

Macroeconomic Effects of Foreign Direct Investments on Fragile Five Countries*

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Abstract

This study investigates the effects of foreign direct investments (FDI) on the export and gross domestic product (GDP) in the original fragile five countries for the period 1990-2017. For the sake of the analysis, annual data is used, and two econometric models are utilized to determine the stationarity of variables, their long-term relationship, regression coefficients, and causality relationship between variables. The regression results indicate that a 1% rise in FDI stock increases exports by 0.06% where a 1% rise in imports increases exports by 0.81%. On the other hand, a 1% growth in FDI increases GDP by 0.12% where a 1% rise in exports, increase GDP by 0.79%. The causality test results show that there is a bidirectional relationship between FDI and Imports and GDP, unidirectional relationship from FDI to exports, and bidirectional relationship between GDP and exports.

Keywords: Foreign Direct Investment, Export, Gross Domestic Product, Import, Panel Data Analysis

Doğrudan Yabancı Yatırımların Kırılgan Beşli Ülkeleri Üzerindeki Makro Ekonomik Etkileri

Öz

Bu çalışma orjinal kırılgan beşli ülkeleri olan Türkiye, Brezilya, Hindistan, Endonezya ve Güney Afrika'da doğrudan yabancı yatırımların, ihracat ve gayri safi yurtiçi hasılaya olan etkileri, 1990-2017 dönemi yıllık verileri kullanılarak, iki farklı ekonometrik model yardımıyla, panel veri analiziyle incelenmiştir. Regresyon sonuçlarına göre doğrudan yabancı yatırım stoku %1 arttığında ortalama %0.06, ithalat %1 arttığında ortalama %0.81 oranında, GSYH'nin ise; doğrudan yabancı yatırım stoku %1 arttığında ortalama %0.12, ihracat %1 arttığında ise ortalama %0.79 oranında artmış olduğu belirlenmiştir. Nedensellik testi sonuçlarına göre doğrudan yabancı yatırımlar ile gayri



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safi yurtiçi hasıla ve ithalat arasında çift yönlü, doğrudan yabancı yatırımdan ihracata doğru tek yönlü, gayri safi yurtiçi hasıla ile ihracat arasında çift yönlü nedensellik ilişkileri tespit edilmiştir.

Anahtar Kelimeler: Doğrudan Yabancı Yatırım, İhracat, Gayri Safi Yurtiçi Hasıla, İthalat, Panel Veri Analizi

1. Introduction

The need for technology and capital investments is rapidly increasing in the globalizing world. Foreign direct investments have importance especially for the developing countries with their feature to meet this need as well as their positive effects on the economic performances of countries. In addition to the current deficit problem that Brazil, India, Indonesia, South Africa, and Turkey, known as the original "Fragile Five" countries, the lack of advanced technology and investments causes foreign direct investments to become more important.

Foreign direct investments can affect the economy performances of countries through various channels. The purpose of this study is to analyse the impact of FDI on the exports and GDP in the original Fragile Five countries within the scope of their macroeconomic effects. The reason why the export data is preferred is that companies that have foreign direct investments are able to export the products that they produce cross-border through their international connections and that this condition directly affects the economic performance of the country. The GDP data is preferred because it is the most common indicator that provides information regarding the economy performances of the countries.

In this study, it was suggested that there is a positive directional relationship between the FDI and the export and GDP of the original fragile five countries; this hypothesis was explained with tables, graphics, and figures and it was analysed with the use of the yearly data that was provided The World Bank for the 1990-2017 period. As a result of the analysis, it was expected that the findings of the presence of a positive directional relationship between the FDI and the export and GDP would be obtained. Although there are many studies on foreign direct investments in the literature, this study is thought to contribute in the literature due to the limited number of studies which involve the original Fragile Five countries and where current panel data analysis methods are used.

Considering the fact that FDI and foreign trade are two of the crucial factors that accelerates the economic growth and development of countries, it is thought that this study will be effective in the subject of country leaders, who want to keep the economic growth rate consistent and high, attaching more importance to foreign direct investments and free foreign trade.

In the following sections of this study data and methodology and models were given. An empirical analysis was performed with the help of economic models and the study was completed by giving place to results and suggestions.

2. Data and Methodology

In the study, the yearly data of the Export of Goods and Services (Export: X, US Dollar, 2018a), the Import of Goods and Services (Import: M, US Dollar, 2018b), the Gross Domestic Product (GDP, US Dollar, 2018c) by the World Bank and Foreign Direct Investments (FDI, Stock, US Dollar) by UNCTAD (2018) for the 1990-2017 period were

provided to determine the impact of FDI on the export and GDP in the original Fragile Five countries¹. Logarithmic transformations were performed on all series to eliminate the changing-variance problem that may arise as a result of the analysis. In addition, the effects of the 2008 Global Economic Crisis that falls within the analysis period and that affected all the economies of countries were included in the study with a dummy variable (K_{2008}). While creating the dummy variable, the value "1" was given to 2008 and 2009, and the value "0" was given to all other years².

Initially, the stationary degrees of the series need to be determined in the study. For this purpose, the panel unit root tests of Levin, Lin, and Chu (2002) (LLC) and Im, Pesaran, and Shin (2003) (IPS) were used. The existence of the cointegration relationship among the series in the models was examined using the Pedroni (2004) panel cointegration test. The panel regression analyses were performed with the Panel FMOLS. The causality relations between the series included in the analysis were tested using Dumitrescu and Hurlin (2012) panel causality test.

3. Model

In this study, the following econometric models were created in order to determine the impact of FDI on the export and GDP in the Fragile Five countries.

$$\text{Model 1: } \ln X_{it} = \beta_0 + \beta_1 \ln FDI_{it} + \beta_2 \ln M_{it} + \beta_3 K_{2008} + u_{it} \quad (1)$$

$$\text{Model 2: } \ln GDP_{it} = \alpha_0 + \alpha_1 \ln FDI_{it} + \alpha_2 \ln X_{it} + \alpha_3 K_{2008} v_{it} \quad (2)$$

Here, i ; is the horizontal cross-section length of the panel and it represents the five countries in this study. t ; It demonstrates the horizontal cross-section length of the panel and consists of the data of the 1990-2017 period u_{it} and v_{it} demonstrates the series of error terms clear of econometric problems.

4. Empirical Findings

Panel Unit Root Test

Panel data analyses are significantly sensitive to the stationary degrees of the series (Barbieri, 2006, p. 1-4). Analyses conducted without considering the stationary degrees of the series can provide sceptical results (Pesaran, 2003). For this reason, LLC and IPS panel unit root tests were initially used to find out the stationary degrees of the series. While LLC assumes that the unit root parameter is homogeneous in the countries forming the panel, IPS anticipates that this parameter is heterogeneous and tests accordingly. Following hypothesis of both tests are in the format as follows:

H_0 : The series is not stationary.

H_1 : The series is stationary.

¹ Turkey, Brazil, India, Indonesia, and South Africa.

² While the dummy variable was being formed and deciding the years to be given with 0 and 1 values, the fact that the crisis broke out in 2008 and that it affected the countries most in 2009 was selected as the base line. For example, after Turkey's economy experienced a negative growth due to the crisis of 2008:Q3, 2009:Q1, 2009:Q2, and 2009:Q3, it started to grow positively in 2009:Q4. Therefore, the crisis affected the national economies intensively in 2008 and 2009.

The series that are stationary in their degree values are named $I(0)$, and the series that become stationary when their first differences are taken are named $I(1)$ (Tari, 2012, p. 387). In the study, LLC and IPS panel unit root tests were performed and Table 1 presented the findings.

Table 1: Panel Unit Root Test Results

Variable	LLC		IPS	
	Test Statistics	Probability Value	Test statistics	Probability Value
<i>LnFDI</i>	0.33	0.63	0.32	0.62
<i>LnGDP</i>	-0.45	0.32	-0.89	0.18
<i>LnX</i>	2.02	0.97	1.96	0.97
<i>LnM</i>	1.84	0.96	0.50	0.69
$\Delta LnFDI$	-8.27***	0.00	-8.25***	0.00
$\Delta LnGDP$	-9.04***	0.00	-8.19***	0.00
ΔLnX	-8.33***	0.00	-7.24***	0.00
ΔLnM	-8.99***	0.00	-7.80***	0.00

Note: *** shows that the related variable is stationary at 1% significance level. The lag lengths are determined according to Schwarz Information Criterion. Δ ; It shows that a degree difference of the respective series was taken.

According to the findings in Table 1, all of the series are series that are not stationary in their degree values but become stationary when their first differences are taken. In this case, all series are $I(1)$.

Panel Cointegration Test

When the series used in the study are not stationary at their degree values, a spurious regression problem may be encountered in the analyses that are performed with the degree values of these series (Whelan, 2011). Engle and Granger (1987) expressed that in such cases, a cointegration test should be performed initially, and when the series are cointegrated, a spurious regression problem will not be experienced in the analyses to be performed with the degree values of the series.

The existence of the cointegration among the series in the models was investigated through the Pedroni (2004) Panel Cointegration test. Pedroni (2004) developed seven different test statistics for the cointegration relationship among the series in the panel to be tested. In these test statistics, the homogeneity and the heterogeneity of the horizontal cross-sections are considered separately. With this feature, Pedroni test is stronger than all other panel cointegration tests (Barbieri, 2006, p. 15). The hypothesis of Pedroni (2004) panel cointegration test:

H_0 : There is no cointegration among the series.

H_1 : There is cointegration among the series.

In this study, Pedroni (2004) panel cointegration test was conducted separately for two models and the findings acquired are presented in Table 2.

Table 2: Panel Cointegration Test Results

	<i>Model 1</i>		<i>Model 2</i>	
	<i>Test Statistics</i>	<i>Probability Value</i>	<i>Test Statistics</i>	<i>Probability Value</i>
<i>Panel ϑ Statistics</i>	1.02	0.15	0.28	0.38
<i>Panel ρ Statistics</i>	-1.21	0.11	-0.63	0.26
<i>Panel PP Statistics</i>	-1.89**	0.02	-1.44*	0.07
<i>Panel ADF Statistics</i>	-1.68**	0.04	-2.12**	0.01
<i>Group ρ Statistics</i>	-0.42	0.33	-0.62	0.26
<i>Group PP Statistics</i>	-1.73**	0.04	-2.04**	0.02
<i>Group ADF Statistics</i>	-2.31**	0.01	-2.28**	0.01

Note: The values in the table are the probability values of the Pedroni (2004) test. ** and * expressed the existence of the cointegration relationship at 5% and 10% significance degrees respectively. The optimum lag lengths are determined according to Schwarz Information Criterion.

According to the findings in Table 2, there is a cointegration relationship among the series in both models. In other words, these series act together in the long term and a spurious regression problem will not be encountered in the regression analysis to be performed with the degree values of these series.

Panel Regression Analysis

Since the series used in the study are cointegrated, the regression analyses among these series should be performed with one of the Panel FMOLS or Panel DOLS methods (Costantini, 2010). Being a robust estimator for changing variances and auto-correlation problems, Panel FMOLS provides estimations stronger than the Panel DOLS in situations³ where the number of observations is low (Pedroni, 2000). In this study, Panel FMOLS estimations were created for each model separately and the findings are presented in Table 3.

³ In the study, this method is preferred because the number of countries is low.

Table 3: Panel Regression Analysis Results

Variable	Model 1			Model 2		
	Coefficient	t-statistics	Probability Value	Coefficient	t-statistics	Probability Value
<i>LnFDI</i>	0.06***	3.48	0.00	0.12**	2.41	0.01
<i>LnX</i>	-	-		0.79***	7.85	0.00
<i>LnM</i>	0.81***	17.15	0.00	-	-	-
<i>K₂₀₀₈</i>	0.01	0.22	0.82	-0.03	-0.60	0.54
<i>R²</i>	0.98			0.97		
<i>R̄²</i>	0.98			0.96		
<i>SSR</i>	1.42			3.02		
<i>Jarque-Bera</i>	0.25			1.70		
<i>F-statistics</i>	278.27			18.85		

Note: *** and ** expressed that the related coefficient was statistically significant at 1% and 5% significance degrees respectively. The optimum lag lengths are determined according to Schwarz Information Criterion. SSR: Sum Squares of Residuals, when this value is low, it indicates that the model estimation has been successful.

In Table 3 showed that the explanatory power of models (R^2) was quite high, that the total of the squares of error terms (SSR) was quite low, which means that the analyses performed were reliable. The Jarque-Bera normality test results of the models showed that the series of error terms obtained as a result of the estimations had a normal distribution; therefore, the findings obtained were reliable. The F -statistics results showed that the independent variables affected the dependent variable significantly and collectively.

According to the results founded for Model 1 in Table 3, the exports of the Fragile Five countries in the 1990-2017 period increased by an average of 0.06% when the FDI stock increased by 1% and by an average of 0.81% when the imports increased by 1%. According to the findings obtained for Model 2, the GDP of the Fragile Five countries in the 1990-2017 period increased by an average of 0.12% when the FDI stock increased by 1% and by an average of 0.79% when the exports increased by 1%. These results are important because they revealed that the exports and the GDP of the countries increased with the increasing foreign direct investments. Although the coefficient of the dummy variable for the global economic crisis of 2008 was found to be statistically insignificant, the existence of this variable in the models was observed to increase the estimation power (\bar{R}^2) of the models; thus, it was decided to be more useful.

Panel Causality Test

In the study, the existence and direction of causality relations between the series were investigated using Dumitrescu and Hurlin (2012) panel causality test. Dumitrescu

and Hurlin (2012) panel causality test can be done by using the following equation system with representational variables as X and Y :

$$Y_{i,t} = \delta_{1i} + \sum_{j=1}^p \theta_{1j} Y_{it-j} + \sum_{j=1}^p \beta_{1j} X_{it-j} + e_{it} \quad (3)$$

$$X_{i,t} = \delta_{2i} + \sum_{j=1}^p \theta_{2j} X_{it-j} + \sum_{j=1}^p \beta_{2j} Y_{it-j} + \varepsilon_{it} \quad (4)$$

Here p ; is the optimum (ideal) lag length. Equation (5) tests from X to Y ; and Equation (6) tests the existence of a causality relationship from Y to X . In Dumitrescu and Hurlin (2012) panel causality test, two different test statistics are calculated as W and \bar{Z} ; \bar{Z} statistic is more effective on the final decision on the existence of causality (Lopez and Weber, 2017, pp. 2-4). Hypothesis of Dumitrescu and Hurlin (2012) panel causality test:

$H_0: \beta_{1i} = 0$ There is no causality from X to Y in all horizontal sections.

$H_1: \begin{cases} \beta_{1i} = 0, & i = 1, 2, \dots, N_1 \\ \beta_{1i} \neq 0, & i = N_1 + 1, N_1 + 2, \dots, N \end{cases}$ There is a causality relationship from X to Y in some horizontal sections.

For the sake of Dumitrescu and Hurlin (2012) panel causality tests, it is necessary to find out the optimum lag length. For this, a standard VAR estimation is performed, and optimum lag length determination criteria are applied. In this study, the results of the optimum lag length determination are shown in Appendix 1; the graph of inverse characteristic roots indicating that the VAR model with this lag length is stable is shown in Appendix 2; the results of the autocorrelation test for this VAR model are shown in Appendix 3; and the variance test results of this VAR model are given in Appendix 4. The results of Dumitrescu and Hurlin panel causality tests are presented in Table 4.

Table 4: Dumitrescu and Hurlin (2012) Panel Causality Test Results

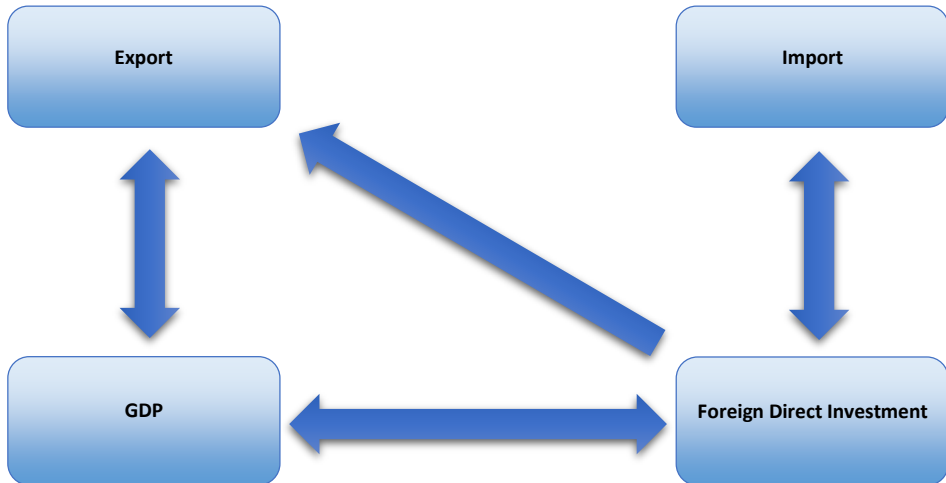
Null Hypothesis	W – statistics	\bar{Z} – statistics	Probability Value
$LnX \nRightarrow LnGDP$	7.85	3.12	0.00***
$LnGDP \nRightarrow LnX$	6.58	2.23	0.02*
$LnFDI \nRightarrow LnGDP$	7.43	2.81	0.00***
$LnGDP \nRightarrow LnFDI$	7.83	3.09	0.00***
$LnM \nRightarrow LnGDP$	2.64	-0.50	0.61
$LnGDP \nRightarrow LnM$	5.34	1.37	0.17
$LnFDI \nRightarrow LnX$	9.81	4.46	0.00***
$LnX \nRightarrow LnFDI$	5.43	1.42	0.15

$LnM \Rightarrow LnX$	4.03	0.45	0.64
$LnX \Rightarrow LnM$	5.17	1.25	0.20
$LnM \Rightarrow LnFDI$	5.94	1.78	0.07*
$LnFDI \Rightarrow LnM$	11.61	5.71	0.00***

Note: * and *** expressed that the related coefficient was statistically significant at 10% and 1% significance degrees respectively.

In order to be able to interpret the results in Table 4 more easily and to make the subject easier to follow for other researchers, Figure 1 was created by the author.

Figure 1: Causality Relationship Between Series



In the original fragile five countries shown in Figure 1, exports, imports and GDP affected foreign direct investment during the period 1990-2017. This result confirms the basic argument of the study. In other words, foreign direct investments are very important investments in developing countries for increasing foreign trade and economic growth.

The bidirectional causality relationship between export and GDP in Figure 1 supports the main idea of Adam Smith's (1776) Book of Wealth which is "Free trade, division of labour and specialization are the best means of enrichment for all nations." However, it should be noted that in terms of causality from GDP to export, export is an autonomous variable in terms of GDP and are unlikely to be affected by GDP in the short term. The bidirectional causality relationship between GDP and FDI; shows that foreign direct investments have increased GDP but have taken into account the GDP level of the country when deciding to go to a country.

The bidirectional causality relationship between FDI and imports; shows that the foreign companies, which follow the horizontal production strategy⁴, obtain some of the necessary intermediate parts (intermediate goods) for their production from their own factories or from the factories in different parts of the world or from the countries that produce them less cheaply.

Similarly, foreign companies entering the retail sector are known to be more inclined to bring and sell the goods they produce in foreign countries. The causality relation between imports and foreign direct investments; implies that some of the foreign firms prefer to buy their source in time in order to ensure that they import some of the factors of production, cheaper and provide security of supply⁵.

Conclusion

This study investigates the impact of the FDI on exports and GDP in original fragile five countries. In this respect, two different econometric models that were utilized by using a set of data relating to the period of 1990-2017 and this data was analysed with the help of the panel data analysis in order to determine the impact of the FDI on the exports and GDP.

The stationary degrees of the series used in the analyses were examined through Levin, Lin, and Chu (2002) and Im, Pesaran, and Shin (2003) panel unit root tests, and it was determined that all series were not stationary at their degree values; however, they became stationary when their first differences were taken, which means that they were I(1) series.

The presence of the cointegration relationship among the series in the models was tested with the Pedroni (2004) panel cointegration test and it was found that there was a cointegration relationship among the series in both models, which means that these series had a long-term relationship.

Two regression models using the Panel FMOLS method were utilized in the study, results point out the existence of a positive direct relationship between the exports, imports and the levels of FDI in the original fragile five countries. An average increase of 0.06% and 0.81% in the exports is documented with respect to a 1% increase in FDI and imports in the countries under analysis for the 1990-2017 period. Additionally, empirical results also show that the original fragile five countries' GDP increased by an average of 0.12% when the FDI increased by 1%, and by an average of 0.79% when the exports increased by 1%.

The causality relationship between variables was examined through Dumitrescu and Hurlin (2012) panel causality test and it was determined there was a bidirectional relationship between FDI and Imports and GDP, unidirectional relationship from FDI to exports and bidirectional relationship between GDP and exports.

Results concluded from this study can be of a vital use to economists and practitioners in developing countries as it sheds the light on the significance of foreign direct investments to the acceleration of the economic growth in those countries.

⁴ Horizontal production strategy; refers to the realization of different stages of production in different countries (Ünsar, 2007). For example; the production of tires of a car in a country where oil is abundant, production of the vehicle body in a country that has plenty of steel, engine and electronics to be produced in countries with high qualified labor force, and then assembling all of them at specific centers.

⁵ For example; the Chinese firms, long-term marble importers from Muğla-Kavaklıdere region, have started to buy these marble quarries. These acquisitions are a foreign direct investment for the country.

Authorities should attach importance to economic and political stability, credibility, environment of trust and investment incentives as these factors have an impact on the investment decisions of investors. Besides, it should be taken into consideration that determining sectors for foreign investments could be beneficial for countries which would like to provide technological transfer towards their countries and achieve significant economic growth by attracting foreign investments. The relationship between the monetary policy shocks and the income generated by the foreign investments in fragile five countries may be considered in the future researches in this field.

REFERENCES

- BARBIERI, L. (2006). Panel Unit Root Tests: A Review. Serie Rossa: Economia – Quaderno No: 43.
- COSTANTINI, M. (2010). Panel Unit Root and Cointegration Methods. https://homepage.univie.ac.at/mauro.costantini/master_class_2010.pdf
- LOPEZ, L. & WEBER, S. (2017). Testing for Granger Causality in Panel Data. The University of Neuchatel, Institute of Economic Research, IRENE Working Paper No: 17-03., 2-4
- PEDRONI, P. (2000). Fully Modified OLS for Heterogeneous Cointegrated Panels. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.294.1320&rep=rep1&type=pdf>
- PESARAN, M. H. (2003). A Simple Panel Unit Root Test in the Presence of Cross Section Dependence.
- TARI, R. (2012). Econometrics. (8. Edition), Umuttepe Publications, Kocaeli.
- UNCTAD (2018). Foreign direct investment: Inward and outward flows and stock, annual, <http://unctadstat.unctad.org/wds/TableViewer/downloadPrompt.aspx>
- ÜNSAR, S. (2007). Production Strategies in International Business. Journal of Yasar University, 2(7), 695-708.
- WHELAN, K. (2011). MA Advanced Econometrics: Spurious Regressions and Cointegration. <http://www.karlwhelan.com/Teaching/MA%20Econometrics/part4.pdf>
- WORLD BANK (2018a). Exports of goods and services (current US\$). <https://data.worldbank.org/indicator/NE.EXP.GNFS.CD?view=chart>
- WORLD BANK (2018b). Imports of goods and services (current US\$). <https://data.worldbank.org/indicator/NE.IMP.GNFS.CD?view=chart>
- WORLD BANK (2018c). GDP (current US\$). <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD>

Özet

Küreselleşmeyle birlikte ileri teknoloji ve sermaye yatırımlarına olan ihtiyaç her geçen gün artmaktadır. Bu ihtiyaçların karşılanması hususunda doğrudan yabancı yatırımlar büyük rol oynamakla birlikte, ülkelerin ekonomik performansına sağladığı pozitif katkılarla da büyük önem arz etmektedir. Brezilya, Hindistan, Endonezya, Güney Afrika ve Türkiye'nin cari açık problemine ek olarak, ileri teknoloji ve yatırım eksiklikleri söz konusu ülkeler için doğrudan yabancı yatırımların önemini daha da artırmaktadır.

Bu çalışmada orjinal kırılğan beşli ülkeleri olan Türkiye, Brezilya, Hindistan, Endonezya ve Güney Afrika'da doğrudan yabancı yatırımların, ihracat ve gayri safi yurtiçi hasılaya olan etkileri, 1990-2017 dönemi yıllık verileri kullanılarak, iki farklı ekonometrik model yardımıyla, panel veri analiziyle incelenmiştir. Regresyon sonuçlarına göre doğrudan

yabancı yatırım stoku %1 arttığında ortalama %0.06, ithalat %1 arttığında ortalama %0.81 oranında, GSYH'nin ise; doğrudan yabancı yatırım stoku %1 arttığında ortalama %0.12, ihracat %1 arttığında ise ortalama %0.79 oranında artmış olduğu belirlenmiştir. Nedensellik testi sonuçlarına göre doğrudan yabancı yatırımlar ile gayri safi yurtiçi hasıla ve ithalat arasında çift yönlü, doğrudan yabancı yatırımdan ihracata doğru tek yönlü, gayri safi yurtiçi hasıla ile ihracat arasında çift yönlü nedensellik ilişkileri tespit edilmiştir. Araştırma sonuçlarından yola çıkarak, doğrudan yabancı yatırımların kırılğan ekonomiye sahip ülkeler açısından önemi ortaya koyulmuştur.

Literatürde doğrudan yabancı yatırımlara ilişkin birçok çalışma bulunmasına karşın orjinal kırılğan beşli ülkeleri üzerine yapılan araştırmaların sınırlı olduğu gözlemlenmiştir. Bu bağlamda ortaya koyulan bu araştırmanın literatüre katkı sağlayacağı düşünülmektedir.

APPENDIXES

Appendix 1: Determination/Selection of Optimal Lag Length

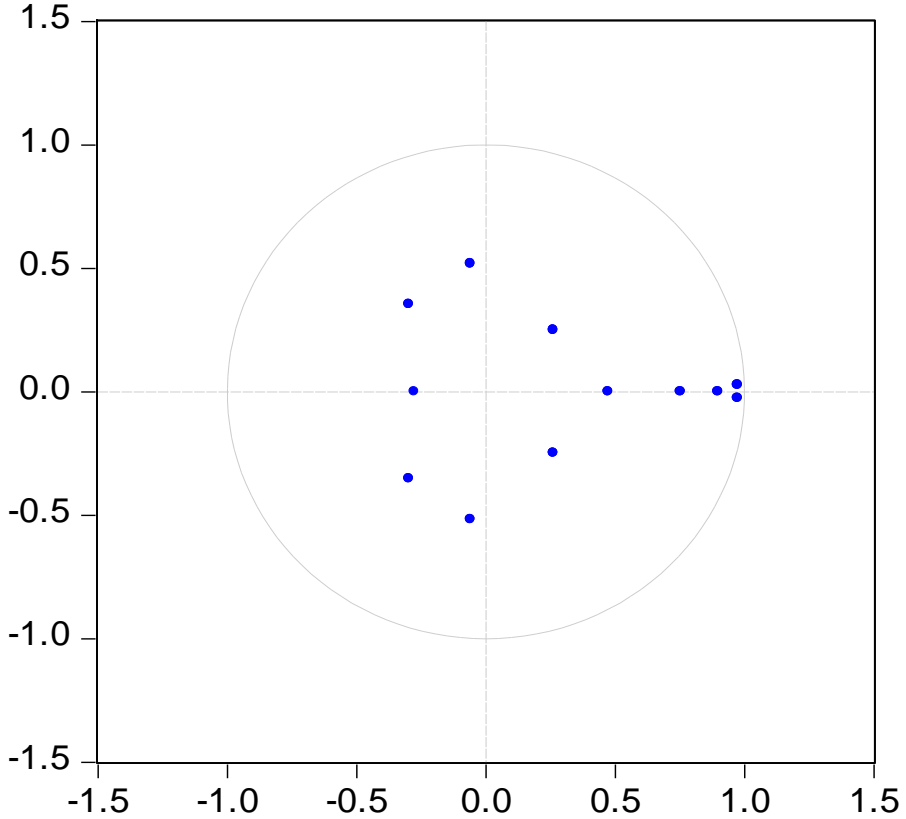
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-148.4716	NA	0.000335	3.351024	3.461392	3.395551
1	229.9700	715.2962	1.16e-07	-4.614724	-4.062887*	-4.392092
2	254.9924	45.09538	9.57e-08	-4.813020	-3.819713	-4.412282*
3	273.7797	32.20678*	9.05e-08*	-4.874279*	-3.439502	-4.295436
4	280.3521	10.68927	1.12e-07	-4.667080	-2.790833	-3.910131
5	297.3954	26.22037	1.12e-07	-4.690008	-2.372292	-3.754954
6	309.7525	17.92462	1.24e-07	-4.609945	-1.850759	-3.496785
7	324.6083	20.24304	1.31e-07	-4.584797	-1.384141	-3.293532
8	336.8731	15.63434	1.50e-07	-4.502706	-0.860581	-3.033336

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

In this table, the maximum 3 recommended by the criterion is considered to be the optimal lag length. This length is based on the LR, FPE and AIC criteria that are automatically marked with * by the EViews 9 program.

Appendix 2: Inverse Roots of AR Characteristic Polynomial

Inverse Roots of AR Characteristic Polynomial



The fact that the dots remain within the unit circle shows that the 3 delayed VAR model used in the causality test is stable; and this shows that the results of the causality test are reliable.

Appendix 3: Autocorrelation Test Results

Sample: 1990 2017 Included observations: 121		
Lags	LM-Stat	Prob
1	18.46592	0.2973
2	16.89739	0.3923
3	13.94517	0.6028
Probs from chi-square with 16 df.		

The fact that the probability values in this table are greater than 0.05 shows that there is no autocorrelation problem in the 3-delayed standard VAR model used in the causality test.

Appendix 4: Heteroscedasticity Test Results

Joint test:		
Chi-sq	df	Prob.
958.9531	890	0.0537

The fact that the probability values in this table are greater than 0.05 shows that there is no heteroscedasticity problem in the standard 3-delayed VAR model used in the causality test.