

# FDI and economic growth: the role of natural resources?

FDI and  
economic  
growth

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## Abstract

**Purpose** – The purpose of this paper is to investigate the foreign direct investments (FDI)-growth nexus and the impact of natural resource abundance in the host country on the FDI-growth nexus.

**Design/methodology/approach** – For a large data set of 104 countries for the period 1996-2015, Arellano and Bond's GMM estimation method is applied to investigate the impact of FDI inflow on economic growth and the role of the natural resource sector on the FDI-growth relationship.

**Findings** – The paper found a positive and significant effect of FDI inflows on economic growth of the host country. However, the impact of FDI inflows on economic growth changes with the changes in the size of the natural resource sector. The estimated positive impact of FDI inflows on economic growth declines with the expansion in the size of natural resources. Beyond a certain limit, a further expansion in the size of natural resource sector will lead to a negative effect of FDI on economic growth.

**Research limitations/implications** – The paper found a positive and significant impact of FDI inflows on economic growth of the host country. However, the impact of FDI inflows on economic growth changes with the changes in the size of the natural resource sector. The estimated positive impact of FDI inflows on economic growth declines with the expansion in the size of the natural resources. Beyond a certain limit, a further expansion in the size of the natural resource sector will lead to a negative effect of FDI on economic growth. The same analysis is repeated for groups of countries divided into different income groups. FDI inflows are found to have significant growth enhancing role in all three groups of countries. However, FDI inflows-induced growth was found to be more pronounced in the middle- and low-income countries compared to high-income countries. Further, FDI-induced economic growth is slowed down in low-income and middle-income countries by the increase in size of the natural resource sector. While in high-income countries, the size of the natural resource sector has no significant role on the FDI-growth nexus.

**Practical implications** – While countries use their natural resource sector as an instrument to attract FDI into the countries, low- and middle-income countries face the dilemma of experiencing the resource curse in the form of watered down FDI-induced growth. Therefore, low- and middle-income countries need to try at the same time to attract FDI into the non-resources sector to keep the relative size of the natural resource sector low as to avoid hampering the FDI-induced economic growth. High-income countries, on the other hand, do not experience the FDI-induced growth hampering impact of the natural resource sector. Therefore, high-income countries should attract FDI into the countries regardless of the sector attracting the foreign investments.

**Originality/value** – The paper is part of the author's PhD research and is an original contribution.

**Keywords** Economic growth, Foreign direct investment, Natural resources, Generalized method of moments, Arellano and bond, Resource curse

**Paper type** Research paper

## 1. Introduction

The role of foreign direct investments (FDI) inflow in the economic growth of host countries has been studied extensively. While the majority of studies reveal a positive effect of FDI on host country economic growth, the debate is still far from over. Empirical studies conclude mixed results about the impact of FDI on economic growth. Studies like Javorcik (2004), Reganati *et al.* (2008) and Havranek and Irsova (2011) conclude a positive effect of FDI on economic growth. Gorodnichenko *et al.* (2007) found a strong vertical spillover effect for both supplier and consumer firms in the domestic economy. Examining the data for a group of OECD and non-OECD countries, De Mello (1999) found that the FDI inflow affected



economic growth in the host country via technology and knowledge spillovers. Most of the studies that concluded a positive impact of FDI on economic growth found that the FDI-growth relationship is contingent upon the different types of absorptive capacity of the host country. Factors that contribute to the country's absorptive capacity and, ultimately, the FDI-growth relationship are identified by studies as the level of host country human capital (Borensztein *et al.*, 1998), financial markets development (Hermes and Lensink, 2003; Alfaro *et al.*, 2004; Azman-Saini *et al.*, 2010; Alfaro *et al.*, 2010), trade liberalization (Borensztein *et al.*, 1998), level of economic development (Blomstrom *et al.*, 1994), economic stability and liberal markets (Bengoa and Sanchez-Robles, 2003), institutional quality (Jude and Leveigue (2015), technology gap between the host and FDI originating country (Havranek and Irsova, 2011), shared ownership of the FDI firm and lower level of corruption (Freckleton *et al.*, 2012).

However, the debate about growth-inducing role of FDI is far from over, and there are studies that question the impact in FDI on economic growth of the host country. In a metadata analysis of the FDI spillover, Havranek and Irsova (2011) found that the spillover effect of FDI in the local economy is smaller than projected by most of the papers. Examining the firm-level data from Venezuela, Aitken and Ann (1999) doubted the spillover theory by finding that FDI inflow does have a positive but very small effect on the FDI receiving firm while a negative effect on the productivity of domestically owned firms. In a study of sectoral FDI inflow in Egypt, Hanafy (2015) found a positive effect of FDI in the manufacturing sector, no significant effect of FDI in the services sector and a negative effect of FDI in the agriculture sector. The study found no significant growth-inducing impact of FDI for the whole economy.

The relationship between FDI and economic growth has been explored from many aspects. As described above, many studies reveal that the relationship between FDI and host country economic growth is conditional upon many other relevant factors and variations in these factors substantially alter the FDI-growth relationship. This paper considers one such factor, i.e. the size of the natural resource sector which is ignored by studies in exploring the FDI-growth relationship.

The impact of natural resource abundance on economic growth is vastly researched and studies reveal that countries with abundant natural resources tend to grow slower than countries with scarce natural resources (Sachs and Warner, 2001). This phenomenon is called natural resource curse in the literature. Many studies have also looked into the role of natural resource abundance in attracting FDI (Aseidu and Lien, 2011; Anyanwu, 2012). However, the question of the impact of natural resource abundance on the FDI-growth nexus is largely ignored. This paper is an attempt to close this gap and explore the FDI-growth nexus, altering the role of natural resource abundance.

This paper attempts to answer the following main questions: does FDI inflow contribute to GDP growth in the host country after controlling for endogeneity? And more importantly, does natural resource abundance alter the FDI-Growth nexus? If yes, does this FDI-growth nexus altering role of natural resources vary across countries of different income levels, namely, low-income, middle-income and high-income countries?

The main contribution of this paper is twofold. First, the paper looks into the impact of the size of the natural resource sector on the economic growth. The literature on FDI-growth effect to the knowledge of the author has ignored the potential role of natural resource sector in altering the FDI-growth relationship. This paper is an attempt to close that gap in the literature. Further, countries are divided into different income groups according the World Bank classification, and the FDI-growth nexus and the potential role of the natural resource in altering the FDI-growth nexus is investigated for each income group.

Second, this paper uses a larger data set of 104 countries for the period 1996-2015 and adopts a simple dynamic panel data (DPD) model, and used GMM estimation based on (Arellano and Bond, 1991) to answer the question of the still debatable FDI-growth relationship. The model enables us to cover for any perpetual characteristics of the growth data and solve the problem of endogeneity in FDI.

The paper finds a positive and significant impact of FDI on economic growth. Further, the paper also confirms the presence of a small but significant natural resource curse for the countries in the data used. The most important result of this paper is that natural resource abundance alters the FDI-growth relationship, and the increase in natural resource exports leads to eliminate the potential growth benefits of FDI inflow. In case the natural resource sector grows too large, FDI inflow into the country might contribute negatively to the growth rate of the country. In a further analysis of countries divided into income groups, this paper finds that FDI inflows have stronger growth enhancing impact in the low- and middle-income countries compared to the high-income countries. However, the increase in the size of natural resources significantly reduced the FDI-induced economic growth in the low- and middle-income countries, whereas no such impact of the natural resource sector was found in the high-income countries.

The remainder of the paper is structured as follows: Section 2 provides the conceptual background and arguments for the channels through which natural resource abundance affect FDI-growth relationship. Section 3 describes the methodology adopted, and Section 4 describes the data used in this paper. Section 5 presents the main results of the paper, and section 6 concludes the paper.

## **2. Why natural resource abundance may alter the FDI-growth relationship?**

This section provides arguments explaining the channels through which natural resource abundance may alter the FDI-growth relationship. First, while natural resource abundance is considered to be a factor in attracting FDI (Kekic, 2005), it is expected to result in lower levels of FDI inflow in the non-resource tradable sector of the economy. The aggregate level of FDI inflow is expected to fall because of increased resource sector (Aseidu and Lien, 2011). This will result in lowering the levels of capital accumulation in the economy and, ultimately, will result in lower economic growth. This is expected to reduce any possible technology spillover of FDI. Aseidu (2006) concluded that FDI does not have the positive spillovers of job creation and technology transfers because countries that are rich in resources generally channel FDI to the natural resource industries.

The second channel of the natural resources' impact on the FDI-growth relationship is through the capital accumulation in the resource sector. Natural resource abundance alters the FDI inflow position of a country in favor of resource sector at the cost of non-resource tradable sector (Poelhekke and van der Ploeg, 2013). This will result in greater capital accumulation in the resource sector and will increase resource exports further. Natural resource exports are associated with slower growth rate (Sachs and Warner, 2001), therefore such accumulation of FDI in the resource sector is expected to fuel the natural resource curse further and deny any potential growth-inducing effect of FDI. An increased activity in the resource sector due to accumulation of FDI in the resource sector will make firms operating in the non-resource tradable sector less competitive. This, in turn, is expected to deny any potential positive impact of FDI on economic growth.

Natural resource curse takes shape by lowering institutional and governance quality of the country which ultimately adversely affects economic growth (Sala-i-Martin and Subramanian, 2008; Busse and Gröning, 2013). This also reduces the potential growth-inducing effect of FDI because studies have shown that countries with better institutional quality tend to receive higher FDI-induced economic growth (Jude and Levieuge, 2015; Hayat, 2016). Donato and Mariana (2012) found that the high degree of resource exports is associated with the worse

government effectiveness and reduced level of competitiveness. However, this paper covers that channel by controlling for governance and institutional quality. This paper analyzes a larger panel data of 104 countries and revisits the FDI-growth relationship and natural resource curse. Further, the paper investigates if resource abundance results in undoing any potential FDI-induced growth that might exist for countries with lower levels of natural resources.

### 3. Methodology

This section describes the econometric models used in this paper. In the first step, this paper uses the following simple DPD model to investigate the impact of FDI on economic growth of the host country:

$$Y_{it} = \alpha Y_{it-1} + \gamma \text{FDI}_{it} + X_{it}\beta + v_{it} \quad (1)$$

where  $v_{it} = \mu_i + \varepsilon_{it}$ ,  $Y_{it}$  is the real growth rate of GDP per capita, FDI is the natural logarithm of the ratio of net FDI inflow to GDP.  $Y_{it-1}$  is the lagged value of real GDP growth per capita.  $X_{it}$  represents all the exogenous control variables include initial GDP, population growth rate, trade volume, gross domestic investment, government consumption spending, Inflation rate, money supply (M2) and institutional quality. In the second model described below, natural resources and the interaction term between natural resources and FDI inflow are included in order to find out if the presence of natural resource in the country altera the FDI-growth relationship:

$$Y_{it} = \alpha Y_{it-1} + \gamma \text{FDI}_{it} + \theta \text{NR}_{it} + \varphi(\text{FDI}_{it} \times \text{NR}_{it}) + X_{it}\beta + \eta_{it} \quad (2)$$

where  $\eta_{it} = \mu_i + \delta_{it}$ , and  $\text{NR}_{it}$  is natural logarithm of the ratio of natural resource exports to goods exports. All other variables are the same as described above. The reason for using a DPD model and including the lagged value of GDP growth rate per capita is that it will capture any relevant explanatory variable missing from the model. The second reason behind using DPD is that the model will enable us to deal with the problem of endogeneity with FDI. FDI is considered to be endogenous and studies have shown that FDI tend to reinforce itself overtime (Wheeler and Mody, 1992). Therefore, this paper uses the lagged value of FDI as an instrument for FDI. The dynamic nature of the model enables us to deal with this problem.

In order to estimate the models described above, the paper adopts Arellano and Bond's (1991) GMM estimation method. Arellano and Bond's GMM estimator provides consistent estimators and are best suited for data with a relatively short time period ( $T$ ) and larger cross-sections ( $N$ ). The estimation technique is also best suited for endogenous explanatory variables that are dynamic in nature. In each regression, Sargan test is applied to check for the validity of overidentifying restrictions.

### 4. Data

This section presents data, sources of data and explains all the variables used in the paper. This paper is based on analyzing data from 104 countries for the period of 20 years from 1996 to 2015. Countries in the data used are classified into low-income countries, middle-income countries and high-income countries according to the World Bank criteria. The selection of countries and the time period is solely based on the availability of data. The variables used in this paper are real per capita GDP growth, the ratio of net FDI inflow to GDP, the ratio of trade volume to GDP, used as an instrument for trade openness, initial GDP, ratio of gross domestic private investment to GDP, ratio of government spending to GDP, ratio of money supply (M2) to GDP, population growth rate and inflation. The data on these variables are obtained from the World Bank database[1]. Natural resources exports, as a share of total export, are used as an indicator for natural resource. Studies exploring the impact of natural resource abundance on productivity (e.g. Sachs and Warner, 2001) have

used the share of natural resources in the good export as an indicator for the size of the natural resources sector. Data are obtained in the form of “fuels plus ore and metal” exports as a share of goods exports from the World Bank database.

Data on institutional quality and governance variables are obtained from the Worldwide Governance Indicators (WGI)[2] project (Kaufmann *et al.*, 2002).

The institutional quality variable is an average of six different institutional quality and governance indicators including political stability and absence of violence, voice and accountability, control of corruption, government effectiveness, rule of law and regulatory quality. The WGI ranks countries from 1 to 100, where 1 represents the lowest level of institutional quality and 100 represents the highest institutional quality and governance. The variable selection is in line with the standard literature on FDI, natural resources and economic growth (Barro and Sala-i-Martin, 1995).

Table I presents descriptive statistics of data on net FDI inflow, real GDP growth rate per capita, share of resource exports in goods exports, trade volume, domestic investment, population growth inflation, institutional quality, government spending and money supply. The variables used in the paper for FDI inflow are  $\ln(\text{FDI}/\text{GDP}+1)$ , and the population growth rate is  $\ln(\text{population}+4)$ . Inflation is the growth rate of GDP deflator index. The variable used in the paper is  $\ln(\text{inflation}+1)$ . The variable modification was done to avoid taking the natural logarithm of negative values. Initial GDP is the natural logarithm of real GDP per capita in the year 1996. Trade volume is natural logarithm of imports plus exports as a fraction of GDP. Money supply is the natural logarithm of  $(M2/\text{GDP})$ , and institutional quality is the natural logarithm of the average rank of six institutional quality measures. The measures are further described in Table AII.

## 5. Analysis of results

This section presents the results of the estimated models. Table II shows the GMM estimated coefficients of Equation (1) with the country-clustered robust standard errors presented in parenthesis. It can be seen from the results that the coefficient of FDI is positive and significant. This shows that the FDI inflow strongly enhances growth rate of the host country economy.

Precisely the coefficient our interest here is  $(dY/d\ln\text{FDI}) = \gamma$ . Therefore, the estimated coefficient of FDI is  $\hat{\gamma} = 11.032$  which means that a 1 percent increase in the ratio of FDI inflow to GDP leads to a 0.11 percentage points increase in the per capita growth rate of the host country. The result is in line with the majority of earlier studies. The results on the rest of the variables are very much as expected. Domestic investment, institutional quality and volume of trade all significantly contribute to economic growth of the country. Coefficients of population growth rate and inflation rate both are negative and significant which again is in line with the literature. Government spending and money supply both

Variable	Mean	SD	Minimum	Maximum
Real GDP growth/capita	2.3600	3.7361	-18.8748	33.030
FDI/GDP	0.0499	0.1803	-0.7973	4.7678
NR exports/total goods exports	24.445	27.7941	0.0009	99.66927
Initial GDP/capita	13,430.2	17,293.2	149.36	102,910.4
Population growth	1.4095	1.4622	-3.8201	17.624
Inflation	0.0753	0.2510	-0.2763	9.5864
Investment/GDP	0.2291	0.0663	0.0029	0.5799
Institutional quality	54.725	25.408	4.452	99.750
Trade volume/GDP	0.8088	0.4550	0.1563	4.3965
Govt spending/GDP	0.1569	0.0501	0.0204	0.3301
M2/GDP	0.5771	0.3773	0.0857	2.5192

**Table I.**  
Descriptive statistics

**Table II.**  
Foreign direct investments and economics growth: GMM estimation of the dynamic panel data model: dependent variable: real GDP per capita growth (1996-2015)

Variables	Coefficients
GDPGPC <sub>t-1</sub>	-0.006 (0.038)
FDI	11.032*** (2.731)
FDI <sub>t-1</sub>	-17.218*** (5.029)
Population growth	-8.147*** (1.516)
Investment	4.999*** (0.914)
Inflation	-3.283*** (1.030)
Institutional quality	0.334* (0.180)
Trade volume	5.111*** (1.146)
Government spending	-4.819** (1.925)
Money supply	-6.634*** (0.973)
No of observations	901
No of instruments	323
Serial correlation test ( <i>p</i> -value)****	0.0899
Sargan test ( <i>p</i> -value)*****	1.000

**Notes:** Country-clustered robust SEs are presented in parenthesis. \*, \*\*, \*\*\*Significant at 10, 5 and 1 percent confidence intervals, respectively; \*\*\*\*\**H0*: no serial autocorrelation; \*\*\*\*\**H0*: overidentifying restrictions are valid

have negative and significant coefficient. The results about the government spending are mixed, and many empirical results show a negative impact of government spending on economic growth.

Equation (2) is estimated with an interaction term between FDI and natural resources in order to estimate the potential role that natural resource abundance may play in altering the FDI-economic growth relationship and to estimate how much change does 1 standard deviation increase in the natural resources brings about in the economic growth of a country that is attracting the average amount of FDI. Moreover, it can be used to find out how much change does an increase in FDI bring about in the growth rate, given that the country has a certain amount of natural resources?

Note here that  $(d\ln Y/d\ln FDI) = \gamma$ , therefore the coefficient of our interest for finding the impact of FDI on economic growth is  $\hat{\gamma}$ . As shown in Table III,  $\hat{\gamma} = 18.483$ , which is positive

**Table III.**  
FDI-growth nexus: does nature resource abundance alter the relationship? GMM estimation of the dynamic panel data model: dependent variable: real GDP per capita growth (1996-2015)

Variables	Coefficients
GDPGPC <sub>t-1</sub>	-0.045*** (0.010)
FDI	18.483*** (4.544)
NR	-0.408* (0.222)
(FDI × NR)	-6.028*** (1.938)
Initial GDP	0.517*** (0.235)
Population growth	-8.555*** (1.191)
Investment	6.491*** (0.656)
Inflation	-1.963 (1.531)
Institutional quality	0.272*** (0.058)
Trade volume	3.796*** (0.948)
Government spending	-5.770*** (2.305)
Money supply	-3.761*** (0.983)
No of observations	608
No of instruments	404
Serial correlation test ( <i>p</i> -value)****	0.304
Sargan test*****	0.9998

**Notes:** Country-clustered robust SEs are presented in parenthesis. \*, \*\*, \*\*\*Significant at 10, 5 and 1 percent confidence intervals, respectively; \*\*\*\*\**H0*: no serial autocorrelation; \*\*\*\*\*overidentifying restrictions are valid

and strongly significant. Ignoring the level of natural resource and its impact on the FD-growth relationship, this tell us that a 1 percent increase in FDI inflow into the country leads to a 0.184 percentage points increase in GDP per capita of the country. However, this was without taking into account the size of natural resource sector in the country. Therefore, the total effect of FDI inflow on the economic growth of host country while controlling for the natural resources would be:

$$\frac{dY}{d \ln \text{FDI}} = \hat{\gamma} + \hat{\phi} \ln(\text{NR})$$

The estimated impact of FDI on economic growth of the host country after taking into account the size of natural resource sector would be the following:

$$\frac{dY}{d \ln \text{FDI}} = 18.483 - 6.028 \ln(\text{NR})$$

Considering the average level of natural resource, the net effect of FDI inflow on economic growth would be  $18.483 - 6.028(2.547) = 3.129$ . This means that a 1 percent increase in FDI inflow into a country with an average level of natural resource lead to a 0.031 percentage point increase in economic growth. This is significantly smaller than  $\gamma$  which estimated the effect of FDI inflow on economic growth without taking into account the natural resource abundance.

Considering the example of Malaysia with an average natural resource export of 15.031 percent in the total goods exports, The estimated impact of FDI inflow on economic growth of Malaysia taking into account the size of natural resource sector would be  $(dY/d\ln\text{FDI}) = 18.483 - 6.028(2.71) = 2.146$ . Now, assuming that the average natural resource export of Malaysia goes up by 10 percent, the resulting impact of FDI on economic growth is 1.571 ( $(dY/d\ln\text{FDI}) = 18.483 - 6.028(2.805) = 1.571$ ), which is far lower than the impact without considering the size of natural resource sector of the country. Now we consider a very high resource exporting country, Algeria, with 97.48 percent of its exports consisting of natural resources. The impact of FDI inflow on economic growth for Algeria is  $-9.12$  ( $(dY/d\ln\text{FDI}) = 18.483 - 6.028(4.579) = -9.123$ ). This means that for a high resource exporting country like Algeria, FDI inflow contributes negatively to its economic growth, and a 1 percent increase in FDI inflow will lead to a 0.09 percentage points decrease in the economic growth of Algeria. The explanation of this negative effect would be that in a country with a large resource sector which experiences resource curse, FDI inflow is more likely to go to the resource sector and further fuel the natural resource curse.

Looking into the natural resource curse, note that  $(dY/d\ln\text{NR}) = \theta$ ; therefore, the coefficient of our interest for natural resource is  $\hat{\theta}$ . As shown in Table III,  $\theta = -0.408$ , which is negative and significant, which means that in the absence of FDI inflow, the natural resource contributes negatively to the economic growth of the country. This is in line with the idea of “resource curse” and with the earlier studies. This shows that there still exists a negative impact of natural resource abundance on economic growth even after controlling for the institutional quality of the country.

However, after controlling for the FDI inflow in our model, the full effect of natural on economic growth is:

$$\frac{dY}{d \ln \text{NR}} = \hat{\theta} + \hat{\phi} \ln(\text{FDI})$$

and the estimated impact of natural resource on economic growth for a country with mean level of FDI inflow is:

$$\frac{dY}{d \ln \text{NR}} = -0.408 - 6.028(0.036) = -0.625$$

This shows a marginally stronger negative effect of natural resources on economic growth for countries that attract a mean level of FDI inflow. This tells us that in countries with larger natural resource sectors, FDI inflow leads to the intensification of the natural resource curse. This can be explained as the FDI inflow into countries with natural resource sector accelerates the growth hampering effect of natural resources. Natural resource abundance tilts the FDI in favor of the resource sector at the cost of FDI in the tradable non-resource sector. This can be an explanation of the exaggerated negative effect of natural resources on economic growth.

The same analysis is repeated for countries divided into three different groups, namely, low-income, middle-income and high-income groups, according to the World Bank classification which is based on their per capital income level. Table IV presents the estimation results for each group. In each case, the FDI coefficient is positive and significant. However, in the case of low-income and middle-income countries, the coefficients of FDI are 30.552 and 26.883 respectively, which are sizably larger than the coefficient of FDI for the high-income countries, i.e. 8.15. This indicates that while FDI plays a significant role in fostering economic growth in the host countries, this role is substantially larger in the case of low- and middle-income countries compared to high-income countries. Assuming that most of the FDI is originating from the high-income countries, this also reinforces the earlier conclusions that the technology gap between the originating and receiving countries is an FDI-induced growth boosting factor.

However, this is again without taking into account the size of the natural resource sector in the respective countries in each group. The net effect of FDI inflow on economic growth after taking into account the size of the natural resource sector for each income group would be:

$$\frac{dY}{d \ln \text{FDI}} = \hat{\gamma} + \hat{\phi} \ln(\text{NR})$$

Thus, the estimated impact of FDI on economic growth of the high-income host country after taking into account the size of natural resource sector would be the following:

$$\frac{dY}{d \ln \text{FDI}} = 8.156 - 0.037 \ln(\text{NR})$$

Variables	Arellano and Bond's estimation of the dynamic panel data model		
	High-income countries	Middle-income countries	Low-income countries
GDPGPC <sub>t-1</sub>	0.047*** (0.016)	-0.144*** (0.020)	-0.707 (0.453)
FDI	8.156*** (1.245)	30.552*** (9.255)	26.883** (13.169)
NR	-0.719** (0.375)	-0.656 (0.532)	0.660*** (0.236)
(FDI × NR)	-0.037 (0.069)	-0.195** (0.092)	-0.118** (5.226)
Population	-8.294*** (1.210)	-7.707* (4.160)	-3.421 (2.322)
Inflation	-3.718** (1.866)	-0.719 (1.432)	-12.755 (21.873)
Investment	7.774*** (1.092)	6.923*** (0.937)	20.110*** (17.201)
Institutional quality	0.292*** (0.0738)	0.347*** (0.057)	2.699 (4.241)
Trade volume	5.790*** (1.483)	5.644*** (0.818)	-7.938 (5.057)
Government spending	-17.541*** (2.722)	-6.264** (2.953)	
No. of countries	47	47	10
Observations	535	513	119
Number of instruments	196	190	74
Sargan test ( <i>p</i> -value)****	0.998	1.000	0.999

**Table IV.** FDI-NR and growth nexus by income groups: dependent variable: real GDP per capita growth (1996-2015)

**Notes:** SEs are presented in parenthesis. \*, \*\*, \*\*\*Significant at 10, 5 and 1 percent confidence intervals, respectively; \*\*\*\**H0*: overidentifying restrictions are valid

Considering the average level of natural resource in the high-income countries group, the total effect of FDI inflow on economic growth for this group would be  $8.156 - 0.037(2.547) = 8.061$ . This means that a 1 percent increase in FDI inflow into a high-income country with an average level of natural resource leads to a 0.080 percentage point increase in economic growth. This is only slightly smaller than  $\gamma = 8.156$ , which estimated the effect of FDI inflow into the high-income countries on economic growth without taking into account the natural resource abundance. Further, the interaction term (FDI X NR) for the high-income countries is insignificant. Which indicates that, while the natural resource stock in the high-income countries contributes negatively to the economic growth, it does not significantly alter the FDI-growth nexus in these countries.

For the middle-income countries, the estimated impact of FDI on economic growth of the host country after taking into account the size of natural resource sector would be the following:

$$\frac{dY}{d \ln \text{FDI}} = 30.552 - 0.195 \ln(\text{NR})$$

which, for a middle-income country of an average natural resource sector, becomes  $30.552 - 0.195(2.446) = 30.075$ , which suggest a larger and significant reduction in FDI-induced economic growth because of the natural resources.

For low-income countries, the effect is similar and the net effect of FDI inflow on economic growth of the countries classified as low-income after taking into account the presence of natural resources is given as below:

$$\frac{dY}{d \ln \text{FDI}} = 26.883 - 0.118(1.657) = 26.687$$

which is a small, but significant, reduction. As shown above, FDI inflows induce stronger economic growth in middle and low-income countries compared to high-income countries. However, this FDI-induced growth is hampered significantly by the size of the natural resources sector in the low- and middle-income countries while no such significant impact of the natural resources was found for high-income countries.

## 6. Conclusion

This paper focuses on the relationship between FD inflows, natural resource abundance and economic growth. The paper attempts to investigate the impact of FDI inflow on economic growth. Further, the paper investigates the natural resource curse for a large data set of 104 countries. However, the main contribution of the paper is to investigate the role of natural resource sector in altering the FDI-growth relationship and to further investigate if this FDI-growth nexus altering role of the natural resource abundance in the home country varies across countries of different income groups, namely, low-income, middle-income and high-income countries.

The results conclude a positive and significant impact of FDI inflows on economic growth of the host country. However, the impact of FDI inflows on economic growth changes with the changes in the size of the natural resource sector. The estimated positive impact of FDI inflows on economic growth declines with the expansion in the size of natural resources. Beyond a certain limit, a further expansion in the size of the natural resource sector will lead to a negative effect of FDI on economic growth. In high-income countries, the FDI-induced growth was observed to be a lot smaller than that observed for the middle- and low-income countries. However, contrary to the low- and middle-income countries no FDI-induced growth hampering role was found for the high-income countries. This shows that while there is scope for achieving a high economic growth rate in the low- and

middle-income countries through attracting FDI inflows, this enhanced growth is hampered by the increase in the natural resource sector.

While countries use their natural resource sector as an instrument to attract FDI into the countries, low- and middle-income countries face the dilemma of experiencing the resource curse in the form of watered down FDI-induced growth. Therefore, low- and middle-income countries need to try at the same time to attract FDI into the non-resources sector to keep the relative size of the natural resource sector low as to avoid hampering the FDI-induced economic growth. High-income countries, on the other hand, do not experience the FDI-induced growth hampering impact of the natural resource sector. Therefore, high-income countries should attract FDI into the countries regardless of the sector attracting the foreign investments.

### Notes

1. World Bank database can be accessed at: <http://databank.worldbank.org/data/home.aspx>
2. WGI indicators database and methodology can be accessed at: <http://info.worldbank.org/governance/wgi/#home>

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**Appendix**

In total, 104 countries are included in the study which are divided into three categories of low-income, middle-income and high-income countries by the World Bank. The countries are provided in Table AI and Table AII

High income	Middle income	Low income
Argentina	Albania	Burkina Faso
Australia	Algeria	Madagascar
Austria	Bangladesh	Malawi
Azerbaijan	Belarus	Mali
Bahrain	Belize	Mozambique
Barbados	Bolivia	Rwanda
Belgium	Botswana	Tanzania
Brunei Darussalam	Brazil	Togo
Canada	Bulgaria	Uganda
Chile	Cameroon	Zimbabwe
Croatia	China	
Cyprus	Colombia	
Czech Republic	Costa Rica	
Denmark	Cote d'Ivoire	
Finland	Dominican Republic	
France	Ecuador	
Germany	Egypt. Arab Rep.	
Greece	El Salvador	
Hungary	Fiji	
Iceland	Ghana	
Ireland	Guatemala	
Israel	Honduras	
Italy	India	
Japan	Indonesia	
Korea. Rep.	Jamaica	
Kuwait	Jordan	
Malta	Kazakhstan	
Mexico	Kenya	
The Netherlands	Malaysia	
New Zealand	Morocco	
Norway	Nicaragua	
Oman	Nigeria	
Poland	Pakistan	
Portugal	Panama	
Qatar	Paraguay	
Russian Federation	Peru	
Saudi Arabia	Philippines	
Singapore	Romania	
Slovak Republic	Senegal	
Spain	South Africa	
Sweden	Sri Lanka	
Switzerland	Sudan	
Trinidad and Tobago	Thailand	
UK	Tunisia	
USA	Turkey	
Uruguay	Ukraine	
Venezuela. RB	Vietnam	

**Table AI.**  
List of countries  
included in the paper

Variable	Description	Source
FDI	The ratio of FDI inflow to GDP	WDI
GDP	Growth rate of real GDP per capita	WDI
NR	Share of natural resource exports in goods exports	WDI
Inflation	Rate of growth of consumer price index	WDI
Trade	Ratio of import and export to the gross domestic product	WDI
Government expenditure	Ratio of government expenditure to the GDP	WDI
Initial GDP	Gross domestic product at the start of the period of data	WDI
Population growth rate	Growth rate of population of the country	WDI
Investment	Gross domestic capital formation (gross domestic investment)	WDI
Institutional quality	Average value of rule of law, control of corruption, regulatory quality, government effectiveness	WDI
Rule of law	Rule of law reflects the reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police and the courts, as well as the likelihood of crime and violence	WGI
Control of corruption	Control of corruption reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests	WGI
Regulatory quality	Regulatory quality reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development	WGI
Government Effectiveness	Government effectiveness reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation	WGI

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