



The Impact of Public Debt on Economic Growth in Türkiye and PIIGS Countries ¹

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Abstract

In economies, borrowing may be resorted to in case of insufficient tax and tax-like revenues in financing public expenditures. In this respect, public debts are essential for financing growth and development. The effects of public debts, among the natural income sources of economies, on economic growth are intensely discussed today. The relationship between public debt and economic growth is important, especially in developing countries and relatively fragile economies where savings are insufficient to finance investments. This study aims to reveal the effects of public debt on economic growth in Portugal, Ireland, Italy, Greece, and Spain (PIIGS), which are considered the fragile economies of the Eurozone, and also in Türkiye. For this purpose, the study's findings, which analyze the panel data of the relevant countries for the period 1998-2022, basically conclude that public debt positively affects economic growth in Türkiye and PIIGS countries. These findings emphasize the importance of accurately formulating public borrowing policies and implementing appropriate strategies for economic growth in the relevant countries.

Keywords: Public debt, economic growth, Türkiye, PIIGS countries, panel data
Jel Codes C23, H63, O40

Türkiye ve PIIGS Ülkelerinde Kamu Borcunun Ekonomik Büyüme Üzerindeki Etkisi

Özet

Ekonomilerde kamu harcamalarının finansmanında vergi ve vergi benzeri gelirlerin yetersizliği durumunda borçlanma yoluna gidilebilmektedir. Bu yönüyle kamu borçları büyüme ve kalkınmanın finansmanında önemli bir kaynak olarak görülmektedir. Ekonomilerin doğal gelir kaynakları arasında yer alan kamu borçlarının ekonomik büyüme üzerindeki etkileri bugün yoğun şekilde tartışılmaktadır. Kamu borçları ve ekonomik büyüme arasındaki ilişkinin tespiti özellikle yatırımların finansmanında tasarrufların yetersiz kaldığı gelişmekte olan ülkelerde ve görece kırılgan ekonomilerde önemli bir yere sahiptir. Bu çalışmada da amaç Avro Bölgesi'nin kırılgan ekonomileri olarak görülen Portekiz, İrlanda, İtalya, Yunanistan ve İspanya (PIIGS) ile Türkiye özelinde kamu borçlarının ekonomik büyüme üzerindeki etkilerini ortaya koymaktır. Bu amaca yönelik olarak 1998-2022 dönemi için ilgili ülkelere ait panel verilerin analiz edildiği çalışmanın bulgularında temel olarak Türkiye ve PIIGS ülkelerinde kamu borçlarının ekonomik büyüme üzerinde pozitif etkilere sahip olduğu sonucuna ulaşılmaktadır. Bu bulgular ilgili ülkelerde kamu borçlanmasına yönelik politikaların doğru şekilde oluşturulmasının ve uygun politikaların belirlenmesinin ekonomik büyüme üzerindeki önemine vurgu yapmaktadır.

Anahtar kelimeler:Kamu borcu, ekonomik büyüme, Türkiye, PIIGS ülkeleri, panel veri
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1. INTRODUCTION

States resort to various ways of financing their expenditures to meet increasing social needs. These are ordinary public revenues such as taxes, fees, levies, parafiscal, penalties, and property and enterprise revenues. However, reasons such as war, natural disasters, budget deficits, economic crises, large infrastructure investments, and increasing public expenditures, which are seen as insufficient public revenues, lead states to borrow. Public borrowing, referring to the debts incurred by the state or other public institutions, is also known as government borrowing. Public debt shows how much public expenditures are met by borrowing instead of taxation.

The government can borrow through treasury bills, bonds, loans from the Central Bank, or commercial banks. Borrowing resources can be obtained from domestic and foreign markets. Effective and efficient utilization of these resources will positively affect macroeconomic balances, particularly economic growth.

Economic growth is a country's total output (goods and services) over a specific period. It also reflects the rise in the economy's capacity to produce goods and services over time, representing an increase in national income accumulation. A country's effectiveness in the international economy is closely linked to economic growth. In the long run, economic growth offers advantages to countries, such as capturing advanced technology opportunities and providing various economic, ideological, and institutional benefits to society.

Economic growth and development are the main goals for developing countries. Development is a concept that includes economic growth as well as economic, political, and social areas. To realize countries' growth and development goals, governments must overcome savings deficits and the underinvestment problem arising from insufficient capital accumulation through borrowing. At this point, the source from which the public sector borrows and in which areas it uses the resources provided are significant. Therefore, the choice of the source of borrowing and the use of the borrowed funds in the regions that will increase production and employment are the factors that should be taken into consideration.

Although the public sector's intervention in economic policies in the face of increasing market failures is considered necessary for stabilization and redistribution, it has occasionally led to deviations from these objectives. When the fact that macroeconomic variables affect each other is ignored, the economic policies implemented lead to these deviations. This study aims to solve this problem by minimizing the monetary policy of public debt management, which is vital for the state, with a comparison between Türkiye and PIIGS countries.

Borrowing, which is essential in financing public deficits, is also the primary determinant in implementing fiscal and economic policies. In the globalizing world, free capital movements have increased the risk that borrowing poses to the economic balance, and this situation has necessitated professional efficiency in public debt management. While placing debt management policies in an illegal and inefficient framework creates pressure on public finance, high borrowing levels will cause adverse developments in many macroeconomic variables. Among these macro variables, growth, the main objective of all national economies, is deemed worthy of study due to the magnitude of its interaction with public debt. From this point of view, the study's main objective is to examine the extent to which public debt, which has long been known as a complex and controversial issue in the economics literature, affects economic growth performance.

The literature is sparse with empirical studies on the PIIGS countries and the fact that these countries experienced the 2008 global economic crisis negatively, and Türkiye experienced the 2001 crisis negatively made these six countries a preferred sample worthy of investigation in the study.

The study hypothesizes that public debt as a source of public finance positively affects economic growth. The validity of the hypothesis is analyzed using current panel data econometric techniques for PIIGS countries and Türkiye. The study findings will provide important clues about the efficiency of public debt instruments in PIIGS countries, which are considered fragile economies in Europe, and in Türkiye, which has a relatively fragile economy. Studies examining the relevant relationship in the literature, specifically for fragile economies, are quite limited. The study is original in filling the literature gap with its subject sample, and current techniques.

2. CONCEPTUAL FRAMEWORK

This section presents the conceptual and theoretical public debt and economic growth framework.

2.1 Concept of Public Debt

In its simplest definition, debt refers to money-like valuables that are received and must be paid to be returned at maturity. The concept of debt, which includes money debt in a narrow sense, can be explained by a debt relationship in a broad sense. A debt relationship consists of at least two parties, the debtor and the creditor. The debtor is obliged to do, give, or not do something. In terms of its relationship with money, borrowing refers to the receipt of a certain amount of money and the principal and interest to be repaid at a certain maturity (Yılmaz, 2015, p.13).

On the other hand, public debt refers to all kinds of financial obligations that the state or other public legal entities are party to or undertake as debtors. In public debt, all legal obligations, such as maturity, interest, etc., are determined in advance, and the debt in question is paid together with the principal and interest when due. The state has to fulfill the public needs and provide services to society. To meet these needs and fulfill these services, it resorts to various sources of financing. The primary sources of financing that the state, which has to meet the public services and needs of the society, uses to fulfill this duty are taxes, emission revenues, parafiscal revenues, fees, revenues from money transactions, paintings, goodwill, property and enterprise revenues, taxes and fines, borrowing and other revenues (Tosunoğlu, 2012, p.3).

Borrowing revenues, which were considered extraordinary revenues among public revenues, are now considered ordinary revenues. The state may borrow due to the insufficiency of ordinary revenues, such as taxes, duties, fees, etc., in financing public expenditures. In case of unforeseen expenditures in extraordinary periods, it is difficult to increase ordinary public revenues in a short period, so it is compulsory to resort to borrowing (Karakoç, 2003, p.2). In government debt, all legal obligations, such as maturity, interest, etc., are determined in advance, and the debt in question is paid together with the principal and interest when due.

2.2 Economic Growth

Upon observing an unprecedented improvement in human life for years after the Industrial Revolution, Kuznets called the magnitude of this increase in national income per capita modern economic growth (Snowdon & Vane, 2012, p.514).

Economic growth means the annual increase in material production, the growth rate in national income, or the growth rate in GDP, which, according to economic theory, represents an important value for growth. Economic growth refers to the growth in production, which means exactly this (Mladen, 2015, p.56). In other words, economic growth is a quantitative expression that refers to a process. This process grows macro indicators (especially GDP) and the economy in the country (Haller, 2012, pp.66-67).

Growth is the increase in national income caused by increased production of goods and services. National income per capita increases in an environment where the increase in national income is

higher than the increase in population. In this case, the welfare level increases, which is desirable (Yılmaz, 2013, p.93).

Economic growth, which is generally determined by percentage measurement, can be expressed in two different ways:

Since growth, which is a primary and essential goal for a country, refers to the increase in goods and services, it can be said that where there is growth, unemployment decreases, welfare and enrichment increase, and basic state functions such as education, justice, health, and defense improve (Başar, 2014, p.48-49).

When production increases, which have an essential place in explaining economic growth, are analyzed in terms of their sources of emergence, it is understood that they have two different characteristics: The increase in production capacity as a result of supporting the economy with technological development and the addition of new production factors while the economy is at full employment. Long-term production increases develop due to this situation. Short-term increases in output due to increased capacity utilization resulting from increased demand when the economy is underemployed (Berber, 2011, p.2).

Since the mid-1970s, the adequacy of a quantitative definition of growth has been debated. Today, unlike the understanding of the Industrial Revolution, factors that increase human welfare are seen as means, while increasing human welfare is seen as the goal. In this framework, 'good growth' and 'bad growth' distinctions have started to be made in which the qualitative aspect of growth is emphasized. According to the United Nations Human Development Report (1996), there are 'five types of bad growth' that should be avoided (Tümertekin & Özgüç, 2012, p. 96):

- ❖ Unemployment growth: Unemployment growth is a situation where there is no decrease in unemployment rates due to the inability to provide sufficient employment in a country where growth increase is observed. In this way, the realization of growth, together with unemployment, is more common in less developed countries. It is a form of growth observed in our country in 2002 and later in EU countries.
- ❖ Ruthless growth: In an economy where growth is observed, the unjust distribution of the blessings of growth, that is, the inability to ensure justice in income distribution, is the ruthless growth model. The most typical example is the growth seen in Latin American countries.
- ❖ Silent growth: This situation is where freedoms and individual rights deteriorate in development. If democracy is not ensured, society gradually becomes a society that does not speak, is silent, and does not discuss. It is a type of growth in many underdeveloped and East Asian countries.
- ❖ Rootless growth: In this type of growth, society loses its cultural identity. In other words, economic growth has corrupted society and made it forget its unique traditions and customs.
- ❖ Future-less growth: This occurs when the natural resources used in the growth process are non-renewable, resulting in an unsustainable, environmentally, and globally hostile growth model.

When we look at the definition of good growth developed by endogenous growth theorists based on the five definitions of lousy growth, it is seen that human development and human well-being are the main goals. The forms of 'good growth' of this approach can be listed as follows (Mızrak, 1997, p.29):

- ❖ Encouraging employment,
- ❖ Offering people the chance to control and decide on their destiny,
- ❖ Adopting the principle of equitable welfare increase,

- ❖ Attaches importance to harmony and cooperation in society,
- ❖ Growth aimed at human development with sustainable characteristics.

Borrowing is a method used in financing development. Considering that public intervention in the economy is intense today, it can be considered that public debt can also be a source of financing for economic growth and development. From this perspective, there is a positive relationship between the variables in question. However, increasing public debt stock can also negatively affect economic growth. As can be understood from these statements, although the direction and effect cannot be clearly shown, the probability of a statistically significant relationship between public debt and growth is extremely high.

3. LITERATURE

The literature has discussed the impact of public debt on economic growth with different intensities and dimensions in other periods. This section briefly mentions studies in which the relationship between these variables is positive and negative.

Some of the studies conducted for Türkiye on the relevant subject can be seen as follows.

Bakkal and Gürdal (2007) investigated the effects of domestic debt on economic growth, economic balance and development, and income distribution in the 1980-2006 period. They analyzed the effects of domestic debt on macro aggregates by evaluating investment changes. As a result, they drew attention to the fact that the increase in domestic debt interest rates negatively affected private sector investments. They also stated that domestic borrowing negatively affected income distribution.

Demir and Sever (2008) investigated the effects of public domestic borrowing on inflation, growth, and interest rates in Türkiye for the 1987-2007 period by using VEC models in the short run and the Johansen co-integration test in the long run. It is pointed out that borrowing can have a positive impact on growth and development only if it is used for productive investments. Otherwise, he emphasized that borrowing in financing consumption expenditures and increasing interest rates above the growth rates will also reveal the crowding-out effect and create significant pressure on macro balances. He concluded from the empirical findings that public domestic borrowing in Türkiye has a negative impact on gross national product, interest rates, and inflation.

Çataloluk (2009) investigated the impact of public borrowing on macroeconomic balances within the scope of public sector domestic borrowing or external borrowing instruments after 1990 with the support of TUIK and public sector financial reports and other analyses, scientific publications, and statistics published on this subject. He concluded that public borrowing should be limited and should be kept around 60% of GNP (Maastricht Criterion). Otherwise, it may have negative consequences such as the 'crowding out' effect, income inequalities, and employment contraction. He pointed out that public borrowing was seen as the primary financing instrument rather than a temporary one in Türkiye from 1990-2005.

Çiçek et al. (2010) investigated the relationship between domestic and external borrowing and economic growth in the Turkish economy by using quarterly data for the period 1990-2009 with the help of unit root test, structural break test, and regression analysis. As a result, they concluded that increases in domestic debt stocks positively affect GDP, whereas increases in external debt stocks negatively impact GDP.

Umutlu et al. (2011) analyzed the effects of tax revenues and domestic and external borrowing on economic growth in Türkiye for the period 1990-2008 using the Least Squares method. As a result,

domestic lending has a negative effect on growth, taxes have no impact, and external borrowing has a positive effect in accordance with the Growth by Debt theory.

Doğan (2012) analyzed the relationship between external borrowing and growth in Türkiye and OECD group countries by distinguishing between private and public external debt, short and long-term, with the help of data for 1970-2009. The study aims to examine and model the relationship between the variables used. For this purpose, the Markov-Switching model was used. The model results show that human capital and investment positively affect growth, while short, long, public, and private external borrowing variables negatively affect growth in regime one and regime zero. In addition, the negative effect of private borrowing on growth is smaller than that of public borrowing on growth. It is also among the results that the negative effect of long-term borrowing is larger than that of short-term borrowing, and the relationship between growth and borrowing is non-linear.

Kırcı Çevik and Cural (2013) analyzed the causality relation between domestic and external borrowing and economic growth in Türkiye for the period 1989-2012. The Toda-Yamamoto causality technique and Vector Autoregressive Model (VEC) were used to observe the existence of causality relationships between the variables. The analysis results indicate that domestic debt has no impact on economic growth. However, a unidirectional causality was identified from external debt to economic growth. Additionally, external debt in the private and public sectors, treated as separate variables, was found to be a Granger cause of economic development. The 2001 economic crisis found no evidence that domestic borrowing affected economic growth.

Doğanalp (2015) aims to examine the relationship between domestic debt and growth within the framework of the Turkish economy, which entered a stable process with the transition to a strong economic program after the November 2000 and February 2001 crises. Causality and cointegration tests were used in the analyses using quarterly data for 2001-2013. As a result, it was determined that there is causality between domestic borrowing and growth at a 5% significance level regarding six lags and that domestic borrowing and growth are cointegrated.

Using the time series method, Gürdal and Yavuz (2015) analyzed the relationship between domestic borrowing and economic growth in Türkiye between 1990 and 2012. The stationarity of the series was analyzed using the KPSS (Kwiatkowski-Phillips-Schmidt-Shin) (1992) unit root test, the co-integration test of Maki (2012), and the causality between variables was determined using the Toda-Yamamoto (1995) Causality Test. The analysis revealed a positive co-integration relationship between domestic borrowing and economic growth. The test also showed unidirectional causality running from domestic debt to economic growth.

Yaraşır Tülümce and Yavuz (2017) analyzed the relationship between growth and long and short-term domestic/foreign debt and the total debt in Türkiye in four different models using ARDL and VAR models. According to the ARDL test, the variables are cointegrated in the long and short run; according to the VAR model, external borrowing and domestic borrowing, short-term domestic borrowing, and long-term external borrowing, total borrowing negatively affects economic growth, while long-term domestic debt positively affects economic growth.

Kanca (2017) investigated the interaction of domestic borrowing, inflation, and economic growth rates in Türkiye with annual data from 1980-2014. The variables used are inflation rate, growth rate, and domestic debt/GDP ratio, and the tests used are ADF and PP stationarity tests and the Toda-Yamamoto causality test. The research findings indicate a bidirectional causality between domestic debt and inflation and a unidirectional causality from growth to inflation.

Bayraktaroğlu (2018) investigated the relationship between economic growth and external debt in Türkiye using quarterly data between 1998 and 2017 with the help of co-integration and causality analyses. His findings proved that there is co-integration and a two-way interaction between these

two variables in the short and long term and that this is due to the use of borrowed money in productive investments. After emphasizing that the causality relationship is from growth to external debt, he said that the reason for this is external resource dependence in Türkiye. According to the results of asymmetric causality and frequency causality analyses, it was seen that a contraction in the country creates an increase in external debt, and economic growth in Türkiye is dependent on external debt.

Civelek (2018) estimated growth in Türkiye using data from 2005 to 2017 in his study. For this purpose, he used Factorial Designs, an experimental design method, in his study. With the help of correlation analysis, unemployment and inflation rates, foreign trade volume, industrial production index, and gross foreign debt stock to GDP ratio were selected as independent variables. According to the results of the selected regression model (MS Excel Solver), it was observed that low levels of foreign debt/GDP ratio slowed down economic growth, which is the response variable.

Akpınar (2019) concluded in his study that public debt in Türkiye after 2000 could have positive and negative effects on growth and that the relative results of these two effects could only be reached through empirical analyses. According to his studies, in which he determined the direction of the effects in question, public debt positively affects growth in the long term. Still, it does not affect growth when separated into its subcomponents, domestic and foreign debt.

Turan (2019) investigated the effect of public debt on economic growth in Türkiye with the help of ARDL and NARDL tests. As a result, it was shown that total public debt did not affect economic growth in the long term and had a negative effect in the short term. He pointed out that public external debt negatively affected economic growth in the short term and positively impacted the long term. The NARDL estimation results and the quadratic model, including total public debt and the model variables where the explanatory variable is public domestic debt, showed no co-integration relationship.

Noyan and İdiküt Özpençe (2021) analyzed the impact of domestic debt on growth in Türkiye with simple linear regression in their study. They completed their survey with the help of 1981-2015 data, mentioning that the ineffective use of the income obtained by the public sector through borrowing would create an exclusionary effect in the private sector and the negative pressure of this situation on economic growth.

Arslan (2022) investigated the effect of domestic and foreign debt on economic growth in Türkiye from 1998- to 2020 on the axis of debt interest payments. He used the VAR model in his analysis. As a result, a significant and positive relationship was found between domestic debt and growth. According to the causality analysis, domestic debt leads the economy to growth, while growth causes external debt.

Kaya and Çadırcı (2022) conducted a study on the relationship between public domestic debt and economic growth in Türkiye, using annual data from 1998 to 2021. Tsong et al. (2016) discovered a long-term relationship between public debt and economic growth through the Fourier co-integration test. They identified a unidirectional causality from public debt to economic growth using the Hacker-Hatemi causality test. The analysis results drew attention to the determinant effect of domestic debt on economic growth in Türkiye.

Using the VAR model, Ekinci and Eser (2023) analyze the macroeconomic effects of real domestic public debt in Türkiye for 2011-2022. The variables used in the model are economic growth, inflation, exchange rate, and interest rate. The study found that domestic debt positively affects these variables, while exchange rate and inflation have a decreasing effect on domestic debt. In addition, although the inference that the increase in growth has a downward effect on real domestic debt is weak, it can be argued.

İlter and Günsoy (2024) tested the effect of public and private external debt on economic growth in Türkiye with the help of an annual data set for 1989-2021. As a result, it is found that public and private sector external debt has a negative impact on economic growth. In addition, a unidirectional causality relationship between growth and public sector external debt stock was found in the study.

Güvenoğlu (2024) investigated the impact of public and private sector external debt on economic growth in Türkiye using quarterly data from 2011-2019. In his study, which included openness, investment, and labor control variables, he tested the short and long-run relationship between variables with the ARDL bounds test. As a result, he found that public sector external borrowing has a positive effect on economic growth in the long run and a negative effect in the short run. In contrast, external private-sector borrowing negatively affects economic growth in the long run and has a positive effect in the short run.

When the relevant literature is examined, it is also possible to find studies that examine the relationships between public debt and other macroeconomic variables for various country groups. Some of these studies can be listed as follows.

Chen's (2006) study includes a nonparametric regression analysis focusing on the debt-growth relationship in the context of the Philippine economy from 1993 to 2004. The study investigates the common dynamics between external debt and growth. The results indicate that external debt has a minimal impact on economic growth in the Philippines; however, GDP and export growth above a certain threshold are observed to reduce external debt.

Bakar and Hassan (2008) used the VAR test to analyze the effect of debt on economic growth in Malaysia from 1970- to 2005. The study used GDP, capital accumulation, external debts, human capital, and labor force variables. The estimation results show that total external debts positively affect economic growth. In particular, a one-point increase in total external debts causes a 1.29-point rise in economic growth in the long run.

Jayaraman and Lau (2009) studied six Pacific island countries (PICs) from 1988-2004. They drew attention to the fact that the annual domestic budget deficits in these countries, which had decreased in annual aid inflows due to the end of the Cold War in the late 1980s, forced them to finance their domestic yearly budget deficits through borrowing. The study used Pedroni Co-integration and FMOLS tests to examine whether external debt contributed to economic growth in PICs and positive findings were obtained.

Minea and Parent (2012) stated that public debt above a specific size will positively affect growth, although it varies from country to country. Baum et al. (2013) used data from the 1990-2010 period in 12 Eurozone countries to investigate the non-linear effects of public debt on economic growth. According to the empirical findings, the short-term effects of public debt on economic growth are statistically significant and positive.

Broner et al.'s (2013) study, touched upon the reason for the high debt burden in PIIGS countries: the increase in public debt stocks after the global crisis increased private sector credit costs and the shift of credits towards the public sector. They emphasized that the debt burden caused economic stagnation by reducing private investments.

In his study, Canbek (2014) analyzed the relationship between public debt and growth in 128 countries (62 undeveloped, 40 developing, and 26 developed) with panel data analysis between 1960-2011. His study used a fixed effects model and a cross-sectional distributed lag model. He also analyzed different debt levels and groups of undeveloped, developing, and developed countries. As a result, he concluded that the contractionary effect of public debt on growth is much higher in undeveloped countries than in developed and developing countries. He found that there is no

sensitivity to different levels of growth in developed economies and observed that the rate of increase in growth also shrinks the economy.

Chudik et al. (2017) created panel data for 40 developed and developing countries in their studies, considering cross-sectional dependence and heterogeneity. As a result of the findings, they stated that no common and appropriate public debt burden limit is required for economic growth. They emphasized that countries' growth is positively affected in a generally decreasing debt-burden environment.

Hayaloğlu et al. (2017) analyzed the impact of public, external, and private sector borrowing on growth with panel data analysis a sample of EU countries from 2000-to 2015. The results reveal a positive correlation between public debt and economic growth, alongside a negative correlation between private sector debt and external debt. Additionally, a non-linear relationship is identified between public debt and economic growth.

Şanlı et al. (2018) analyzed the effect of inflation and public debt/GDP growth on economic growth for EU 15 countries with a 50-year panel for the period 1960-2010 by using the PCSE method pays which attention to autocorrelation and heterogeneity, the MG estimator, and the AMG and CCEMG methods which take into account horizontal cross-section dependence and heterogeneity problems. As a result, it was found that the effect of public debt and inflation increase on growth is negatively significant.

Investigating the impact of public debt burden on long-term economic growth in PIIGS countries and Türkiye for the period 1960-2015, Tarhan Bölükbaş et al. (2018) concluded that increases in public debt burden in all other countries except Italy negatively affected long-term economic growth performance.

Özdemir Gündüz (2019) analyzed the public debt burden and economic growth variables in a sample of 52 countries, grouped as low-income, low-middle-income, upper-middle-income, and high-income, in the period 2000-2017, using unit root analysis, Johansen co-integration test, and Panel Error Correction Models. As a result of the study he conducted by determining the short- and long-term coefficients, he found that in low-income countries, a one-unit increase in the debt burden in the long term reduces economic growth statistically and significantly by 0.6 per thousand. An increase in the debt burden in the short term will not statistically affect economic growth. In other groups, an increase in the debt burden in the long term does not statistically affect economic growth, and a one-unit change in the debt burden in the short term affects economic growth statistically negatively and significantly.

Ünsal (2020) conducted panel data analysis in his study investigating the effects of public revenues, public debts, and public expenditures on economic growth with the help of data from OECD countries from 1995-2007. The real GDP data of the countries were used as the dependent variable, and the countries' public debt, public expenditures, and public revenues data were used to select independent variables. According to the analysis results, which emphasized that the regression analysis should be carried out with the Huber-Eicker-White Estimator, it was concluded that public debts did significantly affect economic growth. In contrast, public revenues and public expenditures positively affected economic growth.

Çetin (2020) examined the effect of total public debt on economic growth by using developing countries as a basis. The study investigated the long-term relationships of the variables with 15 developing countries and 2001-2018 period data. A positive relationship was found in the long term. The control variables added to the analysis did not change this result.

Yıldız et al. (2020) wanted to examine the relationship between public debt stock and growth in the “Fragile Eight” sample and used annual data between 1992 and 2017. In this study, where they conducted panel analysis, they used the error correction model, including the Common Correlated Effects Model (CCE) and Extended Average Group (AMG) estimators. According to the findings they obtained, public debt negatively affects economic growth both as a group and as a country. They showed that the reason for this situation is the continuity of current account and budget deficits, and the use of borrowings to finance these deficits.

Using panel data analysis, Türkey (2020) examined the relationship between public debt and economic growth in 43 countries. The study employed extended average group (AMG) and common correlated effects (CCE) estimators, which account for slope coefficient heterogeneity and cross-sectional dependence. As a result, the relationship between the variables was found to be negative in developing countries, while it was positive in developed countries.

Gediz Oral & Arpacılı Fazlılar (2021) investigated the causes and sources of the European debt crisis in Türkiye and PIIGS countries in terms of macroeconomic variables (growth, current account deficit, investment and savings, inflation and unemployment rates, the share of budget deficits in national income, competitiveness and financialization of countries). As a result, they concluded that the macroeconomic variables of Türkiye and PIIGS countries, which negatively affected the real sector and then all sectors throughout this process, were parallel.

Köstekçi and Yıldız (2021) touched upon the pressure on public finances caused by the implementation of debt management policies in an ineffective and illegal framework and the negativities in macroeconomic balances caused by the increasing trend of borrowing. The study examined the effect of debt management efficiency on macroeconomic performance for 35 OECD countries from 1995-to 2017 using panel data analysis. As a result, it was determined that the public debt burden increased the budget deficit, unemployment, and inflation and negatively affected economic growth.

In their study, Yıldız and Tuncer (2021) investigated the relationship between public debt and economic growth spatially with LISA analysis for the EU-28 member countries from 2009-2019. Spatial similarities were seen in 2012, 2011, and 2009. According to the analysis results, it is said that the low public debt burden is effective in increasing economic growth, and a possible negative public debt burden effect on economic growth can create a spillover effect between countries.

Yıldız and Sağdıç (2021) investigated the effect of external debts (private and public sectors) on economic growth within the scope of BRICS-T countries between 1997 and 2019. Short-term and long-term relationships between variables were examined with the Pooled Average Group (PMG) Estimator. According to the findings, the long-term economic growth effect of private sector external debt, public external debt, and total external debt is negative. The most significant negative effect is the public external debt effect. He argued that the empirical results prove the hypothesis that growth is negatively affected in countries with high debt levels.

Malak (2022) examined the effect of public debt on economic growth using panel data analysis for 25 European countries between 2004-and 2019 and found that public debt reduces economic growth.

Çobanoğulları (2024) investigated the relationship between public debt and economic growth in 2000-2023 in his study on six countries from the euro area. According to the estimation results of wavelet analysis, the public debt and economic growth relationship shows a high correlation in short and long scales. According to his analyses, the relationship between public debt and economic growth is negative, although it varies across countries for different periods and frequencies.

Suppose the findings obtained in the relevant literature are evaluated in general. In that case, the literature has no consensus on the relationship between public debt and economic growth. Governments may resort to borrowing to finance public expenditures and development, especially when public revenues are insufficient. However, it is incorrect to say that lending will positively affect national income or other macroeconomic indicators under all circumstances. The efficient use of resources obtained through borrowing and good governance are necessary conditions for borrowing to positively affect economic growth. Otherwise, it is possible to encounter a negative relationship between the relevant variables. This situation indicates that the impact of public debt and borrowing in general on economic growth may differ regionally or periodically. Therefore, it can be stated that the direction and magnitude of the relevant relationship may vary in studies conducted for different countries or groups of countries or different periods.

4. METHODOLOGY AND FINDINGS

This section empirically tests the effects of public debt on economic growth in Türkiye and PIIGS countries. Several econometric methods have been used for this purpose, and information about the methods of these methods is provided in the first part of the section. Then, the analysis results and findings are presented and interpreted from an economic perspective.

In the study, a 25-year panel data set covering the period 1998-2022 was used for 6 countries, including Türkiye and PIIGS countries. The variables' data were analyzed with the Stata 14 program.

4.1 Econometric Model, Data Set and Variables

In the study, which analyzes the effect of public debt on economic growth in the PIIGS country group and Türkiye sample using panel data analysis in 1998-2022, GDP per capita takes its place as the dependent variable. The independent variables are gross fixed capital accumulation, total labor force, and central government total debt stock (public debt). The natural logarithm of all variables was taken and included in the model. The data used in the analysis are annual data from 1998-2022 from the World Bank database.

Table 1: Explanatory Variables of the Data Set and Countries Covered in the Research

Variable	Explanation	Source
Lngdppercapita	Natural logarithm of gross domestic product per capita at current prices in US dollars	World Bank
Lncapital	Natural logarithm of total gross fixed capital accumulation at current prices in US dollars	World Bank
Lnlabor	Natural logarithm of total labor force	World Bank
Lnpublicdebt	Natural logarithm of the central government's total debt stock in US dollars	World Bank
Countries in the Study	Portugal, Ireland, Italy, Greece, Spain and Türkiye	

4.2 Econometric Methods

In the present study, panel data analysis was used to determine the effect of public debt on growth in the PIIGS countries and the Türkiye sample. This section includes general information about panel data analysis and theoretical information for all test methods used in the study.

In the study, correlation tests between cross-sections were performed using the LM test developed by Breusch-Pagan (1980) that provides the $T > N$ condition, the Pesaran Scaled LM test, which is the standardized version of the Breusch-Pagan test, the Bias-Corrected Scaled LM test, which is preferred when the time dimension is short, and the Cross-Sectional Dependence (CD) test developed by Pesaran (2004) that provides the $N > T$ condition. The stationarity of the series with unit root analysis was performed using the CIPS test, which was created by taking the average of the CADF (Cross-sectional Augmented Dickey-Fuller) test statistics results, which is one of the second generation panel unit root tests that gives consistent results in cases of $T > N$ and $N > T$ and takes cross-sectional dependence into account, developed by Pesaran (2007). To determine which model to use during the analysis among classical, fixed effect, and random effect models, the Hausman test was used, and for the tests of autocorrelation, heteroscedasticity, and cross-sectional dependence in fixed effect models, the Born and Breitung (2016) LM, Wald test and Breusch-Pagan (1980) test were used, respectively. After determining autocorrelation, heteroscedasticity, and cross-sectional dependence in the model, a robust estimator was selected that considered deviations from these assumptions, and the Driscoll and Kraay (robust standard errors) estimator was used.

4.3 Findings

In this section, the effect of public debt on economic growth in PIIGS countries and Türkiye is investigated with the help of annual data for 1998-2022, and the application results are given.

4.3.1 Cross-Sectional Dependence Test

This study, examines the effect of public debt on economic growth is examined using the data for 1998-2022 in 6 countries, including PIIGS countries and Türkiye. The dependent variables, GDP, capital, labor, and public debt, are the independent variables in the model. The logarithms of all variables are taken and included in the model.

Cross-sectional dependence tests were applied to determine which generation unit root tests will be used in testing the stationarity of the data in the study. The tests used for this are The LM test developed by Breusch-Pagan (1980), which satisfies the $T > N$ condition; the Pesaran Scaled LM test, which is the standardized version of the Breusch-Pagan test; the Bias-Corrected Scaled LM test because the Pesaran Scaled LM test statistic may give deviant results in cases where the time dimension is short, and finally the Pesaran (2004) CD test statistics that satisfies the $N > T$ condition. Cross-sectional dependence was tested separately for the variables and the model. The results of the test are given in Table 2.

Table 2: Cross-Sectional Dependence Test Results for Variables

	lngdppercapita	lncapital	lnlabor	lnpublicdebt
Breusch-Pagan LM	278.8383 (0.0000)	136.0171 (0.0000)	145.4298 (0.0000)	225.1848 (0.0000)
Pesaran scaled LM	48.17007 (0.0000)	22.09460 (0.0000)	23.81312 (0.0000)	38.37432 (0.0000)
Bias-corrected scaled LM	48.04507 (0.0000)	21.96960 (0.0000)	23.68812 (0.0000)	38.24932 (0.0000)
Pesaran CD	16.54849 (0.0000)	9.607018 (0.0000)	5.241655 (0.0000)	11.58487 (0.0000)

Probability values are shown in parentheses.

The table, shows that the series' probability values were less than 0.05. In this case, the hypothesis: 'There is no cross-sectional dependence.' is rejected at a significance level of 5%. Therefore, the analysis revealed cross-sectional dependence among the variables, making it appropriate to use second-generation unit root tests for this dependence in the stationarity analysis. Consequently, the Pesaran (2007) panel unit root test was applied to assess the stationarity of the series.

4.3.2 Panel Unit Root Test

As a result of the analysis performed on the established model, the existence of cross-sectional dependence between variables was determined. Therefore, a second-generation panel unit root test that accounts for cross-sectional dependence should be chosen. Among these, the CIPS test developed by Pesaran (2007) is preferred, providing consistent results in cases where $T > N$ or $N > T$. The CIPS test is constructed by averaging the results of the CADF test statistic. The hypotheses established for the test are as follows;

H_0 : Series are not stationary. (Series contain a unit root.)

H_1 : Series are stationary. (Series does not contain a unit root.)

The results of the panel unit root analysis are shown in Table 3.

Table 3: Pesaran Panel Unit Root Test Results

	Lnpercapita	Lncapital	Lnlabor	Lnpublicdebt
CIPS test stat.	-3.82708	-3.40903	-3.42281	-3.36535
	%1		-3.13	
Critical Values	%5		-2.87	
	%10		-2.74	

Using the CIPS test, a unit root test was applied to fixed and trend models. CIPS test statistics values in Table 3 are compared with critical values (significance level). According to the findings, CIPS test statistics of variables are more significant than critical values in absolute value (at 1%, 5%, and 10% significance levels). In this case, the basic hypothesis of 'Series is not stationary,' which shows that the test contains a unit root in the series, is rejected. Therefore, all series are stationary at level, and the level values of the series can be used.

4.3.3 Model Selection

Some tests have been developed to choose which model to use when performing panel data analysis, among the classical, fixed effect, and random effect models. The Hausman (1978) Test, one of the pioneers of these tests, is used in model selection in this part of the analysis.

The Hausman test is designed to compare the random effects model with the fixed effects model. The test's null hypothesis assumes that the difference between the parameters is not systematic, meaning there is no correlation between the independent variables and the unit or time effects, making the random effects model appropriate. The alternative hypothesis of the test is that the difference between the parameters is systematic. In other words, there is no correlation between the independent variables and the unit or time effect, and the fixed effects model is appropriate. Hypotheses of the Hausman test statistics;

H_0 : There is no correlation between the unit-time effect and the independent variables, and the random effects model is valid.

H_1 : There is no correlation between the unit-time effect and the independent variables, and the fixed effects model is valid.

When the Hausman test statistics values applied for model selection analysis are significant, the H_0 hypothesis is rejected, and the H_1 hypothesis is accepted.

The results of the Hausman test are shown in Table 4.

Table 4: Test Results for Model Selection

	Hypothesis	Test Statistics
Hausman Test	H_0 : The random effects model is valid. H_1 : The fixed effects model is valid.	57.76 (0.0000)

Probability values are shown in parentheses.

The probability values of the Hausman test statistics are shown in parentheses. As a result of the test, the probability value of the model is obtained as significant, so the basic hypothesis H_0 is rejected, and the alternative hypothesis H_1 is accepted. Since the difference between the parameters is systematic, the random effects model is unsuitable, and the fixed effects model is suitable. Accordingly, the estimated model is as follows:

$$\ln gdp_{percapita_{it}} = \beta_0 + \beta_1 \ln capital_{it} + \beta_2 \ln labor_{it} + \beta_3 \ln publicdebt_{it} + \varepsilon_{it} \quad i=1...6, t=1...15$$

4.3.4 Test for Heteroscedasticity, Autocorrelation, and Cross-Sectional Dependence for The Fixed Effects Model

In this part of the panel data regression analysis, before interpreting the coefficients of the fixed effects model selected in the previous step, it was examined whether there were deviations from the three basic assumptions, such as changing variance, autocorrelation, and cross-sectional dependence.

The autocorrelation assumption, which is encountered mostly in panel data analysis where the cross-section and time dimensions are examined and express a significant relationship between the successive values of the error terms, causes a systematic relationship in the analysis due to the unit values affecting each other. Therefore, this situation creates the problem of deviations and inconsistent estimates.

In the fixed effects model selected after the Hausman test analysis, the Born and Breitung (2016) LM test was used to test the assumption of no relationship between the error terms (autocorrelation), one of the critical assumptions of the panel data analysis.

Hypotheses belonging to the Born and Breitung (2016) LM test;

H_0 : There is no autocorrelation.

H_1 : There is autocorrelation.

As a frequently encountered problem in analyses performed with cross-sectional data, heteroscedasticity refers to the variances of error terms that are different for all cross-sections, and their covariances are not equal to zero. In other words, it means that the constant variance assumption is not valid. While the error process is homoscedastic, heteroscedasticity was tested for the fixed effect model because its conditional variance varies according to units. The Modified Wald test of Heteroscedasticity by Units was used for this test. Hypotheses of the Wald Test;

H_0 : The constant variance assumption is valid.

H_1 : The heteroscedasticity assumption is valid.

To test whether there are deviations from the cross-sectional dependence, which is one of the basic assumptions in fixed effect panel data models, the Breusch-Pagan LM test, which satisfies the $T > N$ condition, was used. Hypotheses of the Breusch-Pagan LM Test;

H_0 : There is no cross-sectional dependence.

H_1 : There is cross-sectional dependence.

Table 5 shows the heteroscedasticity, autocorrelation, and cross-sectional dependence test statistics analyzed using the fixed effects model.

Table 5: Heteroscedasticity, Autocorrelation, and Cross-Sectional Dependence Tests for the Fixed Effects Model

	Hypothesis	Test Statistics
Born and Breitung (2016) LM	H_0 : No autocorrelation.	2.83
	H_1 : Autocorrelation exists.	(0.0050)
Wald Test	H_0 : No heteroscedasticity.	632.52
	H_1 : There is heteroscedasticity.	(0.0000)
Breusch-Pagan LM	H_0 : No cross-sectional dependence.	129.3197
	H_1 : There is cross-sectional dependence.	(0.0000)

Probability values are shown in parentheses.

The results of Table 5, which show deviations from the basic assumptions in the model, can be summarized as follows:

According to the Born and Breitung (2016) LM test result for autocorrelation testing, the H_0 hypothesis is rejected because the probability values are below the critical value. In this case, the successive values of the error terms are not independent, and the model has an autocorrelation problem.

According to the results of the Modified Wald test analysis of Heteroskedasticity According to Units used for the constant variance assumption in the fixed effects model, it was determined that the probability value of the test statistic was less than the critical value of 0.05 and the H_0 hypothesis was rejected. In this case, it was determined that the variances of the error terms were not constant for all units; the covariances of the units differed from zero. Therefore, there was heteroskedasticity according to the units. In other words, there was a heteroskedasticity problem in the panel.

According to the analysis results of the Breusch-Pagan LM test used in testing the cross-sectional dependence, another assumption, the probability values of the fixed effects model were less than 0.05. In this case, the hypothesis is rejected at a significance level of 5%, and there is a cross-sectional dependence problem between units in the panel data model.

As can be seen from the analysis results, since the model includes autocorrelation, heteroscedasticity, and cross-sectional dependence problems, estimators with robust standard errors should be used instead of deviant standard errors. At this point, the Driscoll and Kraay Standard Errors Test Statistics method, which considers deviations from the assumptions in Table 5, is preferred in estimating the fixed effects model.

4.3.5 Driscoll-Kraay Standard Errors Test

Since the fixed effects model includes autocorrelation, heteroscedasticity, and cross-sectional dependence problems, the problem of inconsistent estimation of the results to be obtained from the

model analysis may arise. To get more effective and consistent results in these three situations, the Driscoll and Kraay Standard Errors Test Statistics (Robust Standard Errors) that are resistant to deviations from basic assumptions are preferred. The results of the test are shown in Table 6.

Table 6: Driscoll-Kraay Standard Errors Estimation Results

	Coefficient	Std. Error	t-stat.	Prob.
Constant	-13.19319	3.1022070	-4.25	0.0000
Lncapital	0.1890459	0.0582654	8.39	0.0000
Lnlabor	0.4783432	0.2693608	1.78	0.0880
Lnpubli debt	0.1167249	0.0596938	1.96	0.0620
Observation/Unit			150/6	
F (Prob)			77.40 (0.0000)	
R²			0.8149	

The Driscoll and Kraay estimator (robust standard errors) is used, which is robust enough to deviation from the basic assumptions in the model. Capital is statistically significant at the 1% significance level, and labor and public debt are at the 10% significance level. There is a positive relationship between all three variables and growth. Since the model is a full logarithmic model, the coefficients should be interpreted in percentages. Accordingly, it is understood that a 1% increase in public debt in the relevant period for Türkiye and PIIGS countries causes an increase of approximately 0.11% in gross domestic product per capita.

5. CONCLUSION

The effect of the change in public debt on economic growth is examined in the current analysis. The study covers the period between 1998-2022 in the sample of Türkiye and PIIGS countries. In this context, in the study where a panel data set was created with annual data obtained from the World Bank, the Breusch-Pagan (1980) LM test, Pesaran Scaled LM test, Bias- Corrected Scaled LM test, and Pesaran (2004) CD test was used for cross-sectional dependence analysis; Pesaran Panel Unit Root Test as CIPS test; Hausman test in analysis model selection; Born and Breitung (2016) LM, Wald test and Breusch-Pagan (1980) test for testing heteroscedasticity, autocorrelation, and cross-sectional dependence in the model; finally, Driscoll and Kraay estimator (robust standard errors) was used in estimation analysis.

GDP per capita was selected as the dependent variable in the analysis. In contrast, variables closely related to growth, such as labor force, fixed capital investment, and public debt, were considered independent variables, and the relationship between them was investigated. The natural logarithm of all variables was taken and included in the model. The findings showed that public debt positively affected GDP growth in Türkiye and PIIGS countries from 1998 to 2022.

The study hypothesizes that public debt positively affects economic growth. The findings obtained from the empirical analysis also support this argument. The study findings are also parallel to some study findings in the literature (Minea & Panet, 2012; Baum et al., 2013; Çetin, 2020; Hayaloğlu et al., 2020; Türkay, 2020). The positive effect of the increase in public debt on economic growth shows that fiscal policy was effective in the relevant years in the countries examined. The years examined include the Global Financial Crisis in 2009 and the Covid-19 pandemic in 2020. Both periods were generally years when fiscal policy was heavily resorted to due to the ineffectiveness of monetary policy in the world, especially in the countries examined. At the same time, the relevant years were when the share of public debt in national income increased in most countries examined. Based on this, it is possible to say that fiscal policy is effective, especially in recession periods, and can play an essential role in increasing economic growth together with monetary policy. Again, it should be taken into account that the low interest rate policy at the global level in the years examined was a factor

that reduced the public's borrowing cost. The monetary expansion policies adopted by Central Banks during the Global Financial Crisis and the COVID-19 pandemic eased states' access to debt. However, while these policies enhance the effectiveness of fiscal measures, they also carry the potential to increase risks and adversely impact economies. High levels of public debt have the potential to cause a debt crisis by increasing the risk premium of countries in periods when access to debt becomes difficult. Therefore, it is necessary to be cautious and selective when implementing expansionary fiscal policy. In cases where fiscal policy is overly dominant and is financed by printing money, expansionary fiscal policy can also create an inflation problem. Finally, the composition of the debt can also affect the public debt's economic growth. In addition to the fact that external debt provides an inflow of external resources to the economy and positively affects growth, a possible exchange rate shock can also increase public debt abnormally. Therefore, for fiscal policy to be effective, the composition of the debt, the cost of borrowing, and coordination with monetary policy must be reasonable.

As a result, the study findings offer suggestions for future studies on several points. The direction of the relationship between public debt and economic growth may change depending on whether resources are used effectively. The literature often emphasizes this situation, and it is stated that this is one of the reasons for the different results achieved. On the other hand, the structure and terms of debts can also be a determining factor in this sense.

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CONTRIBUTIONS OF AUTHORS

Semiha Bayhan: Conceptualization, literature review, data curation, analysis, writing, approval.

Ümit Yıldız: Conceptualization, analysis, supervision, approval.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

DATA AVAILABILITY

The data are publicly available.

ETHICAL STATEMENT

The study does not require ethics committee approval.

ARTIFICIAL INTELLIGENCE (AI) USAGE STATEMENT

No AI-based tools were used in this study.

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