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Validity of Wagner's Law in EU Member Transition Economies: Panel Causality Analysis

AB'ye Üye Geçiş Ekonomilerinde Wagner Kanununun Geçerliliği: Panel Nedensellik Analizi

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ABSTRACT

One of the main issues which has been given great emphasis in economics literature, particularly since the 19th century, is that of the relationship between public expenditure and economic growth. There are two theoretical approaches in the literature dealing with this relationship. The first is Wagner's law which states that public expenditure increases as growth expands. The second is related to the Keynesian hypothesis which states that public spending encourages growth. In other words, while Wagner asserts that the causality runs from growth to public spending, Keynes claims that public spending causes growth. In this study, the validity of Wagner's Law was analyzed with the Dumitrescu and Hurlin (2012) panel causality test using annual data from between the years 1995 and 2019 for eleven European Union member transition economies. Our main purpose in this study was to determine whether public expenditure can be used as an effective policy tool in transition economies that are members of the European Union. The test results revealed that there is one-way causality from growth to public spending. In other words, Wagner's Law is valid for the country group and period subject to the study.

Keywords: Transition economies, Wagner's law, Public expenditures, Growth, Panel causality analysis
Jel Code: E62, C33, H59

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ÖZ

Özellikle 19. yy'dan sonra kamu harcamaları ve ekonomik büyüme ilişkisi iktisat literatüründe önemle üzerinde durulan konulardan biridir. Bu ilişki iki teori açısından incelenmektedir. Bunlardan ilki Wagner yasasıdır.

Wagner'e göre kamu harcamalarındaki artış büyümenin bir sonucudur. İkincisi ise Keynesyen hipotezdir. Keynes'e göre kamu harcamaları büyümeyi teşvik etmektedir. Diğer bir ifadeyle Wagner yasasında nedensellik büyümeden kamu harcamalarına doğru iken Keynes bunun tam tersini yani kamu harcamalarından büyümeye doğru bir nedensellik ilişkisi olduğunu öne sürmektedir. Bu çalışmada Avrupa Birliği'ne üye on bir geçiş ekonomisi için 1995-2019 yılları arasında yıllık veriler kullanılarak Wagner Yasasının geçerliliği Dumitrescu ve Hurlin (2012) panel nedensellik analizi ile incelenmiştir. Bu çalışmadaki asıl amacımız Avrupa Birliği'ne üye bu geçiş ekonomilerinde kamu harcamalarının etkin bir politika aracı olarak kullanılıp kullanılamayacağını belirlemektir. Test sonuçlarına göre büyümeden kamu harcamalarına tek yönlü nedensellik vardır. Diğer bir ifadeyle çalışmaya konu olan ülke grubu ve dönem için Wagner Yasası geçerlidir.

Anahtar Kelimeler: Geçiş ekonomileri, Wagner yasası, Kamu harcamaları, Büyüme, Panel nedensellik analizi
Jel Kodları: E62, C33, H59

1. Introduction

When planning their growth strategies some countries have leaned towards capitalism for reasons such as lifting trade barriers, globalization, and technological innovations. A similar pattern can also be seen even in centrally planned economies after the 1980s. What is often referred to as planned, or transition, economies in the literature is the group of countries that emerged with the collapse of the socialist block (Papava, 2005, p.79; Kesici, 2008, p.75). Much as this definition is generally accepted in the literature, Sakınç (2005) mentioned that since those countries did not want to be categorized as either developed or underdeveloped countries, they are therefore called transition economies. However, it is also possible to see that those economies have changed in many areas, and thus the term 'transition economy' has typically been used for countries transitioning from centrally planned economies to a market economy (Bulut, 2019, p.2).

IMF puts the countries that emerged out of events such as the demolishing of the Berlin wall in the 20th century or the disintegration of the Soviet Union in 1991 into geographical groups such as Eastern and Central Europe, Caucasus, Baltic countries, Central Asia, and East Asian countries. They can also be grouped under two titles in terms of the market economy. The first group consists of Central and Eastern European countries and the Baltic states, which have become members of the EU or fulfill most membership requirements. The second group is the Ex-Soviet Block that cannot achieve the desired success of transitioning to a market economy (Jantsan, 2013, p.14).

It was not easy for transition economies to pass from a command economic structure to a market economy. The reform movements of the countries leaving the Soviet Bloc progressed very slowly. Reformist movements in Central and Eastern Europe and the Baltic states made the transition slightly more quickly. After a great deal of effort these countries managed to become members of the EU. Thus, macroeconomic indicators of EU member countries are much better compared to those of the Soviet Block (Katchanovski, 2000, pp.55-56).

Although there are various opinions in the literature on the relationship between government expenditure and economic growth, these are principally based on Wagner's and Keynes's theories. Wagner (1883) conducted a study on developed countries and argued that an increase in national income gives rise to an increase in government expenditure at the same time. According to this argument, urban population growth, industrialization, education, and health expenses that the government has to provide all serve to increase the social and cultural expectations of the public and thus bring with them   increases in government expenditure (Chang, 2002, p.1158)

According to this view, government expenditures are accepted as an external variable. Increases in government expenditure will increase the revenue (Arısoy, 2005, p.64). According to Keynes, government expenditures are a fiscal policy instrument. It is an efficient method, especially in developing countries, to increase revenue and remove imperfections (Ansari, Gordon, & Akuamoah, 1997, p.544). However, the "crowding-out effect" criticism of monetarists toward government expenditure financing needs to be considered in the circumstances. The direction of the relationship between government expenditure and economic growth is crucial for policymakers. Government expenditure cannot be used as a political tool if Wagner's approach is valid. On the other hand, government expenditure can be utilized as an efficient political tool if Keynes's theory is valid (Singh & Sahni, 1984, p.630).

Wagner's Law sets out whether public spending, which is of great importance for all economies, can be used effectively as a policy tool. This study aims to test the validity of Wagner's law for eleven EU member transition economies with Dumitrescu and Hurlin (2012) panel causality analysis and present an alternative road map to policymakers. The Dumitrescu and Hurlin (2012) test is a Granger causality-based test used in heterogeneous panels. Monte Carlo simulations have shown that the test gives satisfactory results in small and large samples.

2. Literature Review

As of today, Wagner's law has been tested on many countries. Results vary because of differences in methods, time, country or country group dimension. Regarding the panel studies for testing Wagner's law, Thornton (1999) reviewed European countries in the 19th century, Kolluri, Panik, and Wahap (2000) analyzed G7 countries, and Wu, Tang, and Lin (2010) performed analyses for 182 countries. Tang (2001), Srinivasan (2013), Oyinlola and Akinnibosun (2013), Menyah and Wolde-Rufael (2013), Odhiambo (2015), Magazzino (2012), and Iniguez-Montiel (2010) obtained results that support Wagner's law the countries of Malaysia, India, Nigeria, Ethiopia, South Africa, Italy, and Mexico.

Regarding studies on the validity of Keynes's theory, Iyare and Lorde (2004) reviewed Caribbean countries; Dogan and Tang (2006) analyzed Southeast Asian countries; Liu, Hsu, and Younis (2008) reviewed the US and Huang (2006) reviewed China and Taiwan. Moreover, Loizides and Vamvoukas (2005) conducted a study for Greece and Ireland and found a causality from government expenditure to economic growth in all countries mentioning a causality relation for Ireland and Greece in the long run. A study for Asian countries was performed by Lahirushan and Gunasekara (2015). For their results, there is a two-way causality relation between government expenditure and economic growth, and both Keynes's and Wagner's laws are valid.

Abdieva, Baigonushova, and Ganiev (2017) reviewed the relationship between government expenditure and economic growth in transition economies and accepted Keynes's theory as valid for Kyrgyzstan while not finding a relationship for Tajikistan. Biswal, Dhawan, and Lee (1999), Ziramba (2008), Gurgul, Lach, and Mestel (2012) respectively conducted research on Canada, South Africa and Poland, and accepted Keynes's theory as valid. Pula and Elshani (2018) emphasized a two-way causality relation between government expenditure and economic growth. Paparas and Stoian (2016) conducted a study on Romania and concluded that five versions of Wagner's law are valid.

Abbasov and Aliyev (2018) studied nine former Soviet countries and concluded that Wagner's law is valid in Latvia, Lithuania, Uzbekistan, Georgia, Kyrgyzstan, and Ukraine, while Keynes's theory is valid in Estonia, Uzbekistan, Azerbaijan, Kyrgyzstan, and Moldova.

Ağayev (2012) analyzed ten former Soviet countries and obtained results that support Wagner's law. Saridogan and Gülşen (2010) performed a panel analysis for 21 transition economies and concluded that growth is positively affected by public expenditure. Another analysis was made by Lingxiao and Peculea (2016) for Romania. According to their results, there is a two-way causality relation between variables; in other words, Keynesian and Wagnerian theories are valid. Chletsos and Kollias (1997) analyzed public expenditure and components for Greece. He stated that Wagner's law applies only to defence spending.

Samudram, Nair, and Vaithilingam (2008) examined the relationship between the components that make up public expenditure and growth for Malaysia. They found a bidirectional causality relationship between administration and health expenditure and economic growth in the long run. They found that the relationship between defence, education and agricultural expenditure and growth support the Wagner hypothesis.

Wahab (2004), in his study of 24 OECD countries, draws attention to the periods when economic growth accelerated and slowed down. He stated that public expenditure increased proportionally more in periods of accelerated economic growth, while it decreased

proportionally in periods of decrease. Thus, the study reveals that Wagner's law has limited validity. In his study on Nigeria, Babatunde (2011) stated that Wagner's law is not valid and has weak empirical evidence for the validity of Keynes' hypothesis.

3. Data and Methodology

In order to review the relationship between government expenditure (GE) and growth (GDP), annual data for the period between 1995 and 2019 were used for eleven EU member transition economies, namely Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, Slovenia. GDP data with the base year as 2010 was used to represent growth; final government expenditures data was utilized for the government expenditures. All the series were in US Dollar; their logarithms were taken. Data of variables were obtained from the World Development Indicator published by the World Bank.

Table 1: Descriptive Statistics and Correlation Matrix of Variables

Variables	Mean	Std. Dev.	Min.	Max.	Skewness	Kurtosis
LNGDP	10.8406	0.4113	10.0152	11.8202	0.3235	2.3834
LNGE	10.1381	0.3985	9.4771	11.0536	0.3735	2.2242
Correlation matrix and t-stat.			**Covariance Analysis**			
	LNGDP	LNGE		LNGDP	LNGE	
LNGDP	1.000000		LNGDP	0.168576	0.161198	
LNGE	0.987097 (101.8543)	1.000000	LNGE	0.161198 (101.8543)	0.158199	

Note: Values in parentheses indicate t-statistics.

3.1. Cross-Section Dependence and Homogeneity Test

Breusch and Pagan's (1980) LM test is one of the tests used to measure cross-section dependence. Below panel regression is estimated for the LM test

$$y_{i,t} = a_i + \beta_i x_{i,t} + \varepsilon_{i,t} \, for \, i = 1, \dots . N: t = 1, \dots , T \qquad Eq.(1)$$

i in the equation is the unit dimension; t is the time dimension. a_i and β_i respectively are constant and cut-off terms that take value based on the units in the panel. $H_0: Cov(\varepsilon_{i,t}, \varepsilon_{j,t}) = 0 \; \forall t$ and $\forall i \neq j$ that is the main hypothesis is tested compared to the alternative hypothesis called $H_1: Cov(\varepsilon_{i,t}, \varepsilon_{j,t} \neq 0) \; \forall t$ and $\forall i \neq j$. LM test statistics as follows:

$$LM = T \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} T_{ij} \hat{p}_{i,j}^2 \quad \frac{X^2 N(N-1)}{2} \qquad Eq.(2)$$

$\hat{p}_{i,j}$ is the residue of the correlation coefficient of equation 1. It is appropriate to use the test below that was developed by Pesaran (2004) if the unit number (N) is larger than the time dimension (T)

$$CD = \sqrt{\frac{1}{N(N-1)} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} (T_{ij}\hat{p}_{ij} - 1)} \sim N(0,1) \qquad Eq.(3)$$

CD_{LM} was used in situations in which N is larger than L. Afterwards, Pesaran (2004) developed a new test for situations in which N and T are large at the same time.

$$CD_{LM} = \sqrt{\left(\frac{2T}{(N(N-1))}\right) \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{p}_{ij}\right)} \sim N(0,1) \qquad Eq.(4)$$

Pesaran and Yamagata (2008) developed the below test that gives better results in larger panels.

$$LM_{adj} = \sqrt{\left(\frac{2}{N(N-1)}\right) \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{p}_{ij} \frac{(T-k)\hat{p}_{ij}^2 - \mu_{Tij}}{\sqrt{v_{Tij}^2}}} \sim N(0,1) \qquad Eq.(5)$$

k is the regressor number, and v is the predicted value of the variance of p_{ij} (Menyah, Nazlioglu, & Wolde-Rufael, 2014, pp.390-391).

3.2. CADF Unit Root Test

Cross-sectionally Augmented Dickey-Fuller (CADF) test developed by Pesaran (2007) is utilized for heterogeneous panels. Second generation tests, namely, the tests that consider cross-section dependence, should be used when the series are heterogeneous. Otherwise, the result may be fallacious. Unit effects are removed by adding cross-section averages in the CADF test to ADF. CADF is formulated as follows when there is no autocorrelation (Tatoğlu, 2017, p.85).

$$\Delta Y_{i,t} = a_i + p_i Y_{i,t-1} + d_0 \bar{Y}_{t-1} + d_1 \Delta \bar{Y}_t + \varepsilon_{i,t} \qquad Eq.(6)$$

$\bar{Y}_t$ in the equation means the cross-section average of $Y_{i,t}$. $\bar{Y}_t$ and $\bar{Y}_{t-1}$ values were used as an instrumental variable for common factors on the condition that there will be no autocorrelation in $\varepsilon_{i,t}$; corresponding values can also eliminate the unobservable effect. Regarding this equation, hypothesis theses are as follows:

H_0: $p_i = 0$ (for all i)

H_1: $p_i < 0$ $(i = 1,2, ..., N_i)$ and $p_i = 0 \sim (i = N_{i+1}, N_{i+2}, ..., N)$

CADF test statistic;

$$t_i(N,T) = \frac{\Delta Y_i' \bar{M}_w Y_{i,-1}}{\hat{\sigma}_i (Y_{i-1}' \bar{M}_w Y_{i,-1})^{1/2}} \qquad Eq.(7)$$

The equation gives the test statistics for each unit. CIPS panel test statistic is obtained by computing the average of these test statistics.

$$CIPS = N^{-1} \sum_{i=1}^{N} CADF_i \qquad\qquad Eq.(8)$$

3.3. Dumitrescu and Hurlin (2012) Panel Granger Causality Test

Granger's (1969) causality test is used in the literature to test several economic models. This is because, as mentioned by Granger (1969), causality analyses test whether the Y variable has useful information to estimate the values that a variable such as X will take in the future. Causality analyses that are used as time series have been utilized in panel data analyses as well (Das, 2019, p.400; Bozoklu & Yılancı, 2012, p.175). All the units in the panel have different effects on causality when this situation is followed within the frame of cross-section dependence. X and y, as two static variables in unit and time dimension in Dumitrescu and Hurlin (2012) test, as follows:

$$y_{i,t} = a_i + \sum_{k=1}^{K} \gamma_i^{(k)} y_{i,t-k} + \sum_{k=1}^{K} \beta_i^{(k)} x_{i,t-k} + \varepsilon_{i,t} \qquad\qquad Eq.(9)$$

There is $\beta_i = \beta_i^{(1)}, \beta_i^{(2)}, \dots, \beta_i^{K}$ in the equation. It is assumed that the unit effect is constant in the time dimension of a_i. $x_{i,t}$ and $y_{i,t}$ are observable variables. K shows the static lag length in all cross-sections. Hypotheses of this test that can be used for both heterogeneous and homogeneous models are as follows:

$$H_0 = B_i = 0 \ \forall_i = 1,2,\dots,N$$

$$H_1 = \beta_i = 0 \ \forall_i = 1,2,\dots,N_1 \qquad\qquad Eq.(10)$$

$$\beta_i \neq 0 \ \forall_i = N_1 + 1, N_1 + 2, \dots, N$$

N_1 here is not known as well as taking a value to be $0 \leq \frac{N_1}{N} < 1$. There is no causality among the units in the panel if $N_1 = N$. A causality among units can be talked about if $N_1 = 0$. The main hypothesis assumes that there is no causality under homogeneous units. It is compared to the alternative hypothesis assuming that there is causality in one unit at least.

Since Dumitrescu and Hurlin (2012) can be used for both heterogeneous and homogeneous panels, the test statistic that is utilized in the heterogeneous panel and unstable panels is as follows (Dumitrescu & Hurlin, 2012, p.1459).

$$\tilde{Z}_{N,T}^{HNC} = \frac{\sqrt{N\left[W_{N,T}^{Hnc} - N^{-1}\sum_{i=1}^{N} E(W_{i,T})\right]}}{\sqrt{N^{-1}\sum_{i=1}^{N} Var(W_{i,T})}} = \frac{\sqrt{N\left[W_{N,T}^{Hnc} - N^{-1}\sum_{i=1}^{N} K_1 \times \frac{(T_i - 2K_i - 1)}{(T_i - 2K_i - 3)}\right]}}{\sqrt{N^{-1}\sum_{i=1}^{N} 2K_i \times \frac{(T_i - 2K_i - 1)^2 \times (T_i - K_i - 3)}{(T_i - 2K_i - 3)^2 \times (T_i - 2K_i - 5)}}} \qquad Eq.(11)$$

Monte Carlo simulations that were applied to measure the power of the Dumitrescu and Hurlin (2012) test gave somewhat good results even in such small unit and time dimensions.

Table 2: Cross-Sectional Dependence and Slope Homogeneity Test Results

Test	GDP → GE	GE → GDP
LM	1265.44* (0.0000)	880.77*(0.0000)
CD_{LM}	115.41* (0.0000)	78.73* (0.0000)
CD	35.56* (0.0000)	28.19* (0.0000)
LM_{adj}	115.18* (0.0000)	78.50* (0.0000)
$\tilde{\Delta}$	161.7* (0.0000)	164.2* (0.0000)
$\tilde{\Delta}_{adj}$	25.23* (0.0000)	27.23* (0.0000)

Note: * is 1% of significance level; values in parenthesis are the probability values of tests.

LM, $\tilde{CD}_{LM}$, CD, LM_{adj} tests in the table were used to measure cross-section dependence; $\tilde{\Delta}$ and $\tilde{\Delta}_{adj}$ were used to measure the homogeneity; all the test results are significant at 1%. Since the series are heterogeneous and have cross-section dependence, the second-generation unit root tests were used in unit root and causality analyses.

Table 3: CADF Unit Root Test Result

Variables	Constant		Constant & Trend	
	CIPS-t.stat	p-value	CIPS-t.stat	p-value
GDP	-3.484*	0.000	-3.276*	0.000
GE	-2.732*	0.000	-2.854*	0.000

Note: Critical values of CADF at 1%, 5% and 10% levels respectively are-2.45, -2.25, -2.14 in constant model; -2.96, -2.76, -2.66 in constant & trend model. Lag length was specified as 1 for CADF test.

According to the CADF unit root test results in the Table, GDP and GE series are stationary from the first degree for the model with constant and the model with constant and trend. Therefore, the series were left at their level values in causality analyses.

Table 4: Dumitrescu and Hurlin (2012) Panel Granger Causality Test Results

The null hypothesis	k		t-stat.	Prob.
GE ↛ GDP	6	$\bar{Z}$	1.3206	0.1866
		$\tilde{Z}_{N,T}^{HNC}$	-0.4626	0.6436
GDP ↛ GE	6	$\bar{Z}$	22.4396*	0.0000
		$\tilde{Z}_{N,T}^{HNC}$	5.8339*	0.0000

Note: * is 1% of significance level; k is the lag length and was determined based on Akaike criteria.

Regarding the analysis in Table 4, there is causality from GDP to GE while there is no causality from GE to GDP. This is because Wagner's law is valid for EU member transition economies for the 1995-2019 period. Moreover, the results arising from this research are supported in the literature by Thornton (1999), Kolluri et al. (2000), Al-Faris (2002), Wu et al. (2010), Paparas and Stoian (2016), Abbasov and Aliyev (2018), Ağayev (2012).

4. Conclusion

The relationship between government expenditure and economic growth is a crucial issue that has been the focus of much attention in the literature. This relationship was analyzed for EU member transition economies by Dumitrescu and Hurlin's (2012) causality analysis for the 1995-2019 period. The conclusion of this study showed that Wagner's Law is valid for both the years covered by this study and the country groups. In other words, there is a one-way causality from the gross domestic product (GDP) to government expenditure (GE).

Since the country group in this study is part of the EU, it is known that they are on a specific growth increase and supported by the union. Therefore, even though they came from a centrally planned economy tradition, they are accepted as developing countries operating in the free market economy. Wagner's Law, indeed, focuses on the relationship between government expenditure and growth for the countries in the industrialization process.

At this point, it is expected that Wagner's law is valid for these transition economies because of their current status. Moreover, the analysis results also show that using government expenditure as a political tool in these countries will not be efficient. So, we believe that reviewing the relationship between price stability and government expenditure with growth will light the way for policymakers regarding EU member and non-EU member transition economies. In addition, the use of public expenditure as a policy tool in periods of disruption in the macroeconomic balance in transition economies will only create a disruptive effect on the fiscal discipline in practice. This is because Wagner sees the increase in public spending as a result of growth. In other words, in order to achieve sustainable growth dynamics, fiscal discipline must be respected. Besides, it is thought that monetary policy tools will play an influential role in resolving economic imbalances.

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