FDI, natural resource and economic growth: A Threshold model approach

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Foreign Direct Investment, Natural Resources, and Economic Growth: A Threshold Model Approach

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Abstract

In this paper, we present analyses of the link between natural resources, FDI, and economic growth. We use the Fixed Effect Threshold Model for panel data with annual frequency for 83 countries. Our results show that FDI has a strong positive impact on the economic growth of the host country if the host country's natural resources export is below the statistically significant estimated threshold. However, this FDI-induced economic growth is watered-down if the countries natural resources export is larger than the estimated threshold. The results are robust for alternative indicators of natural resources, i.e., natural resources rents.

Key Words: FDI, Economic Growth, Natural Resources, Threshold Model

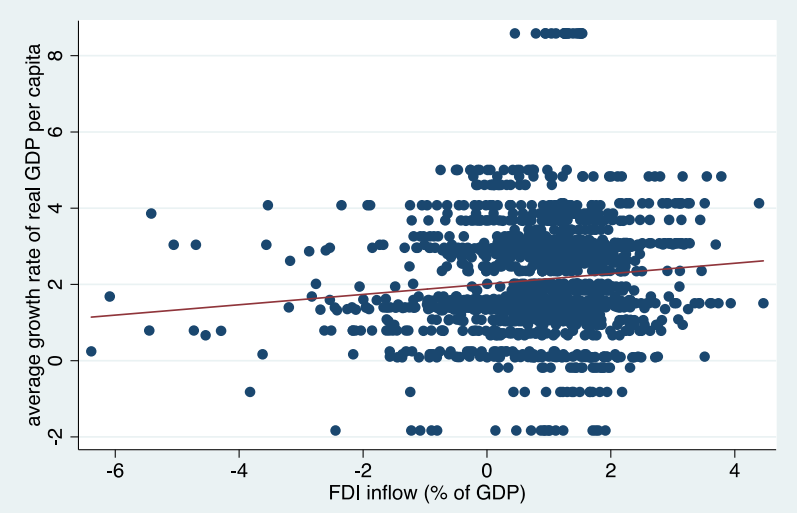
JEL Classification: P45, O47, P28, Q3

1 Introduction

Foreign direct investments (FDI) and their impact on the host country's economic growth have been investigated extensively. While many studies suggest a positive effect of FDI on economic growth (see for example (Javorcik, 2004) (Reganati, Pittiglio, & Sica, 2008)), the idea of FDI - induced economic growth is still debated, and an overwhelming majority view the FDI-growth relationship to be ambiguous (see(Bruno & Campos, 2003); Gorg & Greenaway, 2003)). This has led researchers to come up with modeling contingency effects in the FDI - growth relationship. Studies have suggested that the FDI growth relationship is dependent on many other factors. For instance: level of economic development (Blomstrom, Lipsey, & Zejan, 1994), financial markets development (Alfaro, Chanda, Kalemli-Ozcan, & Sayek, 2004; Hermes & Lensink, 2003) (Azman-Saini, Law, & Ahmad, 2010), trade liberalization (Balasubramanyam, Salisu, & Sapsford, 1996), human capital (Borensztein, Gregoreio, & Lee, 1998), economic stability and markets liberalization (Bengoa & Sanchez-Robles, 2003), technology gap between the host and origin country (Havranek & Irsova, 2011). Figure 1 below presents a scatter plot of the FDI inflow and Economic growth.

In this paper, we explore another contingency effect, the size of the natural resources sector in the economy, and the role it plays in altering the FDI-growth relationship. In one of the most important papers in the literature on the role of natural resources in economic growth, Sachs and Warner (2001) found that natural resources abundant countries are expected to grow slower than the resources scarce countries.

Figure 1. FDI inflow and Economic Growth (1996-2016)



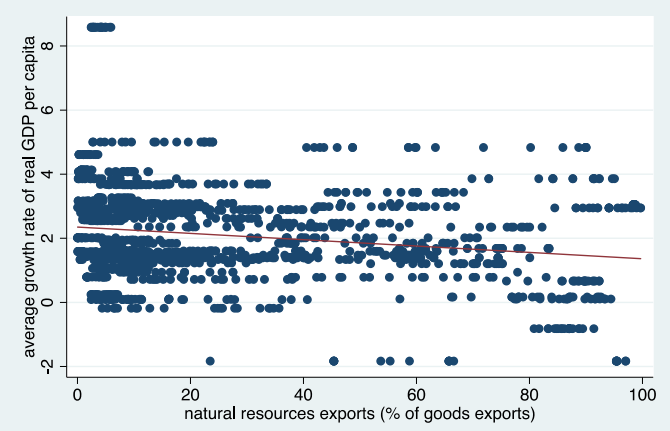
Notes: The figure above shows a weak positive relationship between the net FDI inflows and economic growth for the sample of 83 countries. The Horizontal line represents the natural logarithm of net FDI inflows as a percent of GDP; the vertical line represents the average growth rate of real GDP per capita over the 21 years period (1996-2016).

There are three main channels of the impact of natural resources on economic growth identified in the literature. These channels include the so-called Dutch disease- the appreciation of real exchange rate and thus making the non-resources tradeable sector uncompetitive. Secondly, natural resources exports expose the exporting countries to commodity prices volatility, which could have negative consequences for the economic growth of the country (Van der Ploeg & Poelhekke, 2009). Finally, natural resources are associated with rent generation and thus leading to increase corruption (Mauro, 1995; Leite and Weidman, 1999) and slow economic growth via their negative impact on institutional quality (Sala-i-Martin and Subramanian, 2012). Sala-i-Martin and Subramanian (2012) found a significant natural resources curse taking root through the institutional quality channel. The study found a positive impact of institutional quality on economic growth. This impact of institutional quality, however, was found to be nonlinear and was found to be contingent on the size and growth of natural resources in the country. Asiedu (2013) applied a dynamic panel data linear model to a panel of 91 countries over the period 1984-2011 and found the

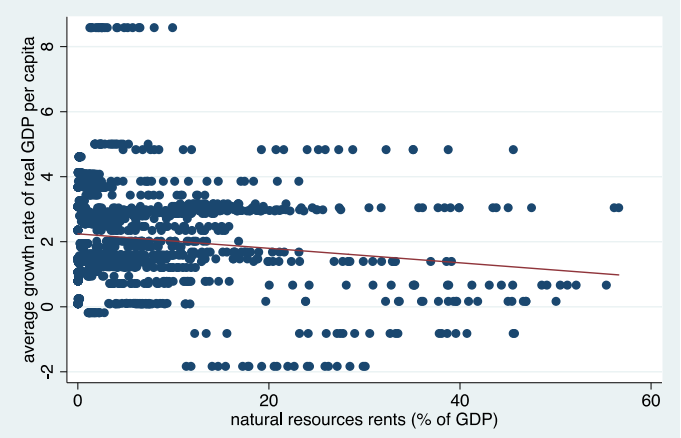
presence of the natural resources curve. The study also found that the natural resources curse exists even after controlling for the quality of institutions. Investigating the role of institutions and natural resources in attracting FDI inflows in sub-Saharan Africa, Fiodendji (2016) found that institutional quality attracts FDI inflows into resources abundant countries; however, it negatively affects FDI inflows in natural resources intensive countries. figure 2 below shows

Figure 2. Natural Resources abundance and Economic Growth (1996-2016)

a. Natural resources exports and economic growth



b. Natural resources rents and economic growth



Notes: The figures above show a negative relationship between the measures of natural resources, namely natural resources exports (% of goods exports) (a), natural resources rents (% of GDP) (b), and economic growth for the sample of 83 countries. The horizontal line represents the respective measure of natural resources; the vertical line represents the average growth rate of real GDP per capita over the 21 years period (1996-2016).

Natural resource abundance is also considered to be a factor in attracting FDI inflows, as described by Kekic (2005). However, Asiedu and Lien (2011) discovered that resource-rich countries tend to divert FDI inflow into the resources sector. This is expected to lower FDI in the non-resources sectors. This diversion of FDI from non-resources sectors to the natural resources sector reduces positive spillovers and technology transfers (Asiedu, 2006). Therefore, we expect the larger size of the natural resources sector to dampen the potential FDI-induced growth.

Hayat (2018) investigated the role of natural resource abundance on the FDI-growth relationship by using dynamic panel data linear model for a panel of 117

countries over the period 1991-2016. The study concluded that natural resources rich countries tend to receive no FDI-induced growth, while countries with lower levels of natural resources receive positive FDI-induced growth. The limitation of the linear model is that it assumes the growth effect of FDI to be monotonously decreasing (increasing) with the increase (decrease) in the size of the natural resources sector in the country. However, it may be that the FDI inflow into an economy with a natural resources sector beyond a certain size tends to be ineffective in inducing economic growth. Therefore, there is a need for a different kind of model with a more flexible specification to explain the natural resources, FDI, and economic growth relationship.

Some studies have approached the FDI economic growth relationship with non-linear modeling. These studies have estimated threshold models for different variables that influence the FDI-economic growth relationship. For instance, Jude and Levieuge (2017) applied a panel smooth transition regression (PSTR) for a panel of 94 developing countries to investigate the presence of an institutional quality threshold in determining the FDI growth relationship. The study found a significant threshold impact of law and order for the positive effect of FDI on economic growth to kick in. Trojette (2016) applied a dynamic panel data regression to a panel of countries from five regions covering the period 1985-2013 and found a significant threshold effect of institutional quality on FDI-growth relationship. The study found the FDI-growth relationship to be different for countries with institutional quality levels below the estimated threshold compared to the ones with institutional quality above that level. Azman-Saini et al. (2010) applied a fixed effect threshold model to a panel of 91 countries over the period 1975-2005 and found that positive impact of FDI inflows kick in on the host country's economic growth only when the country achieves the financial development level beyond the estimated threshold.

However, according to our knowledge, there is no study that has estimated the non-linear impact of natural resource abundance on the FDI-growth relationship. Our research presents an original contribution in this regard by estimating the threshold

level of natural resources. We use the fixed effect Threshold Model for panel data with annual frequency for 83 countries over the period 1996-2016, to find the threshold size of the natural resources sector for which the FDI-growth relationship changes. Secondly, contrary to many earlier studies on natural resources, in this paper, we use both natural resources exports and natural resources rents to investigate their impact on the FDI-growth relationship. The threshold model enables us to relax the assumption that there is a linear relationship between the FDI inflow and the economic growth of the host country. This model also allows us to estimate the indirect effect of FDI inflow on economic growth through the channel of the host country's natural resources sector.

The rest of the paper is organized as follows: Section 2 describes models and methodology, section 3 explains the used data, section 4 presents results, and section 5 concludes the paper. Appendices follow the bibliography.

2 Model Specification

In this section, we describe the Threshold Model for investigating the FDI-growth relationship across a panel of 83 countries over the period 1996-2016 with heterogeneous levels of natural resources.

2.1 Threshold Model

The panel threshold model was developed by Hansen (2000), and it has since been widely adopted in analyzing non-linear relationships. The models enable us to see if the coefficients of the regression are consistent for different subsets of the data. The fixed effect threshold model is applied by many studies modeling economic growth. For instance, the same fixed effect threshold model was used by Adam and Bevan (2005) on fiscal deficit and economic growth, and by Khan and Senhadji (2001) to inflation threshold and economic growth. Azman-Saini et al. (2010) applied a fixed effect threshold model to investigate the presence of a financial development level threshold in determining the FDI-growth relationship. Following Azman-Saini et al. (2010), we adopt the following fixed effect threshold model and investigate the

contingency effect of natural resources on the FDI-growth relationship.

In the model below, γ is the threshold, and NR_{it} is the threshold variable that splits the sample into two subsets depending on the level of NR_{it} in the country above or below the threshold γ.

$$Y_{it} = \alpha + \beta X_{it} + \eta_i \begin{pmatrix} FDI_{it}, & NR_{it} \leq \gamma \\ FDI_{it}, & NR_{it} > \gamma \end{pmatrix} + e_{it}$$

Y_{it} is the growth rate of real GDP per capita, FDI_{it} is the net FDI inflow into the country, and e_{it} is the error term. X_{it} is the set of control variables included in the model. The selection of control variables is based on economic growth literature, and they include initial GDP, domestic investment, human capital, inflation, international trade government consumption spending, quality of governance, population growth rate. Initial GDP is the GDP per capita of the country for the first year of every five-year subset of the dataset. Studies have shown that the initial level of GDP is a strong determinant of economic growth and that countries with the lower level of economic development tend to grow faster compared to countries with a lower level of economic development (see, for instance, Solow 1956; Mauro 1995; Feng 2003). Domestic investment is arguably the most important determinant of a country's economic growth, and most of the important studies on economic growth have used domestic investment as a control variable (see, for example, Barro 1991; Borensztein et al. 1998; Levine and Renelt 1992; Alfaro et al. 2004 and Gui-Diby 2014). For domestic investment, we use gross domestic capital formation as a percentage of GDP. Countries with a higher level of human capital are expected to grow faster compared to countries with a lower level of human capital. Many studies like Romer (1990), Levine and Rneelt (1992), Mankiw et al. (1992) found a positive impact of human capital on economic growth. In this study, we use Gross secondary enrollment (enrollment) as an indicator of human capital. There is extensive research on the potential positive impact of

international trade openness on economic growth. Most of these studies [1] used trade volume as a percentage of GDP as a control variable, following which we also adopt exports plus imports as a percentage of GDP as an indicator of international trade. Barro (1991) showed that government consumption spending causes a slowdown in economic growth by introducing distortions through taxation and spending program. Following many similar studies[2], we use government spending as a percentage of GDP as an indicator of government consumption spending. Many growth studies, including Kormendi and Meguire (1985), Stockman (1991), Barro (1995), Carkovic and Levine (2002), used inflation and found it to have a negative impact on economic growth. Besides other control variables, the quality of institutions and governance is also considered a strong determinant of economic growth. International Country Risk Guide (IRCG) [3] produces governance indicators which are used by many studies [4]. In this paper, we use IRCG indicators like corruption and law & order to control for governance quality. A growing population is considered to be a hindrance to economic growth. Solow growth model [5] describes increasing growth rate to lower per worker capital and hence output per work. Many studies like Barro (1998), Feng (2003), Alfaro et al. (2004), Gui-Diby (2014), Jude & Levieuge (2015), and Bucci (2015) found population growth rate to have a negative impact on economic growth.

3 Data and Methodology

In this section, we explain the data and methodology used for the estimation of the model.

1 See for example, Levine and Renelt (1992); Frankel and Romer (1999) Alcala and Ciccone, 2004; Dollar and Kraay 2003; Frankel and Romer 1999; and Harrison 1996).
2 See for example Butkiewicz & Yankikhaya 2011; Dao 2014;
3 IRCG data, available at: https://epub.prsgroup.com/products/icrg
4 See Jude and Levieuge 2017, Knack and Keefer 1995.
5 Solow (1956)

3.1 Data

To estimate the threshold model described above, this paper uses data with annual frequency from 83 countries [6] for the period 1996-2016. FDI is the ratio of net FDI inflow as a percentage of GDP. The selection of countries was solely based on the availability of data on all variables as the threshold model estimation required balanced panel data with no missing values. Net FDI inflow data is obtained from the United National Conference on Trade and Development (UNCTAD) Statistics [7].

Data on the following variables are obtained from the Worldwide Development Indicators (WDI) [8] of the World Bank databank.

GDP Growth	- the growth rate of real GDP per capita,
NR exports	-Natural resources [9] export as a percentage of merchandise exports,
NR Rents	-Natural resources rents as a percentage of GDP,
Initial GDP	- natural logarithm of real GDP per capita for the first year of every five-year subset of the dataset (i.e., the year 1996, 2001, 2006, and 2011)
Population Growth	- Population growth rate,
Inflation rate	- The growth rate of Consumer Price Index (CPI)
Domestic Investments	-Ratio of gross domestic capital formation to GDP,
Government Spending	*Government consumption spending as a percentage of GDP.*

6 List of countries is provided in appendix II.

7 United National Conference on Trade and Development (UNCTAD) Statistics can be accessed at https://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx?sCS_ChosenLang=en Data was downloaded on September 10, 2019.

8 World Development indicators can be accessed from https://databank.worldbank.org/source/world-development-indicators Data was downloaded on September 15, 2019.

9 Natural resources include "fuels plus ores and metal" Fuels comprise the commodities in SITC section 3 (mineral fuels, lubricants and related materials). Ores and metals comprise the commodities in SITC sections 27 (crude fertilizer, minerals nes); 28 (metalliferous ores, scrap); and 68 (non-ferrous metals)

Data on the enrollment (Gross secondary enrollment rate) is obtained from the Sustainable Development Goals (SDGs) report of the UNESCO Institute for Statistics database.[10]

Corruption and law & order data are obtained from the International Country Risk Guide (IRCG) compiled by the Political Risk Services (PRS)[11]. The indicator corruption and law & order both ranges from 0-6, where 6 indicate the lowest level of corruption and the highest level of law & order while 0 indicates the highest level of corruption and the lowest level of law & order in the country. Detailed definitions of each variable are given in Appendix I.

Table 1 presents the descriptive statistics of the data used in the analysis. It is evident from the table that both the rate of growth of GDP and the net FDI inflow varies a lot as the standard deviation in both cases is larger than the respective mean values of the variables. The dataset includes countries with natural resources exports making a maximum of 99.669% of the total goods exports of that countries and the highest level of natural resources rent recorded was 56.609% of GDP of the country. The highest level of investment, government spending, and trade were recorded as 58.15% of GDP, 30.069% of GDP, and 437.327% of GDP, respectively. The lowest level of enrollment was recorded at 7, while the highest level of enrollment was recorded at 158. Enrollment greater than 100 indicates overage or underage enrollment. Niger was recorded as a country with the highest level of corruption and got the lowest score of 0. Colombia, Jamaica, and Guatemala together got the worst score of 1 for law & order in the country in different years.

Table 1 **Summary Statistics**

Variable	Mean	Std. Dev.	Min	Max
GDP Growth rate	2.103	3.214	-15.3	23.986
FDI Inflow (% of GDP)	3.825	5.764	-37.155	86.611

10 Sustainable Development Goals report of the UNESCO Institute for Statistics can be accessed at: http://data.uis.unesco.org/index.aspx?queryid=142#

11 IRCG data is available at https://epub.prsgroup.com/products/icrg

NR Exports (% of Goods exports)	25.055	28.024	.026	99.669
NR Rents (% of GDP)	6.354	9.397	0	56.609
Investment (% of GDP)	23.419	5.965	.272	58.151
Govt Spending (% of GDP)	15.428	5.101	.911	30.069
Trade (% of GDP)	77.649	46.903	15.636	437.327
Population growth rate	1.592	1.362	-2.171	15.177
Inflation rate	7.890	103.436	-4.478	1058.374
Initial GDP	15854.891	19507.497	322.778	90132.352
Enrollment	76.544	32.187	7	158
Corruption	2.992	1.278	0	6
Law & Order	3.852	1.393	1	6

3.2 Methodology

We estimate the above-described threshold model to capture the contingency effect of natural resources on the FDI inflows and economic growth relationship. The single threshold model described above can be written as follows.

$$Y_{it} = \alpha + \boldsymbol{X_{it}}\boldsymbol{\beta} + FDI_{it}(NR_{it} \leq \gamma)\eta_1 + FDI_{it}(NR_{it} > \gamma)\eta_2 + u_i + e_{it} \qquad (1)$$

The variable natural resources (NR_{it}) is the threshold (sample splitting) variable, and the specification enables us to estimate the impact of FDI inflow on economic growth and that impact can take different values (i.e., η_1 and η_2) depending on the country's natural resources exports below or above the threshold γ. The indicators η_1 and η_2 are the coefficients of FDI inflows that are subject to change depending on the country in question exporting more or less NR exports as a percentage of goods exports compared to the estimated threshold ($\hat{\gamma}$).

The countries with the natural resources in period t, smaller than the threshold (γ) would in that period receive an FDI inflows induced per capita GDP growth of η_1 while countries with the natural resources' in period t larger than the threshold (γ) would in period t receive an FDI inflows induced per capita GDP growth rate of η_2.

While β is the coefficient of other control variables that do not depend on the threshold (γ).

The value of the threshold parameter γ is estimated by the residual sum of squares (RSS) $\hat{e}^{*\prime}\hat{e}^{*}$, which Hansen (2000) proved to be a consistent estimator of γ.

$$\hat{\gamma} = \arg\min_{\gamma} S_1(\gamma)$$

The significance of the threshold parameter γ is tested for significance by testing the hypothesis that the impact of FDI inflow on economic growth is the same in both regimes, i.e., Ho: $\eta_1 = \eta_2$. The inference is conducted on model-based bootstraps design suggested by Hansen (1996).

Coefficients β, η_1 and η_2 are estimated with respect to cross-sectional fixed effects. The estimation method for panel data threshold regression and the STATA command is developed and is described by Wang (2015). For estimation, we use Stata 14.0, basically command xthreg.

4 Analysis of Results

In this section, we present and analyze the results. Table 2 presents the estimation results for the fixed effect Threshold Model with one threshold for natural resources. The indicator for the threshold variable used in table 2 is the natural resources exports as a percentage of total goods exports. The table presents the model estimation with eight different specifications (column 1-8). The first four columns used corruption, while the remaining four models used law & order as an indicator of institutional quality. The four models vary slightly in specification by including inflation and population growth rate. Table 2 presents the 10,000-bootstrap replication with a 10% trimming estimated threshold model. We found that the threshold effect of natural resources, which splits the sample into two, is significant at least at a 1% confidence level in all model specifications. The estimated threshold ($\hat{\gamma}$) ranges from 25.9% to

31.1% of natural resources exports for different specifications of the model. The coefficient of FDI inflow for the subset of data natural resources exports below the estimated threshold η_1=0.2, compared to the FDI inflow coefficient of η_1-0.07 for the subset of data with the natural resources above the estimated threshold. This indicates the presence of a nonlinear FDI-growth relationship that depends on the size of natural resources in the host country.

Poelhekke & Van der Ploeg (2013) argued that an increase in natural resources reduced FDI inflow into the non-resources sector, and Asiedu (2006) found that such diversion of FDI inflow from the non-resources sector lowers the positive spillover effect of FDI inflow. Our result is in line with these findings. Our results also reaffirm the earlier result of Hayat (2018), which showed that an increase in natural resources dampens the FDI-induced economic growth in the host country.

Studies like Poelhekke & Van der Ploeg (2013) used alternative measured of natural resources, including natural resources rents. Thus, we used natural resources rents as a measure of natural resources and estimated a natural resources rents threshold results of which are presented in table 3. The natural resources rents threshold ($\hat{\gamma}$) was estimated to be 6.6% of GDP (in columns 1,2, 5, and 6) and 9.9% of GDP (in columns 3, 4, 7, and 8), which is significant at 1% confidence level. This indicates the presence of a significant sample splitting threshold of natural resources rents, which determine the FDI-growth relationship. The coefficient of FDI inflow for the sample below the NR rents threshold is η_1=0.21 compared to the coefficient of FDI inflow for the sample above the threshold, which is η_2=0.05. This confirms that our results are robust across the different specifications and different measures of natural resources.

The coefficients of control variables like domestic investment, trade, enrollment, corruption, and law and order are found to be positive and statistically

significant, which is in line with the existing growth literature[12]. Initial GDP and population growth rate were found to have a significant negative impact on the growth rate of real GDP per capita. The coefficient of inflation rate though negative, was found to be statistically insignificant.

[12] Feng (2003), Alfaro et al. (2010), (Azman-Saini, Law, & Ahmad, 2010), Jude and Levieuge (2017)

Table 2 FDI and Economic Growth: Fixed Effect Threshold estimates of **NR exports**; dependent variable: growth rate of RGDP per capita

Variable		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Initial GDP		-0.001***	-0.001***	-0.002***	-0.001***	-0.001***	-0.001***	-0.002***	-0.001***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Domestic Investment		0.135***	0.133***	0.107***	0.106***	0.133***	0.131***	0.106***	0.105***
		(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Trade		0.007	0.007	0.011**	0.011**	0.007	0.007	0.011**	0.011**
		(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Govt Spending		-0.226***	-0.236***	-0.172***	-0.176***	-0.230***	-0.234***	-0.171***	-0.175***
		(0.036)	(0.036)	(0.037)	(0.037)	(0.037)	(0.036)	(0.037)	(0.037)
Enrollment		0.012*	0.013*	0.019***	0.020***	0.013*	0.013*	0.017**	0.018**
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Population growth rate		-1.037***	-1.037***			-1.022***	-1.022***		
		(0.096)	(0.097)			(0.097)	(0.097)		
Inflation rate		0.001		0.001		0.001		0.001	
		(0.001)		(0.001)		(0.001)		(0.001)	
FDI Inflow	*NR Exports* $\leq \gamma$	0.241***	0.213***	0.231***	0.231***	0.213***	0.213***	0.232***	0.232***
		(3.134)	(3.125)	(3.225)	(3.226)	(3.126)	(3.127)	(3.224)	(3.225)
	NR Exports $> \gamma$	0.067***	0.071***	0.077***	0.077***	7.281***	0.072***	0.078***	0.078***
		(1.576)	(1.584)	(1.636)	(1.636)	(1.583)	(1.583)	(1.634)	(1.635)
Corruption		0.201*	0.179**	0.113**	0.099*				
		(0.119)	(0.119)	(0.123)	(0.123)				
Law & Order						0.142*	0.145**	0.244**	0.246*
						(0.157)	(0.157)	(0.162)	(0.162)
Threshold Estimate ($\widehat{\gamma}$)		0.2598***	0.313**	0.313***	0.313***	0.311***	0.313***	0.313**	0.312***
Bootstrap p-value for threshold		0.000	0.040	0.000	0.000	0.000	0.000	0.020	0.000
No. of Observations		1,743	1,743	1,743	1,743	1,743	1,743	1,743	1,743
R-squared		0.178	0.172	0.115	0.114	0.172	0.171	0.116	0.115
No. of Countries		83	83	83	83	83	83	83	83

Notes: All *Regressions include a constant term. The P-value for the threshold test was bootstrapped with 10,000 replications and a 10% trimming percentage.* Initial GDP is the logarithm of real GDP per capita of the first year of every five-year subset. All the remaining variables used are in levels. ****indicate significance at 1% level ** indicates significance at 5% level * indicates significance at the 10% level. The exact model estimated is* $RGDP_{it} = \alpha + \boldsymbol{X_{it}\beta} + FDI_{it}(NR_{it} \leq \gamma)\eta_1 + FDI_{it}(NR_{it} > \gamma)\eta_2 + u_i + e_{it}$*, where NR is the natural resources exports (% of total goods exports), and X represents the set of control variables.*

Table 3 FDI and Economic Growth: Fixed Effect Threshold estimates of **NR rents**; dependent variable: growth rate of RGDP per capita

Variables		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Initial GDP		-0.001***	-0.001***	-0.001***	-0.001***	-0.002***	-0.001***	-0.001***	-0.001***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Domestic Investment		0.136***	0.135***	0.112***	0.111***	0.135***	0.134***	0.111***	0.110***
		(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Trade		0.009*	0.009*	0.012**	0.012**	0.009*	0.009*	0.011**	0.011**
		(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Govt Spending		-0.235***	-0.239***	-0.178***	-0.182***	-0.234***	-0.237***	-0.177***	-0.181***
		(0.036)	(0.036)	(0.037)	(0.037)	(0.036)	(0.036)	(0.037)	(0.037)
Enrollment		0.013*	0.013*	0.018**	0.019***	0.013*	0.013*	0.017**	0.017**
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Population growth rate		-1.045***	-1.045***			-1.031***	-1.031***		
		(0.096)	(0.096)			(0.096)	(0.096)		
Inflation rate		0.001		0.001		0.001		0.001	
		(0.001)		(0.001)		(0.001)		(0.001)	
FDI Inflow	*NR Rents* $\leq \gamma$	0.213***	0.213***	0.225***	0.225***	0.213***	0.213***	0.225***	0.225***
		(2.730)	(2.731)	(2.788)	(2.789)	(2.732)	(2.732)	(2.787)	(2.787)
	NR Rents $> \gamma$	0.057***	0.057***	0.060***	0.060***	0.058***	0.058***	0.061***	0.061***
		(1.651)	(1.652)	(1.731)	(1.731)	(1.652)	(1.652)	(1.729)	(1.729)
Corruption		0.189**	0.175**	0.120***	0.106*				
		(0.119)	(0.119)	(0.123)	(0.122)				
Law & Order						0.124**	0.127**	0.233***	0.236*
						(0.157)	(0.157)	(0.162)	(0.162)
Threshold estimate ($\widehat{\gamma}$)		0.066***	0.066***	0.099***	0.099***	0.066**	0.066***	0.099**	0.099**
Bootstrap p-value for threshold test		0.000	0.000	0.000	0.000	0.020	0.000	0.000	0.020
No. of Observations		1,743	1,743	1,743	1,743	1,743	1,743	1,743	1,743
R-squared		0.177	0.176	0.119	0.118	0.176	0.175	0.120	0.119
No. of countries		83	83	83	83	83	83	83	83

Notes: All *Regressions include a constant term. The P-value for the threshold test was bootstrapped with 10,000 replications and a 10% trimming percentage.* Initial GDP is the logarithm of real GDP per capita of the first year of every five-year subset. All the remaining variables used are in levels. *The exact model estimated is* $RGDP_{it} = \alpha + \boldsymbol{X_{it}}\boldsymbol{\beta} + FDI_{it}(NR_{it} \leq \gamma)\eta_1 + FDI_{it}(NR_{it} > \gamma)\eta_2 + u_i + e_{it}$, *where NR is the natural resources rents (% of GDP), and X represents the set of control variables.*

5 Conclusion

In this article, we investigate the relationship between natural resources, FDI inflow, and economic growth across countries. We have aimed to investigate the FDI-Growth relationship across countries with heterogeneous levels of natural resources export and estimate a threshold of the natural resource. The threshold is then tested for statistical significance in altering the FDI-growth relationship.

We have found that countries with the average natural resources export smaller than the threshold tend to experience higher FDI - induced economic growth. On the other hand, countries with natural resources exports above the estimated threshold receive a positive statistically significant; however, smaller FDI-induced economic growth than the country with the natural resources' exports below the threshold. The results are consistent across different natural resources indicators, namely natural resources exports and natural resources rents.

Results in this analysis could have been expected as studies have shown that countries with larger natural resource sectors tend to receive FDI into the natural resources sector at the cost of FDI in the non-natural resources sectors. This diversion of FDI into the natural resources sector crowds out the potential growth effect of FDI inflow. A clear policy implication for countries with a larger natural resource sector is to invest in the non-resources sector as well as attract foreign direct investment into the non-resource sector. This will enhance FDI-induced economic growth.

Bibliography

Adam, C. S., & Bevan, D. L., (2005). Fiscal deficits and growth in developing countries. *Journal of Public Economics*, 89(4), 571-597.

Alcala, F., & Ciccone, A. (2004). Trade and Productivity. *The Quarterly Journal of Economics, Vol. 119, Issue 2*, pp. 613–646, https://doi.org/10.1162/0033553041382139

Alfaro, L., Chanda, A., Kalemli-Ozcan, S., & Sayek, S. (2004). FDI and Economic Growth: The Role of Local Financial Markets. *Journal of International Economics, 64*, 89–112, http://dx.doi.org/10.1016/S0022-1996(03)00081-3.

Asiedu, E. (2006, January). Foreign Direct Investment in Africa: The Role of Natural Resources, Market Size, Government Policy, Institutions and Political Instability. *The World Economy, 29*(1), 63–77, http://dx.doi.org/10.1111/j.1467-9701.2006.00758.x.

Asiedu, E., & Lien, D. (2011). Democracy, Foreign Direct Investment and Natural Resources. *Jounal of International Economics, 84*(1), 99-111, http://dx.doi.org/10.1016/j.jinteco.2010.12.001 .

Asiedu, E. (2013) Foreign Direct Investment, Natural Resources and Institutions. IGC Working paper, https://www.theigc.org/wp-content/uploads/2014/09/Asiedu-2013Working-Paper.pdf

Azman-Saini, W., Siong, H. L., & Ahmad, A. H. (2010). FDI and Economic Growth: New Evidence on The Role of Financial Markets. *Economic Letters*, 211-213, http://dx.doi.org/10.1016/j.econlet.2010.01.027 .

Balasubramanyam, V. S. (1996). Foreign Direct Investment and Growth in EP and IS Countries. *The Economic Journal, 106*(434), 92-105, http://dx.doi.org/10.2307/2234933

Barro, R.J. (1991). Economic Growth in a Cross-Section of Countries. *The Quarterly Journal of Economics, Vol. 106, No. 2, pp. 407-443.*

Barro, R.J. (1995). Inflation and Economic Growth. *NBER Working Paper No. 5326*

Barro, R.J. (1998). Determinants of Economic Growth: A Cross-Country Empirical Study. *The MIT Press, edition 1, volume 1, number 0262522543*

Bengoa, M., & Sanchez-Robles, B. (2003). Foreign Direct Investment, Economic Freedom and Growth: New Evidence from Latin America. *European Journal of Political Economy, 19*, 529–545, http://dx.doi.org/10.1016/S0176-2680(03)00011-9

Blomstrom, M., Lipsey, R., & Zejan, M. (1994). *What Explains Developing Country Growth? Convergence and Productivity: Gross-National Studies and Historical Evidence.* NBER Working Paper No.4132, http://dx.doi.org/10.3386/w4132

Borensztein, E., De Gregorio, J., & Lee, J.-W. (1998). How Does Foreign Direct Investment Affect Economic Growth", *Journal of International Economics, 45*, 115–135, http://dx.doi.org/10.1016/S0022-1996(97)00033-0

Bruno, R., & Campos, N. (2013). Re-examining the Conditional Effect of Foreign Direct Investment. *IZA Discussion Paper 7458* Available at http://ftp.iza.org/dp7458.pdf

Bucci, A. (2015). Product proliferation, population, and economic growth. *Journal of Human Capital, Volume 9, pp. 170-197*

Butkiewicz, J.L., & Yanikkaya, H. (2011). Institutions and The Impact of Government Spending on Growth. *Journal of Applied Economics.* Vol, 14. (2), pp. 319-341.

Carkovic, M.V., & Levine, R. Eric. (2002). Does Foreign Direct Investment Accelerate Economic Growth? *University of Minnesota Department of Finance Working Paper.* Available at SSRN: https://ssrn.com/abstract=314924

Dao, A, T., (2014). Trade Openness and Economic Growth. *Mark A. Israel '91 Endowed Summer Research Fund in Economics. 2. http://digitalcommons.iwu.edu/israel_economics/2*

Dollar, D., & Kraay, A. (2003). Institutions, Trade, and Growth. *Journal of Monetary Economics Volume 50, Issue 1,* pp 133-162 https://doi.org/10.1016/S0304-3932(02)00206-4

Feng, Y. (2003). Democracy, Governance, and Economic Performance: Theory

and Evidence. *The MIT Press Cambridge, Massachusetts. United States*

Fiodendji, K (2016), 'Quality of Institutions, Natural Resources and Foreign Direct Investment (FDI) in Sub-Saharan Africa: Dynamic Approach', *Journal of Economics and Development Studies June 2016, Vol. 4, No. 2, pp. 28-55* DOI: 10.15640/jeds.v4n2a3

Frankel, J.A., & Romer, D. (1999). Does Trade Cause Growth. *American Economic Review, Vol 89, No. 3,* pp. 379-399

Gorg, H., & Greenaway, D. (2003). Much ado about Nothing? Do Domestic Firms Really Benifit from Foreign Direct Investment? *IZA Discussion Paper 944* Available at: http://ftp.iza.org/dp944.pdf

Gui-Diby, S.L. (2014). Impact of Foreign Direct Investment on Economic Growth in Africa: Evidence from Three Decades of Panel Data Analyses. *Research in Economics, Volume 68, pp. 248-256*

Hansen, B. E (1996). Inference when a nuisance parameter is not identified under the null hypothesis. *Econometrica 64*, pp. 413-430

Hansen, E. B. (2000). Sample Splitting and Threshold Estimation. *Econometrica, 68*(3), 575-630, http://dx.doi.org/10.1111/1468-0262.00124

Harrison, A. (1996). Openness and Growth: A Time-Series, Cross-Country Analysis for Developing Countries. *Journal of Development Economics, Vol 48,* pp. 419-447

Havranek, T., & Irsova, Z. (2011). Estimating Vertical Spillovers from FDI: Why Results Vary and What the True Effect Is? *Journal of International Economics, 85*(2), 234-244, http://dx.doi.org/10.1016/j.jinteco.2011.07.004

Hayat, A. (2018). FDI and Economic Growth: The Role of Natural Resources? *Journal of Economic Studies Vol 45 Issue No.2 pp 283-295. https://doi.org/10.1108/JES-05-2015-0082*

Hermes, N., & Lensink, R. (2003). Foreign Direct Investment, Financial Development and Economic Growth . *Journal of Development Studies, 40*, 142–163, http://dx.doi.org/10.1080/00220380412331293707

Javorcik, B. S. (2004, June). Does Foreign Direct Investment Increase the Productivity of Domestic Firms? In Search of Spillovers Through Backward Linkages. *The American Economic Review*, 605-627, http://dx.doi.org/10.1257/0002828041464605

Jude, C., & Levieuge, G. (2017), 'Growth Effect of Foreign Direct Investment in Developing Economies: The Role of Institutional Quality, *the world economy vol 40, issue 4 pp.715-742* https://doi.org/10.1111/twec.12402

Khan, M.S., & Senhadji, A.S., (2001). Threshold Effects in the Relationship between Inflation and Growth. *IMF Staff Papers, 48*(1), 1-21. http://www.jstor.org/stable/4621658

Kekic, L. (2005). Foreign direct investment in the Balkans: recent trends and prospects. *Southeast European and Black Sea Studies, 5*(2), http://dx.doi.org/10.1080/14683850500122687

Knack, S., & Keefer, P. (1995). Institutions and Economic Performance: Cross-country Tests Using Alternative Institutional Measures. *Economics and Politics, Vol. 7, No. 3.* pp. 207-227

Kormendi, R.C., & Meguire, P.G. (1985). Macroeconomic Determinants of Growth: Cross-country Evidence. *Journal of Monetary Economics, Volume, 16, Issue 2.* Pp. 141-163 https://doi.org/10.1016/0304-3932(85)90027-3

Leite, C. and M. Weidmann (1999) 'Does Mother Nature Corrupt? Natural Resources, Corruption and Economic Growth', IMF Working Paper WP/99/85. *Washington, D.C: International Monetary Fund.*

Levine, R., & Renelt, D. (1992). A Sensitivity Analysis of Cross-Country Growth Regressions. *American Economic Review, American Economic Association, vol. 82(4),* pages 942-963.

Mankiw, N.G., Romer, D., & Weil, D.N. (1992). A Contribution to the Empirics of Economic Growth. *The Quarterly Journal of Economics*, pp. 407-437

Mauro, P. (1995) 'Corruption and Growth', *Quarterly Journal of Economics, 90: 681–712*

Poelhekke, S., & Van der Ploeg, F. (2013). Do Natural Resources Attract Nonresource FDI? *Review of Economics and Statistics* Volume 95 (3) pp.1047-1065 https://doi.org/10.1162/REST_a_00292

Reganati, F., Pittiglio, R., & Sica, E. (2008). Horizontal and Vertical Spillovers from FDI in the Italian Productive System. *Dipartimento di Scienze Economiche, Matematiche e Statistiche Università Degli Studi di Foggia*. Available at: http://www.economia.unifg.it/sites/sd01/files/allegatiparagrafo/29-11-2016/q082008_abstract.pdf

Romer, P. (1990). Endogenous Technological Change. *Journal of Political Economy*. Volume 98(5), pp.71-102

Sachs, J. D., & Warner, A. M. (2001). Natural Resources and Economic Development The curse of natural resources. *European Economic Review, 45*, 827-838. Available at: www.earth.columbia.edu/sitefiles/file/about/director/pubs/EuroEconReview2001.pdf

Sala-i-Martin, X, Subramanian A. (2012) 'Addressing the Natural Resource Curse: An Illustration from Nigeria' *Journal of African Economies, Vol. 22, number 4, pp. 570–615* doi:10.1093/jae/ejs033

Solow, R.M. (1956). A Contribution to the Theory of Economic Growth. *The Quarterly Journal of Economics, Vol. 70, No. 1 pp. 65-94*

Stockman, A. (1981). Anticipated Inflation and the Capital Stock in Cash in-advance Economy. *Journal of Monetary Economics, Vol 8, Issue 3,* pp. 387-393.

Trojette, I. (2016) The Effect of Foreign Direct Investment on Economic Growth: The Institutional Threshold. *Région et Développment*, 43, 111-138.

Van der Ploeg, F. & Poelhekke, S. (2009), Volatility and the Natural Resources Curse. *Oxford Economic Papers,* Volume. 61(4), pp. 727-760

Wang, Q. (2015). Fixed-Effect Panel Threshold model using Stata. *The Stata Journal, 15*(1), 121-134, Available at http://www.statajournal.com/article.html?article=st0373

Appendix I

Table.1 Definition of Variables

Variable	Description	Source
FDI Inflow	Net FDI Inflow as a percentage of GDP measured in 2010$.	UNCTAD
GDP growth	Growth Rate of Real GDP Per capita	WDI
NR Exports	Percentage of Natural Resource exports in goods exports Fuels comprise the commodities in SITC section 3 (mineral fuels, lubricants, and related materials). Ores and metals comprise the commodities in SITC sections 27 (crude fertilizer, minerals nes); 28 (metalliferous ores, scrap); and 68 (non-ferrous metals).	WDI
NR Rents	Rents received from natural resources exports as a percentage of GDP.	WDI
Inflation rate	Rate of growth of consumer price index	WDI
Trade	The sum of exports and imports as a percentage of GDP	WDI
Govt Spending	Government consumption expenditure as a percentage of GDP	WDI
Initial GDP	The GDP per capita of the initial year of each five-year subset of the dataset starting 1991.	WDI
Population Growth Rate	The annual growth rate of the population of the country	WDI
Domestic Investment	Gross domestic capital formation as a percentage of GDP (Gross domestic investment)	WDI
Enrollment	Gross secondary school enrollment rate of secondary school-going age	SDG's of UIS
Corruption	It evaluates the degree of corruption within the political system	PRS-IRCG
Law & Order	Quantifies Law and Order, that is, the strength and impartiality of the legal system	PRS-IRCG

Table. 2 List of Countries:

Angola	Egypt, Arab Rep.	Korea South	Poland
Australia	El Salvador	Madagascar	Portugal
Austria	Finland	Malawi	Romania
Bahamas, The	France	Malaysia	Saudi Arabia
Bahrain	Gabon	Mali	Senegal
Bangladesh	Germany	Mexico	Singapore
Bolivia	Ghana	Mongolia	South Africa
Botswana	Guatemala	Morocco	Spain
Brazil	Guinea	Namibia	Sri Lanka
Bulgaria	Guyana	Netherlands	Sudan
Burkina Faso	Honduras	New Zealand	Sweden
Cameroon	Iceland	Nicaragua	Switzerland
Canada	India	Niger	Thailand
Chile	Indonesia	Nigeria	Tunisia
China	Ireland	Norway	Turkey
Colombia	Israel	Oman	Uganda
Costa Rica	Italy	Pakistan	United Arab
Cote d'Ivoire	Jamaica	Papua New Guinea	United
Denmark	Japan	Paraguay	United States
Dominican Republic	Jordan	Peru	Uruguay
Ecuador	Kenya	Philippines	