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FDI and Economic Growth: The Role of Natural Resources

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Abstract:

In the paper, I explored links between inflow of FDI, natural resource abundance and economic growth. The paper is an attempt to analyze a lager sample of 106 countries and investigate the impact of FDI inflow on the economic growth of the host country. Further, natural resource abundance is considered to slow down the economic growth. The paper explores if the natural resource abundance affect the FDI-growth relationship. Using panel data for a sample the period 1993-2012, the paper uses fixed effects model and conclude that FDI inflow accelerates economic growth of the host country. However, the presence of natural resources slows down the FDI induced growth. The same results hold after controlling for endogeneity.

Keywords: Foreign Direct Investment, Economic Growth, Natural Resources, Resource Curse, Hausman Test
JEL: F23, F43, O4, Q0

I. Introduction:

The role of foreign direct investment (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. 2007; Havranek and Irsova 2011) conclude a positive effect of FDI on economic growth. Gorodnichenko et al. (2007) examined firm level data from 17 emerging economies for the period 2002-2005 in order to find out the impact of FDI inflow on the productivity and spillover effect on the host country firms. The study found a strong vertical spillover effect for both supplier and consumer firms in the domestic economy. Examining the data from 1970-1990 for a large 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.

However, other studies failed to find any positive effect of FDI on economic growth (Borensztein et al. 1998). In a metadata analysis of the FDI spillover, Havranek and 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 and Harrison (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.

The relationship between FDI and economic growth has been explored from many aspects. Studies reveal that the relationship between FDI and host country economic growth is dependent up on many other relevant factors and variations in these factors substantially alter the relationship.

Trade volume is considered one of the most important factors affecting the role FDI in economic growth in the host country. Examining a cross sectional data of 46 developing

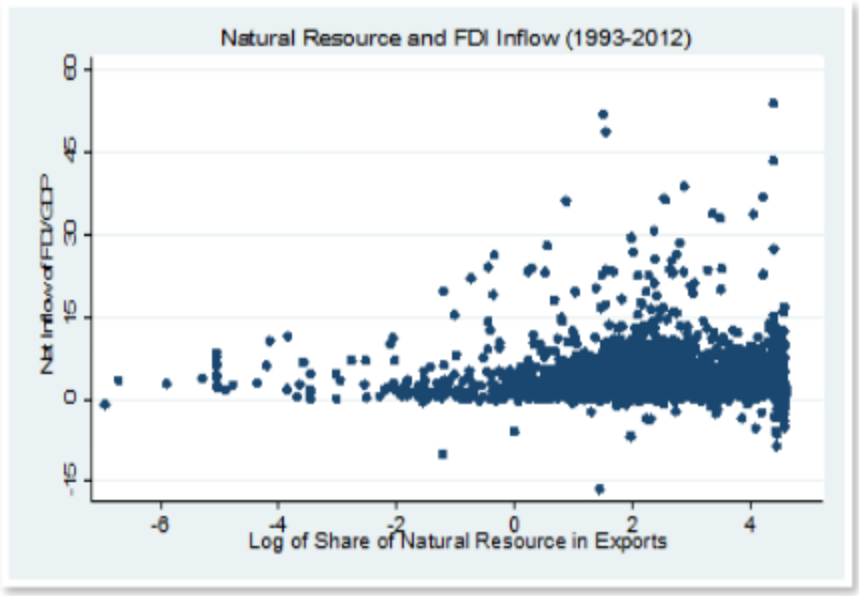
countries Balasubramanyam et al. (1996) conclude that the growth effect of FDI inflow is greater for export promoting countries as compared to the import substituting countries. In a metadata analysis Havranek and Irsova (2011) found that countries more open to international trade receive greater FDI spillover than others.

Other studies reveal the importance of many relevant factors in determining the FDI-host country economic growth relationships. For example Borensztein et al. (1998) found that FDI is an important factor for technology transfer and economic growth. However, the growth enhancing effect takes place only when the host country has an absorptive capacity in terms of minimum threshold of human capital. Examining data from a panel of 18 Latin American countries, Bengoa et al. (2002) conclude that while FDI affect economic growth positively, adequate level of human capital, economic stability and liberalized markets in the host country are needed in order to benefit from FDI.

Development level of financial markets is an important determinant of the FDI-economic growth relationship. Countries with well-developed financial markets gains significantly from FDI in terms of growth (Alfaro et.al 2010). The impact of FDI inflow on the economic growth in terms of productivity spillovers take place if the country in question has a well-developed financial system that can provide credit facilities to the firms wanting to expand. Azman-Saini et al. (2010) developed a threshold model for financial markets development for its role in determining the impact of FDI on economic growth in the host country and conclude that FDI is an important factor that positively affect economic growth. However, the positive effect of FDI takes place only when the host country has a minimum level of threshold financial sector development. Examining cross sectional data for a large group of countries. Other factors affecting the impact of FDI on host country economic growth are the technology gap between the host and origin country (Havranek and Irsova 2011) and shared ownership of the FDI firm (Javorcik 2004).

The studies while exploring many aspects of the FDI-growth relationships, do not examine the possible role of the natural resource abundance in the host country on the FDI-growth relationship and on the potential productivity spillovers. Multinational firms invest beyond the national boarder and are attracted to different locations for many reasons. Natural recourse endowment is one of the many factors attracting FDI (Kekic 2005). Asiedu (2005) found for a set of African countries that besides other things natural resources attract FDI inflow. (See Fig.1).

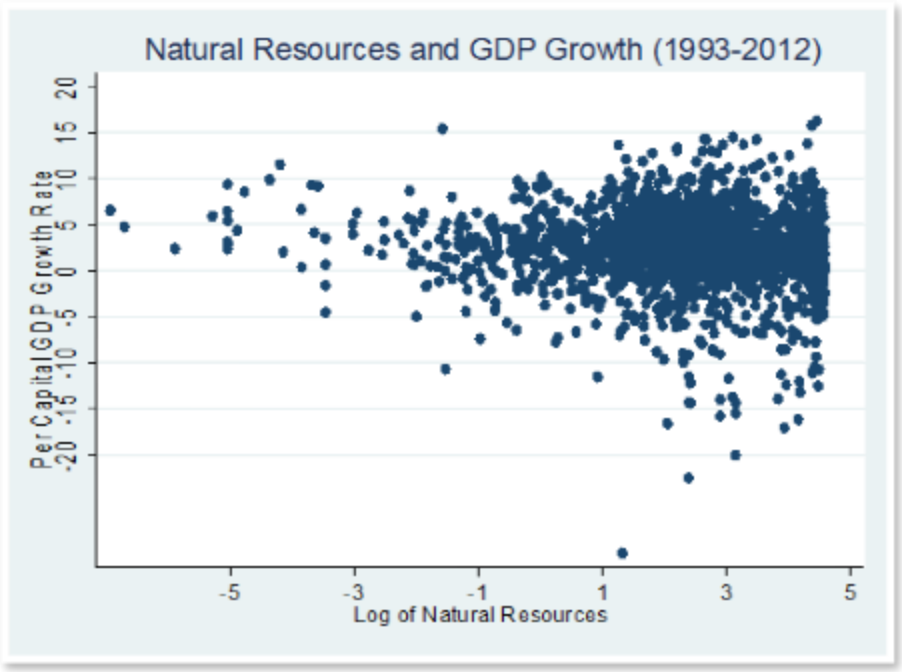
Figure. 1



However, the abundance of natural resources in a country also effects the type of FDI the country attracts. Analyzing the role of natural resources in attracting FDI, Poelhekke and Van der Ploeg (2010) found out that natural resources attract higher resource FDI and crowds out the non-resource FDI. This effect of natural resource abundance on the sector wise composition of natural resource alter the FDI-growth relationship in the overall economy of the country. According to Asiedu (2005) "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".

While the abundance of natural resources attract FDI into the country and change the composition of FDI inflow in favor of the resource sector, the size of the resource sector of an economy is generally associated with the slower growth of the economy. Natural resource rich countries fail to grow faster than the resource scarce countries (Sachs and Warner 1997).

Figure. 2



The phenomenon is often referred to as the "resource curse". Many studies have attempted to explain the causes behind the resource curse. One of the main causes is that resource abundance lead to higher corruption in government. In a panel data analysis of natural resources Busse et.al (2011) found out that natural resources led to increase in corruption level. De Rosa et.al (2012) concluded that the high degree of resource exports is associated with the worse government effectiveness and reduced level of competitiveness.

Natural resource abundance attract the FDI into resource sector and causes the resource sector to grow larger. The larger the size of the resource sector is, the larger the resource

curse is expected to be and the economic growth of the country is expected to be slower. Therefore, it is pertinent to question the role of natural resource abundance in the FDI-growth relationship. The abundance of natural resources in the country is expected to attract larger proportion of the FDI inflow into the resource sector. The concentration of FDI in the resource sector expand the sector relative to the size of the economy. However, as explained by the phenomenon of resource curse, countries with the larger resource sector grow slower than countries with smaller resource sector. Therefore, it is logical to think that the expansion of the resource sector due to inflow of FDI would speed up the "slowing down" effect of the resource sector the overall economic growth of the country.

The paper is an attempt to analyze a larger dataset of 106 countries and investigate the impact of FDI on the economic growth of the FDI receiving country taking into account the size of the resource sector relative to the size of the economy. The paper try to answer if the abundance of resources in a country alters the FDI-growth relationship in that country. The rest of the paper is organized as the following. Description of data is presented in section II and is followed by methodology in section III. Results are presented in section IV while section V concludes the paper.

II. Data:

In this section, the data about all the variables used in the paper is described. The study is based on analyzing data for the period of 20 years from 1993 to 2012 from 106 countries classified into low income countries, middle income countries and high income countries according to the World Bank criteria. I used real per capital GDP growth and the ratio of net FDI inflow to GDP which is obtained from World Bank database [2].s In order to capture the role of human capital for economic growth (absorptive capacity), many studies have used schooling variable. Schooling is

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

measured by the "average years of secondary school attainment" which is obtained from Barro and Lee (1996). Data on ratio of trade volume and GDP, initial GDP, ratio of gross domestic private investment and GDP, ratio of government spending and GDP and M2/GDP, population growth rate and inflation is also obtained from the World Bank database. Money supply (M2) is used as instrument for financial markets development which besides similar indicators is used as an instrument for the financial markets development by Alfaro et al. (2004). 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 and Warner 1997) have used share of natural resources in the good export as an indicator for the size of natural resources sector. Data is obtain in the form of "fuels plus ore and metal" exports as a share of good exports from the World Bank database.

Table1. Descriptive Statistics

Variable	Observation	Mean	Standard Deviation	Min	Max
Real GDP Growth Per Capita	2120	2.357184	4.042897	-30.69423	16.19617
Net Inflow as percent of GDP	2120	3.914004	5.030745	-16.41802	53.81077
Percentage Share of NR in Goods Exports	2120	23.25761	27.75933	.0009666	99.70905
Trade Volume	2120	0.8509623	0.5329907	0.1454222	4.602714
Schooling	2120	2.758	1.388604	0.08	7.48
Private Investment/GDP	2120	0.2272467	0.0820041	-0.5090844	0.8592907
Population Growth Rate	2120	1.317804	1.414712	-3.820174	17.31492

The 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, schooling, domestic investment and population growth. There are huge variations in

the data. The biggest negative growth in Real GDP is recorded in the year 1994 for Moldova while the biggest positive growth rate in real GDP per capita is recorded at 16.19 by Venezuela. Net FDI inflow also show a lot of variations ranging from -16.41% of GDP for Hungry in the year 2010 to 53.81% of GDP in Mongolia. Natural resource export ranges from as low as 0.0009 percent of total goods exports for Belize in 2003 to 99.70% of total goods export for Brunei Darussalam in the year 1993.

III. Methodology:

In order to find out the impact of FDI on economic growth of the host country the following model is estimated

$$Growth_{i,t} = \beta_0 + \alpha_i + \beta_1 FDI_{i,t} + \beta_2(Control\ Variables_{i,t}) + \boldsymbol{\varepsilon}_{i,t} - - - - - (1)$$

Growth in the model above refers to the real growth rate of GDP per capital, FDI is the log of net FDI inflow as a percentage of GDP. The control variables include initial GDP, population growth rate, trade volume, gross domestic investment, government consumption spending, Inflation rate, money supply (M2) and schooling. Money supply (M2) is included in order to capture the level of financial markets development. The variable M2 is used because it is easily available for the large sample of countries used in the paper. The α_i in the model (1) above is random variable and is fixed across the time series and it captures the unobserved heterogeneity across the cross-sections of the data. If the α_i is correlated with the error term then the appropriate model to estimate the coefficients would be the fixed effect model otherwise random effect model would be best to estimate. Further country lever cluster robust standard errors are estimated. In order to choose appropriate panel data model the following Hausman specification test is estimated.

Ho: COV $(\alpha_i, \boldsymbol{\varepsilon}_{i,t})$ =0 (βRE is consistent and efficient and βFE is consistent but inefficient)

H1: COV ($\alpha_i, \boldsymbol{\varepsilon}_{i,t}$) ≠0 (βRE is inconsistent and βFE is consistent)

Based on the hausman test I chose the appropriate model to estimate the equation (1).

The Role of Natural Resources:

The purpose of the paper is to examine the impact of the natural resource abundance on the FDI-Economic growth relationship. Natural resource abundance is considered to be changing the pattern of FDI the country attracts in favor of resource sector. The phenomenon of resource curse explains that the countries with the larger resource sector tend to grow slower than other countries. Therefore, FDI inflow by expanding the resource sector is expected to slow down the economic growth in the host country. Therefore, the presence of a larger resource sector is expected to cause the FDI inflow to affect the overall economic growth negatively or at least decrease any possible FDI induced growth effect.

In order to capture the role of natural resources in altering the FDI, growth relationship, a modified model is estimated that include the variable natural resources and an interaction term between the natural resources and FDI.

$$Growth_{i,t} = \beta_0 + \alpha_i + \beta_1 FDI_{i,t} + \beta_2\left(Natural\ Resource_{i,t}\right) + \beta_3\left(Natural\ Resource_{i,t} \times FDI_{i,t}\right) + \beta_4(Control\ Variables_{i,t}) + U_{i,t} - (2)$$

In order to estimate the appropriate model again the Hausman test for specification is estimated and I choose the best model between the fixed effect and random effect model based on the results from the following hypothesis.

Hypothesis:

Ho: COV ($\alpha_i, U_{i,t}$) =0 (βRE is consistent and efficient and βFE is consistent but inefficient)

H1: COV ($\alpha_i, U_{i,t}$) ≠0 (βRE is inconsistent and βFE is consistent)

IV. Analysis of Results:

In order to choose the appropriate model for estimation of equation (1), the hausman test for specification is estimated. The results from hausman tests are below.

$$x^2(9) = (\mathrm{b} - \mathrm{B})'[(\mathrm{Var}\ (\mathrm{b}) - \mathrm{Var}\ (\mathrm{B})]) - 1(\mathrm{b} - \mathrm{B})$$

$$= 32.36$$

$$Prob > x^2\ (9) = 0.0002$$

Based on the above test at 5% confidence interval we can reject the null hypothesis and therefore choose to estimate the fixed effect model based on equation (1) and the results are presented in the table 2 below. The table 2 below show the estimated coefficients against the robust standard errors and the p-values. It can be seen from the results clearly that the coefficient of FDI is significant and show that FDI inflow strongly enhances growth rate of the host country economy. The result is in line with the majority of earlier studies. The coefficients of Money supply (which is used as an indicator for the financial markets development) initial GDP and domestic investment are positive and significant. Coefficient of trade volume is positive, however insignificant. Government spending, inflation rate and population growth rate are all negative and significant which are according to the expectations. However, schooling coefficient turned out to be insignificant and unexpectedly negative.

Table. II Fixed Effect Estimates from Equation (1), FDI and Economic Growth:
Dependent Variable ---Growth Rate of Real GDP Per Capita

EXPLANATORY VARIABLES	COEFFICIENTS	ROBUST ST. ERRORS	P-VALUES

FDI	0.3935579	0.1264894	0.002
POPULATION GROWTH RATE	-0.8309264	0.2174761	0.000
INITIAL GDP	4.28689	0.7851106	0.000
SCHOOLING	-1.680057	1.288161	0.195
INFLATION	-3.444187	1.242565	0.007
MONEY SUPPLY (M2)	0.4412349	0.2102992	0.038
GOVT CONSUMPTION EXPENDITURE	-0.7335161	0.1662518	0.000
TRADE VOLUME	0.4690785	0.8564131	0.585
INVESTMENT	2.117069	0.7877093	0.008
R-SQUARED	0.0029		
CORR(U_I, XB)	-0.9597		

Note: The regression has a constant term. FDI is log of net inflow of FDI as a percent of GDP, initial GDP is log of initial GDP, and schooling is log (1+ average number of secondary school years), inflation is log (1+inflation rate), money supply is log of ratio of M2 and GDP, Government consumption expenditure is log of the ratio of government consumption expenditure and GDP, trade volume is the log of ratio of trade volume and GDP and investment is the log of ratio of gross private investment and GDP.

Equation (2) is estimated with an interaction term between FDI and NR in order to estimate the role of natural resources in economic growth 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?

The following hausman test for specification is estimated again to choose the appropriate model for estimation of equation (2).

$$x^2(9) = (\mathrm{b} - \mathrm{B})'[(\mathrm{Var}\ (\mathrm{b}) - \mathrm{Var}\ (\mathrm{B})]) - 1(\mathrm{b} - \mathrm{B})$$
$$= 34.30$$
$$Prob > x^2\ (9) = 0.0003$$

From the test results above we can reject the null hypothesis and choose to estimate the fixed effect model for equation (2). Results of the fixed effect model are given in the table III below.

Table. III FDI-GDP Relationship: The Role of Natural Resources, Dependent Variable—Growth Rate of Real GDP Per Capita

EXPLANATORY VARIABLES	COEFFICIENTS	ROBUST ST. ERRORS	P-VALUES
FDI	0.5061783	0.1379253	0.000
NATURAL RESOURCES (NR)	-0.3542202	0.1544536	0.024
FDI X NR	0.1184186	0.0618053	0.058
POPULATION GROWTH RATE	-0.8664374	0.2272307	0.000
INITIAL GDP	5.700979	1.025478	0.000
SCHOOLING	-1.260249	1.345865	0.351
INFLATION	-3.408732	1.243534	0.007
MONEY SUPPLY (M2)	0.4401302	0.2108278	0.039
GOVT CONSUMPTION EXPENDITURE	-0.7668331	0.1679339	0.000
TRADE VOLUME	0.6494067	0.8555337	0.450
INVESTMENT	2.11283	0.7320628	0.005
R-SQUARED	0.0010		
CORR(U_I, XB)	-0.9779		

Note: The regression has a constant term. Natural resources (NR) is the log of share of natural resources export (fuels plus ore and metal) in the total goods export.

The natural resource coefficient$\beta_2 = -0.3542202$, so in case the FDI inflow is zero, the coefficient of natural resource is negative and significant. 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. However, in case there is an inflow of FDI and the FDI inflow is controlled for in the model then the effect of natural resource is dGrowth/dlnNR = $\beta_2 + \beta_3$ lnFDI. So at the mean value of FDI inflow the net effect of NR on the economic growth is -0.3542202+0.1184186 (-0.15066) ≈ -0.37206114627. This shows a marginally stronger negative effect of natural resources on economic growth when a mean level of FDI inflow occurs. This can be explained as the FDI inflow into countries with natural resource sector accelerates the growth hampering effect of natural resources.

The FDI coefficient $\beta_1 = 0.5061783$ is positive and significant. However, considering the FDI alone would be misleading because this tells us the impact of FDI inflow incase where the natural resources in a country is zero. Therefore, the total effect of FDI inflow on the economic growth of host country while controlling for the natural resources would be dGrowth/dlnFDI = $\beta_1 + \beta_3$ lnNR. So at the mean value of natural resources the net effect of FDI inflow on economic growth is 0.5061783 + 0.1184186 (-1.4585) ≈ 0.3334647719. The statistical significance of the term $\beta_1 + \beta_3$ lnNR is tested by re-running the model and replacing the interaction term by ln_FDI X (ln_NR- ln Mean of NR). The P-value is less than 0.05 therefore, the term is concluded to be statistically significant. In this case of mean natural resources the impact of FDI inflow on the host country economic growth is still positive however smaller than the impact the FDI inflow had on economic growth without controlling for natural resources. Which is an evidence of the fact that the FDI inflow into the resource sector causes slower growth in the overall economy compare to the inflow of FDI in the non-resource sector.

Endogeneity Issues:

The issues of endogeneity has not been discussed until now in the paper. However, FDI is considered to be endogenous. FDI is very likely to vary with the growth rate of economy. In order to tackle the problem of endogeneity, the paper use real affective exchange rate (REER) and lagged value of the FDI as instruments for FDI. Many studies on FDI have used Real exchange rate as an instrument for the FDI. It is considered to be determinant of FDI because it affects foreign investor's decision making through its role in determining the relative cost and relative wealth. The lagged value of FDI is considered to be a very useful instrument of the FDI. Wheeler and Mody (1992) found that FDI is self-enforcing and the existing stock of FDI attracts more FDI. Results from the generalized method of moments (GMM) model using REER and FDI lagged value as instruments are presented in table IV.

Table. IV FDI-GDP Relationship: The Role of Natural Resources, (GMM) Dependent Variable—Growth Rate of Real GDP Per Capita

EXPLANATORY VARIABLES	COEFFICIENTS	ROBUST ST. ERRORS	P-VALUES
FDI	0.5107564	0.1623809	0.002
NATURAL RESOURCES (NR)	-0.1509047	0.0561245	0.007
FDI X NR	0.0980292	0.0489137	0.055*
POPULATION GROWTH RATE	-0.5243552	0.1073515	0.000
INITIAL GDP	0.0492758	0.06541	0.451
SCHOOLING	-0.6665577	0.2009155	0.001
INFLATION	-35.50187	37.552	0.344
MONEY SUPPLY (M2)	0.2149048	0.0796663	0.007
GOVT CONSUMPTION EXPENDITURE	-0.5959162	0.2755264	0.031
TRADE VOLUME	-0.6630708	0.1351213	0.000
INVESTMENT	1.601561	0.4983146	0.001
R-SQUARED			

NO OF OBSERVATION			
CORR(U_I, XB)			

*significant at 10% confidence interval

The results from the GMM model controlling for endogeneity of FDI are given in the table above. The results, after taking into consideration the endogeneity issue, support the earlier findings that without controlling for NR, FDI has a strong positive effect on economic growth and the NR has a negative effect on economic growth. The results also confirms the outcome that controlling for the NR, FDI has a relatively smaller effect on economic growth compare to FDI effect on economic growth without controlling for the NR.

V. Conclusion:

The paper focuses on the role the abundance of natural resources in a country plays in altering the relationship between the inflow of FDI and economic growth. While the impact of FDI inflow on economic growth of the host country is still being debated, majority of studies conclude a positive impact of FDI inflow on the domestic economic growth. The size and sign of the impact of FDI on economic growth varies greatly due to changes in different variables. The host country absorptive capacity in the shape of human capital, developed financial markets and open trade policies are considered to be detrimental in extracting the FDI induced growth. Countries with developed financial markets, greater absorptive capacity and maintaining trade tend to benefit more from the inflow of FDI. Natural resources is one of the reasons firms take into consideration while moving into a country and countries with natural resources in abundance do attract large amount of FDI. However, natural resources and growth in the natural resource sector is considered to be negatively associated with growth in the non-resource sector and an overall slower growth economic growth.

The paper examined the impact of FDI inflow and natural resource abundance on the economic growth. Further, the paper focused on the impact of FDI on economic growth of the host country while controlling for the natural resource sector. The paper conclude that the FDI inflow accelerates economic growth in the host country. However, the natural resource abundance in the country slows down the FDI induced economic growth. The same results are confirmed after controlling for endogeneity of FDI.

Appendix

A1

106 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

Benin Cambodia Kenya Kyrgyz Republic Malawi Mali Mozambique Tanzania Togo Uganda

Middle income countries are

Albania Algeria Argentina Armenia 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 Islamic Republic of Iran Jordan Kazakhstan Malaysia Mauritius Mexico Moldova Mongolia Morocco Nicaragua Pakistan Panama Paraguay Peru Philippines Romania Senegal South Africa Sri Lanka Sudan Thailand Tunisia Turkey Ukraine Venezuela, RB Vietnam Yemen Republic Zambia

High income countries

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

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