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Natural Resources, Institutional Quality, and Economic Growth The Case of Africa

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Abstract

The resource curse hypothesis has been a topic of significant interest among researchers over the years, particularly in the context of African nations endowed with abundant natural resources. Despite their resource wealth, many African countries remain classified as developing nations. This study investigates the relationship between natural resources, both in aggregated and disaggregated forms, and composite institutional quality on the economic growth of 43 resource-rich African countries, juxtaposed against nine non-resource-rich African nations. The research seeks to analyze the interactive effect of natural resources and institutional quality on economic growth by utilizing annual data spanning from 1980 to 2020 across 52 African countries. To ensure robustness and accuracy in parameter estimation, the study employs the Driscoll-Kraay estimation technique. The findings of this study reveal that resource-rich African countries tend to experience higher economic growth rates compared to their non-resource-rich counterparts. Surprisingly, the analysis indicates that institutional quality does not exert a significant influence on economic growth in either resource-rich or non-resource-rich African nations. Furthermore, the marginal effect analysis demonstrates that weak institutional quality in Africa has mitigated the positive impact of natural resources on economic growth in resource-rich African countries. Among the disaggregated natural resources studied, natural gas emerges as a resource with no statistically significant impact on the economic growth of both resource-rich and non-resource-rich African countries. Conversely, oil and mineral resources exhibit a positive influence on economic growth.

Notably, the effect of oil and mineral resources on economic growth is more pronounced in resource-rich countries compared to non-resource-rich nations. This study underscores the imperative for resource-rich African countries to prioritize the strengthening of their institutional structures as a means to achieve sustained economic growth.
Keywords: Economic Growth, Natural Resource Curse, Driscroll-Kraay, Natural Resource, Institutions, Africa.

Introduction

The natural resources curse on economic growth hypothesis could be traced back to the works of (Anty, 1993; Karl, 1997). Ever since then, scholars have explored the impact of natural resources on the economic growth of different countries and regions. Albeit mixed findings from these studies, it is believed that any nation's economic development and growth depend on the level of its natural resources. The examination of the impact of natural resources on economic growth has taken different dimensions by scholars (John, 2011; Sun and Wang, 2021; Gylfason, 2001; Sachs & Warner, 1997; Sala-i-Martin & Subramanian, 2008). These scholars tried to see the economic, political, institutional, and even environmental intuition behind the natural resources and economic growth relationships.

The studies of John (2011); Sun and Wang (2021) assert that countries that benefited from the positive impact of natural resources on economic growth are those that care about their environment. Among those earlier studies that examined the economic factors that mediate the impact of natural resources on economic growth is the study Gylfason 2001 which documents that the positive impact of natural resources on economic growth depends to a larger extent on the level of human capital. The studies of Sala-i-Martin & Subramanian, (2008); Qiang and Jian (2020) opined that the state of institutions plays a major role in the natural resources and economic growth relationship, while Zaidi et al (2019) opine that both institutional quality and human capital do not affect the natural resource curse hypothesis.

Natural resources play a major role in the wealth creation of most African countries (Liu et al., 2022). Yet, it is evident that the numerous resources endowments are insufficient for economic prosperities (Epo and Faha, 2019). Epo and Faha (2019) attribute this failure to over-dependence on natural resources with little diversification in most African countries, which prevents resource-rich economies from achieving sustained economic growth through natural resources. South Africa, Nigeria, Algeria, Angola, and Libya are the African countries with the most revenues from mineral resources in recent years with $125bn, $53bn, $39bn, $32bn, and $27bn, respectively. These countries produced more than two-thirds of Africans' natural resources wealth. Despite the abundant resources of the aforementioned countries and other resource-rich countries in Africa, many questions remain unanswered in the existing literature. Some resource-rich countries such as Nigeria, Angola, and DR Congo experienced low economic growth, and some resource-scarce countries like Ethiopia and Rwanda experienced positive growth rates in recent years (Adika, 2020).

Some empirical studies have examined the impact of aggregate and disaggregated institutional quality on economic growth (Ashraf et al., 2022). Ashraf et al (2022) found that institutional quality has a spillover effect on economic prosperity and growth, and Shittu et al (2022) found that institutional quality negatively influenced the economic growth of MENA African countries. This is so because most African countries' institutional quality has been

considered weak over the years. Some studies also suggest that the nature of natural resources also affects the link between institutions and resources. Numerous studies demonstrate that the "point" (concentrated) natural resources lead to bad institutions, while "diffuse" resources do not. This is so that point resources (such as crude oil, minerals, and plantations) may be secured and controlled at comparatively low expense and are available from a limited geographic or economic basis. Contrarily, horizontally oriented agents exploit diffuse natural resources (such as agricultural products) dispersed throughout space (Bulte et al., 2005). These have less of a correlation with institutional quality.
Hence, considering the richness of natural resources in Africa and the nature of institutional qualities of African countries, it is pertinent to examine how institutional quality moderates the impact of natural resources on the economic growth of the resource-rich countries in Africa. This is built on the premise that countries with strong institutions are more likely to drive economic growth and development.

This study will contribute to the existing literature in different folds. Firstly, it will unleash the effect of disaggregated resource rent vis-à-vis oil rent, natural gas rent, and mineral resources on economic growth in Africa. Aggregate resource rent refers to the total income or revenue generated from the exploitation of a country's natural resources, such as oil, natural gas, and minerals, without distinguishing between different resource types. In contrast, disaggregated resource rent involves a detailed breakdown of this income, separating it into specific categories like oil rent, natural gas rent, and mineral resource rent. Studying these forms of rent in Africa is essential for several reasons.
Firstly, it helps unravel the distinct impacts of different resource types on economic growth, shedding light on the nuanced dynamics of resource-dependent economies. Secondly, it enables policymakers and researchers to craft more targeted and effective resource management strategies. Lastly, this study contributes to the existing literature by enhancing our understanding of how the exploitation of specific resources can influence economic development in the diverse and resource-rich African context, thus aiding in the formulation of more informed policies and sustainable development pathways for the continent.

This study will also compare the effect of institutional quality and total natural resources on the economic growth of resource-rich and non-resource-rich African countries. Lastly, we adopt Driscoll-Kraay standard error estimator, which is robust to serial correlation, autocorrelation, heteroscedasticity, and most importantly cross-sectional dependence in panel analyses.

The remainder of the paper has been structured as follows: In the next section, we explored the relevant literature of studies on the effect of natural resources and institutional quality on economic growth. In section Three, we explained the methodology including the model and data sources. Section Four is dedicated to the analyses, interpretation, and discussion of the main results while we conclude, in section Five, with policy implications and recommendations

Literature Review

There are three distinct categories that can be applied to the body of empirical research that has been conducted on the roles of natural resources and institutions on economic growth. The first category of research contends that the quality of institutions is negatively affected

when natural resources are present, which leads to poor economic performance. This phenomenon, known as the "institutional curse of natural resources," refers to the fact that the existence of natural resources makes it impossible to build effective institutions or institute institutional reforms that are beneficial to economic growth.

According to the findings of these studies, natural resources bring about a decline in the quality of institutions by retarding the process of democratization, diminishing the scope of civil liberties, and undermining the authority of the rule of law (Leite and Weidmann, 1999; Isham et al., 2005; Sala-i-Martin and Subramanian, 2008). For instance, Leite and Weidmann (1999) demonstrated that nations blessed with an abundance of natural resources are typically the same nations with the highest corruption rates. According to Isham and colleagues (2005), countries that have poorer institutional quality are more likely to be well-endowed with easily accessible natural resources (such as gold and diamonds) and cash crops (such as coffee and cocoa). The use of revenues from natural resources by governments to appease dissent, shift public accountability, and counter pressures for institutional reform is another way in which natural resources are detrimental to the development of institutions (Isham et al., 2005; Sala-i-Martin and Subramanian, 2008).

In addition, Sachs and Warner (1997) demonstrated that the countries that are the most richly endowed in terms of natural resources are also the countries that have the poorest quality of institutions. This is because an abundance of natural resources is generally considered a factor in the growth of corrupt activities and as a result, the inefficiency of institutions. As a result, the institutional curse manifests itself most prominently through the increased likelihood of civil wars in nations that are abundant in resources (Collier and Hoeffler, 2005).

Therefore, natural resources can cause the quality of institutions to deteriorate due to civil wars and institutional convulsions, which can weaken the state. Additionally, struggles for the capture and distribution of rent raise both the probability of armed conflict and the likelihood of political instability (Carbonnier, 2013). According to Carbonnier (2013), in order to maintain their hold on power, leaders frequently redistribute extractive rents to more influential groups than is proportional to the growth in income. Ross (2001) concludes that oil rent is a constraint on democracy for this reason and in accordance with the theory of the rentier state. According to Jensen and Wantchekon (2004), evidence supports the hypothesis that there is an inverse relationship between the abundance of natural resources in Africa and democratic regimes.

They contend that the availability of resources not only plays a significant role in determining the success of democratic transition in Africa but that it also plays a part in determining the success of democratic consolidation there. In addition, because citizens only contribute a small amount to the public purse, leaders are hesitant to report to them on the distribution of rent. This contributes to the trend of emerging institutions that are not democratically accountable and transparent (Leite and Weidmann, 1999; Ross, 1999). According to Karl (1997), the cost of rent would have a corroborating negative relationship with the quality of institutions. For instance, economies that are highly dependent on the export of commodities such as fuels, minerals, and crops tend to have indicators of the quality of their particularly low institutions.

It has also been demonstrated, most notably by Auty (2000); Collier and Hoeffler (2005), that there is a negative correlation between an abundance of natural resources and democratic governance. Indeed, the combination of democratic rule and revenues derived from natural resources has significantly impacted the rate at which countries' economies have grown. According to Acemoglu et al (2001), the type of institutions established in the colonies

depends on the available resources and the ease with which rent can be appropriated for those resources.

The second type of research proposes that natural resources have an effect on the quality of institutions and that it is the quality of these institutions that determines how the revenues from natural resources are spent, which, in turn, determines whether natural resources are a boon or a bane in the long run (Mehlum et al., 2006). To put it another way, the institution's strength ultimately determines whether natural resources are converted into increased economic activity. According to the research of Norman (2009), initial stocks of natural resources are linked to very weak institutional capacities in terms of the rule of law.
Despite this, initial stocks of natural resources do not directly affect economic growth. When resource stocks are taken into account, however, gross resource exports do not significantly impact the rule of law; however, they do affect the average growth rate. The research of Sala-i-Martin and Subramanian (2008) demonstrates that when the quality of the institutions is managed, the quality of natural resources no longer directly impacts the rate of economic growth. Mehlum et al (2006) also demonstrated that growth is fostered by natural resources but only in the presence of high-quality institutions.

On the other hand, the presence of institutions that are amenable to activities that constitute predation is one factor that contributes to the transformation of natural resources into a curse. From this point of view, there is a certain point beyond which the potentially harmful effects of natural resources are completely nullified. The curse can be explained by looking at the relationship between institutions and economic growth. According to this point of view, the curse can only become apparent when there are institutions that are of low quality. The third category of research demonstrates that organizations are impartial (Mehlum et al., 2006). As a consequence of this, institutions do not have any bearing on the connection between natural resources and economic expansion. As a result, Sachs and Warner (1997) contend that institutions do not play any distinct role in the phenomenon known as the resource curse. According to these authors, the most significant way in which the scourge of natural resources manifests itself is not through the impact that an abundance of natural resources has on societal institutions. Furthermore, Arezki and van der Ploeg (2007) conclude that natural resources do not influence the economy's expansion.

Recently, studies have investigated the effect of natural resources on the economic performances of developed countries, oil-rich countries, and developing countries. For instance, Damette (2018) extended the concept of the conditional natural resource curse by investigating the quantity and quality of public spending as the primary drivers of the oil curse in oil-exporting countries. Using nonlinear threshold models, there is evidence in favor of a nonlinear relationship between oil income and economic performance. According to the study, highly oil-dependent countries are more likely to experience inefficiencies in government decision-making and, as a result, misallocation of oil revenues, which leads to underdevelopment. When human capital is used as a proxy for both the quantity and quality of government spending on education, the study finds a similar pattern. According to the findings, the main mechanism by which oil income leads to poor economic performance is a decrease in government efficiency. This justifies the reason why the role of government spending should be accommodated in the examinations of the impact of crude oil price volatilities on economic performance.

Shittu et al (2022) investigate the roles of human capital and institutional quality in the MENA region's natural resource endowment, FDI, and economic growth. Based on annual data from 1990 to 2017, their empirical estimates indicate that natural resource endowment is positively related to growth, while human capital has both negative and positive effects. Furthermore, whereas aggregated institutional quality produces a negative estimate, disaggregated institutional quality produces a mixed result. Furthermore, FDI stimulates growth in the short run but not in the long run; human capital is observed to mitigate the negative effect of FDI on MENA region growth, whereas institutions alter the negative FDI–growth relationship.

Similarly, Musibau et al (2022) investigate the effects of FDI, globalization, and economic governance on the growth of the West African economy, as well as natural resource endowment. The study confirms that natural resource endowment has a significant and positive impact on economic growth using the panel ARDL technique on West African data from 1996 to 2016. Furthermore, FDI boosts economic growth, whereas the globalization coefficient is mixed. Finally, the study discovers that government effectiveness stimulates regional growth while decreasing the positive effect of natural resource endowment on economic growth, whereas regulatory quality increases the positive effect of natural resource endowment on economic growth. The above findings are in agreement with the study of Triki et al (2022) who found a resource curse phenomenon in the MENA region.

In contrast, using daily data between January 1, 2019, to July 1, 2021, Sun and Wang (2021) investigated the relationship between natural resource commodity price volatility and global economic performance. Their empirical findings show that only natural resource commodity prices are vulnerable when using the wavelet power spectrum and wavelet coherence approaches. However, no vulnerability to global economic performance has been identified. Furthermore, wavelet coherence reveals that these two variables have no long-run or short-run causal relationship. Furthermore, the Breitung-Candelon spectral Granger causality test confirms that commodity price volatility has no causal relationship with global economic performance.

Ciu et al (2021) used the Wavelet power spectrum and Wavelet coherence approaches to track natural resource commodity price volatility and establish a link between resource rent, natural gas, and oil production, and economic growth. Their empirical findings for the specified period show high fluctuations in natural resources such as total natural resources, natural gas resources, and oil rent. Their findings revealed a bidirectional relationship between economic performance, total natural resources, natural gas resources, and oil rent.

Zhang et al (2022) investigate the link between natural resource volatility, global economic performance, and public administration during earlier and Covid-19 pandemic peak periods. The study covers the years 1990 to 2020 for global data. Their empirical cointegration test results indicated that the variables are cointegrated. Their research employs three long-run estimators: fully modified ordinary least squares (FMOLS), dynamic ordinary least squares (DOLS), and Canonical Cointegrating Regression (CCR). According to the empirical findings, natural resource volatility (TNR) has a negative and significant impact on global economic performance. While natural gas rents, oil rents, and the quality of government administration (QPA) all contribute to improved global economic performance. Furthermore, the findings show that combining QPA and TNR improves economic performance.

Similarly, Liu et al (2022) examine the impact of commodity price volatility and economic performance on environmental quality for the Group of Seven (G7) economies between 1990 and 2020. To validate the long-run relationship between the study variables, they used a

cointegration test, as well as several second-generation methodologies such as slope heterogeneity, cross-section dependence, and the unit root test. Furthermore, they used a novel method of moments panel quantile regression to conduct an empirical investigation of the problem. Their empirical findings demonstrate that economic growth and commodity prices for natural resources are detrimental to environmental quality by increasing carbon emission levels in all three quantiles. Arif et al (2022) examined the impact of natural resource price volatilities on the economic performances of some selected countries globally. The study differs from most previous studies with technique of data analysis used. The study employed panel unit root test, cointegration, and AMG. The study found that natural resource price volatility promotes economic performance, even during the COVID-19 pandemic period. However, their study fails to capture the moderating effect of the natural resource endowment on the natural resource price volatilities and economic performance.

Similarly, the study of Miamo and Achuo (2022) employed a VAR technique to examine the resource curse hypothesis on 32 countries in Sub-Sahara Africa. The study split the countries into oil and non-oil-exporting countries and found the presence of a resource curse hypothesis for the oil-exporting countries in Africa and also found that crude oil price volatility has a positive impact on all oil-importing countries in Africa. However, their finding also fails to establish the link between other resources deposited in those countries while testing the presence of the resource curse hypothesis in the selected countries in Africa. The study of Adebayo et al (2022) who tested the presence of the resource curse hypothesis in Nigeria, Indonesia, Mexico, and Turkey uses quantile on-quantile techniques and found the presence in some countries and absence in some countries. Despite the abundant resources in the selected countries, yet the natural resources harms the growth of some while enhancing it elsewhere. This suggests that the resource curse could be one reason why the volatilities in crude oil prices on growth differ across countries. Hence, there is a need to examine how the resource endowment in oil-abundant countries moderates the effect of crude oil prices on economic performance.

Methodology

This study employs the endogenous growth model, which explains how economic growth is influenced by the growth of factors of production (Olayungbo, 2019). The endogenous growth theory explains how economic growth is influenced by internal economic factors such as human capital, particularly, those forces governing the opportunities and incentives to create technological knowledge, and economic and political institutions. Romer (1994) assumed that equation 3.1 exhibits increasing returns to scale. Human capital comes in by splitting K (capital stock) in equation 3.1 into physical and human capital. Corrupt and rent-seeking institutions have an impact on both human and physical capital development. High corruption, for example, reduces economic growth and development by diverting funds intended to improve people's lives, improve educational quality, and build infrastructure to unproductive activities such as embezzlement, money laundering, wasteful spending, poor investment, and other corrupt practices (Olayungbo, 2019).

Hence, Institution quality enters the model through human capital. It is important to know that most African countries are endowed with huge natural resources, which implies that the growth of these countries depend on their natural resources. Therefore, this study considers natural resource as a major explanatory variable. The Phisiocrats identified the exploitation of natural resources as a key determinant of growth for resource- rich countries (Zalle, 2019).The A in equation 3.1 represents technology progress, and it is included because Sub-

Saharan African countries are developing countries that adopt technology from developed countries. The baseline theoretical model is specified below:

$$Y = Af(L, K) \quad (3.1)$$

where *Y* is gross domestic product, *K* is the capital stock, L is labour, and A represents the level of technology or total factor productivity, which enters the model as an exogenous variable and is assumed to be constant. Following the theoretical model in equation 3.1, this study modifies the models of Zalle (2019) as follows:

$$\Delta GDP_{it} = \alpha_0 + \beta_1 Res_{it} + \beta_2 Inst_{it} + \beta_3 HC_{it} + \beta_4 Inv_{it} + \varepsilon_{it} \quad (3.2)$$

Where ΔGDP_{it} represent the real GDP growth rate, Res is the revenue from natural resources, Inst is the institutional quality index, HC is the human capital index, and Inv represents the investment level. Our model differs by comparing the moderating effect of natural resource abundance and institutional quality on the economic growth of resource-rich and resource-scarce African countries. Hence, incorporating capital stock (K) as suggested by theory, moderation term $Res * Inst$ and disaggregating natural resource abundance into oil, natural gas and minerals for natural resource-rich and non-natural resource-rich produced equations 3.3, 3.4,3.5 and 3.6.

$$\Delta GDP_{itr} = \alpha_0 + \beta_1 Oil_{itr} + \beta_2 NG_{itr} + \beta_3 Min_{itr} + \beta_4 Inst_{itr} + \beta_5 HC_{itr} + \beta_6 Inv_{itr} + \beta_7 K_{itr} + \beta_8 Res * Inst_{itr} + \varepsilon_{it} \quad (3.3)$$

$$\Delta GDP_{itr} = \alpha_0 + \beta_1 Res_{itr} + \beta_2 Inst_{itr} + \beta_3 HC_{itr} + \beta_4 Inv_{itr} + \beta_5 K_{itr} + \beta_6 Res * Inst_{itr} + \varepsilon_{it} \quad (3.4)$$

$$\Delta GDP_{itr} = \alpha_0 + \beta_1 Oil_{itnr} + \beta_2 NG_{itnr} + \beta_3 Min_{itnr} + \beta_4 Inst_{itnr} + \beta_5 HC_{itnr} + \beta_6 Inv_{itnr} + \beta_7 K_{itnr} + \beta_8 Res * Inst_{itnr} + \varepsilon_{it} \quad (3.5)$$

$$\Delta GDP_{itnr} = \alpha_0 + \beta_1 Res_{itnr} + \beta_2 Inst_{itnr} + \beta_3 HC_{itnr} + \beta_4 Inv_{itnr} + \beta_5 K_{itnr} + \beta_6 Res * Inst_{itnr} + \varepsilon_{it} \quad (3.6)$$

Nature of Data and Souces

This study utilizes a panel data of fourty three (43) natural resource-rich African countries and nine (9) non-natural resource rich African countries. The data were sourced from World Bank Development Indicators and Penn World data as explained in Table1. The data rages between 1980 and 2020 due to data paucity in some countries prior to 1980. The descriptions of the variables, sources and a priori expectations are explained in Table 1 below.

Table 1
Description of Variables and Sources

Variable Accronyms	Description	Sources	A priori expectations
ΔGDP	This represents economic growth. It is computed by the growth rate of real GDP	World Development Indicators	-
INV	This represents the level of investment. It is included as one of the key determinants of aggregate output and economic growth.	World development indicators	positive
K	This represent Capital stock, it is included in the model as one of the determinants of output as suggested by prominent growth theories	Penn World Data 10.0	positive
HC	This represents human capital development, which is proxied by government expecnditure on education. This is also suggested by economic theories and some emprical studies	World Development Indicators	Positive/Negative
Min	This represents mineral resources which is the difference between the value of mineral stock of production at the world price and their production cost	World Development Indicators	Positive/Negative
NG	This represents natural gas. It is the difference between the regional prices of natural gas and the total cost of production.	World Development Indicators	Positve/Negative
Oil	This represent crude oil. It is the difference between the regional price of crude oil and the total production cost	World Development Indicators	Positive/Negative
Res	This represent the total natural resources. It is the summation of crude oil, minerals and natural Gas.	World Development Indicators	Positive/Negative
INST	This represents the aggregate institutional quality index. It is computed by using principal component analysis (PCA) using all the six institutional quality indexes.	World Development Indicators	Positive/Negative
Res_INST	This repreents the interactive term of resources and institutional quality. It signifies the marginal effect of resources and instutional quality on economic growth	World Development Indicators	Positive/Negative

Source: Authors computation.

Estimation Technique

There are at least three estimation issues that are peculiar to panel data analysis that needs to be resolved in equation 3.3 to 3.6. The panel estimation issues include heteroscedasticity, multicollinearity, endogeneity, and autocorrelation. This is because some variables are unobservable directly. Another reason is the simultaneity problem which is often caused by

endogeneity. For instance, some existing literature postulated a bi-directional causality between environmental degradations and energy consumption, which they addressed by employing a Generalised method of the moment (GMM). Hence, the presence of these issues will make OLS inconsistent, and the coefficients will not be efficient. In a situation where exogeneity is present and other issues are present, a Driscoll Kraay standard error estimator which is robust to serial correlation, autocorrelation, and heteroscedasticity, could be employed (Driscoll & Kraay, 1998). Another distinct feature of this technique is its ability to accommodate an unbalanced panel (Hoechle, 2007). The features of the Discroll Kraay estimator is explained in equations 3 and 4 below

$$Y_{it} = X'_{it}\theta + \varepsilon_{it}, \text{ i =1,..., N, t =1,..., T} \quad (3.7)$$

Where Y_{it} represents the explained variable, and *Xit* is a (K+1)*1 vector of the explanatory variables where the first element is equal to 1, θ is a (K+1)*1 vector of unknown coefficients. All observations of the explained and the explanatory variables can be stacked as follows

$$\text{Y} = ([y_1t_{11} \dots y_1T, y_2t_{21} \dots y_NT_N] \text{ and X} = [X_1t_{11} \dots X_1T, X_2t_{21} \dots X_NT_N]' \quad (3.8)$$

The above information allows the panel to be unbalanced since for individual *i* only a subset $t_{i1}, \dots, T_i$, with $1 \leq t_{i1} \leq T_i \leq T$ of all T observation may be available (Jimoh & Chua,2021). It is assumed that there is strong exogeniety among the explanatory variables. The above assumptions suggest that this method is a reliable estimator (Shittu et al., 2022).

Table 2
Correlation Analysis

	GRGDP	INV	K	HC	Min	NG	Oil	INST	Res_INST
ΔGDP	1								
INV	0.692***	1							
K	0.450***	0.395***	1						
HC	0.281***	0.343***	0.183***	1					
Min	0.483***	0.406***	0.466***	0.206***	1				
NG	0.256***	0.312***	0.333***	0.0926**	0.264***	1			
Oil	0.241***	0.288***	0.325***	0.0649*	0.264***	0.760***	1		
INST	0.0241	0.0414	0.203***	0.0198	0.156***	0.0544*	0.0493	1	
Res_INST	-0.0531*	-0.0368	-0.00291	0.00426	-0.0168	0.00249	0.00851	0	1

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The pairwise correlation analysis is presented in Table 2. The correlation result show the relationship between all the variables used in this study. The coefficient of correlation (r) shows that majority of the variables have positive association with one another. The result also reveals that there is no evidence of multicollinearity among the variables used as none of the variables have a correlation coefficients higher than 0.80.

Table 3
Panel Unit root test

Level	LLC	IPS	Pesaran
Δ*GDP*	7.255	7.334	-1.526
INV	2.996	6.505	-2.218
HC	10.989	8.545	-0.502
Min	8.266	6.222	-1.291
NG	9.410	12.499	-1.621
Oil	-3.192**	-4.712***	-2.934***
INST	-0.525	-1.160	-2.081
First Difference			
Δ*GDP*	-6.712***	-10.878***	-4.101***
INV	-6.059***	-8.829***	-4.471***
HC	21.065	-8.906***	-4.471***
Min	24.314	-11.050***	-3.629***
NG	0.0196	-7.462***	-3.894
Oil	-11.224	-12.600**	-5.564
INST	-8.711***	-10.524***	-4.103

Source: Authors computations

In order to examine the order of integrations and the unit root properties of variables used this study, we employed the first and second generation panel unit root tests as presented in Table 3. There is no evidence of unit root at levels for all the variables used except for *oil* which is found to be significant (stationary) in first and second generation tests at levels. However, all the variables (Δ*GDP, INV,K, HC, Min, NG, Oil, INST*) are found to be stationary at varying critical values (1 and 5%) at first difference. Hence, it is evident that the order of integration is combination of I(0) and I(I) series

Table 4
Panel Cointegration test

Kao Test of Panel cointegration test	**statistics**	**P-value**
Modified Dickey-Fuller t	2.3559	0.0092
Dickey-Fuller t	3.1648	0.0008
Augmented Dickey-Fuller t	3.6142	0.0002
Unadjusted modified Dickey Fuller t	1.5697	0.0582
Unadjusted Dickey-Fuller t	1.8478	0.0323
Pedroni panel cointegration test		
Modified Phillips-Perron t	0.2571	0.3986
Phillips-Perron t	-1.7326	0.0416
Augmented Dickey-Fuller t	2.028	0.001

Table 4 presents the panel cointegration analysis relying on the Kao and Pedroni panel cointegration tests. The p values of most of the statistics in the two tests are significance at 1% and 5% which implies the existence of cointegration among the variables used in this study. Impliedly, there is long run association among the variables used in this study.

Table 5
Cross-Sectional Dependence test (CSD) and Heteroscedasticity

Cross-sectional dependence	**P-value**	**Heteroscedasticity test**	**P-value**
Pesaran test	0.0018	Breausch- Pagan	0.2141
Frees	0.0000		

The result of the cross-sectional dependence test is presented in Table 3. This study test for CDS because of the likelihood CSD in the data sets, which are mainly caused by unobserved components and the existence of common shocks (Haruna & Abu Bakar, 2020)Baltagi, 2008). Table 4 shows the presence of CSD from the Pesaran and Frees CSD tests as the null hypothesis cross sectional independence is rejected. Also, the p values of the Breauch Pagan test in Table 5 signifies the absence of heteroscedasticity in the data series.

Table 6
Estimates of Driscroll-Kraay Results

VARIABLES	Model1	Model2	Model3	Model4
lnINV	0.712***	0.498***	0.648***	0.384***
	(0.0344)	(0.0357)	(0.0809)	(0.100)
lnK	0.0446***	0.0153	0.311***	0.201***
	(0.0136)	(0.0125)	(0.0267)	(0.0280)
lnHC	0.00648	0.00732	0.00673	0.00868
	(0.00606)	(0.00574)	(0.0192)	(0.0153)
lnMin	0.0793***		0.0092***	
	(0.0105)		(0.0049)	
lnNG	0.00460		-0.0529	
	(0.0123)		(0.0377)	
Oil	0.10511**		0.008***	
	(0.0006)		(0.0308)	
lnINST	-13.93	9.234	4.641	6.703
	(0.75)	(17.66)	(9.970)	(9.764)
lnRes_INST	0.0479*	0.0850***	0.0406	0.0391
	(0.0260)	(0.0245)	(0.0319)	(0.0251)
lnRes		0.163***		0.120***
		(0.0105)		(0.0349)
Constant	1,302***	924.9***	43.02	72.73
	(78.77)	(77.85)	(30.44)	(48.35)
Observations	1,564	1,564	333	333
Number of Country	43	43	9	9

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6 presents the estimates of Driscoll Kraay that examines the effect of natural resources and institutional quality on the economic growth of natural resource rich and non-resource rich African countries. The coefficients of variables in Model 1 of Table 6 shows the effect of dissagregated natural resources, aggregate institutional quality and interations of natural resources and institutions on economic growth of natural resource rich countries in Africa. The coefficients of variables in Model 2 of Table 6 shows the effect of aggregate natural resources, institutional quality and interaction of natural resources and institutional quality on economic growth. Models 3 and 4 of Table 6 shows the corresponding results of Models 1 and 2 for non-oil rich countries in Africa. The coefficients of INV are found to be positive in all the four estimating models. Specifically, the result shows that a percentage increase in investment increases economic growth of both natural resource rich and non-natural resource rich countries by 0.606 and 0.516 percents on average, respectively. This finding is inline with the study of Karimu et al (2017) which found that investment has positive influence on economic growth of resource-rich countries. In line with the Solow growth model, this study found a positive and significant impact of capital stock (K) on the economic growth of resource rich and non-resource rich countries in Africa. Specifically, a percentage increase in capital stock increases economic growth of resource rich countries by 0.0446 percent, while it increases the economic growth of non-resource rich African countries by 0.256. This implies that capital stock has more influence on the economic growth of non-resource rich countries than the resource rich countries in Africa. The coefficients of human capital in all the models are positive but not significance in all the results. The positive effect of human capital on economic growth is in line with the studies of (Shittu et al., 2022; Benhabib and Spiegel, 1994). The insignificance of human capital on economic growth in Africa is due to the fact that many African countries have high poverty rates and limited resources, which can make it difficult for individuals to access education and training. As a result, the workforce may not have the necessary skills and knowledge to drive economic growth.

Among the coefficients of narural resources considered in this study (Minerals, oil and natural Gas), Minerals and crude oil have positive impact on the economic growth of resource rich and non-resource rich countries in Africa. However, natural Gas does not have a significant impact on the economic growth of the two categories of countries. The effect of crude oil and mineral resources on economic growth is higher in resource rich countries than non-resource rich African countries. Specifically, a percentage increase in minerals and oil increases economic growth of resource rich countries by 7% and 10%, respectively, while the duo have 0.09 and 0.08%, respectively on the economic growth of non-resource rich countries. This result could be the fact that countries like Uganda, Madagascar and Kenya now listed among the emerging resource rich African countries, which reduces the numbers of non-resource rich African countries. Also, it also means that the resource scarce countries have been managing the little resource they have efficiently, which have contributed to their growth. The coefficient of aggregate natural resources endowment in models 2 and 4 shows that natural resources have more impact on economic growth in natural resource rich countries than non-resource rich countries in Africa. Specifically, the effect of natural resources on economic growth in resource rich countries is 4.3% higher than non-resource rich African countries. This is in agreement with the findings of Adika (2020) which shows that resource rich African countries grow faster than the non-resource rich African countries.

The coefficient of the interactive term of natural resources and composite institutional quality, which shows the marginal effect of resources and institution on economic growth in models 2 and 4 shows that the state institutional quality is very crucial to the impact of resources on economic growth. The results shows that institutional quality significantly affects the impact of natural resource on economic growth in resource rich countries. The result shows that a percentage increase in the intercative term increases economic growth of resource rich countries by 0.066% on average. This is because a strong institutions create a stable and predictable business environment, which encourages investment and also ensures that the benefits of natural resources extraction are shared evenly, rather than being concentrated amongst the small elites. The institutional quality of most African countries are very weak, i.e corruption is on the high side which could be one of the reasons why institutional quality retard the positive effect of resources on economic growth. This result is consistent with the result of (Adika, 2020). Finally, the composite instutional quality in Models 1 to 4 show that institutional quality does not have a significant impact on the economic growth of resource rich and non-resource rich African countries.

Conclussion and Recommendations

The resource curse hypothesis has generated the interest of scholars over the years. Virtually all African countries are blessed with one resources or another. Despite the abundant resources in Africa, the countries are still ranked amongst the less developed countries in the world. This study compares the impact of aggregate and dissagregated natural resource and composite institutional quality on the economic growth of fourty-three resource rich countries in African counries and nine non-resource rich African countries. The study also examine the ineraction effect of natural resources and institutional quality on economic growth using annual data between 1980 and 2020 for the same countries. The study deviates from previous studies by examining the effect of dissagregated natural resources such as oil, natural Gas and minerals on economic growth using a a Driscroll-Kraay estimation technique that is robust to cross-sectional dependence and endogeneity that are peculiar to panel analysis. The result reveals that the resource rich African countries grow faster than the non-resource rich countries, institutional quality does not influence economic growth in resource rich and non-resource rich African countries. Also, the marginal effect of institutions on natural resources and economic growth reveals that the weak institutional quality in Africa has reduced the effect of resources on economic growth of resource rich countries in Africa. Finally, among the dissagregated natural resources, natural gas does not have significant impact on the economic growth of resource rich and non-resource rich African countries, while oil and mineral resources positively influenced economic growth. However, the effect of oil and mineral resources on economic growth is more in resource rich countries than non-resource rich countries. This study concludes that natural resources relatively affect economic growth in resource scarce resources countries than the resource rich countries due to weak institutional qualities. This study recommends that the Africa resource rich countries should streghtened their institutional structure to achieve sustained economic growth. Ultimately, the research underscores the importance of strengthening institutional structures in resource-rich African nations to achieve sustained economic growth, offering valuable insights for policymakers and adding nuance to the resource curse debate in the African context.

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Appendix (1)

Variable	VIF	1/VIF
NG	2.39	0.418418
Oil	2.35	0.424903
K	1.48	0.677846
INV	1.47	0.678118
Min	1.40	0.712946
HC	1.15	0.872736
INST	1.05	0.948263
Res_INST	1.00	0.997746
Mean VIF	1.54.	