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DOES GOVERNANCE MATTER IN MEDIATING THE RESOURCE CURSE? EVIDENCE FROM ZAMBIA

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DOES GOVERNANCE MATTER IN MEDIATING THE RESOURCE CURSE? EVIDENCE FROM ZAMBIA

Chali Nondo, Talknice Saungweme[1], & Nicholas M. Odhiambo

Abstract

The objective of this study is to empirically examine the short and long-run relationship between natural resource rent, economic growth, governance mechanisms based on the Polity IV, gross capital formation, inflation, and population in Zambia over the period 1986-2018. This study employs the autoregressive distributed lag model (ARDL) to estimate the underlying long-run and short-run relationships between the variables. The study uses three proxies of governance quality, namely autocracy, executive recruitment, and democracy, and estimates three regression models. Furthermore, interaction terms are included to explore how different forms of governance quality influence the economic impact of natural resources. The results confirmed a long-run equilibrium relationship among the variables included in the estimated models. The results further show that the impact of natural resource rents on economic growth depends on the model specification. It is also time-variant, depending on whether the model is estimated in the short run or the long run. Overall, our results do not support the existence of the resource-curse phenomenon in Zambia, regardless of the time frame considered. Instead, the results indicate that natural resources have the potential to spur economic growth in the short run when both executive recruitment and democracy are used as governance proxies, and in the long run when democracy is used. The results also show that governance modulates the impact of natural resource rents on economic growth, but only when proxied by democracy. However, the findings vary depending on the timeframe. While democracy positively influences growth through natural resources in the long run, it has adverse effects in the short run. The results of the study suggest that policymakers in Zambia should enact cautious measures that encourage responsible approaches to utilizing natural resource rents to foster sustainable economic growth. This involves using natural resource rents to boost human and physical capital, as well as diversify the economy.

Key words: Economic growth, governance, natural resources; resource curse; Zambia

JEL Classification codes: C22, O13, O43, O55, Q34

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1. Introduction

Following Auty's (1993) seminal work on the resource curse, a substantial body of literature has examined why resource-rich countries often underperform in terms of economic growth and development compared to resource-poor nations (Sachs and Warner, 1995, 1997; Gylfason, 2001; Ross, 2001). Several transmission channels have been proposed, including Dutch Disease, commodity price volatility, and institutional weakness. The Dutch Disease framework, developed by Corden and Neary (1982), explains how large foreign currency inflows from resource exports lead to real exchange rate appreciation. This appreciation undermines the competitiveness of non-resource sectors and contributes to broader economic instability (Gylfason, 1984; Sachs and Warner, 1995; World Bank, 2003).

Another mechanism relates to the pro-cyclicality of resource revenues due to global commodity price volatility (Barma et al., 2012). Price booms often trigger unsustainable spending, while downturns lead to fiscal crises, underinvestment in public goods, and inflationary pressures (Auty, 1993; Vasishtha, 2022; Mohommad et al., 2023). These dynamics are especially pronounced in developing countries, where such volatility directly undermines macroeconomic stability and long-term growth (Abaidoo and Agyapong, 2023; World Bank, 2024).

In addition to economic mechanisms, institutional quality plays a pivotal role. Weak governance often leads to rent-seeking, corruption, and elite capture, diverting resource revenues away from productive investment (Mehlum et al., 2006; Auty, 1991). Studies by Collier and Hoeffler (2005) and Bhattacharyya and Hodler (2010) show that strong institutions curb corruption and lower conflict risk. In contrast, weak and fragmented governance, which are prevalent in many resource-rich countries undermines transparency and hinders equitable distribution (Barma et al., 2012; Isham et al., 2005). Consistent with this literature, Zambia presents a compelling case. Despite its abundant mineral resources, particularly copper, cobalt, and gold, Zambia defaulted on its sovereign Eurobonds in 2020 and accumulated arrears to both official bilateral and other commercial external creditors, leading to a high external debt burden (IMF, 2023; 2024). The country's economy faces several structural challenges, including limited diversification (AfDB, 2022), weak institutions (World Bank, 2016), and vulnerability to commodity price shocks (Rajaram et al., 2022). These conditions mirror many of the classic symptoms of the resource curse.

Unlike Botswana, which has effectively managed diamond revenues through strong governance (Auty, 2008), Zambia remains highly dependent on copper exports, with limited structural transformation (Boos and Holm-Müller, 2016). These structural limitations place Zambia at the center of ongoing debates around resource-led development, making it a relevant and policy-salient case.

Moreover, Zambia's experience has broader implications for several Sustainable Development Goals (SDGs), especially SDG 8 (inclusive and sustainable growth), SDG 1 (No Poverty), SDG 10 (Reduced Inequalities), and SDG 16 (Strong Institutions). Assessments by the Extractive

Industries Transparency Initiative (EITI, 2021; 2023) highlight systemic issues in Zambia's resource governance, including weak accountability, revenue mismanagement, and political elites diverting funds for personal enrichment rather than national development. These challenges contribute to a cycle of economic exclusion and governance breakdown that hampers poverty reduction and equitable growth.

To explain why natural wealth has not translated into inclusive, sustained growth, this study introduces an interaction term between resource rents and governance quality. This allows us to test whether good governance mitigates or amplifies the effects of resource dependence. In doing so, the analysis offers insights relevant not only to Zambia but to many similarly resource-dependent economies, particularly those lacking economic diversification and exposed to global shocks (Gelb et al. 1988).

While prior research has addressed elements of Zambia's resource-dependence, few studies have integrated governance dimensions over a long historical period using a unified empirical framework. This study makes three key contributions to the literature on the resource curse and economic development. First, it provides a comprehensive analysis of the dynamic relationship between natural resource rents, economic growth, governance (measured via Polity IV indicators), gross capital formation, inflation, and population in Zambia over the period 1986–2018. Second, unlike prior studies that emphasize short-term effects (e.g., Asiamah et al., 2022; Unceta, 2021; Boos and Holm-Müller, 2016), this study adopts a long-horizon perspective to examine how these variables evolve and interact across both the short and long run. Third, it is the first empirical study on Zambia's resource curse to model governance–resource interactions within a multivariate ARDL framework, thereby providing a more nuanced understanding of institutional mediation in resource-dependent economies.

The rest of the study is organized as follows. Section II presents some literature on the resource curse related to Zambia, while Section III provides an overview of the empirical literature. Section IV deals with the methodology and data types, and Section V presents the empirical results. Finally, Section VI offers concluding remarks and policy recommendations.

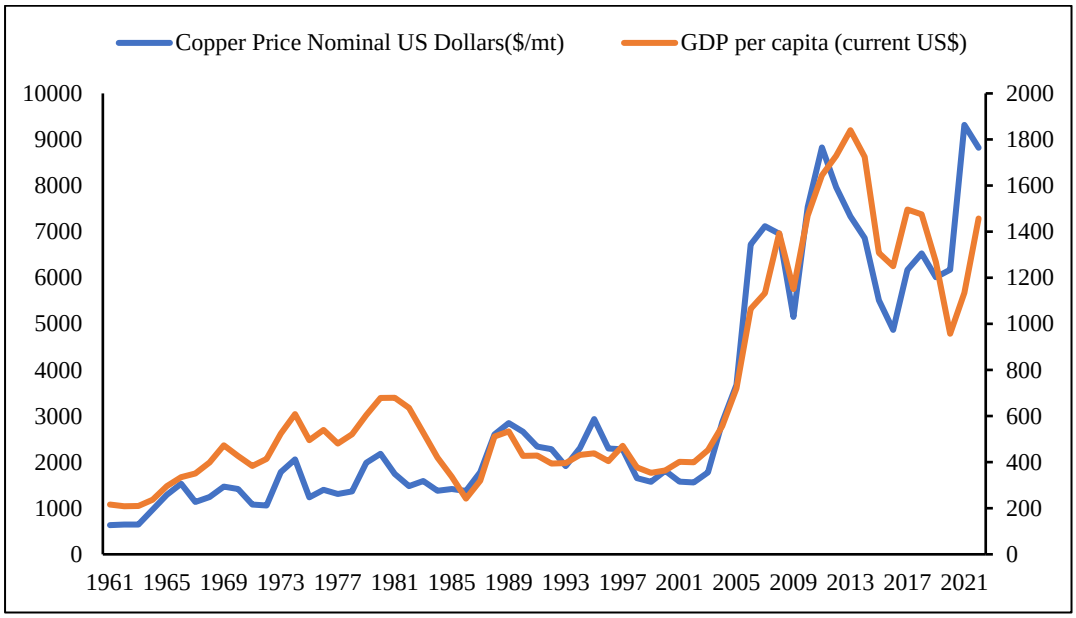
2. Overview of Zambia Natural Resources and Macroeconomic Performance

Zambia is classified as a lower-middle-income country, and as of 2022, its per capita income was US$1,456. Zambia ranks as Africa's second-largest producer of copper and the world's tenth-largest producer. Since independence in 1964, the mining sector has been the main driver of Zambia's foreign exchange earnings, accounting for 70% of export revenue and 12% of gross domestic product (GDP) in 2020. Between 2018 and 2020, Zambia's copper exports amounted to $26 billion. While economic diversification has been one of the major priorities of the Zambian government, efforts to diversify the economy through non-traditional exports (NTEs) have not seen much success (Auty, 1993; Rajaram et al., 2022). For example, in 2021, the mining sector's contribution to Zambia's GDP was 17.5 percent, accounting for only 2% of total employment. In contrast, although agriculture accounted for almost 24% of all

employment in 2021, the industry contributed a paltry 3.4% to GDP, while the manufacturing and transport sectors contributed less than 10% (IMF, 2023). These stark differences in employment contribution by the key sectors underscore the dominance of the mining sector in Zambia's economy.

The lack of success in diversifying the Zambian economy has been attributed to a variety of factors, including a lack of political will, ineffective policies, and external shocks, among others (Chitonge, 2016; Kragelund, 2017). Inevitably, the lack of economic diversification has hurt the country, as fluctuations in copper prices directly affect the nation's economic stability and growth prospects (World Bank, 2016). Figure 1 shows the correlation between Zambia's GDP per capita and global copper prices from 1961 to 2022.

Figure 1: Trends in Zambia's GDP Per Capita and Global Copper Prices



Source: Author's compilation using World Bank data

As shown in Figure 1, changes in Zambia's GDP per capita appear to move in tandem with global copper prices. Further, Figure 1 illustrates that Zambia has not fared well economically during the years that copper prices declined. Notably, the decline in global copper prices during the mid-1970s, late 1990s, early 2000s, and during the 2008 financial crisis spelled economic problems for Zambia. During these years, debt increased unsustainably while the Zambian Kwacha depreciated, per capita incomes dropped, and the government's fiscal position deteriorated. Between 2011 and 2021, Zambia's public debt increased from approximately 19 percent to over 120 percent of GDP. During the same period, external debt increased from $1.96 billion to $13.04 billion, and the balance of payment deteriorated.

The interconnection between natural resource exports and sustainable development has been a subject of debate in the development economics arena. A growing body of literature

underscores the potential for wealth generated from natural resource exports to catalyze broad-based economic growth and attainment of various United Nations' Sustainable Development Goals (SDGs). The World Bank (2016) has observed that Zambia's mineral policy has not been fully integrated into the national development framework to the extent of ensuring that mining profits contribute to long-term development. As a result, the Zambian government has failed to adequately reinvest resource rents into other vital sectors such as infrastructure, human capital, health, education, and others (World Bank, 2016). For this reason, Zambia has failed to capitalize on its natural wealth and catalyze growth because of poor institutions and governance. Similarly, Kragelund (2017) contends that Zambia's ineffective policies have contributed to the country's failure to diversify its economy beyond copper mining and hindered the creation of a broad range of economic opportunities for its citizens.

3. Literature Review

Since the 1960s, numerous investigations have been conducted to empirically test the resource curse theory. The outcomes have been conflicting and far from conclusive. This current study categorizes previous studies on the relationship between natural resources and economic growth into four groups. The first group consists of studies reinforcing the resource curse hypothesis (see, for instance, Bruno, 2023; Singh et al., 2023; Nzié and Pepeah, 2022). The second category is research exploring how effective governance can mitigate the resource curse. Contrary to the resource curse narrative, the third category of literature focuses on studies that establish a positive link between resource endowment and economic growth (see, for example, Adabor et al., 2022; Aslan and Altinoz, 2021; Ben-Salha et al., 2021). The final category comprises research findings that lack proof of a resource curse (see, for example, Badeeb et al., 2017; Badeeb and Lean, 2016).

3.1 Studies that Reinforce the Resource Curse Hypothesis

Bruno (2023) examined the relationship between natural resources and economic growth in four resource-rich nations: Finland, Sweden, Indonesia, and Malaysia. The study compared two time periods: 1860–1910 and 1970–2016. A two-step methodology was used in the investigation. The first method concentrated on how public policies impact cross-sector collaboration and how innovative capabilities evolved across the industrial life cycle. The second strategy examined the macroeconomic effects of natural resources by applying an autoregressive distributed lag approach (ARDL) technique. The findings revealed a consistent pattern across both periods, suggesting that the resource curse was evident in the latter period (1970–2016), particularly due to the influence of public policies on sectoral collaboration and the evolution of innovative capabilities.

Singh et al. (2023) investigated the impact of natural resource rents on economic growth in the United States, United Kingdom, France, China, Russia, and Germany. The underlying relationships were investigated using cross-sectional ARDL, quantile regression and the Dumitrescu-Hurlin panel causality tests. The study found a negative relationship between

natural resource rents and economic growth. In particular, the findings indicate that natural resources and economic growth are positively correlated in China and the US for both lower and higher quantiles. The Dumitrescu-Hurlin causality test revealed a unidirectional causal relationship running from natural resources to economic growth only in China and the United States.

Khan et al. (2020) applied the ARDL model to examine the impact of natural resources, technological innovation, human capital, and trade openness on financial development and economic growth in China (1987–2017). Their findings confirmed the resource curse hypothesis, revealing a negative relationship between natural resource dependence and both financial development and growth. Similarly, Ampofo et al. (2020) employed nonlinear ARDL and Granger causality models across nine mineral-rich countries from 1981 to 2017. They found evidence of nonlinear cointegration in several cases, with natural resource rents negatively affecting economic growth in Australia, India, and the Democratic Republic of Congo, but positively influencing growth in Brazil and Canada. These mixed results highlight the conditional nature of the resource-growth relationship and underscore the role of country-specific factors.

Kouotou and Ondoa (2023) examined the influence of heads of state on worsening or minimizing the resource curse phenomena in African countries. The research employed annual data from 1972 to 2014 and an unbalanced panel of forty-three African nations. The study found that although the direct effect of natural resource rent has a negative effect on economic growth, political alternations had a positive and significant impact. This indicates that as natural resources are disseminated through the political cycle of changing leaders of state, their negative effects are reversed and become positive. This implies that the negative impact of natural resources is neutralised and turned positive when it is conveyed via the political cycle of heads of state. Furthermore, threshold results reveal that the total impact of natural resources on growth is negative before the sixth political cycle within a nation; beyond that, it turns positive.

Inuwa et al. (2022) used annual time series data spanning the years 1981–2017 to analyse the impact of disaggregated natural resource rents on economic growth in Nigeria. The estimated model consisted of GDP per capita, oil rents, natural gas rents, mineral rents, coal rents, forest rents, and domestic credits to private sector. The analysis for the study was conducted using fully modified ordinary least square and applied canonical cointegration regression techniques. The findings validated the resource curse theory by showing that oil and forest rents negatively affected economic growth in the long run. Nevertheless, it was shown that mineral, coal, and natural gas rentals positively affected economic growth.

Acheampong et al. (2023) re-examined the resource curse phenomena using a panel dataset from 43 sub-Saharan Africa (SSA) countries from 1990 to 2017. The study utilised the instrumental variable generalised method of moments and the Driscoll-Kraay estimator to test the impact of democracy and natural resources on income inequality in the SSA countries. The

findings indicate that natural resource rent positively influences income inequality in SSA countries, implying income inequality gets worse when natural resource rent rises. Additionally, a regional comparative analysis revealed that while the democracy indices had no effect on income inequality in Eastern Africa, they did raise it in West, Central, and Southern Africa. It has been shown that whereas natural resources increase income disparity in Eastern Africa, they decrease it in West and Southern African nations.

Mpuure and Menba (2023) investigated the impact of natural resource dependence, quality of institions for environmental sustainability on African welfare. The study used panel data spanning the period from 2005 to 2021 from 30 African countries. The results of the two-step dynamic GMM model indicate that African countries that rely extensively on natural resources experience negative effects on welfare, particularly in terms of under-five mortality and human development. Additionally, the results offer substantial proof in favour of countries with strong environmental sustainability policies and institutions in reducing the adverse impacts of on natural resources reliance on welfare.

Zallé (2019) examined the impact of natural resources on economic growth for 29 African nations between 2000 and 2015 using a panel ARDL model. The estimated model was made up of GDP per capita, natural resources rents, investment, human capital and other institutional variables. The findings suggested that natural resources significantly and negatively affect economic growth. Similarly, economic growth has been adversely affected by the majority of institutional determinants, including internal conflict, religious and ethnic tensions, and corruption. Additionally, it turned out that human capital positively affected economic growth.

Liao et al. (2023) explored the linkages between natural resource rents and industrial expansion in China using time series data from 1985 to 2021. The study employed the nonlinear ARDL technique to test the asymmetric impact of disaggregated natural resources on industrial expansion. The study found that mineral and forest rents positively influences industrial growth in China, while coal rents significantly decrease it. These findings imply that depending on the kind of resource, the effects of natural resources on the economy differ significantly. In a different study, Tan et al. (2023) examined the impact of natural resource dependency and green finance on regional 'green' economic growth in China using yearly data from 2008 to 2021. The study employed the system GMM model to examine the underlying linkages. The findings indicate that while evidence of resource curse was not found in the central region, it is present throughout the country's eastern and western regions.

3.2 The Nexus between Institutions, Political Regime and the Resource Curse

Kerner et al (2023) examined the influence of political institutional quality on the use of natural resources such as fossil fuels, biomass, non-metallic minerals, and metal ores to support economic growth. The study used a fixed-effects estimation in a dynamic balanced panel of 159 countries during the years 1992–2010. Overall, the results indicate that total resource use growth in all resource types contributes positively to economic growth, but the degree of impact

varies considerably across countries. Furthermore, the results show a positive realtionship between political institutional quality and total resources, biomass, and non-metallic minerals, across studied countries.

Abdulahi et al. (2019) tested the nonlinear relationship between natural resource rent and economic growth using institutional quality (IQ) as a threshold variable. The study made use of panel data from 14 resource-rich sub-Saharan African countries and applied GMM model, White-correlated standard error, and conventional ordinary least squares standard error techniques. The empirical results revealed evidence in support of threshold effects. Explicitly, the results show a positive relationship between resource rent and economic growth when a country's IQ is within the bounds −1.28 and −1.37. Nonetheless, resource curse has been proven to exist below the −1.37 minimal threshold.

Nzié and Pepeah (2022) examined the effects of natural resource endowments on economic growth in Africa based on a sample of 37 African countries split between resource-rich and resource-poor countries. The study employed an ARDL model on yearly time series data spanning the years 1996 to 2019. The study found that weak institutions in resource-rich countries worsen the negative relationship between natural resources and economic growth in the long run. Furthermore, it was shown that there is a positive relationship between institutional quality and natural resource income in resource-poor countries, which eventually contributed significantly to economic growth.

Amiri et al. (2019) investigated the impact of natural resource rents and institution quality on performance of tradable and non-tradable sectors in resource-rich countries. The study made use of panel data models and data from 2000 to 2016 from 28 resource-rich countries with varying degrees of institutional quality. The estimated model included natural resources, terms of trade, and institutional quality as determined by factors such as accountability, lack of violence and terrorism, effectiveness of the government, corruption, and rule of law. The findings point to the possibility of a natural resource curse affecting countries with weak institutions. The poor quality of institutions retrained the growth of the manufacturing sector leading to economic decline. These findings buttress the theory that the Dutch disease exists in nations with weak institutional quality.

Saeed (2022) examined the impact of disaggregated institutional quality on economic growth in natural resource-dependent countries using a panel of 58 developing countries over the years 1996 to 2014. The study decomposed institutional quality into six governance indicators, namely, control of corruption, government effectiveness, political stability and absence of violence, regulatory quality, role of law, and voice and accountability. The study also employed an index of fuels and non-fuels exports as a proxy for resource dependence. Using time fixed-effects model, the study found that, in countries with weak systems of voice and accountability, natural resources had a negative impact on economic growth, thus validating the resource curse hypothesis. The study further found that reducing corruption might not be sufficient to completely offset the negative impact of resource reliance on economic growth.

Fagbemi and Kotey (2022) examined the resource-growth nexus in Nigeria from 1996 to 2019 using the ARDL approach, VECM, and Granger causality tests. By incorporating institutional quality indicators—namely, rule of law, democratic accountability, and corruption—the study provides empirical support for the resource curse hypothesis. The results indicate that natural resource rents, when combined with weak governance, exert a negative influence on economic growth. Furthermore, the causality analysis revealed a unidirectional relationship from natural resources to growth, emphasizing the pivotal role of institutional frameworks in shaping long-term development outcomes.

Complementing this institutional perspective, Adams et al. (2019) investigated the role of multinational oil and gas corporations in shaping resource governance outcomes in oil-dependent developing countries. Their findings suggest that the behavior of multinational firms, driven by globalization and profit maximization is a major contributor to the persistence of the resource curse. Institutional weaknesses at the national level enable practices such as transfer pricing, tax evasion, rent-seeking, and revenue mismanagement. Together, these factors create an environment conducive to capital flight and economic inefficiencies, reinforcing the argument that both internal governance quality and external corporate behavior jointly determine whether resource wealth becomes a blessing or a curse.

3.3 Positive Relationship Between Natural Resources and Economic Growth

Olayungbo (2019) tested the applicability of the resource curse hypothesis in Nigeria using the Bayesian time-varying parameter and yearly data from 1970 to 2015. The estimated model comprised of GDP per labour, GDP, investment, oil revenue, trade openness and primary school enrolment. They found that economic growth in Nigeria is considerably influenced by oil revenue exports. In another study, Olayungbo and Kazeem (2017) used an ARDL model to investigate the relationship between oil revenue, institutional quality, and economic growth in Nigeria from 1984 to 2014. The study showed that while oil revenue positively influences economic growth in the short run, the impact was negative in the long run. Additional study findings demonstrate the negative impact of corruption on economic growth.

Adabor et al. (2022) tested the causality between oil resource rent and economic growth in Ghana. The study modelled economic growth as a function of oil resource rent, non-oil revenue, foreign direct investment, capital and interest rate in a Cobb–Douglass production framework. Four distinct estimating procedures were employed in this study: the nonlinear autoregressive distributed lags model, the autoregressive distributed lags model, the Toda-Yamamoto test methodology, and the nonlinear Granger causality. The findings generally indicate that natural resources and economic growth are positively correlated. It was found that, a one percent rise in oil resource rent corresponded to a 0.84% increase in economic growth in the long run. The Toda-Yamamoto test of causation revealed a unidirectional relationship running from oil resource rent to economic growth.

Hayat and Tahir (2021) investigated the impact of natural resources volatility on economic growth in United Arab Emirates (UAE), Saudi Arabia, and Oman using yearly time series data from 1970 to 2016. Employing the autoregressive distributed lag procedure, the study found that natural resources have a significant and positive impact on economic growth for the economies of UAE and Saudi Arabia only, and an insignificant relationship in Oman.

Ben-Salha et al. (2021) conducted causality tests between total natural resource rents and economic growth in a sample of top resource-abundant countries between 1970 and 2013. The study used both a panel-ARDL framework and the Pooled Mean Group estimator to test the underlying causality relationships. ARDL results shows evidence in support of a positive relationship between natural resource rents and economic growth in the long run, while no such evidence is confirmed in the short run. The findings further suggest that total natural resource rents and economic growth have a bidirectional causal relationship.

Haseeb et al. (2021) studied the effect of natural resources on economic growth in China, India, Thailand, Malaysia and Indonesia using time series data from 1970 to 2018. The study utilized the quantile regression methodology. The results of the study were mixed; indicating that natural resources had a significant and positive influence on economic growth in China, Indonesia, Thailand, and Malaysia. The results, however, point to a negative effect of natural resources on economic growth in India.

3.4 No Relationship between Natural Resources and Economic Growth

While several studies support the natural resource hypothesis, a substantial body of research provide evidence that contradicts the existence of a resource curse. This literature review focuses on articles that do not find evidence of the resource curse, analyzing their methodologies, findings, and implications. Badeeb and Lean (2016) used an ARDL technique to analyse the impact of oil dependence on economic growth in Malaysia using data from 1970 to 2013. The model by Badeeb and Lean (2016) comprised of oil and gas rents (a measure of oil dependence), financial development, investment and labour productivity. The results found no relationship between oil dependence and economic growth in Malaysia across all time periods considered.

Tan et al. (2023) investigated the impact of natural resource dependency and green finance on regional 'green' economic growth in China, employing the system GMM model. Their findings indicated no evidence of a resource curse in China's central region, although the curse was present in the eastern and western regions. This nuanced finding underscores the importance of regional factors and green finance in mediating the relationship between natural resources and economic growth. Kerner et al. (2023) explored the influence of political institutional quality on the use of natural resources for economic growth across 159 countries from 1992 to 2010. Their results showed that the total resource use growth, including fossil fuels, biomass, non-metallic minerals, and metal ores, contributed positively to economic growth. This study

highlights the role of political institutional quality in harnessing natural resources for positive economic outcomes, challenging the conventional resource curse narrative.

It is evident from the empirical literature analysis above that the resource curse is not a universal problem that resource-rich countries face. Among the observed avenues of the negative relationship between resource abundance and economic growth are regional differences, the quality of institutions and policies, as well as the income level of studied countries. Thus, the primary reason of Africa's resource curse may be institutional structural weakness that results in widespread corruption, rent-seeking behaviour, and political instability (see Adams et al., 2019). The literature review also revealed contradicting findings for the same country (see, for instance, Haseeb et al. (2021) and Khan et al. (2020) for China; Haseeb et al. (2021) and Badeeb et al. (2017) for Malaysia; and Fagbemi and Kotey (2022) and Olayungbo (2019) for Nigeria). Only a handful of research studies included democracy, property rights, innovation, and climate change as potential factors influencing the relationship between resource abundance and economic growth. Finally, the analysis of the resource curse hypothesis needs to be explored on a case by case basis to account for the variations in resource endowments among studied countries and the potential influence on economic growth.

4. Methodology and Empirical Analysis

This study employs the Autoregressive Distributed Lag (ARDL) approach, developed by Pesaran and Shin (1999) and extended by Pesaran et al. (2001), to examine the short- and long-run relationships between natural resource rents, economic growth, governance (measured using Polity IV indicators), capital formation, inflation, and population in Zambia over the period 1986–2018. The ARDL model is particularly suitable because it accommodates variables with mixed orders of integration (I(0) and I(1)) without requiring that all variables be integrated of the same order (Pesaran, Shin, and Smith, 2001; Nkoro and Uko, 2016). This feature is especially relevant in macroeconomic studies involving developing countries, where structural instability often leads to diverse integration properties (Nkoro and Uko, 2016). Since our unit root tests indicate that the variables under consideration are fractionally integrated, this reinforces the appropriateness of the ARDL approach for this study.

In contrast, Vector Error Correction Models (VECM) are applicable only when all variables are integrated of order one (I(1)) and are cointegrated; conditions not met in our dataset. Similarly, the structural vector autoregressive (SVAR) model was not used because they are not suited for variables with mixed orders of integration. SVAR models require all variables to be stationary in levels (I(0)) and require stringent identifying restrictions for interpretation of structural shocks, making them less suitable for our analysis. Additionally, in contrast to VECM and SVAR models, which involve multiple equations treating all variables as interdependent, ARDL focuses on modelling a single equation (Pesaran, Shin, and Smith, 2001). This simplification reduces the complexity associated with estimating numerous interconnected equations and is particularly beneficial when dealing with small sample sizes (Narayan, 2005). The ARDL model also allows for the simultaneous examination of short-run

dynamics and long-run equilibrium relationships, providing a comprehensive understanding of the interactions among variables (see also Nondo et al.2024; Odhiambo, 2009). Given these considerations, the ARDL approach is the most appropriate technique for our analysis, offering robustness in small samples, the ability to model both short-run and long-run relationships, and flexibility in handling variables with mixed integration orders without compromising inferential accuracy.

Prior to estimating the ARDL model, we also ascertain the stationarity properties of the time series involved. To test for stationarity, we employ the Phillips-Perron (PP) and Zivot-Andrews unit root tests (ZAURoot). The PP test is chosen for its robustness in handling general forms of heteroskedasticity in the error term. On the other hand, the Zivot-Andrews test allows for examining structural breaks in the series, which may stem from significant changes in economic or political events that ultimately impact the time series properties of the variables under study.

4.1. Model Specification

The baseline empirical model for studying the impact of natural resources on economic growth, while also considering the influence of governance, capital formation, population growth, and inflation is formalized as follows:

$$y_t = \alpha_0 + \alpha_1 NR_t + \alpha_2 GOV_t + \alpha_3 INV_t + \alpha_4 POP_t + \alpha_5 INF_t + \epsilon_t \quad (1)$$

To examine how the abundance of natural resources (NR) in Zambia interacts with different forms of governance to affect economic growth, we specify interaction models that include interaction terms between natural resource rent and various governance variables such as autocracy, executive recruitment, and democracy. These interaction terms allow us to assess how the relationship between natural resources and economic outcomes might change at different levels of governance. Equations (2) through (4) present the specification of the interaction models:

Model 1:

$$y_t = \alpha_0 + \alpha_1 NR_t + \alpha_2 AUTO_t + \alpha_3 NRxAUTO_t + \alpha_4 INV_t + \alpha_5 POP_t + \alpha_6 INF_t + \epsilon_t \quad (2)$$

Model 2;

$$y_t = \beta_0 + \beta_1 NR_t + \beta_2 EXECU_t + \beta_3 NRxEXECU_t + \beta_4 INV_t + \beta_5 POP_t + \beta_6 INF_t + \epsilon_t \quad (3)$$

Model 3:

$$y_t = \rho_0 + \rho_1 NR_t + \rho_2 DEMO_t + \rho_3 NRxDEMO_t + \rho_4 INV_t + \rho_5 POP_t + \rho_6 INF_t + \epsilon_t \qquad (4)$$

Where *y* is economic growth, *NR* denotes natural resource rent, *AUTO* is the level of autocratic or authoritarian governance in a country while *EXEC* is executive recruitment, focuses on how political leaders are selected, and thus, provides insights into the level of democratization and institutionalization of the political processes within a country.[2] Another governance proxy used is *DEMO*, which represents the level of democratic governance in a country. Additionally, *NRxAUTO* represents the interaction between autocratic regime and natural resource rent, *NRxEXECU* is the interaction between executive recruitment and natural resource rent, *NRxDEMO* denotes the interaction between democracy and natural resource rent, *INV* equals Investment, *POP* is population, and *INF* represents inflation.

The inclusion of capital formation, population, and inflation variables helps control for other factors that can influence economic growth, ensuring a more robust analysis of the resource curse phenomenon in Zambia. Consistent with previous studies (see Olaniyi and Oladeji, 2022; Ehigiamusoe et al., 2020; Gazdar and Cherif, 2015), these models are structured to investigate how the abundance of natural resources (NR) in Zambia interacts with different forms of governance (autocracy, political stability, and democracy) to influence economic outcomes. The interaction terms (*NRxAUTO*$_t$, *NRxEXECU*$_t$, and *NRxDEMO*$_t$) are particularly crucial as they may reveal conditions under which the resource curse is mitigated or exacerbated. For instance, higher levels of democracy or political stability might weaken the resource curse by ensuring better management of resource revenues (Mehlum et al., 2006; Ross, 2001). Conversely, autocracy could strengthen the curse through mismanagement or corruption.

Consequently, the coefficient of the interaction terms can yield four possible outcomes:

1. If $\alpha_1 > 0$ and $\alpha_3 > 0$; $\beta_3 > 0$; $\rho_3 > 0$, then natural resource rent positively contributes to economic growth and governance, political participation, and democracy provides the requisite stimulus to enhance the growth benefits of natural resource rent.

2. If $\alpha_1 > 0$ and $\alpha_3 < 0$; $\beta_3 < 0$; $\rho_3 < 0$, then natural resource rent positively contributes to economic growth, but governance, political participation, and democracy impedes the positive impact of natural resources rent on economic growth.

3. If $\alpha_1 < 0$ and $\alpha_3 > 0$; $\beta_3 > 0$; $\rho_3 > 0$, then natural resource rent negatively affects economic growth (i.e., there exists a resource curse), but governance, political

[2] EXECU also encompasses political participation as measured by the degree to which all the adult population in a country has the opportunity to influence the selection of leaders through open and competitive elections. By Understanding how leaders come into power is crucial for assessing the broader political context, especially in terms of stability, governance quality, and policy continuity (Marshall and Jaggers, 2020). The level of a country's democratic system can inarguably indicate the extent to which power is distributed among the population and their representatives.

participation, and democracy reduces the severity of the natural resource curse.

4. If $\alpha_1 < 0$ and $\alpha_3 < 0$; $\beta_3 < 0$; $\rho_3 < 0$, then natural resource rent negatively affects economic growth (i.e., there exists a resource curse) and governance, political participation, and democracy aggravates the severity of the natural resource curse.

Equations (5), (6), and (7) specifies the ARDL models.

Model 1:

$$\begin{aligned}\Delta \ln y_t = {} & \delta_0 + \sum_{i=1}^{\rho} \tau_{1i} \Delta \ln y_{t-i} + \sum_{i=0}^{n} \tau_{2i} \Delta \ln NR_{t-i} + \sum_{i=0}^{n} \tau_{3i} \Delta \ln AUTO_{t-i} + \sum_{i=0}^{n} \tau_{4i} \Delta \ln NRxAUTO_{t-i} \\ & + \sum_{i=0}^{n} \tau_{5i} \Delta \ln INV_{t-i} + \sum_{i=0}^{n} \tau_{6i} \Delta \ln POP_{t-i} + \sum_{i=0}^{n} \tau_{7i} \Delta \ln INF_{t-i} + \sigma_1 \Delta \ln y_{t-1} + \sigma_2 \ln NR_{t-1} \\ & + \sigma_3 \ln AUTO_{t-1} + \sigma_4 \ln NRxAUTO_{t-1} + \sigma_5 \ln INV_{t-1} + \sigma_6 \ln POP_{t-1} + \sigma_7 \ln INF_{t-1} \\ & + \varepsilon_{1t} \end{aligned} \quad (5)$$

Model 2:

$$\begin{aligned}\Delta \ln y_t = {} & \gamma_0 + \sum_{i=1}^{\rho} \mu_{1i} \Delta \ln y_{t-i} + \sum_{i=0}^{n} \mu_{2i} \Delta \ln NR_{t-i} + \sum_{i=0}^{n} \mu_{3i} \Delta \ln EXECU_{t-i} + \sum_{i=0}^{n} \mu_{4i} \Delta \ln NRxEXECU_{t-i} \\ & + \sum_{i=0}^{n} \mu_{5i} \Delta \ln INV_{t-i} + \sum_{i=0}^{n} \mu_{6i} \Delta \ln POP_{t-i} + \sum_{i=0}^{n} \mu_{7i} \Delta \ln INF_{t-i} + \theta_1 \Delta \ln y_{t-1} \\ & + \theta_2 \ln NR_{t-1} + \theta_3 \ln EXECU_{t-1} + \theta_4 \ln NRxPOLI_{t-1} + \theta_5 \ln IN_{t-1} + \theta_6 \ln POP_{t-1} \\ & + \theta_7 \ln INF_{t-1} + \varepsilon_{2t} \end{aligned} \quad (6)$$

Model 3:

$$\begin{aligned}\Delta \ln y_t = {} & \emptyset_0 + \sum_{i=1}^{\rho} \pi_{1i} \Delta \ln y_{t-i} + \sum_{i=0}^{n} \pi_{2i} \Delta \ln NR_{t-i} + \sum_{i=0}^{n} \pi_{3i} \Delta \ln DEMO_{t-i} + \sum_{i=0}^{n} \pi_{4i} \Delta \ln NRxDEMO_{t-i} \\ & + \sum_{i=0}^{n} \pi_{5i} \Delta \ln INV_{t-i} + \sum_{i=0}^{n} \pi_{6i} \Delta \ln POP_{t-i} + \sum_{i=0}^{n} \pi_{7i} \Delta \ln INF_{t-i} + \omega_1 \Delta \ln y_{t-1} \\ & + \omega_2 \ln NR_{t-1} + \omega_3 \ln DEMO_{t-1} + \omega_4 \ln NRxDEMO_{t-1} + \omega_5 \ln INV_{t-1} + \omega_6 \ln POP_{t-1} \\ & + \omega_7 \ln INF_{t-1} + \varepsilon_{3t} \end{aligned} \quad (7)$$

Based on the ARDL models specified in equations 5-7 for models 1, 2, and 3, we can specify the corresponding error correction models as follows:

Model 1:

$$\Delta \ln y_t = \delta_0 + \sum_{i=1}^{\rho} \tau_{1i} \Delta \ln y_{t-i} + \sum_{i=0}^{n} \tau_{2i} \Delta \ln NR_{t-i} + \sum_{i=0}^{n} \tau_{3i} \Delta \ln AUTO_{t-i} + \sum_{i=0}^{n} \tau_{4i} \Delta \ln NRxAUTO_{t-i} + \sum_{i=0}^{n} \tau_{5i} \Delta \ln INV_{t-i} + \sum_{i=0}^{n} \tau_{6i} \Delta \ln POP_{t-i} + \sum_{i=0}^{n} \tau_{7i} \Delta \ln INF_{t-i} + \lambda ECM_{t-1} + \varepsilon_{1t} \quad (8)$$

Model 2:

$$\Delta \ln y_t = \gamma_0 + \sum_{i=1}^{\rho} \mu_{1i} \Delta \ln y_{t-i} + \sum_{i=0}^{n} \mu_{2i} \Delta \ln NR_{t-i} + \sum_{i=0}^{n} \mu_{3i} \Delta \ln EXECU_{t-i} + \sum_{i=0}^{n} \mu_{4i} \Delta \ln NRxEXECU_{t-i} + \sum_{i=0}^{n} \mu_{5i} \Delta \ln INV_{t-i} + \sum_{i=0}^{n} \mu_{6i} \Delta \ln POP_{t-i} + \sum_{i=0}^{n} \mu_{7i} \Delta \ln INF_{t-i} + \varphi ECM_{t-1} + \varepsilon_{2t} \quad (9)$$

Model 3:

$$\Delta \ln y_t = \emptyset_0 + \sum_{i=1}^{\rho} \pi_{1i} \Delta \ln y_{t-i} + \sum_{i=0}^{n} \pi_{2i} \Delta \ln NR_{t-i} + \sum_{i=0}^{n} \pi_{3i} \Delta \ln DEMO_{t-i} + \sum_{i=0}^{n} \pi_{4i} \Delta \ln NRxDEMO_{t-i} + \sum_{i=0}^{n} \pi_{5i} \Delta \ln INV_{t-i} + \sum_{i=0}^{n} \pi_{6i} \Delta \ln POP_{t-i} + \sum_{i=0}^{n} \pi_{7i} \Delta \ln INF_{t-i} + \delta ECM_{t-1} + \varepsilon_{3t} \quad (10)$$

Where ECM_{t-1} = Error-correction term lagged one period.

Table 1 provides the definitions of the variables and their data sources.

Table 1: Definitions of variables and data sources

Variable Name	Variable Definition	Data Source
Economic growth	GDP per capita	WDI
Natural resource rent	Total natural resources rents (% of GDP)	WDI
Investment	Gross fixed capital formation	Penn World Tables
Population	Total population (15-64 years)	WDI
Inflation	Inflation (annual %)	WDI
AUTO	Regime government that is autocratic with Polity score ranging between -10 to -6. The AUTO score helps in identifying regimes where power is centralized and where there is little to no institutional framework to challenge or change leadership legally and peacefully.	Polity IV Database
EXECU	The EXEC variable measures the executive recruitment process, specifically how political leaders are selected. The variable encompasses several elements critical to	Polity IV

	understanding the nature of leadership transitions, including openness of executive recruitment, regulation of executive recruitment, authority patterns, and competitiveness of executive recruitment. The EXECU score ranges from 1 to 7, with each value representing a specific level of openness in the recruitment process.	
DEMO	The DEMO variable is used to evaluate the level of democratic governance in a country. Regime categories that is democratic has scores between +6 to +10. In general, democratic governments reflect various characteristics, including competitiveness of political participation, open and fair elections, political pluralism, and checks and balances	Polity IV

Notes: WDI = World Bank Development Indicators online database.

4.2 Empirical Analysis

4.2.1 Unit Root Tests Results

The results of the three stationarity tests, ADF, PP and Zivot Andrews unit root tests (ZAURoot), are reported in Table 2. ADF test findings indicate that all the variables become stationary following first differencing, that is are I (1). The PP test results show a mixture of order of integration with inflation and investment being stationary in levels, I(0), while the rest of the variables were determined to be stationary after first differencing, I(1).

Table 2: Stationarity results for all variables

	Augmented Dickey (ADF)		**Phillips-Perron (PP)**		**Zivot-Andrews (ZAURoot)**			
Variable	Level	First Difference Δ	Level	First Difference Δ	Level	Break	First Difference Δ	Break
Y	-1.361	-4.004***	0.479	-3.956***	-3.041	1994	-6.057***	1998
NR	-1.179	-5.892***	-1.179	-5.892***	-3.306	2001	-8.132***	1991
INF	-1.767	-3.290**	-4.386***	-	-6.759***	1992	-	-
POP	-1.912	-3.294**	-1.515	-2.536**	-5.201***	1998	-	-
INV	-0.209	-3.104**	-4.585***	-	-3.312	1995	-7.045***	1996
AUTO	-1.664	-4.225***	-1.762	-6.176***	-12.462***	1990	-	-
DEMO	-1.674	-4.180***	-1.887	-6.108***	-4.612***	1990	-	-
EXECU	-1.666	-4.210***	-1.800	-6.273***	-7.630***	1990	-	-

*Notes: ** and *** denote statistical significance at the 5% and 1% levels, respectively. Δ represents first differencing.*

Additionally, the Zivot-Andrews unit root test was employed to account for potential structural breaks in the time series data. The results reveal that several variables exhibit significant breaks during the 1990s and early 2000s. Notably, a structural break in natural resource rent (NR) was identified in 2001, a period that aligns with major policy reforms. This period aligns with intensified structural reforms under the Poverty Reduction and Growth Facility (PRGF) (IMF, 2006). These reforms were part of Zambia's transition from the Enhanced Structural Adjustment Program (ESAP) era of the 1990s toward a more poverty-focused macroeconomic framework. Notably, Zambia reached the Heavily Indebted Poor Countries (HIPC) Initiative decision point in 2000 and began implementing key macroeconomic stabilization and debt relief measures between 2000 and 2005 (IMF, 2006). The timing of the break suggests a potential reconfiguration in the long-run behaviour of resource-related variables. The absence of structural breaks beyond 2001 indicates that the policy changes between 2000 and 2005, as well as the economic disruptions caused by COVID-19, did not significantly affect the relationships among the variables studied. This stability enhances the reliability of our findings, suggesting that the interactions between the variables remained consistent throughout the analysis period.

4.2.2 Bounds Test Results for Cointegration

The results of the cointegration tests conducted using the ARDL bounds testing methodology are reported in Table 3. The results indicate that the F-statistic values in the three specifications, governance (AUTO), executive recruitment (EXECU) and democracy (DEMO) are higher than the asymptotic critical values at a 1% significance level. This implies the presence of a cointegration in the specified models, i.e., models 1, 2 and 3. Hence, there is a long-run relationship between economic growth, natural resource rents, and the control variables in each of the three estimated models.

Table 3: Bounds F-test results for cointegration – NARDL

	Model 1 (AUTO)		Model 2 (EXECU)		Model 3 (DEMO)	
F-statistic	7.666505***		7.451333***		7.658605***	
	Asymptotic critical values for NARDL model					
	10%		5%		1%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
Asymptotic	1.750	2.870	2.040	3.240	2.660	4.050

*Notes: *** signifies statistical significance at 1% level.*

4.2.3 Long-run and Short-run Results

The results of long and short run relationship among the variables in the three model specifications are reported in Table 4, Panels A and B.

Table 4: Long-run and short-run results

	Model 1 (AUTO Proxy)			Model 2 (EXECU Proxy)			Model 3 (DEMO Proxy)		
	Coefficient	t-Statistic	Prob.	Coefficient	t-Statistic	Prob.	Coefficient	t-Statistic	Prob.
Panel A: Long-run results									
LnNR	32.97312*	1.759170	0.0899	15.67734	1.371817	0.1814	1.319497	0.159866	0.8742
LnAUTO	44.69269	1.342140	0.1907	-	-	-	-	-	-
LnEXECU	-	-	-	-28.39216	-1.293443	0.2068	-	-	-
LnDEMO	-	-	-	-	-	-	-38.51966	-1.246312	0.2234
LnNRxAUTO	-4.690191	-1.640239	0.1126	-	-	-	-	-	-
LnNRxEXECU	-	-	-	3.024854	1.556132	0.1313	-	-	-
LnNRxDEMO	-	-	-	-	-	-	5.221454*	1.880013	0.0709
LnINV	14.20183***	3.334034	0.0025	14.11319***	3.060535	0.0050	12.78920***	4.156639	0.0003
LnPOP	144.7370*	1.705284	0.0996	198.8685***	3.260420	0.0030	245.3682***	6.590616	0.0000
LnINF	0.114381	0.110967	0.9125	0.452570	0.382164	0.7053	0.162709	0.178078	0.8600
Panel B: Short-run results									
	Coefficient	t-Statistic	Prob.	Coefficient	t-Statistic	Prob.	Coefficient	t-Statistic	Prob.
ECM-1	-0.172934***	-8.403127	0.0000	-0.156891***	-8.234509	0.0000	-0.202750***	-8.398796	0.0000
D(LnYPC(-1))	-0.429483***	-3.217956	0.0036	-0.433841***	-3.197461	0.0036	-0.596236***	-4.454294	0.0002
D(LnYPC(-2))	-	-	-	-	-	-	-0.393690***	-2.929917	0.0071
D(LnNR)	0.679542	0.420131	0.6780	2.459637*	1.965322	0.0634	3.942936**	2.479066	0.0203
D(LnAUTO)	-11.52664**	-2.160328	0.0405	-	-	-	-	-	-
D(LnEXECU)	-	-	-	4.946178*	1.759158	0.0503	-	-	-
D(LnDEMO)	-	-	-	-	-	-	12.43141*	2.039555	0.0521
D(LnNRxAUTO)	0.405740	1.388328	0.1773	-	-	-	-	-	-
D(LnNRxEXECU)	-	-	-	-0.139386	-0.782008	0.4413	-	-	-

D(LnNRxDEMO)	-	-	-	-	-	-	-0.977933**	-2.135683	0.0427
D(LnINV)	4.569609***	3.742901	0.0010	4.187745***	3.414895	0.0021	2.593010***	3.335233	0.0035
D(LnPOP)	-142.6328***	-3.094997	0.0048	-116.7509**	-2.593273	0.0154	-94.13607**	-2.283478	0.0312
D(LnINF)	-0.368981***	-2.830659	0.0090	-0.292912**	-2.322486	0.0283	-0.219876*	-1.925528	0.0656

Panel C: Test Statistics

	Model 1 (AUTO Proxy)	**Model 2 (EXECU Proxy)**	**Model 3 (DEMO Proxy)**
R-squared	0.763365	0.747058	0.800122
Adjusted R-squared	0.697108	0.688687	0.744156
F-statistic	11.52115	12.79840	14.29663
Prob(F-statistic)	0.000002	0.000001	0.000000
Akaike info criterion	8.824355	8.830391	8.655543
Schwarz criterion	9.187144	9.147832	9.018333
Durbin-Watson statistic	2.301831	2.353335	2.232595

*Notes: *, ** and *** denote statistical significance at 10%, 5% and 1% levels, respectively*

The results reported in Table 4 show that, in the short run, total natural resource rent has an unconditional positive impact on economic growth in two out of the three models, namely when governance is proxied by executive recruitment (EXECU) and democracy (DEMO). However, when autocracy (AUTO) is used as a proxy for governance, natural resource rent is found to have no significant impact on economic growth. This indicates that, in the short run, revenues from natural resources have contributed to sustaining higher levels of economic output or growth in these specifications. This finding, therefore, rejects the existence of a resource curse in Zambia in the short run.

In the long run, however, the results show that natural resource rent has a positive and significant impact on economic growth only when governance is proxied by democracy. Although the coefficients of natural resource rent in the autocracy and executive recruitment models were found to be positive in the long run, they were statistically insignificant.

There are several potential factors that can cause natural resource rent to positively affect economic growth in Zambia. First, Zambia has a large endowment of copper and other critical minerals such as gold, cobalt, zinc, emeralds, silver, uranium, lead, and coal. Thus, the country can tremendously benefit from selling these resources on the global market while attracting foreign direct investment. As a result, this can generate revenue that can be used to invest in infrastructure and other economic development initiatives, which can ultimately lead to long-term growth. Second, natural resource rent can increase employment and income for workers in the resource extraction sector. This can help reduce poverty, enhance productivity and boost economic growth. Based on these findings, it is highly unlikely that a distinct resource curse phenomenon exists in Zambia, regardless of the time frame considered. The findings of this research correspond with those of previous studies conducted by Adabor et al. (2022) for Ghana and Aslan and Altinoz (2021) in developing countries across the European, Asian, African, and American continents.

The results show varied unconditional impacts of governance measures on economic growth in Zambia. In model 1, autocracy (AUTO) appears to have an unconditional negative effect on economic growth in the short run. The negative effect of AUTO on economic growth in the short run implies that autocratic governments exacerbate the challenges associated with managing resource revenues, which leads to economic instability, ceteris paribus. Given that autocratic governments often lack transparency and accountability, this can lead to poor management of resource revenues (Kragelund, 2017). The weak institutions in autocracies can potentially lead to increased rent-seeking behavior, where individuals or groups within the government might prioritize their personal gain over national economic welfare. This behavior can divert natural resource rents away from productive investments like infrastructure, education, and healthcare.

The coefficient for the interaction between autocracy (AUTO) and natural resource rents is insignificant in both the short and long run, indicating that autocracy does not play a

modulating role in the relationship between natural resource rents and economic growth in Zambia.

Model 2 shows that effective executive recruitment, as measured by the EXECU variable from Polity IV, has unconditional positive influence on economic growth in the short run. This finding suggests that when executive leadership is chosen through broad-based, inclusive electoral processes, it likely instils confidence among investors and the general populace, leading to economic uplift. Broadly, these findings emphasize the importance of citizen participation in the electoral process. When citizens actively participate in electing their leaders, it often results in a government that is more responsive to the needs of its people, including the need for economic stability and growth. The unconditional positive effect of EXECU on economic growth suggests that the positive effects of natural resource rents on the economy may be enhanced when there is a stable political cycle with regular, fair changes in leadership. This implies that when resource rents are managed and distributed within a politically stable environment, their impact on economic development is maximized. The result is not unique to this study as it confirms those in Kouotou and Ondoa (2023) for the case of 43 African countries.

Finally, the results of model 3, which uses DEMO as a proxy for governance, show that democracy has an unconditional positive impact on economic growth in the short run. This shows that democratic governance is an important driver of economic growth in the short run. These findings may suggest that the election process in Zambia gives citizens a voice in the political and democratic processes, which increases political stability, a crucial factor for economic growth.

The interaction between democracy and natural resource rents reveals mixed effects. The results show that the coefficient for LnNRxDEMO is negative in the short run but positive in the long run. These findings suggest that while democracy positively influences growth via natural resources in the long run, it might also have adverse effects in the short run. The positive impact of the interaction between democracy and natural resource rents implies that democratization levels play a crucial role in mediating the adverse effects of natural resource wealth on economic growth. Our results corroborate the findings of Bhattacharyya and Collier (2014), who posit that the quality of democracy moderates the negative impact of natural resources on economic growth.

The outcomes of control variables show that investment in the three model specifications positively influences economic growth in the short and long run. The role and magnitude of the impact of capital formation on economic growth may well be dependent on governance and institutional frameworks. Consistent with the Solow-Swan model and endogenous growth theories, investment directly contributes to capital accumulation in an economy. Accordingly, investments in physical capital like machinery, infrastructure, and technology enhance the economy's productive capacity. These findings align with previous research, such as Tahir et al. (2023) for Brunei Darussalam. The results further show that economic growth in the

previous period negatively affects current growth patterns. This finding would suggest the presence of a dependence effect, which would account for the direct influence of earlier growth rates on the current rate of economic growth.

Additionally, the findings indicate that population growth has a statistically significant positive and negative impact on economic growth in Zambia in the long run and short run, respectively. The long run positive impact of population growth on economic growth may mean a larger workforce, which can lead to increased production and consumption. In the short run, however, population growth can have a negative impact on economic growth by putting pressure on the country's resources such as increased welfare expenditures to alleviate poverty. Social expenditures can therefore have a net crowding out effect on productive government expenditure.

Furthermore, inflation was found to have a statistically significant negative impact on economic growth in the short run, and no impact in the long run. Inflation lowers purchasing power, which discourages investment and spending by businesses and individuals. Therefore, inflation may contribute to increased economic instability and unpredictability, potentially deterring investment and slowing economic growth.

Finally, the coefficients of the error correction term (ECM-1) across all models is statistically significant at the 1% level and negative, indicating that in the case of an economic shock, economic growth would recover to equilibrium in the three models at approximately 17.3%, 15.7%, and 20.3% annually, respectively.

In panel C of Table 3, the p-values of the F-statistics for the estimated ARDL models are less than the 1% significance level. This suggests that the coefficients in the three estimated models are jointly significant, indicating that there is sufficient proof in the sample data to verify the assertion that the estimated regression models correctly describe the data. The R-square values of 76.3%, 74.7%, and 80% are relatively high and thus provide further evidence that the models explain a substantial portion of the variability in GDP growth. Additionally, the Durbin-Watson (DW) statistic values of 2.3, 2.3 and 2.2 indicate the absence of autocorrelation. Finally, Table 5 shows that all the probabilities of the performed tests are above 0.05. This suggests that there is no proof of serial correlation, heteroskedasticity or normality issues in the data, indicating the validity of the study's conclusions.

Table 5: Normality, serial correlation and heteroscedasticity results

	Jarque-Bera [probability]	Serial Correlation LM Test	Heteroscedasticity Test
Model 1 – AUTO	0.516991 [0.772224]	1.159877 [0.2957]	0.964341 [0.3339]
Model 2 – POLI	0.512437 [0.773973]	1.055718 [0.4223]	1.365007 [0.2519]

Model 3 – DEMO	2.499611 [0.286561]	1.247372 [0.3123]	0.076062 [0.7846]

To assess the stability of the estimated parameters, the Cumulative Sum of Recursive Residuals (CUSUM) and the Cumulative Sum of Squares of Recursive Residuals (CUSUMSQ) tests were conducted for all three model specifications. The results, presented in Figures 2, 3, and 4, indicate that the plots of both CUSUM and CUSUMSQ remain within the 5% significance level bounds. This confirms the structural stability of the models over the sample period, thereby supporting the reliability and consistency of the estimated coefficients.

Figure 2: Model 1- AUTO

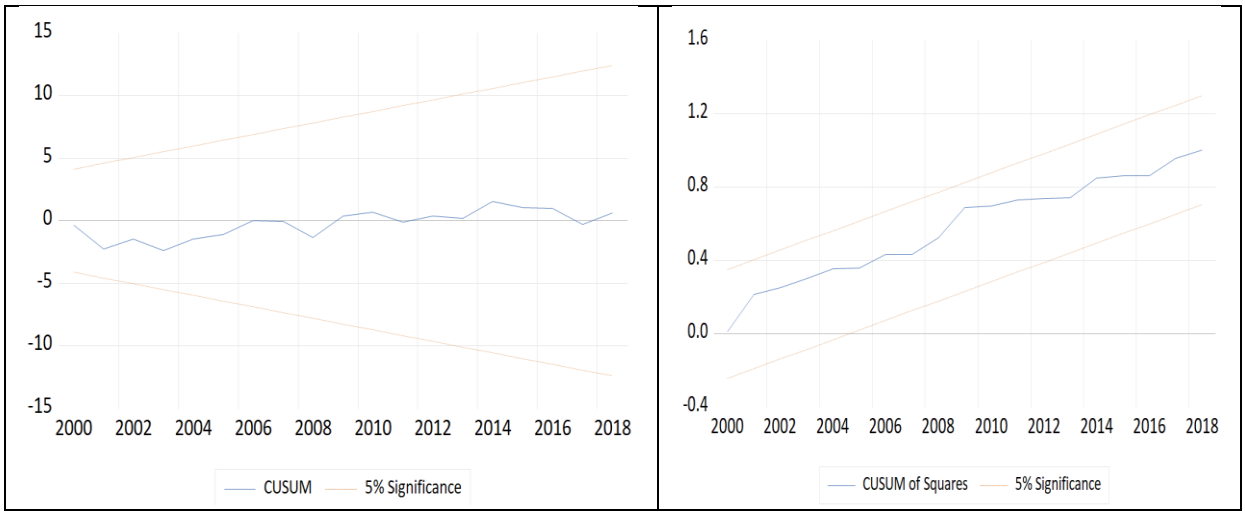


Figure 3: Model 2 - POLI

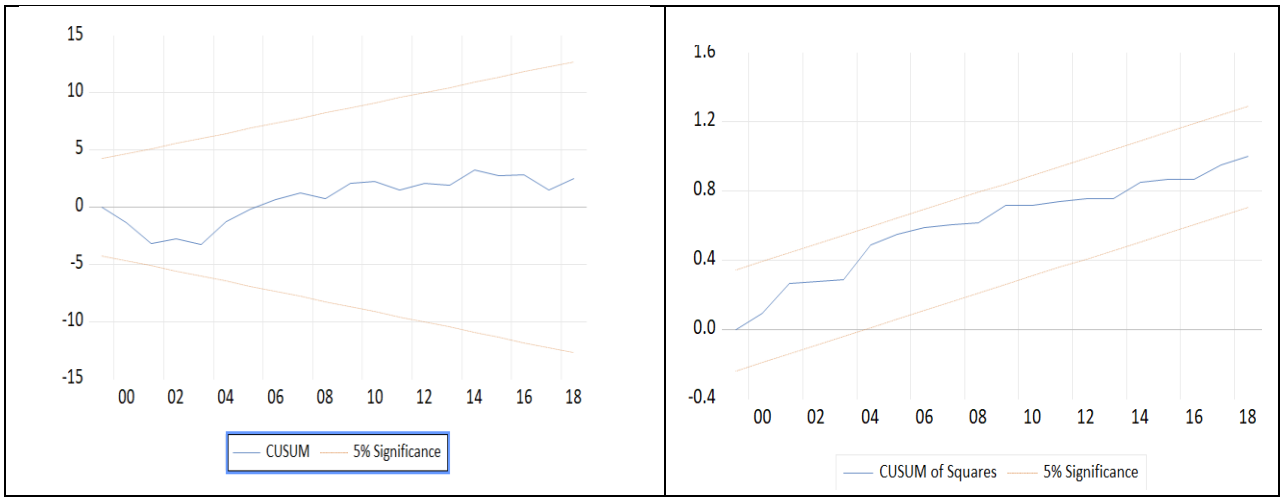
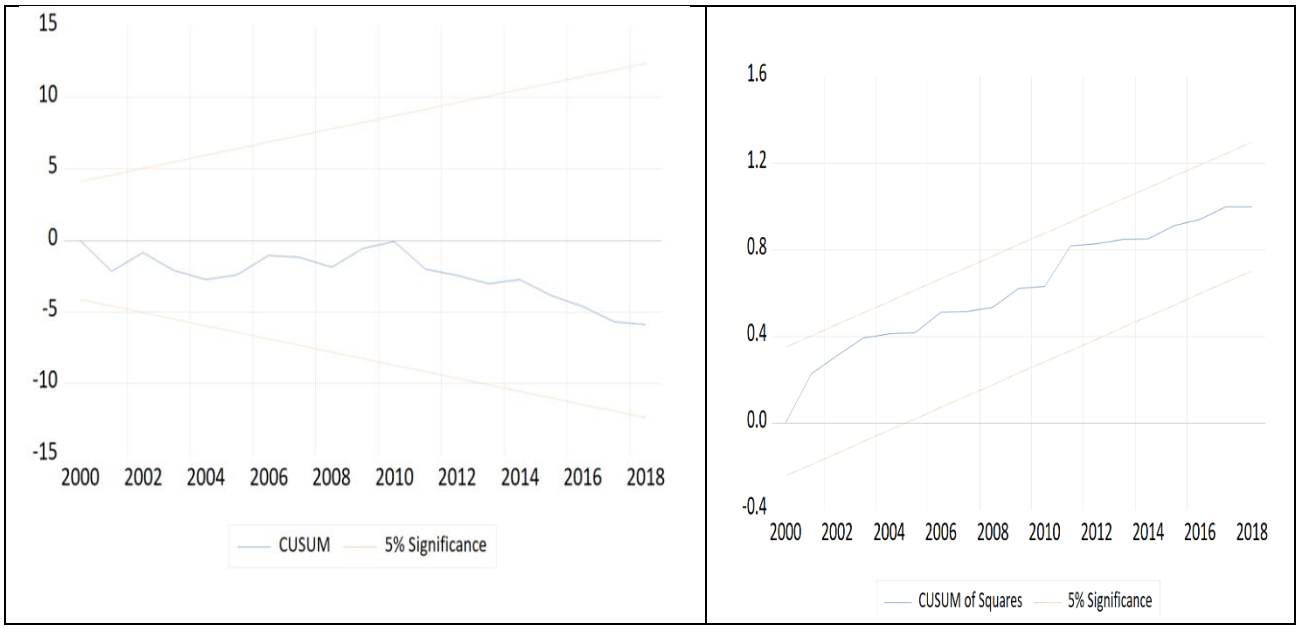


Figure 4: Model 3 - DEMO



5. Conclusion

The possible effects of relying excessively on natural resources on most resource-rich economies have been the subject of numerous research. The ultimate goal of these studies has been to identify methods of enhancing sustainable economic growth and poverty eradication by determining the fundamental causes of natural resource curse. Considering the aforementioned, the purpose of this research was to conduct an empirical investigation into the short- and long-run relationships between natural resource rent, governance and economic growth in Zambia from 1986-2018. The empirical investigation was conducted using the Autoregressive Distributed Lag (ARDL) model and the Error Correction Model (ECM). The study used three proxies for governance quality: autocracy, executive recruitment, and democracy, to examine this linkage. Furthermore, interaction terms were included to explore how different forms of governance quality influence the economic impact of natural resources. The empirical results show that the impact of natural resource rents on economic growth depends on the specific model specification estimated.

It is also time-variant, depending on whether the model is estimated in the short run or the long run. Overall, our results find no support for the existence of the resource-curse phenomenon in Zambia, regardless of the time frame considered. Instead, the results show that natural resources have the potential to spur economic growth in the short run when both executive recruitment and democracy are used as governance proxies, and in the long run when democracy is used. The results also show that governance modulates the impact of natural resource rents on economic growth when measured by democracy. However, the findings vary depending on the timeframe. While democracy positively influences growth through natural resources in the long run, in the short run, it has adverse effects on the relationship between natural resource rents and economic growth.

The results highlight the complex interactions between governance forms, natural resources, and economic variables in shaping Zambia's economic growth trajectory. The long-term results show that while natural resource rents positively contribute to economic growth when governance is proxied by autocracy, autocracy does not provide the necessary stimulus to enhance the benefits of natural resource rents, suggesting potential governance challenges in resource management. In the context of Zambia, the positive coefficient for the interaction term between total natural resource rent and democracy (LnNRxDEMO) in the long run, but not in the short run, suggests that the benefits of natural resources can only be significantly enhanced in the long run after the country's democracy has matured.

In conclusion, the positive interaction between democracy and natural resource rents in promoting economic growth underscores the significance of strengthening democratic governance to enable Zambia to fully capitalize on its natural resource wealth. More so, establishment of transparent and accountable public financial management systems ensures that resource revenues are collected, allocated, and utilized efficiently to fund essential sectors such as infrastructure, education, health, and social programs. Furthermore, enacting clear laws and regulations that promote contract transparency, along with implementing checks and balances, helps prevent corruption and rent-seeking behaviors. Finally, strengthening civil society organizations empowers the public to hold the government accountable for natural resource management, nurturing a more inclusive and responsible approach to governance. These measures not only promotes fiscal responsibility but also support sustained economic growth, contributing to overall societal well-being.

In light of the prima facie evidence that natural resource rents positively influence economic growth in Zambia, the study recommends the following:

(i) Zambia should invest in developing its infrastructure to increase the productivity of its natural resource sector. Also, Zambia's overly dependence on copper has possibly eclipsed the country's potential for diversification into non-resource sectors. Hence, natural resource rent should be used to diversify the economy which makes the economy less reliant on the mining industry and less vulnerable to external risks like COVID-19 and unfavourable changes in global commodities markets, notably decline in terms of trade.

(ii) Since executive recruitment and democracy provide the requisite stimulus to economic growth, Zambia should implement policies to promote democratic systems, accountability, and transparent frameworks that promote the proper management of natural resource rent.

(iii) Zambia should also invest in human capital by improving education and healthcare. This will help ensure that the benefits of natural resource extraction are shared more widely and help to reduce poverty.

(iv) Through the Bank of Zambia, the Zambian government must carefully monitor and manage inflation by judiciously implementing monetary policy.

Further research on this topic should expand the analysis by investigating the impact of disaggregated natural resource rents on economic growth in Zambia. Additionally, incorporating nonlinear methodologies would provide valuable insights into determining the optimal levels of resource rents needed to promote sustainable economic growth and reduce income inequality.

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