



# Natural resource dependence and institutional quality: Evidence from Sub-Saharan Africa

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## ABSTRACT

Recent development in the resource curse literature highlights that one of the channels through which the curse may occur is the tendency of resource wealth to weaken institutional quality. Using an intermediary framework, this study examines whether natural resource dependence weakens institutional quality in sub-Saharan Africa (SSA) using the system dynamic general methods of moments. The results indicate that natural resource dependence is negatively associated with institutional quality. From this perspective, the study concludes that natural resource dependence weakens institutional quality in SSA which provides empirical support for the rent-seeking theory. In addition, employment, education, and FDI exhibit positive significant relationships with institutional quality. In light of this, the study recommends that policy development in SSA countries should encourage modernisation and diversification of their economies from natural resource dependence to enhance the growth of other sectors. Furthermore, policies on natural resources should incorporate sustainable exploitation to limit rent seeking and ensure the independence and quality of institutions to turn the resource curse into a blessing.

## 1. Introduction

The key role of institutional quality in economic growth and development has gained attention in recent years. Institutional structures in a country play significant roles in creating a favourable environment which helps in the development and implementation of policies to enhance economic growth and development (North, 1990). However, the creation of institutional structures that enhance economic growth may be inhibited by the political economy. The distribution of economic power and economic resources basically interact to produce the features of institutional structures (Acemoglu and Robinson, 2012). Politicians may favour the development of policies that increase their political power by ensuring that the system allocates a large share of resources to them.

After the influential works of Gelb and Associates (1988) and Auty (1993, 1994), most studies have sought to examine the channels through which natural resource dependence may inhibit economic growth.

Although traditional economists in the golden age explain that resource-rich countries experience higher growth than resource-poor countries, there have been recent arguments that countries with abundant natural resources experience slower growth than their resource-poor counterparts. The term “natural resource curse” has been coined to explain this phenomenon of a negative relationship between natural resource dependence and economic growth (Auty, 1993). Over the decades, studies on the resource curse hypothesis have been widespread and efforts have been made to find the channels through which the curse may occur.

One of the channels that have been suggested in the resource curse literature is the argument that the discovery of natural resources weakens institutional quality due to the tendency of the incumbent government to over-exploit natural resources and divert the resource rents for their private gains (Eregba and Mesagan, 2016). Incumbent leaders may seek to achieve higher resource rents during their tenure of office to spend it in a manner that enables them to win subsequent

Abbreviations: SSA, Sub-saharan Africa; GMM, General methods of moments.

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elections rather than using the resource revenue to fund productive activities. This behaviour which is termed as “rent seeking”, practiced by political leaders diverts their attention from investing in entrepreneurial ventures to the utilisation of political powers to seek benefits from the resource rents. Some of the avenues through which political leaders spend the resource rents include; offering public jobs, public goods, and transfer payments for political support during election periods (Robinson et al., 2006). Due to this rent-seeking behaviour, higher levels of public budget do not transcend into the lives of citizens of such natural resource-rich countries.

This study seeks to examine the impact of natural resource dependence on institutional quality within an intermediary framework. Following Mukand and Rodrik (2018), and Grabowski and Self (2020), the study agrees that improvement or deterioration in the governance institutional quality occurs through intermediary variables. Policies affect these intermediary variables which gradually transform the quality of institutions. Intermediary variables represent macroeconomic factors that can be influenced by policy initiatives in resource-rich countries. Although it may be argued that occasionally, certain events may lead to an unexpected change in institutions, institutional change mostly occurs in a gradual process over time and through policies (Chang, 1994; Taylor, 2009). The intermediary variables used in this study include natural resource rents, employment, foreign direct investment, education, inflation, gross capital formation, and trade openness. Although it may be argued that several non-economic variables may influence institutional quality, this study basically considers the macroeconomic determinants of governance. To control for the potential omitted variable bias, the study employs a dynamic panel estimation technique with the lagged dependent variable expected to control the bias that may result from omitted variables. This study contributes to the existing literature on the subject matter by examining the separate impacts of total natural resource rent, mineral rents, coal rents, oil rents, and natural gas rents on the six measures of institutional quality by Kaufman et al. (2010). These include control of corruption, governance effectiveness, rule of law, political stability, voice and accountability, and regulatory quality.

Continuous emphasis has been made in the resource curse literature that resource-rich countries seem to exhibit dysfunctional and unpatriotic state behavior, especially the public sector institutions and budgetary policies (Robinson et al., 2006). Demissie (2014) explains that resource-rich countries with crippled growth have poor institutional quality. In addition, successful resource-rich countries have common traits related to institutional quality which enhance economic growth and development. Economists usually omit a key factor in the interpretation of the crippled economic growth experienced by resource-rich countries, which is the role of governance institutions (Newberry, 1986). In Africa, most countries that have abundant natural resources have in one way or the other experienced some level of ethnic, tribal, or political war. Elbadawi and Sambanis (2000) explain that the belief that civil war in Africa is caused by ethnicity and religion is false. They rather find that civil wars in Africa are particularly due to poverty, weak political institutions, and natural resources. Again, Collier (2003) postulates that there is a higher probability of civil war in African countries with abundant natural resources as compared to resource-poor countries in Africa. Werner (2017) reports that about 12.5% of the oil exported from Africa to the United States results from corruption whilst McMillan (2005) finds that Angola loses about \$1 billion of income from oil rents to corruption each year. In summary, a small group of elite citizens gets the larger share of the national cake from their natural resources for their private benefit at the expense of the public. The deprived may thus engage in violent acts to exhibit their displeasure, which might lead to conflict and political instability.

Furthermore, natural resource dependence can deteriorate the effective functioning of institutions by exacerbating the political agency problem and corrupting political candidates (Brollo et al., 2010). This mechanism occurs because higher resource rents lead to higher income

and budget which worsens the corruption of the incumbent government through the moral hazard effect. In addition, most economists generally agree that the windfall of natural resource income enhances the power of elites and increases income inequality which may generate conflict in the country (Badeeb et al., 2017). There is also a tendency for natural resource dependence to hinder democratic transition due to the possibility of incentivising autocratic political leaders to entrench power (Badeeb et al., 2017). In a similar vein, it is argued that the demand for public accountability is lower in natural resource-dependent countries due to low taxes which incentivise the citizens to limit their demand for public accountability (Ross, 2001; McFerson, 2010).

The channels through which natural resource dependence may weaken institutional quality have been suggested to include; rent seeking (Sach and Warner, 1995), discouraging the development of sound economic policies (Karl, 1997), disincentivizing the government to build the bureaucratic capacity of the state (Besley and Persson, 2010), encouraging incompetent candidates to contest for public positions (Brollo et al., 2013), deliberate delay of the modernisation of the economy to prevent alternative sources of economic and political power (Auty, 2001; Ross, 2001) and encouraging politicians to weaken effective institutions that regulate natural resources in order to expropriate resource rents.

The sub-Saharan region of Africa is considered the most natural resource-endowed part of the world (Smith, 2020). The region boasts of oil and gas, mineral resources, and other precious metals (Aryeetey et al., 2012). In addition, most countries in the region depend on natural resource rents to enhance economic growth. Leaders in the region accept this fact and proclaim that efforts are been made to diversify the economy. However, all the promises have proved fatal as the natural resource share of exports continues to increase in most countries (Shaxson, 2007). Although institutions play a significant role in the relationship between natural resource dependence and economic growth, there is a strong argument that the quality of institutions may be eroded by natural resource wealth (Lay and Mahmoud, 2004). In countries like Angola, Nigeria and DR Congo, natural resource discoveries have been linked to systemic corruption and weakened institutions.

Although the literature on the subject matter is extensive, the issue remains unsettled. This study is related to studies such as Ross (2009, 2011), Barro (1999), Aslaksen (2010), and Tsui (2011) who examined the impact of natural resources on democracy. Again, Ades and Di Tella. (1999), Treisman (2013), Serra (2006), Leite and Weidmann (2002), Bhattacharyya and Hodler (2010), Sala-i-Martin and Subramanian (2013), Shaxson (2007), Alexeev and Conrad (2009), Brollo et al. (2010), Vicente (2010) and Busse and Gröning (2011) all examined the impact of some natural resources on selected governance indicators. However, this study is different from three perspectives. Firstly, the study examines the relationship between natural resource dependence and institutional quality within an intermediary framework since it is argued that institutional changes evolve from changes in intermediary variables which occur through policies. Most of the previous studies analysed the issue from a demographical or cultural perspective. However, we employ the intermediary framework since changes in institutional quality are likely to occur on a piecemeal basis through intermediary variables which are affected by policies (Mukand and Rodrik, 2018). To the best of the knowledge of the authors, this is the first study to empirically assess the impact of natural resource dependence on the quality of institutions within an intermediary framework in SSA. Secondly, the study employs five measures of natural resource dependence including total natural resource rents, mineral rents, coal rents, natural gas rents, oil rents, and all the six measures of institutional quality by Kauffman et al. (2010). This ensures the robustness of our results and accounts for any potential confounding effects that may be associated with any of our measures of resource dependence and institutional quality. Previous studies on the subject matter have largely concentrated on how democracy and corruption are affected by the discovery of crude oil. We examine how the extraction of major natural

resources affects diverse aspects of institutional quality. The authors believe that a more concrete conclusion can be made in this way since oil-rich countries may exhibit different characteristics compared to countries endowed with other resources. Lastly, we focus on SSA where the resource curse problem largely exists (i.e., rich in natural resource endowments and poor in economic growth), which provides a homogeneous sample for the use of a panel data set to reflect the practicality of the issue being studied.

The organisation of the remaining sections of the study is presented as follows: section 2 presents a review of the related theoretical and empirical literature, section 3 explains the research methodology employed in this study, section 4 presents the results and discussion, section 5 provides the conclusions and lastly section 6 provides policy recommendations from this study.

## 2. Literature review

The optimistic view of Adam Smith and David Ricardo that natural resource-rich countries enjoy higher levels of economic growth has suffered a lot of rebuttals (Gelbs and Associates, 1998; Auty, 1993, 1994). There have been divergent opinions that natural resource-dependent countries experience crippled growth and development as compared to resource-poor countries. After the influential works of Gelb and Associates (1988), there has been several pieces of evidence confirming the existence of a negative relationship between natural resource endowments and economic growth. The most prominent and credited work is the study by Sach and Warner (1995) who used data across a relatively large sample of countries to conclude that natural resource dependence is harmful for economic growth. This mechanism has been popularised by the term “natural resource curse” by Auty (1993).

Several studies have developed on these previous works to find the channels through which the curse may occur. Following a decline in the growth of the manufacturing sector of Netherland after the discovery of natural gas, the “Dutch disease” has usually been cited as the mechanism through which the curse may occur (Iimi, 2007). Another channel that has been suggested in the literature is budgetary uncertainty due to the volatile nature of natural resource commodities which may distort economic growth and development (van der Ploeg and Poelhekke, 2009). Lastly, “rent seeking” or the “Political Dutch Disease” has been suggested as another channel through which the curse may occur (Lam and Wantchekon, 2003). This occurs when government officials seek political rents for their private benefits through their political power. Through this rent seeking behaviour, natural resource discoveries weaken institutional quality so that government officials can use their political influence to obtain political rents. In addition, high dependence on natural resources does not incentivise the government to invest in human capital and develop economic policies to enhance the income from taxation, leaving the government with no option other than rent seeking (Ross, 2015). This rent seeking theory and the agency problem (or the moral hazard problem) are the theories underpinning this study. Government officials are entrusted with natural resources to utilise the rents for the benefit of all citizens. However, there is a tendency for political leaders to expropriate resource rents and formulate policies that maximise their powers by circumventing and harming institutions that regulate the exploitation of natural resource.

In addition, some empirical studies find evidence to support this theory of rent seeking behaviour in resource-rich countries and its impact on institutional quality (Arezki and Bruckner, 2011; Sala-i-Martin and Subramanian, 2013). Andersen et al. (2013) finds that a boom in oil rents or gas rents leads to a corresponding increase in the transfer of money from the rental income into tax havens. Vicente (2010) concludes that the discovery of crude oil in Sao Tome and Principe led to an increment in the perceived level of corruption in the public sector. Similarly, Zhu and Wu (2014) report that companies in the Chinese mining sector make corrupt payment to government officials.

These results raise concerns for developing economies such as SSA countries since Mehlum et al. (2006) argue that only strong and quality institutions can turn the resource curse into a blessing. If institutions are also harmed by natural resource dependence, escaping the curse becomes extremely difficult (Ross, 2015). However, these studies examined the relationship by modelling certain resource discoveries, demographic variables and country-specific characteristics on potential conflict and selected governance measures (mostly corruption). This study is different because we employ an intermediary framework and employ all major natural resources (using their rents) in SSA on diverse aspects of institutional quality to form a strong basis for an empirical conclusion.

Karl (2007) postulates that natural resource dependence in the SSA has fuelled political instability. Similarly, Collier and Hoeffler (2005) report that natural resource abundance is negatively associated with political stability and, resource-rich countries are more vulnerable to civil war. Ross (2003) supports the findings of Collier and Hoeffler (2005) with data from SSA countries. Again, Bannon and Collier (2003) report that there is 30% probability for resource-rich countries to experience conflicts but less than 1% for resource-poor countries. In addition, Iimi (2007) posits that natural resource dependence may exacerbate corruption and deteriorate institutional quality. Furthermore, Shaxson (2007) reports that countries that depend highly on mineral resources does not only experience crippled growth but are also vulnerable to conflicts, high income inequality, corruption and a weak democratic system. In Nigeria, Sala-i-Martin and Subramanian (2013) find that natural resource dependence has a detrimental effect on the quality of domestic institutions and affects long-term growth through this channel. Ades and Di Tella (1999) conclude that natural resource dependence stimulate corruption among bureaucrats and politicians. Acemoglu et al. (2004) report that natural resource dependence enables dictators to influence opposing candidates to pull off from contesting against the incumbent government. In a similar vein, Aslaksen (2009) concludes that both oil discovery and mineral rents are followed by higher levels of corruption. Recently, Mahdavi (2020), after controlling for institutional choices finds a strong positive relationship between oil-related institutions and bribery and corruption in oil producing countries.

From the theoretical underpinnings and empirical evidence presented, the study hypothesizes that.

**H1.** Natural resource dependence weakens institutional quality.

Other studies find contradictory results. For example, Alexeev and Conrad (2009, 2011) report that once the countervailing impacts of oil rents on income have been duly accounted for, resource wealth has no detrimental impact on institutional quality. Consistent with their findings, Kennedy and Tiede (2013) find insignificant evidence that oil rents deteriorate institutional quality. Busse and Groning (2013) find that natural resources exacerbate corruption but do not harm other measures of institutional quality. Treisman (2013) and Serra (2006) reject the hypothesis that natural resource dependence escalates corruption. Recently, Orihuela et al. (2021) finds that mineral-rich countries are likely to have proper structures because foreign companies usually need some license to operate but for such institutions to curb the resource curse, bureaucratic autonomy is required. The models used in all these studies impliedly represent that institutional change does not happen through macro-economic variables. However, since it is argued that institutional changes occur through intermediary macro-economic variables, we employ an intermediary framework in this study.

In addition, previous studies have indicated that employment, inflation, trade openness, gross capital formation, education and FDI are key macroeconomic determinants of institutional quality (Grabowski and Self, 2021). Lehne et al. (2014) report that economic openness enables countries to improve the quality of its economic institutions. Also, Glaeser et al. (2004) report that education significantly improves the quality of institutions and helps developing countries get out of poverty.

Grabowski and Self (2021) concludes that FDI, trade openness and education exhibit significant positive relationships with institutional quality whilst fixed capital formation and inflation have negative impacts on governance institutional quality. Since these intermediary variables may influence institutional quality, we control for them in our model to prevent the issue of endogeneity that may arise from omitted variable bias.

### 3. Materials and methods

We examine the effect of natural resource dependence on institutional quality in SSA after controlling for employment, inflation, FDI, trade openness, gross capital formation and education using the system general methods of moments (GMM) estimation technique. The dataset covers all countries in the SSA region who had adequate data from 2005 to 2019 (15 years' period). We settle on this period to reflect the recency of the issued been studied coupled with the fact that the efficiency of the system GMM technique employed in this study diminishes in longer time periods (Roodman, 2009). The study also recognises and controls for the issue of endogeneity, which may bias our results if ignored. Following Mukand and Rodrik (2018), and Grabowski and Self (2021), the models employed in the study is adapted from the intermediary framework. This framework explains that changes in institutions occurs in a gradual process and through intermediary variables. Policies affect intermediary variables which may in turn influence the quality of institutions. The models specify the macroeconomic determinants of governance institutional quality. Since it may be argued that there may be some non-economic determinants of institutional quality, the study adopts the GMM estimation technique which controls for such omitted variable problem by including the lagged dependent variables in the model. The study uses Equation (1) to examine the effect of natural resource dependence on institutional quality.

$$INST_{it} = \beta_1 INST_{it-1} + \beta_2 NRR_{it} + \beta_3 EMP_{it} + \beta_4 INF_{it} + \beta_5 FDI_{it} + \beta_6 TO_{it} + \beta_7 GCF_{it} + \beta_8 EDU_{it} + \mu_i + \varepsilon_{it} \quad (1)$$

$INST_{it}$  represents institutional quality;  $INST_{it-1}$  represents the lag of institutional quality;  $NRR_{it}$  is a measure of natural resource dependence;  $EMP_{it}$  represents employment;  $INF_{it}$  represents the rate of inflation;  $FDI_{it}$  represents of foreign direct investment.  $TO_{it}$  represents trade openness;  $GCF_{it}$  represents gross capital formation.  $EDU_{it}$  represents education,  $\mu_i$  represents the country invariant factors and  $\varepsilon_{it}$  represents the error term. The subscript ( $it$ ) refers to the country and period respectively.

We employ the six governance indicators by Kaufmann et al. (2010) to measure institutional quality including control of corruption, rule of law, governance effectiveness, voice and accountability, regulatory quality and political stability. Again, we employ five proxies to measure the rate of natural resource dependence including total natural resources rents, mineral rents, natural gas rents, coal rents, and oil rents (all in % of GDP). Previous studies such as Sach and Warner (1995), Atkinson and Hamilton (2003) and Gylfason (2001) have confirmed the appropriateness of natural resource rents as a measure of natural resource dependence.

Equation (1) assessed the impact of natural resource dependence on institutional quality in SSA. It highlights that institutional quality during the period was influenced by the previous level of institutional quality, employment, inflation, FDI, trade openness, gross capital formation in addition to natural resource dependence in SSA. The control variables were determined from Grabowski and Self (2021).

Table 1 presents a description of the variables and their sources. Furthermore, due to the difference in natural resource endowments among SSA countries, the number of countries used in this study varied slightly among the models for natural resource dependence. The countries included in each model are presented in Table A1 in the appendix.

Furthermore, the study adopts the systems dynamic panel estimation technique as proposed by Roodman (2009a, b) in estimating equation

(1). This approach is used since equation (1) assesses the autoregressive nature of institutional quality by including lag of the dependent variables. In addition, the estimation technique proposed by Roodman (2009a, b) is used in this study because of the convenience it provides in the implementation of Arellano and Bond (1991) who give suggestions in dealing with the endogeneity problem resulting from the inclusion of lagged dependent variables in a panel data model. Again, the technique uses instrumental variables to reduce over identification to obtain unbiased results. These procedures are also necessitated by the number of countries exceeding the number of years used in the study. In all our models, the number of countries exceeded 15 (which is the number of years considered in this study). Recent studies such as Agyei et al. (2020), Agyei et al. (2021) and Xu et al. (2021) has confirmed the appropriateness of Roodman (2009a, b).

The general form of the system GMM estimation used in the study is presented in Equations (2) and (3).

$$INST_{it} = \gamma_0 + \gamma_1 INST_{it-\tau} + \sum_{h=1}^5 \gamma_h W_{h,i(t-\tau)} + \theta_i + \mu_t + \varepsilon_{it} \quad (2)$$

$$INST_{it} - INST_{it-\tau} = \gamma_1 (INST_{it-\tau} - INST_{it-2\tau}) + \sum_{h=1}^5 \gamma_h (W_{h,i(t-\tau)} - W_{h,i(t-2\tau)}) + (\mu_t - \mu_{t-\tau}) + \varepsilon_{it} - \varepsilon_{it-\tau} \quad (3)$$

$INST_{it}$  represents institutional quality for country  $i$  at time  $t$ ;  $\gamma_0$  denotes a constant,  $W$  represents a vector of control variables (employment, inflation, foreign direct investment, trade openness, gross capital formation and education);  $\tau$  represents the coefficient of autoregression, which is one for the specification,  $\mu_t$  denotes the time-specific constant, whilst  $\theta_i$  represents the country-specific effect, and  $\varepsilon_{it}$  denotes the error term. Since the GMM estimation technique is susceptible to the problem of identification, simultaneity and exclusive restrictions, we form a priori expectation that the explanatory variables are endogenous, but we consider the time-invariant variables as strictly exogenous (Roodman, 2009b; Tchamyou, 2019; Nchofoung and Asongu, 2022 and Nchofoung et al., 2022). The appropriateness of this analogy is also confirmed in studies such as Agyei et al. (2021), Agyei et al. (2020) and Boateng et al. (2018) and supported by the Hansen J tests and the Sargan over-identification tests presented in Tables 3–8.

## 4. Empirical results and discussions

### 4.1. Descriptive statistics

Table 2 presents the descriptive statistics of the variables used in the study. From Table 2, it can be observed that all the measures of institutional quality averaged negative over the period, representing poor governance institutions in the SSA. This confirms the argument in the natural resource curse literature that the quality of institutions in countries with abundant natural resources are weak. In addition, Table 2 indicates that total natural resource rents averaged 13% of the GDP with a wide variation of about 11%. This implies that the dependence of countries in the SSA region on natural resources is high. Also, the dependence of natural resources in SSA varies among the countries sampled in this study. Whilst natural resource rents account for about 60% of the GDP in some countries, other countries have less than 1% of their GDP coming from resource rents. Mineral rents averaged about 3.3% of the GDP with a variation of about 6% whilst oil rents averaged about 8% of the GDP with a variation of 14%. This indicates that oil resources in the SSA region is higher than other resources and varies among the countries in the SSA region. Recent discoveries of oil in some countries in the region may further increase oil rents since a lot of efforts are been made in exploring crude oil in the region. The volatile nature of crude oil may distort budgets and forecast which may also have

**Table 1**  
Variables, definitions and sources.

| Variable                            | Definition                                                                                                                                                                                                          | Source of data                        |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| <b>Total natural resource Rents</b> | Total natural resource rents as a percentage of GDP. Total natural resources rents are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents.                        | World development indicators (WDI).   |
| <b>Mineral</b>                      | Mineral rents as a percentage of GDP. Minerals included in the calculation are tin, gold, lead, zinc, iron, copper, nickel, silver, bauxite, and phosphate.                                                         | WDI                                   |
| <b>Natural gas rents</b>            | Natural Gas rents as a percentage of GDP.                                                                                                                                                                           | WDI                                   |
| <b>Coal rents</b>                   | Coal rents as a percentage of GDP                                                                                                                                                                                   | WDI                                   |
| <b>Oil rents</b>                    | Oil rents as a percentage of GDP                                                                                                                                                                                    | WDI                                   |
| <b>Employment</b>                   | The proportion of a country's population that is employed. Ages 15 and older are generally considered the working-age population.                                                                                   | WDI                                   |
| <b>FDI</b>                          | Foreign direct investment (net inflows) as a percentage of GDP.                                                                                                                                                     | WDI                                   |
| <b>Inflation</b>                    | Inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy.                                                                                         | WDI                                   |
| <b>Trade Openness</b>               | Trade openness, modelled as the sum of imports and exports divided by GDP.                                                                                                                                          | WDI                                   |
| <b>Education</b>                    | Education, measured as the net % of primary school enrolment.                                                                                                                                                       | WDI                                   |
| <b>Control of corruption</b>        | Control of Corruption reflects perceptions of the extent to which public power is exercised for private gain. Estimate of governance (ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance) | Worldwide Governance Indicators (WGI) |
| <b>Rule of law</b>                  | Rule of law reflects perceptions of the extent to which agents have confidence in and abide by the rules of society.                                                                                                | WGI                                   |
| <b>Regulatory quality</b>           | Regulatory quality reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.                              | WGI                                   |
| <b>Governance effectiveness</b>     | Governance effectiveness reflects perceptions of the quality of public services, civil service and the degree of its independence from political pressures.                                                         | WGI                                   |
| <b>Voice and accountability</b>     | Voice and accountability reflect perceptions of the extent to which a country's citizens can participate in selecting their government, as well as freedom of speech and association and an independent media.      | WGI                                   |
| <b>Political stability</b>          | Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism.                                   | WGI                                   |

Note 1: FDI represents foreign direct investment, WDI represents World Development Indicators whilst WGI represents World Governance Indicators. Source: Adapted from World Development Indicators and the World Governance Indicators.

**Table 2**  
Descriptive statistics.

| Variable                | Obs | Mean   | Std. Dev. | Min     | Max     |
|-------------------------|-----|--------|-----------|---------|---------|
| VA                      | 657 | -.599  | .741      | -2.23   | 1       |
| PS                      | 660 | -.55   | .845      | -2.7    | 1.2     |
| GE                      | 660 | -.785  | .601      | -1.85   | 1.06    |
| RQ                      | 658 | -.685  | .605      | -2.27   | 1.13    |
| CC                      | 660 | -.657  | .612      | -1.83   | 1.16    |
| RL                      | 660 | -.721  | .614      | -1.85   | 1.03    |
| Total resource rents    | 581 | 13.04  | 10.82     | .001    | 59.548  |
| Mineral rents           | 552 | 3.314  | 5.979     | 0       | 46.625  |
| Natural gas rents       | 294 | .478   | 1.094     | 0       | 7.071   |
| Coal rents              | 343 | .262   | .855      | 0       | 7.869   |
| Oil rents               | 341 | 7.946  | 13.96     | 0       | 58.101  |
| FDI                     | 649 | 4.58   | 8.552     | -11.635 | 103.337 |
| Trade Openness          | 652 | .496   | .325      | -.117   | 2.759   |
| Gross capital formation | 621 | 22.968 | 9.057     | 0       | 53.988  |
| Education               | 352 | 77.781 | 14.832    | 36.086  | 98.856  |
| Employment              | 659 | 63.032 | 13.507    | 36.498  | 87.818  |
| Inflation               | 652 | 7.133  | 10.772    | -29.691 | 100.627 |

Note 2: VA represents voice and accountability, PS represents political stability, GE represents governance effectiveness, RQ represents regulatory quality, CC represents control of corruption, RL represents rule of law and FDI represents foreign direct investment.

ramifications on the economy. Both natural gas rents and coal rents averaged less than 1% of the GDP, indicating that natural gas and coal are not abundant in SSA.

Furthermore, employment in the period averaged about 63% of the total population, indicating that the unemployment rate in the region is quite high. High rates of unemployment may weaken institutional quality since the unemployed may take dubious means to earn a living. In addition, high rates of unemployment may induce the populace to put pressure on the government, which may lead to conflict. Trade openness averaged about 50% indicating that SSA countries largely participate in international trade. They export natural resources in their raw state to Europe and America and import some finished goods and services from these countries. In addition, the gross capital formation averaged about 23% of the GDP. It can be inferred that the countries in the region are building recognisable physical capital which are expected to enhance the standard of living and improve the quality of institutions. In addition, the level of education measured by the net enrolment in primary school averaged about 78% of the population. This means that the level of education in the region is encouraging. Education is expected to inculcate and impart positive values in the citizens, enhance tolerance with a positive impact on institutional quality.

Table 2 also indicates that level of inflation averaged 7.1% with a variation of about 11%. High inflation may induce violence and encourage political unrest as experienced in certain SSA countries (for example, Zimbabwe). Lastly, the inflows of FDI averaged about 5% of the GDP. FDI is expected to create employment opportunities and enhance economic growth with an expected positive effect on institutions.

#### 4.2. Correlation matrix

To ensure that multicollinearity is not problematic in this study, we employ a correlation matrix to obtain the pairwise correlation between the variables. With a benchmark of 0.7, the authors conclude that multicollinearity among the regressors is very low. Table A2 in the Appendix presents the correlation matrix.

#### 4.3. Discussion of regression results

Table 3 presents the results when control of corruption is employed as a proxy for institutional quality. The results indicate that the previous levels of control of corruption are significantly associated with their current levels confirming the autoregressive nature of control of

**Table 3**  
Control of Corruption and Natural resource dependence.

| Variables                     | CC                     | CC                       | CC                      | CC                        | CC                       |
|-------------------------------|------------------------|--------------------------|-------------------------|---------------------------|--------------------------|
| LCC                           | 1.018***<br>(0.0323)   | 0.995***<br>(0.0370)     | 0.994***<br>(0.0259)    | 0.980***<br>(0.0245)      | 0.949***<br>(0.0315)     |
| Total resource rents          | −0.00461*<br>(0.00240) |                          |                         |                           |                          |
| Employment                    | 0.00316**<br>(0.00135) | 0.00387***<br>(0.00129)  | 0.00530**<br>(0.00208)  | 0.00326***<br>(0.000730)  | 0.00211**<br>(0.000975)  |
| Inflation                     | 9.92e-05<br>(0.000832) | 0.000818<br>(0.00129)    | 0.00111<br>(0.00109)    | 0.00256*<br>(0.00131)     | 0.000161<br>(0.00182)    |
| Foreign direct investment     | −0.00273<br>(0.00337)  | 0.00947**<br>(0.00395)   | −0.00411**<br>(0.00167) | −0.000836<br>(0.00207)    | 0.00219<br>(0.00225)     |
| Trade openness                | 0.0843***<br>(0.0307)  | 0.0840***<br>(0.0291)    | 0.0552*<br>(0.0270)     | 0.103***<br>(0.0283)      | 0.0516***<br>(0.0127)    |
| Gross capital formation       | 0.00214*<br>(0.00108)  | −0.00177**<br>(0.000793) | 0.00550*<br>(0.00269)   | −0.00233***<br>(0.000806) | −0.00207**<br>(0.000873) |
| Education                     | −0.00182<br>(0.00158)  | 0.00167<br>(0.00173)     | −0.00236<br>(0.00188)   | 0.00294**<br>(0.00134)    | 0.00200<br>(0.00209)     |
| Mineral rents                 |                        | −0.00386**<br>(0.00151)  |                         |                           |                          |
| Natural gas rents             |                        |                          | −0.0369***<br>(0.0119)  |                           |                          |
| Coal rents                    |                        |                          |                         | −0.0900***<br>(0.0291)    |                          |
| Oil rents                     |                        |                          |                         |                           | −0.00342*<br>(0.00198)   |
| Constant                      | −0.0795<br>(0.133)     | −0.414**<br>(0.195)      | −0.296**<br>(0.127)     | −0.452***<br>(0.0966)     | −0.296<br>(0.205)        |
| AR (1) [p-value]              | 0.011                  | 0.042                    | 0.013                   | 0.063                     | 0.057                    |
| AR (2) [p-value]              | 0.897                  | 0.764                    | 0.130                   | 0.146                     | 0.655                    |
| Sargan OIR                    | 0.800                  | 0.922                    | 0.744                   | 0.711                     | 0.932                    |
| Hansen OIR                    | 0.451                  | 0.675                    | 0.282                   | 0.746                     | 0.464                    |
| DHT for Instruments           |                        |                          |                         |                           |                          |
| (a)GMM Instruments for levels |                        |                          |                         |                           |                          |
| H excluding group             | 0.869                  | 0.630                    | 0.597                   | 0.293                     | 0.706                    |
| Diff (null, H=exogenous)      | 0.231                  | 0.578                    | 0.224                   | 0.845                     | 0.327                    |
| (b) IV (years, eq(diff))      | 0.538                  | 0.849                    | 0.783                   | 0.681                     | 0.544                    |
| H excluding group             | 0.135                  | 0.059                    | 0.013                   | 0.747                     | 0.160                    |
| Diff (null, H=exogenous)      |                        |                          |                         |                           |                          |
| Fisher                        | 1483.43***             | 379.78***                | 1345.69***              | 2582.02***                | 2306.23***               |
| Instruments                   | 26                     | 26                       | 18                      | 18                        | 22                       |
| Observations                  | 294                    | 265                      | 151                     | 160                       | 169                      |
| Number of countries           | 39                     | 37                       | 20                      | 22                        | 23                       |

Note 3: Standard errors in parentheses, \*\*\*p<0.01, \*\*p<0.05, \*p<0.1. CC represents control of corruption.

Source: Authors.

corruption. Again, there is a significant negative relationship between control of corruption and all the measures for natural resource dependence. This implies that corruption is high in countries that depends largely on natural resources. From the intermediary framework, it may be inferred that, policies that tend to favour reliance on resource rents encourage corruption. The result from this study is consistent with previous studies such as [Busse and Groning \(2013\)](#) and [Ades and Di Tella \(1999\)](#) who find that natural resource dependence exacerbates corruption.

In addition, [Table 3](#) indicates that employment is positively associated with control of corruption. Employment improves the standard of living in the country and reduces the tendency of engaging in corruptible activities to earn a living. It may be inferred that policies that improves employment in a country reduces corruption. The results also indicate that the relationship inflation and control of corruption is insignificant. Consistent with the findings of [Grabowski and Self \(2021\)](#), the results from [Table 3](#) indicate a positive association between control of corruption and FDI. Inflows of FDI is expected to create employment opportunities, improve the standard of living and encourage transparency and accountability since foreign investors will make efforts to make sure that their investment is well accounted for. In addition, it is expected that corruption in the private sector will be lower as compared to the government sector. This implies that policies that encourage the attraction of FDI tends to reduce corruption in the country. The relationship between control of corruption and gross capital formation is mixed whilst

the relationship between education and control of corruption is largely insignificant.

[Table 4](#) presents the results when governance effectiveness is employed as a measure of institutional quality. The results indicate that previous levels of governance effectiveness are significantly associated with current levels. From [Table 4](#), all the measures of natural resource dependence exhibit negative associations with governance effectiveness. This implies that countries that depend largely on natural resources have weak quality public and civil services which are not independent from governmental pressures. This may happen when the incumbent government significantly influences the public and civil service with resource rents to win future elections. From the intermediary framework, it can be inferred that policies that favour the dependence on natural resources deteriorate governance effectiveness. The results from [Table 4](#) support the argument that natural resource dependence weakens institutional quality.

In addition, employment is positively associated with governance effectiveness. This is expected since, high employment rate mirrors a good economic performance which may limit the tendency of the populace to put pressure on the incumbent government with an expected positive impact on governance effectiveness. High employment rate is expected to reduce crime rates, robbery and violence which may in turn strengthen governance effectiveness. In addition, inflation is negatively associated with governance effectiveness. Excessive rates of inflation may induce citizens to protest and take actions against

**Table 4**

Governance effectiveness and natural resource dependence.

| Variables                     | GE                       | GE                       | GE                      | GE                        | GE                      |
|-------------------------------|--------------------------|--------------------------|-------------------------|---------------------------|-------------------------|
| L.GE                          | 0.862***<br>(0.0532)     | 0.988***<br>(0.0520)     | 0.985***<br>(0.0620)    | 1.037***<br>(0.0448)      | 0.451***<br>(0.141)     |
| Total resource rents          | −0.00638***<br>(0.00156) |                          |                         |                           |                         |
| Employment                    | 0.00427**<br>(0.00158)   | 0.00321**<br>(0.00134)   | 0.00929**<br>(0.00351)  | 0.000152<br>(0.00125)     | 0.0112**<br>(0.00479)   |
| Inflation                     | 0.00167<br>(0.00220)     | 0.000258<br>(0.00173)    | −0.00835*<br>(0.00472)  | −0.00507***<br>(0.00133)  | 0.0100*<br>(0.00505)    |
| Foreign direct investment     | 0.00808**<br>(0.00367)   | 0.0104***<br>(0.00286)   | 0.00576***<br>(0.00200) | 0.00556**<br>(0.00264)    | 0.0194*<br>(0.0108)     |
| Trade openness                | 0.0842***<br>(0.0276)    | 0.0532*<br>(0.0309)      | 0.205<br>(0.126)        | −0.0390<br>(0.0532)       | 0.0382<br>(0.202)       |
| Gross capital formation       | −0.00482***<br>(0.00146) | −0.00448***<br>(0.00145) | −0.00196<br>(0.00150)   | −0.00319***<br>(0.000997) | −0.00644**<br>(0.00237) |
| Education                     | 0.00434**<br>(0.00194)   | 0.00312*<br>(0.00163)    | −0.00563*<br>(0.00300)  | −0.00193<br>(0.00154)     | 0.00857**<br>(0.00349)  |
| Mineral rents                 |                          | −0.00416**<br>(0.00164)  |                         |                           |                         |
| Natural gas rents             |                          |                          | −0.0495**<br>(0.0214)   |                           |                         |
| Coal rents                    |                          |                          |                         | −0.0472*<br>(0.0231)      |                         |
| Oil rents                     |                          |                          |                         |                           | −0.0137***<br>(0.00467) |
| Constant                      | −0.605***<br>(0.197)     | −0.412**<br>(0.160)      | −0.153<br>(0.359)       | 0.291*<br>(0.150)         | −1.705***<br>(0.399)    |
| AR (1) [p-value]              | 0.001                    | 0.004                    | 0.026                   | 0.010                     | 0.003                   |
| AR (2) [p-value]              | 0.050                    | 0.123                    | 0.707                   | 0.993                     | 0.739                   |
| Sargan OIR                    | 0.107                    | 0.151                    | 0.870                   | 0.751                     | 0.358                   |
| Hansen OIR                    | 0.548                    | 0.445                    | 0.524                   | 0.462                     | 0.606                   |
| DHT for Instruments           |                          |                          |                         |                           |                         |
| (a)GMM Instruments for levels |                          |                          |                         |                           |                         |
| H excluding group             | 0.428                    | 0.559                    | 0.490                   | 0.848                     | 0.371                   |
| Diff (null, H=exogenous)      | 0.549                    | 0.354                    | 0.471                   | 0.368                     | 0.591                   |
| (b) IV (years, eq(diff))      | 0.478                    | 0.465                    | 0.427                   | 0.539                     | 0.638                   |
| H excluding group             | 0.909                    | 0.251                    | 0.866                   | 0.185                     | 0.269                   |
| Diff (null, H=exogenous)      |                          |                          |                         |                           |                         |
| Fisher                        | 386.29***                | 179.27***                | 186.67***               | 341.09***                 | 10.33***                |
| Instruments                   | 26                       | 26                       | 18                      | 18                        | 18                      |
| Observations                  | 294                      | 265                      | 151                     | 160                       | 169                     |
| Number of countries           | 39                       | 37                       | 20                      | 22                        | 23                      |

Note 4: Standard errors in parentheses, \*\*\*p&lt;0.01, \*\*p&lt;0.05, \*p&lt;0.1.GE represents governance effectiveness.

Source: Authors.

government with several ramifications on the effectiveness of governance. Also, FDI and trade openness is positively associated with governance effectiveness. FDI is expected to create employment opportunities, help in building the structures to ensure accountability and improve economic institutions with an expected positive effect on governance effectiveness. In addition, countries that are open to international trade may have better systems of civil and public services since international trade creates opportunities for the home country to learn from other countries and enhances the import of systems and structures. Surprisingly, gross capital formation is negatively associated with governance effectiveness. However, education is positively associated with governance effectiveness. Education is expected to significantly improve patriotism, build courage and encourage citizens to demand for the independence and quality of civil service. This result is consistent with the findings of [Grabowski and Self \(2021\)](#) who report that gross capital formation is negatively associated with governance effectiveness whilst education improves governance institutional quality. From the intermediary framework, we can infer that, policies that improve employment, attract FDI, encourage trade openness and promote education improve governance effectiveness whilst policies that increase inflation and gross capital formation harm governance effectiveness.

[Table 5](#) presents the results when political stability is employed as a proxy for institutional quality. The results indicate that previous levels of political stability are significantly associated with current levels, implying that current levels of political stability may influence future

levels. In addition, except for oil rents, all the measures of natural resource dependence are negatively associated with political stability. The struggle for power in natural resource endowed countries in SSA has led to several coup d'états. This result is consistent with previous studies such as [Ross \(2003\)](#), [Collier and Hoeffler \(2005\)](#) and [Karl \(2007\)](#) who postulate that natural resource dependence fuel political instability. From the intermediary framework adapted in this study, the results imply that policies that favour the natural resource dependence tend to harm political stability.

The results from [Table 5](#) indicate that employment is positively associated with political stability. High employment is expected to reduce politically induced violence and terrorism because it is difficult to incentivise the employed to engage in such activities. In addition, inflation is positively associated with political stability whilst gross capital formation is negatively associated with political stability. This is counter-intuitive since high rate of inflation may induce violence and protests against the incumbent government which may lead to military coup d'état. Again, countries with physical capital which are not fairly distributed in the country may encourage citizens which are deprived of such physical capital to engage in protests and violence against the government. This result is consistent with the findings of [Grabowski and Self \(2021\)](#) who report that gross capital formation negatively influences political stability. In addition, education is positively associated with political stability. This implies that education promotes the reduction of political induced violence and terrorism, enhances the understanding of

**Table 5**  
Political Stability and natural resource dependence.

| Variables                     | PS                      | PS                      | PS                    | PS                       | PS                        |
|-------------------------------|-------------------------|-------------------------|-----------------------|--------------------------|---------------------------|
| L.PS                          | 0.958***<br>(0.0258)    | 0.981***<br>(0.0208)    | 1.046***<br>(0.0219)  | 0.974***<br>(0.0185)     | 1.032***<br>(0.0227)      |
| Total resource rents          | −0.00437*<br>(0.00229)  |                         |                       |                          |                           |
| Employment                    | −0.00352<br>(0.00239)   | −0.00292<br>(0.00223)   | 0.0144**<br>(0.00522) | 0.00164<br>(0.00125)     | 0.00395*<br>(0.00211)     |
| Inflation                     | 0.00314<br>(0.00308)    | 0.00324<br>(0.00252)    | 0.00752*<br>(0.00408) | 0.00866**<br>(0.00395)   | 0.0102**<br>(0.00396)     |
| Foreign direct investment     | 0.00607<br>(0.00725)    | 0.00490<br>(0.00491)    | −0.00461<br>(0.00346) | 0.00492*<br>(0.00248)    | −0.00344<br>(0.00319)     |
| Trade openness                | 0.150***<br>(0.0480)    | 0.150**<br>(0.0660)     | 0.414***<br>(0.0887)  | 0.236***<br>(0.0361)     | 0.534***<br>(0.0640)      |
| Gross capital formation       | −0.00440**<br>(0.00200) | −0.00296**<br>(0.00121) | 0.00201<br>(0.00478)  | −0.00633***<br>(0.00166) | −0.00734***<br>(0.000996) |
| Education                     | 0.000295<br>(0.00293)   | −0.000734<br>(0.00138)  | −0.00439<br>(0.00357) | 0.00497**<br>(0.00204)   | 0.00851**<br>(0.00318)    |
| Mineral rents                 |                         | −0.00532*<br>(0.00298)  |                       |                          |                           |
| Natural gas rents             |                         |                         | −0.0736*<br>(0.0386)  |                          |                           |
| Coal rents                    |                         |                         |                       | −0.110***<br>(0.0283)    |                           |
| Oil rents                     |                         |                         |                       |                          | −0.00169<br>(0.00484)     |
| Constant                      | 0.201<br>(0.300)        | 0.198<br>(0.268)        | −0.836*<br>(0.449)    | −0.577**<br>(0.236)      | −1.029**<br>(0.378)       |
| AR (1) [p-value]              | 0.001                   | 0.003                   | 0.021                 | 0.018                    | 0.010                     |
| AR (2) [p-value]              | 0.314                   | 0.324                   | 0.470                 | 0.190                    | 0.640                     |
| Sargan OIR                    | 0.374                   | 0.496                   | 0.616                 | 0.685                    | 0.759                     |
| Hansen OIR                    | 0.549                   | 0.553                   | 0.682                 | 0.616                    | 0.695                     |
| DHT for Instruments           |                         |                         |                       |                          |                           |
| (a)GMM Instruments for levels |                         |                         |                       |                          |                           |
| H excluding group             | 0.605                   | 0.448                   | 0.322                 | 0.614                    | 0.216                     |
| Diff (null, H=exogenous)      | 0.444                   | 0.542                   | 0.693                 | 0.520                    | 0.853                     |
| (b) IV (years, eq(diff))      | 0.479                   | 0.502                   | 0.653                 | 0.643                    | 0.617                     |
| H excluding group             | 0.907                   | 0.602                   | 0.432                 | 0.264                    | 0.986                     |
| Diff (null, H=exogenous)      |                         |                         |                       |                          |                           |
| Fisher                        | 973.67***               | 846.73***               | 912.76***             | 953.65***                | 27999.69***               |
| Instruments                   | 26                      | 26                      | 18                    | 18                       | 22                        |
| Observations                  | 294                     | 265                     | 151                   | 160                      | 169                       |
| Number of countries           | 39                      | 37                      | 20                    | 22                       | 23                        |

Note 5: Standard errors in parentheses, \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ . PS represents political stability.

democracy and tolerance and generally encouraging political stability. From the intermediary framework, we can infer that, policies that create employment and promote education enhance political stability.

Table 6 presents the results when rule of law is employed as a proxy for institutional quality. From the results, the previous levels of rule of law exhibit a significant positive relationship with their current levels confirming the autoregressive assumption of institutional quality. In addition, all the measures of natural resource dependence exhibit significant negative relationships with rule of law. This implies that citizens in countries with abundant natural resources have low confidence in the laws of the land and hence, exhibit lower compliance with such laws. This result is consistent with the view that natural resource dependence weakens the rule of law and institutional quality in general. This implies that policies that do not encourage the diversification of the economy from natural resource dependence deteriorate rule of law. In addition, the results indicate that employment is positively associated with rule of law. This is consistent with the economic intuition that high rate of employment reduces crime rate and violence in a country and improves compliance and confidence in the laws of the country. Table 6 also indicates that inflation and education are positively associated with rule of law whilst gross capital formation deteriorates rule of law. Education is expected to enhance the knowledge of the citizens to have respect and

high regard for the laws of the country with a positive impact on rule of law. From the intermediary framework, we can infer that, policies that create employment, encourage international trade and promote education may enhance rule of law.

In Table 7, the result for regulatory quality as a measure of institutional quality is displayed. The results indicate that the current levels of regulatory quality exhibit significant positive relationships with their previous levels, indicating that current levels of regulatory quality may influence future levels. Consistent with our previous findings, all the measures of natural resource dependence exhibit significant negative relationships with regulatory quality. This implies that natural resource dependence inhibits the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development in the country. This result is consistent with the findings of Ross (2015) who reports that dependence on natural resources discourages the government from developing sound economic policies and delay the modernisation of the economy. From the intermediary framework adapted in this study, it may be inferred that policies that encourage natural resource dependence deteriorate regulatory quality.

The relationship between employment and regulatory quality is positive and largely significant. This implies that a country who can

**Table 6**

Rule of law and natural resource dependence.

| Variables                      | RL                       | RL                       | RL                      | RL                     | RL                      |
|--------------------------------|--------------------------|--------------------------|-------------------------|------------------------|-------------------------|
| L.RL                           | 0.787***<br>(0.0434)     | 0.883***<br>(0.0339)     | 0.957***<br>(0.0623)    | 0.946***<br>(0.0808)   | 0.869***<br>(0.0501)    |
| Total resource rents           | −0.00710***<br>(0.00204) |                          |                         |                        |                         |
| Employment                     | 0.00244*<br>(0.00141)    | 0.00302<br>(0.00232)     | 0.00820***<br>(0.00251) | 0.0104***<br>(0.00333) | 0.00318*<br>(0.00160)   |
| Inflation                      | 0.00497***<br>(0.00152)  | 0.00450**<br>(0.00204)   | 4.50e-05<br>(0.00179)   | 0.00475<br>(0.00378)   | 0.00216**<br>(0.000939) |
| Foreign direct investment      | 0.00331<br>(0.00297)     | −0.00718***<br>(0.00191) | −0.00175<br>(0.00206)   | 0.000795<br>(0.00285)  | −0.00376<br>(0.00441)   |
| Trade Openness                 | 0.104***<br>(0.0311)     | 0.0884*<br>(0.0511)      | 0.0984**<br>(0.0441)    | −0.00127<br>(0.141)    | 0.200**<br>(0.0785)     |
| Gross capital formation        | −0.00201<br>(0.00150)    | 0.00161<br>(0.00105)     | 0.000832<br>(0.000547)  | −0.00335<br>(0.00218)  | −0.00147<br>(0.00151)   |
| Education                      | 0.00433**<br>(0.00175)   | 0.00406**<br>(0.00161)   | −0.00226<br>(0.00141)   | 0.00684*<br>(0.00373)  | 0.00282**<br>(0.00126)  |
| Mineral rents                  |                          | −0.00176*<br>(0.00102)   |                         |                        |                         |
| Natural gas rents              |                          |                          | −0.0251*<br>(0.0141)    |                        |                         |
| Coal rents                     |                          |                          |                         | −0.0577***<br>(0.0183) |                         |
| Oil rents                      |                          |                          |                         |                        | −0.00233*<br>(0.00118)  |
| Constant                       | −0.599***<br>(0.207)     | −0.650**<br>(0.282)      | −0.441*<br>(0.233)      | −1.233***<br>(0.295)   | −0.526***<br>(0.134)    |
| AR (1) [p-value]               | 0.010                    | 0.017                    | 0.006                   | 0.057                  | 0.056                   |
| AR (2) [p-value]               | 0.142                    | 0.143                    | 0.146                   | 0.562                  | 0.161                   |
| Sargan OIR                     | 0.459                    | 0.878                    | 0.700                   | 0.923                  | 0.108                   |
| Hansen OIR                     | 0.471                    | 0.705                    | 0.524                   | 0.771                  | 0.539                   |
| DHT for Instruments            |                          |                          |                         |                        |                         |
| (a) GMM Instruments for levels |                          |                          |                         |                        |                         |
| H excluding group              | 0.992                    | 0.682                    | 0.412                   | 0.643                  | 0.342                   |
| Diff (null, H=exogenous)       | 0.180                    | 0.586                    | 0.492                   | 0.706                  | 0.578                   |
| (b) IV (years, eq(diff))       | 0.401                    | 0.661                    | 0.464                   | 0.887                  | 0.463                   |
| H excluding group              | 0.989                    | 0.586                    | 0.525                   | 0.154                  | 0.790                   |
| Diff (null, H=exogenous)       |                          |                          |                         |                        |                         |
| Fisher                         | 227.23***                | 663.78***                | 147.13***               | 64.67***               | 747.40***               |
| Instruments                    | 26                       | 26                       | 18                      | 18                     | 22                      |
| Observations                   | 294                      | 265                      | 151                     | 160                    | 169                     |
| Number of countries            | 39                       | 37                       | 20                      | 22                     | 23                      |

Note 6: Standard errors in parentheses, \*\*\*p&lt;0.01, \*\*p&lt;0.05, \*p&lt;0.1. RL represents rule of law.

Source: Authors.

effectively utilise its human capital can develop sound economic policies to enhance economic growth and development. In addition, the results indicate that inflation is negatively associated with regulatory quality whilst trade openness and gross capital formation are positively associated with regulatory quality. Inflation distorts the long-term economic planning of government and compels the government to undertake short-term policies to curb the situation which may harm private sector investment and development. However, a country which is more open to trade broadens its scope of importing technical knowledge and know-how in areas where they lack such expertise to help in the formulation of such policies and innovations. Through international trade, the country can also learn from the innovative policies taking by other countries. This finding is consistent with the findings of [Grabowski and Self \(2021\)](#), who report that trade openness is positively associated with regulatory quality. In addition, a country with enough capital formation is expected to have a higher capacity of developing its private sector since capital infrastructure provides a favourable environment for the private sector to develop. Within the intermediary framework, we can infer that, policies that create employment, encourage international trade, enhance the development of physical capital and curb inflation have a high tendency of enhancing regulatory quality.

Lastly, [Table 8](#) presents the results when voice and accountability is employed as a proxy for institutional quality. All the previous levels of voice and accountability are significantly associated with their current levels. In addition, all the measures of natural dependence exhibit negative significant relationships with voice and accountability. This implies that citizens in countries with abundant natural resources have limited opportunities in the participation and selection of government, limited media independence and freedom of speech. This result is consistent with [Ross \(2001\)](#) and [McFerson \(2010\)](#) who argue that the demand for public accountability is lower in natural resource dependent countries due to low taxes which incentivise the citizens to limit their demand for public accountability. Within the intermediary framework, it may be inferred that policies that discourage the diversification of the economy from natural resource dependence deteriorates voice and accountability.

For the control variables, [Table 8](#) reports that employment exhibit a significant positive relationship with voice and accountability. People in employment pay taxes to the government and may be encouraged to demand for the accountability of such taxes by the government. The employed may also demand for their employment rights and liberties which increases voice and accountability. In addition, inflation is

**Table 7**  
Regulatory quality and natural resource dependence.

| Variables                     | RQ                      | RQ                       | RQ                      | RQ                      | RQ                       |
|-------------------------------|-------------------------|--------------------------|-------------------------|-------------------------|--------------------------|
| L.RQ                          | 1.054***<br>(0.0399)    | 0.913***<br>(0.0294)     | 0.999***<br>(0.0558)    | 0.914***<br>(0.0541)    | 0.866***<br>(0.0770)     |
| Total resource rents          | −0.00322**<br>(0.00157) |                          |                         |                         |                          |
| Employment                    | 0.00260**<br>(0.00124)  | 0.00249*<br>(0.00138)    | 0.0118***<br>(0.00334)  | 0.00377***<br>(0.00123) | 0.00394*<br>(0.00222)    |
| Inflation                     | −0.00334*<br>(0.00174)  | −0.000629<br>(0.000605)  | −0.000327<br>(0.00274)  | −0.00529**<br>(0.00193) | −0.0109***<br>(0.00242)  |
| Foreign direct investment     | −0.00277<br>(0.00229)   | −0.00392***<br>(0.00126) | −0.00142<br>(0.00283)   | 0.00111<br>(0.00183)    | −0.00308<br>(0.00248)    |
| Trade Openness                | 0.00170<br>(0.0273)     | 0.0803**<br>(0.0326)     | 0.140**<br>(0.0529)     | −0.00204<br>(0.0247)    | −0.0483<br>(0.0508)      |
| Gross capital formation       | 0.00178<br>(0.00123)    | 0.00134<br>(0.00149)     | 0.00512***<br>(0.00177) | −0.000581<br>(0.000547) | 0.00290***<br>(0.000935) |
| Education                     | −0.00447<br>(0.00266)   | −0.00114<br>(0.00120)    | −0.00281<br>(0.00209)   | −0.00222<br>(0.00153)   | −0.0102***<br>(0.00187)  |
| Mineral rents                 |                         | −0.00454*<br>(0.00239)   |                         |                         |                          |
| Natural Gas rents             |                         |                          | −0.0606**<br>(0.0248)   |                         |                          |
| Coal rents                    |                         |                          |                         | −0.0338***<br>(0.00777) |                          |
| Oil rents                     |                         |                          |                         |                         | −0.00754***<br>(0.00232) |
| Constant                      | 0.237<br>(0.198)        | −0.158<br>(0.140)        | −0.675**<br>(0.256)     | −0.0821<br>(0.180)      | 0.529***<br>(0.151)      |
| AR (1) [p-value]              | 0.001                   | 0.001                    | 0.001                   | 0.001                   | 0.001                    |
| AR (2) [p-value]              | 0.813                   | 0.889                    | 0.392                   | 0.810                   | 0.198                    |
| Sargan OIR                    | 0.902                   | 0.479                    | 0.296                   | 0.320                   | 1.000                    |
| Hansen OIR                    | 0.710                   | 0.824                    | 0.606                   | 0.232                   | 0.591                    |
| DHT for Instruments           |                         |                          |                         |                         |                          |
| (a)GMM Instruments for levels |                         |                          |                         |                         |                          |
| H excluding group             | 0.614                   | 0.840                    | 0.882                   | 0.905                   | 0.579                    |
| Diff (null, H=exogenous)      | 0.631                   | 0.645                    | 0.507                   | 0.110                   | 0.506                    |
| (b) IV (years, eq(diff))      | 0.647                   | 0.792                    | 0.714                   | 0.521                   | 0.556                    |
| H excluding group             | 0.839                   | 0.611                    | 0.168                   | 0.024                   | 0.458                    |
| Diff (null, H=exogenous)      |                         |                          |                         |                         |                          |
| Fisher                        | 156.58***               | 549.15***                | 282.16***               | 597.48***               | 854.44***                |
| Instruments                   | 26                      | 30                       | 18                      | 18                      | 22                       |
| Observations                  | 291                     | 262                      | 151                     | 160                     | 169                      |
| Number of countries           | 39                      | 37                       | 20                      | 22                      | 23                       |

Note 7: Standard errors in parentheses, \*\*\*p<0.01, \*\*p<0.05, \*p<0.1. RQ represents regulatory quality.

Source: Authors.

positively associated with voice and accountability. Persistent and unbearable inflation may lead to demonstrations against the government and the demand for public elections to be held to replace the incumbent government. Table 8 also reports that FDI, gross capital formation and education exhibit positive significant relationships with voice and accountability. Education is expected to increase the confidence of citizens to demand for their political and fundamental human rights. From the intermediary framework, it can be inferred that policies that improve employment creation, attract FDI, increase gross capital formation and promote education are likely to improve voice and accountability in the country.

In summary, the findings from this study empirically justify that natural resource dependence exhibit a significant negative relationship with institutional quality. The study therefore fails to reject hypothesis 1, which posits the existence of a significant relationship between natural resource dependence and institutional quality.

## 5. Conclusions

Recent development in the resource curse literature reveals that one of the main channels through which the curse may occur is the “rent seeking” behaviour of governments in resource-rich countries which weakens institutional quality. This study examined whether natural resource dependence weakens institutional quality using data from Sub-Saharan Africa (SSA) within an intermediary framework. The study used the GMM estimation technique on data from the World Development Indicators (WDI) and the World Governance Indicators (WDI) within the period of 2005–2019. The results indicate the existence of a negative relationship between natural resource dependence and institutional quality. In almost all instances, all our measures of natural resource dependence show a negative significant relationship with institutional quality. The result from this study therefore supports that one of the channels through which the resource curse may occur is the possibility of resource dependence to weaken institutional quality through the “rent seeking” behaviour. The study concludes that natural resource dependence weakens institutional quality in SSA countries. The result

**Table 8**  
Voice and accountability and natural resource dependence.

| Variables                     | VA                      | VA                      | VA                     | VA                       | VA                     |
|-------------------------------|-------------------------|-------------------------|------------------------|--------------------------|------------------------|
| L.VA                          | 1.033***<br>(0.0519)    | 0.970***<br>(0.0289)    | 1.164***<br>(0.0675)   | 0.775***<br>(0.0904)     | 0.840***<br>(0.0823)   |
| Total resource rents          | −0.00356*<br>(0.00197)  |                         |                        |                          |                        |
| Employment                    | 0.00161<br>(0.00238)    | 0.00486***<br>(0.00124) | 0.00561**<br>(0.00263) | 0.00533<br>(0.00429)     | 0.00337<br>(0.00407)   |
| Inflation                     | 0.00896***<br>(0.00182) | 0.00495***<br>(0.00123) | −0.00429<br>(0.00250)  | −0.00607***<br>(0.00111) | 0.0106**<br>(0.00382)  |
| Foreign direct investment     | −0.00319<br>(0.00395)   | 0.00608<br>(0.00370)    | 0.00635*<br>(0.00356)  | 0.00583*<br>(0.00312)    | 0.0176*<br>(0.0102)    |
| Trade openness                | 0.00187<br>(0.0295)     | 0.0476*<br>(0.0261)     | 0.213***<br>(0.0592)   | 0.259***<br>(0.0664)     | −0.207<br>(0.142)      |
| Gross capital formation       | 0.00261*<br>(0.00148)   | −0.00180*<br>(0.00105)  | 0.00354*<br>(0.00200)  | −0.00278<br>(0.00186)    | −0.00403<br>(0.00319)  |
| Education                     | 0.00537*<br>(0.00287)   | 0.00454***<br>(0.00123) | −0.00465<br>(0.00284)  | −0.00271<br>(0.00352)    | 0.00945*<br>(0.00537)  |
| Mineral rents                 |                         | −0.00256**<br>(0.00123) |                        |                          |                        |
| Natural gas rents             |                         |                         | −0.104***<br>(0.0248)  |                          |                        |
| Coal rents                    |                         |                         |                        | −0.0844*<br>(0.0461)     |                        |
| Oil rents                     |                         |                         |                        |                          | −0.00827*<br>(0.00463) |
| Constant                      | −0.602**<br>(0.294)     | −0.720***<br>(0.161)    | −0.0686<br>(0.269)     | −0.262<br>(0.541)        | −0.933*<br>(0.532)     |
| AR (1) [p-value]              | 0.002                   | 0.005                   | 0.007                  | 0.021                    | 0.001                  |
| AR (2) [p-value]              | 0.473                   | 0.651                   | 0.261                  | 0.730                    | 0.399                  |
| Sargan OIR                    | 0.697                   | 0.531                   | 0.927                  | 0.935                    | 0.915                  |
| Hansen OIR                    | 0.742                   | 0.524                   | 0.606                  | 0.596                    | 0.825                  |
| DHT for Instruments           |                         |                         |                        |                          |                        |
| (a)GMM Instruments for levels |                         |                         |                        |                          |                        |
| H excluding group             | 0.560                   | 0.786                   | 0.725                  | 0.777                    | 0.793                  |
| Diff (null, H=exogenous)      | 0.740                   | 0.330                   | 0.518                  | 0.503                    | 0.749                  |
| (b) IV (years, eq(diff))      | 0.808                   | 0.657                   | 0.610                  | 0.547                    | 0.795                  |
| H excluding group             | 0.169                   | 0.095                   | 0.326                  | 0.484                    | 0.479                  |
| Diff (null, H=exogenous)      |                         |                         |                        |                          |                        |
| Fisher                        | 85.99***                | 226.65***               | 337.51***              | 38.31***                 | 62.75***               |
| Instruments                   | 26                      | 26                      | 18                     | 18                       | 18                     |
| Observations                  | 292                     | 292                     | 149                    | 158                      | 167                    |
| Number of countries           | 39                      | 37                      | 20                     | 22                       | 23                     |

Note 8: Standard errors in parentheses, \*\*\*p<0.01, \*\*p<0.05, \*p<0.1. VA represents voice and accountability.

Source: Authors.

from this study therefore supports the rent seeking theory in the natural resource curse literature. We also conclude that policies that encourage natural resource dependence weaken institutional quality.

In addition, the study finds that employment is positively associated with all the measures of institutional quality whilst inflation is positively associated with political stability, voice and accountability and rule of law but negatively associated with regulatory quality and governance effectiveness. Furthermore, FDI is positively associated with voice and accountability and governance effectiveness whilst trade openness is positively associated with political stability, voice and accountability, regulatory quality, rule of law and control of corruption. Gross capital formation is negatively associated with governance effectiveness and political stability, but positively related with regulatory quality. In addition, except for control of corruption, education is positively associated with all the measures of institutional quality.

## 6. Policy implications

Resource-rich countries in SSA have suffered severely from political instability, civil war, corruption and severe retardation in economic growth. The result from this study confirms that resource-rich countries in SSA are vulnerable due to rent seeking behaviour of politicians which leads to weakened institutions. Countries such as Angola are reported to lose about \$ 1 billion every year from oil rents to corruption (McMillan, 2005) whilst an annual 12.5% of oil exports from Africa to US is attached with corruption (Werner, 2017). From this perspective, we recommend that countries in sub-Saharan Africa should redraft their laws to limit any loopholes that give the opportunity for politicians to divert resource rents for their personal interest. In addition, we encourage the development of policies that promote the diversification from natural resources dependence and economic modernisation to enhance growth of other sectors of the economy. Furthermore, policies on natural resources

should be drafted to incorporate the sustainable exploitation of natural resources to limit rent seeking and ensure the independence and quality of institutions to turn the resource curse into a blessing. Also, educational reforms must incorporate patriotism and building of moral values to change the corruptible attitude of politicians in the future.

## Declaration of competing interest

The authors certify that there are no competing financial interests (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest.

## CRediT authorship contribution statement

Oliver Asiamah: Conceptualization, Data curation, Formal analysis, Methodology. Samuel Kwaku Agyei: Supervision, Writing - review & editing. Ahmed Bossman: Roles/Writing - original draft, Writing - review & editing. Ellen Animah Agyei: Project administration, Supervision. Asucam Joseph: Writing - review & editing. Michael Arku-Asare: Project administration.

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## Data availability

Data will be made available on request.

## Appendix

**Table A1**

List of countries included in the study

| Total natural resource rents                                                                                                                                                                                                                                                                                                                                                                                        | Minerals                                                                                                                                                                                                                                                                                                                                                                                                       | Natural Gas Rents                                                                                                                                                                                                                    | Coal Rents                                                                                                                                                                                                                                 | Oil Rents                                                                                                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Ivory Coast, Democratic Republic of Congo, Eritrea, Eswatini, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia, Zimbabwe. | Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Ivory Coast, Democratic Republic of Congo, Eritrea, Eswatini, Ethiopia, Equatorial Guinea, Eritrea, Gabon, Ghana, Guinea, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Niger, Nigeria, Republic of Congo, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia, Zimbabwe. | Angola, Benin, Cameroon, Chad, Democratic Republic of Congo, Ethiopia, Equatorial Guinea, Gabon, Ghana, Ivory Coast, Mauritania, Mozambique, Niger, Nigeria, Republic of Congo, Senegal, South Africa, South Sudan, Sudan, Tanzania. | Angola, Botswana, Central African Republic, Democratic Republic of Congo, Eswatini, Ethiopia, Kenya, Lesotho, Madagascar, Malawi, Mozambique, Niger, Nigeria, Rwanda, Republic of Congo, South Africa, Tanzania, Uganda, Zambia, Zimbabwe. | Angola, Benin, Cameroon, Chad, Democratic Republic of Congo, Ethiopia, Equatorial Guinea, Gabon, Ghana, Ivory Coast, Madagascar, Mauritania, Mozambique, Namibia, Niger, Nigeria, Republic of Congo, Senegal, South Africa, South Sudan, Sudan, Uganda. |
| 39                                                                                                                                                                                                                                                                                                                                                                                                                  | 37                                                                                                                                                                                                                                                                                                                                                                                                             | 20                                                                                                                                                                                                                                   | 22                                                                                                                                                                                                                                         | 23                                                                                                                                                                                                                                                      |

**Table A2**  
Pairwise correlations

| Variables            | (1)    | (2)    | (3)    | (4)    | (5)    | (6)    | (7)    | (8)    | (9)    | (10)   | (11)   | (12)   | (13)   | (14)   | (15)   | (16)  | (17)  |
|----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|-------|
| VA                   | 1.000  |        |        |        |        |        |        |        |        |        |        |        |        |        |        |       |       |
| PS                   | 0.588  | 1.000  |        |        |        |        |        |        |        |        |        |        |        |        |        |       |       |
| GE                   | 0.732  | 0.623  | 1.000  |        |        |        |        |        |        |        |        |        |        |        |        |       |       |
| RQ                   | 0.776  | 0.582  | 0.892  | 1.000  |        |        |        |        |        |        |        |        |        |        |        |       |       |
| CC                   | 0.717  | 0.660  | 0.850  | 0.763  | 1.000  |        |        |        |        |        |        |        |        |        |        |       |       |
| RL                   | 0.759  | 0.685  | 0.893  | 0.866  | 0.838  | 1.000  |        |        |        |        |        |        |        |        |        |       |       |
| Total resource rents | -0.431 | -0.286 | -0.542 | -0.451 | -0.538 | -0.472 | 1.000  |        |        |        |        |        |        |        |        |       |       |
| Mineral rents        | 0.029  | -0.005 | -0.093 | -0.020 | -0.007 | -0.039 | 0.364  | 1.000  |        |        |        |        |        |        |        |       |       |
| Natural gas rents    | -0.278 | 0.085  | -0.236 | -0.201 | -0.313 | -0.247 | 0.274  | 0.033  | 1.000  |        |        |        |        |        |        |       |       |
| Coal rents           | 0.157  | 0.072  | 0.248  | 0.145  | 0.123  | 0.074  | -0.068 | 0.033  | 0.238  | 1.000  |        |        |        |        |        |       |       |
| Oil rents            | -0.401 | 0.021  | -0.327 | -0.320 | -0.443 | -0.353 | 0.761  | -0.185 | 0.295  | -0.141 | 1.000  |        |        |        |        |       |       |
| FDI                  | 0.058  | 0.073  | -0.054 | -0.046 | 0.014  | -0.008 | 0.131  | 0.128  | 0.404  | 0.087  | 0.139  | 1.000  |        |        |        |       |       |
| Trade openness       | 0.206  | 0.263  | 0.130  | 0.105  | 0.223  | 0.078  | 0.039  | 0.140  | 0.091  | 0.045  | 0.277  | 0.188  | 1.000  |        |        |       |       |
| GCF                  | 0.189  | 0.244  | 0.240  | 0.252  | 0.281  | 0.253  | 0.078  | 0.167  | 0.257  | 0.006  | 0.146  | 0.225  | 0.251  | 1.000  |        |       |       |
| Education            | 0.420  | 0.466  | 0.504  | 0.441  | 0.463  | 0.433  | -0.325 | -0.004 | -0.159 | 0.178  | -0.315 | -0.067 | 0.156  | 0.204  | 1.000  |       |       |
| Employment           | -0.216 | -0.193 | -0.192 | -0.218 | -0.231 | -0.212 | 0.049  | -0.110 | 0.060  | -0.132 | -0.084 | 0.065  | -0.157 | -0.122 | -0.043 | 1.000 |       |
| Inflation            | -0.111 | -0.159 | -0.058 | -0.105 | -0.089 | -0.095 | 0.203  | 0.074  | -0.087 | -0.030 | 0.143  | -0.040 | -0.072 | -0.043 | -0.081 | 0.039 | 1.000 |

Note A2: VA represents voice and accountability, PS represents political stability, GE represents governance effectiveness, RQ represents regulatory quality, CC represents control of corruption, RL represents rule of law, FDI represents foreign direct investment whilst GCF represents gross capital formation.

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