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FDI and Economic Growth: The Role of Natural Resources?

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Abstract

This paper focuses on the relationship between FD inflows, natural resource abundance and economic growth. For a large dataset of 104 countries for the period 1996-2015, the paper applies Arellano and Bond GMM estimation to investigate natural resource curse, the impact of FDI inflow on economic growth growth and more finally the role of natural resource sector on the FDI-growth relationship. The paper found a positive and significant affect 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 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.

Keywords: Foreign Direct Investment, Economic Growth, Natural Resources, Resource Curse, GMM

JEL Classification: F23, F43, O4, Q0

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I. Introduction:

The role of foreign direct investments (FDI) inflow in the economic growth of host countries has been studied extensively. While 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); (Havranek & 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 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 & Lensink, 2003) (Alfaro et al., 2004) (Azman-Saini et al., 2010) (Alfaro L. , Chanda, Ozcan, & Sayek, 2010), trade liberalization (Borensztein et al., 1998), level of economic development (Blomstrom et al., 1994), economic stability and liberal markets (Bengoa & Sanchez-Robles, 2003), Institutional quality (Jude & Leveigue, Growth Effect of FDI in Developing Economies: The Role of Institutional Quality, 2015), technology gap between the host and FDI originating country (Havranek & Irsova, 2011), shared ownership of the FDI firm and lower level of corruption (Freckleton et al., 2012).

However, the debate about the growth inducing role of FDI is far from over and there are studies that question the impact of FDI on economic growth of the host country. In a metadata analysis of the FDI spillover (Havranek & Irsova, 2011) found that the spillover effect of FDI in local economic is smaller than projected by most of the papers. Examining the firm level data from

Venezuela, (Aitken & Ann E, 1999) doubts 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 manufacturing sector, no significant effect of FDI in 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 relationship. This paper considers one such factor i.e. the size of 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 & 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 & 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 role of natural resource abundance.

This paper tries to answer the following main questions. Does FDI inflow contribute to GDP growth in the host country after controlling for endogeneity? Does natural resource curse exist after controlling for institutional quality heterogeneity? And more importantly, does natural resource abundance alter the FDI-Growth nexus?

The main contribution of this paper is twofold. First, the paper is to look into the impact of the size of the resource sector on the economic growth. Literature on FDI-growth effect to the knowledge of the author has ignored the potential role of natural resource sector in alter the FDI-growth relationship. This paper is an attempt to close that gap in the literature. Secondly this paper uses a larger dataset of 104 countries for the period 1996-2015 and adopts a simple dynamic panel data model and used GMM estimation based on (Arellano & Bond, 1991) to answer the question of 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.

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 results of this paper is that natural resource abundance alter 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.

The remainder of the paper is structured as follows: Section II provides conceptual background and arguments for the channels through which natural resource abundance affect FDI-growth relationship. Section III describes data and methodology adopted for the paper. Section IV presents the main results of the paper and section V concludes the paper.

II. Why Natural Resource Abundance may Alter 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 non-resource tradable sector of the economy. The aggregate level of FDI inflow is expected to fall because of increased resource sector (Aseidu & 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) conclude 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 & van der Ploeg, 2013). This will result in greater capital accumulation in resource sector and will increase resource exports further. Natural resource exports are associated with slower growth rate (Sachs & 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 affect of FDI. 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 tern 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 & Subramanian, 2008) (Busse & Gröning, 2013). This also reduces the potential growth inducing affect of FDI because countries with (Jude & Leveuge, 2014) (Hayat, 2016). (Donato & 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 revisit 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.

III. Methodology

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

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

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} represent 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 is included in order to find out if the presence of natural resource in the country alter the FDI-growth relationship.

$$Y_{it} = \alpha Y_{it-1} + \gamma FDI_{it} + \theta NR_{it} + \varphi (FDI_{it} \times NR_{it}) + X_{it} \beta + \eta_{it} \quad (2)$$

where

$$\eta_{it} = \mu_i + \delta_{it}$$

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 dynamic panel data 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 dynamic panel data 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 & Mody, 1992). Therefore, this paper uses lagged value of FDI as an instrument to 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 (Arellano & Bond, 1991) GMM estimation method. Arellano and Bond GMM estimators provides consistent estimators and are best suited for data with a relative 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.

IV. Data

This section presents data, sources of data and explain 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 is 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 are used in the analysis. The data on these variables is obtained from World Bank database [2] Natural resources exports as a share of total export is used as an indicator for natural resource. Studies exploring the impact of natural resource abundance on productivity (e.g. (Sachs & Warner, 2001) have used share of natural resources in the good export as an indicator for the size of natural resources sector. Data is obtained in the form of “fuels plus ore and metal” exports

² World Bank database can be accessed from <http://databank.worldbank.org/data/home.aspx>

as a share of good exports from the World Bank database. Data on institutional quality and governance variables is obtained from the Worldwide Governance Indicators (WGI)³ project (Kaufmann et al., 2002). The institutional quality variable is an average of the 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 1-100 where 1 represent lowest level of institutional quality and 100 represent the highest institutional quality and governance. The variable selection is in line with the standard literature on FDI, natural resources and economic growth (Barro & Sala i Martin, 2003)

Table1. Descriptive Statistics

Variable	Mean	Std. Deviation	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	13430.2	17293.2	149.36	102910.4
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

³ WGI indicators database and methodology can be accessed at <http://info.worldbank.org/governance/wgi/#home>

Table 1 above present 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 $\ln(\text{FDI}/\text{GDP}+1)$ and for 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 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/GDP) and institutional quality is the natural logarithm of the average rank of six institutional quality measures. The measures are further described in appendix 2.

V. Analysis of Results:

This section presents the results of the estimated models. Table 2 below show 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 $\frac{dY}{d\ln\text{FDI}} = \gamma$. Therefore the estimated coefficient of FDI is $\hat{\gamma} = 11.032$ which means that one 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 and population growth rate and inflation rate both are negative and significant which again is in line with literature. Government spending and money supply both have negative and significant coefficient. The results about the government spending are mixed and many empirical results show negative impact of government spending on economic growth.

Table2: 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 _{t-1}	-0.006 (0.038)
FDI	11.032*** (2.731)
FDI _{t-1}	-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 (P-Value)+	0.0899

Country clustered robust standard are presented in parenthesis. *** indicates a significance at a 1% confidence interval, **indicates a significance at a 5% confidence interval and * indicates a significance at a 10% confidence interval.

+ H0: No Serial Autocorrelation

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 alter the FDI-economic growth relationship and to estimate how much change does one standard deviation increase in the natural resources brings about in the economic growth of a country that is attracting average amount of FDI. Moreover, 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 $\frac{d \ln Y}{d \ln FDI} = \gamma$, therefore the coefficient of our interest for finding the impact of FDI on economic growth is $\hat{\gamma}$. As shown in table 3 below $\hat{\gamma} = 18.483$. which is positive and strongly significant. Ignoring the level of natural resource and its impact on the FD-growth relationship this tell us that one 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

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

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

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

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 one 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 the γ which estimated the affect of FDI inflow on economic growth without taking into account the natural resource abundance.

Table 3: 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 _{t-1}	-0.045*** (0.010)
FDI	18.483*** (4.544)
FDI _{t-1}	-1.052 (2.986)
NR	-0.408* (0.222)
(FDI X 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 (P-Value)+	0.304

*Country clustered robust standard are presented in parenthesis. *** indicates a significance at a 1% confidence interval, ** indicates a significance at a 5% confidence interval and * indicates a significance at a 10% confidence interval.*

+ H0: No Serial Autocorrelation

Considering the example of Malaysia with an average natural resource export of 15.031% 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 $\frac{dY}{d\ln FDI} = 18.483 - 6.028 (2.71) = 2.146$. Now assuming that the average natural resource export of Malaysia goes up by 10%, the resulting impact of FDI on economic growth is 1.571 ($\frac{dY}{d\ln FDI} = 18.483 - 6.028 (2.805) = 1.571$) 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% of its exports consisting of natural resources. The impact of FDI inflow on economic growth for Algeria is -9.12 ($\frac{dY}{d\ln FDI} = 18.483 - 6.028 (4.579) = -9.123$). This means that for a high resource exporting country like Algeria, FDI inflow contributes negatively to its economic growth and a 1% increase in FDI inflow will lead to a 0.09 percentage points decrease in economic growth of Algeria. The explanation of this negative effect would be that in country with large resource sector which experience 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 $\frac{dY}{d\ln NR} = \theta$ therefore, the coefficient of our interest for natural resource is $\hat{\theta}$. As shown in the table 3 below $\theta = -0.408$, 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

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

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

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

This shows a marginally stronger negative effect of natural resources on economic growth for countries that attract mean level of FDI inflow. This tells us that in countries with larger natural resource sectors FDI inflow leads to intensify 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.

VI. Conclusion:

This paper focuses on the relationship between FDI inflows, natural resource abundance and economic growth. The paper attempts to investigate the impact of FDI inflow on economic growth. Further the paper investigates natural resource curse for a large dataset of 104 countries. However, the main contribution of the paper is to investigate the role of the natural resource sector on the FDI-growth relationship.

The results conclude 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 the natural resource sector will lead to a negative effect of FDI on economic growth.

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Appendix

A1

104 countries are included in the study which are divided into three categories of poor income, middle income and high income countries by the World Bank. The countries are the following.

Low income countries are

Burkina Faso Cambodia Kenya Madagascar Malawi Mali Mozambique Rwanda Tanzania Togo
Uganda

Middle income countries are

Albania Algeria Argentina Barbados Belize Bolivia Botswana Brazil Bulgaria Cameroon China
Colombia Costa Rica Cote d'Ivoire Dominican Republic Ecuador Arab Republic of Egypt El
Salvador Gabon Ghana Guatemala Honduras Hungary India Indonesia Jamaica Jordan Kazakhstan
Malaysia Mauritius Mexico Moldova Mongolia Morocco Nicaragua Pakistan Panama Paraguay
Peru Philippines Romania Senegal South Africa Sri Lanka Sudan Thailand Togo Trinidad and
Tobago Tunisia Turkey Ukraine Venezuela, RB Vietnam Republic Zimbabwe

High income countries

Azerbaijan Australia Austria Bahrain Belgium Brunei Darussalam Canada Chile Croatia Cyprus
Czech Republic Denmark Finland France Germany Greece China Iceland Ireland Israel Italy Japan
Korea, Republic Malta Netherlands New Zealand Norway Oman Poland Portugal Qatar Russian
Federation Saudi Arabia Singapore Slovak Republic Slovenia Spain Sweden Switzerland United
Kingdom United States Uruguay

A2

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
