

## Impact of foreign direct investment inflows on tax revenues in OECD countries: A panel cointegration and causality analysis<sup>(1)</sup>

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**Abstract.** *Globalization process has led considerable increases in the global foreign direct investment flows especially as of mid-1980s. Foreign direct investment inflows have potential to affect economic growth, capital accumulation, human capital, competitiveness, development of finance sector and technological progress in the host country and in turn affects the tax revenues. In this study, we analyzed the relationship among foreign direct investment inflows, economic growth and total tax revenues in 33 OECD countries during 1995-2014 period using Westerlund-Durbin-Hausmann (2008) panel cointegration test and Dumitrescu and Hurlin (2012) panel causality test. We revealed a cointegrating relationship among foreign direct investment inflows, economic growth and total tax revenues. Furthermore, there was one-way causality from foreign direct investment inflows to total revenues and bidirectional causality between economic growth and foreign direct investment inflows.*

**Keywords:** foreign direct investment inflows, tax revenue, panel data analysis.

**JEL Classification:** E60, F62, H20.

## 1. Introduction

Global foreign direct investment (FDI) flows have been raised considerably since mid-1980s due to the increases in the production as of industrial revolution, technological advancements and the accelerating globalization. The liberalization of capital flows together with the globalization, corporate tax reductions and fiscal incentives decreased the cost of FDIs and in turn made the opportunity of FDI easier. As a consequence FDI inflows have increased sharply from USD 13.2 billion in 1970 to the USD 1.87 trillion in 2007, then 2008 global financial crisis and Eurozone sovereign debt crisis caused the contractions in the flows of FDI, but FDI inflows again increased after meltdown of the crises and were USD 1.757 trillion in 2016 (World Bank, 2017). However, OECD countries still are the important recipients of FDIs, although both recent crises affected the FDIs negatively.

FDIs have significant implications over the national economies as an important cause and result of the fast growing globalization process. FDI inflows can improve the competitiveness through capital inflows and technology transfer and make contribution to the economic growth and development (Saray, 2011). However, foreign direct investment inflows also have potential to affect the total taxes indirectly, which is an important component of public sector revenues, through economic activity. On the other hand, cuts in the rate of corporation tax or giving exemption from taxes for a length of time and giving legal privileges to the multinational corporations in profit transfer by many countries can affect tax revenues negatively. So the net impact of FDI inflows on the total tax revenues has been unclear theoretically.

In this study, we focus on the long and short run interaction between FDI inflows and total tax revenues in OECD countries during 1995-2014 period employing panel cointegration and causality analysis. In this context, the relevant theoretical and empirical literature are summarized in the coming section, then dataset and econometric methodology are shortly described. Empirical analysis and major findings are given in Section 4 and the study is finished with the Conclusion section.

## 2. Literature review

The significant increases in the global FDI flows have encouraged the researchers to investigate the economic effects of FDIs. FDI inflows can affect the economic growth positively through raising the capital stock, transfer of technology and know-how, improving the human capital, increasing the competitiveness and enhancing the development of financial sector (Hlavacek and Domanska, 2016). In this regard, FDI inflows can influence the total taxes positively indirectly by boosting economic growth and employment (Grop and Costial, 2000). But FDI inflows can affect the total taxes negatively in case tax reductions, legal privileges in the transfer of income and fiscal incentives such as free land allocation and supports for the labor costs are provided to attract FDIs. In this sense, the net impact of FDI inflows on the total taxes have stayed inconclusive.

A wide range of papers have researched the effect of taxation and taxes on FDI attraction and revealed that taxes and taxation are a crucial determinant of FDI inflows and there was a negative relationship between tax rates and FDI inflows (e.g. see Razin et al., 2005; Beck and Chaves, 2011; Varol et al., 2015). But, relatively few studies have researched the effect of FDI inflows on the tax revenues and most of the limited literature discovered that FDI inflows affected the tax revenues positively (e.g. see Gropp ve Kostial, 2000; Sarisoy and Koc, 2010; Mahmood and Chaudhary, 2013; Okey, 2013; Bunescu and Comaniciu, 2014; Odabas, 2016). However, few studies have reached the contrary findings (e.g. see Tabasam (2014)).

In one of the early studies, Grop and Costial (2000) investigated the interaction among FDI, taxation and revenues of corporate tax in 19 OECD countries during 1987-1997 period employing panel data analysis and revealed that FDI inflows affected the corporate tax revenues positively. On the other hand Mahmood and Chaudhary (2013) researched the effect of FDI inflows on the total tax revenues in Pakistan over the period 1972-2010 and discovered that FDI inflows affected the total tax revenues positively. Okey (2013) also researched the influence of FDI inflows on the tax revenue in 8 West African countries over the period 1989-2009 employing panel regression and discovered that FDI inflows affected the tax revenues positively.

In another study, Bunescu and Comaniciu (2014) investigated the economic and non-economic factors affecting the tax revenues in 27 EU countries during 1995-2011 period with correlation analysis and revealed that FDI inflows had a weak positive effect on the tax revenues. On the other side Tabasam (2014) researched the interaction among tax revenues and FDI inflows in Pakistan over the period 1975-2012 using time series analysis and discovered that FDI inflows affected the tax revenues negatively. Aslam (2015) also analyzed the long run interaction between FDI inflows and tax revenues in Sri Lanka during 1990-2013 period and found that FDI inflows made a significant positive contribution to the tax revenues. Gaalya (2015) researched the same relationship for Uganda during the period 1994-2012 with regression analysis and reached the same findings.

Balikcioglu et al. (2016) researched the effect of FDI inflows on the tax payments of the firms with different technology levels in Turkey during 2004-2012 period and discovered that FDI inflows increased the tax payments by the firms and the effect was found to be highest in the firms with high technology level. Finally Odabas (2016) researched the causal interaction between tax revenues and FDI inflows in 7 EU transition economies during 1996-2012 period with causality test of Dumitrescu and Hurlin (2012) and discovered a one-way causality from FDI inflows to the tax revenues.

### 3. Data and econometric methodology

We investigated the long and short run interaction between FDI inflows and total tax revenues in OECD countries during the 1995-2014 period employing the cointegration test of Westerlund-Durbin-Hausmann (2008) and the causality test of Dumitrescu and Hurlin (2012).

### 3.1. Data

In the study, we selected total tax revenues (% of GDP) as the dependent variables, because we considered that the countries generally make corporate tax reductions or do not collect the corporate taxes for a determined period to attract FDI inflows. On the other side, our independent variables are FDI net inflows (% of GDP) and growth rate of real GDP per capita as seen in Table 1. The data of total tax revenues was extracted from OECD database, the data of FDI inflows was provided from World Bank database and growth data was provided from IMF database. We took the sample of OECD countries, because the share of the OECD countries in the global FDI inflows was about 60% and the United State, Ireland, the Netherlands, Switzerland and Canada have been major recipients of FDI flows (World Bank, 2016). The existence of data determined our sample and Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States formed our sample.

**Table 1.** Data description

Variables	Description	Data source
TAX	Total tax revenues (% of GDP)	OECD (2016)
FDI	Foreign direct investment inflows (% of GDP)	World Bank (2016)
GRW	Growth rate of real GDP per capita	IMF (2016)

We made benefit of Stata 14.0, Eviews 9.0, and Gauss 11.0 software packages in the empirical analysis. The descriptive statistics and correlation matrix of the dataset was displayed in Table 2. The correlation matrix revealed a positive correlation between FDI inflows and total tax revenues.

**Table 2.** Descriptive statistics and correlation matrix

Variable		Average	Standard Deviation	Min	Max	Observation
TAX	overall	33.61953	7.345131	14.84	50.882	N = 660
	between		7.26295	17.35515	46.58845	n = 33
	within		1.649664	26.05738	41.04403	T = 20
FDI	overall	4.38691	7.315445	-16.09109	87.44259	N = 660
	between		4.276202	0.1546755	19.38001	n = 33
	within		5.97971	-21.21643	72.44949	T = 20
GRW	overall	1.993699	3.003981	-14.69132	13.32501	N = 660
	between		1.136132	0.2376984	4.912619	n = 33
	within		2.78753	-17.61024	10.40609	T = 20
Correlation Matrix						
	TAX	FDI	GRW			
TAX	1	0.087481	-0.081626			
FDI	0.087481	1	0.103569			
GRW	-0.081626	0.103569	1			

### 3.2. Econometric methodology

One of the major problems for the panel data analysis is cross-sectional dependence. Therefore, test of cross-sectional dependence is important for the selection of future econometric tests in the empirical analysis. In this study, we analyzed the cross-sectional

dependence among the cross-section units with LM CD test of Pesaran (2004), because cross-section of the dataset was found to be higher than the time dimension of the dataset. Then homogeneity of the cointegrating coefficients was examined with the adjusted delta tilde test of Pesaran and Yamagata (2008). In the next stage, the stationarity of the series was investigated by CIPS (Cross sectionally Im-Pesaran-Shin, 2003) panel unit root test of Pesaran (2007) taking into account the existence of cross-sectional dependence among the series.

We analyzed the long run relationship among FDI inflows, economic growth and tax revenues with Westerlund-Durbin-Hausman (2008) cointegration test, because the variables of the study were found to have different integration level. The test regards the cross-sectional dependence and also calculates two statistics called as Durbin-Hausman group statistic and Durbin-Hausman panel statistic. The group statistic is used to see whether there is cointegrating relationship among the series in case the panel is found to be heterogeneous. Otherwise panel statistic is used. The cointegrating coefficients were estimated with AMG estimator of Eberhardt and Bond (2009), which takes account of cross-sectional dependence and heterogeneity. Finally, the short run interaction among the series were examined with causality test of Dumitrescu and Hurlin (2012).

#### 4. Empirical analysis

##### 4.1. Cross-sectional dependency and homogeneity tests

The determination of cross-sectional dependency and homogeneity are important for selection of the tests employed in further stages of the empirical analysis. The cross-sectional dependency was investigated by LM CD test of Pesaran (2004), because the cross-section of the dataset ( $N = 33$ ) was found to be higher than the time dimension of the dataset ( $T = 20$ ) and the results were displayed in Table 3. The null hypothesis was rejected considering the test results and we revealed that there was cross-sectional dependency among the cross-sections. On the other side, the homogeneity of the cointegrating coefficients was examined with the adjusted delta tilde test of Pesaran and Yamagata (2008) and the test results were displayed in Table 3. The null hypothesis was declined and the cointegrating coefficients were found to be heterogeneous.

**Table 3.** Results of cross-sectional dependency and homogeneity tests

Cross-sectional dependency tests		
Test	Test statistic	P value
LM (Breusch and Pagan, 1980)	1764.537	0.000
LM adj* (Pesaran et al., 2008)	34.498	0.000
LM CD* (Pesaran, 2004)	38.052	0.000
Homogeneity tests		
Test	Test Statistic	P value
Delta_tilde	5.698	0.000
Delta_tilde_adj	6.333	0.000

\*two sided test.

#### 4.2. Panel CIPS unit root test

In the second stage of the empirical analysis, the integration levels of the variables were analyzed with the unit root test of Pesaran (2007) and the test results were presented in Table 4. FDI and GRW variables were found to be I(0), while TAX variable was found to be I(1) in the light of the test results.

**Table 4.** Results of Pesaran (2007) CIPS unit root test

Variables	Constant		Constant + Trend	
	$p = 0$	$p = 1$	$p = 0$	$p = 1$
TAX	-0.003 (0.499)	2.134 (0.984)	1.04 (0.852)	3.527 (1.000)
dTAX	-22.829 (0.000)***	-8.366 (0.000)***	-20.968 (0.000)***	-6.622 (0.000)***
FDI	-9.635 (0.000)***	-3.249 (0.001)***	-8.300 (0.000)***	-2.529 (0.006)**
dFDI	-22.132 (0.000)***	-12.644 (0.000)***	-19.155 (0.000)***	-9.117 (0.000)***
GRW	-6.797 (0.000)***	-3.508 (0.000)***	-3.937 (0.000)***	-0.768 (0.221)
dGRW	-18.411 (0.000)***	-8.987 (0.000)***	-15.103 (0.000)***	-5.483 (0.000)***

**Notes:**

\*\*\* indicates that it is statistically significant at 1% significance level.

Lag length (p) was determined by AIC and SIC criteria.

Pesaran (2007) unit root test was implemented by “multipurt” command developed by Markus Eberhardt.

#### 4.3. Westerlund-Durbin-Hausmann (2008) cointegration test

Westerlund-Durbin-Hausman (2008) cointegration test was employed to investigate the cointegrating relationship among the variables regarding the integration levels of the variables and the test results were presented in Table 5. Durbin-Hausman group statistic was taken in considerations, because the panel was found to be heterogeneous. Therefore, the null hypothesis was rejected at 1% significance level and we revealed that there was a cointegrating relationship among the variables.

**Table 5.** Results of Westerlund-Durbin-Hausman (2008) cointegration test

	Test statistics	P value
Durbin-Hausman group statistic	4.329	0.000
Durbin-Hausman panel statistic	2.129	0.017

#### 4.4. Estimation of cointegrating coefficients

The cointegrating coefficients were estimated by AMG estimator considering the existence of cross-sectional dependence and heterogeneity and the test results were displayed in Table 6. The results suggested that both FDI inflows and economic growth did not have significant effects on the total tax revenues at the panel level. However, FDI inflows affected the total tax revenues positively in Iceland, Israel, Sweden, the United Kingdom, and the United States, while FDI inflows affected the total tax revenues negatively in Austria, France, Italy, and Poland. Furthermore, economic growth had positive influence on the tax revenues in Chile and Poland, but economic growth had negative effect on the total tax revenues in Austria, Estonia, Germany, Hungary, Norway, Sweden, and Switzerland.

**Table 6.** Estimation of cointegrating coefficients

Country	FDI		GRW	
	Coefficient	P value	Coefficient	P value
Australia	-0.0102456	0.932	0.4920851	0.089*
<b>Austria</b>	<b>-0.0627568</b>	<b>0.021**</b>	<b>-0.2547427</b>	<b>0.033**</b>
Belgium	-0.0088029	0.329	-0.0926685	0.338
Canada	0.0219368	0.729	-0.0596248	0.508
Chile	0.0422021	0.746	<b>0.2555512</b>	<b>0.009***</b>
Czech Republic	-0.0974511	0.171	0.0812241	0.206
Denmark	-0.0028367	0.954	0.1542911	0.271
Estonia	-0.0917103	0.257	<b>-0.1725773</b>	<b>0.006***</b>
Finland	-0.0418935	0.598	-0.0433055	0.677
<b>France</b>	<b>-0.2972352</b>	<b>0.053*</b>	0.1095838	0.346
Germany	0.076669	0.421	<b>-0.1650208</b>	<b>0.089*</b>
Greece	-0.803297	0.314	-0.0762441	0.514
Hungary	0.0173207	0.164	<b>-0.3579511</b>	<b>0.000***</b>
<b>Iceland</b>	<b>0.2874083</b>	<b>0.000***</b>	0.0604963	0.611
Ireland	-0.0129701	0.608	0.0944514	0.171
<b>Israel</b>	<b>0.1633896</b>	<b>0.075*</b>	-0.0499847	0.526
<b>Italy</b>	<b>-0.6696029</b>	<b>0.081*</b>	-0.1486518	0.281
Japan	-0.8686863	0.439	-0.0286062	0.714
Mexico	0.0476133	0.892	-0.036182	0.560
Netherlands	-0.0034162	0.805	-0.0313175	0.838
New Zealand	0.1705738	0.460	-0.0295026	0.910
Norway	0.1283616	0.394	<b>-0.4083154</b>	<b>0.030**</b>
<b>Poland</b>	<b>-0.4843183</b>	<b>0.006***</b>	<b>0.5257282</b>	<b>0.001***</b>
Portugal	-0.0156837	0.829	-0.0108433	0.903
Slovakia	-0.2977829	0.003	-0.0643459	0.467
Slovenia	0.0910983	0.424	-0.0935971	0.138
South Korea	-0.5691898	0.229	-0.01123	0.858
Spain	0.2899929	0.198	0.3340188	0.137
<b>Sweden</b>	<b>0.0915475</b>	<b>0.066*</b>	<b>-0.0282276</b>	<b>0.770</b>
Switzerland	0.0346513	0.446	<b>-0.2614478</b>	<b>0.008***</b>
Turkey	-0.6317951	0.121	-0.0790167	0.306
<b>United Kingdom</b>	<b>0.1454205</b>	<b>0.024**</b>	-0.1058898	0.361
<b>United States</b>	<b>0.6705001</b>	<b>0.002***</b>	0.0380561	0.711
Panel	-0.0815451	0.158	-0.0140548	0.690

\*\*\*, \*\*, and \* indicate that it is respectively significant at 1%, 5% and 10% significance levels.

The composition of FDI inflows and the level of financial incentives by host countries are determinative for the relationship between total tax revenues and FDI inflows. Greenfield investments, establishment of new facilities in the host country, have more potential to increase the capital accumulation and in turn enhance the economic activity when compared with the brownfield investments, in other word words mergers and acquisitions. But the investors generally make greenfield investments in case the countries provide financial incentives, legal privileges and privileges in transfer of income. On the other side brownfield investments may not contribute to the capital accumulation, but can make contributions to the economic growth through know-how and technology transfer. Some countries also grant privileges to attract brownfield investments. Therefore it does not seem possible to predict the effect of both greenfield and brownfield investments on the total tax revenues. For example the effect of FDI inflows on the total tax revenues have been found to be negative in Italy and France. We evaluated that the negative interaction was resulted from the relatively low level of green field investments in these countries, because the share of greenfield investments in total

FDI inflows was 17.43% in France and 30.59% in Italy. However, FDI inflows affected the total tax revenues positively, although both greenfield and brownfield investments followed a fluctuating course in Iceland, Israel, Sweden, the United Kingdom, and the United States.

#### 4.5. Dumitrescu and Hurlin (2012) panel causality test

The causal interaction among total tax revenues, FDI inflows and economic growth was investigated with causality test of Dumitrescu and Hurlin (2012) and the test results were displayed in Table 7. The results revealed a one-way causality from FDI inflows to the total tax revenues. Furthermore, a mutual interaction between economic growth and total tax revenues was discovered as a consequence of the test.

**Table 7.** Results of Dumitrescu and Hurlin (2012) causality test

Null hypothesis	W-Stat.	Zbar-Stat.	P value
Lag length=1			
$\Delta FDI \rightarrow \Delta DTAX$	1.73473	1.81265	0.0699
$\Delta DTAX \rightarrow \Delta FDI$	1.38263	0.71391	0.4753
$\Delta GRW \rightarrow \Delta DTAX$	1.12563	-0.08806	0.9298
$\Delta DTAX \rightarrow \Delta GRW$	1.65514	1.56430	0.1177
$\Delta GRW \rightarrow \Delta FDI$	1.79452	2.07165	0.0383
$\Delta GDI \rightarrow \Delta GRW$	2.00547	2.74229	0.0061
Lag length=2			
$\Delta FDI \rightarrow \Delta DTAX$	3.62090	2.38605	0.0170
$\Delta DTAX \rightarrow \Delta FDI$	2.08944	-0.60693	0.5439
$\Delta GRW \rightarrow \Delta DTAX$	2.14218	-0.50387	0.6144
$\Delta DTAX \rightarrow \Delta GRW$	2.68060	0.54838	0.5834
$\Delta GRW \rightarrow \Delta FDI$	2.21975	-0.29098	0.7711
$\Delta FDI \rightarrow \Delta GRW$	4.24511	3.80473	0.0001

## 5. Conclusion

Increasing financial and economic liberalization together with the globalization has led substantial increases in FDI flows. The improving integration between international financial markets and increasing mobility of production factors between the countries affect the FDI flows positively. In this context, FDI inflows have potential to affect the national economies through multiple channels. FDI inflows may affect the economic growth and in turn employment positively through increasing the capital stock and improving the human capital or technology and know-how transfer in the host country. Furthermore, FDI inflows also may contribute to the development of financial sector, raising the competitiveness and tax revenues indirectly. However, FDI inflows may affect the economic growth negatively to cause that the local firms are exposed unfair competition against multinational firms. FDI inflows also have potential to affect the balance of payments negatively through profit transfer and contribute to the environmental degradation.

In this study, the short and long run interaction among tax revenues, FDI inflows and economic growth were analyzed in 33 OECD countries during 1995-2014 period with Dumitrescu and Hurlin (2012) causality test and Westerlund-Durbin-Hausmann (2008) cointegration test. The results revealed that both FDI inflows and economic growth did



not have significant effects on the total tax revenues at the panel level. However, FDI inflows affected the total tax revenues positively in Iceland, Israel, Sweden, the United Kingdom, and the United States, while FDI inflows affected the total tax revenues negatively in Austria, France, Italy, and Poland. Furthermore, economic growth had positive influence on the tax revenues in Chile and Poland, but economic growth had negative effect on the total tax revenues in Austria, Estonia, Germany, Hungary, Norway, Sweden, and Switzerland. Furthermore, the results of causality test discovered a one-way causality from FDI inflows to the total tax revenues. A mutual interaction between economic growth and total tax revenues was also seen as a consequence of the test. We evaluated that the composition of FDI inflows and the level of financial incentives by host countries are determinative for the relationship between total tax revenues and FDI inflows. In this regard, many OECD countries have tried to increase the tax revenues by expanding the tax base through reducing the tax exemptions and tax reductions.

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#### Note

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- <sup>(1)</sup> This study was derived from the PhD thesis entitled “Impact of Foreign Direct Investment Inflows on Tax Revenue: The Case of OECD Countries” of Omer Faruk Ozturk under the advisory of Assoc. Prof. Yilmaz Bayar.

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