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Resource Endowment and Economic Growth in Selected African Countries

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Abstract
Natural resources endowment is expected to boost wealth and purchasing power in resource endowed economies. It is expected that resource availability should be able to drive investment and consequently boost growth in these economies. However, experiences with some resource - rich economies suggest that resource endowment may not be a blessing and can actually be categorized as a curse. To this end therefore, this study investigates the relationship between resource endowment and economic growth using nine resource-rich African countries as a case study. The study used the fixed effect model with cross section as well as time dummy variables. The study did not establish the significant positive impact of resource extraction on economic growth in these economies and therefore concludes that resource curse is indeed true in countries under the study. This paper recommends that as resources' booms are occurring, governments of resource rich economies can channel the surplus funds into the development of other sectors of the economy to enhance their competitiveness and capacity and boost their productivity so that when resources rents becomes low, other sector can cushion the effect. This is a form of diversification for a resource rich economy among others.

Introduction

Surprisingly, resource-rich developing countries of the World tend to exhibit stagnant or negative growth rates. Under normal condition, natural resources endowment is expected to boost wealth and purchasing power in resource-rich economies. It is expected that resource availability should be able to raise investment and consequently drive growth in these economies. However, negative and slow rate of growth seems to be prevalent in resource-rich economies. This condition has been coined as 'Dutch Disease'.

Dutch disease is a term coined after Netherlands despite its abundant mineral and natural gas resources, economic growth was still so slow. In any economy plague with Dutch Disease, the normal channel of growth became impotent or perverse results are obtained. Trade is a positive contributor to economic growth in any normal economy, however, in a Dutch infected

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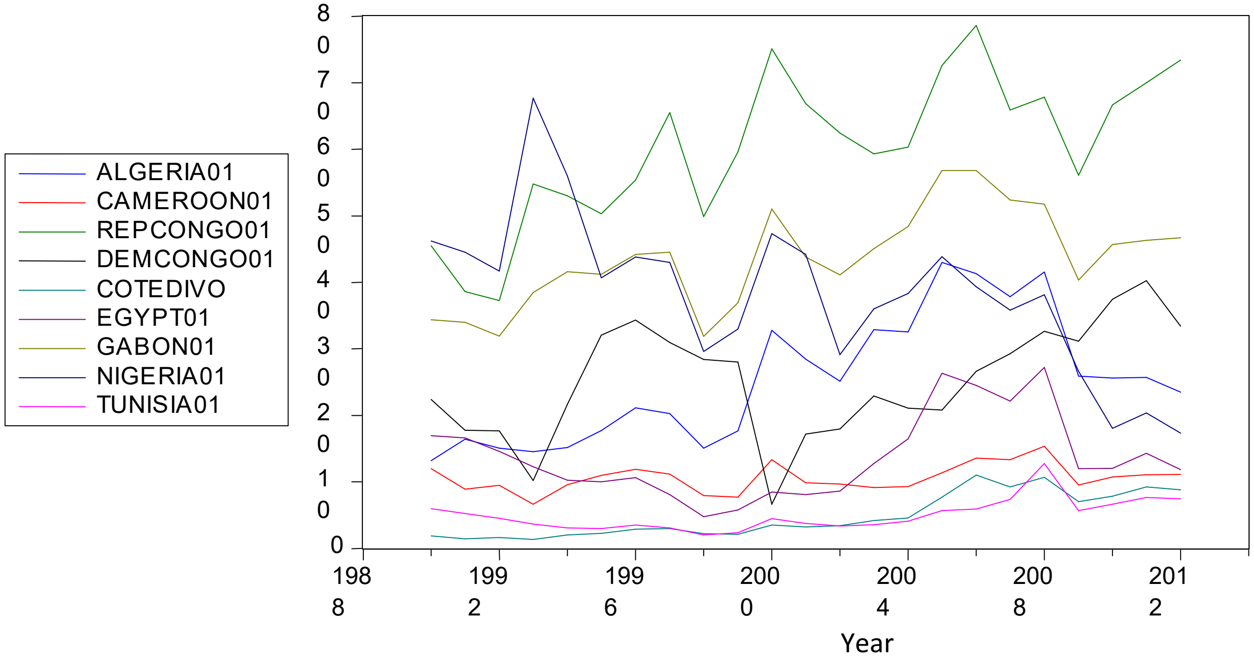
economy, trade causes imbalances and consequently causes low economic growth. In addition, investments by the three main sectors (individuals, firms and governments) are expected to also aid growth, but in a Dutch infected economy, investments are poorly allocated as they are diverted away into resource rich natural resource sector to the detriment of other sectors. Dutch Disease also limits the consumption and investment in education because resource intensive businesses do not reward or encourage workers with advanced education (Elliot, Hartarska and Bailey, 2007).

The extent of the resource curse theory in one of African economies has been well observed by Arezki, Rota-Graziosi and Senbet (2013) when they observed that the Democratic Republic of Congo is widely considered to be among the World's richest countries in terms of mineral deposits, but the irony of it is that it also soar high on various categorization of World's poorest economies. A similar condition is also prevalent in many other African countries and other parts of the World.

Taking Nigeria as an example, it is well endowed with vast human and material resources that can guarantee sustainable economic growth. For instance, Nigeria has large reserves of solid minerals which include bitumen, coal, tin, topaz, lignite, columbite, iron ore, talc, barite and gypsum. Metallic minerals are mostly located in the middle belt, coal is found in the Southeast and middle belt, bitumen is predominantly in the Southwest, crude petroleum and natural gas are located in the Southern area of Nigeria known as Niger Delta region among others. The proven reserves of crude oil in Nigeria are well over 37 billion barrels while the reserves of natural gas stand at over 187 trillion standard cubic feet. Yet growth is stagnated in Nigeria as also in other naturally endowed countries of Africa. Figure 1 below showed the natural resources rent as a percentage of the GDP for nine mineral – rich countries of Africa. Based on table in appendix 1, the contribution of resources in proportion to total output for the 9 countries have been rising over the years despite some fluctuations in their values. This point to the importance of natural resources in the productivity of these economies.

Figure 1: Resource rent as a % of GDP in resource-rich economies of Africa

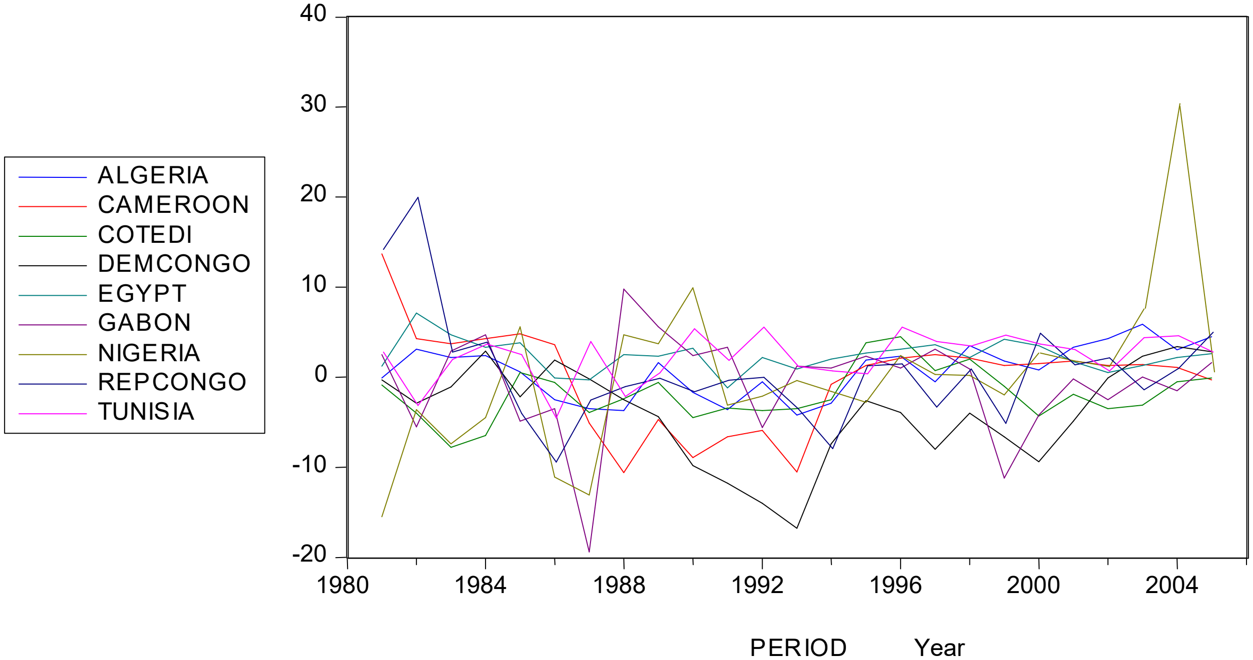
Resource rent as % of GDP



Source: Author's Compilation based on the World Bank Data

Tunisia, Cameroon, Cote D'ivoire and Egypt have relatively low natural resources rent as a proportion of its GDP when compared with countries like Nigeria, Gabon, Democratic Republic of Congo, Congo Republic and Algeria. Resources rent as a proportion of their GDP is high for the period under consideration in all the countries. Resources rent exhibited an upward trend throughout the period although with slight variations. This indicates the importance of natural resources in the growth potentials of these economies. Figure 2 however presents the growth in GDP per capita for the corresponding period.

Figure 2: GDP per capita growth in the resource-rich economies of Africa
GDP capita (US$)



Source: Author's Compilation based on the World Bank Data

The above figure showed the per capita growth rate for the nine countries under consideration. The growth rate clustered around zero with most readings falling below zero. This indicates that these economies rather than transforming their resource endowment as a channel for sustained economic growth and a weapon to reduce poverty, not much has been seen as can be seen in appendix 2 where per capital income has been following a downward trend in all the resource rich economies. According to De Melo *et al.* (1997), the contributions of natural resources to economic growth in resource-rich economies is still unclear. Some of the findings on literature claimed that there is a weak positive effect while in others it is negative. To this end, this study therefore makes its contributions using nine resource-rich African countries as a case study.

Literature Review

Natural resources endowment is supposed to be a window of opportunity for economic growth. According to Arezki, Rota-Graziosi and Senbet (2013), natural resources exploitation is expected to assist developing countries in transforming their economies, create employment and boost economic growth. Experiences with the resource- rich countries (mostly those rich in oil and minerals) suggest that resource endowment may not be a blessing and can actually be categorized as a curse. Frankel (2012) has concluded that over the past few decades, economic growth in resource-rich countries has on the average been lower than those recorded in resource-poor countries.

Frankel (2012) gave some insights as to why resource exploitation could result into negative consequences for resource – rich economies. One of these is the corruption of public administrators and political class who capitalize on the weak checks and balances to direct funds abroad for themselves to fuel capital flight. Another channel of effect is the globalization and the unrestricted activities of the multinationals who have unhindered access to capital, labour, and natural resources at the expense of their host economies thereby diverting resources from the local economy. The multinationals (MNCs) manipulate prices, and take advantage of taxes loopholes in their host economies to cheat on them. These manipulations have more daring consequences on resource – rich economies.

On the contrary, Ding and Field (2004) observed that natural resources abundance can bring about economic growth as they would attract entrepreneurs who will utilize resources in production and create new jobs and support industries. Therefore any resource-rich economy that utililizes its resources well would experience sustainable growth. According to Sala-i-Martin and Subramanian (2003) various studies have been conducted on the effects of shocks on resource sector and the response in other sectors and their results have been mixed.

Ismail (2010) conducted a study on the effects of oil price shocks on manufacturing sector in some oil exporting countries. The study allowed for the possibility that the extent of Dutch Disease depends on capital intensity in the manufacturing sector as well as the economy's trade openness to capital flows. His results showed that a one percent increase in the World price of oil led to 0.34 percentage decline in the value added of various manufacturing sectors' productivity. The decline in manufacturing productivity is more pronounced in the more open economies than in less open economies.

Sachs and Warner (1995) studied the trend in economic growth in some economies abundance in natural resources as opposed to economies with little natural resources using regression analysis. They found that economies with a high ratio of natural resources exports to GDP in 1970 (base year) had the tendency to grow slowly between 1970 and 1990. This relationship holds true despite controlling for other important variables that are germane to economic growth.

Collier and Hoffler (2002) however explored the relationship between natural resources and institutional quality based on the belief that natural resources availability increases the likelihood of civil conflict. They concluded that the effect of natural resources on conflict is non-linear and strong. Countries with natural resources to GDP of 26 percent face a higher probability of 23 percent as against the 0.5 percent of country without natural resources. Civil conflict is therefore an offshoot of institutional collapse.

Sala-i-Martin and Subramanian (2003) explored the role of institutional quality and growth in resource-rich countries and also explored the reality or otherwise of Dutch Disease in Nigeria and found that there is no direct impact of natural resources on growth. Natural resource is detrimental to institutional quality. Once institutions are controlled for, natural resources have no further impact on growth even if its effect on growth is positive. It is only oil and mineral that impacts negatively on institutional quality. In the case of Nigeria, they concluded that waste and corruption rather than Dutch Disease is the explanation for Nigeria's economic woes as Nigeria has over-invested in physical capital and suffered from poor productivity.

Brunnschweiler (2009) conducted a study on the impact of oil on economic development in transition economies using data from 1990 to 2006. She used oil production and oil reserves to capture resource abundance as they were not subjected to price fluctuations and climate as was the case with oil production. She concluded that oil production/reserves exerted strong positive impact on economic growth and this is robust irrespective of the model specified. Changing the measure of oil abundance to exports/GDP, export per capita, exports to merchandize exports; the above result is still valid.

Alexeev and Conrad (2010) examined the impact of natural resource endowment (oil wealth) on economic growth, institutions and; on welfare (as captured by life expectancy at birth, infant mortality and so on). The study utilized cross-country regression and then introduced dummy variable with a value of one if the country is a transition economy and zero if otherwise. They found that natural resources endowment did not affect economic growth between 1996 and 2005. They also found some evidence to support the fact that natural resources availability is linked with higher infant mortality in transition economies. This relationship differs in the case of other economies in transition in which resource-rich transition economies did not perform worse.

Ahrend (2002) did a study on economic performances in various regions of Russia. She concluded that natural resources abundance in the form of oil production, coal and natural gas production has been beneficial to growth at least in the first five years of transition because it facilitated commodity exports and also generated some streams of incomes to Russian economy. According to her, as at that period, World prices of natural resources were higher than the internal prices in the Soviet Union. So, resource-rich Russian regions benefitted greatly from a positive term of trade shock. This benefit helped in overcoming the overall fall in production and consequently aided economic growth.

Baghebo and Atima (2013) critically analyzed the impact of petroleum on Nigeria's economic growth using data from 1980 to 2011. They regressed the real GDP on foreign direct investment, oil revenue, corruption index and external debt. They utilized the co-integration tool and the error correction model to analyze the impact of oil revenue on growth in Nigeria. The study found that oil revenue and corruption index negatively impacted on growth as captured by the real GDP. FDI and external debt however exerted positive impact on growth. They concluded that resource-curse theory is proven to be true for Nigeria. They suggested the implementation of the proposed petroleum industry bill passage in Nigeria.

So far, literature on the impact of resource endowment and growth has produced mixed results. According to De Melo *et al.* (1997) the impact of natural resources on economic growth is still unclear. As a matter of fact, the variables used in capturing resource endowment are so diverse and so are the results generated from various variables used. All other explanatory variables used are also diverse. Some of them are not the determinants of growth. Studies have also lumped together countries of diverse standing. All these shortcomings this study hope to overcome by studying nine countries in Africa.

Theoretical Framework

The term "Dutch Disease" has been coined in the late 1950s when natural gas discoveries in Netherlands created a setback in the competitiveness of the Dutch manufacturing sector. Gas export boom led to the appreciation of the Guilder (Dutch currency). This brought about reductions in competitiveness and profitability of the other sectors especially the manufacturing and the service sectors and consequently led to inflation. The Dutch exports crashed relative to GDP in the 1960s and the process would have degenerated to a de-industrialization if not for timely intervention by the Dutch government.

Thereafter, 'Dutch Disease' has been used to explain economic performance of any economy facing similar conditions with the Dutch in the 1950's and 60's. The term 'Dutch Disease' has been explained as the adverse effects on other sectors (for instance manufacturing) of natural resource discoveries and exploitation.

The disease is such that at the discovery of a tradable resource or an increase in the World price of a natural resource, this facilitated an unprecedented appreciation in the exchange rate of the resource-rich economy. This also enhances wage increases and a relocation of substantial amount of the labour force to the resource sector.

Currency appreciation in the natural resources endowed country according to Krugman (1987) reduces the international competitiveness of the tradable sectors as the resource-based exports crowd-out commodity exports and other growth enhancing sectors of the economy.

Corden and Neary (1983) broke down the theory of Dutch Disease more comprehensively. The model broke down the economy into three sectors. The first being the natural resource sector (R), the non-resource tradable sector (usually termed to be agriculture and manufacturing) (M) and the non-tradable sector (these are the construction and the non-tradable services represented as by N). The prices of non-resource tradables sector (M) as well as the natural resource (R) are set in the World market while the prices of non-tradables sector (N) are set in the domestic economy. The real exchange rate therefore is the price of non-tradables relative to the price of tradables.

The theory assumes that there is perfect labour mobility among these sectors and that wages are constant among these sectors. It also assumes that both commodity and factor prices are not distorted in the economy. In addition, all goods are meant for final consumption and lastly, that trade is always balanced as output and expenditure are always equal in the economy.

Suppose there is a favourable shock such as the discovery of a large natural resource deposit or a rise in the World price of an exportable commodity which is expected to last long. This resource boom creates two impacts.

The first impact is the spending effect. The boom creates an additional income for the country, which in turn brings about increase in import. It also raises the aggregate demand and spending by both private and public sectors. Since the prices of non-resource tradables are set at the international markets, it results into rising prices (and wages) of non-tradables relative to tradables. This causes the appreciation of the real exchange rate, and in addition crowd-out labour and capital of the non-resource tradables sector (manufacturing sector).

The second effect is the resource movement effect. As the increase in the World price of the natural resource goes up for instance, it raises the marginal product of labour in the resource sector and pushes the equilibrium wage rate up. This causes a movement of labour from the tradables non-resource sector (manufacturing) and the non-tradable sector (services and construction) to the natural resource sector. The implication of this is that these sectors (tradables non-natural resource sector and the non-tradable sector) would be squeezed out of business as resources would be diverted from them. Put in another way, a boom in natural resource attracts both labour and capital from other sectors. This tends to reduce output in the rest of the economy. Specifically, reduced output in the non-tradables sector causes the price of the non-tradables to rise relative to the price of the tradables which are set at the World market (Brahmbhatt, Canuto and Vostroknutova, 2010).

The above effects produces significant economic improvements in the short run due to a substantial increase in revenues from the resource exports the effect however is different in the long run. The above theory runs contrarily to the theory of comparative advantage as a resource rich country is expected to be better off specializing in the extraction of its natural resources. In the practical sense however, the shift away from manufacturing sector and other sectors can be dangerous. For instance, if the natural resources continue to run out or if there is a downward trend in the price of the natural resource, the hitherto competitive manufacturing industries do not bounce back or have a turnaround so quickly as they were initially. This is due to the fact that production requires ‘learning by doing’ processes and long periods of inactivity are detrimental to the survival and growth of the sector. So, when financial flows in the natural resources is negatively affected by shocks, the manufacturing sector is no more able to compete internationally and cannot replace the resource sector in driving the economy. This is highly detrimental to the long – run growth prospects of the affected economy.

The lesson to be learnt from the Dutch Disease is that resource availability gave rise to excessive reliance on resource intensive industries which had no assurance of enhancing long term stability. Long term stability however depends on the resource maintaining value and exclusivity. If however more discoveries are made of the resources elsewhere in the World, and is no longer exclusive, this lead to a price decline and the resource intensive industries in resource dependent economy fail. The alternative tradables sector are no longer able to sustain the economy as they have been neglected and are no more internationally competitive leading to a distorted growth (Elliot, Hartarska and Bailey, 2007).

Methodology

This study adapted the model of Chambers and Guo (2009) in which growth, captured as average annual growth of GDP per capita in country I is regressed on human capital (education captured as average years of schooling for population of 15 years plus), capital formation (investment share in output), trade openness ((import + export)/GDP), and natural resource utilization in production (footprint measured as log of per capita quantity of renewable natural resources).

This study therefore re-formulated the model as change in real GDP as a function of domestic credit provided by financial sector as a percentage of GDP, net foreign direct investment as percentage of GDP, gross fixed capital formation as percentage of GDP, gross national expenditure as percentage of GDP, total labour force, trade openness and; total natural resources rents as percentage of GDP.

The reason for the re-formulation of Chambers and Guo's model includes the dependent variable of this study captured growth that is unaffected by population dynamics. I further included all components of domestic investments in the model (net FDI and domestic investment) as Chambers and Guo (2009), Sachs and Warner (1995, 1997 and 2001), Fiodendji (2016) included investments as a determinant of growth. This study captured domestic investment as gross fixed capital formation as % of GDP as done by Fiodendji (2016). This study also used gross national expenditure as % of GDP to account for differences in fiscal policies across countries as Chambers and Guo did. We used strength of labour force as a good proxy to capture human capital in growth process. This study also differs with Chambers and Guo on the variable of interest (natural resources).instead of using the footprint measure; it used total natural resources rents as % of GDP to capture resource-dependence. The re-formulated model is as follows:

$$DRGDP_{it} = \alpha_0 + \pi_1 DCP_{it} + \pi 2FDIR_{it} + \pi_3 GCFGDP_{it} + \pi_4 GNE_{it} + \pi_5 LFT_{it} + \pi_6 TRADO_{it} + \pi_7 TNR_{it} + \mu_{it} \text{ --------- } (1)$$

Where;

$DRGDP_{it}$ is $RGDP_{it} - RGDP_{it-1}$ (change in real GDP) in year t for country i
TNR_{it} is Total natural resources rents (% of GDP) in year t for country i
DCP_{it} is the Domestic credit provided by the financial sector as % of GDP in year t for country i
$GCFGDP_{it}$ is the Gross fixed capital formation (% of GDP) in year t for country I (proxy for domestic investment)
LFT_{it} is the total labour force in year t for country i
$TRADO_{it}$ is the trade openness ((import + export)/GDP) in year t for country i.
GNE_{it} is the gross national expenditure as % of GDP in year t for country i.
$FDIR_{it}$ is the net FDI inflow as % of GDP in year t for country i.

Failure to ascertain the stationarity of time series before using them in any regression may lead to spurious regression. The implication of this is that regressing one random work against another one can lead to spurious results. Spurious regression occurs when apparently significant regression results are obtained from unrelated data. To avoid running a spurious regression therefore, the study conducted the stationarity test on all variables of the model. Im, Pesaran and Shin W-statistic, ADF - Fisher Chi-square and Phillip Perron - Fisher Chi-square were used to test the null hypothesis of the presence of unit root for individual country. Levin, Lin & Chu t-test was used to test the null hypothesis of the presence of unit root in the pooled (common) data. Their respective probabilities were used in making judgement.

Conducting the tests on all variables, it was ascertained that the variables are mostly all integrated of order zero. Since they are integrated of different orders, the study conducted the co-integration test. After co-integration was established, it proceeded by estimating the random effect model. This estimation was carried out by transforming the variables to remove the covariance structure. The study then proceeded by using OLS on the transformed variables. This is an example of generalized least squares (GLS). When it (the random effect model) was estimated, it then proceeded to conduct the Hausman test to determine which of the effects is applicable to this study. If the random effect model is correct, is consistent and efficient, if the random effect model is wrong, then the random effect estimates are inconsistent, but the fixed effect estimates are still consistent.

The Hausman's chi-square statistic was used in conducting the test. The test involve the determination of whether the random effects model passes the Hausman test for the random effects being uncorrelated with the explanatory variables or not and the result concluded that random effect is wrong and inconsistent. The study therefore tested for the inclusion of cross section and time in the fixed effect model and only the cross section fixed effect model was significant and it was therefore utilized for analysis and conclusions emanating from this formed the basis for recommendation.

Country and Year Fixed Effect (two way fixed effect model)

The study finally applied the fixed effects panel model where the slope coefficients are constant, but the intercept varies over country. We would have a regression model with *i-1* country dummies. The model was specified as follows:

$$DRGDP_{it} = \alpha_0 + \alpha_1 \text{ Country1} + \alpha_2 \text{ Country2} + \ldots\ldots + \alpha_9\text{Country9} + \pi_1 DCP_{it} + \pi 2FDIR_{it} + \pi_3 GCFGDP_{it} + \pi_4 GNE_{it} + \pi_5 LFT_{it} + \pi_6 TRADO_{it} + \pi_7 TNR_{it} + \mu_{2t} \quad \text{-----} \ (2)$$

Data

All data for the study were taken from 1990 to 2012 for nine natural resource rich countries of Africa. Angola and Libya were excluded from the study because of paucity of data. The following nine African countries were included in the study-Tunisia, Cameroon, Cote D'ivoire, Egypt, Nigeria, Gabon, Democratic Republic of Congo, Congo Republic and Algeria. All data were sourced from the World Bank database except Congo DR whose data for domestic credit to private sector (as a % of GDP) were generated for 1996 to 1999 using a regression model DCP = 195.57 – 0.0975 Time. FDIR for Algeria has missing data for 1993 to 1995 and trend analysis of $FDIR_t$ = 16.1576 – 0.007519Time based on the data for 1996 to 2015.

Results and Findings

Table one below present the results of the stationarity tests conducted to confirm the stationarity of variables as well as their order of integration, since running run a regression using non stationary variable against other non-stationary variables can lead to spurious regression in which we may conclude that some relationship exists between some variables when in fact it is not true. This has the potential of giving rise to poor policy recommendation which this study is guiding against.

Table 1: Panel unit root test: Summary

	Individual unit root Null: Unit root (assumes common unit root process)			Order of Integration	**Common unit root** Null: Unit root (assumes common unit root process)	
Series	IPS	ADF Fisher	PP Fisher		LLC – t	Order of Integration
GCF	-2.79919 (0.0026)	36.5602 (0.0060)	47.1133 (0.0002)	I(0)	-2.06305 (0.0196)	I (0)
DCP	-4.17032 (0.0000)	54.3806 (0.0000)	43.9944 (0.0006)	I(0)	-4.47703 (0.0000)	I (0)
DRGDP	-1.79711 (0.0362)	25.47.94 (0.1123)	55.7621 (0.0000)	I(0)	-2.666 (0.0038)	I(0)
TNR	-1.01203 (0.1558)	23.5467 (0.1704)	23.5536 (0.1702)	I(1)	-2.05592 (0.0199)	I(0)
LFT	6.62511 (1.00000)	1.99453 (1.0000)	6.00878 (0.9962)	I(1)	3.08014 (0.999)	I(1)
TRADO	-1.1.07574 (0.1410)	21.7415 (0.2437)	27.1311 (0.0766)	I(1)	-2.02359 (0.0215)	I(0)
GNE	-11.6688 (0.0000)	66.4862 (0.0000)	37.3677 (0.0019)	I(0)	-16.699 (0.0000)	I(0)
FDIR	-5.44482 (0.0000)	64.3823 (0.0000)	56.1736 (0.0000)	I(0)	-4.79013 (0.0000)	I(0)
GCFGDP	-2.33154 (0.0099)	36.3232 (0.0064)	29.1673 (0.0464)	I(0)	-1.08676 (0.1386)	I(1)

Where, LLC-t is Levin, Lin & Chu t*, IPS is Im, Pesaran and Shin W-stat ADF Fisher is ADF - Fisher Chi-square and PP Fisher is the PP - Fisher Chi-square. All figures in parenthesis are their respective probabilities. Note: Not all the first difference results are presented

There are two components of the unit root result presented in table 1. A section of it tested the null hypothesis of the existence of unit root for individual countries and the other section tested the existence of unit root for all the country pooled together. Most of the results for Im, Pesaran and Shin, PP –

Fisher Chi-square and; ADF - Fisher statistics indicate the rejection of the null hypothesis of the existence of unit root at 5% for individual country except for natural resources (TNR), trade openness (TRADO) and total labour force (LFT) which are all integrated of order one. However, the Levin, Lin and Chu t-statistic (LLC-t) for the pooled data all the variables are integrated of order zero apart from the total labour force (LFT) and gross fixed capital formation which are integrated of order one.

Generally, since all the variables as viewed by their common unit root are not stationary at level, the study moved on to test for co-integration by using the Kao residual co-integration test. In effect, variables are co-integrated if they have a long run, or equilibrium relationship between them. In other words, if we can confirm that the residuals from the regression of model used are integrated of order zero {I(0)} or stationary, we would be sure of not running a spurious regression. The result of Kao residual co-integration is presented in table 2.

Table 2: Kao Residual Cointegration Result

Kao Residual Cointegration Test				
Series: DRGDP DCP FDIR GCFGDP GNE LFT TRADO TNR				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(RESID)				
Method: Least Squares				
Date: 08/16/17 Time: 05:29				
Sample (adjusted): 1992 2012				
Included observations: 170 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.913305	0.077809	-11.73771	0.0000

Table two presents the Kao co-integration result where the residual of our model estimate was regressed on a year lag of the residual, and the coefficient estimate is -0.913305 with the t-statistic of -11.73771 and corresponding probability of zero shows high level of significance of the explanatory variable $RESID_{t-1}$ in explaining the dependent variable, $RESID_t$. That means that there is co-integration or long run equilibrium relationship among the variables of the model even though there might be a short run disequilibrium relationship. That means that long run estimates of the model will be reliable and not spurious.

It is also necessary to ascertain which of the estimation techniques (random or fixed effects) is more appropriate before interpreting the result (if necessary). Hausman’s chi-square statistic was used in conducting the test. The test involves the determination of whether the random effects model passes the Hausman test for the random effects being uncorrelated with the explanatory variables or not.

Table 3: Hausman Test Results

Correlated Random Effects - Hausman Test			
Equation: Untitled			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	21.759702	7	0.0028

Correlated Random Effects - Hausman Test			
Equation: EQ31			
Test period random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	18.347997	7	0.0105

The p-values for the tests are < 5%, specifically they are less than two percent (0.3 and 1.1%) thus indicating that the random effects models are not appropriate and that the fixed effects specification is to be preferred.

To do a robust estimate of the model, there is the need to conduct the joint significance test of the fixed effects estimates in least squares specifications. To test the significance of the effects we must first estimate the unrestricted specification that includes the effects of interest (cross-section fixed and period fixed). The test is predicated on the null hypothesis that the effects (cross-section fixed and period fixed) are not present. The significance of our chi-squares means that we are rejecting the null hypothesis that these effects are redundant. In the case chi-square is insignificant, we would fail to reject the null hypothesis and conclude that there are no time/period and cross-section effects. The result for cross section and period fixed effects are provided below.

Table 4: Cross-section fixed effects test's result

Redundant Fixed Effects Tests			
Equation: Untitled			
Test cross-section fixed effects			
Effects Test	Statistic	d.f.	Prob.
Cross-section F	5.088819	(8,163)	0.0000
Cross-section Chi-square	39.908039	8	0.0000

In the above result, the cross-sectional F statistic of 5.088819 with a probability of about 0% indicates that the null hypothesis of non existence of cross-sectional effect is rejected. The cross-sectional Chi-square of 39.908039 with probability of 0% indicates that there is cross-sectional effect in our fixed effect model.

Table 5: Period fixed effects test's result

Redundant Fixed Effects Tests			
Equation: Untitled			
Test period fixed effects			
Effects Test	Statistic	d.f.	Prob.
Period F	1.283889	(21,150)	0.1943
Period Chi-square	29.588315	21	0.1006

The result of the test statistic for the hypothesis of non-existence of time/period effect cannot be rejected as the F–statistic is 1.283889. The associated probability of this estimate at degree of freedom of 21 and 150 is 0.1943. In addition, the Chi square statistic for the period effect is 29.588315 which are not significant at 1%. The null hypothesis of non-existence of time effect was not rejected indicating the need to estimate the fixed effect model which incorporates the time/period effect. The result based on this is provided below.

Table 6: Fixed Effect (with cross-section dummy) Result

Dependent Variable: DRGDP				
Method: Panel Least Squares				
Sample (adjusted): 1991 2012				
Periods included: 22				
Cross-sections included: 9				
Total panel (unbalanced) observations: 179				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.41E+10	3.67E+09	-3.849007	0.0002
DCP	81168449	35028062	2.317241	0.0218
FDIR	-1.14E+08	97919214	-1.168461	0.2445
GCFGDP	1.62E+08	64518434	2.514638	0.0130
GNE	85669035	33547795	2.553641	0.0117
LFT	339.1392	43.46097	7.803303	0.0000
TRADO	-3101929.	22668624	-0.136838	0.8913
TNR	36148850	36673741	0.985688	0.3259
	Effects Specification			
Period fixed (dummy variables)				
R-squared	0.537815	Mean dependent var		2.93E+09
Adjusted R-squared	0.451541	S.D. dependent var		6.58E+09
S.E. of regression	4.88E+09	Akaike info criterion		47.60055
Sum squared resid	3.57E+21	Schwarz criterion		48.11694
Log likelihood	-4231.249	Hannan-Quinn criter.		47.80994
F-statistic	6.233774	Durbin-Watson stat		1.557138
Prob(F-statistic)	0.000000			

The fixed effect model with country specific effects presented in table 6 indicates that all the independent variables have accounted for about 54 percentage of the variability in growth. This is a good fit suitable for policy formulation. The F-statistic of 6.2338 and a probability of (0.0000) is also highly significant, indicating that all the explanatory variable of the model jointly determined growth significantly. The Durbin Watson result also shows that autocorrelation can be ruled out of the above estimates; the results can be interpreted and used as a tool of policy formulation.

Based on the results, domestic credit by financial sector, gross fixed capital formation (domestic investment), government expenditure and labour force (a proxy for human capital) significantly explained economic growth in these resource rich economies. Contrary to expectation, net foreign direct investment inflows and trade openness are inversely related to growth. In addition, the contributions of trade openness and net foreign direct investment inflows to growth in resource rich economies have been insignificant. A major reason for the negative impact of FDI on growth in these economies may be traced to the business environment of these countries which may be detrimental to FDI growth, thus making them unattractive to FDI inflows. A possible reason why trade openness may not be beneficial to these economies is the fact that they over rely on their natural resources and shy away from the development of other sectors and at the end, they spend their resources rent surplus on excessive importation thereby negating the beneficial impact of their resource endowment.

Natural resource endowment; based on the result, is positively related to growth, but has not significantly contributed to growth. This study's conclusion is in agreement with the findings of Baghebo and Atima (2013), Alexeev and Conrad (2010), Sala-i-Martin and Subramanian (2003), and Ismail (2010). There are some factors that may be causing this. The first is the mis-management of resources especially during booms of these resources. Surplus rents are mostly squandered on frivolous importations, corruption and consumption. Another major problem with natural resource endowment is that it has been a major source of conflicts in resource rich economies leading to serious crisis if not properly managed. This has the capacity to hinder growth rather than propel it. Again, resource endowment always leads to the abandoning of other sectors and overconcentration on resource rich sector leading to massive unemployment and dwindling production of other sectors. Lastly Frankel (2012) also highlighted the roles of the multinational corporations in distorting the beneficial impact of resource extraction. This may be a major growth inhibiting factor in resource-rich African economies.

Recommendations

Based on the foregoing, this paper recommend that resource – rich countries should adopt the Hartwick -Solow model which posits that constant consumption could be maintained over time if resource – rich countries could invest their Hotelling rent from natural resources extraction into man-made alternatives. In other words, as resources' booms are occurring, governments of resource rich economies can channel the surplus funds into the development of other sectors of the economy to enhance their competitiveness and capacity and boost their productivity so that when resources rents becomes low, other sector can cushion the effect. This is a form of diversification for a resource rich economy.

Secondly, government could channel rent (during boom) from resource extraction via fiscal measures to the private sector since they are more efficient in fund utilization. Alternatively, Government could put up welfare programmes that ensure equitable distribution of proceeds from resource extraction. In other word, government of resource-rich countries must ensure that there is equitable distribution of economic and social benefit of resources to its citizens. In addition, when there is positive shock in the resource market, government should increase investment in social capital.

Governments of resource – rich countries can also utilize the resource rent surpluses into building of infrastructures and local capacity so as to encourage inflows of productive FDIs and enhance the effectiveness and efficiency of local productive capacity so as to compete favourably in an open economy.

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Appendix 1: Total Natural Resources Rents (% of GDP)

Total natural resources rents (% of GDP)

YEAR	**Cote D'ivore**	**Cameroon**	**Congo Rep.**	**Algeria**	**Egypt**	**Gabon**	**Nigeria**	**Tunisia**	**Congo DR.**
1970	1.616941	3.290379	5.986483	8.708061	2.258177	20.74478	4.68151	2.923538	11.2055
1990	1.88117	11.99032	45.48185	13.19469	16.96525	34.36104	46.23528	5.985427	22.40928
2000	3.501637	13.32265	75.0825	32.78375	8.471042	51.05002	47.35717	4.478299	6.643362
2012	8.792382	11.10223	73.40132	23.45598	11.85238	46.65541	17.3022	7.447837	33.39619

Appendix 2: GDP Per Capita Growth (Annual %)

GDP Per Capita Growth (Annual %)									
Country name	Algeria	Cameroon	Congo,Dem. Rep.	Congo, Rep.	Cote d'Ivoire	Egypt, Arab Rep.	Gabon	Nigeria	Tunisia
1981	-0.1	13.7	-0.3	14.2	-0.9	1.2	2.5	-15.5	2.8
1990	-1.7	-8.9	-9.8	-1.6	-4.5	3.2	2.4	9.9	5.4
2000	0.8	1.5	-9.4	4.9	-4.3	3.5	-4.2	2.7	3.7
2012	1.3	2	3.8	1.2	8.1	0	4.1	1.5	3.7