


## Interest Rate-Savings Nexus: Keynesian-Classical Debate Revisiting in OECD Economies

Faiz Oranı-Tasarruf İlişkisi: Keynesyen-Klasik Tartışmanın OECD Ekonomilerinde Yeniden Değerlendirilmesi

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### ABSTRACT

There are many factors that determine savings, especially income and consumption. However, classical and Keynesian economic theories disagree on how interest rates affect savings. According to classical theory, an increase in interest rates will increase savings, whereas, according to Keynes, it will definitely decrease it. This is because, according to Keynes, savings are a decreasing function of interest rates and an increasing function of income. In this study, the effect of GDP per capita, especially interest rates, on savings is analysed in the context of the disagreement between Classical and Keynesian economic theories by using a static panel data analysis method on a sample of 35 OECD countries. According to the findings of this study, a 1% increase in GDP per capita increases gross domestic savings by approximately 2.25%, whereas a 1-unit increase in interest rate decreases gross domestic savings by approximately 2.26%. In conclusion, in the dispute between mainstream economic theories regarding the interest-savings relationship, Keynesian theory prevails in the context of OECD countries from 1995 to 2021. In this respect, from a macroeconomic policy perspective, the focus should be on increasing total income rather than interest rates to increase savings.

**Keywords:** Savings, Interest, Panel data analysis, Keynesian theory, Classical theory

**JEL Codes:** E12, E13, E22

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## ÖZ

Bir ulusal ekonomide tasarrufları belirleyen başta gelir ve tüketim olmak üzere birçok faktör mevcuttur. Ancak, faiz oranlarının tasarrufları nasıl etkilediği konusunda Klasik ve Keynesyen ekonomi teorileri arasında bir anlaşmazlık söz konusudur. Klasik teoriye göre faiz oranlarındaki bir artış tasarrufları artırırken, Keynes'e göre kesinlikle azaltacaktır. Çünkü Keynes'e göre tasarruflar faiz oranlarının azalan, gelirin ise artan bir fonksiyonudur. Bu çalışmada, Klasik ve Keynesyen iktisat teorileri arasındaki görüş ayrılığı bağlamında kişi başına düşen GSYH'nin ve özellikle faiz oranlarının tasarruflar üzerindeki etkisi 35 OECD ülkesi örneklemini üzerinden statik panel veri analizi yöntemi kullanılarak incelenmiştir. Çalışmanın bulgularına göre, kişi başına GSYH değişkenindeki %1'lik artış gayrisafi yurtiçi tasarrufları yaklaşık %2,25 oranında artırırken, faiz oranı değişkenindeki 1 birimlik artış gayrisafi yurtiçi tasarrufları yaklaşık %2,26 oranında azaltmaktadır. Sonuç olarak, faiz-tasarruf ilişkisine dair ana akım iktisat teorileri arasındaki tartışmada, 1995-2021 döneminde OECD ülkeleri bağlamında Keynesyen teori ağır basmaktadır. Bu bakımdan, makroekonomik politika perspektifinden bakıldığında, tasarrufların artırılması açısından faiz oranlarından ziyade toplam gelirin artırılmasına odaklanılmalıdır.

**Anahtar Kelimeler:** Tasarruf, Faiz, Panel veri analizi, Keynesyen teori, Klasik teori

**Jel Sınıflandırması:** E12, E13, E22

## Introduction

Almost all countries in the world are susceptible to chronic diseases that impact their economies. Several countries face economic challenges, such as inflation, while others grapple with issues like sluggish growth, high unemployment, and current deficits.

It can be asserted that countries' economies, which can be primarily categorised into three levels of development, share certain common economic issues based on their respective development classes. In many developing economies, a savings gap exists that is significant. Key features of these countries' economies include rapid population growth rate, a low national income compared to industrialised countries, and inadequate savings and capital stock (Uluyol, 2011). In theory, a low per capita income suggests that a significant portion of the income is used for consumption, with little or no savings allocated. The paradoxical situation faced by certain developing nations compels them to confront a bottleneck in funding their economic expansion, thereby entangling them into a cycle of domestic and foreign debt. In many developing economies, a noticeable disparity between savings and investment levels, which has been a persistent issue throughout history and has intensified in recent years. The saving gap contributes to macroeconomic issues such as economic growth, employment, and current deficits in the mentioned countries. Assuming that savings are the dependent variable in the causation connection, how are they related to other economic factors? If we restrict these variables, what is the impact on savings in terms of income, particularly about interest? In theory, there is a consensus on the impact of income on savings. However, Classical and Keynesian theories differ in their views on the influence of interest on savings.

Classical Theory posits that there is a positive relationship between savings and interest rates, meaning that savings increase as interest rates increase ( $S = f(I)$ ). In contrast, the Keynesian theory argues the contrary. The Keynesian hypothesis posits that there exists an inverse correlation between interest rates and savings ( $S = f(Y)$ ). It argues that higher interest rates lead to reduced savings (İstekli, 2024).

This study examines the correlation between savings and interest rates, specifically focusing on OECD economies. This study focuses on the reasons why OECD countries have a limited number of empirical studies on the relationship between interest rates and savings. It also considers the time since the most recent study on this topic, conducted in 2011 by Yaraşır and Yılmaz. It is worth noting

that a more recent study conducted in 2018 in Sweden, which examined a smaller sample of 15 OECD countries, was not included in the literature review. Furthermore, the study in question was conducted from 1999 to 2007. Put simply, there is currently no recent empirical study in the literature that examines an extended period in relation to OECD nations that have recently experienced growth. Therefore, the intention behind examining the difference between Classical Theory and Keynesian theory regarding the connection between interest and saving is to provide empirical evidence and update the existing literature.

## 1. Conceptual and theoretical frameworks

“Saving” which is defined as the “unconsumed part of income” in the literature (Hançerlioğlu, 1993), is being compared with other concepts in both colloquial and economics literature. For instance, the concepts of saving and capital can sometimes be used interchangeably. However, capital is defined as “means of production, products or money enabling the accumulation of surplus values in industrial society” (Ülken, 1969). Based on these definitions, it can be observed that saving is a factor that determines capital.

In colloquial language, the concept of saving is rather confused with investment. For instance, while depositing under-the-mattress cash in a bank is deemed an investment in colloquial terms, it is deemed a saving strategy in terms of economics. The same issue can also be addressed when opening a foreign currency account (Eğilmez, 2015). The point to which it is required to draw attention here is the requirement that saving plays an active role in the economic activities system for it to be deemed as “saving” in the literature on economics. For instance, if gold is under-the-mattress, it is not considered saving in economic terms (Sancak, and Demirci, 2012).

According to Rist (1997), income pours on households, individuals, or legal entities just like rain drops. Plant roots immediately hold some of the rain. However, a greater portion of the rain drops is held by the soil, and it turns into large water basins that accumulate at deeper layers of the ground. The benefit of underground water is sensed when it comes out of the ground. Just like this, while a portion of income is consumed immediately, the remaining portion is saved and is kept in the inactive part of the economy. The value of such savings can only be understood if they turn to investment, just like the outflow of water from the ground. In other words, the savings do not have the power to determine production and capital stock by themselves. Production and capital stock is possible by the transformation of savings to investments. At this point, investment may be deemed as kinetic energy, and saving may be deemed as potential energy. Then, idle state and the loss of savings without being transformed into real investment is a great waste and loss for a country’s economy.

Rist (1997), after explaining the concept of saving with an interesting simile, divided it into productive and reserve saving. And then by dividing the markets into two categories, money and financial markets, he associated these markets with the two types of saving. Among these, productive saving causes the establishment of new enterprises and increases production and productivity in agriculture and industry. New factories, machines, and infrastructure operations may be indicated as examples of productive saving. The type of saving that directly increases the welfare of a country’s economy is productive saving.

Reserve saving is one in which a portion of income is allocated as caution with the motive of keeping in reserve. When considered from a macroeconomic perspective, such savings enter circulation in the loanable fund market with the purpose of lending. However, because they are lent on a short-term and temporary basis, their period of immobilisation is short. For this reason, financial institutions,

such as banks and stock exchanges, are required for reserve savings to enter circulation and to be immobilised rapidly (Rist, 1997). Thus, Rist associates productive saving with financial markets as long-term and reserve saving with money markets as short-term.

The Theory of Saving is not examined in the literature of economics. For instance, Classical economic theory analyzes savings under the Theory of Interest. According to Classical Theory, interest functions as a means enabling savings to be reintroduced into the economy as investment in cases when Say's Law does not operate, in other words, when oversaving occurs. Namely, interest undertakes the duty of equalising the supply of savings and investment demand (Öztürk and Durgut, 2011).

From a different perspective, Classical economists deem interest as the consideration of desisting from current consumption and preferring future consumption, and consequently, as saving current income. In other words, through the interest mechanism, individuals distribute their income within the framework of utility maximisation in between their current and future consumption. Therefore, saving becomes an increasing function of interest (Yıldırım et al., 2012).

Accordingly, in Classical theory, an increase in interest rates increases savings while decreasing current consumption. The disagreement between Classical Theory and Keynesian Theory regarding saving arises at this point. In *General Theory*, a work by John Maynard Keynes published in 1936, he claims that interest has an effect contrary to the common belief in determining savings. Keynes, while accepting the increasing interest rates' tendency to decrease current consumption, asserts that they will decrease savings, contrary to the Classical School. The basis for this claim is as follows: An increase in interest rates will decrease investments. Subsequently, income will also decrease, and accordingly, savings will also decrease (Keynes, 2010). According to Keynes, the primary source of saving is income (Eğilmez, 2009). Namely, according to Keynesian School, savings are an increasing function of income and not of interest.

According to Keynes, the causes pushing people to save are requirements of taking measures in the face of unexpected incidents, meeting future needs, being able to make more expenditure with the purpose of increasing welfare, generating more income by directing the idle funds to investment, improving the sense of self-confidence, being involved in speculative activities, bequeathing for descendants, satisfying greed, and preventing stinginess (Çetin, 2013). When these issues are examined, it is seen that Keynes addresses saving decisions within the framework of expectations and uncertainties, which are the new elements introduced to the theory of economics. According to this, people make their decisions regarding future uncertainties not by mathematical calculations but by basic instincts and intuitions (Duman Yavuz and Tokucu, 2006).

Acceptance or rejection of Say's Law lies on the basis of this discussion between Classical Economy and Keynesian Economy. Classical economists, along with accepting that a part of the income will not be spent, claim that this unspent part of the income, defined as saving, will definitely transform into an investment demand pursuant to Say's Law (Akçay, 1997). Keynes asserts that the interest mechanism, which has critical importance at this point, is not enabling the equilibrium of investment and saving, claims the presence of underemployment and thus the dysfunction of Say's Law. According to Aydın (2013), there is no mechanism enabling the referred equilibrium (Aydın, 2013).

Consequently, in the theory of economics, while Classical theory guarantees the savings and investment equilibrium within the framework of Say's Law, it claims that the mechanism enabling this is the presence of a reverse relationship between interest and savings as a function of the interest

rate of saving (Aydın, 2015). Keynes, under the assumption that Say's Law is invalid and that the economy is at equilibrium in the case of underemployment, expresses that he has no doubt regarding that an increase in interest rates will affect savings in the direction of a decrease (Keynes, 2010).

## 2. Literature review

In the empirical literature, various studies have been conducted regarding the relationship between interest and savings. Empirical literature on this subject will be presented chronologically, considering the years of the studies. Moreover, as the variable of "income" will be included as a control variable in the econometric model to be established in the study, the studies scrutinising the relationship between income and savings will be considered in the literature review. The empirical literature determined because of the review will be summarised in a table.

Edwards (1996) examined special and public savings using data on 36 countries from different geographies such as Türkiye, Germany, and Cameroon, and by especially emphasising the Latin American countries. According to the findings of the panel data study performed based on the period of 1970-1992, while the variable of income per capita was significant and positive, whereas the variable of real interest was insignificant and negative.

Callen and Thimann (1997) examined the effect of taxation and social security systems on household savings in 21 OECD countries based on the period of 1975-1995. According to the panel regression results of this study, in which short-term real interest rates were used as the control variable, an increase of 1 basis point in interest rates increased household savings by 0.06 units.

Masson et al. (1998), in their study in which they searched the determinant factors of special savings, considered the period of 1971-1993 as basis for 21 industrialised countries, and the period of 1982-1993 as basis for 40 developing countries, including. According to the results of this study, in which both time series and cross-sectional data methods were used, a significant and positive relationship was determined between the dependent variable of special savings / GDP and the independent variables of GDP growth and real interest rates.

Loayza (2000) examined the factors determining special savings for the economies of 150 countries based on the period of 1965-1994. According to the results of the study in which panel data analysis was used, there was a significant and positive relationship between personal income and special savings.

Athukorala and Sen (2001) examined the determinants of special savings in the economic development process of India within the framework of the lifecycle hypothesis. According to the findings of the study, which covered the period of 1954-1998, and which was modelled by the time series analysis, while a 1% increase in income per capita increased the special savings at a rate of 0.09%, a 1% increase in real interests increased the special savings at a rate of 0.20%. In other words, the relationship indicates a positive correlation between both variables.

Hallaq (2003) examined the factors determining special savings regarding the economy of Jordan for the period of 1976-2000. According to the findings of the study, while there was a positive relationship between special savings and GDP and income per capita, the effect of real interest on savings was insignificant.

In the study by Özcan et al. (2003), the period of 1968-1994 was examined by considering the case of Türkiye. According to the findings of the study, which was modelled by deeming special savings as the dependent variable, income level and real interest rates as independent variables, and

using the least squares method, it was determined that income level had a positive effect on special savings, and real interest rates were statistically insignificant.

Pelgrin (2003) examined the determinants of declining saving rates in 15 OECD countries in the 1990s by dynamic panel regression analysis. According to the results of the study, which was based on the period of 1970-2000, it was found that 1 point of increase in real interest rates decreased the share of saving in GDP by 0.331 units.

Dirschmid and Glatzer (2004) examined the factors determining the savings in the economy of Austria by the time series analysis. According to the result of the study, which was based on the period of 1960-2002, while 1% growth in income increased savings by 0.61% in the short term and by 0.97% in the long term, a 1% increase in real interests increased savings by 0.69% in the short term and by 1.16% in the long term. In other words, the effect of an increase in both income and interest on savings is positive.

Çağlayan (2006) examined the effect of inflation, interest, and growth rates on domestic savings using the ARDL bound test method. According to the findings of the study, which was performed based on the data of Türkiye's economy in the period of 1970-2004, the variables of interest and growth were positively affecting domestic savings.

Ramajo et al. (2006) scrutinised the determinants of special savings in 21 OECD countries by panel data analysis. According to the findings of the study based on the period of 1964-2001, the growth in income had significant and positive effect on savings.

Bhandari et al. (2007) examined the determinants of private sector savings of 5 Southern Asian countries (Bangladesh, India, Nepal, Pakistan, and Sri Lanka) by time-series and panel data analysis for each country. According to the panel data analysis results of the study based on the period of 1976-2001, while 1 unit of increase in income per capita increased private sector savings by 0.13 units, the effect of real interest rates on special savings was found to be statistically insignificant.

Ekinçi and Gül (2007) examined the relation between domestic saving and economic growth rates in Türkiye. In this study, it is based on the period of 1960-2004, and a vector error correction model, co-integration techniques, and causality analysis methods were used. According to the results of the study, a long-term relationship was determined between growth and saving rates, and a causal relationship between economic growth and domestic savings was found.

Agrawal et al. (2009) examined the factors affecting the domestic savings regarding 5 South Asian countries (India, Pakistan, Sri Lanka, Bangladesh, and Nepal) based on the period of 1960-2005. According to the findings of the study, which was conducted with a specific time series analysis for each country, the increase in per capita income positively affected savings rates, while real interest rates positively, albeit insignificantly, affected savings rates for two countries and negatively for three countries.

Düzgün (2009) analysed the determinants of special savings in Türkiye based on the period of 1987-2007 by the use of regression model. This study concluded that the increases in money supply and interest rates negatively affected special savings.

Yaraşır and Yılmaz (2011) examined by dynamic panel data analysis method the determinants and effects of special savings for 20 OECD countries based on the period of 1999-2007. According to the findings of this study, the effect of growth rate per person and real interest rates on special savings was found to be statistically insignificant.

Nabar (2011) examined the relationship between savings and interest rates in urban areas in China, based on the period of 1996-2009. According to the result of the study in which the dynamic panel

data analysis method was used, 1 point of increase in real interests decreased the savings by 0.167 units.

Raza and Atiyasaeed (2017) examined the relationship between interests and savings for the economy of Pakistan by the use of regression model established by the least squares method. According to the result of the study, in which interest rates on deposit and savings data for Pakistan's economy for the period of 2002-2016 was used, 1 point of increase in interest rates decreased savings by 1.07 units. In other words, the relationship between interest and saving was determined as negative.

Özlale and Karakurt (2012), in their study of the causes of the savings gap in Türkiye based on the period of 1987-2010, used regression analysis. According to the findings of the study, while the increases in savings interest on deposits affected savings in a positive direction, loans provided to the private sector affected the same in a negative direction.

Özcan and Günay (2012) established a special saving model for factors determining special savings in Türkiye based on the period of 1975-2006. According to the findings of the model determined by the time series analysis method, the relationship between income and savings was statistically insignificant.

Gök (2014) examined the factors that determine special savings in Türkiye using a time series analysis method. According to the findings of the study, which was performed based on the period of 1985-2010, it was determined that among the factors determining special savings, income had a positive effect, and interest had a negative effect.

In the study performed by Barış and Uzay (2015) study, the relationship between domestic savings and economic growth was examined in the context of Türkiye's economy based on the period of 1960-2012 by the use of Johansen cointegration analysis, Granger causality test and Toda-Yamamoto causality test. It was observed by the findings of the study that economic growth and thus the increase in income increased domestic savings and supported the life-cycle hypothesis.

Hamarat and Özen (2015) tested the variables affecting the saving preferences in Türkiye by the canonical correlation analysis. In this study, it was determined that high income is a factor that increases savings.

**Table 1: Literature Summary**

Author Name	Country Group/Period	Method	Findings
Edwards (1996)	36 Countries from Different Geographies/1970-1992	Panel Data Analysis (Panel Regression)	0
Callen and Thimann (1997)	21 OECD Countries/1975-1995	Panel Data Analysis (Panel Regression)	+
Masson et al. (1998)	21 Industrialised Countries-40 Developing Countries/1971-1993-1982-1993	Panel Data Analysis	+
Loayza (2000)	Different 150 countries	Panel Data Analysis	+
Athukorala and Sen (2001)	India/1954-1998	Time Series Analysis	+
Hallaq (2003)	Jordan/1976-2000	Time Series Analysis	0
Özcan et al. (2003)	Türkiye/1968-1994	Time Series Analysis	0
Pelgrin (2003)	15 OECD Countries/1970-2000	Panel Data Analysis	-
Dirschmid and Glatzer (2004)	Austria/1960-2002	Time Series Analysis	+
Çağlayan (2006)	Türkiye/1970-2004	Time Series Analysis	+
Ramajo et al. (2006)	21 OECD Countries/1964-2001	Panel Data Analysis	+(Income)
Bhandari et al. (2007)	5 Southeast Asian countries (Bangladesh, India, Nepal, Pakistan, and Sri Lanka)	Time Series Analysis (A Specific Model for Each Country)	0
Ekinci and Gül (2007)	Türkiye/1960-2004	Time Series Analysis	Causal Relationship (+/-)
Agrawal et al. (2009)	5 South Asian Countries (India, Pakistan, Sri Lanka, Bangladesh, and Nepal)/ 1960-2005	Time Series Analysis (A Specific Model for Each Country)	0 (for 2 Countries), - (for 3 Countries)
Düzgün (2009)	Türkiye/1987-2007	Time Series Analysis	-
Yaraşır and Yılmaz (2011)	20 OECD Countries/1999-2007	Panel Data Analysis	0
Nabar (2011)	China/1996-2009	Time Series Analysis	-
Raza and Atiyasaeed et al. (2017)	Pakistan/2002-2016	Time Series Analysis	-
Özlale and Karakurt (2012)	Türkiye/1987-2010	Time Series Analysis	-
Özcan and Günay (2012)	Türkiye/1975-2006	Time Series Analysis	0 (Income)
Gök (2014)	Türkiye/1985-2010	Time Series Analysis	-
Barış and Uzay (2015)	Türkiye/1960-2012	Time Series Analysis	+
Hamarat and Özen (2015)	Türkiye/2010	Cross-Sectional Data Analysis	+(Income)

**Note:** "0" in the finding column means statistically insignificant.

It is observed that the literature review provides different results. In this respect, it can be said that there is also a difference and discussion in the empirical literature, as in the theoretical dimension. In other words, regarding the sense of interest and saving relationship, the results of empirical studies differ according to the dimensions of sample and time, and the results support both Classical theory and Keynesian theory. Moreover, according to the results of some studies, the referred relationship was found to be statistically insignificant. The weighted distribution of the three results (positive, negative, and insignificant) regarding this relationship is very close to each other. Namely, the results of 6 of the studies that empirically examined the interest-savings nexus and included in the literature review were found to be positive, 5 were found to be negative and 5 were found to be insignificant. Thus, it is difficult to determine which result is outweighing the literature. In this



respect, the discussion of the theoretical ground for the interest–saving relationship is also present in the empirical dimension.

### 3. Findings of the study

#### 3.1. Method

The variables used in this study were scrutinised by panel data analysis (Gujarati, 2004), in which cross-sectional data, expressing the data obtained from different units in a single timeframe, and time series data, expressing the data obtained from only a single unit in different timeframes, were used together. Panel data analysis, despite having some constraints, such as the error term generally being deviant, lack of data for some countries, and shortness of time dimension (Yerdelen Tatoğlu, 2018), has some advantages, such as rapid development of its theory and estimation methods (Greene, 2003), allowance of the use of more data due to being two-dimensional in terms of both unit and time, performance of estimations with higher degrees of freedom (Önder, 2017), elimination of the problem of multicollinearity, elimination of problems arising from specification error (Baltagi, 2005), and establishment of more extensive models (Yerdelen Tatoğlu, 2012).

The general equation of linear panel data models is as follows (Yerdelen Tatoğlu, 2012):

$$Y_{it} = \alpha_{it} + \beta k_{it} X k_{it} + \varepsilon_{it} \quad i = 1, 2, \dots, N; t = 1, 2, \dots, T \quad (1)$$

In eq. (1), Y is the dependent variable, X is the independent variable,  $\alpha$  is the constant parameter,  $\beta$  is the inclination parameter, and  $\varepsilon$  is the error term. The sub-index of i expresses the dimension of the cross-section, such as the country, city and company; and the sub-index t expresses the dimension of time, such as year, month, and day (Hsiao, 2003).

Panel data models are generally divided into three categories as unidirectional models, in which constant parameter changes only as per unit or time (as specified in the sub-indices), bidirectional models, in which it changes as per both units and time, and classical models, in which it does not change as per unit or time. The referred models are estimated using three different methods: pooled classic model, fixed effects model, and incidental effect model (Sheytanova, 2014).

Within this frame, primarily, whether the effects of unit and time were valid or not was tested at the model preference stage, and if both effects were invalid, the classical model was used. However, if the presence of the effects of unit and/or time was determined, it would be decided on either the fixed-effects model or the random-effects model using the Hausman test. Then, the deviations from econometric assumptions were tested, and if deviations from the assumption were present, they were corrected, and subsequently, the model was interpreted in statistical and economic terms.

#### 3.2. Variables and Dataset

Primarily, the reason for preference of the gross domestic savings series, as representing the saving variable, was that it is the most extensively used data set in literature studies regarding savings on a macroeconomic basis. For the interest rate variable, long-term interest rates for Luxembourg for the period 1995-1998 and Lithuania for the period 2005-2021 (maturities up to 2 years) had to be preferred due to a lack of data. With this exception, the cause of preference for short-term interests, as an interest variable, was that their flexibility against policy interests is higher than that of long-term interest rates, and thus, there is relatively greater control of monetary policy authorities. Moreover,

the annual basis of data used in econometric analysis makes the effect of the short-term status of interest rates—which are the independent variable—more significant on the saving rates—which are the dependent variable. Lastly, the main cause of preference for income, which was selected as the control variable, over local currencies in GDP per capita was domestic savings mostly over local currencies on the basis of countries. In other words, in the econometric model, the use of two independent variables—as one being the control variable—as against the dependent variable was deemed sufficient at the point of examining the relationship between interest and saving, which is the motivation of the study.

In light of these explanations, detailed information on the variables and databases can be provided. The dependent variable indicates current domestic savings in local currency. This variable is obtained from The World Bank's World Development Indicators (WDI) data bank and obtained by subtracting total consumption from GNP and adding net transfers to that. In addition, the variable is formed by the special saving data.

Regarding the independent variables, the interest rate variable for Chile, Hungary, Lithuania, Luxembourg, Mexico, Slovenia, Slovakia, Switzerland, and Türkiye was obtained from the International Financial Statistics (IFS) database of the International Monetary Fund (IMF), which has been active since January 1948; for Estonia, from the Estonian Central Bank (Eesti Pank), and for Japan, from the Bank of Japan (BoJ). In the rest of the countries, the interest rate variable is obtained from the Monthly Monetary and Financial Statistics (MEI) database of the Organisation for Economic Co-Operation and Development (OECD) and reflects interest rates with maturities less than 1 year.

The final variable of per capita GDP was again obtained from The World Bank's World Development Indicators (WDI) database and derived by dividing the GDP by the total population in the midyear. The data referenced were calculated in local currencies using fixed prices.

Table 2 presents the descriptive statistics of these variables.

**Table 2:** Variables and Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Saving	945	26.29301	2.608257	20.1408	34.23721
Income	945	11.47569	2.032198	8.400393	17.42706
Interest	945	4.343607	9.61927	-2	183.2

The dataset covers the years 1995-2021 and includes statistics from 35 OECD nations.<sup>1</sup> The data is collected annually. The model incorporates savings and income variables in logarithmic form. However, the interest rate variable is excluded because of the presence of negative values. The mathematical expression representing the semi-logarithmic panel data model is provided in eq. (2) as follows:

$$\text{Log}(\text{Saving})_{it} = \alpha_{it} + \beta_{0it}\text{Log}(\text{Income})_{it} + \beta_{1it}\text{Interest}_{it} + \varepsilon_{it} \quad (2)$$

<sup>1</sup> Although the organisation consisted of 36 countries, Latvia was removed from the model due to insufficient data.

### 3.3. Empirical findings

The main objective of this study was to investigate the impact of unit and time effects on the relationship between GDP per capita and interest, which influence gross domestic savings in OECD countries. This was done using the Panel Data Analysis Method. The co-presence of the effects of unit and time was initially examined using the Maximum Likelihood Estimator (LR Test). The variable  $M_i$  represents the effect of unit, and the variable  $X_t$  represents the effect of time on determining the consequences.

**Table 3:** Co-Testing of the Effects of Unit and Time: Maximum Likelihood Test

Test Statistic	Probability Value
3276.41	0.0000

$H_0: M_i=X_t=0$   
 $H_1: At least one different from 0.$

Based on the findings presented in Table 3, the null hypothesis  $H_0$ , which states that unit and time effects are equal to zero, was rejected with a 95% confidence level. Simply put, the model exhibits either the unit effect, time effect, or both. This outcome suggests that the model does not conform to classical effects but rather falls into either a fixed-effects or random-effects model. It is necessary to test the effects of unit and time separately in this scenario. The LR (Likelihood Ratio) test, LM (Breusch-Pagan Lagrange Multiplier) test, and F-tests were used to separately examine the effects of unit and time.

**Table 4:** Testing the Effect of Unit: F, LR, and LM

Test's Name	Test Statistic	Probability Value
F	1133.01	0.0000
LR	3238.47	0.0000
LM	11083.41	0.0000

$H_0: M_i=0$   
 $H_1: M_i \neq 0$

The results of the F, LR, and LM tests in Table 4 strongly reject  $H_0$ , which assumed that the effect of the unit was 0. This rejection was based on all probability values being 0 at a 95% confidence level. Simply put, the model's analysis determined that the unit had an observable effect.

**Table 5:** Effect of Time: F, LR, and LM

Test's Name	Test Statistic	Probability Value
F	0.97	0.5020
LR	0.00	1.0000
LM	0.00	1.0000

**H<sub>0</sub>:**  $M_t=0$   
**H<sub>1</sub>:**  $M_t \neq 0$

Based on the test results presented in Table 5, the null hypothesis ( $H_0$ ) that states there is no effect of time cannot be rejected at the 95% confidence level. In other words, the analysis determined that the time variable did not have any effect on the model. The probability values, which were consistently close to 1, strongly indicate that the effect of time was firmly dismissed.

Based on the results of the F, LR, and LM tests, it was concluded that the model is unidirectional, meaning that the effects of time is absent while the effect of unit is present. The Hausman test was used in the model to determine whether the independent variables were correlated with the current effect of the unit.

**Table 6:** Selection of Model: Hausman Test

Test Statistic	Probability Value
169.48	0.0000

**H<sub>0</sub>:** Fixed-effects model, consistent; Random-effects model, effective  
**H<sub>1</sub>:** Fixed-effects model, consistent; Random-effects model, inconsistent.

The Hausman test results in Table 6 rejected the hypothesis  $H_0$ , indicating that the fixed-effects model was inconsistent and the random-effects model was not effective. Therefore, the alternative hypothesis, which supports the consistency of the fixed-effects model, should be supported. Therefore, the unidirectional fixed-effects model was chosen as the model for the investigation.

In panel data models, it is assumed that the error term is uncorrelated as constant variance (homoscedastic), periodical, and spatial within the unit and among units, and that it is uncorrelated among units (Yerdelen Tatoğlu, 2013). Then, the presence of deviations from the referred assumptions should be tested, and if present, such deviations should be corrected. From among the deviations from the assumption, I tested the initially heteroscedasticity using the modified Wald test.

**Table 7:** Testing of Heteroscedasticity: Modified Wald

Test Statistic	Probability Value
37374.27	0.0000

**H<sub>0</sub>:** Heteroscedasticity is not present.  
**H<sub>1</sub>:** Heteroscedasticity is present.

According to the Modified Wald Test results provided in Table 7, hypothesis  $H_0$ , suggesting that “Heteroscedasticity is not present”, was rejected at a confidence level of 95%. Therefore, heteroscedasticity is present in the model.

**Table 8:** Testing of Autocorrelation: Durbin-Watson Test of Bhargava, Franzini, and Narendranathan, and Locally Best Invariant Test of Baltagi-Wu

Test's Name	Tests Statistics
Durbin-Watson Test of Bhargava, Franzini, and Narendranathan	0.40
Locally Best Invariant Test of Baltagi-Wu	0.61

$H_0$ : Autocorrelation is not present.

$H_1$ : Autocorrelation is present.

Regarding the autocorrelation test, only the test statistics were present, and the probability values were not calculated in both tests. Although critical values are not given in the literature, it is assumed that the autocorrelation is significant if the test statistics are less than 2 (Yerdelen Tatoğlu, 2013, p. 214). According to the results of Durbin-Watson Test of Bhargava, Franzini, and Narendranathan, and Locally Best Invariant Test of Baltagi-Wu provided in Table 6, it can be said that autocorrelation is present.

**Table 9:** Effect of Time: F, LR, and LM

Test's Name	Test Statistic	Probability Value
Pesaran Test	20.114	0.0000
Friedman Test	147.000	0.0000
		Critical Values
		10%: 0.0958
Frees Test	9.061	5%: 0.1248
		1%: 0.1794

$H_0$ : Correlation is not present among units.

$H_1$ : Correlation is present among units.

According to the results of the Pesaran, Friedman, and Frees Tests provided in Table 9, the hypothesis  $H_0$ , assuming that correlation is not present among the units, was rejected at a confidence level of 95% as the probability values were less than 0.05. According to the results of the Frees test, hypothesis  $H_0$  was again rejected because the test statistic was larger than the critical values. In other words, correlation is also present among units in the model.

Consequently, as a result of testing deviations from the assumption, the presence of autocorrelation and correlation deviations among units was determined in the model. The analysis results were obtained using the use of Driscoll-Kraay estimator which is robust against the deviations referred to from the assumption.

**Table 10:** Results of Driscoll-Kraay Estimator

	Coefficients	Text Driscoll-Kraay Standard Errors	t-Statistics	Probability Value
Constant	0.599867	1.835718	0.33	0.746
GDP per Capita	2.247476*	0.1569028	14.32	0.000
Interest	-0.0226069*	0.0091563	-2.47	0.020
Number of Observations	F-Test Statistics	Probability Value	R <sup>2</sup>	
945	1439.68	0.0000	0.8165	

According to Table 10, as the F-test of the final model, in which all three deviations from the assumption were corrected by the robust Driscoll-Kraay estimator, was statistically significant, it was completely significant. When the t-tests are scrutinised, it is being observed that two independent variables are significant, excluding the constant coefficient, at a confidence level of 95%. According to determination coefficient (R<sup>2</sup>), approximately 82% of the changes arising in the dependent variable of gross domestic savings can be explained by the independent variables of short-term interests and national income per capita included in the model. Approximately 18% of the changes in the dependent variable of gross domestic savings can be explained by variables not included in the model. The high coefficient of determination indicates that income and interest rate variables are important determinants of saving.

Because the independent variables GDP per capita and interest rate are statistically significant, coefficient interpretations of these variables can be made. The constant coefficient is statistically insignificant. The fact that the constant coefficient is positive contradicts the theoretical background. This occurs because when income is zero, consumption is financed either by borrowing or by dissolving savings from previous periods. Therefore, the fact that the constant coefficient is positive but statistically insignificant is a healthy result in terms of economic theory.

An increase of 1% per capita in income increases gross domestic savings by approximately 2.25%. Consequently, this supports Keynesian theory. In Keynesian theory, the main source of savings is income, and savings are an increasing function of income.

A 1-unit increase in interest reduces gross domestic savings by approximately 2.26%. This result in the model supports the dissertation of Keynesian theory, which is opposite to classical theory claiming that increases in interest rates will decrease savings in the context of OECD countries based on the period of 1995-2017 (Keynes, 2010).

The empirical findings of this study are similar to some studies and dissimilar to others when compared with the results of studies in literature addressing the relationship between income and savings, especially the relationship between interest and savings. As specified in the conclusion section of the literature review, the results of empirical studies in literature nearly have an equal distribution in the context of classical theory and Keynesian theory. In this respect, the empirical results of this study corroborate studies that support Keynesian theory as specific to the relationship between interest and saving.

## Conclusion

In the field of economics, there is a divergence of opinion between Classical Theory and Keynesian theory regarding the determinants of savings, as well as on various other matters. Classical theory claims that the relationship of interest among the factors determining savings is in a positive direction, and in other words, saving is an increasing function of interest. Keynesian theory is also sure that increases in interest rates will diminish savings.

Incorporating this divergence of viewpoints, the study employed an econometric model utilising Panel Data Analysis to examine a sample of 35 OECD nations from 1995 to 2021. The Static Panel Data Analysis Method was chosen as a technique to prevent data loss because the time dimension of the dataset is quite short, and the use of Dynamic Panel Data methods would result in data loss due to differencing processes. The econometric model discussed uses gross savings as the dependent variable, whereas GDP per capita and interest rates are chosen as independent variables. The distinguishing factor of this study in the literature is the absence of empirical research that investigates the correlation between income, interest, and savings within the framework of both Classical Economic Theory and Keynesian Economic Theory. Furthermore, this study stands out because it focuses on referral connections among OECD nations prior to 2000. Moreover, due to the reduced number of member countries before 2000 compared to the present, the samples used in the aforementioned studies are also smaller. The distinguishing features of this study, in comparison to other studies, include a comprehensive examination of the theoretical connection between income, interest, and saving, a longer and more current reference period, and a larger sample size resulting from the inclusion of additional member countries of the OECD. According to the findings of panel data analysis, while the effect of the variable of GDP per capita on savings was in positive direction, as expected by the literature of economics, and by the results of literature, the effect of the variable of interest—which is the main discussion focus of the study—was in negative direction. At this point, the analysis in the subject supports Keynes' assertion that an increase in interests will lead to a decline in savings. Furthermore, as also assessed by the result of the empirical literature review, the relationship between interest and saving provides different results in the empirical dimension, as in the theoretical ground. The results of the relationships referenced in different reference periods and for different sample sizes are also numerically close and may be deemed a reflection of the theoretical dispute in the empirical field. Enlightening this part more both theoretically and empirically may be rendered possible by addressing more reference periods and sample sizes and by assessing the

results in accordance with the economic and social structure of each period and each country by associating the results in regional and spatial dimensions.

Consequently, at the point of increasing savings as specific to 35 OECD countries, the implementation of expansionary monetary and fiscal policies that primarily increase investments and income (also considering the crowding out effect), keeping interest rates as low as possible within the bounds of possibility of both real and financial markets in the context of expansionary monetary policies, and driving expectations in a positive direction by establishing stability and trust in both real and financial markets may be adopted as a strategy. Moreover, suggestions such as improving the individual pension system, which will promote savings, increasing financial depth by diversifying financial instruments, export incentives for increasing GDP, employment support packs for increasing personal saving on a micro basis, increasing real wages by decreasing inflation to reasonable levels, and supporting all kinds of policies for increasing the income of lower-income groups whose tendency for saving is low may be considered in the context of the findings of the study.

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