FOREIGN DIRECT INVESTMENTS, EXPORTS AND ECONOMIC GROWTH: PANEL ARDL AND CAUSALITY ANALYSIS FOR E7 COUNTRIES

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Abstract

The aim of the study is the relationship between foreign direct investments, exports and economic growth. The analysis of this study included E7 (Emerging 7) the so-called developing countries are Turkey, Mexico, China, India, Brazil, Russia and Indonesia in the analysis in this context. This study covered the period of 1992-2018. Pesaran (2007) panel unit root test was used for the analysis of the series stationary. Panel ARDL approach, which allows short and long term relationship, is used for series with different levels of stationary. According to the results of the error correction model established for all panel, any shock in the gross domestic product equation was adjusted by approximately 0.86 % within the first year. Error correction models were estimated for all units, and error correction terms for all units expect India were obtained as negative and statistically significant. As a result of the panel causality test, one-way causality findings were found between economic growth and exports. Additionally, there was a causality relationship with foreign direct investments and exports.

Keywords: Foreign Direct Investment, Export, Economic Growth, Panel Cointegration, Panel Causality.

JEL classification codes: C23, F10, O40.

1. INTRODUCTION

Although foreign direct investment inflows declined by 23% worldwide in 2017, this is different in developing countries. Foreign direct investment inflows in developing countries are approximately USD 671 billion. It means that doubles the value of foreign direct investment outflows (UNCTAD, 2018). One of the crucial factors in economic growth is foreign direct investments. At this point, the inflows of foreign direct investments are important, especially for the development of developing countries (Onuoha, Okonkwo, Okoro and Okere, 2018, p.141).

Foreign direct investments for developing countries positively affect economic development through technology transfer (Urgaia, 2017, p.521-522). If

countries have developments such as education and technology, foreign direct investments can have a significant economic contribution to the country (Acaravcı and Öztürk, 2012, p.52-53). This state indicates that foreign direct investments can be an essential factor in increasing the export potential of developing countries. One of the reasons for this contribution is the way to establish and develop new jobs for the economies in development. Another reason is that foreign direct investment creates resources for efficient production (Pelinescu and Radulescu, 2009, p.156).

Emerging 7 (E7) countries, which consist of Brazil, China, Russia, Indonesia, Mexico, Turkey, and India, share in world gross domestic product by 2050 is estimated to rise from 35% to 50% level. Emerging economies in the context of these countries are the result of another forecasting that will be among the most developed countries in the future. (PricewaterhouseCoopers, 2017). In this context, the effect of foreign direct investments and exports on the economic growth of these countries is discussed. In the study, the relationship between foreign direct investments, exports, and economic growth is examined within the scope of E7 countries. The relationship between the variables is discussed in the context of the short and long term, and it is aimed to contribute to the literature. For this purpose, the following section describes the literature related to the study. The following section provides information about the theoretical structure of the methods. In the following sections, the findings obtained as a result of the analysis, and the results sections are examined.

2. LITERATURE REVIEW

The relationship between foreign direct investment, export and economic growth variables is a mostly studied research subject in the literature. These studies have provided different findings by using various methods, which are cointegration and causality approach, for different periods and countries.

Liu, Burridge and Sinclair (2002) examined the relationship between foreign direct investments, exports, and economic growth in China using the Johansen cointegration approach and Granger causality analysis. This study was found that there was a long term relationship between variables by using 1981: Q1 – 1997: Q3 quarterly data. Furthermore, according to the causality test results, a two-way causality finding was obtained between economic growth, foreign direct investments, and exports. Dritsaki, Dritsaki and Adamopoulos (2004) examined the relationship between foreign direct investments, economic growth and exports for Greece in the period 1960 – 2002. In this study, the cointegration relationship between variables was examined with the Johansen approach, and it was found that there was a long-term relationship. According to the Granger causality test, there was a two-way relationship between exports and economic growth, while there was a one-way relationship from foreign direct investments to economic growth. In another study for Taiwan, the variables of direct foreign investments, exports,

economic growth, as well as the unemployment rate were used in the analysis. Chang (2005) constructed the Vector Autoregressive Model to obtain the appropriate lag length, and the cointegration relationship between the variables is discussed the Johansen approach. The findings of this study indicate that the relationship between economic growth and exports was positive. Iqbal, Shaikh and Shar (2010) investigated the relationship with foreign direct investments, international trade, economic growth for Pakistan in the period 1998 – 2009. The result of the analysis underlined that foreign direct investments had a positive effect on economic growth. In the causality analysis findings, one-way causality relationship was found between direct foreign investments and economic growth, and also economic growth and exports. Oyatote et al. (2011) examined the 1987 – 2006 period for Nigeria and estimated the regression model with Ordinal Least Squares (OLS) method. As a result of the study, a positive relationship was found between economic growth and foreign direct investments. Szkorupová (2014) which examined the period 2001: Q2 – 2010: Q4 for Slovakia in the study, found a long-term relationship between foreign direct investments, exports, and economic growth as a result of Johansen cointegration analysis. Bayar (2014) found a long-term relationship between foreign direct investments, economic growth, unemployment, and exports in the ARDL model prediction results for Turkey. Besides, economic growth and exports affect employment negatively. Sunde (2017) found that there was a one-way causality relationship between variables as a result of causality analysis for South Africa.

The panel data approaches that different groups of countries were dealt with in examining the relationship between foreign direct investments, exports and economic growth had been discussed in the literature. Mehrara, Haghnejad, Dehnavi and Meybodi (2010) examined developing countries in the period 1981 – 2006. They found that exports and foreign direct investments were the cause of gross domestic product in both the short term and long term. Tekin (2012) examined the relationship between foreign direct investments, exports, and economic growth within the context of least developed countries between 1970 – 2009. In the causality analysis findings, one-way causality relationships were reached among the variables. Keho (2015) investigated the relationship between foreign direct investments, exports, and economic growth for African countries in the period between 1970 and 2013, and the results of the Granger causality analysis showed different findings for the countries. Mahmoodi and Mahmoodi (2016) conducted comparative research on eight developed European countries and eight developing Asian countries. As a result of cointegration analysis, it was seen that there was cointegration between foreign direct investments, exports and economic growth for both groups of countries. Sandalcılar and Dilek (2017) obtained two-way causality findings between foreign direct investments, exports and economic growth as a result of panel causality analysis in developing countries.

3. DATA AND METHODOLOGY

In the study, the relationship between foreign direct investments, exports, and economic growth is investigated. E7 countries (Turkey, Mexico, China, India, Brazil, Russia, Indonesia) are analysed using panel cointegration and panel causality. The data covers the period between 1992 – 2018. Data on net inflows of foreign direct investment(%gross domestic product), exports of goods and services (%gross domestic product) and gross domestic product (economic growth) are sourced from World Bank (World Development Database). The descriptive statistics of the series are given in Table 1.

3.1. CROSS-SECTIONAL DEPENDENCE

Pesaran (2004) test is an approach performed by using correlation coefficients between the time series for each unit. According to this test, the null hypothesis is that the series is not a unit correlation. The rejection of the null hypothesis shows that the series is a unit correlation. Pesaran (2004) test statistics are given in Equation (1).

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

In Equation (1), $\hat{\rho}_{i,j}$ is obtained from the mean of the double correlation coefficients of the error terms obtained by the Ordinal Least Squares (OLS) method from the ADF equations created for each unit. e_{it} is the error term obtained by OLS for each unit (Munir and Kok, 2015, p.127).

$$\hat{\rho}_{ij} = \hat{\rho}_{jt} = \frac{\sum_{t=1}^{T} e_{ij}e_{jt}}{\left(\sum_{t=1}^{T} e_{it}^2\right)^{1/2}\left(\sum_{t=1}^{T} e_{jt}^2\right)^{1/2}}$$

3.2. PANEL UNIT ROOT TEST

First-generation panel unit root tests are not preferred if the series are cross-sectional dependence (have a unit correlation) since first-generation tests do not take into consideration cross-sectional dependence. The second-generation panel unit root tests examine whether the series are stationary considering the cross-sectional dependence.

The use of first-generation unit root tests for series with cross-sectional dependence causes some problems and is not suitable for these series. Therefore, second-generation tests are recommended for series with cross-sectional dependence (Hurlin and Mignon, 2007, p.3-4). One of these tests is Pesaran (2007)

approach. This approach is based on the average of the unit augmented ADF test as in Equation (2). $\alpha_i, \beta_i, \delta_i, \varphi_i$ represent the slope coefficients obtained from the ADF test in each unit, $\overline{y}_{t-1}$ is the average of the delayed value, $\Delta\overline{y}_i$ is the average of the first difference series, and $\varepsilon_{i,t}$ refers to the error term.

$$\Delta y_{i,t} = \alpha_i + \beta_i y_{i,t-1} + \delta_i \overline{y}_{t-1} + \varphi_i \Delta\overline{y}_i + \varepsilon_{i,t} \quad (2)$$

Accordingly, the test statistics, which takes cross-sectional dependence into account, is formed as in Equation (3) based on the IPS test approach (Shahbaz, Tiwari and Khan, 2012).

$$CIPS = \frac{1}{N}\sum_{i=1}^{N} t_i(N,T) \quad (3)$$

In Equation (3), i (i = 1,…, N) denotes the countries and T refers to the time. In this test, the null hypothesis states that the series have unit root in other words the series is not stationary, whereas the alternative hypothesis states that the series does not have a unit root, that is, they are stationary.

3.3. PANEL ARDL MODEL

The panel ARDL approach is used to determine whether there are both short and long term relationships between the variables. Pesaran, Shin, and Smith (1999) pooled the average group estimator can be determined cointegration relationships between variables. This approach can be preferred to give more sensitive results than the average group (MG) estimator (Pesaran, Shin and Smith, 1999, p.630). Pesaran, Shin, and Smith (1999) pooled average group estimator provides information about short term Dynamics with the help of error correction models. The fact that all of the series are stationary at the level of I(1) (first difference) is not a problem for the panel ARDL approach. In Equation (4), all variables are shown as a linear regression model.

$$lgdp_{i,t} = \alpha_{i,t} + \beta_{i,t} lfdi_{i,t} + \delta_{i,t} lexport_{i,t} + \varepsilon_{i,t} \quad (4)$$

In Equation (4), i=1,…,N is the index of countries, t=1,…,T denotes the time and $\varepsilon_{i,t}$ is an error term. $lgdp_{i,t}$ is the gross domestic product of countries at time t; $lfdi_{i,t}$ is the ratio of the inflow of foreign direct investments in the gross domestic product; $lexport_{i,t}$ represents the ratio of the total goods and services of the countries to the gross domestic product. In order to test whether there is a cointegration relationship between the variables, hypotheses are established by using Equation (5). If the null hypothesis is rejected, it means that there is cointegration between variables (Alsaleh and Abdul-Rahim, 2019, p.4-6).

$$lgdp_{i,t} = \alpha_{i,t} + \sum_{j=1}^{k} \theta_{i,j} lgdp_{i,t-j} + \sum_{j=0}^{k} \beta_{i,j} lfdi_{i,t-j} + \sum_{j=0}^{k} \delta_{i,j} lexport_{i,t-j} + \sum_{j=0}^{k} \gamma_{1i,j} \Delta lexport_{i,t-j} + \sum_{j=0}^{k} \gamma_{2i,j} \Delta lfdi_{i,t-j} + \varepsilon_{i,t} \quad (5)$$

After determining that there is a cointegration relationship between the variables, panel error correction model is established as in Equation (6). ∂_i refers to the error correction coefficient. This coefficient should be significant and negative.

$$\Delta lgdp_{i,t} = \alpha_{i,t} + \sum_{j=1}^{k} \theta_{i,j} \Delta lgdp_{i,t-j} + \sum_{j=0}^{k} \gamma_{1i,j} \Delta lexport_{i,t-j} + \sum_{j=0}^{k} \gamma_{2i,j} \Delta lfdi_{i,t-j} + \partial_i ECM_{i,t-1} + \varepsilon_{i,t} \quad (6)$$

3.4. DUMITRESCU AND HURLIN (2012) PANEL CAUSALITY

Dumitrescu and Hurlin (2012) develop a Wald based approach to unbalanced panels based on Granger causality test statistics. Accordingly, the following equations are given over two series, such as X and Y.

$$Y_t = \omega_0 + \sum_{i=1}^{n_1} \theta_i \Delta Y_{t-i} + \sum_{j=1}^{n_2} \beta_j X_{t-j} + \varepsilon_{1t} \quad (7)$$

$$X_t = \mu_0 + \sum_{i=1}^{n_1} \emptyset_i \Delta Y_{t-i} + \sum_{j=1}^{n_2} \gamma_j X_{t-j} + \varepsilon_{2t} \quad (8)$$

In equation (7) and (8), ω_0 and μ_0 represent the constant coefficients of the equations, ε_{1t} and ε_{2t} are error terms. The causal relationships from X to Y and from Y to X are examined. The null hypothesis states that there is no causal relationship between the variables and the alternative hypothesis means that there is a causal relationship between the variables.

4. FINDINGS

In the study, the relationship between foreign direct investments, exports and economic growth for E7 countries is examined with Panel ARDL model. It is great importance that the series is stationary in panel data approaches. The series is examined with unit root test. Before applying the unit root test for the series, whether the series has cross-sectional dependence.

Pesaran (2004) test determines cross-sectional dependence. Pesaran (2004) CD test results of the series are shown in Table 2. According to the results, all

series have cross-sectional dependence at 1% significance level. For this reason, Pesaran (2007) CIPS test, which takes into the cross-sectional dependence, was used.

Table 1. *Summary of Descriptive Statistic*

	lgdp	lfdi	lexport
Mean	27.8222	0.5106	3.0671
Median	27.7444	0.7305	3.1610
Standart Deviation	0.6976	0.8330	0.4118
Skewness	0.8684	-1.0835	-0.5988
Kurtosis	4.0168	3.9458	3.0876

Note: lgdp: Logarithm of the gross domestic product; lfdi: Logarithm of foreign direct investment; lexport: Logarithm of exports of goods and services

Unit root test results of the series are given in Table 3. According to the results, the series has a unit root at the level. If the first difference of the series is taken, all series are obtained as 1% significance level. After investigating the stationarity of the series, the relationship between the variables is analyzed by panel ARDL and panel causality test.

Table 2. *Results of Cross-Sectional Dependence Analysis*

	lgdp	lfdi	lexport
Pesaran (2004) CD Test	22.71* (0.00)	4.72* (0.00)	3.43* (0.00)

Note: * indicates 1% significance level. The p-value is presented in parentheses.

Results of the panel ARDL model estimation for both long and short term are shown in Table 4. According to long term estimation results, all series are statistically significant at 1% significance level. For E7 countries, a 1% increase in exports will lead to a 3.31% increase in economic growth. A 1% increase in foreign direct investments will result in an increase of 1.26% on economic growth.

Table 3. *Panel Unit Root Test*

	lgdp	Δlgdp	lfdi	Δlfdi	lexport	Δlexport
Pesaran (2004) CD Test	0.11 (0.55)	-2.53* (0.00)	-0.73 (0.23)	-3.78* (0.00)	-0.89 (0.19)	-2.70* (0.00)

Note: * indicates 1% significance level. Δ denoted the first difference operator. The p-value is presented in parentheses.

According to Table 4, the error correction coefficient (ECM) obtained for all units is negative and statistically significant at 5% significance level. This coefficient is calculated as -0.0086. Any shock in the economic growth equation is about 0.86% for it to return to its original equilibrium in the first year. The error term coefficients obtained by each country are negative and statistically significant at 1% significance level of all except India. When the error correction coefficients

of each country are analysed, it is concluded that Russia is the fastest in equilibrium in the long term, while Brazil is the slowest in the long term.

Table 4. *Panel ARDL Model Estimation*

Long Term Estimation		
Variables	Coefficients	t statistics
lfdi	1.2641***	2.7385
lexport	3.3113***	3.5219
Short Term Estimation		
Variables	Coefficients	t statistics
ECM	-0.0086*	-1.6617
Δlfdi	0.0055	0.9493
Δlexport	-0.0464*	-1.8515
Constant	0.1873	2.3069
Error Correction Coefficients for Each Country		
	Coefficients	t statistics
China	-0.0124***	-1328.374
India	0.0001***	32.9866
Russia	-0.0382***	-192.1294
Turkey	-0.0023***	-28.3961
Indonesia	-0.0045***	-802.9981
Brazil	-0.0004***	-14.8977
Mexico	0.0026***	-78.9098

Note: ***, **, * represent 1%, 5%, 10% significance levels, respectively.

The series should be stationary for the panel causality test. In addition to determining whether there is a causality relationship between variables, this test also shows how variables affect each other if there is a causality relationship between variables. Dumitrescu and Hurlin (2012) Panel Causality test results are given in Table 5. According to the results of the analysis, a causality relationship is found between economic growth and export and between export and foreign direct investments. Economic growth is found to be the reason for export at 5% significance level; also, export is the reason for direct foreign investments at 10% significance level.

Table 5. *Dumitrescu and Hurlin(2012) Panel Causality Analysis*

	Test Statistics	**Probability**
Δlgdp - Δlfdi	1.5611	0.1185
Δlfdi - Δlgdp	-1.2293	0.2189
Δlgdp - Δlexport	2.5619**	0.0104
Δlexport - Δlgdp	0.1209	0.9038
Δlexport - Δlfdi	1.7499*	0.0801
Δlfdi - Δlexport	0.8751	0.3815

Note: **, and * represent 5% and 10% significance levels, respectively.

5. CONCLUSION

In the study, the relationship between foreign direct investment, export, and economic growth for E7 are examined in the period 1992 – 2018. After examining the stationarity of the series with panel unit root test, the relations between panel ARDL and panel causality approaches and the short and long term are discussed.

As a result of panel ARDL estimation, error correction term is found to be negative and significant. The error correction coefficients obtained for all countries except India are negative and significant. According to the panel causality analysis, one-way causality findings are reached from economic growth to exports. Additionally, there is causality from exports to foreign direct investments. According to these findings, export has emerged as an essential factor for foreign direct investments. Stamatiou and Dritsakis (2015) show that the causality findings of their study conducted for thirteen European Union countries for exports and foreign direct investments are similar to the results of this study.

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