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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 for Venezuelan economy. We have applied the ARDL bounds testing approach to cointegration developed by Pesaran et al. (2001) to examine its long run relationship amid the variables. The VECM Granger causality is applied to test the direction of causality among the variables. This 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.

1. Introduction

Initially the term "Dutch disease" was used to explain the indirect effects of the boom in gas sector in the Netherlands in the 1960s on the other sectors of the economy (Priyati, 2009). Two gap theory suggests that lack of both domestic savings and foreign exchange reserves provides various hurdles in the way of economic development, especially in the developing countries. In such a situation export boom should provide enough resources to meet the development needs of the developing countries. Coden (1981) provided a theoretical frame work that can be used to analyze the tradeable squeeze; for this purpose he used the economic conditions of British economy of the 1980s. During this time period increase in the value of domestic currency (sterling) and uninterrupted increase in the nominal wages together made the tradeable squeeze. Coden (1981) discussed three important ingredients of the economic theory of squeeze on tradeables which are: short run effects of a monetary squeeze, short effects of North Sea oil, and medium run effects of North sea oil. He concluded that monetary squeeze has larger effects on the various sectors of the economies because it adversely affects both tradeable and non tradeable sectors. Corden and Neary (1982) provided the systematic analysis of the structural changes that occurred in the liberalized small developed and developing economies. They theoretically examined the effects of a boom of a traded goods sector of an economy on the resource allocation, factoral income distribution and the real exchange rate. Australia is rich in mineral resources, the Netherlands has natural gas resources, the United Kingdom, Norway and OPEC are full of oil deposits. They concluded that a booming sector has the extractive nature but manufacturing sectors remain under pressure. Similar findings were reported by Cordon (1982) for Australian economy.

On same lines, Usui (1996) empirically investigated the effects of oil export boom in Indonesia which has implemented the two policy options of exchange rate devaluation and accumulation of budget surplus. The empirical results of this study reveal that exchange rate adjustment policy played a significant role in the expansion of the tradable sectors including the manufacturing and agricultural sectors. Moreover, surplus budget as well as the exchange rate devaluation have also contributed in avoiding the "Dutch disease" in Indonesia during this period. Usui (1997) made a comparison of the critical issue of "Dutch disease" between the economies of Indonesia and Mexico by discussing the policy options with reference to oil boom that occurred in these countries. This study painted a contrast picture in their fiscal, external borrowings and exchange rate policies. It also confirms that booming governments should be conservative while designing economic policies to avoid the "Dutch disease" like Indonesia. Investment use of oil revenue in tradable sector was the other factor behind the Indonesian success. But on the other side the economy of Mexico fails to take the advantage of their natural resources and can be an example of resource curse hypothesis.

Now, the abundance of natural resources and economic growth has become a dominating theme around the globe during the last three decades. The relationship among natural resource 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,

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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 a vital role in enhancing domestic production and hence economic growth (Shahbaz, 2009). Financial development may help in exploring the natural resources and trade openness facilitates the natural resources in stimulating economic growth as well (Shahbaz, 2012).

Development economists of the decades 1950s and 1960s such as Nurkse (1959) and Rostow (1960) 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 the 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 (Gylfason, 2001; Leite and Weidmann, 1999; Sachs and Warner, 1995, 1997, 1999a). 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 resource 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). It is explored by Gylfason (2000) how abundance of natural resources impede economic growth. For example, natural resource abundance can be the cause of overvaluation of the national currency due to the volatility of the exchange rate. *Secondly*, the contest for resource rents can lead to corruption. Therefore, natural resource abundance leads to inefficient allocation of talent and resources, which hinders economic growth of an oil rich country. *Thirdly*, excessive availability of the natural resources gives a false sense of economic security to the people, and government loses the sight to make a growth friendly environment in the country. *Fourthly*, nations with the abundance of natural resources do not give priority to the development of their human resources and allocate less income for the education sector. In fact, their natural wealth may misguide them to the need for educating their children. Education is an important prerequisite for the rapid development of a country because education converts the raw labor into human capital (Gylfason, 2000). This entails that abundance of natural resources is likely to decelerate economic growth not only through the misallocation of resources, breeding corruption but also by weakening the sources for the accumulation of human capital.

An oil resource in any country has some special features. On one side, it earns the revenue for the state and on the 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 $382.4 billion of GDP in 2012. The Venezuelan economy has been exporting oil for almost a century now. The main mineral resource of the Venezuelan economy is oil, which has earned more than a trillion dollars of income between 1950 and 2008. Oil income accounts on average for 61% of total government revenues, over 88% of exports and 14% of GDP. In 2011, oil income amounted to over US$ 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 in 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%. Not only the magnitude but also the structure of taxes has also changed significantly over time because the state is trying to maximize the amount of rent.

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 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 the higher the oil revenues the 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. Furthermore, majority of the countries who have abundance of mineral oil, gas and other natural resources have less growth rate as compared to those countries with no or fewer natural resources. Nigeria, Iran, Libya, Iraq, Kuwait and Qatar are the countries endowed with mineral oil and other natural resources but their growth rate has been very slow since the 1960s and 1970s. For example today Nigeria has the same per capita GNP as it was in 1966. Similarly the growth rate of Iran between 1965 and 1998 on average was recorded at −1% per year, −2% per year for Libya, and −3% for Iraq and Kuwait. It was −6% per year in Qatar during 1970–995. During 1965–98 for OPEC as a whole GNP per capita was on average decreased by 1.3% per year. Out of 65 natural resource abundant countries only four countries succeeded in enhancing the level of investment and per capita GNP by diversifying their economies and industrializing. These four countries are: Botswana, Indonesia, Malaysia and Thailand (Gylfason, 2001). These examples reveal the consistent pattern of slow economic growth in natural resource abundant countries. Economic growth varies inversely with the increase of the share of natural capital in gross national product (GNP).

Table 1
Government share of net-oil revenues.Source: Mazano and Monaldi (2010), PODE.

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

Table 2
GDP growth rate (%) and rents (% of GDP).Source: World Development Indicators, 2011.

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

The key motives that lie 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 the case of Venezuela over the period 1971–2011. We find that natural resource abundance impedes economic growth validating the presence of resource curse hypothesis in the case of Venezuela. Moreover, financial development, trade openness, and capital add to 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 the last section V.

2. Literature review

The existing literature on resource curse hypothesis shows the direct and indirect effects of natural resource abundance on economic growth. These effects are indecisive due to the reason that some studies showed positive impact and other advocated negative effect on economic growth. This implies that empirical studies seem to present a mixed verification on the validity of resource curse hypothesis (Papyrakis and Gerlagh, 2004)[1]. History of economic development reveals that growing economies who relied heavily on the abundance of their natural resources for economic development fail to achieve 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 (Auty, 2001; Lal and Myint, 1996; Ranis, 1991; Sachs and Warner, 1995, 1999).

Some countries of the world reap the benefits of natural resource abundance; the episode of natural resource booms in the 19th 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, the 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 resource abundant economies (Gylfason, 2001; Sachs and Warner, 1995). These natural resource abundant 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 (Gillis et al., 1996; Gylfason, 2001; Sachs and Warner, 1995, 1999). 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 which occurred in the 19th and 20th century was an exception 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 natural resource abundance can be minimized or removed.

The excellent economic performance of Asian tiger economies is a 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 into 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 the second failed to do so due to various domestic reasons. The role of government in the 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 suffer 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 them. 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 the case of Asian Tigers, political stability, role of government and attitude of labor played a significant role for inflow of capital which was crucial for their growth. Niemeyer (2004) analyzed the resource curse hypothesis by including effectiveness of rules 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 a new proxy (genuine income level) for economic growth but it could be that recourse curse hypothesis still exists.

Papyrakis and Gerlagh (2007) investigate the resource curse hypothesis using data of the U.S. states over the period 1986–2001 by incorporating investment, schooling, corruption, and 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 the 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

[1] Torres et al. (2013) surveyed the existing studies conducted on resource curse hypothesis. They claimed that although the paradox of resource curse is resolvable it is difficult to find a conclusive answer. This would be helpful in designing a comprehensive economic policy to reap fruits from abundant resources for sustainable economic development.

showed the long run relationship among the variables. Furthermore, it is noted that oil sector can play a 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 the 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 the oil industry of Nigeria has contributed in accelerating economic growth which are: provision of cheap 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 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.

Recently, Elhannani (2013) investigated the resource curse by showing the importance of macroeconomic variables such as real GDP growth, oil price volatility, government expenditures, financial development and oil share to GDP. Empirical evidence confirmed the presence of resource curse hypothesis due high oil price volatility and abundance of oil as oil abundance has an inverse impact on economic growth. Financial development and government development expenditures spur economic growth. Shaw (2013) tested the resource curse hypothesis in case of Azerbaijan and noted that abundance of natural resources is only a reason for low economic growth. Ross (2013) critically evaluated the resource curse hypothesis and claimed that abundance of natural resource is cause by bad democracy, weak institutions and creates violence within the society. Furthermore, he exposed that abundance of petroleum wealth makes society more durable, corrupt, authoritarian and violent. The role of institution is pointed by Sarmidi et al. (2014) while investigating the relationship between resource curse hypothesis using data of 90 countries over the period 1984–2005. They find that abundance of natural resources affects economic growth positively after a threshold level of institutional quality. Zuo and Schieffer (2014) noted that resource curse effect is valid in resource rich regions of China. This effect prevails just due to crowding-out effects in education and R & D.

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 the case of Venezuela. This present study is a humble effort to fill a gap regarding the Venezuelan economy.

3. Modeling framework, methodology and data collection

The aim of the present study is to investigate the relationship between natural resource abundance and economic growth in the case of the 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 the long run. The empirical equation is modeled as follows:

$$\ln Y_t = \beta_1 + \beta_2 \ln R_t + \beta_3 \ln F_t + \beta_4 \ln K_t + \beta_5 \ln TR_t + \mu_i \tag{1}$$

where, $\ln Y_t$, $\ln R_t$, $\ln F_t$, $\ln K_t$ and $\ln TR_t$ are a natural log of real GDP per capita, real natural resource abundance per capita,[2] 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 a residual term assumed to be normally distributed with homoscedastic variance.

The present study examines the long run relationship between natural resource abundance 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, the 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, the 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 run 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 an

[2] According to definition Paul (2003), I have included mineral rents, forest rents, oil rents, coal rents and natural gas rents. All rents are considered 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.

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.[3] 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 Eq. (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 Eqs. (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 the computed F-statistic is found between LCB and UCB.[4] 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 a 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 a biased decision regarding cointegration between the series. The critical bounds by Pesaran et al. (2001) 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 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 the direction of causal rapport between the variables. Comparatively, the VECM is a 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 a five variable case can be written as follows:

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

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

[4] If the variables are integrated at I(0) then we compare our calculated F-statistic with lower critical bound to make decisions whether cointegration exists between the series or not otherwise we use upper critical bounds if the variables are integrated at I(1).

Table 3
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

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

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

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

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

where Δ represents differenced operator and u_{it} are residual terms and assumed to be identically, independently and normally distributed. The statistical significance of the lagged error term i.e. ECT_{t-1} further validates the established long run relationship between the variables. The estimate of ECT_{t-1} also shows the speed of convergence from short run toward 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 run 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 that 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 the rest of the causality hypotheses. Finally, we use Wald or F-test to test the joint significance of estimates of

Table 4
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
Δ 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
Δ 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
Δ 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
Δ 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
Δ ln TR_t	−5.1103 (1)	0.0007*	−8.1201 (6)	0.0000*

Note: Lag (band width) of ADF (PP) unit test is shown in parentheses.
* Represents significance at 1% level.
** Represents significance at 5% level.

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 (World Development Indicators, CD-ROM, 2012). The consumer prices index and population series are used to convert all the variables into real per capita. The study covers the period of 1971–2011.

4. Results and their discussions

Table 3 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 resource abundance and economic growth is negative. Trade openness is positively linked with natural resource abundance. A negative correlation is found for financial development and capital with natural resource abundance. Capital and trade openness are positively correlated with financial development. A positive correlation is found between trade openness and capital.

The long run relationship between the variables has been examined by applying the ARDL bounds testing approach to cointegration. It is a precondition to test the integrating order of the series. The reason is that the ARDL bounds testing becomes invalid if any variable 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 4.

Table 6
Long and short runs results.

Dependent variable = ln Y_t				
Variables	Coefficient	Std. error	T-statistic	Prob. values
Long run analysis				
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				
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		
χ^2*NORMAL*	0.7091	0.7014		
χ^2*SERIAL*	0.5501	0.5831		
χ^2*ARCH*	0.0023	0.9617		
χ^2*WHITE*	2.1572	0.0597		
χ^2*REMSAY*	0.0624	0.8045		

Note: * and ** show significant at 1 and 5% levels of significance respectively.

The results revealed that both tests show a unit root problem at their level form with intercept and trend. The variables are found to be integrated at I(1). This implies that the variables are stationary at 1st difference and have a 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 the unrestricted VAR model which helps in computing F-statistic to check whether 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 5 shows the results of the ARDL bounds testing approach to cointegration.

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 regress and variables. This confirms the presence of cointegration between the variables. Further, this leads to conclude

Table 5
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 ($T = 42$)[a]				
	Lower bounds, $I(0)$	Upper bounds, $I(1)$			
1%	7.527	8.803			
5%	5.387	6.437			
10%	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 asterisks *, ** denote the significant at 1%, 5% levels of significance. The optimal lag structure is determined by AIC. The probability values are given in parenthesis.
[a] Critical values bounds computed by (Narayan, 2005) following unrestricted intercept and restricted trend.

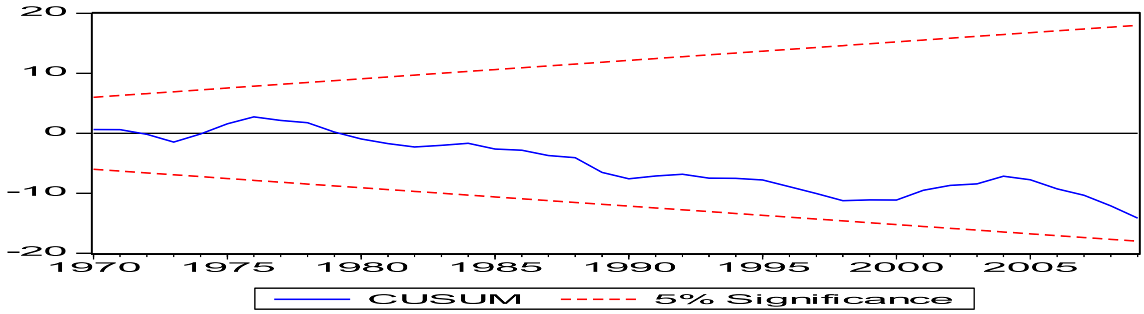

Fig. 1. Plot of cumulative Sum of recursive residuals. The straight lines represent critical bounds at 5% significance level.

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 5).

Table 6 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 the case of Venezuela. A 10% increase in natural resource abundance declines economic growth by 0.934%, all else being the same. It is globally observed that countries with the abundance of natural resources recorded slow economic growth rates in the last 60 years. It strengthens the new emerging idea that natural resources might be a curse rather than blessing in the natural resource abundant countries like Venezuela. Researchers have given several reasons for the negative impact of oil revenue on economic growth for the various countries including Venezuela. These reasons are; volatility in exchange rate, inefficient allocation of resources due to corruption, false sense of economic security due to the abundance of natural resources, parents do not invest in children's education, and lack of priority in developing the human capital. Bodin (1962) explained that more fertile soil makes its owners lazy and inefficient. Labor force works in a sector that has a higher birth rate and gives less education to their children as compared to those people working in a modern sector. Less education establishes a negative relation between natural resources and economic growth (Haaparanta, 2004). This finding is the same with the line of existing empirical studies such as Papyrakis and Gerlagh (2004); Papyrakis and Gerlagh (2007) for US; and Asekunowo and Olaiya (2012) for Nigeria.

The impact of financial development on economic growth is positive and it is statistically significant at 1% level of significance. This confirms that financial development spurs economic growth by increasing capitalization in the country. If other things remain the same, a 1% increase in financial development is linked with 0.0861% 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%. Keeping other things constant, a 1% increase in capitalization (capital use) will increase economic growth by 0.1333%. Importantly, trade openness has a positive effect on economic growth. This finding is consistent with Shahbaz (2012) who reported that trade openness adds to economic growth via income, technique and composite effect. The results unveiled that trade openness is a major contributor to economic growth. A 0.33% economic growth is stimulated by a 1% increase in trade openness if other things remain the same.

The lower part of Table 6 deals with the short run dynamic relationship between natural resource abundance, financial development, capital, trade openness and economic growth in Venezuela. The impact of natural resource 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) lend support to long run relationship among the variables in case of Venezuela. The coefficient is statistically significant at 1% level. This implies that short run deviations are corrected by 40.18% toward 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 is well specified. The stability of long run and short run parameters is investigated by examining the significance of the 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 (Figs. 1–2). The graphs of the CUSUM and CUSUMsq test lie within the 5% critical bounds which confirm stability

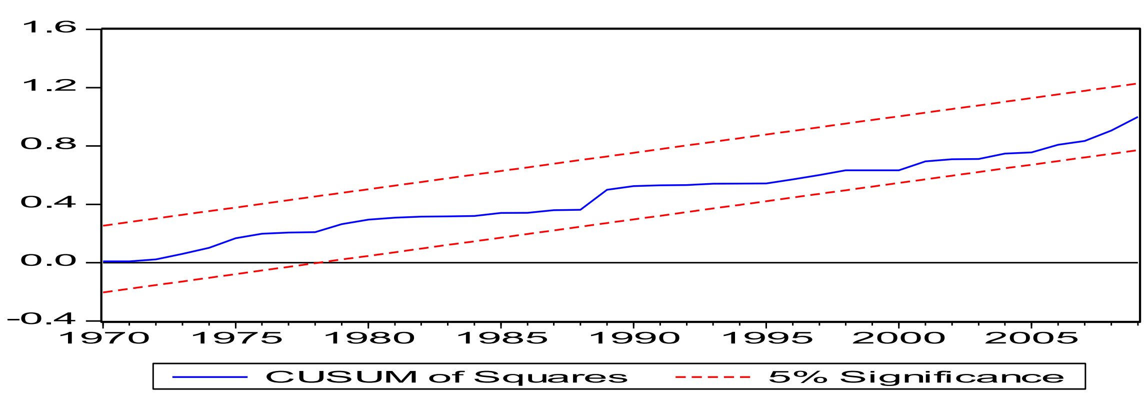

Fig. 2. Plot of cumulative Sum of squares of recursive residuals. The straight lines represent critical bounds at 5% significance level.

Table 7
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***	1.5290	5.5873**	8.8424*	−0.5530*	…	6.1916*	12.8083*	10.0882*	15.7740*
		[0.0803]	[0.2371]	[0.0102]	[0.0013]	[−4.2784]		[0.0029]	[0.0000]	[0.0002]	[0.0000]
$\Delta \ln R_t$	1.1135	…	2.9410***	3.8841**	8.7905*	−0.7871**	3.2090**	…	3.4205**	5.3630*	9.3270*
	[0.3448]		[0.0690]	[0.0346]	[0.0014]	[−2.7981]	[0.0410]		[0.0334]	[0.0057]	[0.0002]
$\Delta \ln F_t$	1.2246	0.3669	…	6.6877*	1.5620	…	…	…	…	…	…
	[0.3109]	[0.6832]		[0.0047]	[0.2295]						
$\Delta \ln K_t$	3.0983***	0.6983	10.0822*	…	1.0376	−0.3396*	5.2401*	6.8543*	10.2920*	…	6.1081*
	[0.0635]	[0.5577]	[0.0007]		[0.3696]	[−3.6480]	[0.0063]	[0.0015]	[0.0002]		[0.0031]
$\Delta \ln TR_t$	4.1827**	10.9449*	4.2114**	1.0177	…	−0.7114**	4.0647**	8.5930*	4.3933**	4.4020**	…
	[0.0276]	[0.0004]	[0.0271]	[0.3765]		[−2.9780]	[0.0181]	[0.0005]	[0.0134]	[0.0133]	

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

of parameters (Bahmani-Oskooee and Nasir, 2004). The model is also well specified.

4.1. 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 a restricted form of unrestricted VAR (vector autoregressive) and restriction is levied on the presence of the 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 7.

The results opined that there is a 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 existing 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. The 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 the 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 resource 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.

5. Conclusion and policy implications

This study dealt with the empirical investigation of the 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 among 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 amid 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. 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 launches 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 tools to exploit natural resources and enhance domestic production which increases economic growth.

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