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Natural Resources Abundance and Health: Does Technological Innovation and Governance Matter?

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Abstract
This paper aims to evaluate the impact of resource abundance on health outcomes, considering the mediating effects of innovation and the quality of governance. We estimate an economic model for 26 African countries from 1996 to 2023. Econometric analysis is performed using the generalized method of moments (GMM) estimator. Results derived from the estimated health function support the natural resource curse hypothesis, extensively discussed in the economic literature, since a statistically negative effect is estimated for the oil rent variable. Furthermore, the finding highlights the significant mediating role of institutional quality and innovation in improving health outcomes. In conclusion, Policymakers in the African region must implement several necessary reforms, especially technological, institutional, and political ones.

Keywords: Natural resources, oil rents, technological innovation, health.

1. Introduction

The world oil market is the largest among all commodities, in volume and value. More than 60% of oil production gives rise to international flows, i.e., almost three-quarters of global energy exchanges. However, the economic performance of almost all oil-exporting countries in the world reveals a counterintuitive phenomenon. The literature on the oil curse is abundant, especially after the oil shocks of the 1970s. However, it fails to reach a consensus regarding the transmission mechanisms: It is shown that natural wealth limits development opportunities Gelb, 1988; Auty, 1990); Gylfason, T. (2001; and Iqbal, N., and Daly, V. (2014). In principle, the rents that natural resource exporting countries receive should relieve the very strong constraint of capital needs of a developing economy. The oil windfall should, in theory, be used for development and represent the basis of the economic growth of these countries. However, the experiences of the development of major oil-producing countries show that the blessing of abundant resources usually turns into a curse.

Researchers often refer to this contradiction as the “natural resource curse”. This theory has come to assert that commodity-based economies tend to grow less than those that are resource-poor and that rent-seeking leads to political tensions that may destabilize the economic activity of the countries in question. The debate on the causes of this phenomenon has enriched many

Vol. 9, No.04; 2025

ISSN: 2456-7760

theoretical and empirical contributions, and the consequences are important for the policies to be adopted in resource-rich economies. The dominant explanation of the natural resource curse essentially comes down to the famous Dutch disease theory, which refers to the harmful effects created in an economy by the expansion of the extractive sector. Still, in the economic curse dimension, countries are experiencing difficulties in implementing effective policies to deal with the appreciation of the national currency, the collapse of the manufacturing industry, the volatility of commodity prices, and the lack of economic diversification. In its politico-institutional aspect, the curse also refers to the weak institutional foundations and the problems linked to the emergence of the rentier economy and the strengthening of rent-seeking and capture activities. The role of institutions and governance becomes crucial in oil economies. The expansion of the oil sector encourages the adoption of rent-seeking behavior. These activities also fuel corruption. Oil money, the object of all desires, very often brings corruption and generates rent-seeking behavior. It represents an obstacle to democratic reforms and can even result in extreme cases of institutional breakdown. On a theoretical level, several works on wealth redistribution conflicts (Tornell and Lane, 1999; Baland and François, 2000 and Torvik, 2002) demonstrate that rent-seeking behavior keeps individuals away from productive and innovative activities and hurts productivity and growth. In addition, oil revenues may delay democratic reforms, as the state frees itself from taxing citizens. The rent can even result, in certain extreme situations, in a total institutional collapse and generate conflicts and civil wars for the appropriation of resources

Furthermore, sustainable development requires not only investing the natural resource receipts in building physical and financial assets to diversify the country's sources of income but also investing in the health sector to improve the harmful impact of resource depletion in the future (Amany A. and Marina-Selini Katsaiti, 2015). A pessimistic view of the oil resource endowment shows that the health sectors of some countries can also be influenced by the curse. The consequences of the curse on public health are pernicious and affect the main determinants of health, such as household income, savings, and education. Indeed, it is the effects of rents that pass directly through economic mechanisms and indirectly through purely institutional mechanisms. All these elements have led to an abundant literature that deals with the relationship between rents and the development of the health sector in economies rich in natural resources.

Therefore, it is expected that economies that enjoy higher levels of abundant resource revenues, and those that are more dependent on the depletion of oil resources, invest more in the health sector (Gylfason et al. 1999, Gylfason 2001, Birdsall et al. 2001; Acemoglu and Robinson, 2006; Torvik, R., 2009 and Tsani, S., 2013). On the contrary, the experience shows that most types of dependence are associated with higher rates of poverty and worse health outcomes, mirrored by higher infant mortality rates and lower life expectancy (Karl, 2004). This situation is widespread in many oil-endowed countries such as those in sub-Saharan Africa. We believe that good quality institutions can be seen as a catalyst for economic development, and that deep and solid institutions can help offset the negative effects of the curse and promote the health sector(Al-Kasim et al., 2013). To have an efficient healthcare system, previous studies emphasized the roles of GDP growth, health spending, CO2 emissions, and education (Dhrifi et al, 2021, and

Vol. 9, No.04; 2025

ISSN: 2456-7760

Omri et al, 2022). Other research has argued that technological innovations can play an important role during significant health crises (M. Byaro *et al.* 2023). Innovations such as health records, telemedicine, and remote monitoring have brought about a revolution in healthcare delivery (Kahouli et al, 2024). These innovations enable healthcare providers to offer efficient and accessible services, leading to better health outcomes. They have led to the development of innovative medical devices, diagnostic tools, and treatment methods.

This study is part of this research framework, and it attempts to examine whether resource-led development (measured by the degree of resource dependence) is indeed responsible for the deterioration of health indicators and the poorer healthcare status. The objective is to test the technological and institutional role of the relationship between the natural resources and health outcomes in African countries, supposedly rich in oil resources. More specifically, this work seeks to understand why the oil rent of African oil-exporting economies has not promoted health care status. Therefore, a deeper understanding of the resource curse hypothesis and its transmission channels is needed in the African region.

Based on existing theory and empirical studies, we tend to estimate a health model for African countries spanning the period 1996-2023. Econometric analysis is performed using the generalized method of moments (GMM) estimator. The paper contributes to empirical literature in two ways. First, if an empirical consensus on the effect of natural resources on GDP growth seems to be established, the determination of the effects of natural abundance on health remains little debated on the empirical level. Second, the likelihood of the natural resourcecurse' simpact on various economic factors, such as health, is important to cover the economic drivers of the resource curse. This study, to our knowledge, is the first attempt to identify these links using the GMMestimator. Apart from the introduction, the remainder of the present contribution is structured as follows: Section 2 presents the model, the data description, and the methodological framework. The penultimate section discusses the main results. The final section concludes and gives some policy implications.

2. Empirical methodology

2.1. The model

In this study, we present an empirical approach to the oil curse. Our analysis is based on the numerous previous works that explain the delays in the growth of economies highly dependent on natural resources (Sachs and Warner, 1995; Atkinson and Hamilton, 2003; Papyrakis and Gerlagh, 2004; and Sala-i-Martin and Subramanian, 2013). The objective is to test the effect of oil rents on public health as well as the moderating effect that institutional quality can have in such a relationship. The econometric specifications of the models express the health indicator considered with respect to several explanatory variables generally used in this type of empirical work. The first specification of the model to be estimated relates health to the oil resource rent, in the presence of a set of macroeconomic control variables. The econometric model tends to assess the impact of oil dependence on public health, the direct effects of corruption, openness to foreign trade, inflation, financial development, quality of bureaucracy, education, and democracy

Vol. 9, No.04; 2025

ISSN: 2456-7760

on health, as well as the indirect effects of rent on these different variables. We examine first the direct impact of natural resources and institutional quality on health status. Then, we assess the indirect effect of oil rents on health via innovation and governance indicators. Based on existing empirical studies (White et al., 2003; Gwatkin et al., 2007; Berthelemy&Seban, 2009; Dhrifi et al,2021), the following equation is specified:

$$H_{i,t} = \alpha i \quad + \alpha 1 H_{i,t-1} + \alpha 2 ORit + \alpha 3 TEC_{it+} + \alpha 4 INST_{it} + \beta'_i X_{it} + \xi_{it} (1)$$

where H_{it} denotes the health variable measured by life expectancy at birth, OR_{it} is the oil rent variable. Oil rent in GDP is used as the main index of oil abundance in our study. We expect a positive relationship between the abundance of oil resources and health**.**

TEC represents the innovation variable measured by research and development expenditures to GDP, X_{it} is a vector of explanatory variables generally used in this type of model, namely GDP growth, financial development, trade openness, investment, inflation, human capital, and healthcare expenditure.

INST is a matrix of contributing institutional quality measures to include:

1) Transparency International's Corruption Perception Index, which measures corruption since 1996. Remember that the CPI ranks countries on a scale of 0 (degree of perceived corruption as high) to 10 (degree of corruption perceived as low).
2) The World Bank Corruption Control Index: This index is constructed on a scale of -2.5 (high corruption) to +2.5 (low corruption). We consider the average over the period 1996-2023.
3) Democracy: The Freedom House indicator ranks countries on respect for political and civil rights. This index includes two measures of political freedom: civil liberties and political rights. Note that an increase in the democracy indicator should, in theory, hurt economic activity because the ranking ranges from 1 (free) to 7 (not free).
4) Bureaucratic Quality: We use the bureaucratic quality index given by the International Country Risk Guide (ICRG). It measures the institutional and bureaucratic quality of a country. It is calculated on a scale of 0 (lower quality) to 4 (higher quality). A high index is assigned to countries where the bureaucracy is strong enough to govern without drastic political changes or disruptions to government services.

Finally, β refers to a vector of parameters to be estimated, and ε_{it} is the error term.

The following table summarizes the variables and data considered in our model. We have reported in the first column the sign of the expected coefficient concerning the impact on the endogenous variable, the life expectancy at birth.

Vol. 9, No.04; 2025

ISSN: 2456-7760

Table 1. Definition of variables, data sources, and expected signs

variables	Descriptions	Sources	Expected signs
Hit-1	The lagged variable of the considered health indicator. It is measured by life expectancy at birth	WDI	+
OR	The share of oil revenue in GDP	WDI	-
GDPG	GDP growth rate	WDI	+
TRADE	Exports + imports of goods to GDP	WDI	+
FD	Financial development; domestic credit to private sector to GDP	WDI	+
HC	Human capital: Average number of years of secondary education for those aged 15 and over.	WDI	+
TEC	Technological innovation. Measured by Research and Development expenditure/GDP	WDI	+
INF	Inflation: Consumer price index	WDI	-
GEXP	Government expenditure	WDI	+
BUR	Measures bureaucratic quality – scale from 0 (lower quality) to 4 (higher quality)	ICRG	+
CCI	Corruption control index. This index is constructed on a scale of -2.5 (high degree of corruption) to +2.5 (degree of low corruption).	WDI	+
CPI	Corruption Perception Index. The CPI ranks countries on a scale of 0 (degree of perceived corruption as high) to 10 (degree of corruption perceived as weak)	Transparence International	+
BUR	Measures bureaucratic quality – scale from 0 (lower quality) to 4 (higher quality)	ICRG	+
DEM	Indicator measuring respect for political rights. Index on a scale from 1 (free) to 7 (not free)	Freedom House	-

Notes: the signs (+) and (-) correspond respectively to the expected positive and negative effects. To test how much the impact of oil rents on health is influenced by the quality of governance, and based on existing empirical literature in the subject (Dhrifi et all 2021, S. Kehinde Medase et al 2023, and Setareh Katircioglu. 2024), we introduce into the equation 2 below, the interaction term between these variables and oil rents. Then, the following Eq. 2 is specified as follows:

$$H_{i,t} = \alpha i \ + \alpha 1 H_{i,t-1} + \alpha 2 ORit + \alpha 3 TEC_{it} + \ \alpha 4 TEC_{it} + \beta'_i X_{it} + \gamma(ORit * INST_{it}) + \ \xi_{it} (2)$$

We note that the parameters respectively of the oil rents, and the level of the political institutions take again only the general effect of these variables on public health, whereas the parameter to be estimated of the interaction term denotes the differential impact of the

Vol. 9, No.04; 2025

ISSN: 2456-7760

relationship between oil resources and innovation of a political nature on the health sector of the considered region. Our objective is to combine the coefficients α2 (direct effect of oil rent on health) and α_3 (indirect effect of oil rent on innovation). The coefficient $\alpha_2*\alpha_4= \gamma$ will, then evaluate the total impact of the oil rent on health through the level of innovation.

Then, to test the robustness of the results, we use a composite indicator constructed from the four Governance indicators used in this study (CCI, CPI, BUR, and DEM), noted GOV_{it}. This uses the principal component factor method (PCF). The interest of the decomposition of this variable is to consider the other specific governance. The construction of this variable explains the interest in governance quality in the explanation of health status. ($OR_{it}*GOV_{it}$) is the interactive term between oil rents and governance. As mentioned above, good governance is deemed to be more efficient in ameliorating health care services. If the estimatedγ were negative and statistically significant, it would indicate that complementarity exists, and governance is important in mediating the natural resource impact on public health.

2.2. Data and Descriptive Statistics

In the first instance, we report descriptive statistics for the interested variables. Data is averaged for the entire period (1996 to 2021) for the 26 selected countries. The motivation behind this exercise is to understand the dependence of this region on their abundant oil resources exports (see figures 1, 2, and 3 below). Statistics are reported in the following (Table 2).

Table 2. Descriptive statistics

Variables	Mean	St-deviation	Min	Max
OR	24.6547	11.6485	2.6895	63.5478
GDPG	-2.0451	8.6547	0.0456	0.0674
Life exp	55.2548	4.3254	46..4566	70.9614
FD	22.5368	18.2478	2.3547	106.3254
TEC	2.21456	0.42871	1.9621	2.67520
TRADE	0.6354	0.3841	0.0025	2.3521
HC	1.8263	3.6741	-0.6527	8.6452
INF	1.7826	3.6741	1.5679	0.3282
GEXP	0.1462	0.0295	0.0038	0.3917
CCI	0.0423	0.0135	-0.9854	1.8524
CPI	4.3126	0.0925	0.2145	6.2547
BUR	1.0895	0.049	0.0064	1.7912
DEM	4.8952	0.6845	3.5684	6.6783

Source: Statistics provided by STATA14

Vol. 9, No.04; 2025

ISSN: 2456-7760

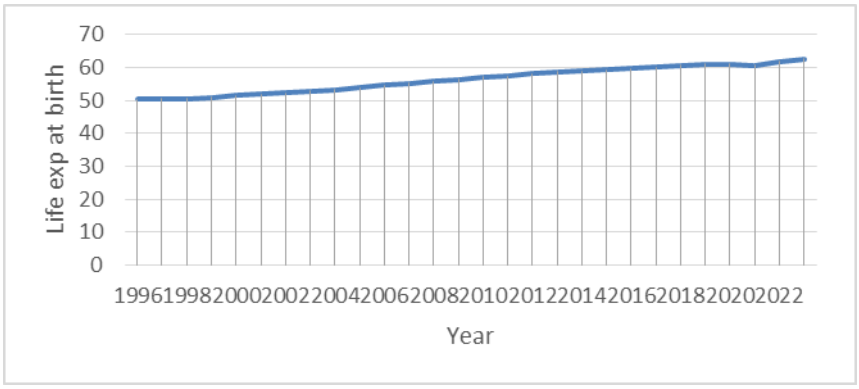

Figure 1. Average evolution of life expectancy at birth of the considered sample

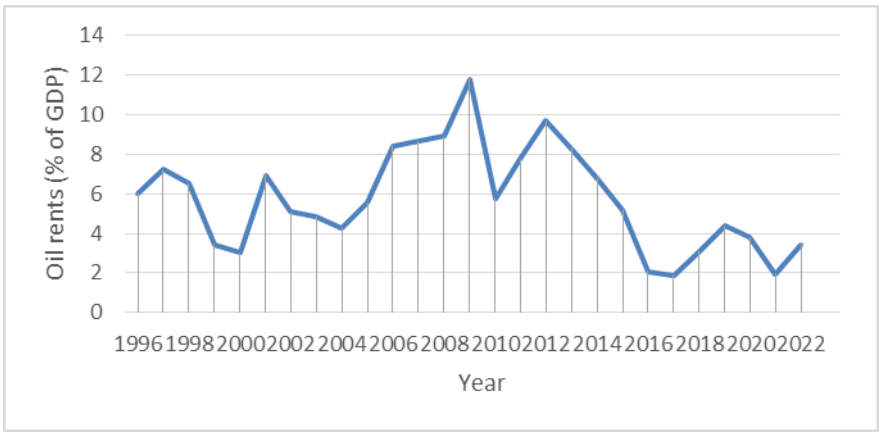

Figure 2. Average evolution of oil rents of the considered sample

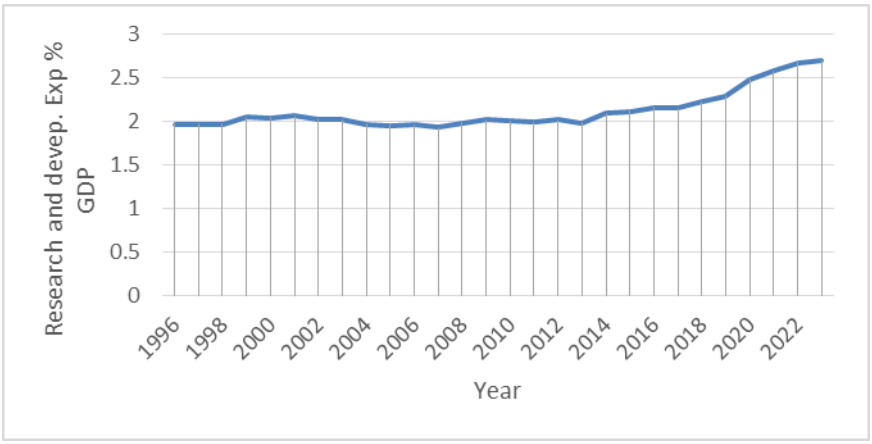

Figure 3. Average evolution of technological innovation of the sample considered

Vol. 9, No.04; 2025

ISSN: 2456-7760

This study uses annual time series data covering 1996-2203 for a sample of 26 sub–Saharan African countries. The data are obtained from a variety of sources, including a series compiled by World Development Indicator, International Country Risk Guide, and the Freedom House. Summary descriptive statistics of the variables used in the empirical analyses are provided in Table 2 above. Among the variables of interest, life expectancy at birth in the sample averaged 55 years, ranging from a minimum of 46 to a maximum of 70 years. Figure 1 demonstrates that life expectancy at birth, as a proxy of health, is increased over time. In the case of oil rents, the average for countries in the sample was about 21 % during the period considered, ranging from a low of 12% to a high of 63%. Figure 2, presented above, shows that oil rents are unstable during the whole considered period. For the third variable of interest, technological innovation measured by research and development expenditures % GDP, this variable averaged 2.21, ranging from a minimum of 1.96 and a maximum of 2.67. Figure 3 above shows the trends of research and development expenditure, which appear to increase during the period considered. For the last variable of interest, governance, CCI (control of corruption index) ranges from a minimum of -0.98 and a maximum of 1.85. As regards the CPI (corruption perception index)in the sample, it averages 4.31, ranging from a minimum of 0.2 and a maximum of 6.

As a summary, if the trends of technological innovation and health status increased over time, which may promote economic development, the oil rents in the African region appear to be volatile, suggesting that natural resource abundance is not always a factor that benefits all sectors of the economy in the African region.

3. Results and discussion

Recall that the purpose of this studywas to test the technological and institutional role of the relationship between natural resource abundance and public health for 26 producing oil African countries using annual data for the period 1996–2023, using the GMM technique. In so doing, we included four measures of governance we consider the Corruption Perception Index (CPI) of Transparency International in model 1 and control of corruption in model 2, and then in models 3 and 4, we include, respectively, bureaucratic and democratic quality.

Table 3 reports the estimation results of the estimated models. The dependent variable is health, and our variables of interest are oil rents, innovation, and institutional quality indicators. As can be seen from the table, our findings show that the coefficients of these variables of interest have the correct signs and are statistically significant. We find that in all models (1 to 5), the initial level of health has a positive sign and is statistically highly significant suggesting that the past level status is suited to the explanation of the current level of public health which justifies the dynamism of this link, hence the application of the GMM estimator on dynamic panel.

The coefficient of technological innovation, captured by research and development expenditure, appears to be positively significant, indicating that innovation constitutes a key determinant of health outcomes. These findings are in line with those found by Preetinder Singh Gill (2013), who suggested that, in the US, technological innovation and health outcomes demonstrated a strong relationship at a 5 percent significance level. The same findings are also confirmed by

Vol. 9, No.04; 2025

ISSN: 2456-7760

Kahouli etal (2024), authors documented that Technological innovation is found to have a direct positive impact on improving public health.

Considering the estimated coefficients of the other variables, the results are comparatively consistent across all specifications. We find that the coefficient of oil rents appears to be negatively significant at the 5 % level, suggesting that a 1% increase in oil rents leads to a deterioration of health status by about 0.23 points. This confirms the hypothesis that natural resource abundance has a negative and statistically significant effect on health outcomes. These results show that the importance of wealth derived from oil rents can hinder the improvement of the health sector. The negative and significant sign of the rent confirms the hypothesis of the curse of oil resources in these countries. Theoretically, this may be explained by the fact that the strong dependence on the oil sector represents a brake on investment, education, employment, and savings. Thereby, the oil industry remains an isolated industry, with no link or direct ripple effects on the health sector. This result is consistent with those found by (Ahmed et al., 2016; Apergis et al., 2014; Badeeb et al., 2017; Cockx&Francken, 2016; Crivelli & Gupta, 2014; M Crivelli & Gupta, 2014; Moradbeigi& Law, 2017; Sarmidi et al., 2014; Satti et al., 2014; Shahbaz et al., 2019. However, our results contradict those found by Shahbaz et al. (2019), who showed that the abundance of resources wealth benefits growth, while natural resource dependence depresses GDP growth. This finding is supported by Atkinson and Hamilton (2003), James and Aadl and (2011), and Taguchi and Lar (2016). Finally, this disappointing finding may be attributed to governance mode failures. The role of institutions and governance becomes essential in an oil economy. The expansion of the oil sector encourages the adoption of rent-seeking behavior by many entrepreneurs. These activities also fuel corruption.

From regression (2), we include measures of governance. In model (2), we consider the Corruption Perception Index (CPI) of Transparency International. The CPI is significant at 1%, and the coefficient is positive: an improvement in the corruption index of 10% would push up public health by 0.13 percentage points. To test the robustness of this result regarding the effects of corruption, we consider another indicator of corruption (regression 3): the Corruption Control Index (CCI) of the World Bank. We note that the coefficient associated with the CCI is positive and highly significant (at the 1% level). Increasing this indicator by 10% would increase the life expectancy at birth by around 0.12 percentage points.

Similarly, in regression (4), we examine the impact of democracy (political rights) on health. This indicator, calculated by Freedom House, ranges from 1 (most free) to 7 (least politically free). It therefore has a negative and significant impact on health (Omgba, L. D., 2015). Finally, in regression (5), we consider the bureaucratic quality. The coefficient appears to be positive and significant (at the 10% level). An improvement in the quality of bureaucracy leads to a slight increase in life expectancy at birth over the considered period. This may be explained by the fact that leaders of net oil-exporting countries have less need to develop an elaborate bureaucratic system to generate growth. Oil-producing countries have high levels of corruption and are characterized by a weaker institutional structure on several levels: regulation, government effectiveness, respect for laws, political rights, and civil liberties. We also noticed that the oil

rent gradually lost its significance as soon as these different variables were introduced. It is possible that the dependence on the oil rent has an indirect effect on public health through these different determinants, those linked to Dutch disease and governance deficits. These variables are designated in literature as being the transmission channels of the curse. As regards the coefficient of interaction term between the composite indicator of governance and Oil rents is also positive but not statistically significant.

As regards the explanatory variables, they have the expected signs. Findings show that economic growth has a significant impact on health, whereasa 10% increase in GDP growth raises life expectancy at birth by 3.36 points. A higher level of GDP growth is expected to solve the problems of food insecurity, the budget shortfall needed to reduce mortality, and the lack of adequate social infrastructure. In addition, higher incomes lead to ameliorated health infrastructure such as better housing, water and sanitation, and the ability to pay for health care services (Culter et al. 2006). Findings also show that the coefficient of government expenditure on health appears to be positively significant at the 1% level, suggesting that a 10% increase in health spending ameliorates health status by 1.93 points. This confirms the hypothesis that health expenditure has a positive and statistically significant impact on health. It means that people's health status depends on the spending rate in the health sector, indicating that any increase in this rate implies broader access to health care and services, which helps reduce mortality rates and increase life expectancy at birth(Berger and Messer 2002). As expected, education has a positive impact on health and is highly significant (at the 1% level). A 10% increase in the level of education would increase life expectancy at birth by 0.15 percentage points. The investment rate, financial development, and the indicator of trade are always highly significant.

Table. Estimation results of the effects of oil rents, innovation, and governance quality on health

Variable	1	2	3	4	5	5
Ht-1	0.725	0.725	0.708	0.797	0.719	0.653
	(0.033)**	(0.033)**	(0.041)**	(0.049)**	(0.073)*	(0.047)*
OR	-0.237	-0.237	-0.229	-0.226	-0.204	-0.169
	(0.052)**	(0.096)*	(0.104)*	(0.107)**	(0.82)*	(0.093)*
GDPG	0.027	0.027	0.032	0.029	0.023	0.027
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
TRADE	0.381	0.381	0.425	0.391	0.347	0.252
	(0.108)*	(0.108)*	(0.092)*	(0.11)	(0.088)***	(0.075)***
FD	0.085	0.085	0.0849	0.092	0.0806	0.0934
	(0.034)**	(0.034)**	(0.039)**	(0.0366)**	(0.0376)**	(0.0676)*
HC	2.492	2.492	2.433	2.781	2.467	2.467
	(0.000)***	(0.000)***	(0.008)***	(0.009)***	(0.000)***	(0.000)***
TEC	0.072	0.072	0.0689	0.0974	0.883	0.883
	(0.024)**	(0.026)*	(0.019)*	(0.025)*	(0.028)**	(0.025)**
INF	-0.023	-0.023	-0.029	-0.027	-0.026	-0.021
	(0.114)	(0.118)	(0.116)	(0.108)*	(0.106)*	(0.103)*

Vol. 9, No.04; 2025

ISSN: 2456-7760

GEXP	4.289 (0.000)***	4.289 (0.000)***	4.842 (0.000)**	4.351 (0.002)**	3.687 (0.000)***	3.687 (0.000)***
CCI		0.138 (0.064)*	-- --	-- --	-- --	-- --
CPI		-- --	0.131 (0.002)***	-- --	-- --	-- --
DEM		-- --	-- --	-0.166 (0.006)***	-- --	-- --
BUR		-- --	-- --	-- --	0.152 (0.0423)**	-- --
GOV		-- --	-- --	-- --	-- --	0.407 (0.172)
Diagnostic cheking						
Sargan test		2.0384	2.0457	2.0268	2.0329	2.1064
Observations		676	676	676	676	676

Notes: * represent 10% significance level, **represent 5% significance level, and *** represent 1% significance level.

Finally, we must notice that corruption is certainly not at the root of all the ills of oil-producing countries, but it appears to be the main channel through which the curse is transmitted. It is certain that if the oil resources are discovered in a country that already has a fragile institutional quality, the oil will bring corruption and conflicts overthe redistribution of the rent. In the context of institutional weakness and widespread corruption, macroeconomic policies will be ineffective and will not be enough to trigger growth and raise the living standards of the population in the region considered.

4. Conclusion

A contradiction in our world is that countries richly endowed with natural resources are not necessarily blessed with higher well-being than other nations. Natural resource-abundant nations are extremely diverse. Some countries suffer from poverty, some are rich industrial countries, and many others are in between these two extremes. This makes understanding the impacts of natural resources on welfare difficult to understand. The objective of this paper was to deal with the subject relating to the effects of abundant oil rents on health outcomes and to provide a new explanation of the moderating role that innovation and institutional quality can exert in oil-producing African countries. To do this, we used an estimation methodology and variable data that represent a sample of 26 oil-producing countries for the period 1996-2023. The results show that rents from abundant oil resources hurt health. The obtained results support the natural resource curse hypothesis, which has been extensively discussed in the literature since a statistically significant negative effect is estimated for the oil rent variable. This indicates that the huge rents hinder the efficiency and development of the health sector in cases of oil-rich

countries characterized by weak institutional and political factors, by decreasing the quality of contract enforcement institutions.

Furthermore, the study highlights the direct and indirect significant role of institutional quality and innovations in improving health status in African oil-rich countries. These findings have significant implications for policy sequencing in the African region. To benefit from natural resource-led growth, improving the institutional framework, including reducing political corruption, must precede natural resource management policies. Similarly, a certain diversification of the economy of African countries leads to better efficiency of natural resources in public health and economic activity. Many economic policies that governments can adopt such as the implementation of oil funds or export diversification policies. Other political actions can also enhance institutions by improving governance quality and transparency in the oil sector. A more developed politico-institutional system in countries highly dependent on oil is useful for the development of the health sector. All the results obtained suggest that governments must go through a series of reforms, particularly institutional and political, to improve and rationalize the use of rents from oil resources and transform them into a blessing rather than a curse for public health. These countries must adopt economic diversification strategies such as good governance, sound macro-fiscal management of natural resource revenues, the production and export of non-traditional agricultural and industrial products, the expansion of manufacturing activities, and the further development of services sectors such as tourism, which will all improve Africa's economic prospects—emphasizing the different fields of the economy. Future research should be directed at determining the structural characteristics of countries in the region that should be considered to draw insight into these dimensions and measures of economic diversification of each country. It is believed that such further research is likely to contribute to the relevant literature, truly.

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Vol. 9, No.04; 2025

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