Empirical Evidence on the Resource Curse Hypothesis in Oil Abundant Economy

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Abstract: This present study investigates the relationship between natural resource abundance and economic growth in Venezuelan economy. We have applied the ARDL bounds testing approach to cointegration developed by Pesaran et al. (2001) to examine long run relationship between the variables. The VECM Granger causality is applied to test the direction of causality between the variables. The present study covers the period of 1971-2011.

Our empirical evidence indicated that variables are found to be cointegrated. The results confirm that natural resource abundance impedes economic growth. Financial development, capital stock and trade openness enhance economic growth. The feedback hypothesis is also found between natural resource abundance and economic growth.
Keywords: natural resource abundance, economic growth, cointegration

Empirical Evidence on the Resource Curse Hypothesis in Venezuela

Introduction

The abundance of natural resources and economic growth has become a dominating theme around the globe during the last three decades. The relationship among the natural resources abundance, trade openness and economic development attracted the development economists for academic research (Auty, 2001). The resource curse hypothesis postulates that economies with the abundance of natural resources, such as oil, gas, coal and ore, have better potential to perform better for economic development than the economies with no or fewer natural resources. Sound financial sector also plays vital role in enhancing domestic production and hence economic growth (Shahbaz, 2009). Financial development may help in exploring the natural resources as well trade openness facilitates the natural resources in stimulating economic growth (Shahbaz, 2012).

Development economists of the decades of 1950s and 1960s such as Nurkse and Rostow emphasized the positive role of natural resources to develop the physical and human capital in the country which is inevitable for future growth and economic development. The abundance of natural resources might be a potential source of additional domestic output. Some of the income earned from this additional output can be saved and used for the construction of roads, improvement of health and education sectors, as well as for the modernization of telecommunication systems (Papyrakis and Gerlagh, 2004). The conformist's view before 1980s was that natural resources positively influence the economic prosperity of a country (Rosser, 2006). The theoretical and empirical studies noted that economies with the abundance of natural resources fail to accelerate economic growth (Sachs and Warner, 1995, 1997, 1999a; Leite and Weidmann, 1999; Gylfason, 2001). The growing economies with excessive natural resources showed poor economic performance (e. g, the economies of Russia, Nigeria and Venezuela have shown low economic growth rates over the last two centuries) than those that are undersupplied in natural resources. Therefore, the resource curse hypothesis has become a core area of research for the development economists of this era. The dynamic researchers in the field of economics have been trying to investigate this well constructed concept of resource curse hypothesis for various countries having the natural resources abundance. Various development economists originated the term for this tendency of poor economic performance of the developing countries in the presence of abundant natural resource as a conceptual puzzle (Papyrakis and Gerlagh, 2004).

An oil resource in any country has some special features. On one side, it earns the revenue for the state and on other side, it serves as the vehicle of global industrialization. Venezuela is a resource dependent economy, which has a population of 29.95 million, per capita income of $12,470 and $382.4 billion of GDP in 2012. The Venezuelan economy has been exporting oil for almost a century now. Main mineral resource of the Venezuelan economy is oil, which has earned more than a trillion dollars of income between 1950 and 2008. Oil income accounts on average for 61% of total government revenues, over 88% of exports and 14% of GDP. In 2011, oil income amounted to over US$ 60 billion, the equivalent of US$ 2097 per person. Furthermore, according to OPEC's Annual Statistical Bulletin (2010/2011 edition), Venezuela has the world's largest reserves of crude oil, with 296.5 billion barrels. That's over 7 million barrels per Venezuelan and 32 billion barrels more than Saudi Arabia. At current production levels, it would take over 270 years before Venezuela runs out of oil. Venezuela is, and will remain an important oil producing country for the future (Rodriguez et al. 2012).

Between 2004 and 2008 Venezuela benefited from a prolonged oil boom, showing strong economic growth and a substantial decrease in poverty rates, yet the government's chosen economic and social policies increased the country's dependence on oil revenues making them extremely vulnerable to a fall in prices. While in 1998, oil exports represented 31% of fiscal revenues and 64% of export revenues, by 2008, these figures reached 64% and 92% respectively. After peaking at US$ 126 in July 2008, oil prices collapsed as a result of the financial crisis, reaching a trough of US$ 31 by December 2008. The economy briskly followed, growing by less than 1% in the first quarter of 2009, thereafter displaying negative growth for six consecutive quarters. In 2010 Venezuela, despite a renewed increase in oil prices, was the only country in the region, together with earthquake stricken Haiti, with negative growth. In effect, Venezuela's economic performance has been and remains highly contingent on oil revenues (Rodriguez et al. 2012). Table-1 reveals that the economy of Venezuela has been earning oil maximum revenue. The share of governmental oil income has increased significantly above to 87 percent. Not only the magnitude but structure of taxes has also changed significantly over time because the state is trying to maximize the amount of rent.

Table-1: Government Share of Net-Oil Revenues

Time Period	Share in Oil Revenue (%)
1936-1942	38.8
1943-1957	54.5
1958-1975	73.3
1976-1990	80.6
1990-2004	67.6
2004-2008	87.3

Source: Mazano and Monaldi (2010), PODE

Table-2: GDP Growth rate (%) and Rents (% of GDP)

Years	GDP growth	Mineral Rents	Oil Rents	Coal Rents	Forest Rents
1970s	3.97	0.35	25.19	0.0012	0.1068
1980s	0.16	0.23	26.28	0.0001	0.0628
1990s	3.06	0.33	23.93	-	0.1459
2000s	3.98	0.64	29.19	0.0569	0.0832
2010	-1.49	0.59	18.30	0.0377	0.0379
2011	4.18	0.95	29.98	0.0515	0.0492

Source: World development Indicators, 2012

Table-2 also exhibits that oil rent as percentage of GDP has been increasing. In 1988, oil rent as percentage of GDP was very low i.e. 14.5%, which had increased to 25.4% in 1989, and slightly declined to 23.9% in the decade of 1990s. Similarly, oil rent as percentage of GDP increased to 29.2% in the decade 2000s and declined to 18.3% in 2010. In the year 2011 again it increased to 30%. All these figures reveal that oil rent has been increasing since 1988. It depicts the picture that higher the oil revenues less will be the burden of taxes on the citizens and chances of high per capita income are high for Venezuela. But the per capita GDP growth rate has not been encouraging; in 2008 it was 3.5% which had declined to -4.8%, and -3.0% in 2009 and 2010 respectively. It increased to 2.6% and 3.9% in 2011 and 2012, respectively.

The key motives lies behind this present study is to explore the short run and long run relationship among natural resources, financial development, trade openness, capital and economic growth in case of Venezuela over the period of 1971-2011. We find that natural resource abundance impedes economic growth validating the presence resource curse hypothesis in case of Venezuela. Moreover, financial development, trade openness, and capital add in economic growth. The bidirectional causal relationship exists between natural resource abundance and economic growth in Venezuela.

The rest of the study is organized as follows: Section -II provides the review of literature, Section -III explains the methodological framework and empirical findings are analyzed in section IV, Conclusion and limitations of the study are presented in last section-V.

II. Literature Review

The existing literature on resource curse hypothesis shows direct and indirect effects of natural resource abundance on economic growth. These effects are indecisive due to the reason that some studies showed positive impacts and other advocated negative effect on economic growth. This implies that empirical studies seem to present mix verification on the validity of resource curse hypothesis (Papyrakis and Gerlagh, 2004). History of economic development reveals that growing economies who relied heavily on the abundance of their natural resources for economic development fail to achieve the economic prosperity (Sachs and Warner, 1995). On other hand, economies with no or limited access to natural resources performed very well and recorded high economic growth rates, such as Japan, Hong Kong, Korea, Singapore, Switzerland and Asian Tigers (Krueger,1990,1998). The growth rate of per capita GDP increased approximately three times faster in natural resources deficient countries, as compared to those countries with plentiful natural resources (Ranis, 1991; Lal and Myint, 1996; Sachs and Warner, 1995, 1999; Auty, 2001).

Some countries of the world reap the benefits of natural resources abundance; the episode of natural resource booms in the 19^{th} century encouraged the economic progress in Latin American countries. The economy of Ecuador also witnessed a significant increase in per capita income during this natural resource booms (Sachs and Warner, 1999). The huge deposits of ore and coal in Great Britain and Germany were the principal ingredients behind the success story of industrial revolution in Europe (Sachs and Warner, 1995). The economy of Norway exploited the abundance of their natural resources and succeeded in achieving the elevated level of economic prosperity after careful economic planning. Consequently, income of Norway increased many times and a fair distribution of income among the population is achieved (Gylfason, 2001).

The literature on this topic has discovered several negative transmission channels. The meager need for sound economic management may be the result of abrupt increases in income in natural resources abundance economies (Sachs and Warner, 1995; Gylfason, 2001). These natural resource abundance economies harvest less advantage of technology spillovers that are inevitable in industrialized sectors because the industrial exports are laid up by the appreciation of the exchange rate (Sachs and Warner, 1995, 1999; Gillis et al. 1996; Gylfason, 2001). Papyrakis and Gerlagh, (2004) investigated the economic consequences of the abundance of natural resources through the transmission channels by using the cross-country data and following the methodology set in by Mo (2000, 2001). Their results verified that natural resource abundance is not the vehicle of economic development. The industrial revolution of Europe was an exception which occurred in 19th and 20th century due to the vast mineral deposits in Germany and Great Britain. They also found that with the inclusion of other independent variables such as, investment, corruption, schooling, trade openness and terms of trade then natural resource abundance has a direct effect on economic growth. Their study suggests that more transmission channels should be identified to reap the benefits of natural resource abundance. The operational mechanism behind these transmission channels must be absolutely examined to design the prudent economic policies so that the damaging function of the natural resource abundance can be minimized or removed.

The excellent economic performance of Asian tiger economies is the well established example of those countries that perform better with proper planning in the absence of natural resource abundance. Krueger, (1990) investigated the role of exports in economic growth by focusing outward oriented trade strategies along with trade liberalization and dividing the Asian economies in to East Asian Tigers and South Asian sub continent. The first has successfully reaped the fruits of trade liberalization even in the absence of natural resource abundance, while second failed to do so due to various domestic reasons. The role of government in accelerated growth of East Asian Tigers cannot be ignored. These countries achieved high growth due to government commitment in terms of providing incentives to exporters and development of infrastructure facilities. All these are considered as complementary to trade liberalization for reaping the fruits of accelerated exports. But unfortunately, these complementary domestic policies remained absent in some developing countries and their economic growth remained slow. The study also pointed out that along with these factors, South Asian countries also suffering from high degree of corruption, political instability, poor law and order conditions which hinder the inflow of foreign capital and finally slow down their growth. Therefore, these are the very reasons that East Asian Tigers become successful in attracting foreign investment and South Asian countries failed to benefit from it. The study conducted by Krueger, (1990) failed to address the very important factors like; quality of human capital and technical changes that are very essential to reap the benefits of trade liberalization. In case of Asian Tigers, political stability, role of government, and attitude of labor played significant role for inflow of capital which was crucial for their growth. Such aspects are neglected in the papers. Neumayer, (2004) analyzed the resource curse hypothesis by including effectiveness of rule and regulations in growth function. He reported that natural resource abundance impedes economic growth but trade openness and investment add in it. The author used new proxy (genuine income level) for economic growth but could recourse curse hypothesis is still exists.

Papyrakis and Gerlagh, (2007) investigate the resource curse hypothesis using data of the U.S sates over the period of 1986-2001 by incorporating investment, schooling, corruption, trade openness in growth function. After finding cointegration among the variables, they found that resource curse hypothesis is validated i.e. natural resource abundance impedes economic growth for the U.S states. They also expose that investment, schooling and trade openness add in economic growth but corruption declines it. Akinlo, (2012) examined the significance of Nigerian oil sector in the economic development of a country over the period 1960-2009 by applying multivariate VAR model developed by Johansen and Juselius, (1990, 1992). The results showed the long run relationship among the variables. Furthermore, it is noted that oil sector can play pivotal role to enhance economic growth by encouraging the non- oil sectors. It is evident from that fact that during the period of study the production of crude oil has increased significantly, which increased the contribution of oil sector in GDP. However, the positive contribution of the oil sector to manufacturing sub-sector is denied. The situation of foreign direct investment in the oil industry of Nigeria has been improving and also contributes significantly to economic growth. There are numerous other branches through which oil industry of Nigeria has contributed in accelerating the economic growth which are; provision of cheap of energy, availability of huge foreign reserves and provision of efficient labor force in the country (Odularo, 2008).

Asekunowo and Olaiya, (2012) probed the relationship between crude oil revenues and economic growth in Nigeria by applying Johansen multivariate cointegration over the period of 1974-2008. They reported that variables are cointegrated for long run relationship. Their empirical evidence supports the presence of resource curse hypothesis due to weak and challenged institutions, 'voracity effect', excessive spending, fiscal volatility, excessive borrowing and fractionalization in Nigeria. The role of institution is pointed by Sarmidi et al. (2013) while investigating the relationship between resource curse hypothesis using data of 90 countries over the period of 1984-2005. They find that abundance of natural resources affects economic growth positively after a threshold level of institutional quality.

The above discussion shows that review of literature could not provide any study which investigates empirical relationship between natural resource abundance and economic growth in case of Venezuela. This present study is humble effort to fill gap regarding Venezuelan economy.

III. Modelling Framework, Methodology and Data Collection

The aim of present study is to investigate the relationship between natural resource abundance and economic growth in case of Venezuelan economy. We use log-linear specification for consistent and efficient results which can help policy makers to articulate a comprehensive policy to sustain economic growth in long run. The empirical equation is modeled as following:

$$\ln Y_t = \beta_1 + \beta_2 \ln R_t + \beta_3 \ln F_t + \beta_4 \ln K_t + \beta_5 \ln TR_t + \mu_i \qquad (1)$$

Where, $\ln Y_t$, $\ln R_t$, $\ln F_t$, $\ln K_t$ and $\ln TR_t$ is natural log of real GDP per capita, real natural resource abundance per capita[1], financial development proxies by real per capita domestic credit to private sector, real capital use per capita and real trade openness per capita. μ_i is residual term assumed to be normally distributed with homoscedastic variance.

[1]According to definition Word Bank (2003), I have included mineral rents, forest rents, oil rents, coal rents and natural gas rents. All rents are as share of GDP. I added four series and multiplied it with GDP to convert it into units and then divided it with population to attain per capita natural resource abundance.

The present study examines the long run relationship among the natural and macroeconomic variables such as abundance of natural resources, financial development, trade openness, capital and economic growth for Venezuelan economy using the ARDL bounds testing approach developed by Pesaran et al. (2001) over the period of 1971-2011. The existing literature contains a variety of cointegration techniques to test the cointegration between the series but most of the economists prefer the ARDL bounds testing technique due to its various advantages. For example, order of integration of the series does not matter for applying the ARDL bounds testing if no variable is found to be stationary at I(2). For the empirical studies with fewer observations this econometric technique is more appropriate as compared to traditional cointegration techniques (Haug, 2002). General-to-specific framework, unrestricted version of the ARDL chooses proper lag order to capture the data generating procedure. The bounds testing approach to cointegration helps to correct the serial correlation and endogeneity problems (Pesaran and Shin, 1999). The unrestricted error correction model (UECM) has the following equation to investigate the long-and-short runs relations between the series:

$$\begin{aligned}\Delta \ln Y_t &= \vartheta_1 + \vartheta_T T + \vartheta_Y \ln Y_{t-1} + \vartheta_R \ln R_{t-1} + \vartheta_F \ln F_{t-1} + \vartheta_K \ln K_{t-1} + \vartheta_{TR} \ln TR_{t-1} + \sum_{i=1}^{p} \vartheta_i \Delta \ln Y_{t-i} \\ &+ \sum_{j=0}^{q} \vartheta_j \Delta \ln R_{t-j} + \sum_{k=0}^{r} \vartheta_k \Delta \ln F_{t-k} + \sum_{l=0}^{s} \vartheta_l \Delta \ln K_{t-l} + \sum_{m=0}^{t} \vartheta_m \Delta \ln TR_{t-m} + \mu_t\end{aligned} \tag{2}$$

$$\begin{aligned}\Delta \ln R_t &= \alpha_1 + \alpha_T T + \alpha_Y \ln Y_{t-1} + \alpha_R \ln R_{t-1} + \alpha_F \ln F_{t-1} + \alpha_K \ln K_{t-1} + \alpha_{TR} \ln TR_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta \ln R_{t-i} \\ &+ \sum_{j=0}^{q} \alpha_j \Delta \ln Y_{t-j} + \sum_{k=0}^{r} \alpha_k \Delta \ln F_{t-k} + \sum_{l=0}^{s} \alpha_l \Delta \ln K_{t-l} + \sum_{m=0}^{t} \alpha_m \Delta \ln TR_{t-m} + \mu_t\end{aligned} \tag{3}$$

$$\begin{aligned}\Delta \ln F_t &= \beta_1 + \beta_T T + \beta_Y \ln Y_{t-1} + \beta_R \ln R_{t-1} + \beta_F \ln F_{t-1} + \beta_K \ln K_{t-1} + \beta_{TR} \ln TR_{t-1} + \sum_{i=1}^{p} \beta_i \Delta \ln F_{t-i} \\ &+ \sum_{j=0}^{q} \beta_j \Delta \ln Y_{t-j} + \sum_{k=0}^{r} \beta_k \Delta \ln R_{t-k} + \sum_{l=0}^{s} \beta_l \Delta \ln K_{t-l} + \sum_{m=0}^{t} \beta_m \Delta \ln TR_{t-m} + \mu_t\end{aligned} \tag{4}$$

$$\begin{aligned}\Delta \ln K_t &= \rho_1 + \rho_T T + \rho_Y \ln Y_{t-1} + \rho_R \ln R_{t-1} + \rho_F \ln F_{t-1} + \rho_K \ln K_{t-1} + \rho_{TR} \ln TR_{t-1} + \sum_{i=1}^{p} \rho_i \Delta \ln K_{t-i} \\ &+ \sum_{j=0}^{q} \rho_j \Delta \ln Y_{t-j} + \sum_{k=0}^{r} \rho_k \Delta \ln R_{t-k} + \sum_{l=0}^{s} \rho_l \Delta \ln K_{t-l} + \sum_{m=0}^{t} \rho_m \Delta \ln TR_{t-m} + \mu_t\end{aligned} \tag{5}$$

$$\begin{aligned}\Delta \ln TR_t &= \sigma_1 + \sigma_T T + \sigma_Y \ln Y_{t-1} + \sigma_R \ln R_{t-1} + \sigma_F \ln F_{t-1} + \sigma_K \ln K_{t-1} + \sigma_{TR} \ln TR_{t-1} + \sum_{i=1}^{p} \sigma_i \Delta \ln TR_{t-i} \\ &+ \sum_{j=0}^{q} \sigma_j \Delta \ln Y_{t-j} + \sum_{k=0}^{r} \sigma_k \Delta \ln R_{t-k} + \sum_{l=0}^{s} \sigma_l \Delta \ln F_{t-l} + \sum_{m=0}^{t} \sigma_m \Delta \ln K_{t-m} + \mu_t\end{aligned} \tag{6}$$

Where Δ is the differenced operator and μ_t is residual term in period *t*. The akaike information criterion (AIC) is followed to choose appropriate lag length of the first differenced regression. The suitable calculation of F-statistic depends upon the appropriate lag order selection of the series to be included in the model[2]. By applying the F-test developed by Pesaran et al. (2001), the combined significance of the coefficients of lagged variables has been examined. The null hypothesis that there is no long run relationship between the variables in equation (3) is $H_0:\vartheta_Y=\vartheta_R=\vartheta_F=\vartheta_K=\vartheta_{TR}=0$ against the alternate hypothesis of long run relationship i.e. $H_0:\vartheta_Y\neq\vartheta_R\neq\vartheta_F\neq\vartheta_K\neq\vartheta_{TR}\neq 0$. Two asymptotic critical values have been generated by Pesaran et al. (2001). The decision whether the variables are cointegrated for long run relationship or not depends upon the upper critical bound (UCB) and lower critical bound (LCB). It is more appropriate to use LCB to test the cointegration between the series if all the variables are stationary at I(0). Similarly we apply UCB to investigate the long run relationship between the series if the variables are integrated at I(1) or I(0) or I(1)/I(0). We calculate the F-statistic applying following models such as $F_Y(Y/R,F,K,TR)$, $F_R(R/Y,F,K,TR)$, $F_K(K/Y,R,F,TR)$ and $F_{TR}(TR/Y,R,F,K)$ for equations (2) to (6) respectively. The cointegration is present between the series if upper critical bound (UCB) is less than our calculated F-statistic. If computed F-statistic does not exceed lower critical bound then there will be no cointegration between the variables. The existence of cointegration between the series is not unambiguous if computed F-statistic is found between LCB and UCB[3]. Our decision on the subject of cointegration is inconclusive if calculated F-statistic falls between LCB and UCB. In such a situation, error correction model is an easy and most suitable way to investigate the cointegration between the variables.

The size of our sample is small which consists of 41 observations for the period 1971-2011, and then critical values generated by Pesaran et al. (2001) are inappropriate. Therefore, due to this reason we have used lower and upper critical bounds generated by Narayan (2005). The critical bounds generated by Pesaran et al. (2001) are suitable for large sample size (T = 500 to T = 40, 000). It is indicated by Narayan and Narayan, (2004) that the critical values computed by Pesaran et al. (2001) might provide biased decision regarding cointegration between the series. The critical bounds by Pesaran et al. (2011) are extensively downwards. The upper and lower critical bounds calculated by Narayan, (2005) are more suitable for small samples rages from T = 30 to T = 80.

Once, it is confirmed that cointegration exists between abundance of natural resources, financial development, trade openness, capital and economic growth then we should examine the causal relation between the series over the period of 1971-2011. Granger, (1969) pronounced that once the variables are integrated at I(1) then vector error correction method (VECM) is the most appropriate approach to test direction of causal rapport between the variables. Comparatively, the VECM is restricted form of unrestricted VAR (vector autoregressive) and restriction is levied on the presence of long run relationship between the series. All the series are endogenously used in the system of error correction model (ECM). This shows that in such a situation, response variable is explained both by its own lags and lags of independent variables as well as by the error correction term and by residual term. The VECM in five variables case can be written as follows:

[2]For details see Shahbaz et al. (2011)

[3]If the variables are integrated at I(0) then F-statistic should be greater than lower critical bound for the existence of cointegration between the series

$$\Delta \ln Y = \alpha_{\circ 1} + \sum_{i=1}^{l} \alpha_{11} \Delta \ln Y_{t-i} + \sum_{j=1}^{m} \alpha_{22} \Delta \ln R_{t-j} + \sum_{k=1}^{n} \alpha_{33} \Delta \ln F_{t-k} + \sum_{r=1}^{o} \alpha_{44} \Delta \ln K_{t-r} + \sum_{s=1}^{p} \alpha_{55} \Delta \ln TR_{t-s} + \eta_1 ECT_{t-1} + \mu_{1i} \quad (7)$$

$$\Delta \ln R = \beta_{\circ 1} + \sum_{i=1}^{l} \beta_{11} \Delta \ln R_{t-i} + \sum_{j=1}^{m} \beta_{22} \Delta \ln Y_{t-j} + \sum_{k=1}^{n} \beta_{33} \Delta \ln F_{t-k} + \sum_{r=1}^{o} \beta_{44} \Delta \ln K_{t-r} + \sum_{s=1}^{p} \beta_{55} \Delta \ln TR_{t-s} + \eta_2 ECT_{t-1} + \mu_{2i} \quad (8)$$

$$\Delta \ln F = \phi_{\circ 1} + \sum_{i=1}^{l} \phi_{11} \Delta \ln F_{t-i} + \sum_{j=1}^{m} \phi_{22} \Delta \ln Y_{t-j} + \sum_{k=1}^{n} \phi_{33} \Delta \ln R_{t-k} + \sum_{r=1}^{o} \phi_{44} \Delta \ln K_{t-r} + \sum_{s=1}^{P} \phi_{55} \Delta \ln TR_{t-s} + \eta_3 ECT_{t-1} + \mu_{3i} \quad (9)$$

$$\Delta \ln K = \varphi_{\circ 1} + \sum_{i=1}^{l} \varphi_{11} \Delta \ln K_{t-i} + \sum_{j=1}^{m} \varphi_{22} \Delta \ln Y_{t-j} + \sum_{k=1}^{n} \varphi_{33} \Delta \ln R_{t-k} + \sum_{r=1}^{o} \varphi_{44} \Delta \ln K_{t-r} + \sum_{s=1}^{p} \varphi_{55} \Delta \ln TR_{t-s} + \eta_4 ECT_{t-1} + \mu_{4i} \quad (10)$$

$$\Delta \ln TR = \delta_{\circ 1} + \sum_{i=1}^{l} \delta_{11} \Delta \ln TR_{t-i} + \sum_{j=1}^{m} \delta_{22} \Delta \ln Y_{t-j} + \sum_{k=1}^{n} \delta_{33} \Delta \ln R_{t-k} + \sum_{r=1}^{o} \delta_{44} \Delta \ln K_{t-r} + \sum_{s=1}^{p} \delta_{55} \Delta \ln TR_{t-s} + \eta_4 ECT_{t-1} + \mu_{4i} \quad (11)$$

Where Δ represents differenced operator and u_{it} are residual terms and assumed to be identically, independently and normally distributed. The statistical significance of lagged error term i.e. ECT_{t-1} further validates the established long run relationship between the variables. The estimates of ECT_{t-1} also shows that the speeds of convergence from short run towards long run equilibrium path in all models. The VECM is better to test the causal relation once series are cointegrated and causality must be found at least from one direction. Further, the VECM helps to distinguish between short-and-long runs causal relationships. The VECM is also used to detect causality in long run, short run and joint i.e. short-and-long runs respectively in the following three possible ways:

The statistical significance of estimate of lagged error term i.e. ECT_{t-1} with negative sign confirms the existence of long run causal relation using the t-statistic. Short run causality is indicated by the joint χ^2 statistical significance of the estimates of first difference lagged independent variables. For example, the significance of $\alpha_{22,i} \neq 0 \forall_i$ implies that Granger causality is running from natural resource abundance to economic growth and economic growth Granger causes natural resource abundance can be indicated by the significance of $\beta_{22,i} \neq 0 \forall_i$. The same inference can be drawn for rest of causality hypotheses. Finally, we use Wald or F-test to test the joint significance of estimates of lagged terms of independent variables and error correction term. This further confirms the existence of short-and-long run causality relations and known as measure of strong Granger-causality.

The data for natural resource abundance, real GDP, domestic credit to private sector as share of GDP, capital and trade openness (exports + imports / GDP) has been collected from world development indicators (CD-ROM, 2011). The consumer prices index and population data is used to convert all the series into real per capita. The study covers the period of 1971-2011.

IV. Results and their Discussions

Table-1 reports the descriptive and correlation matrix. The results by Jarque-Bera test indicated that all the series are normally distributed with zero mean and constant variance. The correlation coefficient reveals that financial development, trade openness and capital are positively correlated with economic growth while correlation between natural resources abundance and economic growth is negative. Trade openness is positively linked with natural resources abundance. A negative correlation is found financial development and capital with natural resources abundance. Capital and trade openness are positively correlated with financial development. A positive correlation is found between trade openness and capital.

Table-1: Descriptive Statistics and Correlation Matrix

Variables	$\ln Y_t$	$\ln R_t$	$\ln F_t$	$\ln K_t$	$\ln TR_t$
Mean	7.5356	6.2229	6.1817	5.9543	6.8096
Median	7.5081	6.2186	6.2656	5.9531	6.8102
Maximum	7.7373	7.0441	7.0361	6.5588	7.1071
Minimum	7.2361	5.5926	4.8024	5.3527	6.2856
Std. Dev.	0.1203	0.3529	0.6641	0.3371	0.1870
Skewness	-0.0518	0.0738	-0.4118	0.1701	-0.4514
Kurtosis	2.4040	2.6017	1.8691	2.2080	2.8162
Jarque-Bera	0.6098	0.3006	3.2620	1.2383	1.4148
Probability	0.7371	0.8604	0.1957	0.5383	0.4929
$\ln Y_t$	1.0000				
$\ln R_t$	-0.0165	1.0000			
$\ln F_t$	0.6967	-0.2784	1.0000		
$\ln K_t$	0.7927	-0.2164	0.7607	1.0000	
$\ln TR_t$	0.4251	0.6289	0.0424	0.2423	1.0000

The long run relationship between the variables has been examined by apply the ARDL bounds testing approach to cointegration. It is precondition to test the integrating order of the series. The reason is that the ARDL bounds testing becomes invalid if any variables is stationary at I(2) or beyond that order of integration of the variables. The assumption of the ARDL bounds testing approach is that variables should be integrated at I(1) or I(0) or I(1) / I(0). We have applied ADF and PP unit root tests. The results of both tests are reported in Table-2.

Table-2: ADF and PP Unit Root Analysis

Variables	ADF Test with Intercept and Trend		PP Test with Intercept and Trend	
	T-statistics	Prob. Values	T-statistics	Prob. Values
$\ln Y_t$	-2.6392 (1)	0.2656	-2.1854(1)	0.4870
$\Delta \ln Y_t$	-3.7686(2)	0.0286**	-5.5760(3)	0.0002*
$\ln R_t$	-2.7075 (5)	0.2400	-3.1608 (3)	0.1072

$\Delta \ln R_t$	-5.3290 (1)	0.0005*	-7.0713(3)	0.0000*
$\ln F_t$	-2.1207(1)	0.5217	-1.8407 (3)	0.6671
$\Delta \ln F_t$	-4.0922 (1)	0.0120**	-5.4286 (3)	0.0002*
$\ln K_t$	-2.8433 (1)	0.1895	-2.3960(3)	0.3776
$\Delta \ln K_t$	-5.7976 (1)	0.0001*	-5.9772 (3)	0.0000*
$\ln TR_t$	-2.7345 (1)	0.2280	-3.1580 (3)	0.1047
$\Delta \ln TR_t$	-5.1103 (1)	0.0007*	-8.1201 (6)	0.0000*
Note: * and ** represent significance at 1% and 5% levels. Lag (band width) of ADF (PP) unit test is shown in parentheses.				

The results revealed that both tests show unit root problem at their level form with intercept and trend. Variables are found to be integrated at I(1). This implies that variables are stationary at 1st difference and have unique level of integration. This same level of the variables appeals us to examine cointegration between the series by applying the ARDL bounds testing approach to cointegration. It is necessary to have information about the lag order of the variables using unrestricted VAR model which helps in computing F-statistic to check either cointegration between the variables exists or not. We used Akaike Information Criteria (AIC) which has strong precision power while providing better and consistent results for small samples. The next step is to compute F-statistic to compare it with critical bounds generated by Narayan, (2005). The critical bounds provided Narayan, (2005) more suitable for small samples than Pesaran et al. (2001). Table-3 shows the results of the ARDL bounds testing approach to cointegration.

Table-3: Bounds Testing to Cointegration

Estimated Models	$Y_t = f(R_t, F_t, K_t, TR_t)$	$R_t = f(Y_t, F_t, K_t, TR_t)$	$F_t = f(Y_t, R_t, K_t, TR_t)$	$K_t = f(Y_t, R_t, F_t, TR_t)$	$TR_t = f(Y_t, R_t, F_t, K_t)$
Optimal lag structure	(2, 1, 2, 2, 2)	(2, 2, 2, 2, 2)	(2, 1, 2, 2, 2)	(2, 1, 2, 1, 2)	(2, 2, 2, 2, 2)
F-statistics (Wald-Statistics)	6.607**	7.124**	4.211	7.779**	10.663*
Significant level	Critical values ($T = 42$)#				
	Lower bounds, $I(0)$	Upper bounds, $I(1)$			
1 per cent	7.527	8.803			
5 per cent	5.387	6.437			
10 per cent	4.447	5.420			
R^2	0.8741	0.8998	0.8667	0.8985	0.8499
Adjusted- R^2	0.7261	0.7497	0.7100	0.7913	0.6398
F-statistics (Prob-value)	5.9047 (0.0002)*	5.9924 (0.0006)*	5.5306 (0.0004)*	8.3664 (0.0000)*	4.0457 (0.0039)*
Durbin-Watson	1.9798	2.0076	2.2768	2.1911	2.4631

Note: The asterisk *, ** denote the significant at 1%, 5% level of significance. The optimal lag structure is determined by AIC. The probability values are given in parenthesis. # Critical values bounds computed by (Narayan, 2005) following unrestricted intercept and restricted trend.

The empirical evidence indicates that our computed F-statistics are greater than upper critical bounds provided by Narayan, (2005). The null hypothesis of no cointegration is rejected at 5% and 1% once we used natural resource abundance, economic growth, capital and trade openness used as regressand variables. This confirms the presence of cointegration between the variables. Further, this leads to conclude that there is a long run relationship between natural resource abundance, economic growth, financial development, capital and trade openness in case of Venezuelan economy over the period of 1971-2011.

Table-4 deals with long-and-short runs analysis. The long run analysis exposed that natural resources are inversely linked with economic growth. This validates the presence of resource curse hypothesis in case of Venezuela. A 10 per cent increase in natural resources abundance declines economic growth by 0.934 per cent, all else is same. The impact of financial development on economic growth is positive and it is statistically significant at 1 per cent level of significance. This confirms that financial development spurs economic growth by increasing capitalization in the country. If other things remain same, a 1 percent increase in financial development is linked is inked with 0.0861 percent increase in economic growth. These findings support the view agued by Shahbaz, (2009) and Shahbaz et al. (2010) for Pakistan that financial development plays a vital role to stimulate domestic output by enhancing investment opportunities and hence economic growth. The impact of capital on economic growth is positive and it is statistically significant at 1 per cent. Keeping other things constant, a 1 increase in capitalization (capital use) will increase economic growth by 0.1333 per cent. Importantly, trade openness has positive effect on economic growth. The results unveiled that trade openness is a major contributor to economic growth. A 0.33 per cent economic growth is stimulated by a 1 per cent increase in trade openness if other things remain same.

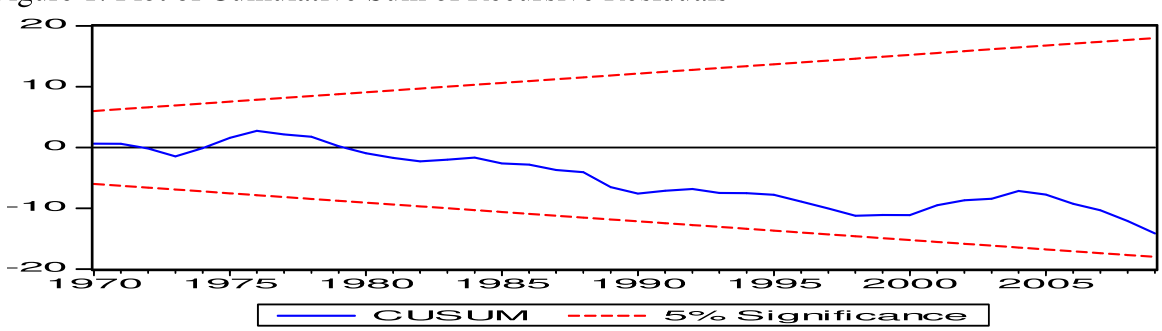
Table-4: Long and Short Runs Results

Dependent variable = $\ln Y_t$				
Long Run Analysis				
Variables	Coefficient	Std. Error	T-Statistic	Prob. values
Constant	4.4853*	0.3612	12.416	0.0000
$\ln R_t$	-0.0934**	0.0372	-2.5110	0.0168
$\ln F_t$	0.0861*	0.0150	5.7130	0.0000
$\ln K_t$	0.1333*	0.0325	4.1045	0.0002
$\ln TR_t$	0.3385*	0.0756	4.4771	0.0001
Short Run Analysis				
Variables	Coefficient	Std. Error	T-Statistic	Prob. values
Constant	-0.0079***	0.0041	-1.9218	0.0645
$\ln R_t$	-0.0026	0.0170	-0.1549	0.8780
$\ln F_t$	0.0697***	0.0408	1.7062	0.0987
$\ln K_t$	0.1538*	0.0377	4.0714	0.0003
$\ln TR_t$	0.1107**	0.0438	2.5291	0.0171
ECM_{t-1}	-0.4018*	0.0894	-4.4914	0.0001

R^2	0.8250			
F-statistic	27.3559*			
D. W	2.1659			
Short Run Diagnostic Tests				
Test	F-statistic	Prob. value		
$\chi^2 NORMAL$	0.7091	0.7014		
$\chi^2 SERIAL$	0.5501	0.5831		
$\chi^2 ARCH$	0.0023	0.9617		
$\chi^2 WHITE$	2.1572	0.0597		
$\chi^2 REMSAY$	0.0624	0.8045		
Note: * and ** show significant at 1 and 5 per cent level of significance respectively.				

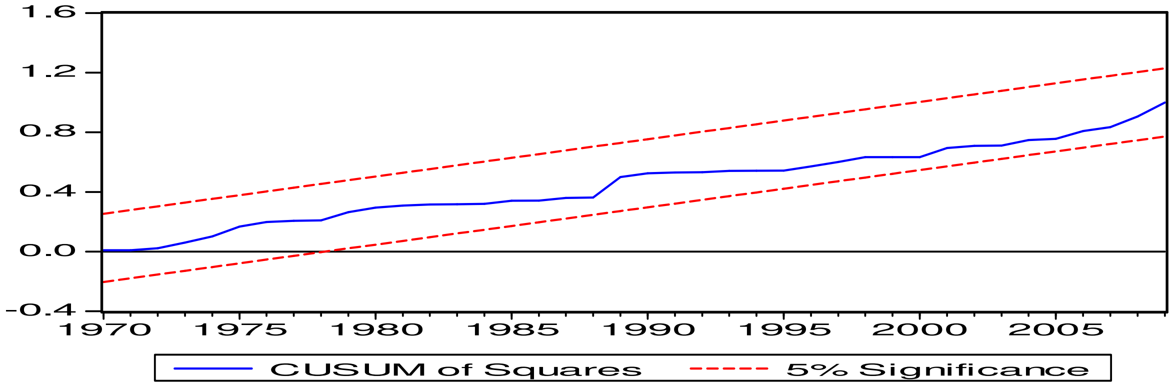
The lower part of Table-4 deals with short run dynamic relationship between natural resources abundance, financial development, capital, trade openness and economic growth in Venezuela. The impact of natural resources abundance is negative but statistically insignificant. Financial development, capital and trade openness stimulate economic growth. The estimates of short run are smaller than long run coefficients which confirm that results are stable and reliable. The negative and statistically significant estimates of ECM_{t-1}, (-0.4018) (for economic growth equation) lends support to long run relationship among the variables in case of Venezuela. The coefficient is statistically significant at 1 per cent level. This implies that short run deviations are corrected by 40.18 per cent towards long run equilibrium path. The short run diagnostic tests show that error terms of short run models are normally distributed but could not pass heteroskedasticity test. The errors are free of serial correlation, and ARCH problems in all three models. The Ramsey reset test shows that functional form for the short run models are well specified. The stability of long run and short run parameters is investigated by examining the significance of CUSUM and CUSUMsq graphs. The test conducted by the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMsq) suggests stability of the long and short run parameters (Figures 1-2). The graphs of the CUSUM and CUSUMsq test lie within the 5 percent critical bounds which confirm stability of parameters (Bahmani-Oskooee and Nasir, 2004). The model is also well specified.

Figure 1: Plot of Cumulative Sum of Recursive Residuals



The straight lines represent critical bounds at 5% significance level.

Figure 2: Plot of Cumulative Sum of Squares of Recursive Residuals



The straight lines represent critical bounds at 5% significance level.

IV.1 VECM Granger Causality Analysis

The presence of long run relationship between natural resource abundance, financial development, capital use, trade openness and economic growth leads us to investigate the causality relation between the variables. It is suggested by Granger, (1969) that vector error correction method (VECM) is more appropriate to examine the causality between the series if the variables are integrated at I(1). The VECM is restricted form of unrestricted VAR (vector autoregressive) and restriction is levied on the presence of long run relationship between the series. The system of error correction model (ECM) uses all the series endogenously. This system allows the predicted variable to explain itself both by its own lags and lags of forcing variables as-well-as error correction term and by residual term. The appropriate growth policy to sustain economic growth is dependent upon the nature of causal relation between the series. In doing so, we applied the VECM granger causality approach to detect the causality between the series. The results of the VECM Granger causality analysis are reported in Table-5.

Table-5: VECM Granger Causality Empirical Evidence

Dependent Variable	Direction of Causality										
	Short Run					Long Run	Joint Long-and-Short Run Causality				
	$\Delta \ln Y_{t-1}$	$\Delta \ln R_{t-1}$	$\Delta \ln F_{t-1}$	$\Delta \ln K_{t-1}$	$\Delta \ln TR_{t-1}$	ECT_{t-1}	$\Delta \ln Y_{t-1}, ECT_{t-1}$	$\Delta \ln R_{t-1}, ECT_{t-1}$	$\Delta \ln F_{t-1}, ECT_{t-1}$	$\Delta \ln K_{t-1}, ECT_{t-1}$	$\Delta \ln TR_{t-1}, ECT_{t-1}$
$\Delta \ln Y_t$	….	2.8037*** [0.0803]	1.5290 [0.2371]	5.5873** [0.0102]	8.8424* [0.0013]	-0.5530* [-4.2784]	….	6.1916* [0.0029]	12.8083* [0.0000]	10.0882* [0.0002]	15.7740* [0.0000]
$\Delta \ln R_t$	1.1135 [0.3448]	….	2.9410*** [0.0690]	3.8841** [0.0346]	8.7905* [0.0014]	-0.7871** [-2.7981]	3.2090** [0.0410]	….	3.4205** [0.0334]	5.3630* [0.0057]	9.3270* [0.0002]
$\Delta \ln F_t$	1.2246 [0.3109]	0.3669 [0.6832]	….	6.6877* [0.0047]	1.5620 [0.2295]	….	….	….	….	….	….
$\Delta \ln K_t$	3.0983*** [0.0635]	0.6983 [0.5577]	10.0822* [0.0007]	….	1.0376 [0.3696]	-0.3396* [-3.6480]	5.2401* [0.0063]	6.8543* [0.0015]	10.2920* [0.0002]	….	6.1081* [0.0031]
$\Delta \ln TR_t$	4.1827** [0.0276]	10.9449* [0.0004]	4.2114** [0.0271]	1.0177 [0.3765]	….	-0.7114** [-2.9780]	4.0647** [0.0181]	8.5930* [0.0005]	4.3933** [0.0134]	4.4020** [0.0133]	….

Note: *, ** and *** show significance at 1, 5 and 10 per cent levels respectively.

The results opined that there is bidirectional causality between natural resource abundance and economic growth. The feedback hypothesis between both variables suggests that government should launch natural resource friendly policies to explore natural resources to sustain economic growth by attaining maximum benefit from existed natural resources. The bidirectional causality also exists between trade and economic growth. This reveals that trade openness enhances the production level by increasing exports potential through spillover effects i.e. technological effects and hence raises economic growth. In resulting economic growth raises the demand for foreign goods and expands the size of exports in international markets hence increases trade volume. This suggests that government should adopt trade liberalization policies to stimulate economic growth in the country. Abundant natural resources and trade openness Granger cause each other. This indicates that both variables are complementary and same inference can be drawn for capital and economic growth and, trade openness and capital.

In short run, feedback hypothesis exists between trade openness and economic growth. Capital and economic growth Granger cause each other. The bidirectional causality is found between financial development and capital and, between natural resource abundance and trade openness. Financial development Granger causes natural resources abundance and capital use. The joint long-and-short run causality results also confirm the causal relationship both for long run as well as for short run.

V. Conclusion and Policy Implications

This study deals with the empirical investigation of impact of natural resource abundance on economic growth in case of oil abundant country i.e. Venezuelan economy. In doing so, we applied ADF and PP unit root test to test the order of integration of the variables. The long run relationship between natural resource abundance, financial development, capital, trade openness and economic growth was investigated by applying the ARDL bounds testing approach to cointegration. The causal relationship between the series was examined by using the VECM granger causality approach.

Our results validated the presence of cointegration between the variables. This confirmed that variables are cointegrated for long run relationship. The empirical exercise reported that abundance of natural resource in Venezuela does not contribute to economic growth. The impact of natural resource abundance on economic growth is negative. Financial development stimulates economic growth. Economic growth is promoted by increasing capitalization in the country. Trade openness plays a vital role in promoting economic growth.

This study suggests that government should encourage natural resource exploration policies. This not only increases the productivity of natural resources. Government also launch development policies to promote economic growth and hence economic development by utilizing natural resources properly after designing a comprehensive natural resource exploration and economic policies. Financial development and trade openness should be used as policy tool to exploit natural resources and to enhance domestic production which increases economic growth.

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