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REGIONAL ANALYSIS OF RESOURCE CURSE HYPOTHESIS: Evidence from Panel Data

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Natural resources are generally considered to be very important for development of any country. Sachs and Warner (1995) empirical study initiated a new debate in the field of economics that countries where natural resources are in abundance have slow growth than the countries which are resource deficient, called the resource curse hypothesis. Many studies have empirically tested this hypothesis and found mixed results. Most of the studies in literature have used primary products exports as a measure of resource abundance which is not very appropriate. This study extends the literature by using various proxies of resource abundance and has decomposed the total natural resource rent to oil, gas, and mineral rents. The study further includes various regions in the empirical analysis to find whether resource curse is region specific or not? Almost all possible channels of resource curse have been investigated. Empirical estimates by using panel data technique (within effect model) have also been provided. The results indicate that natural resources do not adversely affect economic growth directly in the large sample of 170 countries for the period 1991 to 2011. Regional analysis of resource curse hypothesis revealed that South Asia is the only region where resource curse exists with all types of resources because of low level of institutions. In all other regions, natural resource rents positively impact the economic growth.

I. Introduction

Natural resources are considered as one of the important components of national wealth and contribute directly to income, employment and fiscal revenue of the economies. There are two core types of natural resources on the basis of its regeneration. First, renewable resources can be restocked by natural process, e.g., water, land, and forests resources. Second, non-renewable resources cannot be regenerated e.g., oil and minerals, etc.

Empirical results by ample cross-sectional studies surprisingly report a negative relationship between natural resource abundance and economic growth after controlling the main determinants of economic growth [Auty and Miskesll (1998), Sachs and Warner (1995), (2001)]. However some of the renowned researchers called this negative relationship as a conceptual puzzle [Gelb (1988), Auty (1994),

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(2001a), (2001b), (2001c)]. Empirical literature depicts mixed results which create confusion in deciding, whether the natural resource abundance is a blessing or curse.

In this regard advocates of resource curse provide various explanations and claim that in-effective policies regarding exports and wealth creation by some governments can turn the blessing of natural resources into a curse. Governments of resource rich countries often ignore the wealth creation activities and rely more on the exports of primary products which delays the competitive industrialization. This delay in competitive industrialization can cause a slow development of labor intensive manufactured exports which generates a low skilled labor. As a result, there is a surplus of labor supply particularly in rural areas and a high income inequality boosts the social strains in the society. In order to control social tension and unemployment, governments deploy rent of its natural resources to foster industrialization by adopting more protectionist policies. Thus, inefficient allocation of resources by the government impedes the investment opportunities in primary sector; and, as a result, resource rich countries are locked in staple trap [Auty (2002)]. The above mentioned detailed discussion provide a sound ground to state that a general belief of considering the resource abundance as a blessing may not be true all the times while effective government policies for export and efficient allocation of resources play a crucial role in long-run growth of resource rich countries.

Since resource abundance economies have to face challenges like Dutch Disease;[1] volatility of export prices of natural resources and rent seeking behavior, needs an appropriate management of natural resources for long-run growth. On the other hand resource deprived countries have strong incentive to develop public goods by promoting efficient investment. Earlier stage of competitive labor-intensive industrialization enhances the rate of urbanization and ensures the sustainability of a rapid economic growth in resource poor countries. South Korea, Hong Kong and Mauritius have experienced the same (above mentioned) phenomena in their economic growth [Auty (2007)].

Contrary, a sound literature related to resource abundance and economic growth, found no evidence of resource curse as some countries experienced high economic growth with abundance of natural resources. Empirical findings of Alexeev and Robert (2009) suggest that oil and mineral wealth have positive impact on per capita income. Iimi (2006) also concluded that mature political elite of Botswana got a path of developmental by making an investment in human capital. Advocate of resource blessing school strongly favor those policies which are related to investment in human capital, redistribution of income and growth enhancing activities because these are less likely that resource curse occurs [Snyder and Bhavnani (2005)].

Diverse literature have used a proxy 'exports of primary product as percentage of GDP' to measure the resource abundance but according to some researchers like

[1] The phenomenon when an increase in the exploitation of natural resources negatively affects the manufacturing or agriculture sector is called Dutch disease.

Brunnschweiler and Bulte (2008) it is not suitable to use this proxy because it measures the resource dependence rather than the resource abundance. Moreover, Cavalcanti et al. (2011) commented on the methodology which most of the studies follow to explain the impact of natural resource abundance on growth of the economy. It is reported that most empirical literature relies on cross-sectional approach which does not take into account the time dimension and the problem of specification and endogeniety. The above mentioned detailed discussion regarding methodology and proxies, so far used in empirical literature indicates that still there is room to explore the relationship further between natural resource abundance and growth for some economies in more comprehensive way.

The core intention of current study is to investigate the evidence of resource curse in different regions by using proxy of total natural rent as natural resource variable. More explicitly, this study will concentrate on exploring, first the relationship between natural resource and economic growth would stand same across various regions i.e., South Asia, East Asia and Pacific, Europe and Central Asia, Middle East and North Africa, Sub-Saharan Africa, Latin America and Caribbean, North America. Secondly, the study will focus on possible channel through which resource abundance can affect the growth of a country. Finally the study will see how the relationship changes when there is a decomposition of total natural resource rent into oil, gas and mineral rent. For this purpose it is intended to use a panel data set of 170 countries from the year 1991 to 2011 for a regression analysis.

II. Literature Review

Different approaches have been used to explain theoretical relationship in the resource curse hypothesis. Initially, effect of natural resource on economic growth has been explained in four different ways i.e., the linkage theory, the neoclassical theory and related growth, export instability theories and booming sector and Dutch disease theory [Gelb (1988)]. Further, booming sector theory extended two effects; spending effect and resource movement effect. According to the spending effect theory, discovery of natural resource will cause the traded sector to shrink while non-traded sector expands because of increase in prices of non-traded goods, and high profit attracts more investment in this sector. Resource movement effect says that boom in the natural resource will increase the marginal productivity of factors of production which leads to their higher price but some producers will not be able to pay this higher price. Consequently, the traded goods sector starts to decline [Neary and Van (1986)].

Other theoretical studies in resource curse literature are undertaken by Auty [(1994), (2007)], Matsuyama (1992) and Gylfason (2000), (2001a), (2001b). Auty [(1994), (2007)] highlighted the role of macroeconomic policies, management of resource and development of industrialization in resource curse hypothesis which

cause negative impact of natural resource on economic growth in resource rich countries. Matsuyama (1992) discussed resource curse phenomena in the context of labor intensive production of natural resource. Similar fact is also explained by Gylfason (2000), (2001a), (2001b) who revealed that resource rich countries, especially transition economies, are more dependent on export earnings and prices of primary goods are more volatile; thus creating more economic instability in countries.

A comprehensive empirical literature regarding resource curse hypothesis is available but the first wide-ranging empirical attempt was made by Sachs and Warner (1995) which captured the attention of economists. This study identified the negative relationship between economic growth and resource abundance along with explaining the forward and backward linkages as reasons of the resource curse. They were of the view that demand for the manufacturing goods grow higher than the demand for primary goods which leads to higher price for the manufacturing products. Their empirical findings by using different measures proposed that resource abundance leads to higher rent-seeking and corruption, directly through investment; and thus lead to low economic growth. Afterward, Sachs and Warner (1997) tested resource curse hypothesis by using different sample data set and found the same negative relationship between natural resource abundance[2] and growth. In 2001, they extended their earlier work and incorporated geographical variable which was missing in their earlier work but the results remained negative.

Some studies suggested that weak institutions are main reason for resource curse [Arezki and Fredrick (2007), Bulte et al. (2005)]. Countries where institutions were producer friendly, resource abundance did not cause lower growth [Mehlum et al. (2002), (2006a), (2006b)]. Resource abundance surges the level of corruption in countries where democratic institutions are weak but the same results does not hold in countries where democratic institutions are strong [Bhattacharyya and Hodler, (2009)]. Higher income and better institutions improve development indicators [Bulte et al. (2004)].

Some studies also criticized resource curse studies and argued that by changing proxy of natural resource abundance and the methodology, the negative relationship between natural resource and economic growth does not exist [Stijns (2005), Lederman et al. (2008), Cavalcanti et al. (2011)]. Most of the previous studies of resource curse hypothesis did not take into account regional effect in their studies and used cross-sectional data set. Present study incorporates regional effect in a more explicit way. This will give more insight about the resource curse phenomena as each region has different attributes and resource could be regions specific. Different kinds of natural resource rents have been used to provide comprehensive empirical results on resource curse phenomena. Moreover, role of institutions in resource curse hypothesis is also included.

[2] Sachs and Warner (1995) used the definition of resource abundance as "Exports of primary goods".

III. Data and Methodology

Cavalcantie, et al. (2011) developed a theoretical model in order to test the resource curse hypothesis and argued that empirical literature lacks theoretical background of natural resource and economic growth. To produce the consumption goods, they formed the following production function:

$$Y(t) = K(t)^{\alpha 1} O(t)^{\alpha 2} (A(t) L(t))^{1-\alpha 1-\alpha 2} \tag{1}$$

where $\alpha_1, \alpha_2 > 0, \alpha_1 + \alpha_2 < 1, K(t)$ is physical capital, $L(t)$ is labor and $O(t)$ is natural resource. It is assumed that function exhibits constant return to scale and it was found that long-run relationship exist between the natural resource and economic growth by putting the steady state equation. The following was estimated for the panel model.

$$\begin{aligned} lny_t = \frac{(1-\alpha_1-\alpha_2)}{(1-\alpha_1)} lnA_0 - \frac{\alpha_1}{(1-\alpha_1)} + \frac{(1-\alpha_1-\alpha_2)}{(1-\alpha_1)} gt \\ + \frac{\alpha_1}{(1-\alpha_1)} ln\left(\frac{1_t^k}{Y_t}\right) + \frac{\alpha_2}{(1-\alpha_1)} ln \frac{N_t}{Y_t} \end{aligned} \tag{2}$$

where the small letters are in per capita forms, N is natural resource and 1_t^k is investment. Equation states the long-run relationship between GDP per capita, investment share of GDP and real value of natural resource production per capita. Empirical equation for panel data becomes as follows:

$$ln\, y_{it} = c_i + \alpha N_{it} + \beta X_{it} + u_{it} \tag{3}$$

Equation (3) states that GDP per capita depends upon the natural resource and other control variable. In order to find relationship between the natural resource and GDP per capita growth, following equation is formed for regression analysis.

$$G_{it} = c_i + \gamma\, ln\, y_{it-1} + \alpha N_{it} + \beta X_{it} + u_{it} \tag{4}$$

Equation (4) states that GDP per capita growth depends upon the initial income, y_{it-1}, natural resource, N_{it}, and the other explanatory variables denoted by X_{it} . Other exogenous variables are; Human capital, Investment, Openness, Institutions and Terms of Trade. After including the control variables in regression model, equation for estimation becomes as follows:

$$\begin{aligned} G_{it} = c_i + \alpha_1\, ln\, y_{it-1} + \alpha_2 N_{it} + \alpha_3 H_{it} + \alpha_4 I_{it} \\ + \alpha_5\, opn_{it} + \alpha_6\, Ins_{it} + \alpha_7\, TOT_{it} + u_{it} \end{aligned} \tag{5}$$

where α_1, α_2, α_3, α_4, α_5, α_6, α_7 are the parameters. Y_{it-1}, N_{it}, H_{it}, I_{it}, opn_{it}, Ins_{it}, TOT_{it} is Initial income, natural resource variables,[3] human capital measured as School enrollment primary (percentage gross), investment measured as fixed capital formation, openness measured as export plus import divided by GDP, institutional quality measured by corruption index, and terms of trade, respectively. Data has been taken from the Word Development Indicator (WDI), except the corruption index which is taken from the International Risk Country Guide (ICRG). These explanatory variables can change their values, both at across the countries, I and across time *t*. The c_i is unobserved effect which is called individual effect or individual heterogeneity when *i* is indexed as individual. The u_{it} changes both across time *t* and cross sections *i*. It is called idiosyncratic error/or idiosyncratic disturbances. These idiosyncratic disturbances are independent and identically distributed. Now, the question is how to treat c_i? If we treat c_i as fixed (it varies across group or time periods) then the model will be called Fixed Effect Model and if c_i is treated as random then the above model will be called Random Effect Model. If model contains no individual effect then Ordinary Least Squares (OLS) parameters are efficient and consistent. The OLS's five assumptions are; Linearity, exogeneity, homoscedasticity, no autocorrelation, observations on the independent variable which are fixed in repeated sampling and full rank [Greene (2003)]. There are many ways for estimating the fixed effect model; the Least Square Dummy Variable model (LSDV), Within Effect Model and Between Effect Model. Within group effect model does not require dummy variables as it is within transformation because it subtracts each value of cross-sectional object from time-mean of the variable. This transformation will remove the incidental parameter problem.

G is economic growth which is a function of natural resource abundance and other control variables. The first control variable is lag GDP per capita which is called the initial income in literature of conditional convergence theory. This variable will confirm the conditional convergence of countries as in 1960s growth theories which were mainly of neoclassical model developed by Solow (1956), Ramsey (1928) and Swan (1956). These models have considered conditional convergence property which states that countries with low level of initial real GDP per capital will develop faster. If all countries are same having same economic features, then the poor countries will grow faster than the rich countries - it is called Absolute Convergence. When countries are different in various aspects, then convergence will be conditional. When we take into account the other control/explanatory variables which are different in each country, the regression model will verify the conditional convergence hypothesis [Barro (1996)].

[3] Natural resource rents estimates are based on sources and methods described in: The changing wealth of nations: measuring sustainable development in the new millennium, [World Bank (2011)] No Ref..

In a country, N_{it} is a set of natural resource variables which is measured with total natural resource rent as percentage of GDP. which include both renewable (oil, gas, minerals, coal) and non-renewable natural resource (forest). This variable will give an impact of both renewable and non-renewable resource on growth. Total natural resource will also be decomposed into oil rent, gas rent, and mineral rent. Ambiguous relationship between natural resource abundance and economic growth is found by Sachs, et al. [(1995), (2001)] and Gylfason [(2001a) , (2001b)] whereas, negative relationship between the two variables is also found. Martin, et al (2003), Stijns (2006) and Brunnschweiler (2008) found positive relationship between variables. Other important variable in empirical model is quality of institutions which are measured by corruption index taken from the International Country Risk Guide (ICRG).

Other control variable in the model include, gross enrollment ratio, which is taken as a proxy to measure education level in a country which is the ratio of total enrollment to population and no specific age group has been taken.

Gross capital formation variable has been used as a measure of investment level in a country - formerly this variable was called as gross domestic investment. It includes net changes in inventories and fixed assets which consist of land improvements, machinery, equipment purchases, plant, private residential, railways, construction of offices, schools, hospitals and commercial buildings. To meet the unforeseen changes in the future, firms hold the stock of goods; these goods are included in the inventories. Net procurements of antiques are also included in capital formation. Terms of trade index is the percentage ratio of the export unit value indexes to the import unit value indexes, which is measured relative to the base year 2000 (WDI).

Literature has emphasized the institution as main determinant of economic growth and considered it as a major cause of resource curse, [Mehlum, et al. (2002), Martin, et al. (2003)]. Institutions and governance are important channels of resource curse and polices could undermine the social welfare goals in resource rich countries where institutions are not very strong (Martin, et al. 2003). Corruption is considered as a good indicator of governance. Therefore, an interaction model of corruption with natural resource variable is included in Equation 6. To see how corruption will impact the relationship between natural resource rent and economic growth, an interaction term is introduced within the model. Corruption could be the main channel of resource curse hypothesis.

$$G_{it} = c_i + \alpha_1 \ln y_{it-1} + \alpha_2 N_{it} + \alpha_3 H_{it} + \alpha_4 I_{it} + \alpha_5 opn_{it} + \alpha_6 Ins_{it} + \alpha_7 TOT_{it} + \alpha_8 N_{it}\, Corruption_{it} + u_{it} \quad (6)$$

In order to see the relationship between natural resource rent and economic growth in different regions of the world, we have incorporated the set of slope re-

gional dummies in our model, one by one. Seven regression equations are estimated of slope regional dummies which are as follows:

$$G_{it} = c_i + \alpha_1 lny_{it-1} + \alpha_2 N_{it} + \alpha_3 H_{it} + \alpha_4 I_{it} + \alpha_5 opn_{it} + \alpha_6 Ins_{it} + \alpha_7 TOT_{it} + \alpha_8 N_{it} D_1 + u_{it} \quad (7)$$

D_1 = 1 if it is South Asia other wise $D_1 = 0$

$$G_{it} = c_i + \alpha_1 lny_{it-1} + \alpha_2 N_{it} + \alpha_3 H_{it} + \alpha_4 I_{it} + \alpha_5 opn_{it} + \alpha_6 Ins_{it} + \alpha_7 TOT_{it} + \alpha_8 N_{it} D_2 + u_{it} \quad (8)$$

D_2 = 1 if it is North America other wise $D_2 = 0$

$$G_{it} = c_i + \alpha_1 lny_{it-1} + \alpha_2 N_{it} + \alpha_3 H_{it} + \alpha_4 I_{it} + \alpha_5 opn_{it} + \alpha_6 Ins_{it} + \alpha_7 TOT_{it} + \alpha_8 N_{it} D_3 + u_{it} \quad (9)$$

D_3 = 1 if it is Middle East and North Africa otherwise $D_3 = 0$

$$G_{it} = c_i + \alpha_1 lny_{it-1} + \alpha_2 N_{it} + \alpha_3 H_{it} + \alpha_4 I_{it} + \alpha_5 opn_{it} + \alpha_6 Ins_{it} + \alpha_7 TOT_{it} + \alpha_8 N_{it} D_4 + u_{it} \quad (10)$$

D_4 = 1 if it is Europe and Central Asia otherwise $D_4 = 0$

$$G_{it} = c_i + \alpha_1 lny_{it-1} + \alpha_2 N_{it} + \alpha_3 H_{it} + \alpha_4 I_{it} + \alpha_5 opn_{it} + \alpha_6 Ins_{it} + \alpha_7 TOT_{it} + \alpha_8 N_{it} D_5 + u_{it} \quad (11)$$

D_5 = 1 if it is Sub Saharan Africa otherwise $D_5 = 0$

$$G_{it} = c_i + \alpha_1 lny_{it-1} + \alpha_2 N_{it} + \alpha_3 H_{it} + \alpha_4 I_{it} + \alpha_5 opn_{it} + \alpha_6 Ins_{it} + \alpha_7 TOT_{it} + \alpha_8 N_{it} D_6 + u_{it} \quad (12)$$

D_6 = 1 if it is Latin America and Caribbean otherwise $D_6 = 0$

$$G_{it} = c_i + \alpha_1 lny_{it-1} + \alpha_2 N_{it} + \alpha_3 H_{it} + \alpha_4 I_{it} + \alpha_5 opn_{it} + \alpha_6 Ins_{it} + \alpha_7 TOT_{it} + \alpha_8 N_{it} D_7 + u_{it} \quad (13)$$

D_7 = 1 if it is East Asia and Pacific otherwise $D_7 = 0$

IV. Results and Discussion

Table A-1 (Appendix) shows the result of Group effect test and values of F-stats and p suggest that we can reject the null hypothesis of no group effect. It leads to admit that Pooled Regression is not better than the fixed effect model. Hence, it can be concluded that pooling is not appropriate in this particular case because intercept can vary across countries or across time, and it will be plausible and quite suitable to apply either the fixed or random effect model. Hausaman test Table A-2 (Appendix) suggested that fixed effect is appropriate for estimation of the model of current study as individual effects are correlated with regressors, hence fixed effect is better than the random effect model. In this case random effect model give bias result that can be seen in Table A-3 (Appendix).

Empirical results show that initial income is negatively related to GDP per capita growth which confirms the conditional convergence hypothesis i.e., countries with low level of initial income will grow faster as compared to countries with high initial income [Barrow (1996)]. This result remains negative and significant in all regressions. Investment, education and openness are highly significant and positively correlated to the GDP per capita growth. Relationship remains positive and significant in all other regression. Only a slight change in coefficient is observed.

The above mentioned variables contribute positively to development of any country, thereby indicating positive and significant sign. For instance, investment in a country increases the level of output in an economy because it generates employment opportunity which enhances the GDP per capita growth [Barro (1996)]. Terms of trade are significant in 3rd and 4th regression of Table A-5 (Appendix) and are positive correlated to economic growth. Corruption is considered as one of the main problems in the process of development; therefore, it is negatively correlated to economic growth, as it reduces the incentive and opportunity of investment and innovation [North (1990)]. It remains sticky in its direction and level of significance. These results suggest that on an average, GDP per capita growth decreases by 0.75 per cent when corruption increases by one unit. Finally, it is depicted by the empirical procedure that model of the current study is 45 per cent, explained by its explanatory variables as R-square in all regressions remain constant in its magnitude i.e., 0.45 per cent. Further, in different regression models, number of observations also vary due to unbalanced data set as there are some missing observations in time series of some variables.

The main concerned variable i.e., natural resource, can be discussed now. Estimations results in Table A-4 (Appendix) suggest that total natural resource rents are positively correlated to GDP per capita growth which is highly significant and positive related to GDP per capita growth. Results indicate that renewable[4] and non-renewable resources[5] have positive impact on economic growth. Coefficient of total natural resource rent shows that if it increases by one unit then the GDP per capita growth will increase by 0.17 per cent. This positive relationship does not change when we incorporate other control variables, whereas, the value of coefficient changes with every control variable. Inclusion of initial income, human capital and investment in the model cause coefficient of total natural resource rent to rise; whereas corruption causes coefficient to decrease which suggest that corruption could be a possible channel [see, Table A-3 (Appendix)].

The total natural resource is also decomposed into oil, gas and mineral rents and oil rent. Estimation results in Table A-5 (Appendix) shows that oil rents have stronger impact on economic growth (with significant coefficient of 0.27). Moreover, gas rents are positively but insignificantly correlated. Mineral rents are also positively and significantly correlated with GDP per capita growth.

Thus, the empirical findings of the current study are unable to support the resource curse hypothesis and stand with an immense literature of resource blessing. Martin, et al. (2003), Stijn (2006), Brunnschweiler, et al. (2008) and Manzano, et al. (2011) also find the same results in one or another way. There can be two possible reasons for rejecting the resource hypothesis. First reason can be the difference

[4] Forest.

[5] Oil, mineral, gas and coal.

of methodology because mostly cross-sectional studies favor the resource curse hypothesis [Sachs, et al. {(1995), (2001)}, Gylfason (2000), (2001a), (2001b), Atkinson, et al. (2003), Martin, et al. (2003), Papyrakis, et al. (2004)]. In Cross-sectional models, number of observation are usually less than the panel data as omitted variable bias can affect the outcome. There are few studies which used panel technique which seems appropriate since large data set has more variability and less collinearity (Baltagi (2008).

In column (5) of Table A-4 (Appendix), results of interaction term between corruption and mineral resource rent indicates that those countries where corruption is high, natural resource rent will negatively impact the economic growth. Thus, the corruption is confirmed as main channel of resource curse hypothesis.

Regional analysis of resource curse hypothesis in current study illustrated very interesting result whereas negative relationship is found only in the South Asian region. This region has high corruption along with low level of governance. Average level of governance index in South Asia is below 8 while in other regions this figure is above 8 [ICRG (2008)]. Therefore, this region is victim of resource curse because of poor management of natural resources. Total number of seven regional dummies for South Asia, North America, Middle East and North Africa, Europe and Central Asia, Sub-Saharan Africa, Latin America and Caribbean, and East Asia Pacific were introduced [see, Table A-5 (Appendix)]. These results of the said table also indicate that magnitude of relationship differs across North America, Middle East and North Africa, Europe and Central Asia, Sub-Saharan Africa, Latin America and Caribbean, and East Asia Pacific. It is also noteworthy that positive relationship found in the resource rich regions like Middle East and North Africa; Sub-Saharan Africa as the level of governance is relatively higher in these regions with relatively low level of corruption. These regions are rich in their natural resource and our results depict that there is positive relationship between the total natural resource rent and economic growth; and also between the oil rent and economic growth [see, Tables A-5 and A-6 (Appendix)]. This result shows that management of natural resources and quality of institutions are vital in association with natural resources in abundance and the economic growth. Results of interaction term of oil rents with regional dummies are shown in Table A-6 (Appendix) which indicates the same results and again the resource curse is found in the South Asian countries.

V. Conclusion

The core objective of the study is to investigate the resource curse hypothesis in comprehensive way by a large group of 170 countries using various proxies of resource rent variable. The study covers time period of 1991 to 2011 and employ the within effect model for estimations. The results show all types of natural resource rents which are positive, related to the economic growth; hence the resource

curse hypothesis is rejected. The study concludes that natural resources (themselves) are not bad for any countries rather it's the management and state of institutions which makes difference in the economic growth of a country.

Regional analysis of the study prove that negative relationship is found in only the South Asian region where level of institution are very weak; on the other hand, regions where level of institutions are relatively better, no resource curse is found. The relationship remains positive in resource rich regions which show that it's not only the natural resource which matter for any country but other factors are equally important.

The study, also finds that conditional hypothesis holds in given sample countries. Investment, Education and Openness have positive contribution in the economic growth of countries while corruption has negative impact on economic performance of any country. All these variables are significant. Corruption has been found to be another main channel of resource curse hypothesis. Interaction term of corruption and natural resource variable showed that natural resource will have negative impact on economic growth where corruption is high and vice versa. Results of the study are unique, particularly for the South Asian countries.

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APPENDIX

TABLE A-1

Group Effect Test

F-test for no fixed effect			
Num DF	Den DF	F- value	Prob> F
121	1287	5.01	0.0000
F-test for no time effect			
17	1391	7.16	0.0000

TABLE A-2

Hausaman Test

	(α*) Fixed Group	(β**)	(α -β) Diffe-rence	Sqrt (diag (Vα-V_ β)) S.E.
Initial Income	-4.11827	0.3109	-3.80720	0.75489
Investment	0.13487	0.1364	-0.00150	0.01110
Education	0.04707	0.0341	0.01280	0.00580
Corruption	-0.75180	0.4385	-0.31320	0.08620
Terms of trade	-0.00080	0.0088	-0.00960	0.00260
Openness	0.00080	0.0007	0.00008	0.00020
Total natural resource rent	0.17190	0.0349	0.13690	0.02580
chi2(7)		64.250		
Prob		0.000		

*α = consistent under Ho and Ha. **β = inconsistent under Ha, efficient under Ho. Ho : difference in coefficients not systematic.

TABLE A-3

Total Natural Resource Rent and Economic Growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	GDP per Capita Growth	GDP per Capita Growth	GDP per Capita Growth	GDP per Capita Growth	GDP per Capita Growth	GDP per Capita Growth	GDP per Capita Growth
Total natural resource rent	0.0 915.00***	0.10 35.00***	0.19 18.00***	0.20 77.00***	0.17 32.00***	0.17 48.00***	0.17 19.00***
Initial income	(0.0152)	(0.0150)	(0.0184)	(0.0189)	(0.0225)	(0.0222)	(0.0303)
Education	-	-4.5610*** (0.5337)	-4.0949*** (0.5453)	-4.7933*** (0.5625)	-3.1740*** (0.6849)	-4.4557*** (0.7096)	-4.1183*** (0.7705)
Investment Corruption	-	-	0.0466*** (0.0100)	0.0377*** (0.0106)	0.0489*** (0.0107)	0.0442*** (0.0106)	0.0471*** (0.0107)
Openness	-	-	-	0.1862*** (0.0196)	0.1906*** (0.0230)	0.1752*** (0.0229)	0.1349*** (0.0254)
Terms of Trade	-	-	-	-	-0.8750*** (0.1342)	-0.7909*** (0.1335)	-0.7519*** (0.1579)
Cons	-	-	-	-	-	0.0018*** (0.0003)	0.0008* (0.0003)
N R^2	-	-	-	-	-	-	-0.0008 (0.0056)
	1.2312*** (0.1501)	36.1917*** (4.0942)	27.3500*** (4.0811)	29.6648*** (4.2003)	20.0836*** (5.4647)	28.7321*** (5.5901)	26.5702*** (5.7921)
	3571 0.111	3535 0.130	2783 0.176	2592 0.210	179 0.331	1793 0.346	1416 0.426

Standard errors in parentheses, *p< 0.05, **p< 0.01, ***p< 0.001.

TABLE A-4

Total Natural Resource Rents, Oil Rents, Mineral Rents, Gas Rents and Economic Growth

	(1)	(2)	(3)	(4)	(5)
	GDP per Capita Growth	GDP per Capita Growth	GDP per Capita Growth	GDP per Capita Growth	GDP per Capita Growth
Initial income	-4.1183***	-3.8482***	-3.9736***	-4.2629***	-4.1024***
	(0.7705)	(0.7458)	(0.7614)	(0.7852)	(0.7837)
Education	0.0471***	0.0358**	0.0342*	0.0465***	0.0453***
	(0.0107)	(0.0130)	(0.0134)	(0.0109)	(0.0109)
Investment	0.1349***	0.1768**	0.1634**	0.1160***	0.1090***
	(0.0254)	(0.027)	(0.0286)	(0.0256)	(0.0256)
Corruption	-0.7519***	-0.6423***	-0.6455***	-0.8362***	-0.6982***
	(0.1579)	(0.156)	(0.1611)	(0.1591)	(0.1639)
Openness	0.0008*	0.0015**	0.0019**	0.0009**	0.0012***
	(0.0003)	(0.000)	(0.0004)	(0.0003)	(0.0003)
Terms of Trade	-0.0008	-0.0016	0.0133**	0.0115*	0.0115*
	(0.0056)	(0.005)	(0.0047)	(0.0050)	(0.0050)
Total Natural Resource Rent	0.1719***	-	-	-	-
	(0.0303)				
Oil Rent	-	0.2620***	-	-	-
		(0.0406)			
Gas Rent	-	-	0.1128	-	-
			(0.0643)		
Mineral Rent	-	-	-	0.1968**	-
				(0.0604)	
Mineral* Corruption	-	-	-	-	0.5480***
					(0.1216)
cons	26.5702**	24.5206***	25.1490***	28.1335***	26.4464***
	(5.7921)	(5.769)	(5.8977)	(5.9616)	(5.9602)
N	1416	1243	1237	1416	1416
R2	0.426	0.474	0.457	0.416	0.421

Standard errors in parentheses, *p< 0.05, **p< 0.01, ***p< 0.001.

TABLE A-5

Regional Analysis of Total Natural Resource Rents and Economic Growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	GDP per Capita Growth	GDP per Capita Growth	GDP per Capita Growth	GDP per Capita Growth	GDP per Capita Growth	GDP per Capita Growth	GDP per Capita Growth
Initial income	-4.1841***	-4.1087***	-4.5006***	-4.1273***	-4.0537***	-4.0907***	-4.2965***
	(0.7697)	(0.7715)	(0.7750)	(0.7699)	(0.7702)	(0.7711)	(0.7790)
Education	0.0475***	0.0473***	0.0495***	0.0483***	0.0483***	0.0470***	0.0479***
	(0.0107)	(0.0107)	(0.0107)	(0.0107)	(0.0107)	(0.0107)	(0.0107)
Investment	0.1321***	0.1352***	0.1382***	0.1345***	0.1345***	0.1352***	0.1366***
	(0.0254)	(0.0254)	(0.0253)	(0.0254)	(0.0254)	(0.0254)	(0.0254)
Corruption	-0.7590***	-0.7508***	-0.7716***	-0.7476***	-0.7665***	-0.7479***	-0.7440***
	(0.1577)	(0.1580)	(0.1573)	(0.1578)	(0.1579)	(0.1580)	(0.1579)
Openness	0.0008*	0.0008*	0.0010**	0.0008*	0.0007*	0.0008*	0.0009**
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Terms of Trade	0.0007	-0.0010	0.0013	-0.0001	0.0006	-0.0008	-0.0007
	(0.0057)	(0.0057)	(0.0056)	(0.0057)	(0.0057)	(0.0056)	(0.0056)
Total natural resource rent	0.1802***	0.1729***	0.1282***	0.1421***	0.1941***	0.1726***	0.1963***
	(0.0305)	(0.0305)	(0.0327)	(0.0349)	(0.0321)	(0.0303)	(0.0343)
South Asia	0.2781*	-	-	-	-	-	-
	(0.1186)						
North America	-	-0.1229	-	-	-	-	-
		(0.4205)					
Middle East and North Africa	-	-	0.2387***	-	-	-	-
			(0.0684)				
Europe and Central Asia	-	-	-	0.0938	-	-	-
				(0.0545)			
Sub Saharan Africa	-	-	-	-	0.1265*	-	-
					(0.0612)		
Latin America and Caribbean	-	-	-	-	-	-0.8034	-
						(0.8414)	
East Asia and Pacific	-	-	-	-	-	-	-0.0855
							(0.0562)
cons	27.0119***	26.4941***	28.7828***	26.5970***	25.9699***	26.3826***	27.7305***
	(5.7851)	(5.8001)	(5.8018)	(5.7877)	(5.7921)	(5.7957)	(5.8392)
N	1416	1416	1416	1416	1416	1416	1416
R^2	0.428	0.426	0.431	0.427	0.428	0.426	0.427

Standard errors in parentheses, *p< 0.05, **p< 0.01, ***p< 0.001.

TABLE A-6

Regional Anaysis of Oil Rents and Economic Growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	GDP per Capita Growth	GDP per Capita Growth	GDP per Capita Growth	GDP per Capita Growth	GDP per Capita Growth	GDP per Capita Growth	GDP per Capita Growth
Initial income	-3.9060***	-3.8232***	-4.7827***	-3.8086***	-3.7317***	-3.8113***	-4.1587***
	(0.7453)	(0.7500)	(0.7496)	(0.7457)	(0.7447)	(0.7461)	(0.7535)
Education	0.0364**	0.0362**	0.0385**	0.0359**	0.0387**	0.0356**	0.0341**
	(0.0130)	(0.0131)	(0.0128)	(0.0130)	(0.0130)	(0.0130)	(0.0130)
Investment	0.1741***	0.1773***	0.1992***	0.1744***	0.1783***	0.1776***	0.1803***
	(0.0278)	(0.0279)	(0.0276)	(0.0278)	(0.0277)	(0.0278)	(0.0278)
Corruption	-0.6451***	-0.6408***	-0.7377***	-0.6302***	-0.6375***	-0.6397***	-0.6574***
	(0.1566)	(0.1569)	(0.1551)	(0.1569)	(0.1563)	(0.1568)	(0.1565)
Openness	0.0015***	0.0015***	0.0016***	0.0015***	0.0013***	0.0015***	0.0016***
	(0.0004)	(0.0004)	(0.0003)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Terms of Trade	-0.0001	-0.0018	0.0009	-0.0013	0.0006	-0.0016	-0.0027
	(0.0053)	(0.0053)	(0.0052)	(0.0053)	(0.0053)	(0.0053)	(0.0053)
Oil Rent	0.2691***	0.2628***	0.1683***	0.2304***	0.3076***	0.2630***	0.3360***
	(0.0407)	(0.0407)	(0.0428)	(0.0453)	(0.0436)	(0.0406)	(0.0496)
South Asia	-0.3898*	-	-	-	-	-	-
	(0.1924)						
North America	-	-0.6921	-	-	-	-	-
		(2.1204)					
Middle East and North Africa	-	-	0.6054***	-	-	-	-
			(0.0987)				
Europe and Central Asia	-	-	-	0.1278	-	-	-
				(0.0817)			
Sub Saharan Africa	-	-	-	-	0.2398**	-	-
					(0.0853)		
Latin America and Caribbean	-	-	-	-	-	1.8846	-
						(1.4264)	
East Asia and Pacific	-	-	-	-	-	-	-0.1908**
							(0.0737)
cons	24.8829***	24.2966***	30.8698***	24.2703***	23.4143***	24.2578***	26.9394***
	(5.7851)	(5.8001)	(5.8018)	(5.7877)	(5.7921)	(5.7957)	(5.8392)
N	1243	1243	1243	1243	1243	1243	1243
R^2	0.476	0.474	0.491	0.475	0.477	0.474	0.477

Standard errors in parentheses, *p< 0.05, **p< 0.01, ***p< 0.001.