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Natural Resource Endowment, Human Capital Development, and Economic Growth in Selected African Countries

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ABSTRACT

Policymakers, particularly in Africa, have continued to be preoccupied with the issue of the resource curse and how to address it. This study was conducted to investigate the moderating effect of human capital development in the resource-growth relationship in six chosen African countries from 1992 to 2019. Panels Corrected Standard Errors was used as the main estimator. The results confirm the Dutch disease by showing that natural resources had a negative impact on economic growth,while human capital had a beneficial influence. It was also shown that the development of human capital could not mitigate the detrimental impact of natural resources on economic growth. Hence, African countries should make efforts to reduce their dependence on natural resources and focus on the development of other sectors of the economy as a way to solve the problem of the resource curse.

INTRODUCTION

An essential component of a nation's wealth is its natural resources. Many nations possess abundant natural resources that might lead to economic growth. The problem, however, is how to turn these resources into sustainable development and economic growth (Zallé, 2019). Discussions concerning the role of natural resources in economic growth have occupied the literature since the ground-breaking work of Auty (1997) on the curse of natural resources. The study argued that when compared to nations without such resources, nations with abundant resources experienced slower rates of economic growth. The resource curse states that there is an adverse relationship between economic growth and natural resources (Dou *et al.*, 2022). The rate of economic growth decreases as the quantity of natural resources rises. This pattern defies logic as economic theory states that natural resources increase an economy's capacity for production and, hence, its potential for economic expansion.

However, economic stagnation does not result from the simple existence of natural resources. Instead, the availability of natural resources creates economic distortions that act as transmission channels and subsequently impact economic growth negatively. Various factors have been investigated in the literature to explain this phenomenon. These include factors such as political factors, institutional, and even environmental factors (Destek *et al.*, 2023; Leonard, *et al.*, 2022; Mlambo, 2022). In recent times, the discussion has focused on the role of human capital in explaining the resource curse (Ozcan *et al.*, 2023; Tian *et al.*, 2024). Zafar *et al.* (2019) contends that without knowledgeable and competent human capital, sustainable utilization of natural resources is impossible. Societies' willingness to adopt environmentally friendly and energy-efficient technologies is stimulated by human capital. Effective extraction, processing, and management of natural resources depend on knowledgeable and skilled workers. The potential economic gains are hampered by the likelihood of resource waste or mismanagement in the absence of human capital.

Africa is a country blessed with abundant natural resources, ranging from oil, gas, solid minerals, fertile land, and water resources. According to African Development Bank (AFDB, 2016), the proven oil reserves on the continent make up 8% of global reserves, while natural gas reserves make up to 7%. Additionally, according to AFDB (2016) estimates, over USD 30 billion in government revenue might come from Africa's extractive resources annually over the next 20 years.

The continent has failed to convert its resource abundance into long-term economic growth and development in spite of these advantages. 32 of the world's 46 least developed nations are in Africa, and the majority of them are endowed with natural resources (United Nations, 2022). According to Ahmed *et al.* (2020), this has been ascribed to problem of human capital development. Education, health care, and skill development are not adequately funded in many African countries. As a result, there is a shortage of knowledgeable and experienced workforce required for the efficient management and use of natural resources (Chikoko & Mthembu, 2020). If human capital holds the secret to the relationship between natural resources and economic growth, investing in human capital would be the right path for African countries. Hence, this study examines the role of human capital in resource-growth nexus in selected African countries.

LITERATURE REVIEW

Various attempts have been made to examine the

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relationship between natural resource and economic growth in the literature. For instance studies such as Asiedu *et al.*, 2021; Atil *et al.*, 2020; Epo & Nochi Faha, 2020; Khan *et al.*, 2022; Kwakwa *et al.*, 2022; Inuwa *et al.*, 2022; Jie & Lan, 2024; Hayat & Tahir, 2021; Lee & He, 2022; Nawaz *et al.*, 2022; Shabbir *et al.*, 2020; Tabash *et al.*, 2022; Wang *et al.*, 2023) have examined the relationship between natural resources and economic growth. Asiedu *et al.* (2021) investigate how institutional quality mediates the link between economic growth and the endowment of natural resources. The study discover that only when institutional frameworks guarantee openness and effectiveness in resource management do resource-rich nations see growth. Also, Atil *et al.* (2020) look into how the extraction of natural resources affects environmental deterioration and how it affects economic growth. The results show that by making the environment more vulnerable, unsustainable resource exploitation might impede long-term growth.

Similarly, Epo and Nochi Faha (2020) focus on how resource richness and human capital development interact in African economies. The study comes to the conclusion that resource riches frequently does not transfer into sustainable growth in the absence of large investments in human capital.Furthermore, Khan *et al.* (2022) examine resource-dependent economies' macroeconomic stability. The findings draw attention to resource revenue volatility and its detrimental impacts on inflation, exchange rates, and fiscal stability—all of which have a deleterious influence on economic growth. Kwakwa *et al.* (2022) stress the value of economic diversification in nations with abundant natural resources. The study concludes that nations that rely primarily on natural resources experience growth stagnation, but diversification reduces risks and boosts resilience.

Inuwa *et al.* (2022) investigate the connection between growth, economic inequality, and natural resources. According to the findings, an unequal allocation of resource earnings can worsen societal tensions and might impede growth. Additionally, Jie and Lan (2024) evaluate how green technology is being adopted in economies that rely on natural resources. The study concludes that in order to achieve sustainable growth, environmental policy and human capital development are essential.

According to Hayat and Tahir (2021), nations that prioritize R&D get greater returns from their resource riches than those that do not. According to Lee and He (2022), manufacturing sectors are adversely affected by resource dependency, which frequently results in a "Dutch disease" effect. The relationship between governance and corruption and resource growth is examined by Nawaz *et al.* (2022). The study concludes that the benefits of resource riches on economic growth are greatly reduced by corruption. Shabbir *et al.* (2020) look into the connection between poverty alleviation and resource exports. Although resource exports boost GDP, the results show that their ability to reduce poverty is restricted because of inadequate income transfer mechanisms.

In the same vein, Tabash *et al.* (2022) examine how FDI affects the link between growth and resources. According to their findings, when there is a supportive policy environment, FDI increases the benefits of resource riches. Environmental sustainability is the main emphasis of Wang *et al.* (2023) as a mediator in the resource-growth relationship. According to the findings, countries that prioritize sustainability see long-term growth, while those that disregard environmental issues see diminishing gains. The empirical research shows how intricate the connection is between economic growth and natural resources. By analyzing the moderating role of human capital in the resource-growth nexus, this study contributes to the existing studies.

MATERIALS AND METHODS

Two models were used for the analysis. The first was used to examine the effect of natural resource and human capital on economic growth, while the second model was used to examine the moderating effect of human capital in the resource-growth relationship in selected African countries.

Model One

$$ECOGDP_{it} = \gamma_1 + \delta_1 HUMANDEX_{it} + \delta_2 NATUREEND_{it} + \delta_3 GLOBALIZA_{it} + \delta_4 FINDEXONE_{it} + \delta_5 EXCHANGE_{it} + \delta_6 OPENNESS_{it} + \epsilon_{it} \quad (3.1)$$

Model Two

$$ECOGDP_{it} = \gamma_1 + \delta_1 HUMANATU_{it} + \delta_2 GLOBALIZA_{it} + \delta_4 FINDEXONE_{it} + \delta_5 EXCHANGE_{it} + \delta_6 OPENNESS_{it} + \epsilon_{it} \quad (3.9)$$

Where ECOGDP is the log of gross domestic products, NATUREEND is the log of natural resources rent, GLOBALIZA is the log of globalization index, and FINDEXONE is the log of financial development, HUMANDEX is the log of human capital, OPENNESS is the log of trade openness, HUMANATU is the moderating variable (HUMANDEX*NATUREEND) between natural resources and human capital.

Economic growth was measured using GDP per capital in dollar, Human capital index was measured using years of schooling education, Globalization was measured using globalization index, Natural resources endowment was measured using natural resources rent as %of GDP, Trade Openness was measured as the ratio of total trade to GDP. The countries selected for the study are Algeria, Gabon, Mauritius, Egypt, South Africa, Tunisia. They were selected because they were the countries with highest human capital development in Africa (World Bank, 2020). The time series version of the data is from 1992 to 2019. They were sourced from World Bank, (2022) and Feenstra *et al.* (2022). Variance Inflation Factor was used to check for multicollinearity in the models. The test for heteroskdesticity was followed using modified wald test. The Pesaran Cross-Sectional Dependence test was used to test for cross-sectional dependence. The panel unit root

tested using Breitung and Dias panel unit root test. The Panel co-integration test was done using the Pedroni co-integration test, while Panels Corrected Standard Errors was used as the primary estimator.

RESULTS AND DISCUSSIONS

Testing for Multicollinearity

The test for multicollinearity was examined using the variance inflation factor (VIF) and tolerance factor, The VIF should be less than 10 as a general guideline (Thompson *et al.*, 2017). Table 1 outcome reveals that none of the variables has VIF that is up to 8, while the tolerance factor is above 0.1. This suggests that there is no multicolinearity in the models.

Table 1: The Results Of The Multicollinearity Test

Variable	Model One		Model Two	
	Variance Inflation	Tolerance Factor	Variance Inflation	Tolerance Factor
FINDEXONE	7.24	0.138048	4.88	0.204864
EXCHANGE	5.10	0.196068	2.57	0.389130
HUMANDEX	3.09	0.324032		
NATUREEND	2.86	0.349573		
HUMANATU			2.28	0.438871
GLOBALIZA	2.69	0.371270	1.95	0.512788
OPENNNESS	1.72	0.582524	1.65	0.607811

Source: Computed by the Author

Testing for Auto-Correlation

The Wooldridge test for auto-correlation was used to test the auto-correlation in the models. The probability values in Table 2 are less than 5% in the two models, indicating that they are significant at that level.This suggests that the models have serial correlation.

Table 2: The Results of the Multicollinearity Test

Model One		Model Two	
F(1, 5)	147.340	F(1, 5)	75.515
Prob	0.0001	Prob	0.0003

*N.B: ***,**,*, indicates significance at 1%, 5%, and 10% respectively*
Source: Computed by the Author

Testing for Heteroskedasticity

Modified Wald test for groupwise heteroskedasticity was used to examine heteroskedasticity in the models. The result shows that the probability values in Table 3 are less than 0.05. The implication is that heteroskedasticity issue exists in the model.

Table 3: Results of Modified Wald Test for Groupwise heteroskedasticity

Model One		Model Two	
chi2 (6)	173.16***	chi2 (6)	200.07***
Prob	0.0000	Prob	0.0000

*N.B: ***,**,*, indicates significance at 1%, 5%, and 10% respectively*
Source: Computed by the Author

Testing for Slope Heterogeneity

Pesaran and Yamagata (2008) was used to test for the slope heterogeneity in the model. The probability value of the test in models is less than 0.05, which means that the null hypothesis that slope coefficients are homogeneous is rejected, as shown in Table 4. The implication is that the model is heterogeneous.

Table 4: Results of Pesaran and Yamagata Test

Variables	Model One		Model Two	
	Delta	P-value	Delta	P-value
	9.884***	0.000	12.067***	0.000
adj.	11.695***	0.000	13.934***	0.000

*N.B: ***,**,*, indicates significance at 1%, 5%, and 10% respectively*
Source: Computed by the Author

Testing for Cross-Section Dependence

The cross-sectional dependence test in this study was conducted using Pesaran's (2004) CD test. As shown in Table 5, all the variables in the two models have probability values that are less than 0.05 which indicate that cross-sectional dependence is present in the models.

Table 5: The Results of the Cross-Section Dependence Test

Variable	Model One		Model two	
	CD-test	P-Value	CD-test	P-Value
ECOGDP	+7.443	0.000	+7.443	0.000
EXCHANGE	+14.851	0.000	+14.851	0.000
HUMANDEX	+ 20.3	0.000		
NATUREEND	+10.781	0.000		
HUMANATU			+10.912	0.000
GLOBALIZA	+17.595	0.000	+17.595	0.000
FINDEXONE	+7.048	0.000	+7.048	0.000
OPENNNESS	+-2.233	0.026	+-2.233	0.026

*N.B: ***,**,*, indicates significance at 1%, 5%, and 10% respectively*
Source: Computed by the Author

Testing for the Unit Roots in the Panel

Due to the model's cross-sectional dependence, which was demonstrated in the preceding section, Breitung and Dias panel unit root test. The test was initially run using the variables at level form. The p-value of the lambda statistics for each variable indicates that it is higher than 5%. This suggests that the unit root null hypothesis about the series is not rejected. The p-values are all below 5% when the first difference was taken for each variable. Thus, it is said that all of the variables are first-order integrated.

Table 6: Breitung and Dias Panel Unit Root Test Results

Variable	At Level		First Difference	
	lambda	P-value	lambda	P-value
ECOGDP	1.1396	0.8728	-3.4873	0.0002
EXCHANGE	0.2156	0.5853	-2.4334	0.0075
HUMANDEX	-0.4863	0.3134	-1.7191	0.0428
NATUREEND	-0.2854	0.3877	-5.3850	0.0000
GLOBALIZA	1.3119	0.9052	-5.9925	0.0000
FINDEXONE	-1.0392	0.1494	-7.0062	0.0000
OPENNNESS	0.4316	0.6670	-6.4102	0.0000
HUMANATU	-0.0227	0.4909	-7.4031	0.0000

*N.B: ***,**,*, indicates significance at 1%, 5%, and 10% respectively*
Source: Computed by the Author

Testing for Panel Co-integration

Using the Pedroni panel co-integration test, the panel co-integration test was carried out. The test provides three statistics for analysis. All the three statistics reported significant results at 1% level of significance as shown in Table 7. As a result, the null hypothesis of no co-integration among the variables is rejected.

Table 7: The Results Of Pedroni Panel Co-Integration Test

Variable	Model One		Model Two	
	Statistics	P-value	Statistics	P-value
Modified Phillips-Perron	3.3050	0.0005	2.7898	0.0026
Phillips-Perron t	2.3445	0.0095	1.9817	0.0238
Augmented Dickey-Fuller	2.8575	0.0021	2.3220	0.0101

*N.B: ***,**,*, indicates significance at 1%, 5%, and 10% respectively*
Source: Computed by the Author

The Result of the Panel-Corrected Standard Errors (PCSE)

Given the results of the preliminary tests, PCSE was used for the analysis. Table 8 shows that in the first model, there is a positive relationship between human capital index and economic growth. The result shows that a 1% increase in the human capital index is associated with 0.7% increase in the log of GDP which is the proxy for economic growth. However, the result of natural resource endowment shows a negative relationship with the log of GDP.This implies that an increase in natural resource endowment by 1% is associated with 0.1% decrease in the log of GDP, and consequently, economic growth. The result confirms a case of Dutch disease.

In term of the moderating effects of human capital, the result of the second model shows that there is a negative relationship between moderated human capital index and the log of GDP. By implication, the moderated human capital index exerts a negative influence on economic growth.

The implication is that the interaction between human capital development with natural resources does not make the countries avoid the Dutch disease. This shows that the solution to the problem of Dutch disease goes beyond having more human capital development.

The results of the control variables show that there is a positive relationship between exchange rate depreciation and economic growth. Also, a positive relationship was found between financial development and economic growth. Similarly, trade openness was also found to have a positive effect on economic growth, while globalization was found to be insignificant.

Table 8: Effects of Human Capital and Natural Resources Endowment on Economic Growth

	Coef.	P>z	Coef.	P>z
EXCHANGE	.1119741***	0.000	.1464998***	0.000

HUMANDEX	.7154225***	0.000		
NATUREEND	-.0179339**	0.020		
HUMANATU			-.0243825***	0.007
GLOBALIZA	-.0001959	0.998	.177459**	0.049
FINDEXONE	.0714025***	0.007	.1098935***	0.000
OPENNNESS	.1304875***	0.000	.124147***	0.002
_CONS	7.347609***	0.000	6.959705***	0.000
Wald chi2(6)	183.15***		147.62***	
Prob > chi2	0.0000		0.0000	

*N.B: ***,**,*, indicates significance at 1%, 5%, and 10% respectively*
Source: Computed by the Author

CONCLUSION

The study was done to examine the moderating role of human capital development in the resource-growth nexus in selected countries in Africa. The findings show that the individual effect of human capital on economic growth is positive but that of natural resource was found to be negative, confirming the Dutch disease. Also, it was also found that human capital development could not moderate the negative effect of natural resource on economic growth. Given the conclusions of this study, it is recommended African governments should work to improve human capital development in the continent. African countries should tailor human capital development towards the development of their natural resources. African countries should make efforts to reduce their dependence on natural resources and also focus on the development of other sectors of the economy

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