

Wagner's Law vs. Keynesian Hypothesis: Empirical Evidence for G20 Countries¹

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Abstract The economic growth-public expenditure relationship is one of the important subjects that both policymakers and scientists focus on during extraordinary conditions such as economic crises, natural disasters or epidemics. Despite the privatization practices and the efforts to adopt the minimal state approach proposed by neoliberalism, which have become widespread significantly since the 1970s, public expenditures increase the interest in the subject. The study analyses the validity of the Keynesian approach, which argues that public expenditures are a fiscal policy tool that supports economic growth, in G-20 countries, as opposed to Wagner's approach, which argues that economic growth is the reason for the increase in public expenditures. The analysis was carried out with the Pesaran CCEMG estimator, which considers cross-sectional dependence and heterogeneity, using annual data from 1994-2017. According to the findings, it could be stated that Wagner's Law is not valid in G-20 countries because the slope coefficient does not fulfil the condition of being more significant than 1, whereas the Keynesian approach is valid. Moreover, a bidirectional causality was discovered between economic growth and public expenditures. Consequently, public expenditures can be used as an effective fiscal policy tool to eliminate economic instabilities under political, economic, or extraordinary conditions such as COVID-19.

Keywords Wagner's Law, Keynes Hypothesis, Public Expenditure, Economic Growth, COVID-19

JEL Classifications: E12, H50, C23

1. Introduction

Due to the growing trend in the size of the public sector in a significant portion of developed and developing countries, discussions about the relationship between economic growth and public spending have attracted the attention of researchers and have been the subject of debate for years [1]. However, there is no consensus on whether the increase in public expenditures is due to a necessity arising from economic growth or it is due to the policies pursued by governments independently of economic development [2]. In the economics literature, the role of the public sector on the economy is generally tested with two different theoretical approaches, namely Wagner's Law and Keynes Hypothesis [3].

Adolph Wagner (1835-1917) was an economist who favored the welfare state system rather than the socialist welfare state. Wagner was also a member of the Prussian parliament from 1882-1885 and the Prussian House of Lords starting from 1910, supporting the monarchy against social democracy. Wagner supported another type of state socialism, which should not be confused with the communist or socialist style. He wanted the monarchy to be preserved rather than abolished. Therefore, Wagner's contribution to the economy is influential and essential so far because he was the first economist before Keynes to suggest state intervention in the economy. However, unlike Keynes, Wagner believed that state intervention was necessary not for economic stability but the stability of the political system. Briefly, Wagner and Keynes justified increased public spending for different reasons [1].

In his study based on Germany and other industrialized

countries, Wagner argued that the share of the public sector in the national economy, which is based on the ratio of public expenditures to national products, will increase continuously with industrialization and urbanization [4]. According to Wagner, economic growth is the primary determinant of the change in public expenditures [5]. In other words, a one-unit increase in the gross domestic product (GDP) causes an increase in public expenditures by more than one unit [6]. This phenomenon has been named after Wagner as the "Law of Expansion of the Public in State Activities" or simply the "Law of Increased State Activities."

According to the law, the public sector expands with economic development in the long run. This is not just a simple public sector growth due to increased population but a relative expansion with the private sector [7]. Wagner suggested three reasons for the occurrence of this situation. In the beginning, the role of the public sector for the private sector is decreasing in industrialization and modernization with economic growth. The decrease in the share of the public sector causes more public expenditures to regulate the private sector. Second, the income elasticity of demand for goods and services offered by the government is very high. As economic growth increases output, the demand for education, culture, health, and environmental services will rise; thus, public expenditures will also increase [8]. In addition, Wagner argues that the state provides goods and services in these areas more effectively than the private sector [9]. Finally, public expenditures increase as a result of government interventions to manage and finance natural monopolies [10].

Another important element of the Wagner Law is the expectation that the state will fulfil its regulatory, supervisory, and deterrent functions in increasing economic, social, political, and legal relations. In order for the state to fulfill its duties in these activities, it must be technically competent. An example of this situation is provided below. The difference in the quality of the vehicles between the drivers who violate the traffic rules and the traffic policemen who will punish them will cause the criminals not to be caught and therefore not to be penalized. Because the vehicles of the traffic police do not have enough equipment. In this example, the technical features of the cars used by the uncomplying drivers symbolize the country's income level, and the technical features of the traffic police vehicles symbolize the public expenditures [5].

The relationship between economic growth and public expenditures has been a research subject in many countries, even for different periods in the same country, especially since the second half of the 1960s. In these studies, different models were used in terms of Wagner's Law. The most widely used of these models are as follows the Peacock-Wiseman (1961) model, which uses real public expenditures as a function of real income, the Gupta-Michas (1967) model, which takes real public expenditure per capita as a function of real GDP per capita

to take into account the effect of population, the Goffman-Mahar (1968) model, which takes real public consumption expenditures as a function of real GDP per capita, the Mann (1980) model, which takes into account the share of public expenditures in GDP, and Payne-Ewing (1996) model, which defines the share of public expenditures in GDP as a function of real GDP per capita [11].

In this study, the Peacock and Wiseman model was used to be comparable with the Keynes model. The Peacock and Wiseman model is the first modern attempt to examine Wagner's Law. The primary purpose of the model is to test the Wagner Law regarding the expansion of public expenditures. This model defines Wagner's Law as a link between public expenditure and national income [1]. Peacock and Wiseman used the double-sided logarithmic equation to estimate elasticity [9]. Accordingly, the model is in the form. According to the model, for Wagner's Law to be valid, β_1 the coefficient must be greater than 1 [12]:

$$\ln rge = \beta_0 + \beta_1 + \ln r gdp + \mu_t \quad (1)$$

Another approach examining the relationship between economic growth and public expenditure belongs to the English economist John Maynard Keynes. The Keynes Hypothesis approach includes the thesis that the gendarmerie state understanding, which classical economists emphasized, dragged the economies into instability as in the 1929 Economic Crisis. Keynes was the first economist to realize that economic stability during the crisis period could not be achieved spontaneously as the Classics suggested. During economic instability, when problems such as unemployment and inflation occur, the natural balance will not transpire spontaneously, as investment activities will be interrupted due to underemployment of the production factors. Therefore, the government must intervene in the economy during these periods [13]. According to Keynes, the most basic policy tool used in this direction is public expenditures. With increased public expenditures, production will increase, followed by total demand and GDP, respectively. The basis of public expenditures creating this effect is the multiplier mechanism [14]. In addition to the multiplier effect of public expenditures, public expenditures in infrastructure investments, education, health, social security services, defence, and police services that private entrepreneurs cannot execute will also provide economic growth by generating "positive externalities" due to their production-oriented nature [15].

According to Keynes and the economists who followed him, public expenditure is a policy tool that can eliminate short-term fluctuations and ensure economic growth. Wagner's Law includes causality from economic growth to public expenditures and accepts public expenditures as endogenous. On the other hand, in Keynes Hypothesis, the direction of causality is from public expenditures to economic growth; thus, public expenditures are considered an exogenous variable.

In the following years after World War II, public intervention in the economy was perceived as a solution to the problem of economic growth, the biggest problem of most countries [16]. Unemployment was reduced by using Keynes' demand management policy in this period. Therefore, the 1960s were the heyday of Keynesianism [17]. However, the process in which Keynesian policies increased the weight of public expenditures in the economy resulted in stagflation in most countries. During this period, it was understood that public spending was overgrowing for various reasons. Therefore, the problem of high inflation could not be solved. In the 1980s, Keynesian policies were replaced by other economic approaches. The economic liberalization trends started in many countries, causing the state to withdraw from the economy in a controlled manner. However, the upward trend in public expenditures continued unabated. This has been the origin of investigating the relationship between economic growth and public expenditures. In this study, the relationship between economic growth and public expenditures was investigated for G-20 countries. The study first conducted a selected literature review, then presented the data set and model. The methodology section mentioned the basic analysis methods and empirical results used in the study, and the study was concluded with the conclusion section.

2. Selected Literature

Studies examining the relationship between economic growth and public expenditures in the literature differ in terms of variables and methodology. While the variables GDP, GNP, national income, per capita GDP, and GNP represent income, the variables used to represent public expenditures differ in studies conducted with time series and panel data analysis methods. The literature on the subject has been examined in three groups that test Wagner's law, Keynes hypothesis, and both together with time and panel data analysis methods.

Testing Wagner's Law with time series analysis: Gunaydin [18], Arısoy [2], Gacener [19], Isik and Alagoz [20], Selen and Eryigit [21], Verma and Arora [22], Tasseven [23], Bansal et al. [24], Bayrakdar et al. [25], Sanlısoy and Sunal [11], Wang et al. [26], Demir and Balki [6], Kumar and Cao [27], Ayad et al. [28], Esen et al. [29], Inchauspe et al. [30], Oseni and Adekunle [31], Ghazy et al. [32] and Adewinle et al. [33] reached conclusions supporting Wagner's Law.; Cavusoglu [10], Ighodaro and Oriakhi [34], Kesavarajah [9], Amin and Jannat [35], Akbulut [36], and Jaen-Garcia [37] obtained results that did not support Wagner's Law. Moreover, Adil et al. [38] detected a weak relationship, while Wijeweera and Garis [39] and Konya and Abdullaev [7] could not reach a distinct conclusion on this issue. Husnain [40], Agayev [5], Bayrak and Esen [41], Magazzino [42], Karhan [43], Nirola and Sahu [44], Karas [45], and Balaban and Zivkov [46] who tested Wagner's Law with panel data analysis

pointed out that Wagner's Law was valid in their studies; however, Kolapo et al. [47] reached conclusions that did not support Wagner's Law.

Artan and Berber [48], Basar et al. [49], Afsar [50], Tan et al. [51], Yuksel and Songur [8], Gul and Yavuz [52], and Jiranyakul [53] had reached findings supporting Keynes Hypothesis in their research with time series analysis; Oktayer and Susam [54], Altay and Altın [55], Altunc and Aydın [56] and Ahmet and Acet [57] on the other hand, had reached opposite findings. Using panel data analysis, Ahuja and Pandit [58] and Ansari et al. [75] states that the Keynes Hypothesis is valid; Alptekin [59], found that the Keynes Hypothesis is not valid.

In the studies that test Wagner's Law and Keynes Hypothesis together and use time series analysis techniques, Guder et al. [60], Paul and Furahisha [14], Tulumce and Zeren [61], Sit and Karadag [15], Paparas et al. [1], Yavuz and Doruk [16], Sedrakyan and Varela-Candamio [62], Atgur [63], Popescu and Diaconu [64] and Selvanathan et al. [65]'s research findings show that both Wagner's Law and Keynes Hypothesis are valid. Bagdigen and Çetintas [66], Ulucak and Ulucak [67], Timur and Albayrak [68] and Mokoena vd. [69] obtained results rejecting both approaches. Sanchez-Juarez et al. [70], Karabulut [71], and Mostafa [72] observed that Wagner's Law is not valid, but Keynes Hypothesis is. Saglam and Uzun [73] brought attention to the rejection of the Keynes Hypothesis, although they obtained results validating Wagner's Law in their study. Although Govdeli [74]'s results supported Wagner's Law, he could not receive any findings related to the Keynes Hypothesis. While Arestis et al. [75] solely reached conclusions supporting Keynes Hypothesis, Iniguez-Montiel [76] has only access to evidence that Wagner's Law is valid. Olanrewaju and Funlayo [77] concluded that as well as Wagner's Law is valid in some countries in the panel, Keynes Hypothesis is valid in other countries also. Wu et al. [78], Altınur [13], Altınok and Arslan [79], Sagdic et al. [80], Nusair and Olson [3], and Ertekin and Bulut [81], who uses panel data analysis in their studies, had reached findings in favour of both approaches. However, Kuckuck [82] reached contrasting results in his research. Wahyudi [83], meanwhile, only reached conclusions supporting the Keynes Hypothesis. Lastly, Belke and Demir [84] concluded that while Wagner's Law is valid in some countries in the panel, Keynes Hypothesis is valid in other countries.

3. Data Set and Model

The study tested the relationship between public expenditures and economic growth with panel data analysis for the G-20 countries in the 1994-2017. The following 15 member states of G-20 United States, Japan, Germany, United Kingdom, France, India, Italy, Brazil, Canada, Russia, Republic of Korea, Australia, Indonesia,

Turkey, and South Africa were included in the analysis since their data can be accessed.¹ China, European Union, Argentina, Mexico, and Saudi Arabia were not included in the study due to missing data. Expense, goods services expense, GDP and GDP deflator data were obtained from World Bank development indicators. Total public expenditures and GDP values have been converted into real terms by using the GDP deflator. All variables were obtained from World Bank development indicators. Public expenditures included the sum of expense and goods services expense at a market prices based on current local currency. The data of GDP are calculated in local currency. Total public expenditures and GDP values have been converted into real terms by using the GDP deflator.

Well-known Peacock Wiseman model of Wagner's Law and Keynes model used in the study are as follows:

$$\text{Model1: } rexp = \beta_0 + \beta_1 rgdp + \mu_t \quad (2)$$

$$\text{Model2: } rgdp = \beta_0 + \beta_1 rexp + \mu_t \quad (3)$$

For the Peacock Wiseman model to be valid, coefficient β must be positive and greater than 1; for the Keynes model, the coefficient β must be positive and greater than 0.

4. Methods and Findings

Cross-sectional dependency (CSD) is when a shock that transpires in a country at any time affects another country then or in the future. It is essential to determine whether the shock affecting a country affects other countries to determine the appropriate test and prediction methods. Considering the high level of globalization today, the highly integrated structures of countries make it essential to consider cross-sectional dependency in the empirical analysis [85].

The presence of cross-sectional dependence can be examined with the Breusch-Pagan (1980) Lagrange Multiplier (LM) test when the time dimension is larger than the cross-section dimension. Breusch-Pagan (1980) LM statistics can be calculated as follows:

$$CD_{LM} = T \sum_{i=1}^{N-1} \sum_{j=i+1}^N \hat{\rho}_{ij}^2 \sim X_{N(N-1)/2}^2 \quad (4)$$

Here ρ_{ij} is the simple correlation coefficient between the residues obtained from the estimation of each equation using the least-squares method. However, this test statistic is not suitable for large panels. To overcome this difficulty, the following test statistics, developed by Pesaran (2004), are applied in cases where there is $N > T$ or $T > N$ [85].

$$CD = \sqrt{\frac{2T}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^N \hat{\rho}_{ij} \rightarrow N(0,1) \quad (5)$$

the null hypothesis is " H_0 : No cross-sectional dependence" for CD tests used to test cross-sectional dependence.

The findings from the Breusch-Pagan and Pesaran tests for the variables and models are reported in Table 1 with *constant* and *constant and trend* options. According to the test results, the H_0 hypothesis was rejected in the variables and cointegration equations since it is for both fixed and constant and trend models $p - deęeri < 0.05$, and it was decided that there is cross-sectional dependence.

Table 1. Cross-sectional Dependence Tests

Variables and Models	Constant			
	CD _{LM}		CD	
	Statistic	p-value	Statistic	p-value
rexp	163.258	0.000	3.457	0.000
rgdp	940.338	0.000	17.618	0.000
Constant and Trend				
rexp	163.745	0.000	2.582	0.005
rgdp	799.415	0.000	15.035	0.000
Model 1	399.607	0.000	6.886	0.000
Model 2	513.343	0.000	9.708	0.000

Determining the homogeneity or heterogeneity to use appropriate unit root tests in the analysis and whether the slope coefficient is homogeneous in the cointegration equation is necessary. The first studies on this subject started with Swamy (1970). Later Pesaran and Yamagata [86] developed Swamy's (1970) test. In the study, Δ and $\tilde{\Delta}_{adj}$ tests, which were developed by Pesaran et al. (2008) and can be used in $N > T$ or $T > N$ cases, were used to test homogeneity [86]. Here are the $\tilde{\Delta}$ and $\tilde{\Delta}_{adj}$ test statistics, respectively:

$$\tilde{\Delta} = \sqrt{N} \left(\frac{N^{-1} \xi - k}{\sqrt{2k}} \right) \quad (6)$$

$$\tilde{\Delta}_{adj} = \sqrt{N} \left(\frac{N^{-1} \xi - E(\tilde{Z}_{iT})}{\sqrt{\text{Var}(\tilde{Z}_{iT})}} \right) \quad (7)$$

In Delta tests, it is as " $H_0: \beta_i = \beta$ (tüm β_i 'ler için)" and " $H_a: \beta_i \neq \beta$ (for at least one β)". Acceptance of H_0 hypothesis means homogeneity, acceptance of H_a hypothesis means heterogeneity [86].

Table 2 presents the results for homogeneity tests for the variables and regressions in our analysis. According to the test results, the hypothesis $p - deęeri < 0.05$ that the slope coefficients are homogeneous in both the variables and the cointegration equation was rejected, and heterogeneity was accepted.

¹ In the total public expenditures category, one missing data for Turkey and the Republic of Korea, two for Russia and Brazil, and a sum of five for Indonesia were performed by linear interpolation method.

Table 2. Homogeneity Tests

Variables and Models	Δ		Δ_{adj}	
	Statistic	p-value	Statistic	p-value
rexp	2.775	0.003	2.967	0.002
rgdp	7.982	0.000	8.533	0.000
Model 1	30.493	0.000	32.506	0.000
Model 2	32.942	0.000	35.116	0.000

With the acceleration of globalization, the high level of interaction between the countries' economies has made the second generation unit root tests, which consider the dependency between horizontal sections, important. Pesaran [87], Cross-Sectionally Augmented Dickey-Fuller (CADF) test, which is one of the second generation unit root tests, was used in the study due to the presence of cross-sectional dependence.

Pesaran's CADF test is an extended version of ADF regression with first differences of individual series and cross-sectional means of lag levels. The test procedure includes the estimation of the separate cross-sectionally Augmented Dickey-Fuller (CADF) regressions for each country, allowing for different autoregressive parameters

for each panel member. The CADF regression is given by

$$\Delta x_{it} = z_{it} \gamma_i \rho_i x_{i,t-1} + \sum_{j=1}^{k_i} \varphi_{ij} \Delta x_{it-j} + \alpha_i \bar{x}_{t-1} + \sum_{j=0}^{k_i} \eta_{ij} \Delta \bar{x}_{t-j} + v_{i,t} \tag{8}$$

The null hypothesis is that each series contains a unit root, $H_0 = \rho_i = 0$ for all i , while the alternative hypothesis is that at least one of the individual series in the panel is (trend) stationary, $H_1 = \rho_i < 0$ for at least one i . In calculating the CIPS panel statistics, the average of the separate t-statistics of each cross-section is used, and the arithmetic mean of the CADF statistics is taken. Accordingly, the CIPS statistic is as follows:

$$CIPS(N, T) = \bar{t} = N^{-1} \sum_{i=1}^N t_i(N, T) \tag{9}$$

Where t_i is the OLS t -ratio of ρ_i in the above CADF. The CADF test can be used for both $T > N$ and $N > T$ gives consistent results even when the cross-section and time dimensions are relatively small [87].

CADF unit root test results are given in Table 3. Accordingly, according to the CADF (CIPS) statistics for both variables, both public expenditure and income variables are stationary ($I(1)$) at the 1% significance level in the panel.”

Table 3. Unit Root Test: CADF

Countries	Level				1st Difference			
	rexp		gdp		drexp		dgdg	
	CADF Stat.	Lag	CADF Stat.	Lag	CADF Stat.	Lag	CADF Stat.	Lag
USA	-1.2777	3	-2.2209	2	-1.6266	2	-2.5073	2
Japan	-1.9600	2	-2.0278	2	-3.1606	2	-2.8922	2
Germany	-3.8171	2	-2.3046	3	-4.7247	2	-3.5240	3
United Kingdom	-0.2608	2	-2.1258	2	-1.5096	3	-2.5011	2
France	-1.9815	2	-3.2146	2	-3.7088	2	-2.4676	3
India	-1.9542	2	-0.4933	2	-7.4831	2	-2.5536	3
Italy	-3.1764	3	-2.4641	2	-3.0835	2	-3.3391	2
Brazil	-1.4999	3	-0.3736	3	-3.9999	2	-2.1241	2
Canada	-2.8776	2	-2.4774	2	-3.0378	2	-2.2851	3
Russia	-4.9610	2	-2.2956	2	-9.8498	2	-3.4257	2
Rep. of Korea	-0.6120	3	-4.0694	2	-4.2554	2	-5.0403	2
Australia	-2.3555	2	-3.6583	3	-3.7900	2	-4.1685	2
Indonesia	-0.6075	3	-3.1919	2	-2.3634	3	-4.4928	2
Turkey	0.7761	2	-2.2649	2	-3.0222	2	-3.2354	3
South Africa	-1.8325	3	-1.4483	2	-0.9328	3	-2.4006	2
CADF	-1.9966		-2.3087		-3.7699		-3.1305	

Note: Lag length is taken as 2. Critical values for CIPS test are obtain Pesaran (2007). For %1, %5 and %10 respectively CADF statistics, -4.67, -3.88 and -3.49; **CADF** are -2.96, -2.73 and -2.63.

Different types of tests examine the cointegration relationship in panel data analysis. Westerlund (2006) proposed a panel cointegration test based on error correction that takes into account structural breaks and no structural breaks to examine the existence of cointegration. The panel cointegration test with multiple structural breaks proposed by Westerlund is based on the panel LM cointegration test procedure of McCoskey and Kao (1998), which allows for multiple structural breaks in both level and trend in the cointegration equation [88].

The principle of the test is to examine whether there is cointegration by detecting whether each unit has its error correction. Therefore, when the “no error correction” primary hypothesis is rejected during the test process, the “no cointegration” hypothesis is also rejected. The null hypothesis that all the individuals of the panel are cointegrated can be stated equivalently as “ $H_0 = \phi_i = 0$ for all $i = 1, \dots, N$ ” versus “ $H_a = \phi_i \neq 0$ for $i = 1, \dots, N$ and $\phi_i = 0$ for $i = N_1 + 1, \dots, N$ ” [88].

Westerlund (2006) LM cointegration test results are given in Table 4. According to the test results, the “ H_0 : “no cointegration” hypothesis was rejected at the 5% significance level, and it was concluded that while there is no structural break, there is cointegration for the fixed and trend models.

Table 4. LM Cointegration Test

	Test Stat.	Bootstrap p-value
Model 1	5.008	0.000
Model 2	7.001	0.001

Traditional panel data estimation methods are based on the assumption that cross-sections are independent of each other. However, many factors cannot be observed or controlled between the sections. Therefore, it cannot be assumed that the sections are independent of each other. Since the error term includes unobservable factors, it causes inconsistent and misleading estimates. Panel data estimation methods to control the dependency between cross-sections have increased in recent years. The Common Correlated Mean Group Effects (CCEMG) estimator, developed by Pesaran (2006) and took into account cross-sectional dependence for heterogeneous panels, was utilised in this study. The CCEMG estimator

(\hat{b}_{MG}), for heterogeneous panels, allows the coefficients of β_i to be calculated for each slice in the panel and is defined as a simple arithmetic average of the individual CCE estimators as follows:

$$\hat{b}_{MG} = \frac{1}{N} \sum_{i=1}^N \hat{b}_i \quad (10)$$

According to the Monte Carlo simulations, it has been remarked that the CCEMG and CCE pooled estimators provide effective results even in the smallest sample [89].

5. Empirical Findings

5.1. Panel Cointegration Analysis

The estimation results of the *Modell* CCEMG in which the Wagner model was tested are presented in Table 5. The long-term slope coefficient between public expenditures and economic growth is 0.144, and a 1% change in income will cause a 0.144% change in public expenditures. According to the Peacock Wiseman model of Wagner's Law for the panel, since the coefficient is positive as expected, it can be stated that the relationship is valid, but because it is less than 1, the expected effect is not valid. According to the estimation results for the sections, except for Turkey, Russia, South Africa, and Brazil, the coefficients were statistically significant and positive as predicted, except for Indonesia and the Republic of Korea. However, the coefficients do not meet the condition of being greater than 1, specified in the versions of Wagner's Law. Therefore, it can be asserted that Wagner Law is not valid for the G-20 countries. The coefficient is statistically significant in the Republic of Korea and Indonesia, but the direction of the relationship is different from the countries in the panel set. This situation may arise due to the weak relationship between government activities and public expenditures and the structural factors that weaken the effect of the relationship in these countries. The analysis results are similar to the results of the research of Ahuja and Pandit [58] and Ansari et al. [75]. The analysis results of the study are opposite of the results of the research of Husnain [40], Agayev [5], Bayrak and Esen [41], Magazzino [42], Karhan [43], Nirola and Sahu [44], Karas [45], and Balaban and Zivkov [46].

Table 5. Common Correlated Effects (CCE) Estimates for the Model 1

Countries	Coefficient	St. Error	t-Ratio
USA	0.156	0.03	5.03***
Japan	0.149	0.02	7.84***
Germany	0.354	0.01	59.00***
United Kingdom	0.293	0.05	5.86***
France	0.422	0.01	38.36***
India	0.145	0.01	11.15***
Italy	0.38	0.01	29.23***
Brazil	0.033	0.03	1.22
Canada	0.228	0.01	25.33***
Russia	0.079	0.05	1.58*
Rep. of Korea	-0.345	0.07	-5.07***
Australia	0.23	0.01	16.43***
Indonesia	-0.085	0.03	-2.74***
Turkey	0.052	0.21	0.25
South Africa	0.076	0.04	1.95**
Panel CCEMG	0.144	0.05	2.86***

Critical values for t-ratios are 2.32, 1.64 and 1.28 for 1%, 5% and 10% respectively. ***, **, * indicate significance levels at the 1%, 5% and 10%.

Table 6. Common Correlated Effects (CCE) Estimates for the Model 2

Countries	Coefficient	St. Error	t-Ratio
USA	4.123	0.88	4.69***
Japan	5.631	0.69	8.21***
Germany	2.758	0.06	45.97***
United Kingdom	2.508	0.33	7.51***
France	2.343	0.06	40.40***
India	5.365	0.72	7.43***
Italy	2.575	0.09	29.26***
Brazil	0.912	0.91	1.00
Canada	4.240	0.17	25.39***
Russia	0.667	0.25	2.63***
Rep. of Korea	-1.347	0.35	-3.90***
Australia	4.103	0.21	19.17***
Indonesia	-3.598	0.98	-3.67***
Turkey	0.084	0.35	0.24
South Africa	3.276	1.07	3.05***
Panel CCEMG	2.243	0.65	3.43***

Critical values for t-ratios are 2.32, 1.64 and 1.28 for 1%, 5% and 10% respectively. ***, **, * indicate significance levels at the 1%, 5% and 10%.

The estimation results for *Model2*, in which the Keynes model is examined for the G-20 countries, are presented in Table 6. According to the CCEMG estimation results, the long-term slope coefficient between economic growth and public expenditures is 2.243. Subsequently, a 1% change in

public expenditures will cause a 2.243% change in economic growth. Therefore, the panel coefficient is statistically and theoretically consistent with the expectation. According to the sections' estimation results, the coefficients are statistically significant for the countries

except for Brazil and Turkey. Besides Indonesia and the Republic of Korea, the coefficients are positive as expected. According to the cross-sections, while Japan, India, and Canada are the countries where the effect of public expenditures on income is greatest, the smallest countries are Russia, the United Kingdom, and France, respectively. The fact that the coefficient for the Republic of Korea and Indonesia is statistically significant, but the direction of the relationship that is different from the countries in the panel set can be a result of the ratio of public expenditures in these countries being relatively low, the country score in the corruption perception index and the contribution of public expenditures decreases after a certain level of development.

5.2. Panel Causality Analysis

Emirmahmutoglu and Kose (2011) test developed by Emirmahmutoglu and Kose (EK) [91] is a meta-analysis-based method used in heterogeneous panels. Meta-analysis is a statistical technique proposed by Fisher

(1932). The meta-analysis for panel data is performed as follows: N units are tested, and the significance levels of this test statistic (p values) are used. Then, a single panel statistic is created through these p values of the units [90]. EK is a test that can be used even when the series is not stationary at the same level, and there is no cointegration relationship between the variables. Hence, the EK Causality Test could be considered an adapted version of the Toda and Yamamoto test for panel data.

EK causality test results used in heterogeneous panels developed by Emirmahmutoglu and Kose [91] are presented in Table 7. H_0 hypothesis that there is no causality from public expenditures to growth and from growth to public expenditures was rejected, and its alternative was accepted. According to the conclusions, public expenditure is the economic growth and growth in public expenditure's Granger cause. Similarly, in the UK and Australia, public expenditure is the cause of revenue, and economic growth is the Granger cause of public spending in Germany, France, and Brazil.

Table 7. Results of Granger Causality Test

Countries	Lag Length	rexp→rgdp		rgdp→rexp	
		Wald Stat.	p-val	Wald Stat.	p-val
USA	2	1.892783	0.341713	3.158014	0.222702
Japan	1	0.009355	0.923824	0.028963	0.866420
Germany	3	0.697744	0.634852	17.40731	0.025765
United Kingdom	3	12.78710	0.052177	3.798317	0.273821
France	2	1.068501	0.472902	16.62243	0.008902
India	1	0.137238	0.714585	0.525058	0.476329
Italy	3	5.050734	0.209217	5.954997	0.174223
Brazil	2	2.141145	0.312585	7.758005	0.062227
Canada	1	1.656473	0.211458	1.098007	0.306080
Russia	2	2.397484	0.285972	5.488202	0.112481
Rep. of Korea	1	0.033144	0.857207	0.766259	0.390834
Australia	3	9.956589	0.083480	2.360690	0.385583
Indonesia	3	4.487221	0.235544	0.799629	0.611322
Turkey	1	2.832775	0.106498	0.325377	0.574174
South Africa	1	0.019760	0.889488	2.162372	0.155585
Panel		42.30091	0.067434	67.71331	9.76E-05

6. Conclusions

Regarding the growth of public expenditures in the economy, the direction of the relationship between public expenditures and economic growth is important for policymakers and researchers. Despite the acceleration of liberal tendencies and privatization practices, significantly since the second half of the 20th century, the rapid expansion of the public sector in the economy has increased the importance of this relationship. This relationship has become more controversial, especially in extraordinary conditions of economic crises and pandemics. This study examined the relationship between public expenditures and economic growth for the G-20 countries with panel data analysis for the 1994-2017 period.

Due to cross-sectional dependency and heterogeneity, the relationship between public expenditures and economic growth has been examined with the Pesaran CCEMG estimator. In the Peacock Wiseman model used to test Wagner's law, the direction of the relationship was found to be positive and statistically significant; however, the coefficient did not meet the condition of being greater than 1, contrary to expectations. According to the estimation results for the sections, the coefficients for the other countries except for Turkey, Russia, South Africa, and Brazil were found to be statistically significant and positive as predicted, except for Indonesia and the Republic of Korea. Therefore, it can be stated that Wagner's law is not valid for G-20 countries, but economic growth increases public expenditures.

In the Keynes model, it was discovered that a 1% change in public expenditures caused a 2.243% change in economic growth. Consequently, it can be assumed that the increase in public expenditures has a positive and statistically significant effect on economic growth. According to the estimation results for the sections, the coefficients are statistically significant for other countries except for Brazil and Turkey, and they are positive as expected, except for Indonesia and the Republic of Korea. Therefore, it can be assumed that the increase in public expenditures in G-20 countries influences economic growth positively, and Keynesian policies will produce the expected positive results. Results in Indonesia and the Republic of Korea indicate that public spending in these countries should be limited or resources directed towards productive areas. In these countries, the public sector causes inefficiency in the economy. This may be due to the prevalence of corruption or the prevailing x-inefficiency.

Subsequently, Emirmahmutoglu and Kose (2011)'s causality test was used to resolve the direction of causality between the variables, and bidirectional causality was discovered. In other words, according to the conclusions, public expenditure is the economic growth and growth in public expenditure's Granger cause. Likewise, public expenditure is the cause of revenue in the UK and Australia, and economic growth is the Granger cause of public

spending in Germany, France, and Brazil.

In line with the conclusions, it can be stated that the economic growth achieved in the G-20 countries will not cause an increase in the expenditures made by the public sector. Therefore, the increase in income will not trigger tax extension or financing. Hence economic growth will not prevail in a vicious circle. On the other hand, in the light of the Keynesian paradigm in these countries, it can be stated that it would be appropriate to use public expenditures as a strategic policy tool in terms of eliminating economic instabilities, reducing unemployment, and supporting economic growth. In extraordinary situations such as the COVID-19 pandemic, which emerged in China at the end of 2019 and had adverse effects globally, it is recommended that increasing health expenditures, promoting businesses with shrinking sales volumes by the public sector, and providing direct income support to dismissed labourers and closed service businesses can eliminate economic stagnation through the Keynesian transmission mechanism. The appropriate approach would be to provide the support required by the public sector first and foremost to service enterprises, which were strongly affected by the pandemic due to the decline in output caused by the nondeferrable demand. Data for some G20 countries are not available. In addition, a single data representing public expenditures could not be reached. Elimination of these shortcomings will make important contributions to future analyzes.

REFERENCES

- [1] D. Paparas, D. Richter, I. Koskatis. The Validity of Wagner's Law in the United Kingdom during the Last Two Centuries, *International Economics and Economic Policy*, Vol. 16, 269-291, 2018.
- [2] İ. Arısoy. Wagner ve Keynes Hipotezleri Çerçevesinde Türkiye'de Kamu Harcamaları ve Ekonomik Büyüme İlişkisi, *Ç. Ü. Sosyal Bilimler Enstitüsü Dergisi*, Vol. 14, No. 2, 63-80, 2005.
- [3] S. A. Nusair, D. O. Olson. Testing Wagner's Law versus the Keynesian Hypothesis for GCC Countries, *Applied Economics*, Vol. 53, No. 12, 1395-1417, 2021.
- [4] P. Arestis, H. Şen, A. Kaya. On the Linkage between Government Expenditure and Output: Empirics of the Keynesian View versus Wagner's Law, *Economic Change and Restructuring*, Vol. 54, 265-303, 2021.
- [5] S. Ağayev. Kamu Harcamaları ve Ekonomik Büyüme İlişkisi: Eski Sovyetler Birliği Ülkelerinde Wagner Yasası Analizi (1995-2009), *Eskişehir Osmangazi Üniversitesi İİBF Dergisi*, Vol. 7, No. 2, 7-27, 2012.
- [6] İ. C. Demir, A. Balkı. Türkiye'de Wagner Kanunu'nun Sınanması: 1960 – 2016 Dönemi Analizi, *Vergi Raporu*, Vol. 234, 11-27, 2019.
- [7] L. Konya, B. Abdullaev. An Attempt to Restore Wagner's Law of Increasing State Activity, *Empirical Economics*,

- Vol. 55, 1569-1583, 2017.
- [8] C. Yüksel, M. Songur. Kamu Harcamalarının Bileşenleri ile Ekonomik Büyüme Arasındaki İlişki: Ampirik Bir Analiz (1980-2010), *Maliye Dergisi*, Vol. 161, 365-380, 2011.
- [9] M. Kesavarajah. Wagner's Law in Sri Lanka: An Econometric Analysis, *International Scholarly Research Network*, 1-8, 2012.
- [10] A. T. , Çavuşoğlu. Testing the Validity of Wagner's Law in Turkey: The Bounds Testing Approach, *Ankara Üniversitesi SBF Dergisi*, Vol. 60, No. 1, 73-88, 2005.
- [11] S. Şanlısoy, O. Sunal. Kamu Harcamaları-Ekonomi Büyüme İlişkisi: Türkiye Örneği, *Gümüşhane Üniversitesi Sosyal Bilimler Enstitüsü Elektronik Dergisi*, Vol. 7, No.15, 103-122, 2016.
- [12] L. Oxley. 1994. Cointegration, Causality and Wagner's Law: A Test for Britain 1870-1913, *Scottish Journal of Political Economy*, Vol. 41, No. 3, 286-298, 1994.
- [13] A. Altın. OECD Ülkelerinde Kamu Harcamaları ve Ekonomik Büyüme İlişkisi: Panel Simetrik ve Asimetrik Nedensellik Analizi, *Kafkas Üniversitesi İktisadi ve İdari Bilimler Dergisi*, Vol. 33, No. 3, 849-870, 2019.
- [14] F. Paul, G. Furahisha. Government Expenditure and Economic Growth Nexus: Wagner's Law or Keynesian Hypothesis for Tanzania?, *African Journal of Economic Review*, Vol. 5, No. 1, 32-46, 2017.
- [15] M. Şit, H. Karadağ. Türkiye Ekonomisinde Kamu Harcamaları Ekonomik Büyüme İlişkisi: Toda Yamamoto Nedensellik Testi, *Uluslararası Ticaret ve Ekonomi Araştırmaları Dergisi*, Vol. 2, No. 1, 33-41, 2018.
- [16] H. B. Yavuz, Ö. T. Doruk. Türkiye Ekonomisi için Keynesyen Yaklaşım ve Wagner Yasası'nın Test Edilmesi: 1950-2017 Yılları Arasında Bir İnceleme, *Adana Bilim ve Teknoloji Üniversitesi Sosyal Bilimler Dergisi*, Vol. 1, No. 2, 79-93, 2018.
- [17] E. C. , Tan. Does Wagner's Law or the Keynesian Paradigm Hold in the Case of Malaysia?, *Thammasat Review*, Vol. 8, No. 1, 62-74, 2003.
- [18] İ. Günaydın. Türkiye'de Wagner Kanunu'nun Geçerliliği Üzerine Ekonometrik Bir Araştırma, *Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi*, Vol. 17, No. 3, 79-94, 2003.
- [19] A. Gacener. Türkiye Açısından Wagner Kanunu'nun Geçerliliğinin Analizi, *D.E.Ü.İ.İ.B.F. Dergisi*, Vol. 20, No. 1, 103-122, 2005.
- [20] N. Işık, M. Alagöz. Kamu Harcamaları ve Büyüme Arasındaki İlişki, *Erciyes Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, Vol. 24, 63-75, 2005.
- [21] U. Selen, K. Eryiğit. Yapısal Kırılmaların Varlığında, Wagner Kanunu Türkiye için Geçerli mi?, *Maliye Dergisi*, Vol. 156, 177-198, 2009.
- [22] S. Verma, R. Arora. Does the Indian Economy Support Wagner's Law? An Econometric Analysis, *Eurasian Journal of Business and Economics*, Vol. 3, No. 5, 77-91, 2010.
- [23] Ö. Taşseven. The Wagner's Law: Time Series Evidence for Turkey, 1960-2006, *Doğuş Üniversitesi Dergisi*, Vol. 12, No. 2, 304-316, 2011.
- [24] S. N. Bansal, and A. O. M. Hantolai. Growth of Public Expenditure and Testing of Wagner's Law in Eritrea, *Asian-African Journal of Economics and Econometrics*, Vol. 12, No. 2, 293-304, 2012.
- [25] S. Bayrakdar, S. Demez, M. Yapar. Testing the Validity of Wagner's Law: 1998-2004, The Case of Turkey, *Procedia – Social and Behavioral Sciences*, Vol. 195, 493-500, 2015.
- [26] L. Wang, A. D. Peculea, H. Xu. The Relationship Between Public Expenditure and Economic Growth in Romania: Does It Obey Wagner's or Keynes's Law?, *Theoretical and Applied Economics*, Vol. 13, No. 3, 41-52, 2016.
- [27] S. Kumar, Z. Cao. Testing for Structural Changes in The Wagner's Law For a Sample of East Asian Countries, *Empirical Economics*, Vol. 59, 1959-1976, 2019.
- [28] H. Ayad, S. E. S. Hassoun, M. Belmokaddem. Causality Between Government Expenditure and Economic Growth in Algeria: Explosive Behavior Tests and Frequency Domain Spectral Causality, *Economic Computation and Economic Cybernetics Studies and Research*, Vol. 2, 315-332, 2020.
- [29] E. Esen, M. A. Farahmand, M. Ç. Keçili. Ekonomik Büyüme ve Kamu Harcamaları Arasındaki İlişkinin Türkiye için ARDL Yöntemiyle Analizi, *Sakarya İktisat Dergisi*, Vol. 9, No. 3, 219-237, 2020.
- [30] J. Inchauspe, M. A. Kobir, G. Macdonald. Wagner's Law and the Dynamics of Government Spending in Indonesia, *Bulletin of Indonesian Economic Studies*, 1-22, 2020.
- [31] I. O. Oseni, I. A. Adekunle. Relevance of Wagner's Hypothesis in Achieving Sustainable Development Agenda in Nigeria, *African Governance and Development Institute*, Vol. 9, No. 1, 1-21, 2020.
- [32] N. H. Ghazy, H. Ghoneim, D. Pappas. The Validity of Wagner's Law in Egypt From 1960–2018, *Review of Economics and Political Science*, Vol. 6, No. 2, 98-117, 2020.
- [33] F. Adewinle, M. Abdullahi, S. Tukur. Wagner's Law in Nigeria: An Investigation Using Nigeria's Time Series Data, *EPR International Journal of Economics, Business and Management Studies*, Vol. 8, No. 3, 19-22, 2021.
- [34] C. A. U. Ighododaro, D. E. Oriakhi. Does the Relationship between Government Expenditure and Economic Growth Follow Wagner's Law in Nigeria?, *Annals of the University of Petrosani Economics*, Vol. 10, No. 2, 185-198, 2010.
- [35] S. B. Amin, F. T. Jannat. Relationship between Government Expenditure and National Income: The Case of Bangladesh, *Journal of Accounting, Finance and Economics*, Vol. 7, No. 1, 27-41, 2017.
- [36] H. Akbulut. Ekonomik Gelişmişlik-Kamu Harcamaları İlişkisi: 2007:1-2015:3 Dönemi Türkiye Örneği, *Yönetim Bilimleri Dergisi*, Vol. 15, No. 29, 9-23, 2017.
- [37] M. Jaen-Garcia. Wagner's Law: A Revision and a New Empirical Estimation, *Review of Public Economics*, Vol. 224, 13-35, 2018.
- [38] M. H. Adil, A. A. Ganaie, and B. Kamaiah. Wagner's Hypothesis: An Empirical Verification, *IIM Kozhikode Society & Management Review*, Vol. 6, No. 1, 1-12, 2017.

- [39] A. Wijeweera, T. Garis. Wagner's Law and Social Welfare: The Case of The Kingdom of Saudi Arabia, *Applied Econometrics and International Development*, Vol. 9, No. 2, 199-209, 2009.
- [40] M. I. U. Husnain. Keynes versus Wagner: Aggregated and Disaggregated Analysis of Public Expenditure in Selected South Asian Countries, *International Research Journal of Finance and Economics*, Vol. 67, 46-53, 2011.
- [41] M. Bayrak, Ö. Esen. Examining the Validity of Wagner's Law in the OECD Economies, *Research in Applied Economics*, Vol. 6, No. 3, 1-16, 2014.
- [42] C. Magazzino, L. Giolli, M. Mele. Wagner's Law and Peacock and Wiseman's Displacement Effect in European Union Countries: A Panel Data Study, *International Journal of Economics and Financial Issues*, Vol. 5, No. 3, 812-819, 2015.
- [43] G. Karhan. The Relationship Between Public Expenditures and Economic Growth: A Panel VAR Approach, *C. Ü. İktisadi ve İdari Bilimler Dergisi*, Vol. 19, No. 2, 35-43, 2018.
- [44] N. Nirola, S. Saho. Revisiting the Wagner's Law for Indian States Using Second Generation Panel Cointegration, *Economic Change and Restructuring*, Vol. 53, No.5, 1-23, 2018.
- [45] E. Karaş. Wagner Kanunu'nun BRICS Ülkeleri ve Türkiye Bazında Geçerliliğinin Sınanması, *Maliye Dergisi*, Vol. 178, 199-223, 2020.
- [46] S. Balaban, D. Zivkov. Validity of Wagner's Law in Transition Economies: A Multivariate Approach, *Review of Public Economics*, Vol. 236, 105-131, 2021.
- [47] F. T. Kolapo, M. Joseph, T. Oluwaleye, K. M. Alabi. Impact of Government Expenditure on Economic Growth in Sub-Saharan Africa: A Validity of Wagner's Law, *International Journal of Scientific Research and Management*, Vol. 9, No. 2, 2139-2150, 2021.
- [48] S. Artan, M. Berber. Kamu Kesimi Büyüklüğü ve Ekonomik Büyüme İlişkisi: Çoklu Ko-Entegrasyon Analizi, *C. Ü. İktisadi ve İdari Bilimler Dergisi*, Vol. 5, No. 2, 13-29, 2004.
- [49] S. Başar, H. Aksu, M. S. Temurlenk, Ö. Polat. Türkiye'de Kamu Harcamaları ve Büyüme İlişkisi: Sınır Testi Yaklaşımı, *Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, Vol. 13, No. 1, 301-314, 2009.
- [50] M. Afsar. Türkiye'de Eğitim Yatırımları ve Ekonomik Büyüme, *Anadolu Üniversitesi Sosyal Bilimler Dergisi*, Vol. 9, No. 1, 85-98, 2009.
- [51] B. K. Tan, M. Mert, Z. A. Özdemir. Kamu Yatırımları ve Ekonomik Büyüme İlişkisine Bir Bakış: Türkiye, 1969-2003, *Dokuz Eylül Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, Vol. 25, No. 1, 25-39, 2010.
- [52] E. Gül, H. Yavuz. Türkiye'de Kamu Harcamaları ile Ekonomik Büyüme Arasındaki Nedensellik İlişkisi: 1963-2008 Dönemi, *Maliye Dergisi*, Vol. 160: 72-85, 2011.
- [53] K. Jiranyakul. Government Expenditures and Economic Growth: A Cointegration Analysis for Thailand under the Floating Exchange Rate Regime, *Fiscal & Monetary Policy in Developing Economies*, 1-6, 2020.
- [54] N. Oktayer, N. Susam. Kamu Harcamaları-Ekonomik Büyüme İlişkisi: 1970-2005 Yılları Türkiye Örneği, *Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi*, Vol. 22, 145-164, 2008.
- [55] O. Altay, Altın, O. Türkiye'de Kamu Harcamalarının Ekonomik Büyüme ve Yatırımlar Üzerine Etkilerinin Analizi, *Ege Akademik Bakış/ Ege Academic Review*, Vol. 8, No. 1, 267-285, 2008.
- [56] Ö. F. Altunç, C. Aydın. Türkiye'de Kamu Sektörü Büyüklüğü ve Ekonomik Büyüme İlişkisinin Analizi, *Ekonomik Yaklaşım*, Vol. 23, No. 82, 79-98, 2012.
- [57] Z. Ahmed, H. Acet. Public Expenditure and Economic Growth Relationship in Developing Countries: The Case of Bangladesh, *Journal of Current on Business and Economics*, Vol. 10, No.2, 131-144, 2020.
- [58] D. Ahuja, D. Pandit. Public Expenditure and Economic Growth: Evidence from the Developing Countries, *FIIB Business Review*, Vol. 9, No.1, 1-8, 2020.
- [59] V. Alptekin. Benoit Hipotezi: Seçilmiş OECD Ülkeleri Ölçeğinde Panel Verileri Yardımıyla Analizi, *CBÜ Sosyal Bilimler Dergisi*, Vol.10, No. 2, 204-215, 2012.
- [60] F. Güder, P. Yücekaya, ve A. Şenyurt. Kamu Harcamaları ve Ekonomik Büyüme İlişkisi: Türkiye için Keynesyen Görüş mü? Wagner Kanunu mu geçerli?, *ÇOMÜ Uluslararası Sosyal Bilimler Dergisi*, Vol. 1, 47-60, 2016.
- [61] S. Y. Tülümce, F. Zeren. Türkiye'de Kamu Harcamaları ve Ekonomik Büyüme Arasındaki İlişkinin Asimetrik Nedensellik testi İle Analizi, *Uluslararası Yönetim İktisat ve İşletme Dergisi*, Vol. 13, No. 2, 299-310, 2017.
- [62] G. S. Sedrakyan, L. Varela-Candamio. Wagner's Law vs. Keynes' Hypothesis in Very Different Countries (Armenia and Spain), *Journal of Policy Modeling*, Vol. 41, 747-762, 2019.
- [63] Atgür. Kamu Harcamalarının Ekonomik Büyüme Üzerindeki Etkisi: Wagner Yasası'nın ve Keynesyen Hipotez'in Türkiye'de Geçerliliği Üzerine Bir İnceleme, *Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi*, Vol. 34, No. 3, 895-915, 2020.
- [64] C. C. Popescu, L. Diaconu. Government Spending and Economic Growth: A Cointegration Analysis on Romania, *Sustainability*, Vol. 13, 1-16, 2021.
- [65] E. A. Selvanathan, S. Selvanathan, M. S. Jayasinghe. Revisiting Wagner's and Keynesian's Propositions and The Relationship between Sectoral Government Expenditure and Economic Growth, *Economic Analysis and Policy*, Vol. 71, 355-370, 2021.
- [66] M. Bağdigen, H. Çetindaş. Casualty between Public Expenditure and Economic Growth: The Turkish Case, *Journal of Economic and Social Research*, Vol. 6, No. 1, 53-72, 2009.
- [67] R. Ulucak, Z. Ş. Ulucak. Kamu Harcamaları ve Ekonomik Büyüme Arasındaki Nedensellik: Türkiye Örneği, *Uluslararası Yönetim İktisat ve İşletme Dergisi*, Vol. 10, No. 23, 81-98, 2014.
- [68] M. C. Timur, N. Albayrak. Kamu Harcamaları ve Ekonomik Büyüme Arasındaki İlişki: Wagner Kanunu, *Sosyal Bilimler Metinleri*, 803-813, 2016.

- [69] S. K. Mokoena, M. Rachidi, C. C. Ngwakwe. The Nexus between Public Expenditure and Economic Growth, *Euroeconomica*, Vol. 2, No. 39, 135-144, 2020.
- [70] I. Sanchez-Juarez, R. M. G. Almada, H. Barajas. The Relationship Between Total Production and Public Spending in Mexico: Keynes versus Wagner, *International Journal of Financial Research*, Vol. 7, No. 1, 109-120, 2016.
- [71] Ş. Karabulut. Wagner ve Keynes Hipotezinin Geçerliliği: Türkiye Örneği, *Vizyoner Dergisi*, Vol. 11, 150-168, 2020.
- [72] M. G. A., Mostafa. The Causal Link between Government Expenditure and Economic Growth in Egypt over the Period From 1952 to 2020, *Systematic Reviews in Pharmacy*, Vol. 12, No. 3, 231-243, 2021.
- [73] M. Sağlam, S. Uzun. An Analysis on the Relationship Between Public Expenditures and Economic Growth in Turkey, *Academic Studies in Economics and Administrative Sciences*, 50-61, 2020.
- [74] T. Gövdeli. Kamu Harcamaları ve Ekonomik Büyüme: Türkiye'de Wagner Yasası ve Keynesyen Hipotezin Ampirik Analizi, *Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi*, Vol. 33, No. 3, 995-1010, 2019.
- [75] A. Ansari, F. Khan, M. K. Singh. Public Expenditure and Economic Development: New Evidence from The BRICS-SAARC-ASEAN Region, *Theoretical and Applied Economics*, Vol. 2, 155-174, 2021.
- [76] A. J. Iniguez-Montiel. Government Expenditure and National Income in Mexico: Keynes versus Wagner, *Applied Economics Letters*, Vol. 17, 887-893, 2010.
- [77] S. M. Olanrewaju, A. K. Funlayo. Public Expenditure and Economic Growth: A Test of Wagner's and Keynes Hypotheses in Nigeria and Angola Economies, *European Journal of Humanities and Social Sciences*, Vol. 1, No. 3, 1-6, 2021.
- [78] S. Wu, J. Tang, E. S. Lin. The Impact of Government Expenditure on Economic Growth: How Sensitive to the Level of Development?, *Journal of Policy Modeling*, Vol. 32, No. 6, 804-817, 2010.
- [79] H. Altınok, M. O. Arslan. The Relationship Between Public Expenditures and Economic Growth in Southeastern European Countries: An Analysis of Bootstrap Panel Granger Causality, *Economic Computation and Economic Cybernetics Studies and Research* Vol. 3, 249-262., 2020.
- [80] E. N. Sagdic, M. U. Sasmaz, G. Tuncer. Wagner versus Keynes: Empirical Evidence from Turkey's Provinces, *Panoeconomicus*, Vol. 67, No. 5, 657-674, 2020.
- [81] Ş. Ertekin, Ş. Bulut. The Relation of Public Expenditures with Economic Growth in OECD Countries, *Yönetim ve Ekonomi*, Vol. 28, No. 1, 187-203, 2021.
- [82] J. Kuckuck. Testing Wagner's Law at Different Stages of Economic Development a Historical Analysis of Five Western European Countries, *Institute of Empirical Economic Research*, Vol. 91, 1-32, 2012.
- [83] W. Wahyudi. The Relationship Between Government Spending and Economic Growth Revisited, *International Journal of Economics and Financial Issues*, Vol. 10, No. 6, 84-88, 2020.
- [84] M. Belke, H. İ. Demir. BRICS – MINT Ülkelerinde Kamu Harcamaları ve Ekonomik Büyüme İlişkisi: 1990 – 2017 Dönemi, *2nd International Conference on Social Science Research*, 20-32, 2019.
- [85] Ş. Nazlıoğlu, F. Lebe, S. Kayhan. Nuclear Energy Consumption and Economic Growth in OECD Countries: Cross-Sectional Dependent Heterogeneous Panel Causality Analysis, *Energy Policy*, Vol. 39, 6616-6621, 2011.
- [86] M. H. Pesaran, T. Yamagata. Testing Slope Homogeneity in Large Panels, *Journal of Econometrics*, Vol. 142, 50-93, 2008.
- [87] M. H. Pesaran. A Simple Panel Unit Root Test in the Presence of Cross Section Dependence, *Journal of Applied Econometrics*, Vol. 22, 265-312, 2007.
- [88] J. Westerlund. Testing for Panel Cointegration with Multiple Structural Breaks, *Oxford Bulletin of Economics and Statistics*, Vol. 68, 101-132, 2006.
- [89] M. Eberhardt, S. Bond. Cross-section Dependence in Nonstationary Panel Models: A Novel Estimator, *Munich Personal Repec Archive*, 1-26, 2009.
- [90] F. Zeren, S. Ergün. Ticari Açıklık ve Kamu Büyüklüğü İlişkisi: Panel Nedensellik Testi, *Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi* Vol. 27, 229, 2013.
- [91] F. Emirmahmutoğlu, N. Köse. Testing for Granger Causality in Heterogeneous Mixed Panels, *Economic Modelling*, Vol., 28, No. 3, 870-876, 2011.

i This study was derived from the first author's master's thesis.