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Research Article

Testing the Validity of the Feldstein-Horioka Hypothesis in Developed and Less Developed Countries by Panel Data Analysis

Gelişmiş ve Az Gelişmiş Ülkelerde Feldstein-Horioka Hipotezinin Geçerliliğinin Panel Veri Analizi ile Test Edilmesi

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Abstract

In this study, prepared within the scope of the Feldstein-Horioka hypothesis, which tries to analyze the relationship between savings and investments by adhering to the degree of liberty of international capital movements; horizontal cross-section dependence, delta homogeneity, panel unit root and cointegration tests and finally Emirmahmutoğlu and Köse (2011) causality test are applied with the help of annual data on the ratios of investment and savings to gross domestic product covering the period 2000-2021 for 37 developed and less developed countries. As a result of the findings, it was concluded that the Feldstein–Horioka hypothesis is valid. Accordingly, it has been determined that there is a long-term relationship between savings and investments; it has been seen that a shock in any country will affect other countries as well.

Keywords: *Feldstein-Horioka, Panel data analysis, Capital Mobility, Saving, Investment*

Öz

Tasarruflar ve yatırımlar arasındaki ilişkiyi uluslararası sermaye hareketlerinin serbestlik derecesine bağlı kalarak analiz etmeye çalışan Feldstein-Horioka hipotezi kapsamında hazırlanan bu çalışmada, gelişmiş ve az gelişmiş olan 37 ülkeye ait 2000-2021 dönemini kapsayan, yatırım ve tasarrufların gayri safi yurt içi hasılaya oranlarına ilişkin yıllık veriler yardımıyla yatay kesit bağımlılığı, delta homojenliği, panel birim kök ve eşbütünleşme testleri; son olarak da Emirmahmutoğlu ve Köse (2011) nedensellik testi uygulanmıştır. Elde edilen bulgular neticesinde, Feldstein–Horioka hipotezinin geçerli olduğu sonucuna ulaşılmıştır. Buna göre tasarruflar ile yatırımlar arasında uzun dönemli bir ilişki olduğu tespit edilmiş; herhangi bir ülkedeki şokun diğer ülkeleri de etkileyeceği görülmüştür.

Anahtar Kelimeler: *Feldstein-Horioka, Panel veri analizi, Sermaye Hareketliliği, Tasarruf, Yatırım*

1. Introduction

The facilitation of transactions aimed at operating in international financial markets also brings along economic debates and these debates over time increase the importance of certain macroeconomic variables. Among these macroeconomic variables, savings and investment are also included. This is because according to the literature on financial liberalization, one of the most significant factors influencing high investment levels is the savings variable. One of the fundamental factors underlying this relationship is also the degree to which a country is integrated into the global financial system and

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its sensitivity to capital movements. Before 1980, there was a structure where financial repression existed and integration into the world economy was under the control of public authorities. However, after 1980, a period began where risk in international financial markets was not regulated by public authorities and steps towards financial liberalization gained momentum.

Although financial liberalisation policies both accelerate the financial integration process and enable more investment through international capital flows, Feldstein and Horioka (1980), examined the relationship between investment and saving in their study of "Domestic Saving and International Capital Flows" and reached findings that can be a reference for many studies to be conducted in this field. Feldstein and Horioka (1980), as a result of their analysis of investment and saving data of 16 OECD (Organisation for Economic Co-operation and Development) member countries for the years 1960-1970, found that capital does not move much in industrialised countries and domestic investments are sensitive only to domestic savings and the expected benefit from international savings does not emerge. The findings are not surprising considering that the analysis was conducted in a period when the financial globalisation process had not accelerated and therefore capital markets were not free enough. For short, the Feldstein-Horioka Hypothesis (FHP) states that in a country with low capital mobility (in a closed economy), all domestic savings are used to finance domestic investments and the level of investments in the country depends on the level of savings in the country. Nevertheless, if the degree of capital mobility in a country is high, the decline in savings will be stabilised by capital flows into the country, whereas the increase in domestic savings will flow into investments elsewhere in the world and be used for other countries. In this way, the level of investment in a country will be independent of the level of savings in the country (Rye and Robertson, 2003:2).

The main objective of this study is to test the validity of the Feldstein-Horioka hypothesis in 37 countries using advanced panel data analysis method. In this regard, the relationship between domestic investment and domestic saving volumes will be determined and recommendations will be made according to the results.

The study consists of three sectionsThe first, a literature review will be conducted on applied studies examining the relationship between savings and investment and the validity of the Feldstein-Horioka hypothesis. Then, information will be given about the methods applied through annual data for the period 2000-2021 for 37 countries and the findings of the tests will be evaluated. The study will be completed with a conclusion section where a general evaluation is made.

2. Literature

The empirical findings obtained by Feldstein and Horioka (1980) and their comments on the beta(β) coefficient have led to the emergence of many studies in the financial literature. There are basically two views regarding the results of Feldstein and Horioka. The first of these views; indicates that there is a positive relationship between savings and investments in a country. Another view is that the Feldstein-Horioka hypothesis and the interpretation of the β coefficient are incorrect, the relationship between domestic saving and investment may be affected by other factors and that different exchange rate regimes applied by countries should also be taken into account. Not only exchange rate regimes, but also factors such as country size, population growth rate, customs regime, non-tradable goods, current account deficit, real wage level, productivity shocks can be taken into account.

In order to test the Feldstein-Horioka hypothesis, many studies have been conducted on a country or different countries in both national and international literature. In these studies, the validity of the hypothesis was questioned based on different periods. Different methods and findings were included in the analyzes of the studies. A summary of the studies in which panel data analysis was applied by considering different countries to test the validity of the Feldstein-Horioka hypothesis is given in Table 1.

Table 1: Literature review for the Feldstein-Horioka hypothesis

Writer	Period	Sample Group	Method	FHP
Kim (2001)	1960-1992	19 OECD Countries	Panel Data Analysis	Valid

Blanchard ve Giavazzi (2002)	1975-2001	OECD ve EU Countries	Panel OLS	Valid
Coakley, Fuertes ve Spagnolo (2004)	1980-2000	12 OECD Countries	Panel Data Analysis	Invalid
Fouque, Hurlin ve Rabaud (2008)	1960-2000	24 OECD Countries	Panel Threshold Regression	Valid
Georgopoulos ve Hejazi (2009)	1975-2004	62 Developed and Developing Countries	Panel OLS, Generalized Least Squares	Valid
Petreska ve Mojsoska-Blazevski (2013)	1991-2010	Transition Economies (South-Eastern Europe (SEE), Central and Eastern Europe (CEE), Commonwealth of Independent States (CIS)	Panel Cointegration Analysis	Valid, Invalid in Central and Eastern European Countries.
Mercan (2014)	1970-2011	Turkey and EU Countries	PANKPSS Unit Root Test, Cointegration Test	Valid
Akay ve Türküz (2016)	1981-2013	Open, Developed and Developing Countries	Panel Vector Autoregression	Invalid
Yalçınkaya ve Hüseyni (2016)	1980-2013	28 OECD Countries	The New Generation Panel Data Analysis	Valid
Adıgüzel et al. (2017)	1995-2014	Transition Economies	Panel Data Analysis	Invalid in most countries
Ay ve Özmen (2017)	1970-2015	12 Countries	Panel Unit Root Test, FMOLS, DOLS, CCR and Panel Causality Test	Invalid
Çiftçi et al. (2018)	1980-2015	28 OECD Countries	Panel Cointegration Analysis	Invalid
Özek ve Bayat (2020)	2002-2018	Azerbaijan, Kazakhistan, Kyrgyzstan, Tajikistan and Turkey	LLC and IPS Panel Unit Root Test, Panel Cointegration Test, Panel VAR and PVEC Test	Valid in Azerbaijan, Kazakhstan and Turkey; Not valid in Kyrgyzstan and Tajikistan
Alakbarov ve Bayar (2021)	1994-2016	21 Developing Countries	Panel Cointegration and Panel Causality Test	Invalid

Koçdemir ve Gölpek (2021)	1990-2018	The Southern Common Market Countries (Argentina, Brasil, Uruguay, Chile, Bolivia, Ecuador, Peru, Colombia and Venezuela)	Panel Cointegration, Emirmahmutoğlu and Köse Panel Causality Test	Valid
Berkman (2022)	1996-2020	G8 Countries	Panel Data Analysis	Invalid
Konya (2022)	1990-2020	41 Less Developed Countries	Westerlund Panel Cointegration Test, Emirmahmutoğlu and Köse Panel Causality Test	Valid

Note: CCR: Canonical Cointegration Regression, DOLS: Dynamic Ordinary Least Square, EU: European Union, FMOLS: Fully Modified Least Squares, IPS: Im, Pesaran and Shin, LLC: Levin, Lin and Chu, OLS: Ordinary Least Square, PANKPSS: Panel Kwiatkowski, Phillips, Schmidt and Shin, PVEC: Panel Vector Error Correction, VAR: Vector Autoregression

It is thought that this study will make a contribution to the literature by considering a wider country scale (37 countries), using advanced econometric analyses and taking into account and evaluating more reliable results. In the subsequent section of the study, the dataset and model will be explained, providing information about the methods employed in the research. Finally, the findings from the conducted tests will be evaluated and recommendations will be presented.

3. Ampirical Analysis

3.1. Data and Method

In the analysis conducted related to this study, the relationship between domestic investments and savings within the framework of the Feldstein-Horioka hypothesis is investigated using annual data from the period of 2000 to 2021. In this context, the study is based on the classification conducted by the Human Development Index (HDI) for 37 developed and less developed country economies. The variables used in the analysis and explanations regarding these variables can be found in Table 2.

Table 2: Variables and descriptions of variables

Variables	Abbreviation	Utilized Data	Description
Investment Variable (I/Y)	Gross Fixed Capital Formation (GFCF)	Gross Fixed Capital Formation (as a percentage of GDP)	Gross fixed capital formation comprahends land improvements (fences, ditches, sewers etc.), the purchase of plant, machinery and equipment and the construction of roads, railways and the like including schools, hospitals, private residences, commercial and industrial buildings.
Savings Variable (S/Y)	Gross Domestic Savings (GDS)	Gross Domestic Savings (as a percentage of GDP)	Gross Domestic Savings are calculated by subtracting final consumption expenditures (total consumption) from GDP.

Source: https://databank.worldbank.org/source/world-development-indicators

When examining the Human Development Index (HDI) data for developed and less developed countries in Table 3, it is observed that among developed countries, the highest rate is in Switzerland, while the lowest rate is in the United States. Among the less developed countries, the highest rate is in Bangladesh, while the lowest rate is attributed to the Republic of the Congo. The fact that the data for the Human

Development Index is for the year 2021 is due to the most recent release of the Human Development Report in September 2022.

Table 3: Human development index for developed and less developed countries

Number	Country	Human Development Index (HDI)
1	Switzerland	0,962
2	Norway	0,961
3	Iceland	0,959
4	Hong Kong	0,952
5	Australia	0,951
6	Denmark	0,948
7	Sweden	0,947
8	Ireland	0,945
9	Germany	0,942
10	Netherlands	0,941
11	Finland	0,940
12	Singapore	0,939
13	Belgium	0,937
14	New Zealand	0,937
15	Canada	0,936
16	England	0,929
17	USA	0,921
18	Bangladesh	0,661
19	India	0,633
20	Ghana	0,632
21	Micronesia	0,628
22	Kiribati	0,624
23	Honduras	0,621
24	Sao Tome and Principe	0,618
25	Laos	0,607
26	Vanuatu	0,607
27	Nepal	0,602
28	Eswatini	0,597
29	Equatorial Guinea	0,596
30	Cambodia	0,593
31	Zimbabwe	0,593
32	Angola	0,586

33	Myanmar	0,585
34	Syria	0,577
35	Kenya	0,575
36	Zambia	0,565
37	Republic of Congo	0,479

Source: https://hdr.undp.org/data-center/human-development-index#/indicies/HDI

In the study, the Pesaran (2004) CD_{LM} test was initially employed within the framework of the Feldstein-Horioka hypothesis to detect both the cross-sectional dependence of variables and the model established. Secondly, the stationarity of the variables was determined with the CADF (Cross-Sectionally Augmented Dickey-Fuller) unit root test, which is one of the second generation panel unit root tests under horizontal cross-sectional dependence, which is the unit root analysis of the series. In the model utilizing panel data analysis, thirdly, the Homogeneity Test (Δ test) developed by Pesaran and Yamagata (2008) was used to ascertain the homogeneity of cointegration coefficients. Fourthly, the existence of cointegration relationships among the series was analyzed using the panel cointegration test developed by Westerlund and Edgerton (2007). Finally, for the coefficient (β) estimator in panel data analysis, the CCE (Common Correlated Effects) estimator developed by Pesaran (2006) was employed and causality direction between variables was determined using the causality test by Emirmahmutoğlu and Köse (2011).

The test for cross-sectional dependence of variables holds significant importance in determining which tests to employ when conducting unit root tests and cointegration analyses. Cross-sectional dependence assumes that the degrees of influence on all countries from a shock targeting any of the units comprising the panel are equal and that other countries forming the panel are unaffected by a macroeconomic shock occurring in any one country. In today's context, it is more reasonable to assume that an economic shock emerging in one country would have varying effects on other countries. Therefore, due to the inconsistency of results obtained from analyses that neglect cross-sectional dependence, it is imperative to ascertain the presence of cross-sectional dependence among series before conducting the analysis. (Mercan, 2014: 235).

One of the cross-sectional dependence tests is the LM test developed in the study by Breusch and Pagan (1980), which is represented by the following equation (1).

$$\mathrm{CD}_{LM1} = T \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{ij}^2 \qquad (1)$$

In Equation (1), $\hat{\rho}$ represents the sample estimate of the pairwise correlation of residuals. In this test, the null hypothesis H_0 assumes that there is no relationship between cross-sections and as $T \rightarrow \infty$ while N is constant, it is assumed to have a chi-squared asymptotic distribution with N(N-1)/2 degrees of freedom. The test is typically used when the time dimension T is greater than the cross-sectional dimension N (Pesaran, 2004:4).

The CD_{LM} test developed by Pesaran (2004), as shown in Equation (2), can be applied when both N and T are relatively high. This test represents an improved version of the Breusch and Pagan (1980) test.

$$\mathrm{CD}_{LM2} = \sqrt{\frac{1}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} (T\hat{\rho}_{ij}^2 - 1) \qquad (2)$$

According to this test, when $T \rightarrow \infty$ and $N \rightarrow \infty$, it is assumed that there is no cross-sectional dependence. However, when N > T, the CD_{LM} test exhibits high levels of distortion and deviations increase as N increases. Therefore, Pesaran (2004) developed the CD test to determine cross-sectional dependence in cases where N > T. The practical test shown in Equation (3) is applied when N is greater than T (N > T).

$$\mathrm{CD}_{LM} = \sqrt{\frac{2T}{N(N-1)}} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{ij} \right) \quad (3)$$

According to Pesaran et al. (2008), when the probability value obtained is less than 0.05, the null hypothesis (H_0) is rejected at the 5% significance level, indicating that there is cross-sectional dependence among the units forming the panel.

The homogeneity of variables should be considered when deciding which unit root and cointegration tests to apply. In the empirical model where panel data analysis is used, the homogeneity of variables can be examined first using the Homogeneity Test (Δ test) developed by Pesaran and Yamagata (2008). This test is analyzed through equations (4) and (5).

For larger samples (Equation 4):

$$\tilde{\Delta} = \sqrt{N} \frac{N^{-1}\tilde{S} - k}{\sqrt{2k}} \quad (4)$$

For small samples (Equation 5):

$$\tilde{\Delta}_{adj} = \sqrt{N} \frac{N^{-1}\tilde{S} - k}{\sqrt{Var(t,k)}} \quad (5)$$

The hypothesis for the Homogeneity Test is as follows:

H_0: The slope coefficient is homogeneous ($\beta i = \beta$).

H_1: The slope coefficient is heterogeneous ($\beta i \neq \beta$).

In the formula, N represents the number of cross-sections, S represents the Swamy test statistic, k represents the number of explanatory variables and Var(t,k) represents the standard error. According to Pesaran and Yamagata (2008), when the probability value obtained is less than 0,05, the null hypothesis (H_0) is rejected at the 5% significance level, indicating that the panel is heterogeneous.

In this study, the stationarity of the series was analyzed using the second-generation panel unit root test, the Cross-Sectionally Augmented Dickey-Fuller (CADF) test. The CADF test assumes that countries are affected differently by time effects and takes spatial autocorrelation into account. It assumes that the error term is composed of two parts: One that is common to all series and another that is specific to each series. This panel unit root test is based on regression model estimation and hypothesis testing.

H_0: $\rho i = 0$ (Each series belonging to each cross-section of the panel contains a unit root)

H_1: $\rho i < 0$ (Some of the cross-sections forming the panel do not contain a unit root)

In the Cross-Sectionally Augmented Dickey-Fuller (CADF) test, there are t statistics for ρi coefficients. The stationarity of each series belonging to each cross-section forming the panel is determined by comparing it with critical table values created by Pesaran (2007). If the calculated CADF test statistic is greater than the critical table value, the null hypothesis is rejected and it is concluded that the corresponding cross-section is stationary.

In the CADF test developed by Pesaran (2007), the Cross-Sectional Extended Im, Pesaran and Shin (CIPS), which is the unit root test statistic for the entire panel, can be calculated by averaging the unit root test statistics for each cross-section. The CIPS statistic is formulated as follows (Pesaran, 2007:266):

$$CIPS\ (N,T) = N^{-1}\Sigma_{i=1}^{N} t_i\ (N,T) \quad (6)$$

In Equation (6), ti (N,T); represents the CADF statistic for the i-th cross-sectional unit. Therefore, Equation (7), formulated for the CIPS statistic, can be expressed as follows (Pesaran, 2007:276):

$$CIPS\ (N,T) = N^{-1}\Sigma_{i=1}^{N}\ CADF_i \quad (7)$$

To determine whether there is a unit root in the overall panel, the CIPS statistic is calculated by averaging the CADF statistics. If the CIPS statistic value is greater than the critical value produced in Pesaran's (2007) study, the null hypothesis (H_0) is rejected and it is concluded that the panel dataset is stationary.

Since the linear combinations of series that are non-stationary at level can be stationary, there can be a relationship between them in the long term. The presence of such a relationship is determined by panel cointegration tests. Similar to panel unit root tests, cointegration tests are categorized into two main groups based on cross-sectional dependence: First-generation (Johansen, 1988; Kao, 1999; Pedroni, 2004) and second-generation (Westerlund, 2007; Westerlund and Edgerton, 2007).

In this study, the Westerlund (2007) cointegration test, which is based on the second generation analysis and gives reliable results in case of cross-sectional dependence, is based on the assumption that the series forming the panel are I (1) stationary at the same degree and the first difference. Time series are bootstrap distributed when horizontal cross-sectional dependence is available and standard normal distributed when horizontal cross-sectional dependence is not available (Westerlund, 2007).

Westerlund (2007) developed a 4-panel cointegration test based on the error correction model. Two of these tests are group mean statistics and the other two are panel statistics.

To test for cointegration relationships in a panel dataset, the following group mean statistics are calculated:

$$G_t = 1/N \, \Sigma_{i=1}^{N} \, a_i/se(a_i) \sim N(0,1) \quad (8)$$

$$G_a = 1/N \, \Sigma_{i=1}^{N} \, T \, a_i/a_i(1) \sim N(0,1) \quad (9)$$

The hypotheses for group mean statistics are defined as follows:

H_0 : There is no cointegration for all cross-sections forming the αi=0 panel.

H_1 : There is cointegration for some cross-sections that make up the αi <0 panel.

Panel cointegration statistics, which is the second method to test the cointegration relationship in the panel data set, are calculated as follows:

$$P_t = a/se(a) \sim N(0,1) \quad (10)$$

$$P_a = Ta \sim N(0,1) \quad (11)$$

The hypotheses for panel cointegration statistics are defined as follows:

H_0 : There is no cointegration for all cross-sections that make up the αi = 0 panel.

H_1 : There is cointegration for some cross-sections that make up the αi <0 panel.

In the cointegration test proposed by Westerlund and Edgerton (2007), the hypothesis tests differ from those in Westerlund (2007). To ensure the reliability of the results when examining the panel cointegration relationship, it is recommended to formulate the null hypothesis as "there is cointegration" and use it in empirical studies. Westerlund and Edgerton (2007) have developed an LM test statistic based on the Lagrange Multiplier test of McCoskey and Kao (1998) to demonstrate that the null hypothesis is cointegration. This statistic is calculated as follows:

$$LM_N^+ = 1/NT^2 \Sigma_{i=1}^{N} \Sigma_{t=1}^{T} \, \hat{\varphi}_i^2 \, S_{it}^2 \quad (12)$$

The hypotheses for Westerlund and Edgerton (2007) cointegration statistics are defined as follows:

H_0 : There is cointegration for all cross sections forming the ∂i = 0 panel.

H_1 : There is no cointegration for some cross-sections that make up the ∂i <0 panel.

When the LM statistic shows a standard normal distribution, the null hypothesis is accepted if the LM statistic is less than the critical value.

Determining the existence of a long-term cointegration relationship between the variables requires the estimation of the long-term parameters of the explanatory variables. Pesaran (2006) develops the

Commen Correlated Effects (CCE) estimator to take into account the dependency between cross sections and bases the Common Correlated Effects Method on the following heterogeneous panel data regression model:

$$y_{it} = \acute{a}_l d_t + \hat{b}_l x_{it} + e_{it} \quad (13)$$

$$e_{it} = \acute{y}_l f_t + \varepsilon_{it} \quad (14)$$

The d and f in the equation show the observed and unobserved common effects, respectively. Two estimators have been developed to estimate the long-term coefficients of the independent variables in the CCE model. These are the Commen Correlated Effects Mean Group (CCEMG) and Commen Correlated Effects Pooled (CCEP) estimators. If the homogeneous and cross-sectional dependence of the cointegration parameters is decided, CCEMG estimators are used and if the heterogeneous and cross-sectional dependence of the parameters is decided, CCEP estimators are used. In the CCEMG and CCEP approach, the panel cointegration coefficient is obtained as follows, respectively (Nazlıoğlu, 2010):

$$\hat{b}_{CCEMG} = \frac{1}{N} \Sigma_{i=1}^{N} \hat{b} \quad (15)$$

$$\hat{b}_{CCEP} = (\Sigma_{i=1}^{N} \partial_i x_i M_w x_i)^{-1} \Sigma_{i=1}^{N} \partial_i x_i M_w x_i \quad (16)$$

In the research, Emirmahmutoğlu and Köse (2011) causality test, which is a simple Granger causality test that can be applied on heterogeneous panels, was used to test the causality relationship between the variables. Emirmahmutoğlu and Köse (2011) extended the Toda-Yamamoto approach to Granger causality for panel datasets. The Toda-Yamamoto approach allows the causality relationship to be investigated without the need for any preliminary test on whether the series have a unit root or cointegration relationship.

In order to make the estimation in Emirmahmutoğlu and Köse (2011) causality test, the bivariate VAR model is established as follows:

$$x_{i,t} = \mu_i^x + \Sigma_{j=1}^{k_i+dmax_i} A_{11,ij}\, x_{i.t-j} + \Sigma_{j=1}^{k_i+dmax_i} A_{12,ij}\, y_{i.t-j} + \mu_{i,t}^x \quad (17)$$

$$y_{i,t} = \mu_i^y + \Sigma_{j=1}^{k_i+dmax_i} A_{21,ij}\, x_{i.t-j} + \Sigma_{j=1}^{k_i+dmax_i} A_{22,ij}\, y_{i.t-j} + \mu_{i,t}^y \quad (18)$$

dmaxi represents the maximum integration level for each i. To test whether there is causality in heterogeneous panels, the Fisher statistic is defined as follows:

$$\lambda = -2 \Sigma_{i=1}^{N} \ln(\pi_i) \quad (19)$$

The hypotheses of this test are as follows:

H_0: There is no causal relationship between the variables.

H_1: There is a causal relationship between the variables.

4. Results

In the research, the relationship between savings and investment for developed and less developed countries between the years 2000-2021 was examined using panel cointegration and causality tests with ratio variables. The functional expression of the empirical model created is as follows:

$$(I/Y)_{i,t} = a + \beta\, (S/Y)_{i,t} + £_{i,t} \quad (20)$$

In the equation, $I/Y_{i,t}$ represents the ratio of investments to GDP and serves as the dependent variable. α notation represents the constant term, $S/Y_{i,t}$ represents the ratio of savings to GDP and serves as the independent variable, β represents the savings retention coefficient in front of this ratio and $£_{i,t}$ represents the error term.

In the research, the presence of cross-sectional dependence was examined in Table 4, taking into account the time period and the number of cross-sections.

Table 4: Cross-sectional dependence (CD) test results

Methods	I/Y		S/Y	
	Test statistic	**ρ**	**Test statistic**	**ρ**
CD_{LM} **(BP,1980)**	55,29	0,01*	65,65	0,01*
CD_{LM} **(Pesaran, 2004)**	2,75	0,01*	3,494	0,01*
CD**(Pesaran, 2004)**	-1,80	0,03*	-1,77	0,03*
LM_{adj} **(PUY, 2008)**	5,22	0,01*	2,61	0,04*

Table 4 displays three different cross-sectional dependence test results for the variables, (S/Y) the ratio of domestic savings to Gross Domestic Product and (I/Y) the ratio of domestic investments to Gross Domestic Product. When the number of periods (T) is larger than the number of cross-sections (N), two of the test statistics, CD_{LM} (Breusch and Pagan, 1980) and CD_{LM} (Pesaran, 2004) are valid; and if N>T, CD (Pesaran, 2004) is valid. Hence, given that N > T, it is necessary to consider the CD (Pesaran, 2004) test statistic. According to the test statistic results, the probability values for the variables are less than 5%, leading to the rejection of the null hypothesis (H_0) at the 1% significance level. This finding confirms the presence of cross-sectional dependence in the series. Cross-sectional dependence suggests that shocks originating in any country participating in the analysis can impact other countries as well. Therefore, policymakers in these countries need to consider the economic policies implemented in other countries when making their own policy decisions.

Delta Homogeneity Test was applied to determine whether the slope coefficients vary between units, the test results can be seen in Table 5.

Table 5: Delta homogeneity test results

Test	Test statistic	Probability value	Result
Delta Homogeneity Test (Δ)	3,03	0,01*	Heterogeneous
Delta Homogeneity Test ($\tilde{\Delta}_{adj}$)	3,42	0,01*	

Table 5 also includes the test results of the homogeneity of coefficients Δ and $\tilde{\Delta}adj$, which was proposed by Swamy (1970), developed by Pesaran and Yamagata (2008). Here, the Δ test statistic is computed for large samples, while the $\tilde{\Delta}adj$ test statistic is calculated for small samples (Pesaran and Yamagata, 2008:56). The test for coefficient homogeneity examines whether the savings retention coefficient or the Feldstein-Horioka coefficient varies from country to country among the 37 developed and less developed countries. In other words, it tests whether the relationship between domestic savings and domestic investments differs across all analyzed countries. The Δ and $\tilde{\Delta}adj$ test statistics in Table 5 are found to be significant at the 1% significance level, indicating that the coefficients are not homogeneous and vary from one country to another.

Since cross-sectional dependence has been identified among the countries forming the panel, the stationarity of the series was examined using second-generation unit root tests, CADF and CIPS unit root tests. Table 6 provides the results of CADF and CIPS unit root tests for the (I/Y) and (S/Y) variables in both their constant and constant-trend models for 37 developed and less developed countries.

Table 6: CADF and CIPS unit root test results

Country	Constant		Constant and Trending		Constant		Constant and Trending	
	Delay	**CADF**	**Delay**	**CADF**	**Delay**	**CADF**	**Delay**	**CADF**
	GFCF (I/Y)				***GDS (S/Y)***			
Norway	1	-3,36**	1	-3,77**	1	-3,36**	1	-3,88**

Ireland	2	-2,05	2	-1,88	2	-2,06	2	-1,89
Switzerland	1	-1,72	1	-1,64	1	-1,71	1	-1,69
Hong Kong	1	-2,22	1	-2,00	1	-2,23	1	-2,20
Iceland	1	-4,44***	1	-4,29**	1	-4,66***	1	-4,51**
Germany	1	-4,69***	1	-4,75***	1	-4,69***	1	-4,75***
Sweden	1	-4,87***	1	-4,99***	1	-4,84***	1	-4,98***
Australia	1	-2,98	1	-2,88	1	-2,918	1	-2,89
Netherlands	1	-3,19*	1	-3,49	1	-3,28*	1	-3,24
Denmark	2	-2,27	1	-2,94	2	-2,28	1	-2,99
Finland	1	-4,27***	1	-4,00**	1	-4,74***	1	-4,46**
Singapore	2	-3,75**	2	-3,82**	2	-3,65**	2	-3,84**
England	1	-4,35***	1	-4,31**	1	-4,35***	1	-4,39**
Belgium	1	-3,56**	1	-3,42	1	-3,56**	1	-3,41
New Zealand	1	-3,217*	1	-3,23	1	-3,17*	1	-3,31
Canada	1	-2,461	1	-2,62	1	-2,461	1	-2,69
USA	1	-3,95***	1	-3,88*	1	3,951***	1	-3,88*
India	1	-4,94***	1	-4,91***	1	-4,84***	1	-4,61***
Honduras	1	-2,277	1	-2,354	1	-2,27	1	-2,35
Bangladesh	1	-2,26	1	-3,34	1	-2,26	1	-3,34
Kiribati	1	-2,85	1	-3,36	1	-2,805	1	-3,386
Sao Tome and Principe	2	-3,18*	2	-2,74	2	-3,28*	2	-2,79
Micronesia	2	-3,74**	2	-4,94***	2	-3,71**	2	-4,95***
Laos	1	-2,49	1	-2,81	1	-2,49	1	-2,81
Ghana	1	-2,31	1	-2,254	1	-2,32	1	-2,24
Eswatini	1	-2,43	1	-2,371	1	-2,33	1	-2,31
Vanuatu	2	-1,88	2	-1,847	2	-1,80	2	-1,87
Nepal	1	-2,78	1	-4,53***	1	-2,76	1	-4,36***
Kenya	1	-3,83**	1	-3,57*	1	-3,85**	1	-3,547*
Cambodia	1	-4,07***	1	-3,97**	1	-4,05***	1	-3,75**
Equatorial Guinea	1	-3,75**	1	-4,30**	1	-3,79**	1	-4,30**
Zambia	1	-2,97*	1	-2,81	1	-2,97*	1	-2,881

Myanmar	1	-3,96***	1	-3,94**	1	-3,90***	1	-3,94**
Angola	1	-3,861**	1	-4,26**	1	-3,81**	1	-4,46**
Republic of Congo	1	-4,41***	1	-4,65***	1	-4,45***	1	-4,68***
Zimbabwe	1	-3,47**	1	-3,67*	1	-3,41**	1	-3,69*
Syria	1	-2,78	1	-2,98	1	-2,74	1	-2,98
CIPS-Statistic	-3,35***		-3,66***		-3,36***		-3,75***	

Notes: *** indicates rejection of the null hypothesis at 1% level, ** indicates rejection of the null hypothesis at 5% level, * indicates rejection of the null hypothesis at 10% level. Delay length is taken as 2. Critical values of panel statistics are given as -2,23 (1%), -2,11 (5%) and -2,05 (10%) in the model with constant. It was seen that, the CADF statistic critical values of -2,72 (1%), -2,60 (5%), -2,55 (10%) in the model with constant and trended are at the significance levels of -3,95 (1%), -3,27 (5%) and -2,94 (10%) in the model with constant.

According to the results in Table 6, when the test statistic calculated for the I/Y variable in the model with constant is compared with the critical values of Pesaran (2007:275), it is seen that the test statistic calculated in all countries except Ireland, Switzerland, Hong Kong, Australia, Denmark, Canada, Honduras, Bangladesh, Republic of Kiribati, Lao People's Democratic Republic, Ghana, Eswatini, Republic of Vanuatu, Nepal and Syria is greater than the 1%, 5% and 10% critical values in absolute value. Therefore, it was found that the (I/Y) variable was stationary in the fixed model and did not contain a unit root in countries other than the aforementioned countries. When the model with constant and trend for the (I/Y) variable is analysed, it is found that the CADF test statistic calculated for countries other than Norway, Iceland, Germany, Sweden, Finland, Singapore, England, USA, India, Micronesia, Nepal, Kenya, Cambodia, Equatorial Guinea, Republic of the Union of Myanmar, Angola, Republic of the Congo, Zimbabwe is smaller in absolute value than the 1%, 5% and 10% critical values; therefore, in countries other than the mentioned countries, the (I/Y) variable is non-stationary at level values, that is, it contains unit root.

The causality test is very sensitive to the number of delays and the direction of causality may change depending on the number of delayed terms. In the literature, delay values are generally considered to be 12 or 24 in studies using monthly data and 4, 8 or 12 in studies using seasonal data. However, since the annual data are used in this study, delay lengths are considered as 1 and 2, and the results of the delay lengths are given in Table 6. The causality relationship can be both from X to Y and from Y to X. This situation is described as bidirectional causality. The equation used for the causality relationship shows the causality from investments to savings (I/Y) and from savings to investments (S/Y). The dependent variable is included in the equation with the appropriate number of delays and then the other variable is added to the equation with the same number of delays.

Similarly, when the CADF test statistic results calculated for the (S/Y) variable for the fixed, fixed and trended model are compared with Pesaran (2007: 275) critical values, it is found that the variable is non-stationary and contains unit root for all countries except Norway, Iceland, Germany, Sweden, Netherlands, Finland, Singapore, England, Belgium, New Zealand, USA, India, Sao Tome and Principe Republic, Micronesia, Kenya, Cambodia, Equatorial Guinea, Zambia, Republic of the Union of Myanmar, Angola, Republic of Congo, Zimbabwe. In the model with constant and trended, (S/Y) variable was found to be stationary at level value and free of unit root for Ireland, Switzerland, Hong Kong, Australia, Netherlands, Denmark, Belgium, New Zealand, Canada, Honduras, Bangladesh, Republic of Kiribati, Republic of Sao Tome and Principe, Laos, Ghana, Eswatini, Republic of Vanuatu, Zambia, Syria.

When the CIPS test statistics calculated by averaging the CADF test statistics are compared with the critical values of Pesaran (2007:280), it is observed that both variables are stationary at 1% significance level in both the model with constant and the model with constant and trend. When the CADF test statistics of the countries are analysed, the results differ. The results of the said statistics show that the effect of a shock to the economies of the countries subject to the research does not disappear

immediately. Since the series are not stationary at level values, it is decided that the cointegration relationship between these series can be analysed.

In the panel analysed in this study, the existence of cross-country horizontal cross-sectional dependence and heterogeneity features were detected. In addition, the variables in the long-run equation are stationary at first differences. Therefore, the panel cointegration test developed by Westerlund (2007) was used to investigate the existence of a long-run relationship between the series. The results of the cointegration test to test the Fedstein-Horioka hypothesis are presented in Table 7.

Table 7: Panel cointegration test results

Panel A: Westerlund (2007)	**I/Y=f(I/S) [ρ]**
$G\text{-}_{tau}$	-3,02 [0,04] **
$G\text{-}_{alpha}$	-2,14 [0,18]
$P\text{-}_{tau}$	-8,28 [0,01] *
$P\text{-}_{alfa}$	-9,11 [0,01] *
Panel B: Westerlund-Edgerton (2007)	**I/Y=f(I/S) [ρ]**
LM_{+N}	2,61 [0,17]

In Panel A of Table 7, since three of the tests are statistically significant according to the bootstrap distribution, the null hypothesis stating that there is no cointegration between the variables is rejected. In Panel B, on the other hand, cointegration is found and the null hypothesis is accepted. In other words, it is found that there is a cointegration relationship between the variables in at least one of the countries forming the panel. These series move together in the long term and model estimations to be made with the level values of these series do not involve spurious regression problem.

Determining the existence of a long-run cointegration relationship between variables requires the estimation of the long-run parameters of the explanatory variables. Under the assumption that long-run cointegration parameters are heterogeneous, Pesaran (2006) developed the Common Correlated Effects (CCE) estimators that take into account the dependence between the horizontal sections forming the panel (Nazlıoğlu, 2010:101). CCE can be used in both N>T and T>N conditions and can be calculated by the CCEP method. In this method, long-run cointegration coefficients are estimated by taking the arithmetic mean of the parameters calculated for each unit.

Table 8: Panel cointegration relationship estimation

Dependent variable	**Coefficient (β)**
S/Y	0,34[-2,41] *ρ=0,01

Notes: Newey-West variance-covariance estimator is used in CCEP estimation. The numbers in parentheses indicate t-statistics. *indicates statistical significance at 1% level.

According to Table 8, the estimated long-run regression coefficient between investments and savings is statistically significant at the level of 0,34. According to the result, when savings increase by one unit, investments will increase by 34 per cent. The low coefficient β, which measures the ratio of savings to investments, can be interpreted as the fact that investments are not very effective in making investments using savings and that investments are made using other financial instruments. This situation shows that the dependence of investments on national savings has decreased with the increase in financial liberalisation in recent periods and investments are mostly made by using external financing sources.

Table 9: Panel cointegration relationship in less developed and developed countries

Dependent variable	**Less Developed Countries Coefficient (β)**	**Developed Countries Coefficient (β)**
S/Y	0,29[-2,18] *ρ=0,03	0,41 [-3,02] **ρ=0,01

Notes*:* Newey-West variance-covariance estimator is used in CCEP estimation. The numbers in parentheses indicate t-statistics. ** indicates statistical significance at 1% level, * indicates statistical significance at 5% level.

According to the results presented in Table 9, the positive coefficient of saving retention (β) supports the Feldstein-Horioka (1980) hypothesis that the relationship between domestic savings and domestic investments should be weak in a country with full capital mobility. When the results are analysed, it is calculated that the coefficient of β is 0,29 in less developed countries and 0,41 in developed countries. These results show that developed countries meet their investments from savings at a higher rate. In less developed countries, on the other hand, it is observed that a higher proportion of investments are made through other financing instruments or external borrowing. Moreover, these results reveal that the coefficient of saving retention is not only affected by investments but also by the size of the country.

Table 10: Emirmahmutoğlu and Köse panel causality test results

Group	I/Y →S/Y		S/Y →I/Y		Decision
	Statistics (Wald)	Probability Value (ρ)	Statistics (Wald)	Probability Value ρ)	
All Countries	31,52	0,001**	29,24	0,002 **	I/Y ↔S/Y

Note: ** indicates causality level significant at 0,01 level.

Emirmahmutoğlu and Köse (2011) causality test results are shown in Table 10 and bootstrap probability values are taken into account since the coefficients are heterogeneous. According to Table 10, the hypothesis of "I/Y is not the cause of S/Y" and H_0 was rejected at the 1% significance level. Similarly, "S/Y is not the cause of I/Y" and H_0 hypothesis is rejected at 1% significance level. These results show that there is a bidirectional causality relationship between savings and investments in the countries of study. Since the economic structure in underdeveloped countries is still in the transition phase, new financial instruments created by technological developments have not been adopted by domestic investors. With the completion of integration with global money and capital markets, the use of new financial instruments will increase, thus contributing to the transformation of domestic savings into more investments.

5. Conclusion

Domestic savings hold significant importance in the economic development process of a country due to their role as a source of financing for investments. In this context, it becomes crucial to determine the ratio of domestic savings to domestic investments or the level of dependence of domestic investments on foreign savings. The degree of a country's integration into the global financial system and its sensitivity to capital flows are also important factors in identifying the relationship between domestic savings and investments.

As the wave of financial integration gradually gained acceptance worldwide, it allowed capital to flow freely between developed and less developed countries without significant restrictions. These developments have contributed to an increase in domestic savings, a decrease in capital costs and the growth of technology transfer, leading to the expansion of the knowledge and communication sectors. Furthermore, the increase in the number of financial instruments available for use in financial transactions has provided foreign investors with opportunities for risk diversification, thereby contributing to the development of the financial system.

With the widespread financial liberalization, domestic investments have increasingly been financed from the global pool of capital, while domestic savings have started to move abroad to take advantage of attractive international investment opportunities. In such a situation where national borders are gradually decreasing, capital mobility is expected to be high. However, a study conducted by Feldstein and Horioka (1980) revealed that despite increased capital mobility, a significant portion of domestic investments in a country is still financed by domestic savings, sparking a new debate. This debate has been discussed and revisited multiple times with different approaches to date (Karter, 2020:109). This study aims to contribute to the existing literature on the subject by using advanced panel data analysis

techniques within the framework of the basic model, considering both the examined recent time period and the level of integration into the global financial system of countries.

Within the scope of this study investigating the validity of the Feldstein-Horioka hypothesis, the domestic investments-to-gross domestic product (GDP) ratio (I/Y) was used as the dependent variable, while the domestic savings-to-GDP ratio (S/Y) was used as the independent variable. To determine whether there is dependence between the horizontal cross-sections forming the panel, the Breusch and Pagan (1980) LM test, Pesaran (2004) CD_{LM} test and Pesaran et al. (2008) test were used. The results indicated cross-sectional dependence. In other words, a change in domestic investments or domestic savings in one country affects the domestic investments or domestic savings in other countries. Additionally, the homogeneity of the long-term slope coefficient was examined using the Homogeneity Test (Δ test) developed by Pesaran and Yamagata (2008) and it was concluded that the country group considered in the study had a heterogeneous structure.

The unit root analysis of variables, taking into account cross-sectional dependence, was conducted using the Pesaran (2007) CADF panel unit root test, which is a second-generation panel unit root test. Although all series used in the study were found to have unit roots at their level values, it was determined that they were stationary in their first differences. Subsequently, the presence of cointegration between the variables was examined using the Westerlund (2007) cointegration test for both the constant and trend models. It was found that there was a long-term relationship between domestic savings and foreign savings. To determine the long-term cointegration coefficients of the variables, the Common Correlated Effects (CCE) panel cointegration estimator, which takes into account cross-sectional dependence, was utilized. The heterogeneous nature of the countries considered in the study necessitates the observation of individual effects in the series. Therefore, the CCE estimator allowed the relationship between variables to be observed on a country-by-country basis. Upon examining the results, the savings-retention coefficient was found to be approximately 0,34. The effect of this coefficient can be interpreted as "a 1% increase in savings leads to a 0,34% increase in investments." The fact that this value is close to zero supports high capital mobility. Additionally, it was determined that the savings-retention coefficient was positive and smaller than the value found in the Feldstein and Horioka (1980) study. This indicates that, due to increased financial liberalization after the period in which the study was conducted, the degree of domestic capital investments' dependence on domestic savings has decreased and over time, a larger portion of domestic capital investments has been financed by foreign savings.

With the advent of globalization, technological change and development have accelerated the process of financial liberalization. This momentum has led to an increase in capital mobility among countries. In addition to the conducted analyses, the causal relationship between savings and investments has been examined using the panel causality test by Emirmahmutoğlu and Köse (2011). A bidirectional causal relationship between the two variables has been identified.

In order to achieve balance in the economy, the level of savings must be sufficient to cover investments. Otherwise, external financing sources will be needed to address the insufficiency in savings. As a country's economy increasingly relies on external savings, the current account deficit will also increase. Attempting to remedy the current account deficit will make the country's economy more dependent on foreign sources and expose it to potential financial crises. To prevent such crises, it is necessary to implement new fiscal policies that encourage and support savings and for institutions to undertake tax reforms that increase public revenue. Additionally, efforts should be made to improve productivity in the economy. Domestic production of imported goods should be encouraged and strict fiscal policies should be implemented to boost exports. Expanding capital markets and ensuring stability in exchange rates, inflation and interest rates will increase demand for investment assets such as bonds and stocks, consequently leading to an increase in savings. To further increase savings, the informal economy should be brought into the formal sector and existing systems that promote savings, such as individual retirement plans and savings incentive funds, should be enhanced. If a savings deficit persists despite these incentive measures, strict fiscal policies should be applied to attract foreign direct investments that contribute to technological development, high competitiveness and increased production. A low credit risk premium is essential to attract higher levels of foreign direct investment. Moreover, liberalization should extend beyond the economy into areas such as law, education, communication and human resources to increase investment levels in the country. Abandoning restrictive practices and obstacles

will create a more favorable environment for investments and help prevent speculative capital movements.

Studies on the Feldstein-Horioka hypothesis have been the subject of debate for many years. The limitations of this study are the unavailability of up-to-date data for some countries in the country group used in the analyses, the selected data period and the econometric analysis methods applied. In this context, conducting studies that allow for the retesting of this hypothesis with different country groups and different time periods would contribute to the international literature.

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Araştırma Makalesi

Testing the Validity of the Feldstein-Horioka Hypothesis in Developed and Less Developed Countries by Panel Data Analysis

Gelişmiş ve Az Gelişmiş Ülkelerde Feldstein-Horioka Hipotezinin Geçerliliğinin Panel Veri Analizi ile Test Edilmesi

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Genişletilmiş Özet

Yurt içi tasarruflar, yatırımların finansman kaynağı olması nedeniyle bir ülkenin ekonomik gelişim sürecinde büyük önem arz etmektedir. Bu anlamda yurt içi tasarrufların yurt içi yatırımları karşılama oranı ya da yurt içi yatırımların dış tasarruflara olan bağımlılık düzeyinin belirlenmesi gerekmektedir. Yurt içi tasarruf ve yatırım arasındaki ilişkinin belirlenmesinde ise ülkelerin küresel finans sistemine entegre olma derecesi ve sermaye hareketlerine duyarlı olup olmaması önemlidir.

Finansal entegrasyon dalgası aşama aşama dünyaya kendini kabul ettirirken, sermayenin gelişmiş ve az gelişmiş ülkeler arasında hiçbir kısıtlama olmaksızın serbestçe dolaşmasına olanak tanımıştır. Yaşanan bu gelişmeler yurt içi tasarruf hacminin artmasına, sermaye maliyetlerinin düşmesine ve teknoloji transferinin artarak bilgi ve iletişim sektörlerinin gelişmesine imkân tanımıştır. Ayrıca finansal işlemlerde kullanılacak finansal enstrümanların sayısındaki artış da yabancı yatırımcılara risk çeşitlendirmesi yapma fırsatı sunarak finans sisteminin gelişmesine katkıda bulunmuştur.

Finansal serbestleşme politikaları hem finansal entegrasyon sürecini hızlandırması hem de uluslararası sermaye akımları aracılığıyla daha fazla yatırım yapılmasına imkan sunmasına rağmen Feldstein ve Horioka (1980) "Domestic Saving and International Capital Flows" isimli çalışmasında, yatırım ve tasarruf ilişkisini inceleyerek bu alanda yapılacak olan pek çok çalışmaya referans olabilecek bulgulara ulaşmışlardır. Feldstein ve Horioka (1980), 16 OECD(Organisation for Economic Co-operation and Development) üyesi ülkelerin 1960-1970 yıllarına ait yatırım ve tasarruf verilerini ele alarak yapmış oldukları analiz sonucunda; sanayileşmiş ülkeler de sermayenin çok fazla hareket etmediği ve yurt içi yatırımların sadece yurt içi tasarruflara duyarlı olup, uluslararası tasarruflardan beklenen yararın ortaya çıkmadığı bulgusuna ulaşmışlardır. Analizin finansal küreselleşme sürecinin hızlanmadığı ve dolayısıyla sermaye piyasalarının yeterince serbest olmadığı bir dönemde yapıldığı dikkate alınırsa, ulaşılan bulgular şaşırtıcı olmamaktadır. Kısaca Feldstein-Horioka Hipotezine (FHP) göre sermaye hareketlilik düzeyi düşük olan bir ülkede (kapalı bir ülke ekonomisinde) bütün yurt içi tasarruflar yurt içi yatırımları finanse etmek için kullanılmakta ve ülkedeki yatırımların seviyesi, ülkedeki tasarrufların seviyesine bağlı kalmaktadır. Ancak, eğer ülkede sermaye hareketliliğinin derecesi yüksek olursa, tasarruflardaki azalış ülke içine yapılacak olan sermaye akışı ile dengelenirken, yurt içi tasarruflardaki artış da dünyanın başka bir yerindeki yatırımlara akacak ve diğer ülkeler için kullanılacaktır. Bu şekilde ülkenin yatırım seviyesi, ülkedeki tasarrufların seviyesinden bağımsız olacaktır (Rye ve Robertson, 2003:2).

Yaygınlaşan finansal serbestleşmeyle birlikte yurt içi yatırımlar dünya çapındaki sermaye havuzundan finanse edilmeye, yurt içi tasarruflar ise dünya çapındaki cazip yatırım imkanlarını değerlendirmek

üzere ülke dışına çıkmaya başlamıştır. Ulusal sınırların giderek azaldığı böyle bir durumda sermaye hareketliliğinin yüksek olması beklenmektedir. Ancak Feldstein ve Horioka (1980) tarafından yapılan çalışma sonucunda artan sermaye hareketliliğine karşın yurt içi yatırımların büyük bir kısmının yurt içi tasarruflar tarafından finanse edildiği sonucuna ulaşılması, yeni bir tartışmanın başlamasına neden olmuştur. Bu tartışma günümüze kadar farklı yaklaşımlarla pek çok kez ele alınarak yeniden yorumlanmıştır (Karter, 2020:109). Bu çalışmada ise temel model baz alınarak gerek incelenen yakın zaman dilimi gerekse de kullanılan ileri panel veri analiz teknikleri ile konuyla ilgili mevcut literatüre katkı yapmak amaçlanmıştır.

Çalışma üç bölümden oluşmaktadır. İlk olarak tasarruf ve yatırım arasındaki ilişkiyi Feldstein-Horioka Hipotezi'nin geçerliliğini inceleyen uygulamalı çalışmalar hakkında literatür araştırması yapılacaktır. Daha sonra 37 ülke için 2000-2021 dönemine ait yıllık veriler aracılığıyla uygulanan yöntemler hakkında bilgi verilecek ve yapılan testlere ait bulgular yorumlanacaktır. Çalışma, genel bir değerlendirmenin yapıldığı sonuç bölümüyle tamamlanacaktır.

Feldstein–Horioka hipotezinin geçerliliğini araştıran bu çalışma kapsamında, bağımlı değişken olarak yurt içi yatırımların gayri safi yurt içi hasılaya oranı (I/Y), bağımsız değişken olarak ise yurt içi tasarrufların gayri safi yurt içi hasılaya oranı (S/Y) kullanılmış ve paneli oluşturan yatay kesitler arasında bağımlılığın olup olmadığını belirlemek amacıyla Breusch ve Pagan (1980) LM testi, Pesaran (2004) CD_{LM} testi ve Pesaran vd. (2008) testi kullanılmıştır. Elde edilen sonuçlar, yatay kesit bağımlılığına işaret etmiştir. Diğer bir ifadeyle bir ülkede yurt içi yatırımlarda veya yurt içi tasarruflarda meydana gelen bir değişim, diğer ülkelerdeki yurt içi yatırımları veya yurt içi tasarrufları etkilemektedir. Ayrıca uzun dönem eğim katsayısının homojen olup olmadığı Pesaran ve Yamagata (2008) tarafından geliştirilen Homojenite Testi (Δ testi) ile incelenmiş ve çalışmada ele alınan ülke grubunun heterojen yapıda olduğu sonucuna varılmıştır.

Değişkenlerin birim kök analizi, yatay kesit bağımlılığını dikkate alan ikinci nesil panel birim kök testlerinden Pesaran (2007) CADF panel birim kök testi ile incelenmiştir. Çalışmada kullanılan tüm serilerin seviye değerlerinde birim kök içermesine rağmen birinci farklarında durağan oldukları tespit edilmiştir. Daha sonra değişkenler arasında bir eşbütünleşme olup olmadığı, Westerlund (2007) eşbütünleşme testinde hem sabit hem de trendli model için araştırılmıştır. Yurt içi tasarruf ile yurt dışı tasarruf arasında uzun dönemli bir ilişki olduğu tespit edilmiştir. Değişkenlerin uzun dönem eşbütünleşme katsayılarının tespiti için yatay kesit bağımlılığını dikkate alan Ortak İlişkili Etkiler (CCE) panel eşbütünleşme tahmincisinden yararlanılmıştır. Çalışmada ele alınan ülkelerin heterojen yapıda olması, serilerde bireysel etkilerin gözlenmesini gerekli kılmaktadır. Bu yüzden CCE tahmincisi değişkenler arasındaki ilişkinin ülke bazında görülmesine olanak tanımıştır. Sonuçlar incelendiğinde, tasarruf tutma katsayısı yaklaşık 0,34 olarak bulunmuştur. Bu katsayının etkisi "tasarruflarda meydana gelen %1'lik bir artışın yatırımlarda %0,34'lük bir artışa sebep olmaktadır" şeklinde yorumlanabilir. Söz konusu değerin sıfıra yakın olarak bulunması, yüksek sermaye hareketliliğini desteklemektedir. Ayrıca tasarruf tutma katsayısının pozitif olduğu ve Feldstein ve Horioka (1980) çalışmasında bulunan değerden daha küçük olduğu tespit edilmiştir. Bu durum, çalışmanın yapıldığı dönemden sonra finansal serbestleşmenin artması yüzünden yurt içi sermaye yatırımlarının yurt içi tasarruflara olan bağımlılık derecesinin azaldığını ve süreç içerisinde yurt içi sermaye yatırımlarının zamanla daha fazla bir bölümünün dış tasarruflarla finanse edildiğini göstermektedir.

Küreselleşmeyle birlikte teknolojik değişim ve gelişim, finansal serbestleşme sürecine hız kazandırmıştır. Söz konusu bu ivme, ülkeler arasındaki sermaye hareketliliğinin artmasına neden olmuştur. Yapılan analizlere ek olarak tasarruflar ve yatırımlar arasındaki nedensellik ilişkisi Emirmahmutoğlu ve Köse (2011) panel nedensellik testi ile incelenmiştir. İki değişken arasında çift yönlü bir nedensellik ilişkisi tespit edilmiştir.

Ekonomide dengenin sağlanabilmesi için tasarruf miktarının yatırımları karşılayacak seviyede olması gerekmektedir. Aksi durumda tasarruf miktarındaki yetersizliği giderebilmek için dış finansman kaynaklarına ihtiyaç duyulacaktır. Ülke ekonomisi dış tasarruf kullanımını tercih ettikçe de cari açık oranı artacaktır. Cari işlemler dengesi açığını gidermeye çalışmak da ülke ekonomisinin dışa bağımlı olmasını sağlayacak ve yaşanabilecek finansal krizlere karşı riskli hale gelmesine sebep olacaktır. Bu krizi önleyebilmek için tasarruf miktarını özendirici ve destekleyici yeni mali politikaların yürürlüğe

girmesi ve kurumların kamu gelirini arttıracak vergi reformları yapması gerekmektedir. Ayrıca ekonomide verimliliği artıracak iyileştirmeler yapılmalıdır. İthal malların yurt içi üretimi teşvik edilmeli ve ihracatı artıracak sıkı maliye politikaları uygulanmalıdır. Sermaye piyasaları genişletilmeli, döviz kuru, enflasyon ve faiz oranlarında istikrar sağlanmalıdır. Böylece tahvil ve hisse senedi gibi yatırım varlıklarına olan talep artacak ve dolayısıyla tasarruf düzeyinde artış sağlanacaktır. Tasarrufların artırılması için kamuda kayıt dışı ekonominin kayıt altına alınması, diğer taraftan özel tasarrufların artırılması için bireysel emeklilik sistemi, tasarruf teşvik fonu gibi tasarruf düzeyini artırıcı mevcut sistemler geliştirilmelidir. Bu tasarrufu teşvik edici uygulamalara rağmen hala tasarruf açığı devam ediyorsa; ülke ekonomisinde teknolojik gelişime katkı sağlayabilecek, rekabet düzeyi yüksek ve daha çok üretim artışına etki edebilecek, doğrudan yabancı sermaye yatırımlarını teşvik edecek sıkı maliye politikaları uygulanmalıdır. Doğrudan yabancı yatırım miktarının artırılması için ülke ekonomisinin düşük kredi risk primine sahip olması gerekmektedir. Ülke ekonomisinde yapılan yatırım miktarının artırılması için sadece ekonomi alanında değil hukuk, eğitim, iletişim, insan kaynakları gibi alanlarda da liberalizasyon gerçekleşmelidir. Baskı ve engellemeye yönelik uygulamaların terk edilmesi, yatırımlar için daha uygun bir ortam sağlayacak ve spekülatif sermaye hareketliliği engellenmiş olacaktır.

Feldstein–Horioka hipotezi ile ilgili çalışmalar yıllarca tartışma konusu olmuştur. Bu çalışmanın kısıtları; analizlerde kullanılan ülke grubunda yer alan bazı ülkelere ait güncel verilere ulaşılamaması, seçilen veri dönemi ve uygulanan ekonometrik analiz yöntemleri oluşturmaktadır. Bu kapsamda bu hipotezin yeniden test edilmesine imkân sağlayacak çalışmaların farklı ülke grupları ve farklı dönemler ile yapılması uluslararası literatüre katkı sağlayacaktır.