of public expenditure and income levels are visualized in Figure 1.

Evaluating the spatial distribution maps of these variables, it is concluded that public expenditure and income levels concentrate on different regions. These distributions of the map are a pathfinder in terms of econometric methodology and analysis choices.

3. Empirical Methodology and Findings

The main purpose of this study is to analyze Wagner's law and Keynes' hypothesis for Turkey locally. Thus, the validity of the related hypotheses will be conducted using the cointegration panel method based on a long-term relationship between public expenditure and economic growth. The data set used in the study centers on different regions gives a significant clue that cross-sectional dependence and heterogeneity should be taken into consideration.

Thereby, our econometric methodology proceeds in five stages. First, the cross-sectional dependence of the variables is determined with the Pesaran CDLM test developed by M. Hashem Pesaran (2004) and CDLMadj (bias-adjusted cross-sectional dependence Lagrange multiplier (LM)) test developed by Pesaran, Aman Ullah, and Takashi Yamagata (2008). Second, the slope homogeneity of cointegration coefficients is tested with the Delta Test developed by Pesaran and Yamagata (2008). Third, we implement the cross-sectionally augmented Dickey-Fuller test (CADF) developed by Pesaran (2007) to determine the level of integration of the variables. Fourth, after the existence of the cointegration relationship between the variables proven using the LM bootstrap panel cointegration test designed by Joakim Westerlund and David L. Edgerton (2007), long-run cointegration coefficients were estimated by the augmented mean group model (AMG) developed by Markus Eberhardt and Stephen Bond (2009) and Eberhardt and Francis Teal (2010). Finally, the causality relationship between

¹ Ministry of Finance Public Accounts General Directorate. 2017. General Government's Financial Statistics. <https://mu-hasebat.hmb.gov.tr> (accessed January 10, 2017).

² Economic Policy Research Foundation of Turkey. 2016. Research and Publications. <https://www.tepav.org.tr/tr/yayin> (accessed October 10, 2016).

³ World Bank. 2017. Databank. <https://data.worldbank.org> (accessed January 10, 2017).

⁴ Turkish Statistical Institute. 2017. Population and Demography Statistics. <https://data.tuik.gov.tr/Kategori/GetKategori?p=nufus-ve-demografi-109&dil=1> (accessed January 15, 2017).

the series is determined using the Dumitrescu and Hurlin panel causality test developed by Elena-Ivona Dumitrescu and Christophe Hurlin (2012).

Before unit root tests and cointegration relationships are analyzed in panel data analysis, cross-sectional dependence and homogeneity of the series should be tested. The indicators centered on different regions, especially in this study, give important clues about the correlated influence of the shocks in panel units or the heterogeneity in the regions. However, these test results are the determiner for the econometric analysis and the method to be selected. The direction of the variables in the conducted analysis for Wagner’s law is from public expenditure to economic growth (GE/P to Y/P), but for Keynes’ hypothesis it is from economic growth to public expenditure (Y/P to GE/P).

The Breusch and Pagan CDLM1 test developed by Trevor S. Breusch and Adrian R. Pagan (1980), Pesaran (2004) CDLM2 test, Pesaran (2004) CDLM test, and Pesaran, Ullah, and Yamagata (2008) CDLMadj tests are used for testing the cross-sectional dependency among the units (regions) in panel data analyses. These tests are selected according to time and cross-sectional dimension of the panel data. As the study is carried out based on the years between 1992 and 2013 and the data of 81 provinces ($N = 81, T = 22$), the Pesaran (2004) CDLM and CDLMadj test results are regarded for cross-sectional dependence. Moreover, the slope homogeneity of cointegration coefficients is tested with Δ_{tilde} and $\Delta_{tilde_adjusted}$ tests developed by Pesaran and Yamagata (2008). The results of these selected tests are summarized in Table 3.

Table 3 Cross-Sectional Dependence and Slope Homogeneity Test Results

	CDLM Pesaran (2004) t-stat p-value	CDLM ₁ Breusch-Pagan (1980) t-stat p-value	CDLM ₂ Pesaran (2004) t-stat p-value	CDLM _{adj} Pesaran, Ullah, and Yamagata (2008) t-stat p-value
Y/P	-2.284 (0.011)	9244.744 (0.000)	74.595 (0.000)	82.799 (0.000)
GE/P	-2.118 (0.017)	7833.959 (0.000)	57.069 (0.000)	132.284 (0.000)
Homogeneity tests (H_0 : Slope coefficients are homogenous)				
Test	Delta_tilde		Delta_tilde_adj	
	Statistic	p-value	Statistic	p-value
Wagner hypothesis	35.999	0.000	39.608	0.000
Keynesian hypotheses	130.140	0.000	143.185	0.000

Source: Made by the authors through Gauss 10.

As can be seen in the table, the results indicate that the null hypothesis of no cross-sectional dependence is rejected, implying that the presence of common shocks in a region is easily affected by the others. Moreover, the results of the slope homogeneity tests of Pesaran and Yamagata (2008) indicate that there is region-specific heterogeneity, rejecting the null hypothesis of the slope homogeneity.

At the second stage of analyses, we analyzed the integration levels of the variables with the CADF test developed by Pesaran (2007), considering cross-sectional dependency. The result of the second-generation panel unit test of the variables in the models is presented in Table 4. The findings indicated that all variables are stationary in the first difference level.

Table 4 Results of Second-Generation Pesaran CADF Unit Root Test

Panel	Constant			Constant + Trend	
	Level	First dif.		Level	First dif.
Y/P	-0.336 (0.369)	-7.615 (0.000)		4.972 (1.000)	-4.558 (0.000)
GE/P	-2.360 (0.009)	-2.360 (0.009)		-1.499 (0.067)	-8.953 (0.000)

Notes: Values show Cross-Sectionally Augmented IPS (CIPS) statistics, which are average of CADF.

Source: Authors' calculations.

We applied the LM bootstrap panel cointegration test designed by Westerlund and Edgerton (2007) for the existence of cointegration of the models. This test permits cross-sectional dependence both within and between the individual cross-sectional units. The results in Table 5 indicate that there is strong significant evidence in favor of the existence of cointegration of the models.

Table 5 LM Bootstrap Cointegration Test Results

		Constant			Constant + Trend		
		Statistic	Asymptotic p-value	Bootstrap p-value	Statistic	Asymptotic p-value	Bootstrap p-value
Wagner hypothesis	LM_N^+	63.232	0.000	0.000	38.515	0.000	0.998
Keynesian hypotheses	LM_N^+	29.632	0.000	0.471	36.748	0.000	0.999

Notes: The bootstrap p-value was generated with 10,000 replications.

Source: Authors' calculations.

After the existence of the cointegration relationship between the variables, long-run cointegration coefficients were estimated by the AMG estimator developed by Eberhardt and Bond (2009) and Eberhardt and Teal (2010), which account for cross-sectional dependence by means of a “common dynamic process” and heterogeneity.

Table 6 Long-Run Cointegrating Coefficients (AMG)

Wagner's law		Keynesian hypothesis	
Dependent variable: GE/P		Dependent variable: Y/P	
Y/P	0.5819 ^a (11.47)	GE/P	0.2580 ^a (13.90)
Constant	-1.0002 ^a (-7.18)	Constant	1.8008 ^a (27.23)
RMSE	0.0697	RMSE	0.0454
Observations	1755	Observations	1755
Provinces	81	Provinces	81

Notes: *T* statistics reported in parentheses. The superscript a denotes significance at the 1% level.

Source: Authors' calculations.

Empirical results for the AMG estimator with heterogeneous estimates are reported in Table 6. The estimated coefficient on the public expenditure variable is statistically significant at the 1% level. The estimated coefficient on economic growth is positive and statistically significant at the 1% level also. Whereas a 1% increase in economic growth raises public expenditure by 0.5819% for Wagner's law, for Keynes' hypothesis a 1% increase in public expenditure raises economic growth by 0.2580%. The estimated coefficients of the long-run relationships in Table 6 provide evidence in

favor of both Wagner's law and Keynes' hypothesis. Although a large number of studies analyzing the relationship between public expenditure and economic growth for Turkey have mixed results, our results are in accordance with those reported by Yay and Tastan (2009) and Tasseven (2011). We provide the long-run cointegration coefficient of provinces in the Appendix. When we look at the long-term coefficients of the provinces, consistent results were obtained in terms of Wagner's law and Keynes' hypothesis. When these results are evaluated for Wagner's law, positive and significant coefficients in general lead to stimulate the demand of economic growth in the regions in developing countries such as Turkey to public services. This situation overlaps with the theory. However, when Keynes' hypothesis is evaluated, the fact that generally positive and significant results are obtained in regions indicates that the multiplier mechanism has its function.

Table 7 Dumitrescu-Hurlin Test Results

Model	K = 1		K = 2	
	Z_N^{HNC}	Prob.	Z_N^{HNC}	Prob.
Wagner hypothesis	-2.84874	0.0044***	-4.25622	0.0000***
Keynesian hypotheses	21.8547	0.0000***	27.2721	0.0000***

Notes: K shows the lag lengths. The superscript *** denotes significance at the 1% level.

Source: Authors' calculations.

In this analysis, the direction of causal relationship between models is investigated with the Granger noncausality test for heterogeneous panels developed by Dumitrescu and Hurlin (2012). The results of the Dumitrescu-Hurlin test in different lag lengths are given in Table 7. According to the results, there is a bidirectional causal relationship between public expenditure and economic growth. This relationship supports evidence for Wagner's law and Keynes' hypothesis.

4. Conclusion

Public expenditure, economic growth, and stability have effects on income distribution and effective distribution of resources in many of their aspects. In addition, it can be clearly said that factors such as economic growth also have effects on public expenditure directly or indirectly. This mutual relationship between economic growth and public expenditure, which constitutes the main purpose this study, has often been studied empirically and theoretically based on Wagner's law and Keynes' hypothesis. With this aim, we test the validity of Wagner's law and Keynes' hypothesis within 81 provinces of Turkey over the period 1992 to 2013 by applying recent panel cointegration and causality techniques, allowing for cross-sectional dependence and heterogeneity between regions. In the empirical analysis, first, the cross-sectional dependence of the variables and slope homogeneity are determined using the CDLM and CDLMadj tests and Delta Test, respectively. Second, the level of integration of the variables is examined using the CADF test. After the existence of the cointegration relationship between the variables proven using the Westerlund-Edgerton panel cointegration test, long-run

cointegration coefficients were estimated using AMG. Finally, the causality relationship between the series is determined using the Dumitrescu-Hurlin panel causality test. The results of long-term cointegration coefficients indicate that there exists a bidirectional long-term relationship between public expenditure and economic growth. In addition, the Dumitrescu-Hurlin panel causality test results show that Wagner's law and Keynes' hypothesis is valid for Turkey over the period being tested. The results of this analysis indicate that there is strong evidence for the validity of Wagner's law and Keynes' hypothesis for Turkey using regional data.

When public expenditure in developing countries is thought to be derived from economic growth in general, the fact that Wagner's law is determined as more effective in this study indicates that it is compatible in terms of literature and theory. Also, in terms of Keynes' hypothesis, it cannot be missed that public expenditure is an important fiscal instrument that increases economic growth for the fiscal policies in Turkey.

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Appendix

Table A1 Long-Run Cointegration Coefficient of Provinces

Province	Long-run cointegrating coefficients of provinces (AMG) Wagner's law			Long-run cointegrating coefficients of provinces (AMG) Keynesian hypothesis		
	Dependent variable: GE/P			Dependent variable: Y/P		
	Coefficient	p-value	RGDPPC_RANK*	Coefficient	p-value	RGDPPC_RANK*
Adana	0.2918	0.000*	23	0.2138	0.017*	23
Adiyaman	1.2561	0.000*	64	0.4038	0.000*	64
Afyon	0.8431	0.000*	54	0.6154	0.000*	54
Ağrı	0.8180	0.000*	80	0.0637	0.091***	80
Aksaray	1.1492	0.000*	67	0.2938	0.000*	67
Amasya	0.5667	0.000*	51	0.3274	0.000*	51
Ankara	0.3098	0.015**	13	0.1045	0.038***	13
Antalya	0.4573	0.000*	20	0.3510	0.000*	20
Ardahan	0.5510	0.000*	75	0.1240	0.044***	75
Artvin	0.5638	0.000*	25	0.0580	0.243	25
Aydın	0.3880	0.000*	22	0.3682	0.000*	22
Balıkesir	0.5692	0.000*	31	0.3159	0.000*	31
Bartın	0.9394	0.000*	71	0.3889	0.000*	71
Batman	0.6280	0.000*	65	-0.0075	0.814	65
Bayburt	0.6667	0.000*	70	0.2369	0.000*	70
Bilecik	0.6997	0.000*	4	0.3392	0.000*	4
Bingöl	0.6185	0.000*	76	0.0060	0.882	76
Bitlis	0.7148	0.000*	77	0.2720	0.000*	77
Bolu	0.6707	0.000*	9	0.9522	0.000*	9
Burdur	0.5890	0.000*	28	0.2695	0.000*	28
Bursa	-0.4275	0.142	10	0.2859	0.001**	10
Çanakkale	0.8035	0.000*	21	0.3311	0.000*	21
Çankırı	0.6567	0.000*	55	0.3864	0.000*	55
Çorum	0.8526	0.000*	37	0.2723	0.000*	37
Denizli	0.7266	0.000*	11	0.2987	0.001**	11
Diyarbakır	-0.0271	0.610	61	-0.0472	0.393	61
Düzce	0.9494	0.000*	44	0.2778	0.000*	44
Edirne	0.3105	0.000*	32	0.0469	0.595	32
Elazığ	0.0037	0.946	50	0.3038	0.000*	50
Erzincan	0.4974	0.000*	58	0.2955	0.000*	58
Erzurum	0.3961	0.000*	68	0.4268	0.000*	68
Eskişehir	-0.0179	0.776	14	0.0786	0.076***	14
Gaziantep	0.8495	0.000*	42	0.1048	0.199	42
Giresun	0.8695	0.000*	43	0.3335	0.000*	43
Gümüşhane	0.6733	0.000*	60	0.2542	0.000*	60
Hakkari	0.6308	0.047***	81	0.1784	0.001*	81
Hatay	0.6036	0.000*	33	0.5425	0.000*	33
Iğdır	1.6643	0.000*	73	0.2602	0.000*	73
İsparta	0.5006	0.000*	35	0.3864	0.000*	35
İstanbul	-2.0856	0.003**	15	-0.0682	0.177	15
İzmir	-0.1290	0.161	5	0.3097	0.000*	5
K.Maraş	1.3672	0.000*	49	0.4424	0.000*	49
Karabük	0.9360	0.000*	3	0.0566	0.250	3
Karaman	1.0532	0.000*	26	0.0914	0.000*	26
Kars	0.7210	0.000*	72	0.4894	0.000*	72
Kastamonu	0.3089	0.000*	40	0.1052	0.019**	40
Kayseri	0.1014	0.074***	39	0.1931	0.000*	39
Kırıkkale	0.9032	0.000*	16	0.5012	0.000*	16
Kırklareli	0.1653	0.845	6	0.1323	0.003**	6
Kırşehir	0.8537	0.000*	46	0.2524	0.000*	46
Kilis	0.9796	0.000*	19	0.2737	0.000*	19
Kocaeli	0.4304	0.002**	1	0.1140	0.025***	1
Konya	0.5315	0.000*	47	0.3625	0.000*	47
Kütahya	0.8076	0.000*	29	0.5680	0.000*	29
Malatya	1.0271	0.000*	41	0.4497	0.000*	41
Manisa	0.6289	0.000*	7	0.1422	0.000*	7
Mardin	0.2186	0.165	63	0.1085	0.000*	63
Mersin	0.8824	0.000*	17	0.3621	0.000*	17
Muğla	1.1869	0.000*	8	0.1613	0.013***	8
Muş	0.7052	0.000*	78	0.1226	0.000*	78
Nevşehir	0.5316	0.000*	18	0.0706	0.231*	18
Niğde	0.6553	0.000*	34	0.4892	0.000*	34
Ordu	0.7738	0.000*	53	0.2608	0.000*	53
Osmaniye	0.9510	0.000*	57	0.3372	0.000*	57
Rize	0.8645	0.000*	30	0.2804	0.000*	30

Sakarya	0.6275	0.000*	27	0.2869	0.000*	27
Samsun	0.2832	0.000*	36	0.1687	0.000*	36
Siirt	0.3493	0.044***	66	-0.0093	0.718*	66
Sinop	0.5700	0.000*	52	0.1468	0.003*	52
Sivas	0.3765	0.000*	56	0.2231	0.000*	56
Sanliurfa	0.3469	0.008*	59	0.0830	0.007**	59
Şirnak	0.9346	0.009*	79	0.1272	0.001**	79
Tekirdağ	0.1265	0.640	12	0.1977	0.000*	12
Tokat	0.8495	0.000*	48	0.3215	0.000*	48
Trabzon	0.4520	0.000*	38	0.4330	0.000*	38
Tunceli	0.5175	0.000*	69	0.2601	0.026***	69
Uşak	0.5822	0.000*	45	0.3805	0.000*	45
Van	0.3560	0.061***	74	0.0940	0.088***	74
Yalova	0.8817	0.001*	2	0.2271	0.000*	2
Yozgat	1.0113	0.000*	62	0.3054	0.000*	62
Zonguldak	0.5148	0.000*	24	0.3312	0.020***	24
Panel	0.5819	0.000*	-	0.2580	0.000*	-

Notes: *t*-statistics in parentheses. The superscripts *, **, *** denote significance at the 1%, 5%, and 10% levels respectively.
* RGDPCC_RANK is the average of real GDP *per capita* for the period of 1992-2013.

Source: Authors' compilation.