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FDI and Economic Growth: Comparative Analyses between Turkey and the other OECD Countries

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Keywords
Foreign direct investments, Economic growth, Vector Error Correction Model, Fixed-Effects Regression with Driscoll-Kraay Standard Errors.

Abstract
Several studies in the field have demonstrated theoretically and empirically that foreign direct investments are a source of economic growth. This study aims to comparatively investigate the effects of foreign direct investments on economic growth in the cases of Turkey and other OECD countries. With this objective, a Time Series Analysis was conducted for Turkey's economy and a Panel Data Analysis was conducted for OECD countries. In the Time Series Analysis, gross domestic product was chosen as the dependent variable, while foreign direct investments and exports were chosen as the independent variables. In the Panel Data Analysis, gross domestic product was chosen as the dependent variable, while the independent variables were chosen as foreign direct investments, employment, capital stock and total factor productivity. As a result of the tests carried out in the study, it was determined that the method of Vector Error Correction Model should be used for the Time Series Analysis, and the method of Fixed-Effects Regression with Driscoll-Kraay Standard Errors should be used for the Panel Data Analysis. According to the results of the Vector Error Correction Model, no long-term or short-term relationship was found between foreign direct investments and economic growth in Turkey's economy. According to the results of Fixed-Effects Regression with Driscoll-Kraay Standard Errors, foreign direct investments affected economic growth in the positive direction in OECD countries.

1. Introduction

The reinforcing effect of foreign direct investments on economic growth has become a significant field of research, especially given that the phenomenon of globalization started to show itself all around the world. The power of foreign direct investments to affect growth is directly related to increases in the production, exports, level of information and technology, and productivity in the country that is the target of investments. In addition to these indicator, foreign direct investments increase the productivity of domestic investments with their competition-reinforcing effect and influence economic growth positively. Thus, several studies in the field have demonstrated theoretically and empirically that foreign direct investments are a source of economic growth. Therefore, especially

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developing countries are implementing infrastructures and incentive policies that will increase foreign direct investments with the aim of utilizing the effects of foreign direct investments that increase economic growth.

This study aims to comparatively investigate the effect of foreign direct investment on economic growth. With this objective, two separate analyses were conducted on Turkey's economy and OECD countries. The expectation for both analyses is that foreign direct investments affect economic growth positively. The study consists of sections on the literature, methodology and the data set, the analysis for Turkey and the analysis for OECD countries.

2. The Literature

Blomstrom, Lipsey and Zejan (1992) used the data for 78 developing countries for the period of 1960-1985 to study the relationship between foreign direct investments and economic growth. In the study that separated these developing countries as high-income and low-income countries, it was concluded that foreign direct investments affected economic growth positively in high-income countries. On the other hand, no relationship was found between foreign direct investments and economic growth in low-income countries.

Lensink and Morrissey (2001) used the data for 88 countries for the period of 1975-1998 investigate the effects of amounts of foreign direct investment and volatility in foreign direct investments on economic growth. The study which used the technique of instrumental variable in addition to panel data analysis found that there was a positive relationship between the amount of foreign direct investment and economic growth. On the other hand, volatility in foreign direct investments affected economic growth negatively.

Zhang (2001) used the data for China's economy for the period of 1984-1998 to investigate how foreign direct investments affected China's economic growth. The study which used the Cross-Section Model in addition to Panel Data Analysis concluded that foreign direct investments made China's economic growth faster. Additionally, this result was explained by increases in productivity and technology levels as a result of increases in direct foreign capital.

Zhang (2001) investigated the relationship between foreign direct investments and economic growth by using the data on 11 countries in Eastern Asia and Latin America. The results of the study suggested that this relationship was determined by the genuine characteristics of the countries. Foreign direct investments affected economic growth positively in countries with macroeconomic stability, freedom of trade and foreign investments towards exportation.

Basu, Chakraborty and Reagle (2003) used the data for 23 developing countries to investigate the relationship between foreign direct investments and economic growth. In the study where the method of Panel Cointegration was used, two-way causality was found between foreign direct investments and economic growth in open economies, while the causality in closed economies was found as one-way from economic growth to foreign direct investments.

Chowdhury and Mavrotas (2003) used the data for the developing countries Chile, Malaysia and Thailand for the period of 1969-2000 to study the causality

relationship between foreign direct investments and economic growth. The study used the method of Toda-Yamamoto Test for Causality and found a two-way causality relationship between foreign direct investments and economic growth in Malaysia and Thailand, while the causality relationship was one-way in the direction from economic growth to foreign direct investments in the case of Chile.

Hansen and Rand (2004) used the data for 31 developing countries for the period of 1970-2000 to investigate the causality relationship between foreign direct investments and economic growth. The study which used the methods of Panel Data Analysis and Granger Causality found that there was a two-way causality relationship between foreign direct investments and economic growth. Moreover, according to the results of their study, foreign direct investments affected economic growth positively in the long-term.

Li and Liu (2005) used the data for 84 countries for the period of 1970-1999 to investigate how foreign direct investments affect economic growth. In the study where the method of Panel Data Analysis was used, it was concluded that, especially starting with the mid-1980s, foreign direct investments affected economic growth positively. In addition to the direct positive effect found using the data for 84 countries, it was determined that foreign direct investments in developing countries increased economic growth indirectly via increases in human capital.

Ghatak and Halıcıoğlu (2006), the data for 140 countries for the period of 1991-2001 to study how foreign direct investments affect economic growth. While the coefficients reached with the method of OLS Single-Equation Estimate differed among the countries, it was concluded that foreign direct investments affected economic growth positively in all groups of countries.

Chakraborty and Nunnenkamp (2008) used the data for the economy of India for the period of 1987-2000 to investigate the nature of the causality relationship between foreign direct investments and economic growth. In the study where the approaches of Panel Cointegration and Granger Causality were used, the result varied based on sectors. That is, while there was a two-way causality relationship between foreign direct investments and economic growth in the manufacturing sector, the effects of foreign direct investments on economic growth were temporary in the services sector.

Ajaga and Nunnenkamp (2008) studies the long-term causality relationship between foreign direct investments and economic growth using the data for the economy of the United States for the period of 1997-2001. They used the methods of Johansen Cointegration and Toda-Yamamoto Granger Causality and found that there was a long-term, two-way causality relationship between foreign direct investments and economic growth. This result, which was valid for the entirety of the US economy, was also valid for the manufacturing sector in particular.

Abbes, Mostéfa, Seghir and Zakarya (2015) used the data for 65 countries for the period of 1980-2010 to investigate the relationship between foreign direct investments and economic growth. In the study which used the methods of Panel Cointegration and Granger Causality, a one-way causality relationship was found in the direction from foreign direct investments to economic growth.

Ekinci (2001) investigated the long-term relationship between foreign direct investments and economic growth by using the data for Turkey for the period of 1980-2010. In the study which used the Granger Causality method, although a long-term and two-way causality relationship was found between foreign direct investments and economic growth, no long-term relationship was found between foreign direct investments and employment.

Alagöz, Erdoğan and Topallı (2008) used the data for Turkey for the period of 1992-2007 to study the relationship between foreign direct investments and economic growth. In the study which used the method of Granger Causality, it was concluded that there was no causality relationship between foreign direct investments and economic growth.

Ayaydın (2010) used the data for Turkey for the period of 1970-2007 to investigate the causality relationship between foreign direct investments and economic growth. In the study where the method of VAR Causality was used in addition to the Johansen Cointegration Test, a one-way causality relationship was found in the direction from foreign direct investments to economic growth.

Yılmaz, Kaya and Akıncı (2011) used the data for Turkey for the period of 1980-2008 to study how foreign direct investments affect economic growth. In their study where the method of Granger Causality was used, they found a one-way causality relationship in the direction from foreign direct investments to economic growth.

Benli and Yenisu (2017) used quarterly data on Turkey for the period of 2005-2015 to investigate the relationship between foreign direct investments and economic growth. In their study where the methods of Johansen Cointegration and Granger Causality were used, they found a two-way, long-term causality relationship between foreign direct investments and economic growth.

Kahveci and Terzi (2017) used the data for Turkey for the period of 1984-2015 to investigate the relationship between foreign direct investments and variables of economic growth, employment and capital accumulation. In the study which used the Sims and DL-VAR Causality methods, although a one-way causality relationship was found in the direction from economic growth and capital accumulation to foreign direct investments, there was no relationship between foreign direct investments and employment.

3. Methodology and the Data Set

The implementation part of the study uses two different methods. These are Time Series Analysis for Turkey's economy and Panel Data Analysis of OECD countries. In the Time Series Analysis for Turkey, gross domestic product was chosen as the dependent variable, while foreign direct investments and exports were chosen as the independent variables. All of the data that are used in that analysis that covers the period of 1974-2015 were gathered from the database of the World Bank. In the Panel Data Analysis for OECD countries, gross domestic product was chosen as the dependent variable, while the independent variables were chosen as foreign direct investments, employment, capital stock and total factor productivity. In the analysis that covers the countries Canada, Chile, Israel, the Republic of Korea,

Mexico, the Netherlands, Poland, Portugal, Spain and the United Kingdom whose data were accessible for the period of 1991-2014, the data for gross domestic product, foreign direct investments and employment were taken from the database of the World Bank, while the data for capital stock and total factor productivity were obtained from the database of the Federal Reserve Bank of St. Louis (Feenstra et al., 2015).

4. Time Series Analysis for Turkey

This part of the study includes the time series analysis using the data for Turkey for the period of 1974-2015. In this analysis, gross domestic product was chosen as the dependent variable, while foreign direct investments and exports were chosen as the independent variables. The relationship between these variables is analyzed using the regression model seen in Table 1.

Table 1. Regression Model

$GDP_t = \beta0 + \beta1\ FDI_t + \beta2\ EX_t + U_t$	
Variable	**Explanation**
GDP_t	Logarithm of the gross domestic product in the relevant year.
FDI_t	Logarithm of the foreign direct investment in the relevant year.
EX_t	Logarithm of the export in the relevant year.
U_t	Error term.

4.1. Test for Stationarity

Table 2. Augmented Dickey – Fuller Unit Root Test

	Level		**First Difference**	
Variable	**Test Statistic**	**P-Value**	**Test Statistic**	**P-Value**
GDP	-0.956	0.7689	-6.826	0.0000
FDI	-0.872	0.7970	-9.143	0.0000
EX	-1.505	0.5310	-5.623	0.0000

In order to avoid the issue of spurious regression in time series analysis, the series used in the analysis must be stationary, which means, it must not contain unit roots. According to the results of the Augmented Dickey – Fuller Unit Root Test shown in Table 2, while the series used in the time series analysis contained unit root, they became stationary after taking the first differences. Therefore, the first differences of the series must be used in the time series analysis.

4.2. Johansen Test for Cointegration

Table 3. Johansen Test for Cointegration

Lag Order Selection			
FPE	**AIC**	**HQIC**	**SBIC**
1	1	1	1
Maximum Rank	Eigenvalue	Trace Statistic	5% Critical Value
0	.	20.3705	15.41
1	0.38382	0.5179*	3.76
2	0.01255		

It is needed to conduct a Cointegration test in order to determine the method to be used in time series analysis. According to the results of the Johansen Test for Cointegration shown in Table 3, the model contained 1 error term, that is, 1

cointegrated equation. Based on this result, the Vector Error Correction Model (VECM) should be used in the time series analysis.

4.3. Vector Error Correction Model

Table 4. Results of Vector Error Correction Model

D_GDP	Coefficient	P > |Z|
_ce1 LD.	-0.0938814	0.153
GDP LD.	-0.1084323	0.520
FDI LD.	-0.0304673	0.485
EX LD.	0.0010932	0.996
_cons	0.0844269	0.019

Although the coefficient of the error-correction term was negative based on the results of the Vector Error Correction Model shown in Table 4, this coefficient was not statistically significant on the level of 5%. According to this result, there was no long-term causality relationship in the direction from the independent variables to the dependent variable used in the regression model. That is, there was no significant long-term relationship between foreign direct investments and economic growth in Turkey.

4.4. Other Tests

Table 5. Results of the Other Tests

Test		chi2	Prob > chi2
Test Linear Hypotheses		2.53	0.6393
Lagrange Multiplier Test	Lag1	10.9158	0.28152
	Lag2	6.7859	0.65940
Jarque - Bera Test	D_GDP	1.603	0.44873
	ALL	4.730	0.57882

According to the Linear Hypotheses Test results shown in Table 5, the chi2 value was not statistically significant on the level of 5%, and therefore, there was no significant short-term causality relationship in the direction from the independent variables to the dependent variable used in the regression model. That is, there was no significant short-term relationship between foreign direct investments and economic growth in Turkey. According to the results of the Lagrange Multiplier Test shown in Table 5, there was no autocorrelation in the model in terms of both Lag1 and Lag2. According to the results of the Jarque – Bera Test, the residuals were normally distributed both for the GDP variable and for the entirety of the model. According to the results of the Lagrange Multiplier Test and the Jarque – Bera Test, the regression model on which the time series analysis was conducted using the Vector Error Correction Model was significant and valid. As a result, no short-term or long-term relationship was found between foreign direct investments and economic growth in Turkey's economy.

5. Panel Data Analysis for OECD Countries

This part of the study includes the panel regression analysis using the data for 10 OECD countries for the period of 1991-2014. In this analysis, gross domestic product was chosen as the dependent variable, while the independent variables were chosen as foreign direct investments, employment, capital stock and total factor productivity. The relationship between these variables is investigated using the regression model shown in Table 6.

Table 6. Regression Model

$GDP_{it} = \beta 0 + \beta 1\ FDI_{it} + \beta 2\ EMP_{it} + \beta 3\ CAP_{it} + \beta 4\ TFP_{it} + U_{it}$	
Variable	**Explanation**
GDP_t	Logarithm of the gross domestic product of the relevant country in the relevant year.
FDI_t	Logarithm of the foreign direct investment of the relevant country in the relevant year.
EMP_{it}	Logarithm of the employment of the relevant country in the relevant year.
CAP_{it}	Logarithm of the capital stock of the relevant country in the relevant year.
TFP_{it}	Logarithm of the total factor productivity of the relevant country in the relevant year.
U_{it}	Error term.

5.1. Test for Stationarity

Table 7. Levin-Lin-Chu Unit Root Test

	Adjusted t*	
Variables	**Statistic**	**P-Value**
GDP	-1.9721	0.0243
FDI	-2.9271	0.0017
EMP	-1.7282	0.0420
CAP	-3.9118	0.0000
TFP	-2.1438	0.0160

In order to avoid the issue of spurious regression in panel data analysis, the series used in the analysis must be stationary, which means, it must not contain unit roots. According to the results of the Levin-Lin-Chu Unit Root Test shown in Table 7, the series used in the panel data analysis did not contain unit root on a significance level of 5%. Therefore, issue of spurious regression will not arise in the usage of these stationary series in the panel data analysis.

5.2. Model Determination

Table 8. Breusch-Pagan Lagrangian Multiplier Test for Random Effects and Hausman Test

Test	**Chi2**	**Prob > Chi2**
Breusch-Pagan LM Test for RE	828.27	0.0000
Hausman Test	83.45	0.0000

According to the results of the Breusch-Pagan Lagrangian Multiplier Test for Random Effects shown in Table 8, the hypothesis that the variance is zero was rejected. Therefore, panel data analysis should use the fixed effects model or the random effects model. In order to be able to choose between these two models, Hausman Test results should be considered. Based on the results of the Hausman Test shown in Table 8, the hypothesis that random effects are present in the model

was rejected, therefore, the panel data analysis should use the fixed effects model.

5.3. Heteroscedasticity and Cross Sectional Dependence

Table 9. Modified Wald Test and Breusch-Pagan Lagrangian Multiplier Test of Independence

Test	Chi2	Prob > Chi2
Modified Wald Test	110.50	0.0000
Breusch-Pagan LM Test of Independence	43.008	0.0000

According to the results of the Modified Wald Test shown in Table 9, the hypothesis that the variance does not change based on units was rejected, therefore, it was understood that there was unit-wise heteroscedasticity. Based on the results of the Breusch-Pagan LM Test of Independence, the hypothesis that there is no inter-unit correlation was rejected, and therefore, the presence of inter-unit correlation for the Fixed Effects Model was revealed.

5.4. Serial Correlation

Table 10. Modified Bhargava-Franzini-Narendranathan DW Test and Baltagi-Wu LBI Test

Test	Test Statistic
Modified Bhargava et al. DW Test	0.36124149
Baltagi-Wu LBI Test	0.45190312

According to the results of the Modified Bhargava-Franzini-Narendranathan Durbin-Watson Test and the Baltagi-Wu LBI Test shown in Table 10, as both test statistics had values lower than 2, the hypothesis that the autocorrelation coefficient is equal to zero was rejected, and the presence of autocorrelation for the Fixed Effects Model was revealed.

5.5. Panel Fixed-Effects Regression with Driscoll-Kraay Standard Errors

Until this point in the study, it was shown that the series used in the panel data analysis were suitable for the Fixed Effects Model, and they contained heteroscedasticity, autocorrelation and inter-unit correlation. The method of estimation that satisfies these conditions for panel data analysis is Fixed-Effects Regression with Driscoll-Kraay Standard Errors.

Table 11. Results of the Panel FE Regression with Driscoll-Kraay Std. Err.

Number of obs: 240		Number of groups: 10		
F: 218.95		Prob > F: 0.0000		
Within R^2: 0.8837				
Variable	**Coefficient**	**t**	**P > |t|**	**Driscoll-Kraay Std. Err.**
FDI	0.0503966	2.50	0.034	0.0201977
EMP	0.7598534	6.25	0.000	0.1215024
CAP	1.085074	8.66	0.000	0.1252613
TFP	0.4640545	1.77	0.110	0.2617594

The F test was significant based on the results of the Fixed-Effects Regression with Driscoll-Kraay Standard Errors in Table 11, and therefore, it was seen that the independent variables in the model were significant in explaining the dependent variable together. Based on the t-test results, the first three of the coefficients calculated for the independent variables were significant on the level of 5%. According to the coefficient of determination R^2, the panel regression model

explained the variance of the dependent variable to a high degree as 88.37%. Consequently, foreign direct investments affected economic growth positively for OECD countries. Accordingly, if foreign direct investments in OECD countries increase by 1%, GDP increases by 0.50%.

6. Conclusion

This study comparatively investigated the effects of foreign direct investments on economic growth in the cases of Turkey and other OECD countries. With this objective, a Time Series Analysis was conducted for Turkey's economy and a Panel Data Analysis was conducted for OECD countries. According to the results obtained from these two analyses, while there was no short-term or long-term relationship between foreign direct investments and economic growth in Turkey's economy, foreign direct investments affected economic growth positively in other OECD countries.

Both of these results reached in this study is in parallel with most of the previous study results. Additionally, the results obtained for OECD countries are in compliance with the theoretical framework that is concerned with the growth-reinforcing effects of foreign direct investments. Moreover, the results obtained for Turkey's economy provide significant clues about the structural problems in Turkey's economy. Within this context, it may be argued that Turkey's economy has a set of shortcomings that prevent foreign direct investments from reinforcing economic growth. For example, the case might be that foreign direct investments have not been able to create an affect that improves the level of information and technology, or increases productivity. Furthermore, foreign direct investments in Turkey's economy might not have been able to show their competition-reinforcing and export-expanding effects. It is clear that such estimations that indicate structural problems warrant scientific inquiry.

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