The Relationship Between Foreign Direct Investment and Financial Development in OECD Countries

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ABSTRACT

Capital input which is one of the main factors of production function with labour force in traditional economic growth theory is tremendously important for the economic growth of a country. So capital accumulation as a result of domestic savings is crucial for an economy. An increase in savings will be the driving force of the economic growth. On the other hand, the fact that the lack of savings in the country will create a need and demand for foreign countries' savings and thus foreign direct investments for the growth of the economic growth.

International Monetary Fund (IMF) has created the Financial Development Index (IMF-FDI) that summarizes how developed financial institutions and financial markets are in terms of their depth, access, and efficiency. The Organisation for Economic Co-operation and Development (OECD) has also issued The Foreign Direct Investment Regulatory Restrictiveness Index (OECD-FRRI) measures statutory restrictions on foreign direct investment. This study aims to investigate the relationship between the OECD-FRRI data issued by OECD and IMF-FDI issued by IMF for 36 OECD member countries. There is limitation to get data from IMF and OECD. The data of IMF-FDI was available for the period 1980-2016 whereas the data of OECD-FRRI was available for the years 1997, 2003 and 2006 and the period 2010-2018 when this study was conducted. Cross-section data (CSD) analysis and panel data (PD) analysis consisting of random and fixed effects estimations were used in the study to investigate the relationship between Foreign Direct Investment (FDI) and Financial Development for OECD countries for the years 1997, 2003 and 2006 and the 7-year period of 2010-2016. Granger Causality Test (GCT) is also applied to test the direction of causality between two indicators. According to the Random Effects Model (RAM) and Fixed Effects Model (FEM) with PD analysis in the study OECD-FRRI is found as one of the determinants of IMF-FDI and IMF-FDI is found as one of the determinants of OECD-FRRI in OECD member countries. For CSD analysis, there is no significant proof to say OECD-FRRI is one of the main determinants of IMF-FDI and IMF-FDI is one of the determinants of OECD-FRRI in OECD member countries. Granger causality test is also applied to test the direction of causality between OECD-FRRI and IMF-FDI for the selected countries by both PD and CSD analysis. It is obviously seen that OECD-FRRI causes IMF-FDI and vice versa

according to the Granger test statistics for PD. For CSD, OECD-FRRI does not cause IMF-FDI whereas IMF-FDI causes OECD-FRRI.

Keywords: Foreign Direct Investment Regulatory Restrictiveness Index, Financial Development Index,

INTRODUCTION

FDI provides many positive gains to the host economy, such as employment, production, income and export growth. This situation has been effective in increasing the competition of countries to attract FDI in recent years and with their efforts to make their countries attractive for investment. Due to the possible negative effects of indirect foreign capital investments, investing directly in other countries is extremely important for supporting the sustainable growth of especially developing countries.

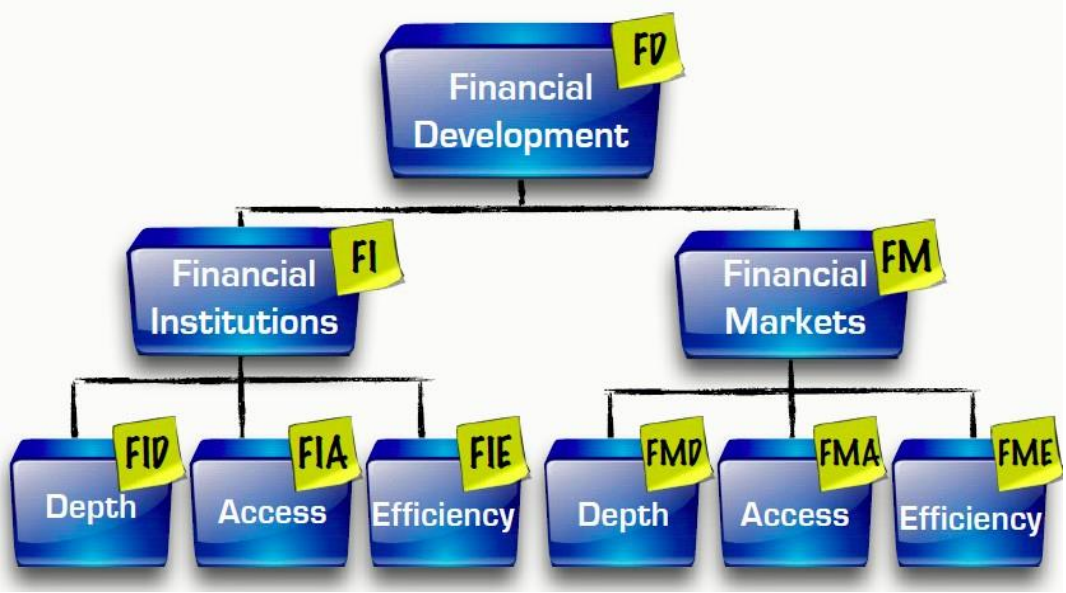
The effectiveness of the financial system comes to the forefront in the success of the economic performance of the countries. Financial stability has become a prerequisite for economic stability. Therefore, the soundness of the financial system, which is important for the foreign investor, is a matter that needs to be paid attention.

The basis of this study is to examine the relationship between FDI and financial development in 36 OECD countries (Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Portugal, Slovak Republic, Slovenia , Spain, Sweden, Switzerland, Turkey, United Kingdom, United States).

For this purpose, the relationship between the International Monetary Fund's (IMF) Financial Development Index (IMF-FDI) and Foreign Direct Investment Regulatory Restrictiveness Index (OECD-FRRI) measured by the OECD has been examined for 36 OECD member countries. Financial Development Index (IMF-FDI) is a relative ranking of countries on the depth, access, and efficiency of their financial institutions and financial markets. It is an aggregate of the Financial Institutions Index and the Financial Markets Index (IMF, https://data.imf.org/).

Financial development is identified as a combination of depth (size and liquidity of markets), access (ability of individuals and companies to access financial services), and efficiency (ability of institutions to provide financial services at low cost and with sustainable revenues, and the level of activity of capital markets). (Figure 1) These indices were originally developed in the context of the IMF's "Rethinking Financial Deepening: Stability and Growth in Emerging Markets" (Sahay et al., 2015).

Figure 1. Financial Development Index Pyramid



Source: IMF Staff, based on Čihák et al. (2012). 9.

The FDI Regulatory Restrictiveness Index (OECD-FRRI) measures statutory restrictions on foreign direct investment in 22 economic sectors across 69 countries, including all OECD and G20 countries. The FDI Index gauges the restrictiveness of a country's FDI rules by looking at the four main types of restrictions on FDI: (OECD, https://www.oecd.org/).

- Foreign equity limitations,
- Screening or approval mechanisms,
- Restrictions on the employment of foreigners as key personnel,
- Operational restrictions, e.g. restrictions on branching and capital repatriation or land ownership.

The FDI Regulatory Restrictiveness Index (FRRI) originally developed in 2003. It is jointly maintained by the OECD Investment Division and the OECD Economics Department as one component of the revised 2008 OECD Indicator of Product Market Regulation (PMR) from which the Going for Growth policy priorities are drawn (https://www.oecd-ilibrary.org/).

In recent years, countries around the world have continued to liberalize international investment restrictions. However, FDI liberalization is still an incomplete issue in various regions and sectors of the world (Mistura and Roulet, 2019). In line with the increasing importance of direct investments for OECD countries as in the world, the subject of our study is to examine the relationship between FDI and financial development for these countries. Cross-section data (CSD) analysis and panel data (PD) analysis were used for the years 1997, 2003 and 2006 and the 7-year period of 2010-2016. Granger Causality Test (GCT) is also applied to test the direction of causality between two indicators.

LİTERATURE REVİEW

With the increasing importance of foreign direct investments for countries, it has started to occupy a wide place in the literature. Research examining the mutual relationship between growth, financial development, and FDI is available in the literature. Besides, there are studies in the literature that examine the relationship between financial development and financial constraint with the relationship between FDI and competitiveness in the literature. The literature also

includes studies on the determinants of foreign direct investment. However, our focus is limited to studies that directly examine the relationship between financial development and FDI. It is possible to see the summary of the studies in the literature in Table 1.

Table 1: Literature Review

Author	Method	Period	Result
Inançlı, Aydın (2015)	Johansen Cointegration Test, Granger Causality Test, Vector Error Correction Model	1980-2012	In the short period, global competitiveness itself has led to foreign direct investment. Also a reciprocal causality between foreign direct investment and foreign competition capacity has come out in the long run in Turkey.
Nur, Dilber (2017)	Panel Data Method	1996-2014	18 developing countries were selected from the (IMF) World Economic Outlook 2015. It concluded that while control of corruption, openness to trade, technology, total labor and rule of law variables affects FDI inflows positively and total debt service, gross fixed capital formation and infrastructure variables affects FDI negatively.
Omran, Bolbol (2003)	Panel Data Method	1975-1999	Data from Arab countries showed that the impact of FDI on growth significantly increased if financial development reached a certain threshold level, and FDI increased financial development.
Ljungwall, Li (2007)	Generalized Method of Moment	1986-2003	Sample consist of a panel of 28 provinces in Mainland China. They show that the interaction between foreign direct investment and indicators measuring the degree of market-oriented financing enhance economic growth. The interaction of FDI and financial development has been stated to increase growth.
Bayar, Gavriletea (2018)	Westerlund Cointegration Test, Dumitrescu and Hurlin Causality Test	1996-2015	Their findings reveal that there is no cointegrating relationship among FDI inflows, investments of foreign portfolio and development of financial sectors. However, there is a one-way causality from development of financial sectors to FDI inflows over the short run.
Alfaro et al. (2003)	Cross-Country Data	1975-1995	The effect of FDI on growth alone is uncertain; however, they concluded that well-organized financial market countries benefited greatly from FDI. *(Sample of 71 countries for which data on credit markets are available, sample of 49 countries for which data on SCAPT and SVALT are available, sample of 53 countries for which SVALT was available but SCAPT was not: Sample of 49 plus Costa Rica, Honduras, Ireland, and Panama).*
Göçer (2013)	Time Series Analysis Methods	1980-2011	As a result of the empirical analysis 1% increases of FDI in Turkey, increases total factor productivity by 0.10%, economic growth by 0.49% and domestic investments by 0.12%, decreases current account deficit by 2.79% and employment by 0.01%.
Raheem, Oyınlola (2013)	TAR (Threshold Autoregressive)	1970-2010	According to data availability, 15 African countries were selected and it was concluded that there is a positive relationship between FDI and growth when the financial development indicator reaches a certain threshold level.
Şahin, (2018)	Panel Data Method	2004-2014	It analyzes the determinants of foreign direct investment in APEC countries. It shows that there is a positive and statistically significant relationship between foreign direct investments, economic growth and trade openness.

Ang (2009)	Annual Time Series	1970-2004	They examined the impact of FDI on the economy of Thailand by controlling for the level of financial development. according to results, financial development stimulates economic development whereas foreign direct investment impacts negatively on output expansion in the long run.
Bolívar et al. (2019)	Panel Data Method	2009-2015	They study the economic performance of countries in terms of their associations with certain FDI partners employing social network analysis. Their conclusion is that country features such as size, openness, skill levels, and institutional stability not only set the pace of FDI, but that they also influence both the network structure and the power positions of each node.
Choong, Lim (2009)	Technique of Co-integration, Error Correction Model	1970-2001	It is stated that the interaction between FDI and financial development exerts a significant effect on the growth performance of Malaysia. Their study showed that the significant role played by FDI–finance interaction in the growth process.
Dunning, Zhang (2008)	Stepwise Test, Country Groups Based on Income Level, Country Groups Based on Openness, Econometric Test	WEF (2005), UNIDO (2004) WIR (2002)	They find that the level of competitiveness does encourage both inward and outward FDI. The Institutions (I) of a country has stronger positive effects on FDI than its RCM (capabilities and markets). For the independent and competitive related variables, they use the rankings of the 117 countries contained in GCR. Their study shows that the effects of I are particularly strong in countries at the advanced stage of development.
Landesman, Stehrer (2000)	Foreign Trade Data	1963-1997	The competitiveness of the processing industry improved the most in transition countries. Moreover, it was the greatest role of firms with foreign participation. (industrialized and developing 32 countries investigated).
Delgado et al. (2012)	Panel Data Method	2001-2008	They define a new concept, global investment attractiveness, which is the cost of factor inputs relative to a country's competitiveness using multiple data sets covering more than 130 countries over. The definition of global investment attractiveness offers a platform for further work.
Pradhan (2010)	Johansen's Cointegration Technique, Error Correction Model	1970-2007	The study examines the long-term relationship between financial development, FDI and growth in India. It is stated that the Indian economy needs a better financial system for growth and FDI.
Bonelli (1999)	A Case Study	1990s.	When looking at data within the manufacturing sector in Brazil linking the growth of competitiveness to FDI, there does not appear to be a clear-cut relationship with either the growth of FDI or the share of foreign capital within different industries. This evidence would suggest that there is no general tendency for FDI to be attracted primarily to industries where competitiveness is improving most rapidly.
Akal, Gökmenoğlu (2012)	Granger Causality Tests	2005	In this study, it was confirmed that direct foreign investments have caused competitive power for each OECD country, R&D expenditures have determined competitive power to a large extent.
Saray, Hark (2015)	Dynamic Panel Data	2004-2012	The most important competitiveness determinant of OECD countries ensues as productivity variable. There have been no relationship determined with competitiveness power, foreign direct investment and the number of patent applications.

Adeniyi et al. (2012)	Error Correction Model, Granger Causality Analysis	1970-2005	They examined the relationship between financial development, FDI and growth for the countries of Cote'ahili, Gambia, Ghana, Nigeria and Sierra Leone in their studies. Financial development in Ghana, Gambia and Sierra Leone has been seen to support economic growth by increasing the benefit from FDI. In Nigeria, there is no relationship between these variables.
Alvarez, Marin (2013)	Panel Data Method	1996-2010	They study how the integration of firms from developing countries in sophisticated high-tech markets can be defined by the combined action of MNE and the ability for technology absorption and creation. Analysis shows how the different dimensions of internal and external factors affect international competitiveness in high-tech industries.
Zhang (2014)	Panel Data Method	2005-2010	Results suggest that FDI has large positive effects on China's industrial performance; such effects are much greater on low-tech manufacturing than medium- and high-tech industries.
Korgaonkar (2012)	Interpreting Regression, Data Mining Techniques	1980-2009	In this study, data about 78 countries were used results showed that FDI did not turn to financially weak countries. Moreover, it is stated that the developed financial system is a prerequisite for the positive effect of FDI on growth.
Artan, Hayaloğlu (2015)	Panel Data Method	1990-2012	Main determinants of foreign direct investment in OECD countries are institutional factors rather than economic determinants. According to this, a good institutional structure plays an important role in attracting foreign direct investment in OECD countries.
Zadeh, Madani (2012)	Regression Model	1971-2008	In this study examines financial market development, FDI and economic growth in Iran, the intermediary role of financial development is tried to be determined in order to benefit from FDI in achieving economic growth. Accordingly, if the country has not reached the threshold level of financial development, it affects growth negatively. Conversely, FDI has a positive impact on growth if financial development has exceeded the threshold level. (ratio of threshold level private sector loans to GDP)
Akal et al. (2012)	Multiple Regression	2007	Net inward foreign direct investment has a statistically significant positive effect on the competitiveness, but it has a very low impact when compared with the impact of Human Development Index and R&D Expenditures. It is stated that the increases in net foreign direct investment used to represent the activities of multinational firms increased the competitiveness of OECD countries.
Çetin, Şeker (2014)	Dynamic Panel Data	1996-2011	They find that trade openness and financial development are positively associated with foreign direct investment in the long-run. The empirical results imply that trade openness and financial development are the determinants of foreign direct investment in OECD countries.
Özgür, Demirtaş (2015)	Unrestricted VAR, Johansen Co-integration Test	1992:1-2013:3	The study investigates the long-run relationship among financial development, FDI and economic growth in Turkey. According to the results, while financial development positively affected growth, long-term effect of FDI was not positive. In addition, it has been suggested that FDI will have an indirect positive effect supporting economic development with increasing financial development level.

Sghaier, Abida (2013)	Generalized Method of Moment (GMM) Panel Data Analysis	1980-2011	4 countries of North Africa (Tunisia, Morocco, Algeria and Egypt) have been studied. They find strong evidence of a positive relationship between FDI and economic growth. In order to increase the positive effects of FDI on the economy, it is necessary to improve the financial system.
Solan, Yenice (2017)	Generalized Method of Moment (GMM) Panel Data Analysis	2005-2015	It was investigated how financial development reduces financial constraints for BIST. According to the results that financial constraints are alleviated by financial development for firms that are considered to be financially constrainted which are not part of a large business group, or without any foreign partners.
Desbordes, Wei (2017)	Regression Model	2003-2006	They investigated the various structural effects of financial development on foreign direct investment. Their empirical results unambiguously indicate that a deep financial system in source and destination countries strongly facilitates the international expansion of firms through FDI. *(in 83 source and in 13 broad manufacturing sectors of 125 (developed and developing) destination countries.)*
Alfaro, Chauvin (2017)	Empirical Research	-	This review focuses on complementarities between FDI and local financial markets. While research focuses on positive development outcomes from foreign direct investment, there is less understanding of the potentially negative effects.

Source: Prepared by the authors.

METHODS

Country and Data Selection

In the study PD observation of 36 OECD countries with the years 1997, 2003 and 2006 and the period 2010-2016 (totally 10 years) and CSD observation of same country group with for the year 2016 were applied. The countries which were observed are all members of OECD.

The data for IMF-FDI was collected from IMF (Svirydzenka, 2016), whereas OECD-FRRI data was collected from OECD (https://stats.oecd.org.) for 36 OECD member countries.

At the initial level of development for Developing Counties (DC) basic inputs such as labour and capital are key determinants of economic growth. Foreign direct investment play a crucial role for DC in two different aspects. First one is it is important for the capital accumulation in the host country where the second one is it brings technology transferring to the country. Besides these two properties it also helps the country to access the new target markets for its export products. Today foreign direct investment is still important for the economic stability of a country whether it is developing or advanced. According to the UNCTAD World Investment Report 2019 (UNCTAD, 2019) there was 1.3 trillion dollar foreign direct investment inflows in the world in 2018 and United States was the most attractive country for foreign direct investments with nearly 251.8 billion dollar inflows with and a 19.4% share. On the other hand, OECD countries attracted 606.6 billion dollars foreign direct investment with a share of 46.8%. Not only the financial stability but the financial development in the country is also an important factor for foreign direct investment inflows into a country so that a country should establish its financial infrastructure to reach financial development and attract foreign direct investments into the country.

An improvement in financial development increases the foreign direct investment inflows into a country resulting with an economic growth and enhancing the competitiveness of the country in international markets. Higher foreign direct investments mean better access to the technology, capital and new target export destinations for the country. The domestic market gains competitiveness with the entrance of foreign direct investments via multinational corporations and transnational corporations. These corporations also establish bridges between hosting domestic country and target market countries.

Following the existing literature for the relationship between foreign direct investment and financial development in a country the estimated model in the study can be described as follow:

ln (Yit) = f (Xit), ln: natural logarithm, Yit: OECD-FRRI, Xit: IMF-FDI

ln (Yit) = f (Xit), ln: natural logarithm, Yit: IMF-FDI, Xit: OECD-FRRI

ln (Yit) = $\alpha+\beta\times Xit+ \upsilon t$, i= 1,2,3 … 36 (countries), t = 2016 for CSD, Yit: OECD-FRRI or IMF-FDI, Xit: IMF-FDI or OECD-FRRI

ln (Yit) = $\alpha+\beta\times Xit+ \upsilon t$, i= 1,2,3 … 36 (countries), t = 1997, 2003, 2006, 2010-2016 (10-year period) for PD, Yit: OECD-FRRI or IMF-FDI, Xit: IMF-FDI or OECD-FRRI

In the study OECD-FRRI or IMF-FDI variable is considered as dependent variable (Y) whereas IMF-FDI or OECD-FRRI variable as independent (explanatory) variable (X) in regressions.

The Financial Development Index (IMF-FDI) which was created by IMF summarizing how developed financial institutions and financial markets are in terms of their depth, access, and efficiency and the Foreign Direct Investment Regulatory Restrictiveness Index (OECD-FRRI) which was created by The Organisation for Economic Co-operation and Development (OECD) measuring statutory restrictions on foreign direct investment were used in the study. For PD analysis 10-year period as 1997, 2003, 2006, 2010, 2011, 2012, 2013, 2014, 2015, 2016 and for CSD analysis the year 2016 were studied for 36 OECD countries.

α is the constant coefficient (intercept) and β is the regression coefficient (independent variable coefficient/ slope). υt is the disturbance (error) term that represents the changes in OECD-FRRI or IMF-FDI is not defined by IMF-FDI or OECD-FRRI at time t. υt is a random variable with well-defined probability properties and is υt ~Normally and Independently Distributed (NID) (0, $\sigma 2$) where υt has zero (0) mean and common variance ($\sigma 2$) for all countries according to the Classical Normal Linear Regression and is normally and independently distributed according to time and countries (Gujarati and Porter, 2008).

RESULTS

The Relationship between OECD-FRRI and IMF-FDI with CSD Method

If the relationship between OECD-FRRI and IMF-FDI is wanted be expressed as a regression for 36 OECD countries for cross-section data the following equations are obtained.

$OECD\text{-}FRRI_{2016} = \square + \square * IMF\text{-}FDI_{2016}$ and $IMF\text{-}FDI_{2016} = \square + \square * OECD\text{-}FRRI_{2016}$ where $\square$ and $\square$ are coefficients.

The relationship between IMF-FDI and OECD-FRRI where OECD-FRRI is as dependent variable and IMF-FDI is as independent variable is estimated with CSD by the EViews 9 software (https://www.eviews.com) is as below (Table 2).

Table 2. The Relationship between OECD-FRRI and IMF-FDI where OECD-FRRI is as dependent variable and IMF-FDI is as independent variable with CSD Method

Dependent Variable: FRRI
Method: Least Squares
Date: 06/26/19 Time: 17:25
Sample: 1 36
Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.029809	0.033183	0.898330	0.3753
FDI	0.056746	0.050831	1.116369	0.2721

R-squared	0.035359	Mean dependent var	0.065250
Adjusted R-squared	0.006987	S.D. dependent var	0.058142
S.E. of regression	0.057938	Akaike info criterion	-2.804920
Sum squared resid	0.114133	Schwarz criterion	-2.716947
Log likelihood	52.48856	Hannan-Quinn criter.	-2.774215
F-statistic	1.246280	Durbin-Watson stat	2.331239
Prob(F-statistic)	0.272092		

Source: Eviews9 software

The equation below tells us one percent increase in IMF-FDI causes approximately 0.057 (5.7%) increase in OECD-FRRI for 36 OECD countries in average.

$$OECD\text{-}FRRI_{2016} = 0.0298 + 0.057 * IMF\text{-}FDI_{2016}$$

In the equation above nearly 3.5% of the changes in OECD-FRRI are expressed by IMF-FDI.

The relationship between IMF-FDI and OECD-FRRI where IMF-FDI is as dependent variable and OECD-FRRI is as independent variable is estimated with CSD by the EViews 9 software) is as below (Table 3).

Table 3. The Relationship between OECD-FRRI and IMF-FDI where is IMF-FDI as dependent variable and OECD-FRRI is as independent variable with CSD Method

Dependent Variable: FDI
Method: Panel Least Squares
Date: 06/26/19 Time: 17:09
Sample: 2007 2016
Periods included: 10
Cross-sections included: 36
Total panel (balanced) observations: 360

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.609068	0.014767	41.24419	0.0000
FRRI	0.183707	0.143380	1.281260	0.2009

R-squared	0.004565	Mean dependent var	0.623034
Adjusted R-squared	0.001784	S.D. dependent var	0.189206
S.E. of regression	0.189037	Akaike info criterion	-0.488212
Sum squared resid	12.79308	Schwarz criterion	-0.466622
Log likelihood	89.87808	Hannan-Quinn criter.	-0.479627
F-statistic	1.641626	Durbin-Watson stat	0.078779
Prob(F-statistic)	0.200932		

Source: Eviews9 software

The equation below tells us one percent increase in IMF-FDI causes approximately 0.057 (5.7%) increase in OECD-FRRI for 36 OECD countries in average.

$$\text{IMF-FDI}_{2016}=0.609+0.184*\ \text{OECD-FRRI}_{2016}$$

In the equation above nearly 0.46% of the changes in IMF-FDI are expressed by OECD-FRRI.

The statistical values of the coefficients of both regressions are not statistically significant ($p > 0.05$ and the absolute values of the coefficients t are inside the threshold values of the t distribution either F-statistic value is lower than critical value). So the regressions above are not adequate. It is obviously seen that there is no relationship between OECD-FRRI and IMF-FDI in short term.

The Relationship between OECD-FRRI and IMF-FDI with Random Effects Model (REM)

If the relationship between OECD-FRRI and IMF-FDI is wanted be expressed as a REM regression for 36 OECD countries for panel data the following equations are obtained.

$\text{OECD-FRRI}_t = \square + \square * \text{IMF-FDI}_t$ and $\text{IMF-FDI}_t = \square + \square * \text{OECD-FRRI}_t$ where $\square$ and $\square$ are coefficients and t = 1997, 2003, 2006, 2010-2016 (10-year period).

The relationship between IMF-FDI and OECD-FRRI where OECD-FRRI is as dependent variable and IMF-FDI is as independent variable is estimated with REM PD by the EViews 9 software is as below (Table 4).

Table 4. The Relationship between OECD-FRRI and IMF-FDI where OECD-FRRI is as dependent variable and IMF-FDI is as independent variable with REM PD Method

Dependent Variable: FRRI
Method: Panel EGLS (Cross-section random effects)
Date: 07/17/19 Time: 19:41
Sample: 2007 2016
Periods included: 10
Cross-sections included: 36
Total panel (balanced) observations: 360
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.201869	0.020277	9.955431	0.0000
FDI	-0.201990	0.027914	-7.236263	0.0000

Effects Specification

			S.D.	Rho
Cross-section random			0.061797	0.8009
Idiosyncratic random			0.030809	0.1991
		Weighted Statistics		
R-squared	0.120529	Mean dependent var		0.011839
Adjusted R-squared	0.118072	S.D. dependent var		0.033892
S.E. of regression	0.031828	Sum squared resid		0.362662
F-statistic	49.06294	Durbin-Watson stat		0.787267
Prob(F-statistic)	0.000000			
		Unweighted Statistics		
R-squared	-0.375868	Mean dependent var		0.076022
Sum squared resid	2.391616	Durbin-Watson stat		0.119380

Source: Eviews9 software

The equation below tells us one percent increase in IMF-FDI causes approximately 0.202 (20.2%) decrease in OECD-FRRI for 36 OECD countries in average. It seems that financial development inhibits foreign direct investment restrictions in a country.

$$\text{OECD-FRRI}_{1997,\ 2003,\ 2006,\ 2010\text{-}2016} = 0.202 - 0.202 * \text{IMF-FDI}_{1997,\ 2003,\ 2006,\ 2010\text{-}2016}$$

In the equation above nearly 12% of the changes in OECD-FRRI are expressed by IMF-FDI.

The statistical values of the coefficients of both regressions are statistically significant ($p < 0.05$ and the absolute values of the coefficients t are outside the threshold values of the t distribution either F-statistic value is bigger than critical value). So the regressions above is adequate. It is obviously seen that there is negative relationship between OECD-FRRI and IMF-FDI in long term.

If the regression is wanted to be obtained by pooled ordinary least squares method it would be as;

$$\text{OECD-FRRI}_{1997,\ 2003,\ 2006,\ 2010\text{-}2016} = 0.06 + 0.02 * \text{IMF-FDI}_{1997,\ 2003,\ 2006,\ 2010\text{-}2016}$$

But it must be considered that pooled all 36 observations and estimate a "grand" regression neglecting the cross-section and time series nature of our data is not meaningful since all 36 countries are not same so the regression will not be valid.

"Hausman Test" can be applied to test the validity of the REM which shows the relationship between OECD-FRRI and IMF-FDI where OECD-FRRI is as dependent variable and IMF-FDI is as independent variable obtained with the EViews 9 software above.

H_0: REM can be applied,

H_1: FEM can be applied instead of REM

The following "Hausman Test" (Table 5) also shows that null hypothesis indicating REM can be applied should be rejected, since with 1 df (degree of freedom) and X^2 (chi-square) value is statistically significant so that FEM can be applied instead of REM.

Table 5. "Hausman Test" for REM to Test The Relationship between OECD-FRRI and IMF-FDI where OECD-FRRI is as dependent variable and IMF-FDI is as independent variable with PD Method

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	25.083455	1	0.0000

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
FDI	-0.279983	-0.201990	0.000243	0.0000

Cross-section random effects test equation:
Dependent Variable: FRRI
Method: Panel Least Squares
Date: 07/17/19 Time: 19:42
Sample: 2007 2016
Periods included: 10
Cross-sections included: 36
Total panel (balanced) observations: 360

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.250461	0.019981	12.53526	0.0000
FDI	-0.279983	0.031964	-8.759420	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.823627	Mean dependent var	0.076022
Adjusted R-squared	0.803969	S.D. dependent var	0.069584
S.E. of regression	0.030809	Akaike info criterion	-4.024941
Sum squared resid	0.306582	Schwarz criterion	-3.625536
Log likelihood	761.4895	Hannan-Quinn criter.	-3.866130
F-statistic	41.89852	Durbin-Watson stat	0.984691
Prob(F-statistic)	0.000000		

Source: Eviews9 software

The Relationship between OECD-FRRI and IMF-FDI where OECD-FRRI is as dependent variable and IMF-FDI is as independent variable with Fixed Effects Model (FEM)

As the null hypothesis is rejected, the alternative one which tells FEM can be applied for the relationship should be accepted and the regression estimated by FEM will be as below.

$$\text{OECD-FRRI}_{1997,\ 2003,\ 2006,\ 2010\text{-}2016} = 0.25 - 0.28 * \text{IMF-FDI}_{1997,\ 2003,\ 2006,\ 2010\text{-}2016}$$

It simply means that one unit increase in IMF-FDI for 36 OECD countries causes nearly 28% decrease in OECD-FRRI in average. The regression above shows that about 82.4% of the changes in the OECD-FRRI is expressed by the IMF-FDI values of the 36 countries (Table 6).

Table 6. The Relationship between OECD-FRRI and IMF-FDI where OECD-FRRI is as dependent variable and IMF-FDI is as independent variable with FEM PD Method

Dependent Variable: FRRI
Method: Panel Least Squares
Date: 07/17/19 Time: 19:41
Sample: 2007 2016
Periods included: 10
Cross-sections included: 36
Total panel (balanced) observations: 360

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.250461	0.019981	12.53526	0.0000
FDI	-0.279983	0.031964	-8.759420	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.823627	Mean dependent var	0.076022
Adjusted R-squared	0.803969	S.D. dependent var	0.069584
S.E. of regression	0.030809	Akaike info criterion	-4.024941
Sum squared resid	0.306582	Schwarz criterion	-3.625536
Log likelihood	761.4895	Hannan-Quinn criter.	-3.866130
F-statistic	41.89852	Durbin-Watson stat	0.984691
Prob(F-statistic)	0.000000		

Source: Eviews9 software

If the relationship between IMF-FDI and OECD-FRRI where IMF-FDI is as dependent variable and OECD-FRRI is as independent variable is estimated with REM PD by the EViews 9 software the results will be as below (Table 7).

Table 7. The Relationship between OECD-FRRI and IMF-FDI where IMF-FDI is as dependent variable and OECD-FRRI is as independent variable with REM PD Method

Dependent Variable: FDI
Method: Panel EGLS (Cross-section random effects)
Date: 06/26/19 Time: 17:10
Sample: 2007 2016
Periods included: 10
Cross-sections included: 36
Total panel (balanced) observations: 360
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.673152	0.031440	21.41088	0.0000
FRRI	-0.659257	0.077335	-8.524655	0.0000

Effects Specification			
		S.D.	Rho
Cross-section random		0.184683	0.9362
Idiosyncratic random		0.048210	0.0638
Weighted Statistics			
R-squared	0.167270	Mean dependent var	0.051256
Adjusted R-squared	0.164943	S.D. dependent var	0.053034
S.E. of regression	0.048463	Sum squared resid	0.840828
F-statistic	71.91102	Durbin-Watson stat	1.090643
Prob(F-statistic)	0.000000		
Unweighted Statistics			
R-squared	-0.091546	Mean dependent var	0.623034
Sum squared resid	14.02827	Durbin-Watson stat	0.065371

Source: Eviews9 software

The equation below tells us one percent increase in OECD-FRRI causes approximately 0.66 (66%) decrease in IMF-FDI for 36 OECD countries in average. It seems that foreign direct investment restrictions inhibits financial development in a country.

$$\text{IMF-FDI}_{1997,\ 2003,\ 2006,\ 2010\text{-}2016} = 0.67 - 0.66 * \text{OECD-FRRI}_{1997,\ 2003,\ 2006,\ 2010\text{-}2016}$$

In the equation above nearly 16.7% of the changes in IMF-FDI are expressed by OECD-FRRI.

The statistical values of the coefficients of both regressions are statistically significant ($p < 0.05$ and the absolute values of the coefficients t are outside the threshold values of the t distribution either F-statistic value is bigger than critical value). So the regressions above is adequate. It is obviously seen that there is negative relationship between IMF-FDI and OECD-FRRI where IMF-FDI is as dependent variable and OECD-FRRI is as independent variable in long term.

If the regression is wanted to be obtained by pooled ordinary least squares method it would be as;

$$\text{IMF-FDI}_{1997,\ 2003,\ 2006,\ 2010\text{-}2016} = 0.61 + 0.184 * \text{OECD-FRRI}_{1997,\ 2003,\ 2006,\ 2010\text{-}2016}$$

But it must be considered that as it is mentioned before pooled all 36 observations and estimate a "grand" regression neglecting the cross-section and time series nature of our data is not meaningful since all 36 countries are not same so the regression will not be valid.

"Hausman Test" can be applied to test the validity of the REM which shows the relationship between IMF-FDI and OECD-FRRI where IMF-FDI is as dependent variable and OECD-FRRI is as independent variable obtained with the EViews 9 software above.

H_0: REM can be applied,

H_1: FEM can be applied instead of REM

The following "Hausman Test" (Table 8) also shows that null hypothesis indicating REM can be applied should be rejected, since with 1 df and X^2 value is statistically significant so that FEM can be applied instead of REM.

Table 8. "Hausman Test" for REM to Test The Relationship between OECD-FRRI and IMF-FDI where OECD-FRRI is as dependent variable and IMF-FDI is as independent variable with PD Method

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	4.777222	1	0.0288

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
FRRI	-0.685574	-0.659257	0.000145	0.0288

Cross-section random effects test equation:
Dependent Variable: FDI
Method: Panel Least Squares
Sample: 2007 2016
Periods included: 10
Cross-sections included: 36
Total panel (balanced) observations: 360

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.675153	0.006470	104.3537	0.0000
FRRI	-0.685574	0.078267	-8.759420	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.941587	Mean dependent var	0.623034
Adjusted R-squared	0.935077	S.D. dependent var	0.189206
S.E. of regression	0.048210	Akaike info criterion	-3.129415
Sum squared resid	0.750704	Schwarz criterion	-2.730010
Log likelihood	600.2948	Hannan-Quinn criter.	-2.970604
F-statistic	144.6285	Durbin-Watson stat	1.226852
Prob(F-statistic)	0.000000		

Source: Eviews9 software

The Relationship between OECD-FRRI and IMF-FDI where IMF-FDI is as dependent variable and OECD-FRRI is as independent variable with Fixed Effects Model (FEM)

As the null hypothesis is rejected, the alternative one which tells FEM can be applied for the relationship should be accepted and the regression estimated by FEM will be as below.

$$\text{IMF-FDI}_{1997,\ 2003,\ 2006,\ 2010\text{-}2016} = 0.67 - 0.69^{*}\ \text{OECD-FRRI}_{1997,\ 2003,\ 2006,\ 2010\text{-}2016}$$

It simply means that one unit increase in OECD-FRRI for 36 OECD countries causes nearly 69% decrease in IMF-FDI in average. The regression above shows that about 94.2% of the changes in the IMF-FDI is expressed by the OECD-FRRI values of the 36 countries (Table 9).

Table 9. The Relationship between OECD-FRRI and IMF-FDI where OECD-FRRI is as dependent variable and IMF-FDI is as independent variable with FEM PD Method

Dependent Variable: FDI
Method: Panel Least Squares
Sample: 2007 2016
Periods included: 10
Cross-sections included: 36
Total panel (balanced) observations: 360

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.675153	0.006470	104.3537	0.0000
FRRI	-0.685574	0.078267	-8.759420	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.941587	Mean dependent var	0.623034
Adjusted R-squared	0.935077	S.D. dependent var	0.189206
S.E. of regression	0.048210	Akaike info criterion	-3.129415
Sum squared resid	0.750704	Schwarz criterion	-2.730010
Log likelihood	600.2948	Hannan-Quinn criter.	-2.970604
F-statistic	144.6285	Durbin-Watson stat	1.226852
Prob(F-statistic)	0.000000		

Source: Eviews9 software

Detecting Autocorrelation in the Regressions

The Relationship between OECD-FRRI and IMF-FDI where OECD-FRRI is as dependent variable and IMF-FDI is as independent variable with FEM PD Method

To detect the presence of autocorrelation in the residuals of the regressions above the Durbin-Watson d statistic is applied.

H_0: there is no sequential relationship between error terms (neither the same direction nor opposite direction),

H_1: There is a sequential relationship between error terms.

The d-value (d_L) at the lower limit is taken as 1.411 and the d-value at the upper limit (d_U) is taken as 1.525 with 1 explanatory variable (IMF-FDI) at level 5% and 36 observations (country). H_0 can't be rejected if $d_U<4 - d_U$ and can be rejected if $0<d_L$. As the d (0.98) value obtained in the regression is $0.98<1.411$ the null hypothesis (H_0) can be rejected and it can be said that there is no positive sequential relationship between the error terms.

The Relationship between OECD-FRRI and IMF-FDI where IMF-FDI is as dependent variable and OECD-FRRI is as independent variable with FEM PD Method

As the d (1.23) value obtained in the regression is 1.23<1.411 the null hypothesis (H_0) can be rejected and it can be said that there is no positive sequential relationship between the error terms.

Granger Causality Tests

The Granger Causality tests may be approved for both PD and CSD sets to show the direction of the causality between OECD-FRRI and IMF-FDI.

To test OECD-FRRI causes IMF-FDI

H_0: OECD-FRRI does not Granger cause IMF-FDI

H_1: OECD-FRRI Granger causes IMF-FDI

To test IMF-FDI causes OECD-FRRI

H_0: OECD-FRRI does not Granger cause IMF-FDI

H_1: OECD-FRRI Granger causes IMF-FDI

To test the direction of relationship between IMF-FDI and OECD-FRRI in CSD

To test OECD-FRRI causes IMF-FDI;

According to the Table 10 results F value doesn't exceed the critical F value and p>0.05 level of significance, so we can't reject null hypothesis so that OECD-FRRI doesn't Granger cause IMF-FDI for CSD.

To test IMF-FDI causes OECD-FRRI;

According to the Table 10 results F value exceeds the critical F value and p<0.05 level of significance, so we reject null hypotheses and accept that IMF-FDI Granger causes OECD-FRRI for CSD.

Table 10. Pairwise "Granger Causality Test" to test the direction of relationship between IMF-FDI and OECD-FRRI in CSD

Pairwise Granger Causality Tests
Sample: 1 36
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
FRRI does not Granger Cause FDI	34	0.36200	0.6994
FDI does not Granger Cause FRRI		3.77688	0.0349

Source: Eviews9 software

To test the direction of relationship between IMF-FDI and OECD-FRRI in PD

To test OECD-FRRI causes IMF-FDI;

According to the Table 11 results F value exceeds the critical F value and p<0.05 level of significance, so we reject null hypothesis so that we accept that OECD-FRRI Granger causes IMF-FDI for PD.

To test IMF-FDI causes OECD-FRRI;

According to the Table 11 results F value exceeds the critical F value and $p<0.05$ level of significance, so we reject null hypothesis so that we accept that IMF-FDI Granger causes OECD-FRRI for PD.

Table 11. Pairwise "Granger Causality Test" to test the direction of relationship between IMF-FDI and OECD-FRRI in PD

Pairwise Granger Causality Tests
Sample: 2007 2016
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
FRRI does not Granger Cause FDI	288	4.22559	0.0155
FDI does not Granger Cause FRRI		5.80160	0.0034

Source: Eviews9 software.

1. CONCLUSION

According to the RAM and FEM with PD analysis in the study OECD-FRRI is found as one of the determinants of IMF-FDI and IMF-FDI is found as one of the determinants of OECD-FRRI in OECD member countries. After applying the appropriate test it is found is FEM is adequate instead of REM. with PD.

For CSD analysis, there is no significant proof to say OECD-FRRI is one of the main determinants of IMF-FDI and IMF-FDI is one of the determinants of OECD-FRRI in OECD member countries.

Granger causality test is also applied to test the direction of causality between OECD-FRRI and IMF-FDI for the selected countries by both PD and CSD analyses. It is obviously seen that OECD-FRRI causes IMF-FDI and vice versa according to the Granger test statistics for PD. For CSD, OECD-FRRI does not cause IMF-FDI whereas IMF-FDI causes OECD-FRRI.

In the study it is found that OECD-FRRI affects IMF-FDI and IMF-FDI affects OECD-FRRI negatively not at once but in a time period. In the manuscript our results show there is a negative relationship between OECD-FRRI and IMF-FDI in both direction according to the PD. As the OECD-FRRI increases in a country IMF-FDI decreases and vice versa. It seems that financial development inhibits foreign direct investment restrictions and foreign direct investment restrictions inhibits financial development in a country.

For CSD there is no exact relationship between OECD-FRRI and IMF-FDI.

Totally removing or at least decreasing restrictions on foreign direct investment will enhance Foreign Direct Investment inflows into a country. Attracting Foreign Direct Investment will enable the financial development of the country's financial institutions and markets and financial development will also promote FDI inflows into the country in long term.

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