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ARAŞTIRMA MAKALESİ / RESEARCH ARTICLE

THE IMPACT OF PUBLIC DEBT ON GROWTH: A PANEL ANALYSIS IN SELECTED COUNTRIES*

KAMU BORÇLARININ BÜYÜME ÜZERİNDEKİ ETKİSİ: SEÇİLMİŞ ÜLKELERDE PANEL ANALİZİ

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Abstract

The existence of economic crises has created a need for new sources through economic history. Most of the time, public debt becomes crucial as a new source. For this purpose, the study tries to explain these questions: Is there any relationship between public debt and economic growth, and if there is a relationship between them what is the size or power of this effect. In this context, panel analysis has been made for selected 14 European countries which are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Luxembourg, Norway, Portugal, Spain, Sweden, and Turkey at the time of 1980-2017. The results indicated that public debt has a detrimental effect on economic growth with different shares, except Denmark and Norway.

Keywords: Public debt, Economic growth, Panel Analysis, AMG Estimator
JEL Code: H63, O40, C23

Öz

Ekonomi tarihi boyunca krizlerin varlığı yeni kaynaklara ihtiyaç duyulmasına neden olmuştur. Çoğu zaman kamu borcu yeni bir kaynak olarak önemli hale gelmektedir. Bu amaçla çalışma şu soruları açıklamaya çalışmaktadır: Kamu borcu ile ekonomik büyüme arasında bir ilişki var mıdır ve aralarında bir ilişki varsa bu etkinin büyüklüğü veya gücü nedir? Bu bağlamda, 1980-2017 döneminde Avusturya, Belçika, Danimarka, Finlandiya, Fransa, Almanya, Yunanistan, İtalya, Lüksemburg, Norveç, Portekiz, İspanya, İsveç ve Türkiye olmak üzere seçilen 14 Avrupa ülkesi için panel analizi yapılmıştır. Sonuçlar, Danimarka ve Norveç dışında, kamu borcunun ekonomik büyüme üzerinde farklı paylarla zararlı bir etkiye sahip olduğunu göstermiştir.

Anahtar Kelimeler: Kamu borcu, Ekonomik büyüme, Panel Analiz, AMG Tahmincisi
JEL Kodu: H63, O40, C23

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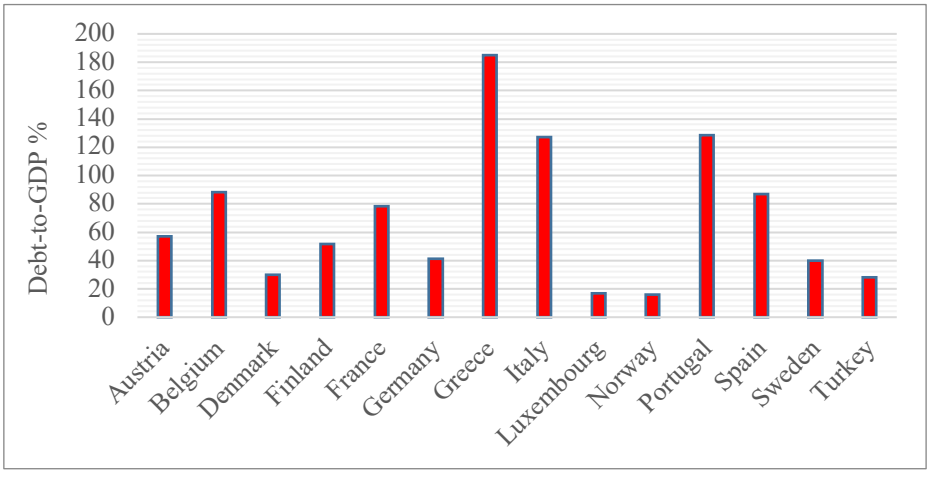
Introduction

The public debt, which can be considered as money that is taken in a time of need with the condition of repayment, is a concept especially considered after crisis periods and maintains its importance for economies. The most important reason for the subsistence of the public debt concept is a budget deficit. A budget deficit arises when there is an excess of government expenditure than government revenues. Basically, a budget deficit is a situation that lacks compensation of expenditures with revenues. There are several methods to finance budget deficits in literature which follow emission, taxation, and borrowing. Since emission causes inflation, and taxation has some limits; public debt seems like the most effective way to finance the budget deficit (Özçelik, 2005:1-6).

The report of the German National Academy pointed out that three intended purposes which are stabilizing function, bridging function, and burden sharing function, of the government debt. The stabilizing function provides to balance the economy according to economic performance, especially in crises periods. The second one, the bridging function, gives alternatives to the government when the tax channel becomes malfunctions. The last one, the burden sharing function decreases tax burden, and instead of a higher tax ratio government uses public debt. As it is understood, the debt channel can be used as a tool or target to close the deficit and stabilize the economy (Holtfrerich et al, 2015:1-80).

The materiality of public debt that has backwards-looking presence, gives a clue about the strong effect on economic growth. However, the direction of this impact becomes a much-debated issue in terms of economic growth. To be able to understand the place of debt in the economy, the debt-to-GDP ratio must pay regard as an essential tool. The debt-to-GDP ratio is the ratio of public net debt stock to GDP of nations. In the light of information and original data, which is explained in the later section, the debt-to-GDP ratios of selected countries are indicated in Figure 1.

Figure 1. The Debt-to-GDP Ratio



Source: International Monetary Fund (IMF)

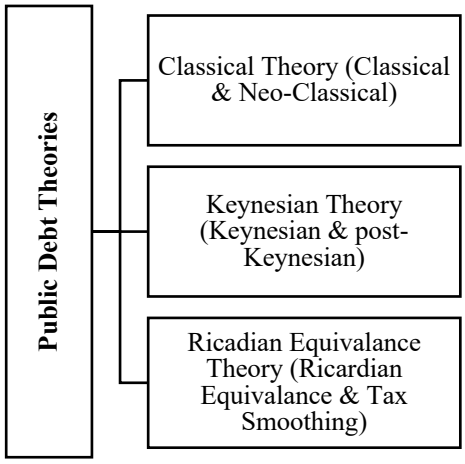
The debt-to-GDP ratio of selected countries, which are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Luxembourg, Norway, Portugal, Spain, Sweden, and Turkey, figured to understand the general view of these variables only for 2017. The figure has shown that Norway has the lowest debt-to-GDP ratio, then Luxembourg and Turkey follow respectively, while Greece has the highest public debt level.

The selected European countries faced different rates of public debt as expected. The share of the public debt, debt-to-GDP ratio, could be originated from nations' economic structures. Still, to enunciate the impact of public debt on economic growth clearly, considering the debt and growth level of each nation, the paper analyzed the relationship of public debt and economic growth via using panel analysis in selected fourteen European countries.

1. Theoretical Framework of Public Debt

Public debt plays a crucial role in the economy from past to present. In this context, being a debt becomes a topic that is always considered in the literature. The existence of different public debt theories explains the situation. Theories of public debt can be separated into three sections. These are Classical theory, Keynesian theory, and Ricardian Equivalence theory respectively (Butkus & Seputiene, 2018:6-62; Karazijienė, 2015:194-208). The theoretical framework of public debt is expressed in Figure 2.

Figure 2. The Theoretical Framework of Public Debt



Initially, Classical theory that is one of the public debt theories, consists of both the Classical approach and Neo-classical approach. The Neo-Classical approach is an extended version of the Classical approach which is based on the core idea of there is no need for government intervention in the economy except some basic areas such as education, health, and defense. These two approaches that have similar perspectives, emphasize the detrimental effect of government expenditures on economic growth when public debt is the matter is hand. The classical approach points out that the

repayment of public debt which includes debt itself and its interest imposes a burden to future generations or society. The other way around, the Neo-Classical approach expresses the effect of public debt in two ways: the rational people who know that repayment of government expenditures cover with higher taxes ratio, decreases consumption; plus, to finance its expenditures government sells its treasures and bonds (called as crowding-out effect). In either case, funds transfer from the private sector to the public sector (Bernheim,1989: 55-72; Karazijienė, 2015: 194-208). The view of Classical theory represents the adverse impact of public debt on economic growth.

Secondarily, the Keynesian theory includes both Keynesian and Post-Keynesian approaches. The post-Keynesian approach is based on the ground of Keynesian theory which emphasized fiscal policy and also the fact remains that Keynesian theory is the opposite of Classical theory via defense of the need for government intervention in the economy. However, Keynesian and Post-Keynesian approaches have divergent ideas about the existence of the public debt. Keynesian approach states that government expenditures do not create a burden on future generations because the reflections of repayment of public debt, taxation, and fulfilment of needs with a level of income generation are equal. Since the advantage and disadvantages of public debt are similar, aside from any burden, the presence of public debt allows economic growth (Karazijienė, 2015: 194-208). On the other hand, Buchanan (1958) who determinate of the Post-Keynesian approach points out that public debt has a real burden for the next generations. Thereby, Keynesian and Post-Keynesian approaches describe contrary conclusions about the effect of public debt on economic growth.

The last one involves Ricardian equivalence theory and tax smoothing theory in the same title. Despite Ricardian equivalence, a theory is mentioned for the first time in 1970 by Robert Barro, since David Ricardo is a pioneer to defend an identical opinion, the name of theory is endowed to him. According to Ricardian equivalence theory, borrowing and taxation have similar outcomes when financing government debt because rational people who know that state uses the power of levy to compensate its debt, also know today's tax cut is the same as tomorrow's tax boost (Bernheim,1989: 55-72). As the progress of Ricardian equivalence theory, Robert Barro explains tax smoothing theory which accepts the condition of constant tax rates. Therefore, a steady tax ratio allows for a wealth of citizens when public debt is used effectively. The situation represents that the adverse impact of public debt can be smoothed (Karazijienė, 2015: 194-208). That is to say, the last one of the public debt theories agrees with a negative effect of public debt has no big influences on economic growth. Besides these theories, Barro (1990:103-125) also has a "government spending model" which describes the effect of public debt on economic growth as regards usage areas of debt: If government expenditures use for non-productive resources, public debt diminish economic growth but if the government makes productive investments with using expenditures, economic growth is affected positively (Barro, 1990:103-125).

Considering all these theories, literature explains the effects of public debt with divergent theories. The impact of public debt can be categorized in second ways with regards to the theoretical framework. The first of these is that there is an adverse effect of public debt on economic growth which is based on approaches of Classical, Neo-Classical, and Post-Keynesians. The second one emphasizes the positive effect that depends upon the usage area of public debt, which are theories of Keynesian, Ricardian equivalence, and Barro's tax smoothing theories and government spending model.

2. Literature Review

The literature which is relative to public debt's effect on economic growth has a wide range in economic history. The materiality of public debt comes into view especially in war and crisis periods. Most of the studies represent detrimental effects of the public debt. Woo & Kumar (2010) indicated that a 10% increase in the debt-to-GDP ratio causes a 0.2% decrease in real per capita GDP. Advanced economies, however, have 0.15% decrease in real per capita GDP that is smaller than the general outcome. Canbek (2014) agreed with this idea and represented the negative effect of public debt, which is more apparent in emerging markets rather than advanced and developing as a result of cross-sectionally distributed lag (CS-DL), and mean group (MG) analyses. Another study that shows detrimental effect of public debt on economic growth, is made by Asteriou, Pilbeam and Pratiwi (2020), which panel analysis of selected Asian countries for the period of 1980–2012. The findings as a result of several econometric panel ARDL models represent that existence of a negative effect of the public debt ratio on economic growth, both in the short-run and long-run. Additional to this, the asymmetric response is only valid for short-run that an increase in public debt decreases growth but a decrease in public debt could not rise economic growth in the short-run.

The bottom line for some of these studies is that having particular and similar threshold values of the public debt. In this context, Reinhart & Rogoff make a major contribution to literature. The study involves forty-four countries (twenty advanced countries and twenty-four emerging countries) for the spanning period 1946 and 2009. The findings of the analysis, which is made separately, concluded that the presence of a high public debt-to-GDP ratio (90% threshold value) causes to decline of economic growth, while the threshold is 60% for the emerging markets. Cecchetti & Mohanty and Zampolli (2011), also found that the general threshold value is about 85% of GDP. Caner, & Grennes, and Koehler-Geib (2010) concluded that if the debt-to-GDP ratio is 77% for the general sample, economic growth decreases by 0.017%. The threshold value of only emerging markets is 64% which causes a 0.02% decrease in economic growth. Additionally, Chudik, Mohaddes, Pesaran & Raissi (2018) indicated above 60% of debt-to-GDP ratios tend to diminish economic growth. Besides these threshold discussions, Égert (2015) emphasized the absence of a certain threshold value because for the analysis threshold value is between 20% and 60%. Besides the other studies, Shahor (2018) estimated the high-level debt-to-GDP ratio that is about 130% by using quadratic regression and the data between the years 1983–2013 in Israeli economy. The author also indicated that an increase in public debt can rise economic growth at lower debt-to-GDP ratio level. Unlike the previous studies Law et al. (2021) found lower public debt-to-GDP ratio, which is 51.65% for seventy-one developing countries from 1984 to 2015, via using dynamic panel threshold estimation. Authors pointed out that the public debt has a significant negative effect above the threshold level and also existence of nonlinear relation between variables, since they found that below part of threshold value is positive but insignificant. According to authors, the harmful effect of public debt can tend to minimize via better institutions. Thus, the threshold value could change across countries and samples.

On the other side, Herndon, Ash & Pollin (2013) replicated the study of Reinhart & Rogoff. The findings of the authors, which created a tremendous impression in both academia and social life, represents opposite results than the study of Reinhart & Rogoff that the real GDP growth becomes 2.2%

within 90% threshold value. Differences between replicated and original studies explained as coding errors, selective exclusion of available data, and unconventional weighting of summary statistics by the Herndon, Ash & Pollin (2013). After the event, Krugman has written an article in The New York Times to criticize Reinhart and Rogoff as fiscal austerity supporter. He conveyed that *"austerity enthusiasts trumpeted that supposed 90 percent tipping point as a proven fact and a reason to slash government spending even in the face of mass unemployment"* (Krugman, 2013). The study that is analyzed by Puente-Ajovín & Sanso-Navarr (2015) in sixteen OECD countries from 1980 to 2009 emphasized that the fiscal austerity cannot be solution to stimulate economic growth because contrary to popular opinion that causality from public debt to growth, it is the household debt (non-financial private debt) that affect cause to economic growth. In addition, the government debt is the influenced by the growth instead to affect it. Ogawa, Sterken & Tokutsu (2016) have agreed with previous study since they found a causal relation from the economic growth to the public debt negatively. According to authors the negative growth shock enhancing public debt either a rise government expenditure in low-debt countries or a rise in long-term interest rates and so lower inflation rate in high-debt countries for 31 EU and OECD countries from 1995 to 2013. Moreover, Owusu-Nantwi and Erickson (2016) examine long-run relationship between the government debt and real GDP growth rate in Ghana via using both the Johansen cointegration and the vector error correction models for the period from 1970 to 2012. The authors found a statistically significant positive long-run association between the variables, which pointed out that a 1% increase in public debt, rise 2.8% in real GDP growth rate. Karagoz and Caglar (2016) also pointed out that positive correlation of external debt and growth for the seventeen OECD countries by using pooled regression, fixed effects and random effects models.

Some of the studies criticize existence of specific threshold value and conclude the possibility various relationship between public debt and economic growth. As an example, Panizza & Presbitero (2014) provided that the absence of the certain threshold value, and negative relationship between public debt and economic growth since the instrumented debt does not decrease economic growth. Donayre & Taivan (2017) examined the causality relationship between public debt and real economic growth od twenty OECD countries via canonical cointegrating regressions and Granger causality test for spanning period between 1970 and 2010. Authors conclude that uniqueness of causal link between variables to each country and higher debt cannot be always harmful for growth, considering the results that modern welfare states, which are restrict government intervention faced with lower growth following rise in public debt while traditional welfare states conducted with larger government faced either causality from low growth to public debt or bidirectional causality. Additionally, Ndoricimpa (2020) made panel smooth transition regression analysis for four country groups, which are low – and middle-income countries, resource – and non-resource intensive countries in Africa. Authors found public debt threshold is in the range between 62% and 66% for the whole sample. The threshold level is in the range of 58% and 63% for middle-income and resource-intensive countries, while the linearity between public debt and growth is hold for low-income countries and non-resource intensive countries. One of the interesting results is that the debt threshold level differentiated depending on the estimation technique. Author represented that public debt-to-GDP rises beyond around 60% within exogeneity assumption debt, while it is around 74% within endogeneity assumption. Additional to existence of different threshold level, Ndoricimpa emphasized that low debt level associated with either growth neutral or growth enhancing but higher public debt has detrimental effect on growth.

Rahman, Shafinar & Ridzuan (2019) finished the discussion as examine thirty-three articles using SCOPUS database to explain whether there exists mutual consensus on the impact of public debt on the economic growth. The authors found the inverse relationship between public debt and economic growth represented by the twenty of these articles. Nevertheless, the authors emphasized that there is no mutual consensus on the association between public debt and economic growth, which can be positive, negative, and non-linear, since the relationship could be positive if the public debt used for leading productive purposes. The whole existing studies about the effect of public debt on economic growth have a different perspective. Herewith, each study in the literature has own unique conclusion. Therefore, the study made panel analysis, which is differentiated from the others due to the sample and analysis, to understand the long-term impact of public debt on economic growth for the fourteen selected countries.

3. Data and Methodology

3.1. Data set

This section of the study purposes to use a method of panel analysis to research the relationship impact of debt-to-GDP ratio on economic growth. Data set of panel analysis consist of Real Gross Domestic Product (RGDP) growth, debt-to-GDP (DEBT) ratio, and gross fixed capital formation (GCF) for the time of 1980-2017 and selected 14 European countries which are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Luxembourg, Norway, Portugal, Spain, Sweden, and Turkey. The aim of the study is that examine the situation for Europe countries. The recent availability of public debt data, however, has limited the study to only selected country groups in order to see the long-term effects of the study. Therefore, the selected countries considered due to availability and period of data. The code and content of the variables are involved in Table 1.

Table 1. Explanation of the Data Set

Variables	Variable Code	Interpretation [1]	Source
Real GDP	RGDP	The growth rate shows the percentage change in GDP compared to the previous year.	Organization for Economic Co-operation & Development (OECD) Statistics
Debt-to-GDP ratio	DEBT	The total stock of debt liabilities issued by the central government as a share of GDP.	International Monetary Fund (IMF)
Gross fixed capital formation	GCF	Gross fixed capital formation includes the percentage of weighted means of the current and previous year.	World Bank Indicators (WBI)

The source of variables is different. The economic growth is taken from OECD statistics, the debt-to-GDP ratio is taken from the International Monetary Fund and gross fixed capital formation is obtained from the World Bank. These three-variable used as a ratio in the analysis. The RGDP and DEBT are imported as ratios directly. To ensure the integrity of analyses, however, GCF becomes ratio via weighted mean of the previous year. Thus, variables are real, seasonality adjusted, and the ratio

1 Explanation of interpretations are taken by sources.

that is prepared for the analyses. Associated with the determination of the data set, the panel model comprises available variables which are expressed as:

$$RGDP_{it} = \beta_0 + \beta_1 DEBT_{it} + \beta_2 GCF_{it} + u_{it} \quad (4.1)$$

where *i*=1, 2, …, N that is sample observations or cross-sections and *t*=1, 2, …, T that is time period.

Depending on a simple regression model of panel data analysis, the panel model of the study is constituted in Equation 4.1. The explained or dependent variable of the study is RGDP that means real gross domestic product growth rate and explanatory or independent variables come from DEBT and GCF. DEBT represents a debt-to-GDP ratio that is the main explanatory variable of the study while GCF indicates weighted mean ratios of gross fixed capital formation which is an auxiliary variable for the study. In Equation 4.1, β_0 shows constant, and β_1 and β_2 demonstrate parameters or coefficients of variables. Since panel analysis includes 14 European countries for the period between 1980-2017; N and T equal 14 and 38 respectively.

3.2. Estimation methods

The section consists of panel analysis when investigating the effect of DEBT on RGDP. In this context, the method of panel ARDL is used for the panel analysis of selected fourteen European countries. Since the panel data compromise of a combination of time series and cross-section, the cross-sectional dependence should be discussed in this analysis. The cross-sectional dependence is that every series are affected by any shock that only one series is faced. To sum up, each series are dependent on another in the data set (Henningsen & Henningsen, 2019: 345-396). The panel ARDL analysis requires the testing process of unit root testing, homogeneity, and cross-sectional dependence test are vital for panel ARDL.

Addition to this, distinctly from time-series ARDL, panel ARDL used homogeneity tests. Both tests are substantial because the existence of heterogeneity and dependency can change the types of tests used in analyses. Following these, the cointegration should be tested to explain whether the existence of the relationship between public debt and economic growth. The last one of the analyses is Augmented Mean Group (AMG) estimation that is used to measure the direction of the relationship between debt-to-GDP ratio and economic growth.

The section is as follows: First of all, the slope homogeneity is estimated which is used to understand whether data are homogenous or heterogeneous. The slope homogeneity is tested with Pesaran and Yamagata (2008). Secondly, a cross-sectional dependency test is analyzed to determine whether and dependency exists or not. For this analysis, Pesaran's CD test (2004) is used. Thirdly, panel unit roots are tested via Pescadf tests to understand whether variables are stationary or not. These tests are appropriate for analyses because it allows for cross-sectional dependence. Fourthly, after panel unit root analyses, the cointegration should be tested to explain the effect of the public debt on economic growth. For this purpose, Westerlund (2007) panel cointegration test is performed. The last one of the analyses is Augmented Mean Group (AMG) estimation

that is used to measure the direction of the relationship between debt-to-GDP ratio and economic growth.

4. Estimation Results

Panel data mostly creates cross-section dependency problem and heterogeneity problems. Therefore, these should be analyzed in the first place. At the beginning of the analysis, the slope homogeneity test, which is called Delta (Δ) test by Pesaran and Yamagata (2008) applied. According to this test, slope coefficients play an important role to explain homogeneity or heterogeneity. Test results are represented in Table 2.

Table 2. Estimation Results of Slope Homogeneity Test

Test	Delta	p-value
Δ	5.167	0.000
$\Delta_{adj.}$	5.462	0.000

The results of Delta (Δ) and adjusted Delta ($\Delta_{adj.}$) statistics indicate H_0 should be rejected since probability values are significant at a 1% level. Thus, slope coefficients are different for cross-sectional units (presence of heterogeneity) (Pesaran & Yamagata, "Testing Slope Homogeneity in Large Panels", 2008)

Additional to slope homogeneity testing, cross-sectional dependence is tested by Pesaran's CD test. Initially, cross-sectional dependence is applied by Breusch Pagan (1980). Then, Pesaran developed the CD test (2004), however, based on the thought that when samples become large, the deviation of test results increases. Therefore, the CD test implies that the correlation of cross-section must not be equal to zero to avoid deviations (Hsiao, Pesaran, & Pick, 2007:1-25; & Pesaran, 2004:1-42). The findings of the Pesaran CD Test are shown in Table 3.

Table 3. Results of Pesaran CD Test

Variable	CD-test	p-value
RGDP	27.878	0.000
DEBT	15.477	0.000
GCF	40.385	0.000

The results of the cross-sectional dependency test respond to higher CD-tests values for RGDP, DEBT, and GCF. Since p-values of test results are smaller than 0.05, H_0 can be rejected. Herewith, the consequence of the analysis is that there is a cross-sectional dependency between variables. After this point, the methods of analysis and types of tests used should be accordant with the cross-sectional dependence condition.

Associated with the completion of the cross-sectional analysis, the unit roots should be tested for several methods Deciding on the unit root test, which are sensitive to for cross-sectional dependency problem, should be chosen and it is checked whether this problem exists in the data. The study performs Pesaran CADF as panel unit root testing. The CADF test is developed by Pesaran in 2007 on

the purpose of considering the existence of cross-sectional dependency. In this context, CADF is the abbreviation of a Cross-sectionally Augmented Dickey-Fuller test (Costantini & Lupi, 2011:1-47). Thus, the test allows checking cross-sectional dependence between the variables. The Pescadf test is analyzed for no and one lag which is shown in Table 4.

Table 4. Estimation Results of Pescadf Test

Variables	Lags	T-bar	Z[T-bar]	P-value
RGDP	0	-4.154	-9.488	0.000*
	1	-3.719	-7.758	0.000*
DEBT	0	-1.380	1.554	0.940
	1	-1.572	0.788	0.785
GCF	0	-4.725	-11.762	0.000*
	1	-3.773	-7.972	0.000*
ΔDEBT	0	-4.341	-10.234	0.000*
	1	-3.367	6.358	0.000*

(*) The significance is measured by a 5% probability level which shows stationary series.

Depending on the estimation results of the Pescadf test, RGDP and GCF are stationary for both zero and one lags since p-values are lower than 5% or rejection of the null hypothesis that is the existence of unit root. There are no unit-roots for these variables at their level. However, the DEBT has a unit root at its level and so it requires to take first differences. The first difference of the variable is ΔDEBT and it is stationary for zero and one lag structure.

After performing panel unit root tests, to analyze the cointegration relationship between the data, the study uses Westerlund (2007) cointegration test. The Westerlund test makes a cointegration analysis by testing whether the whole or each member of panel data has error correction. The Westerlund test is the best option to make a cointegration analysis for two reasons in this study. The first of these is the existence of heterogeneity between the slope coefficients of variables and the second one is the presence of cross-sectional dependency. Since the Westerlund allows for a large degree of heterogeneity between variables and cross-sectional dependency, it is the optimal test for cointegration analysis in the study. (Persyn & Westerlund, 2008:232-241). The estimation results of the Westerlund cointegration test are shown in Table 5.

Table 5. Estimation Results of Westerlund Cointegration Test

Statistics	Value	Z-value	P-Value	Robust P-Value
G_t	-4.578	-9.119	0.000	0.000*
G_a	-17.155	-1.798	0.036	0.004*
P_t	-14.994	-7.133	0.000	0.000*
P_a	-16.837	-3.515	0.000	0.000*

The significance is measured by a 5% (*) probability level

In Table 5, the statistics of Gt and Ga represent group-mean tests statistics while Pt and Pa show panel test statistics. The estimation of the Westerlund test is analyzed considering optimum

options about constant, trend, lags, leads, and bootstrap. The bootstrap options consist of multi-repetitions of significant cointegration tests. Therefore, these options decrease the effects of cross-sectional dependency (Persyn & Westerlund, 2008:232-241; Burret, Feld, & Köhler, 2014:1-27). According to test results, both group-mean (G_t, G_a) and panel test statistics (P_t, P_a) are significant to explain the cointegration relationship between variables since statistics are meaningful at a 5% significance level for p-value and especially robust p-value. The findings of the analysis lay stress on whether the effect of DEBT on RGDP is valid or significant for Westerlund cointegration tests. In other words, according to the results of panel analyses, the relationship between the debt-to-GDP ratio on economic growth is meaningful in the long run for 14 European countries for the period of 1980-2017.

Associated with the existence of a cointegration relationship of variables, explanations of long-term relationships should need to arise in terms of form and degree of relationships. In this context, Mean Group (MG) and Pooled Mean Group (PMG) are the most preferred estimators for panel ARDL analyses. However, both estimation methods do not resist in terms of cross-sectional dependency despite allowing it. In this context, instead of using these estimators, the study uses an augmented mean group estimator to estimate panel analysis of the relationship between debt-to-GDP ratio and economic growth.

A type and improved version of mean group estimators, Augmented Mean Group (AMG) estimator is developed by Eberhardt and Teal in 2010. Like other types of mean group estimators, the AMG estimator permits of estimation of group-specific regression for each unit of the panel (Eberhardt & Bond, 2009). In addition, the otherness of AMG is having an option that imposes a common dynamic process to analyze. However, this option cannot be included in this analysis. Table 6 represents the ultimate long-term coefficients of AMG estimation.

Table 6. Estimation Results of AMG

Augmented Mean Group (AMG)				
Variables	**Coefficient**	**Standard Error**	**z**	**(P>|z|)**
DEBT	-.0269518	.0022074	-12.21	0.000*
GCF	.1203738	.009884	12.18	0.000*
AMG Diagnostic Test Results:				
Wald chi2(2) = 297.39				
Prob > chi2 = 0.000				

The results of augmented mean group estimators are significant at a 1% level for both DEBT and GDP variables. Thus, an increase in 1% of debt-to-GDP ratio diminishes economic growth by about 0.03% and a rise in 1% of the gross fixed capital formation increases economic growth by nearly 0.12% for the long-term. Simply, there is an inverse relationship between public debt and economic growth while economic growth and gross fixed capital formation have positive relationships in the long run. The additional option of AMG analysis is group-specific coefficients that show coefficients of each member of the panel. By this means, coefficients of fourteen European countries are represented to understand the effects of variables on a country basis in Table 7.

Table 7. Results of AMG Group-specific Coefficients

Group-specific coefficients (AMG)						
	DEBT			**GCF**		
Countries	**Coefficients**	**Standard Error**	**z (P>|z|)**	**Coefficients**	**Standard Error**	**z (P>|z|)**
Austria	-.0490323	.0218536	-2.24** (0.025)	.070996	.0171269	4.15* (0.000)
Belgium	-.0287903	.0109992	-2.62* (0.009)	.0991466	.0125201	7.92 * (0.000)
Denmark	.0200207	.0102057	1.96** (0.050)	.1014765	.0121952	8.32* (0.000)
Finland	-.0285143	.0152282	-1.87*** (0.061)	.1712	.0154506	11.08* (0.000)
France	-.0235149	.0059353	-3.96* (0.000)	.0920679	.0116997	7.87* (0.000)
Germany	-.0295689	.0174506	-1.69*** (0.090)	.1375489	.0175802	7.82* (0.000)
Greece	-.0223546	.0068077	-3.28* (0.001)	.164913	.0204652	8.06* (0.000)
Italy	-.0303203	.0071282	-4.25* (0.000)	.1141321	.0122466	9.32* (0.000)
Luxembourg	-.1933697	.0651785	-2.97* (0.003)	.1254816	.0192744	6.51* (0.000)
Norway	.1164701	.0399286	2.92* (0.004)	.0705878	.0222518	3.17* (0.002)
Portugal	-.0237474	.0075558	-3.14* (0.002)	.147939	.0160102	9.24* (0.000)
Spain	-.0202475	.0075351	-2.69* (0.007)	.133074	.0102445	12.99* (0.000)
Sweden	.0073896	.0180965	0.41 (0.683)	.0994772	.0165135	6.02* (0.000)
Turkey	-.0785798	.0365525	-2.15** (0.032)	.1577783	.0176948	8.92* (0.000)

Dependent variable: RGDP
Explanatory variables: DEBT and GCF
*1%, 5% and 10% significance levels are represented by *, **, ** respectively.*

Group-specific coefficient results of AMG indicates that all variables are statistically significant from different level for two independent variables except the only debt-to-GDP ratio of Sweden. The DEBT is significant at 1% level in Belgium, France, Greece, Italy, Luxembourg, Norway, Portugal, and Spain; significant at 5% level in Austria, Denmark, and Turkey; significant at 10% level in Finland and Germany while it is not statistically significant for any level in Sweden. The long-term relationship of DEBT results shows that except Denmark and Norway, which are positively related, eleven European countries are negatively related to RGDP. A 1% increase in debt-to-GDP ratio diminishes economic growth by about 0.03% for Belgium, Finland, France, Germany, Greece, Italy, Portugal, and Spain; and it decreases RGDP by approximately 0.05% for Austria; 0.08% for Turkey; and 0.20% for Luxembourg. Additional to this, a 1% increase in DEBT rises economic growth by about 0.11%

for Norway and 0.02% for Denmark, but there is no statistically significant relationship between DEBT and RGDP for Sweden. Secondly, the effect of GCF on RGDP is statistically significant at 1% for all variables and fourteen European countries. Moreover, a 1% increase in gross fixed capital formation affects economic growth positively for all European countries. The lowest rise is about 0.08% for Norway and Austria and the highest raise is approximately 0.18% for Finland and Greece. The condition of other countries is between these intervals.

Conclusion

Public debt, one of the most preferred methods to inject funds into the economy, is an overemphasized issue lately. The reason is that public debt can cause differential effects on the economy. The impacts of public debt matter for all economies since policymakers want to know how public debt impresses economic growth as a result of the fund-raising method. In this context, the study analyses the effects of public debt on economic growth for selected European countries.

Panel analysis is made for the spanning period of 1980-2017 and selected fourteen European countries. Estimation results of panel analysis show that there is an inverse relationship between public debt and economic growth except for Denmark, Norway which are positively related, and Sweden that is not statistically significant. The percentage of effects of public debt makes differences for each European country. An increase in 1% of public debt pointed out that the lowest impact is about 0.03% in Spain while the highest diminish is about 0.20 % in Luxembourg.

As a consequence of panel analysis, the existence of public debt creates a negative impact on economic growth in the long-term exactly. Policymakers should consider this adverse effect of public debt when deciding to use it in the economy. The general effect of debt represents that size of the effect is about a thousand which means it is not excessive. Correspondingly public debt can be a feasible method for economies. At this point, how public debt is injected into the economy is important. When public debt is used to improve and strengthen the economy, the repayment of debt becomes easier. Indeed, the study emphasizes that impact of public debt depends upon the usage area of the debt, which is directly relevant and hold the views of Keynesian, Ricardian equivalence, and Barro's tax smoothing theories and government spending model.

References

BERNHEIM, Douglas B. (1987). "Ricardian Equivalence: An Evaluation of Theory and Evidenceé. *NBER Working Paper Series*, 263-316.

BERNHEIM, Douglas B. (1989). "A Neoclassical Perspective on Budget Deficits". *Journal of Economic Perspective*, 55–72

BUCHANAN, James M. (1958). "Public Principles of Public Debt".

BURRET, Heiko T., FELD, Lars. P., & KÖHLER, Ekkehard. A. (2014). "Panel Cointegration Tests on the Fiscal Sustainability of German Laender". *Cesifo Working Paper,1-27*.

BUTKUS, Mindaugas., & SEPUTIENE, Janina. (2018). "Growth Effect of Public Debt: The Role of Government Effectiveness and Trade Balance". *Economies (MDPI),6-62*.

CANBEK, Duygu. (2014). "Public Debt and Growth: An Empirical Investigation". *METU*.

CANER, Mehmet, GRENNES, Thomas, & KÖHLER-GEIB, Fritzi. (. (2010). "Finding the Tipping Point—When Sovereign Debt Turns Bad.". *The World Bank Policy Research Working Paper*.

CECCHETTI, Stephen G., MOHANTY, Madhusudan S., & ZAMPOLLI, Fabrizio. (2011). "The Real Effects of Debt". *BIS Working Papers*, No.352.

CHUDIK, Alexander., MOHADDES, Kamiar., PESARAN, Hashem M., & RAISSI, Mehdi (2018). "Rising Public Debt to GDP Can Harm Economic Growth". *Dallas Fed Vol.13, No.3*.

COSTANTINI, Mauro, & LUPI, Claudio (2011). "A Simple Panel-CADF Test for Unit Roots". Institute for Advanced Studies, Vienna,1-47.

DIMITRIOS, Asteriou, PILBEAM, Keith, and PRATIWI, Cecilia Eny. "Public debt and economic growth: panel data evidence for Asian countries." *Journal of Economics and Finance* 45.2 (2021): 270-287. BARRO, Robert J. (1990). "Government Spending in a Simple Model". *Journal of Political Economy* , 103-125.

DONAYRE, Luiggi &TAİVAN, Ariuna (2017). "Causality between Public Debt and Real Growth in the OECD: A Country-by-country Analysis". *Economic Papers: A journal of applied economics and policy*

EBERHARDT, Markus, & BOND, Stephen (2009). "Cross-section Dependence in Nonstationary Panel Models: A Novel Estimator". *Munich Personal RePEc Archive (MPRA),1-28*.

HERNDON, Thomas, ASH, Michael, & POLLIN, Robert. (2014). Does high public debt consistently stifle economic growth? A critique of Reinhart and Rogoff. Cambridge journal of economics, 38(2), 257-279.

HSIAO, Cheng, PESARAN, M. Hashem, & PICK, Andreas (2007). "Diagnostic Tests of Cross Section Independence for Nonlinear Panel Data Modelsé. *DNB Working Paper,1-25*

HENNINGSEN, Arne, & HENNINGSEN, Geraldine (2019). *"Panel Data Econometrics"*. Academic Press,1-404.

HOLTFRERICH, Carl-Ludwig, FELD, Lars P., HEUN, Weun, ILLING, Gerhard, KIRCHGÄSSNER, Gebhard, KOCKA, Jürgen, SCHULARICK, Moritz, STREECK, Wolfgang, WAGSCHAL, Uwe, WALTER, Stefanie ,WEIZSÄCKEr, Carl C. (2015). "Government debt: causes, effects and limits". *German National Academy of Sciences Leopoldina,1-80*.

KARAGOZ, Murat; CAGLAR, Mehmet. Does debt really crack the whip? Evidence from a panel of selected OECD countries. Procedia economics and finance, 2016, 38: 430-437.

KARAZIJIENĖ, Žaneta (2015). "Critical Analysis of Public Debt and Tendencies of Its Management". *Viešoji politika ir administravimas.*, 194-208.

KRUGMAN, Paul (2013). "The Excel Depression". *The New York Times.* "*https://www.nytimes.com/2013/04/19/opinion/krugman-the-excel-depression.html*"

LAW, Siong Hook, NG, Chee Hung, KUTAN, Ali. M., & LAW, Zhi Kei (2021). "Public debt and economic growth in developing countries: Nonlinearity and threshold analysis." *Economic Modelling*, 98, 26-40.

NDORICIMPA, Arcade. "Threshold effects of public debt on economic growth in Africa: a new evidence. *Journal of Economics and Development*", 2020.

RAHMAN, Nur Hayati Abd, ISMAIL, Shafinar & RIDZUAN, Abdul Rahim | MCMILLAN, David (Reviewing editor) (2019) "How does public debt affect economic growth? A systematic review, Cogent Business & Management," 6:1, DOI: 10.1080/23311.975.2019.1701339

OGAWA, Kazuo; STERKEN, Elmer; TOKUTSU, Ichiro. Public debt, economic growth and the real interest rate: A panel VAR approach to EU and OECD countries. Economic Growth and the Real Interest Rate: A Panel VAR Approach to EU and OECD Countries (January 29, 2016), 2016.

OWUSU-NANTWI, Victor; ERICKSON, Christopher. Public debt and economic growth in Ghana. *African Development Review*, 2016, 28.1: 116-126.

ÖZÇELIK, İsmail Y. (2005). "Kamu Borç Yükü – Borçlanmanın Sürdürülebilirliği İlişkisi ve Türkiye Uygulaması". *T.C. Erciyes Üniversitesi, Sosyal Bilimler Enstitüsü, 1-128*.

PANIZZA, Ugo, & PRESBITERO, Andrea F. (2014). "Public debt and economic growth: Is there a causal effect?". *Journal of Macroeconomics*, 21-41.

PERSYN, Damiaan, & WESTERLUND, Joakim. (2008). "Error-Correction–Based Cointegration Tests for Panel Data". *The Stata Journal*, 232-241.

PESARAN, Mohammad H. (2004). "General Diagnostic Tests for Cross Section Dependence in Panels". *University of Cambridge & USC,1-42*.

PUENTE-AJOVÍN, Miguel; SANSO-NAVARRO, Marcos. Granger causality between debt and growth: Evidence from OECD countries. International Review of Economics & Finance, 2015, 35: 66-77.

SHAHOR, Tal. The impact of public debt on economic growth in the Israeli economy. *Israel Affairs*, 2018, 24.2: 254-264.

WOO, Jaejoon & KUMAR, Manmohan S. (2010). "Public Debt and Growth". *IMF Working Papers*, No. 10/174

KAMU BORÇLARININ BÜYÜME ÜZERİNDEKİ ETKİSİ: SEÇİLMİŞ ÜLKELERDE PANEL ANALİZİ

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Amaç

Çalışma bu sorulara cevap aramaktadır:

- Kamu borcu ile ekonomik büyüme arasında bir ilişki var mıdır ve aralarında bir ilişki varsa bu etkinin büyüklüğü veya gücü nedir?
- Karşılaştırılan Avrupa ülkelerinde farklılıklar söz konusu mudur?
- Sonuçlar kamu borcu-büyüme teorileri ile ilişkilendirilebilir mi?

Tasarım ve Yöntem

Bu bağlamda, 1980-2017 döneminde seçilen 14 Avrupa ülkesi için panel analizi yapılmıştır. Öncelikle, verilerin homojen mi yoksa heterojen mi olduğunu anlamak için kullanılan eğim homojenliği tahmin edilir. Eğim homojenliği Pesaran ve Yamagata (2008) ile test edilmiştir. İkinci olarak, bağımlılığın var olup olmadığını belirlemek için bir yatay kesit bağımlılık testi analiz edilir. Bu analiz için Pesaran'ın CD testi (2004) kullanılmıştır. Üçüncü olarak, değişkenlerin durağan olup olmadığını anlamak için panel birim kökleri Pescadf testleri ile test edilir. Bu testler yatay kesit bağımlılığına izin verdiği için analizler için uygundur. Dördüncü olarak, panel birim kök analizlerinden sonra kamu borcunun ekonomik büyüme üzerindeki etkisini açıklamak için eş bütünleşme test edilmelidir. Bu amaçla Westerlund (2007) panel eş bütünleşme testi yapılmıştır. Analizlerden sonuncusu, borç-GSYİH oranı ile ekonomik büyüme arasındaki ilişkinin yönünü ölçmek için kullanılan Augmented Mean Group (AMG) tahminidir.

Bulgular

Sonuçlar, Danimarka ve Norveç dışında, 11 Avrupa ülkesi için kamu borcunun ekonomik büyüme üzerinde farklı paylarla zararlı bir etkiye sahip olduğunu göstermiştir. İsveç verileri istatistiksel

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olarak anlamlı bir sonuç bulmamıştır. Kamu borcunun etkilerinin yüzdesi, her Avrupa ülkesi için farklılık göstermektedir. Kamu borcundaki %1'lik bir artışın, en düşük etkinin İspanya'da yaklaşık %0.03 olduğuna, en yüksek düşüşün ise Lüksemburg'da yaklaşık %0.20 olduğuna işaret etti. Çalışma, kamu borcunun etkisinin, doğrudan ilgili olan ve Keynesyen, Ricardocu denklik ve Barro'nun vergi yumuşatma teorileri ve hükümet harcama modelinin görüşlerini taşıyan borcun kullanım alanına bağlı olduğunu vurgulamaktadır.

Sınırlılıklar

Çalışma sadece seçilmiş Avrupa ülkelerine odaklanmıştır. Kamu borcu verisinin yakın tarihlerde ulaşılabilir olması, çalışmanın uzun dönem etkilerini görebilmek adına çalışmanın seçilen ülke grupları ile sınırlı kalmasına neden olmuştur. Çalışmada bulunmayan ülkeler için bu sonucu genellemek doğru olmayacaktır.

Öneriler (Teorik, Uygulama ve Sosyal)

Kamu borcunun varlığı, mevcut dönemde Danimarka ve Norveç için ekonomik büyüme anlamına gelmektedir. Diğer ülkelere bakıldığından en çok negatif etkilenen ülke %0.02 Lüksemburg'dur. Bu nedenle kamu borcu büyümeyi destekleyici bir araç olarak kullanılabilir. Ancak önemli olan bu kaynağın kullanılacağı alandır. Kamu borcu istihdamı ve büyümeyi artıracak verimli ve doğru yerlerde kullanılmaz ise borcun büyüme üzerindeki etkisi kaçınılmaz bir şekilde negatif olacaktır.

Özgün Değer

Kamu borcunun büyüme üzerindeki etkileri sıklıkla tartışılsa da mevcut çalışmalar bulgular bakımından farklılıklar göstermektedir. Çalışma seçilmiş Avrupa ülkeleri açısından değerlendirilmesi ve kullanılan metodoloji bakımından özgündür. Bu nedenle kamu borcu literatürüne, mevcut örneklem dahilinde, borcun büyüme üzerindeki etkisini anlamak açısından katkı sağlamaktadır.