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Prof. Dr. Ahmet Niyazi Özker

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Editor •. Prof. Dr. Ahmet Niyazi Özker • Orcid: 0000-0001-5313-246X
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website • http://www.livredelyon.com
e-mail • livredelyon@gmail.com



PREFACE

Recent developments in social sciences have made it necessary to discuss scientific studies on a multidisciplinary scientific platform. This requirement also means a structure that is brought together on the same platform and questions mutual result relations related to scientific studies. Multi-faceted responses to the comparison of the findings of all kinds of scientific studies, especially in their own field, in a multidisciplinary field, also constitute a meaningful global activity today. An important source of this global activity is undoubtedly its contribution to developing a ground where all kinds of work at the international level are meaningful.

Obviously, this book, named Reviews in Administrative and Economic Science: Methodology, Research, and Application, has significantly contributed to the scientific literature with its studies focused on social sciences. In this respect, meeting all kinds of studies and findings on an important platform and providing this platform in this book creates a meaningful international position. Discussing all kinds of scientific findings on a platform open to all kinds of thoughts in the related studies in the book also means a meaningful global ground with a qualified infrastructure. In addition to all these, including all kinds of thoughts and opinions open to discussion, especially in a book published at the international level, is undoubtedly indisputably important in terms of its contributions.

In this context, I would like to express my gratitude and respect to all the authors who contributed to the book with their scientific studies and the referee committee and publishing house staff who made important contributions to the book's preparation. I would like to express my respect and hope for future studies.

Prof. Dr. Ahmet Niyazi Özker
Bandırma Onyedi Eylül University

CHAPTER XIII

THE RELATION BETWEEN FOREIGN DIRECT INVESTMENTS AND CRISIS: PANEL UNIT-ROOT ANALYSIS ON SELECTED COUNTRIES

Tunahan HACİİMAMOĞLU & Harun SARAÇ
(RA. Dr.), Recep Tayyip Erdoğan Üniversitesi,
e-mail: tunahanhaciimamoglu@erdogan.edu.tr,
ORCID: 0000-0003-1474-8506
(RA.), Recep Tayyip Erdoğan Üniversitesi,
e-mail: harun.sarac@erdogan.edu.tr, ORCID: 0000-0002-4576-9273

1. Introduction

One of the investment types most triggered by the increase in global capital mobility with the increase in the effectiveness of neo-liberal policies is foreign direct investments. Reasons such as the existence of cheap labor and workforce in developing countries compared to developed countries, incentive regulations and practices regarding the investment environment, and the search for new markets by multinational companies direct foreign investors to this field. In this sense, host countries can gain advantages to benefit from the employment environment created, increase in the amount of output produced, familiarity with international production networks, and technology transfer.

Developing countries are struggling to liberalize their economic policies in to benefit from investment mobility. Developing countries, which offer opportunities that will attract foreign investors to attract foreign direct investments, constitute an important part of this mobility. Developing countries, which attracted 16% of total foreign direct investments from investment mobility in the first years of the 1990s, ensured the realization of foreign direct investments within their own structure at the rate of 34% in the mid-1990s and 54% in 2012

(UNCTAD, 2015: 302). In other respects, how major financial crises, which have the potential to turn into economic crises, affect foreign direct investments considered very valuable for developing countries are the subject of macro-economic studies. Although the effect mainly observed is not as obvious and sudden as short-term capital movements, foreign direct investments also enter a negative trend as the crisis gives signs of deepening. On the other side, studies on this subject demonstrate that factors such as the type of crisis, the dynamics of the crisis, the geography where the crisis originates, and the duration of its impact are determinative in the direction of foreign direct investments.

Financial globalization in developing countries has commenced to take shape, especially since the mid-1980s, with the increase in foreign direct investments, which have started to substitute portfolio investments and debt flows. Since this date, foreign direct investments have come to the forefront as the largest source of foreign financing for many developing countries (Kusek and Silva, 2017: 1). Therefore, issues such as which variables are affected by foreign direct investments, which are becoming increasingly important for the economies of developing countries, the course of the crisis, or the determination of the regulations that need to be made for attracting more investments to the country are attentively followed by researchers and policy makers.

In this study, the data set consisting of the amounts of foreign direct investment entering the country in the period of 1990-2019, which belong to six developing countries with similar economic dynamics, such as Brazil, South Korea, India, Mexico, Thailand, and Turkey, was analyzed using panel unit-root tests. First, the CADF unbreakable unit root test and then the PANKPSS unit root test, which allows two breaks, are applied to perform the stability analysis of the relevant data, and in this way, it is determined whether the impact of the shocks due to the crises in the foreign direct investment series in the countries examined is permanent or not. Secondly, the dates when the structural break is observed is determined by PANKPSS, and the changes in the volume of foreign direct investments in the breakout period and the following period are examined. Hence, it is discussed whether the Krugman (2000) hypothesis is valid or not, based on the structural break dates which coincide with the crises on the country basis and which are determined using current econometric methods.

The following sections of the study are designed as follows. In the second part, foreign direct investments and Krugman (2000) hypothesis are explained. In the third chapter, literature studies related to the subject are given. The fourth part, which includes the introduction of data set and methodology, is followed by the fifth part, which consists of analysis results. Finally, the study is completed with the conclusion part.

2. Foreign Direct Investments and the Krugman Hypothesis

By its nature and definition, foreign direct investment is an investment type that has the feature of creating jobs and employment among investment types and therefore it is considered more beneficial in macro-economic terms compared to short-term capital movements. Hence, developing countries, which have a foreign-exchange bottleneck and especially struggling with the problem of lack of savings, put forward various regulations in order to attract foreign direct investments to ensure their economic development.

The reason for the increase in the desire of developing countries to attract more foreign direct investments is the important advantages that these investments will provide to the economy. These advantages are expressed as follows (Azman-Saini et al., 2010: 1079):

- Increasing efficiency in the production process,
- Transfer of new technology,
- Learning new production processes, managerial skills, technical know-how in the local market, personnel training and international production networks.

The response of foreign investments, which are especially important for developing countries' economies, to global and regional economic crises has also been the subject of research. In this regard, Krugman (2000) investigated the foreign direct investment movements in the relevant regions in his study examining the effects of the Asian crisis that took place in 1997 and the Mexican-centered Latin American crisis in 1995 on foreign direct investments. In this study, it was stated that short-term capital moved in the direction of exit from the region with the effect of the crisis, but since the value of domestic firms and assets fell to a very cheap and affordable level, it was bought by multinational companies at no cost, according to the hypothesis he conceptualized with the name Fire-Sale FDI (sales at no cost). Contrary to expectations, it was seen that foreign direct investments were in an increasing trend with the acquisition of domestic firms and companies in the relevant regions by foreign companies.

The mechanisms whose economic crises affect foreign direct investments vary according to regions and countries. In addition, the source of the crises and the geography where they occur are also decisive in this sense. The crisis that emerged in the USA in 2008 and primarily affected developed countries, and the Asian crisis that emerged in 1997 within the developing countries show variability in terms of their impact on macro-economic variables. For instance, while foreign direct investments were negatively involved in some countries such as Indonesia during the Asian crisis, foreign direct investments increased

and were positively affected in some countries such as South Korea. Considering the reasons for this development, it is seen that South Korea has made a rapid transition to liberal policies and practices that will encourage foreign investors with the crisis (UNCTAD, 2009: 8).

International investments planned to be realized in the future may be affected by pessimistic crisis scenarios depending on their severity, size or type. However, long-term investments initiated generally tend to be completed as planned despite the outbreak of any crisis. In this context, some studies examining the relationship of the Asian crisis in 1997 and the Mexican crisis in 1994 with foreign investments have revealed that foreign direct investments follow a more stable course compared to portfolio investments (Krugman, 2000; Athukorala, 2003).

In a nutshell, although the studies carried out in the relevant field mostly state that the economic crisis affects foreign direct investments negatively, as other macro-economic variables, there are also studies showing that this situation may change depending on the type of crisis and the region in which it occurs. According to Krugman (2000) and Athukorala (2003), foreign direct investments may increase during and after the crisis. Demand contractions and financial bottlenecks, as well as the fact that the current crisis renders the national currency worthless can cause the depreciation of national assets in a country. In such a case, which means an opportunity for multinational companies in search of wealth, significant opportunities arise for foreign investors due to the low investment cost and the opportunity to seize market power (Krugman, 2000). Accordingly, the country group examined and the nature of the crisis should be especially taken into account to determine the impact mechanism and its results accurately.

3. Literature

Athukorala (2003), in line with the Krugman hypothesis (2000), stated that the possible negative impact of the 1997 Asian crisis on foreign direct investments was not seen in Thailand, Malaysia, Indonesia, Korea and the Philippines. Supporting her analysis with various foreign direct investment data and graphs, the author emphasized that multinational companies increased their foreign direct investments by purchasing domestic companies that became economically very suitable in the crisis environment, and reached findings supporting the Fire-Sale FDI approach.

Ucal et al. (2010) tested the relationship between financial crises and foreign direct investments in developing countries using a semi-parametric regression

approach. In the results obtained, it was seen that foreign direct investments increased in the period before the financial crisis, but tended to decrease in the years after the financial crisis.

Dornean et al. (2012) examined the effect of the 2008 crisis on foreign direct investments in Central and Eastern European countries between 1994 and 2011 with panel data analysis. From the results of the analysis, it was determined that the 2008 financial crisis directly affected foreign direct investments negatively.

Dornean and Oanea (2015) investigated how foreign direct investments in Central and Eastern European countries were affected by the 2008 global and economic crisis for the period 2000-2013. According to the results obtained from the study, in which the multivariate regression model based on Dynamic Panel Data methodology was used, it was seen that factors such as infrastructure, crisis, human capital and economic stability had significant effects on foreign direct investments. As the most important factor, it was found that the crises affected negatively.

Stoddard and Noy (2015) tested Krugman's (2000) Fire-Sale hypothesis in their studies on the course of foreign direct investment inflows to developing countries in the context of financial crises and tried to describe the dynamism of foreign direct investment inflows with the economic crisis. The results obtained from the study showed that financial crises have a strong and negative effect on foreign direct investment inflows. Consequently, the authors could not find evidence for the validity of the Fire-Sale FDI hypothesis for the respective countries.

Ersoy and Erol (2016) used dynamic panel data analysis method for 15 European Union member countries in their studies to investigate the effects of crises on foreign direct investments. The main finding of the study is that the Euro-zone debt crisis in 2010 increased foreign direct investments in the relevant countries.

Hasli et al. (2017) investigated how financial crises and macro-economic factors affected foreign direct investments in 23 developing countries for the period 1993-2013. According to the analysis findings, it was determined that the 2008 crisis had a positive effect on foreign direct investment inflows. This finding also supports the Krugman (2000) hypothesis (Fire-Sale FDI).

Castro and Campos (2017) analyzed the data of Asian and Latin American countries with the dynamic panel method in order to test the effect of international financial crises on foreign direct investments. From the results of the study, it was determined that the 2008 crisis affected multinational companies negatively and reduced foreign direct investments in the relevant countries. In addition, it

was revealed in the study that the effect on regions differs and the decrease in foreign direct investment in Asian countries is higher than in Latin American countries. In the post-crisis period, it was observed that the negative effect disappeared and foreign direct investments increased in both regions.

4. Data and Methodology

4.1. Data

In the study, it is aimed to examine the foreign direct investments coming to developing countries such as Brazil, South Korea, India, Mexico, Thailand and Turkey with the unit root tests with and without breaks and to determine whether there is a crisis connection of foreign direct investments. For this purpose, the amount of foreign direct investment coming to the countries representing foreign direct investments (FDI) has been handled and these values have been calculated in US dollars over current prices. The study period covers the years 1990-2019 and consists of annual data. The fact that capital movements started to gain momentum in the 1990s and that accessible FDI data were available until 2019 were decisive in limiting the time period. FDI data was obtained from the UNCTADSTAT[1] database of the United Nations Conference on Trade and Development (UNCTAD). E-views 9 and Gauss 20 programs were used for econometric analysis. The panel data consists of a total of 180 observations with time dimension (T=30) and cross-section dimension (N=6).

4.2. Methodology

Panel data analysis method is more advantageous compared to time series analysis methods with its features such as providing the opportunity to reach more observations, considering heterogeneity, reducing the possibility of biased results, controlling the omitted variable and encountering the problem of multicollinearity less (Baltagi, 2005: 4-9; Hsiao, 2007: 3-6). In addition to the advantages it offers, cross-section dependency is one of the main issues to be considered in panel data analysis. Considering the relations between countries with globalization, development of foreign trade and liberalization, it is highly likely that other countries will be affected by the shock that occurs in any of the countries. Another issue to be considered is checking whether the slope coefficients are homogeneous (Menyah et al., 2014: 389).

In case of cross section independence, first generation unit root tests are applied, and in case of cross section dependence, second generation unit root tests

1 https://unctadstat.unctad.org/EN/Index.html.

are applied (Baltagi, 2008: 284). In the first generation unit root tests, there is a distinction between homogeneous and heterogeneous. While Levin et al. (2002), Breitung (2005), Hadri (2000) unit root tests are employed on homogeneous panels; Im et al. (2003), Maddala and Wu (1999), Choi (2001) unit root tests are widely used on heterogeneous panels. Major second generation unit root tests are Breuer et al. (2002) SURADF, Bai and Ng (2004) Panic, Smith et al. (2004) Bootstrap-IPS, Pesaran (2006) CADF. On the other hand, Charemza and Deadman (1997) state that although there is a structural break, tests that do not take into account the structural breaks yield biased results. Carrion-i Silvestre et al. (2005) developed the PANKPSS test in order to eliminate this deficiency.

The model with a constant was preferred during the modeling phase for the analysis of FDI series. The reason for this is that the structural break dates of the foreign direct investment series of the countries can be obtained more clearly in a model with a constant. Because trend-containing models capture and represent downward or upward movements by nature, break dates may be less obvious as a result of the analysis.

4.2.1. Cross-Section Dependency and Homogeneity Test

Breusch and Pagan (1980) LM test, which is used to test the cross-sectional dependence, is preferred when the time dimension (T) is larger than the cross-section dimension (N), and the LM test statistic is expressed as:

$$LM = T\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{p}_{ij}^{2} \tag{1}$$

$\hat{p}_{ij}$, is the sample estimate of the bidirectional correlation of the error term for each i based on the OLS estimate. For large panels with T $\rightarrow \infty$ and N $\rightarrow \infty$, Pesaran (2004) developed a scaled version of the LM test. This test gives effective results for very large N and T, however, significant distortions occur with a large N and a small T. CD_{LM} test statistic is shown as:

$$CD_{LM} = \left(\frac{1}{N(N-1)}\right)^{1/2}\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}(T\hat{p}_{ij}^{2}-1) \tag{2}$$

The CD_{LM} test is normally distributed with *N(N-1)/2* degrees of freedom and asymptotic chi-square property. On the other hand, Pesaran (2004) CD test and Pesaran et al. (2008) LM_{adj} tests have been proposed because of the need for a cross-section dependency test that can be applied in panels where the cross-section size (N) is relatively larger than the time dimension (T).

Testing the homogeneity of the slope coefficients dates back to Swamy (1970). While this test gives robust results in panels where N is smaller than T, it gives biased results in panels where N is larger than T. At this point, the Delta ($\tilde{\Delta}$) test developed by Pesaran and Yamagata (2008) is a homogeneity test based on the Swamy (1970) test and is explained as follows:

$$\hat{S} = \sum_{i=1}^{N} (\hat{\beta}_i - \hat{\beta}_{WFE})' \frac{X_i' M_\tau X_i}{\hat{\sigma}_i^2} (\hat{\beta}_i - \hat{\beta}_{WFE}) \tag{3}$$

$$\hat{\sigma}_i^2 = \frac{(y_i - X_i \hat{\beta}_i)' M_\tau (y_i - X_i \hat{\beta}_i)}{(T - k - 1)} \tag{4}$$

β_i represents the pooled OLS, $\hat{\beta}_{WFE}$ represents the weighted aggregate effect of the defined slope coefficients, M_τ, represents the unit matrix of T, and $\hat{\sigma}^2_i$ the estimator of σ^2_i

$$\hat{\beta}_{WFE} = \left(\sum_{i=1}^{N} \frac{X_i' M_\tau X_i}{\hat{\sigma}_i^2} \right) \tag{5}$$

Swamy statistic ($\hat{S}$), exhibits a chi-square distribution property asymptotically with *k(N-1)* degrees of freedom in the condition that N is constant and T is infinite. The standardized distribution statistics for the $\tilde{\Delta}$ ve $\tilde{\Delta}_{adj}$ tests are as follows:

$$\tilde{\Delta} = \sqrt{N} \left(\frac{N^{-1} \tilde{S} - k}{\sqrt{2k}} \right) \tag{6}$$

As long as the (N,T) → ∞ condition and $\sqrt{N/T}$ → ∞ and the error terms have normal distribution, the $\tilde{\Delta}$ test is asymptoticlly standart normally distributed. While the $\tilde{\Delta}$ test is a test statistic suitable for small sample characteristics, the $\tilde{\Delta}_{adj}$ test provides an updated test statistic for large sample characteristics. The adjusted $\tilde{\Delta}_{adj}$ test statistic is calculated as follows:

$$\tilde{\Delta}_{adj} = \sqrt{N} \left(\frac{N^{-1} \tilde{S} - E(\tilde{z}_{iT})}{\sqrt{Var(\tilde{z}_{iT})}} \right); \; E(\tilde{z}_{iT}) = k, var(\tilde{z}_{iT}) = \frac{2k(T - k - 1)}{T + 1} \tag{7}$$

According to the test statistics obtained;

$H_0 = \beta_i = \beta$ suggests homogeneity of slope coefficients for all *i*'s,

$H_A : \beta_i \neq \beta$ suggests heterogeneity of slope coefficients for $i \neq j$.

4.2.2. CADF Unit Root Test and Panel KPSS Structural Break Stationarity Test

Pesaran's (2007) CADF unit root test, also referred to as Cross-Sectionally Augmented Dickey-Fuller, was developed by integrating cross-section averages of lagged levels into ADF regression. One of the important features of this test is that it presents both cross-section results and panel results together. Another important feature is that it gives more powerful and consistent results even in panels with small time (T) and section size (N) and can be used regardless of T>N and N>T conditions.

The dynamic heterogeneous panel data model is expressed as:

$$y_{it} = (1 - \emptyset_i)\mu_i + \emptyset_i y_{i,t-1} + u_{it}, \mathrm{i} = 1,2, \ldots, \mathrm{N};\ \mathrm{t} = 1,2, \ldots, \mathrm{T} \quad (8)$$

The single factor error term is shown as:

$$u_{it} = \gamma_i f_t + u_{it} \quad (9)$$

In the single factor error term, f_t, represents the unobserved common effect, and $u_{i,t}$ represents the individual-specific error term.

When equations (8) and (9) are taken together, equation (10) is obtained:

$$\Delta y_{it} = \alpha_i + \beta_i y_{i,t-1} + \gamma_i f_t + u_{it} \quad (10)$$

In equation (10), $\alpha_i = (1-\varnothing_i)\mu_i$ has the equations $\beta_i = -(1-\varnothing_i)$ ve $\Delta y_{it} = y_{it} - y_{i,t-1}$ In this case, provided that $\varnothing_i = 1$, the unit root test hypotheses are:

$H_0 : \beta_i = 0$ for all *i*'s, and,

$H_A = \beta_i < 0,\ \mathrm{i}=1,2,\ldots,N_i,\ \beta_i = 0,\ \mathrm{i} = N_1+1, N_1+2, \ldots, N$

CADF regression is calculated as:

$$\Delta y_{it} = \alpha_i + b_i y_{i,t-1} + c_i \bar{y}_{t-1} + d_i \Delta \bar{y}_t + e_{it} \quad (11)$$

CIPS (Cross-Sectionally IPS) panel unit root statistics are obtained by averaging the unit root statistics of all cross-sections in CADF regression:

$$CIPS(N,T) = t\text{–}bar = N^{-1} \sum_{i=1}^{N} t_i\,(N,T) \quad (12)$$

The t_i(N,T) in the CIPS formula stands for the CADF statistics for each cross-section calculated with the t-statistic of the $y_{i,t-1}$coefficient in the CADF regression number (11) (Pesaran, 2007: 276).

Panel KPSS (PANKPSS) unit root test which was developed by Carrion-i Silvestre et al. (2005) is an extended version of Hadri's (2000) KPSS test, and can be used in cases where there is cross-section dependence and structural breaks. At the same time, this test is a panel stationarity test method that allows different numbers of structural breaks on different dates for each cross-sectional unit. The test model is shown as follows:

$$y_{it} = \alpha_{i,t} + \beta_{i,t}t + u_{i,t} \tag{13}$$

$\alpha_{i,t}$ in model 13 is expressed as :

$$\alpha_{i,t} = \sum_{k=1}^{m_i} \theta_{i,k} D(T_{b,k}^i)_t + \sum_{k=1}^{m_i} \gamma_{i,k} DU_{i,k,t} + \alpha_{i,t-1} + e_{i,t} \tag{14}$$

Here, $u_{i,t} \sim i.i.d.(0, \sigma_{\upsilon,i}^2)$ ve $\alpha_{i,0} = \alpha_i$ and represent a constant. *D* and *DU* in the equation are dummy variables and are defined as:

$D(T_{b,k}^i)_t = 1, t = T_{b,k}^i + 1; 0$ otherwise.

$DU_{i,k,t} = 1$, $t > T_{b,k}^i$; 0 otherwise.

$T_{b,k}^i$; *Tb* represents the break point, *i* symbolizes the cross section unit and k $(k = 1, \ldots, m_i, m_i \geq 1)$ shows the number of breaks since it is expressed as *m*.

It is assumed that the error terms $e_{i,t}$ and u_{it} in equations (13) and (14), respectively, are distributed independently of each other, and the null hypothesis representing the stationarity of the series is $\sigma_{\upsilon,i}^2 = 0, \forall i = 1, \ldots, N$. In the context of this hypothesis, when equations (13) and (14) are considered together, they are arranged as follows:

$$y_{,t} = \propto_i + \sum_{k=1}^{m_i} \theta_{i,k} DU_{i,k,t} + \beta_i t + \sum_{k=1}^{m_i} \gamma_{i,k} DT_{i,k,t}^* + u_{i,t} \tag{15}$$

In Equation (15), the dummy variable is $DT_{i,k,t}^* = t - T_{b,k}^i$ when $t > T_{b,k}^i$ and 0 otherwise. This equation shows the individual break effects that show the changes in the mean due to the structural break, the non-permanent i.e. temporary effects in the case of $\beta_i \neq 0$, the non-permanent effects of the structural break in the case of $\gamma_{i,k} \neq 0$, that is, the change of the individual trends in the panel.

Equation (15) regards the following three factors: 1) Structural breaks in the series have different effects on each series and these effects are calculated with $\theta_{i,k}$ and $\gamma_{i,k}$. 2) Break dates may occur in a different time period for each series that makes up the panel. 3) The number of breaks in the panel may differ for each cross-section unit.

The test statistic used to test the stationarity null hypothesis, assuming that the long-term variance is constant, is introduced as follows:

$$LM(\lambda) = N^{-1}\sum_{i=1}^{N}\left(\widehat{\omega}_i^{-2}T^{-2}\sum_{t=1}^{T}\hat{S}_{i,t}^{2}\right) \tag{16}$$

In Equation (16), $\hat{S}_{i,t} = \sum_{j=1}^{t}\hat{\varepsilon}_{i,j}$, $\omega_i^2 = lim_{T\to\infty}T^{-1}E\left(S_{i,T}^2\right), i = 1,\ldots,N$ and $\hat{\omega}_i^2$ stands for a consistent estimator of the long-run variance of $u_{i,t}$. This test equation is based on the assumption that the long-run variance among individuals is homogeneous. On the other hand, the situation where the long-term variance varies between cross-section units is expressed as follows:

$$LM(\lambda) = N^{-1}\sum\nolimits_{i=1}^{N}\left(\widehat{\omega}^{-2}T^{-2}\sum\nolimits_{t=1}^{T}\hat{S}_{i,t}^{2}\right) \tag{17}$$

In Equation (17), we have $\hat{\omega}^2 = N^{-1}\sum_{i=1}^{N}\hat{\omega}_i^2$. The symbol λ means that the LM test depends on the structural break dates. The λ_i vector for each cross-section unit is standardized as:

$$\lambda_i = (\lambda_{i,1},\ldots,\lambda_{i,m_i})' = (T_{b,1}^{i}/T,\ldots,T_{b,m_i}^{i}/T)' \tag{18}$$

In Equation (18), T represents the relative position of the break dates occurring over the entire time frame (Carrion-i Silvestre et al., 2005: 160-162).

The PANKPSS test allows for a maximum of five breaks and the structural break dates are determined at the point where the error sum of squares is minimum by following Bai and Perron (1998). Bai and Perron (1998) suggest two different processes for this process. The first of this process is based on the Bayesian information criterion and modified Schwarz information criterion put forward by Liu et al.(1997), while the other is based on the successive calculation of the F statistic to determine the number of structural breaks (Carrion-i Slivestre, 2005: 845).

5. Analysis Results

Since the time dimension (T=30) is larger than the cross-sectional dimension (N=6) in the study, Breusch and Pagan (1980) LM and Pesaran (2004) CD_{LM} cross-sectional dependence (CSD) tests were used in accordance with this condition. In Table 2, the results of the analysis of CSD and homogeneity tests for the FDI variable are given.

Table 1: Cross Section Dependency and Homogeneity Test Analysis Results

CSD Test		Homogeneity Test	
LM	CD_{LM}	Delta	$Delta_{adj}$
35.821 [0.002]***	3.801 [0.000]***	2.001 [0.023]**	2.109 [0.017]**

Note: *** and ** represent 1% and 5% significance level, respectively. Values in square brackets are probability values. The lag length is taken as 3.

According to the results of the analysis of the CSD test in Table 1, the main hypothesis that there is no CSD for the FDI variable was rejected at 1% significance level, and it was observed that the CSD exists. In other words, it was concluded that a shock in the FDI variable of any of the countries included in the analysis was effective on other countries. According to the results of the homogeneity test analysis, the main hypothesis was rejected at the 5% significance level and the alternative hypothesis, which means that the slope coefficients differed between the units, was accepted. As a result, it has been determined that the FDI variable has a heterogeneous distribution, that is, the effect of the shock differs among countries.

Table 2: CADF Unit Root Test Analysis Results

Countries	FDI		Critical Values		
	L.L	CADF Statistics	10%	5%	1%
Brazil	1	-2.25	-2.97	-3.36	-4.11
South Korea	1	-3.86	-2.97	-3.36	-4.11
India	1	-2.38	-2.97	-3.36	-4.11
Mexico	1	-2.78	-2.97	-3.36	-4.11
Thailand	1	-3.49	-2.97	-3.36	-4.11
Turkey	1	-3.02	-2.97	-3.36	-4.11

Note: The Schwarz information criterion was used to calculate the lag lengths (L.L) and the maximum lag length was taken as 3. The critical table values for T:30 and N:6 were obtained from the study of Pesaran (2007). The analysis results show the level values for the model with constant. 5% significance level was taken as basis for the analysis results.

The CADF unit root test analysis results are presented in Table 2. According to the CADF statistics, the basic hypothesis, which asserts that there is a unit root, could not be rejected for Brazil, India, Mexico and Turkey, and it was seen that the FDI variable contains a unit root at level. On the other hand, for Thailand

and South Korea, the null hypothesis was rejected at the 5% significance level, and it was concluded that the FDI variable was stationary. In the context of the analysis results, it has been determined that the effect of shocks is permanent for Brazil, India, Mexico and Turkey, that is, the FDI variable cannot come back to the equilibrium in the long run. Conversely, it has been determined that the effect of shocks is not permanent for Thailand and South Korea, and the FDI variable reaches its long-term equilibrium.

Table 3: Analysis Results of PANKPSS Stationarity Test with Structural Breaks

Countries	FDI	Critical Values			Break Dates	
	PANKPSS Test Stats.	10%	5%	1%	T_1	T_2
Brazil	0.044	0.321	0.461	0.816	1996	2009
South Korea	0.234	0.322	0.432	0.792	1998	-
India	0.481	0.36	0.501	0.894	2005	2014
Mexico	0.155	0.336	0.458	0.873	1999	2012
Thailand	0.12	0.328	0.422	0.798	1997	-
Turkey	0.07	0.349	0.464	0.836	2004	2008

Note: Critical values of panel KPSS test statistics were reached with 5000 iterations using bootstrap. The number of breaks was taken as 2. T1 and T2 show the break dates. Analysis results show level values. As the test model, the model that allows the structural break in the constant was chosen. 5% significance level was taken as basis for the analysis results.

In Table 3, the results of the PANKPSS stationarity test analysis, which take into account structural breaks, are given. Accordingly, the null hypothesis was not rejected at any critical level for all of the countries included in the analysis, and it was determined that the FDI series was stationary for all of the countries. According to the findings, it has been concluded that the effect of shocks is temporary in the model, in which structural breaks are taken into account for Brazil, South Korea, India, Mexico, Thailand and Turkey, and the FDI variable comes to the long-term equilibrium in these countries.

As of the analyzed period, one break was detected in Thailand and South Korea, and two in Brazil, India, Mexico and Turkey. It was observed that the breaking dates for Thailand was 1997, South Korea was 1998, Brazil were 1996 and 2009, India were 2005 and 2014, Mexico were 1999 and 2012, Turkey were 2004 and 2008. Within this scope, it is seen that the breaking dates differ

according to the countries and some of the determined dates are similar to the crisis periods mentioned in the literature.

6. Conclusion

In the study, the stagnation of foreign direct investment data of six developing countries with similar economic structures and their course in the structural break dates were examined, and whether the Krugman (2000) hypothesis is valid for countries whose break dates coincide with the crisis period was investigated. According to the results obtained from the CADF test, foreign direct investments in four countries (Brazil, India, Mexico and Turkey) contain unit root. In other words, the effect of shocks is permanent in these countries, namely, the FDI variable cannot return to its equilibrium in the long run. On the other hand, the foreign direct investment variable belonging to Thailand and South Korea is stationary at the level according to the CADF test result. It is noteworthy that the series was stationary even if structural breaks were not observed in Thailand and South Korea, despite the 1997 Asian crisis in the analyzed period. The fact that the FDI variable was steady despite the crisis in these countries shows that, contrary to expectations, the crises did not have a diverting effect from the average of foreign direct investments. This can be interpreted as the first indication that the Krugman Hypothesis (2000) is valid in Thailand and South Korea. According to the results of the PANKPSS, which was applied afterwards and determined the structural breaks externally, the series of foreign direct investments become stationary in all countries. Obtaining the stagnation result through the inclusion of experienced positive or negative shocks in the model can be considered as an expected result. Another important issue at this stage is the structural break dates obtained as a result of the PANKPSS test. While the breaking dates due to positive shocks, which are parallel to the rise of their economies, are observed in some countries, the structural break dates caused by the crises are obtained in some countries. Using these results, the structural break dates in the literature were confirmed by current test techniques, other break dates caused by the crises were revealed, and the reference dates required for the Krugman (2000) hypothesis were determined.

As a result of the PANKPSS test, the years 1996 and 2009 were first determined as the break dates in Brazil. Foreign direct investments that increased in 1996 and later can be considered as a positive shock. In 2009, with the effect of the 2008 crisis, foreign direct investments dropped sharply from 45 billion dollars to 26 billion dollars. Secondly, when we examined South Korea, it was

seen that the only breaking date was 1998. Foreign direct investment in this country, which was 3.3 billion dollars in 1997, reached 6 billion dollars in 1998. This situation, which is also the subject of the study of Krugman (2000), shows that the Fire-Sale FDI hypothesis is valid in South Korea. Despite the Asian crisis in 1997, contrary to expectations, the volume of foreign direct investment in South Korea increased. In India, the third country, the years 2005 and 2014 were determined as the breaking dates. These dates can be characterized as periods when positive shocks were experienced for India as a country that was in a rising period and nominated for the largest economies of the future, and when the volume of foreign direct investment increased at a high rate. In addition, since the structural break dates did not coincide with any crisis period, India was excluded from the Krugman analysis in the study. Breaking dates for Mexico, the fourth country, are 1999 and 2012. These breakout dates obtained as a result of the test are the years when foreign direct investments increased as an effect of positive shocks. The main point that draws attention here is that the 1994 Mexican crisis was not determined as the breaking date. Foreign direct investment of 10.9 billion dollars in 1994 decreased to only 9.5 billion dollars in the next period, and this rate of decrease further reduced in the following year. The fact that this Mexican-specific crisis in 1994 did not appear as a break in the model and that there was no sharp decrease in investments again points to the hypothesis of Krugman (2000). It can be stated that the Fire-Sale FDI activity during the crisis in this country acts as a balancing element by preventing sudden decreases.

In Thailand as the fifth country, the only break date was 1997. The fact that this date, when the 1997 Asian crisis arose, emerged as the breaking date as a result of the analysis, coincides with the expectations. On the other hand, it is quite remarkable that foreign direct investment inflows, which were 3.8 billion dollars in 1997, reached 7.5 billion dollars in 1998. Therefore, it can be stated that Thailand stands out as one of the countries where the Fire-Sale FDI hypothesis is most clearly seen over the 1997 crisis. Finally, when the results for Turkey are evaluated, the years 2004 – 2008 appear as the breaking dates. 2004 can be interpreted as a positive shock year for Turkey, which was on the rise in terms of macro-economic indicators. It is because the volume of foreign direct investments entering the country increased from 2.7 billion dollars to 10 billion dollars. As a crisis period, 2008 affected Turkey as well as the whole world, and the investment volume, which was 19.8 billion dollars, decreased to 8.5 billion dollars in 2009. Although net decreases were observed in the volume of foreign direct investment in all the countries analyzed during the 2008 crisis, according to

the results of the analysis, it was seen that the years 2008-2009 were determined as a structural break period only for Brazil and Turkey. Therefore, in the context of the 2008 crisis, it is concluded that the Krugman (2000) hypothesis is not valid in these two countries and cannot be tested in other countries. Considering the 1997 crisis, it is seen that the Krugman (2000) hypothesis is valid as a result of the analysis and data evaluation made in South Korea, Mexico and Thailand.

As a result, although it is seen that the economic crises differ according to the regions and countries, it has been revealed that the effect of the crises on foreign direct investment varies. Contrary to expectations, economic crises in some countries do not cause structural breaks and can have an increasing effect on foreign direct investments. For example, countries such as South Korea and Thailand have succeeded in turning crisis periods into advantages by focusing on liberal policies aimed at increasing investments in times of crisis. Therefore, developing countries, which are almost the favorites of multinational companies in terms of investment in terms of providing cheap labor and new markets, can attract more foreign direct investment even in times of crisis, by implementing policies that are facilitating and encouraging for foreign investments.

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