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The Resource Curse Across Economies: A Comparative Analysis of Developed and Developing Resource-Rich Countries

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ABSTRACT

This study investigates the relationship between natural resource rents and economic growth, focusing on a diverse sample of developed and developing economies. Using panel data (1998–2021) and robust estimation methods, it examines the roles of institutional quality, governance, economic diversification, and global demand in shaping outcomes across varying contexts.

The findings reveal that the impact of resource rents on growth is complex, differing by resource type, income group, and governance quality. The resource curse is not inevitable; its negative effects are most pronounced in oil-dependent countries with poor governance and limited diversification. In contrast, gas and mineral rents provide more stable growth opportunities when effectively managed. Strong governance and diversification are essential to mitigate risks and maximize the benefits of resource rents. While stable global demand minimizes the impact of fuel price fluctuations on growth, mineral price volatility hampers growth in high- and low-income countries but not in middle-income ones, reflecting varying levels of dependency and resilience.

This study's key contribution lies in addressing the existing gap in the literature by analyzing the impact of resource rents across a diverse set of countries, integrating both developed and developing economies. To our knowledge, only a limited number of studies use mixed samples that encompass both. By doing so, this study provides a more comprehensive understanding of the heterogeneous effects of resource dependence, highlighting the role of institutional quality and economic structures across varying levels of development

1.INTRODUCTION -RELEVANT RESEARCH

Natural resources generate economic rents that can be utilized for providing public goods and implementing structural reforms, such as investments in human and physical capital. However, contrary to traditional economic expectations, poverty and low growth rates are prevalent in many resource-rich countries, especially in the developing world. This phenomenon, known as the "resource curse," highlights the paradox where abundant natural resources are linked to adverse developmental outcomes, including poor governance, corruption, and economic volatility. A substantial body of literature has emerged to explore the causes of this poor performance.. Some researchers link the resource curse to the volatility of natural resource prices in international markets, while others attribute it to the mismanagement of resource export revenues, often stemming from poor governance, bribery, and corruption..

As most resource-rich countries rely heavily on natural resource exports, understanding the mechanisms behind the resource curse is crucial for policymakers in these nations. Such an understanding offers strategies to avoid the pitfalls of natural resource dependence.

Moreover, as global demand for commodities such as oil, minerals, and natural gas continues to fluctuate, identifying pathways to sustainable development remains a pressing issue. Not all resource-rich countries suffer from the resource curse, however. The

experiences of Norway, the U.S., and Australia demonstrate that resource wealth can be a blessing, while for countries like the Congo, Nigeria, or Venezuela, it has become a curse. The key distinction lies in how these countries manage their resources and organize their economies.

The first channel linking resource dependence (or abundance) to growth failure is the phenomenon known as "Dutch Disease," which refers to sectoral imbalances—such as de-industrialization or de-agriculturalization, depending on the composition of the tradable sector—caused by large inflows of foreign currency from natural resource exports. For instance, a significant rise in the price of oil or minerals can misallocate resources through the mechanism of relative prices. The exchange rate may appreciate, crowding out traditional agricultural or manufacturing exports. Domestic price changes then encourage output and investment in non-tradable activities, causing a shift away from internationally tradable sectors (e.g., manufacturing or agriculture) to non-tradable sectors like services (e.g., retail or real estate). This occurs because non-tradable sectors become more profitable due to increased domestic spending fueled by the resource boom (Neary and van Wijnbergen, 1986; Sachs and Warner, 1995, 2001).

Over time, the economy's productive sectors weaken, and the skills and experience in those areas are permanently lost (Krugman, 1987). This loss of economic diversification leaves countries vulnerable to commodity price fluctuations. Dutch Disease also encourages rent-seeking behavior, as high profits in resource sectors divert attention from productive investments, further stalling economic growth. Once the resource boom fades, overall economic activity declines, slowing growth (Baland and Francois, 2000).

The second channel concerns institutional failure. Mavrotas, Murshed, and Torres (2006) find that point-source natural resource endowments impede institutional development, as measured by governance quality and democracy levels, which in turn hinders growth.

In this paper, we analyze a sample of 47 resource-rich countries, encompassing both developed and developing nations, using appropriate panel data estimation techniques. Our goal is to determine whether the negative effects of resource wealth—such as economic instability, corruption, and underdevelopment—are primarily driven by institutional weaknesses in developing countries or by inherent risks common to resource-based economies, such as volatile global markets and reliance on commodities with fluctuating prices.

In other words, we aim to distinguish between country-specific factors—such as corruption, low economic diversification, and weak institutions—and broader external factors, such as global demand for resources, which influence economic stability and growth. Understanding this distinction is crucial, as country-specific factors may necessitate internal reforms, while external factors may require policies that help nations adapt to global market conditions.

Before conducting the analysis, it is important to differentiate between two types of natural resources: non-renewable (or exhaustible) resources—such as oil, gas, precious metals, and rare earth elements—and renewable resources, including water, forests, and arable land. This study focuses exclusively on non-renewable resources.

2. LITERATURE REVIEW

The concept of the natural resource curse has been widely explored in both economic and political contexts, with many scholars identifying factors that exacerbate the negative effects of resource wealth on long-term development. A central theme in the literature is the role of governance and institutional quality in determining whether natural resource wealth leads to economic prosperity or stagnation.

Sachs and Warner (1995, 2001) were among the first to provide empirical evidence that resource-rich countries tend to experience slower economic growth, coining the term "natural resource curse." In their first paper, the authors used a cross-country econometric model including 90 countries from all continents, later expanding the sample to 100 resource-rich and resource-poor countries. Their results showed a negative relationship between natural resource dependence and economic growth. Their work was followed by numerous studies identifying several key factors that exacerbate economic underperformance in resource-rich countries.

Mehlum et al. (2006) argue that institutional quality is the primary factor determining whether resource wealth leads to economic prosperity or stagnation. Countries with producer-friendly institutions can benefit from resource wealth, while those with predator-friendly institutions fall into the resource curse. Along similar lines, Mlambo (2022) emphasizes the governance challenges in resource-rich African countries, where revenue mismanagement leads to rent-seeking, inequality, and political instability, preventing sustainable economic development.

Ross (2012) and Sachs & Warner (1995) attribute the resource curse phenomenon to the Dutch Disease mechanism. The inflow of resource revenues can lead to currency appreciation, making other sectors like manufacturing and agriculture less competitive internationally, thereby weakening economic diversification.

Other authors also point to the lack of economic diversification and the instability of global resource prices as contributing factors to the resource curse. Van der Ploeg & Poelhekke (2009) focus on how macroeconomic instability, driven by volatile international commodity prices, leads to economic volatility in resource-rich countries, which is a key factor in the resource curse. In the same vein, Ramey and Ramey (1995) demonstrated that the vulnerability of low-income countries to external shocks, stemming from their reliance on resource exports, results in reduced growth rates

Lederman and Maloney (2007) emphasize the importance of economic diversification in resource-rich countries as a key factor in avoiding the resource curse. They argue that countries rich in natural resources can achieve sustainable economic growth if they successfully diversify their economies away from heavy reliance on resource sectors like oil or minerals. The authors highlight how successful resource-rich countries, such as Norway and the U.S., have implemented policies to encourage diversification into industries like manufacturing and services, which helps mitigate the risks associated with resource price volatility and promotes long-term growth.

Several other serious factors aggravating the resource curse and negatively affecting long-term economic development include misallocation of capital, poor policy frameworks, authoritarianism, corruption, political instability, and conflict. Ross (2001) finds that oil wealth has a significant negative political impact, as it hinders the development of democratic institutions, contributing to the resource curse not only economically but also politically. Avom et al. (2022) found that democratic regimes, particularly parliamentary democracies, are better at mitigating the negative effects of resource wealth on economic complexity compared to authoritarian regimes.

Sini et al. (2022), examining a sample of Sub-Saharan countries, link resource endowments with price volatility and poor governance, which lead to inefficient capital utilization and hinder long-term economic growth. In the same line, OECD (2008) report highlights the importance of governance in managing natural resources for economic development and poverty alleviation. The study stresses sustainable management, transparency, and inclusive growth as key to ensuring that resources benefit the broader economy. Auty (2001) claims that resource-rich developing countries fail to convert natural wealth into development due to poor governance and economic inefficiencies. Stijns (2006) asserts that the effects of resource wealth on human capital and economic growth are country-specific. He argues that when resources are effectively managed and supported by strong institutional frameworks, they can lead to positive developmental outcomes. Similarly, Torvik (2009) analyzes how resource wealth impacts reform processes, particularly in high-income countries like Norway and Alaska versus low-income, resource-rich nations. He claims that resource wealth often hinders political and economic reforms, creating incentives to maintain the status quo rather than pursuing beneficial reforms.

Finally, some authors argue that resource wealth can fuel internal and international conflicts, as factions compete for control over lucrative assets, weakening governance and causing social unrest (Collier, 2007; Ross, 2012). Moreover, Collier (2007), in a theoretical paper, analyzes the link between natural resources and conflict, pointing out that weak governance leads to economic volatility and societal unrest. He emphasizes that governance improvements and equitable resource distribution are crucial for political and social stability. Schorr & Dietz (2018) examine the social and environmental impacts of extractivism-related conflicts in Latin America. Their paper highlights how resource extraction exacerbates inequalities and leads to social unrest, particularly among marginalized and indigenous communities, influencing governance and policy shifts.

3. STATISTICAL data

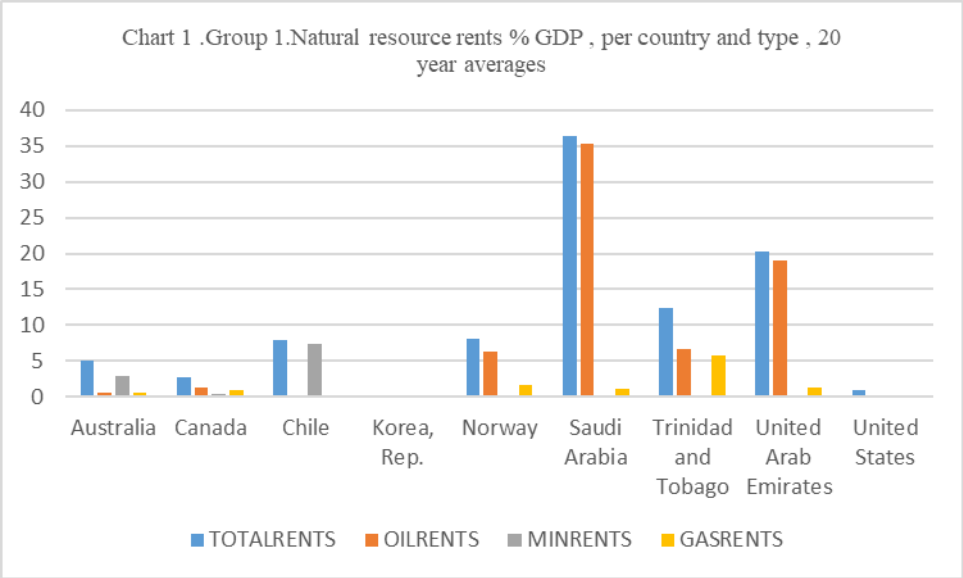
Our initial sample consists of 47 resource-rich developed and developing countries from all continents, focusing on nations with a reliance on non-renewable resources. The criterion for country selection was that the share of resource rents in GDP had to exceed 10%.

The original sample was then divided into three subgroups (High-Income, Upper-Middle-Income, and Lower-Middle-Income/Low-Income countries) based on per capita income levels, according to the World Bank classification. (For a full description of the countries included in each group, see the appendix.)

The subsequent grouping and presentation of natural resfource rents . over a twenty-year period aim to illustrate the temporal evolution of natural resource shares by country group and resource type, as well as highlight the importance of natural resource rents for different income groups. However, the deviations from the original selection criterion (10% share of GDP) are noted below, result from the grouping of countries and averaging, where outliers in some cases have affected the overall numerical average.

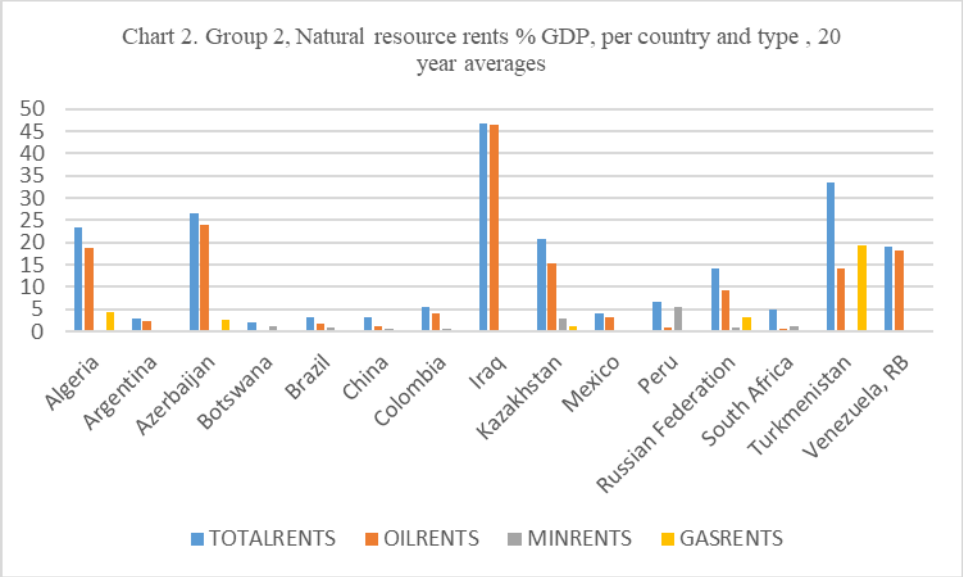
A key observation is that, within each group, countries differ significantly in socio-economic and political structures. For example, in the high-income group,), only 5 out of 9 countries are classified as developed nations, showcasing variation in financial systems and institutional quality. Additionally, Even within the same group, there is significant diversity in the level of natural resource dependence and the types of resources that dominate the economy.

In the high-income group (chart 1 , below) the share of total natural resource rents in GDP is relatively low, ranging from 1% to 8% on average over the past 20 years. However, two outliers show 20% and 36%, indicating significant resource dependence for those specific countries. Moreover, oil is the predominant natural resource revenue, followed by minerals while gas revenues are are negligible in this group.



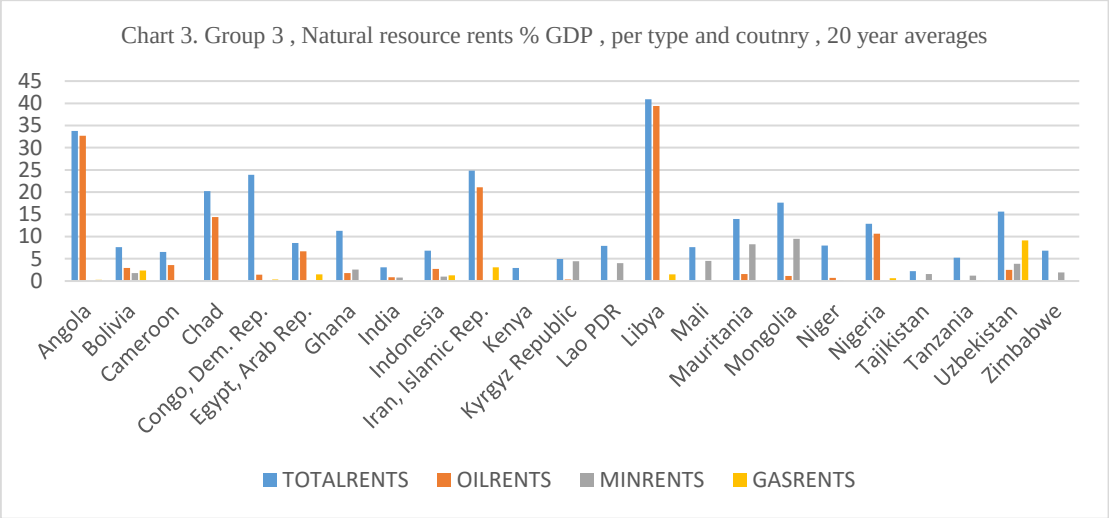
Source: World Bank-WDI and author's calculations

In group 2 (Upper middle income countries) the share of NR rents as a percentage of GDP ranges from 5% to 33% (20-year average), indicating a moderate to high level of resource dependence. Oil remains the dominant resource, with minerals as the second-largest contributor and gas as a smaller contributor (chart 2, below)



Source: World Bank-WDI and author's calculations

In group 3 (Lower middle & Low income countries) NR rents as a share of GDP are highest in this group, ranging from 7% to 40% (20-year average), reflecting substantial dependence on natural resource revenues. Oil dominates, followed by minerals, with natural gas rents being negligible.



Source: World Bank-WDI and author's calculations

As shown in the graphs based on country-level statistical data, the second and third groups of countries demonstrate greater dependence on natural resource revenues compared to the high-income countries in the first group. These revenues are predominantly derived from oil, with minerals as the second most significant source, while natural gas rents account for a negligible share of GDP and are limited to a small number of countries across all groups.

4.VARIABLES AND METHODOLOGY

4.1 Variables' Descritpion

We aim to examine how resource wealth—measured as natural resource rents as a percentage of GDP—and other factors, such as economic diversification, institutional quality, political stability, and international commodity prices, affect economic growth, with a focus on comparing developed and developing countries. Additionally, we incorporate several control variables to better capture the factors that may influence the relationship between resource wealth and economic growth.

In the context of natural resource analysis, these variables collectively help explain why some resource-rich countries achieve sustainable economic growth, while others succumb to the "resource curse."

The dependent variable is

$\ln GDP_{it}$ = Real GDP growth for country i at time t **(**lnGDP per capita provides a measure of the overall level of income or economic development, which is crucial in our case, for cross-country comparisons

Explanatory and Control Variables

1. Resource Rents= Natural resource rents (oil, gas, minerals) as a percentage of GDP for country (log-transformed).

2. Government Effectiveness Index (proxy for institutional quality):

Measures the quality of public services, policy formulation, and government credibility.

3. Diversification Index, measured using the Theil export product concentration index, which reflects the degree of economic diversification.

4. Political stability index, captures the likelihood of political turmoil or violence.

5. Corruption Perception Index: Assesses the level of corruption, which can significantly influence economic outcomes.

6. Tertiary Education Index (proxy for human capital):

Represents educational attainment in the workforce, measured as the gross percentage of school enrollment in tertiary education. This variable reflects the role of human capital in enhancing productivity.

7. Trade Openness: The ratio of total trade (exports + imports) to GDP, reflecting the degree of an economy's integration with the global market (log-transformed).

8. Foreign Direct Investment (FDI): inflows of foreign capital as percentages to GDP (log-transformed).

9. International Commodity Price Indexes: Used to examine the impact of global demand on economic growth:

ompricefuels: Fuel commodity price index.

compriceminerals: Minerals commodity price index.

Interaction Variables

To clarify how and under what conditions resource wealth affects economic growth, we include interaction variables in the model. These interaction terms allow us to examine the indirect mechanisms through which resource rents influence an economy.

The key interaction variables are:

1.(oil, gas, minerals rents) × Government Effectiveness Index: This index captures the moderating effect of institutional quality on resource rents.
2.(oil, gas, minerals rents) × Diversification Index. This index evaluates the interaction between economic diversification and resource rents in influencing economic growth.

4.2 The model

$$\mathbf{GDPit = \alpha + \beta_1\ Resource\ Rents_{it} + \beta_2 Diversification_{it} + \beta_3 PoliticalStability + \beta_4 Govermenteffectiveness + \beta_5 HumanCapital_{it} + \beta_6 Tradeopeness + \beta_7 FDI_{it} + \beta_8\ compricefuels + \beta_9 compriceminerals + \beta_{10} Corruption + \beta_{11}\ Resourcerents*Governmenteffectiveness + \beta_{12}\ Resourcerents*Diversificationindex + \gamma_i + \delta_i + \varepsilon_{it}}$$

Where
γi = Country fixed effects (captures time-invariant country-specific factors like geography, culture, and history).
δt = Time fixed effects (captures global or regional shocks common to all countries in a specific year).
єit = Error term (captures unobserved factors affecting economic growth for country I at time t).

5. ESTIMATION PROCEDURE

5.1 Stationarity Tests

In panel data analysis, testing for stationarity is essential to ensure that variables do not exhibit trends over time or across individual units, as such trends can lead to spurious or misleading results. Stationarity tests were performed for all variable combinations within the three (or two) groups using the Levin, Lin & Chu method. Most variable combinations were found to be stationary. Given the large number of combinations and results, detailed tables are provided in the appendix.

5.2 Estimation methods

In panel data analysis, three different estimation methods are commonly applied:
The main methods for panel data estimation are Pooled OLS, Fixed Effects (FE), and Random Effects (RE) models. We rejected Pooled OLS because it ignores individual-specific effects, which is unsuitable for our heterogeneous sample of countries with distinct characteristics.
Between FE and RE, the Fixed Effects model was chosen because it controls for unobserved heterogeneity by allowing each country to have its own intercept, addressing potential endogeneity. In contrast, the Random Effects model assumes full exogeneity, which is unrealistic in economic models. Additionally, RE requires a sufficient number of cross-sectional units relative to coefficients for variance estimation, which was not possible due to missing data[1]. Therefore, the Fixed Effects model was the most appropriate choice for our analysis

5.3 Estimation results

The following table presents the impact of natural resource rents on economic growth across high-, middle-, and low-income countries. The results highlight the differential effects of oil, gas, and mineral rents, along with interaction terms involving governance and diversification.
Impact of Natural Resource Rents and Interaction Terms on Economic Growth by Income Group and type of natural resource endowments

Table 1. Regression Results by Income groups

Dependent Variable:lnGDPpercapita

	high income countries	middle income countries	Low income countries
Variable	Coefficient	Coefficient	Coefficient
C	2.86963	4.87195	3.55282
	(0.000)*	(0.000)*	(0.0000)*
OILRENTS	-0.03862	-0.34712	-0.19472
	(0.2952)	(0.000)*	(0.000)*
MINRENTS	0.02717	0.15645	0.03849

The initial dataset included 47 cross-sectional units; however, missing data led to the exclusion of some countries during the estimation process. The primary reason for missing data is that many countries in the sample are developing nations with less well-organized statistical systems, leading to inconsistent reporting across years. To ensure robust estimation, observations with missing values were excluded, leaving a final sample of [number of countries] and [number of years]. While we explored strategies to mitigate the impact of missing data, such as focusing on variables with fewer gaps, we chose to avoid imputation methods that might introduce bias. This limitation reflects broader challenges in data collection in developing economies but does not compromise the validity of the results.

	(0.0504)*	(0.0008)*	(0.0015)*
GASRENTS	0.06078	0.28328	0.03471
	(0.1070)	(0.0000)*	(0.4444)
COMMODITYPRICEINDEX-FUELS	7.86E-05	-4.33E-05	0.00010
	(-0.4360)	(-0.8550)	(0.4200)
COMMODITYPRICEINDEX-MINERALS	-0.00040	-0.00007	-0.00065
	(0.028)*	(0.8800)	(0.0470)*
TRADEOPENESS	0.02816	-0.42468	-0.14870
	(0.6923)	(0.0070)*	(0.0000)*
DIVERSIFICATION INDEX	0.01798	0.16117	0.02354
	(0.1418)	(0.0050)*	(0.0011)*
FDI	-0.00709	-0.12131	0.03463
	(0.5097)	(0.0001)*	(0.0014)*
GOVEFFECTIVENESS	-0.04909	0.32649	0.00273
	(0.063)	(0.0001)*	(0.0714)
CORRUPTION	0.01826	-0.19909	0.06579
	(0.0736)	(0.0007)*	(0.0063)*
POLSTABILITY	-0.05897	0.02539	0.05084
	(0.0005)*	(0.3774)	(0.2040)
HUMAN-CAPITAL	0.00315	0.00769	0.00334
	(0.000)*	(0.000)*	(0.0037)*
OILRENT*GOVEFFECTIVENESS	0.00297	-0.12762	0.02131
	(0.8599)	(0.0779)	(0.4478)
MINRENTS*GOVEFFECTIVENESS	-0.02909	-0.03216	-0.04294
	(0.0016)*	(0.4838)	(0.1134)
GASRENTS*GOVEFFECTIVENESS	-0.02903	0.08368	0.02319
	(0.1829)	(0.2171)	(0.0187)*
OILRENTS*DIVERSIFICATION	0.01232	0.11661	0.04469
	(0.0885)	(0.0000)*	(0.7786)
GASRENTS*DIVERSIFICATION	-0.01752	-0.08050	-0.00455
	0.0161)*	(0.0179)*	(0.4478)
MINRENTSDIVERSIFICATION	0.00395	-0.03429	-0.00152
	(0.2617)	(0.0748)	(0.7538)
R-squared	0.99640	0.98846	0.97255
Adjusted R-squared	0.99523	0.98727	0.96776
Cross-sections included	7	12	11
Total pool (unbalanced) observations	91	209	176
Sample (adjusted):	2002-2022	1998-2022	2000-2021

Numbers in brackets indicate P-values. (*) indicate significant coefficient at 5% level.

6. DISCUSSION

The analysis sheds light on the impact of oil, gas, and mineral rents on economic growth across income groups, emphasizing the role of interaction variables and control factors.

Oil Rents have a significantly negative effect on growth in middle- and low-income countries, reflecting challenges such as Dutch disease, governance inefficiencies, and weak institutional frameworks. These findings align with the resource curse theory, which posits that oil wealth often hampers growth in less developed economies. Conversely, the non-significant effect in high-income countries suggests that these economies have achieved sufficient diversification, reducing their dependence on oil rents as a growth driver. Interestingly, the interaction of oil rents with government effectiveness is non-significant across all income groups, indicating that good governance alone does not mitigate the negative effects of oil rents. This may stem from oil price volatility or structural dominance of the oil sector, challenges that governance alone cannot fully address without broader economic reforms. Meanwhile, the interaction with the diversification index is negatively significant for middle-income countries, implying that greater economic diversification helps alleviate the harmful effects of oil dependency. However, for high-income countries, where diversification has likely reached advanced stages, and low-income countries, which may lack the capacity for meaningful diversification, this interaction remains non-significant.

Gas Rents have a positive and significant impact on growth for middle-income countries, likely because revenues are being effectively leveraged for development projects in these transitioning economies. However, their impact is non-significant for high-income countries, which may have reduced reliance on gas revenues due to mature, diversified economies, and for low-income countries, where gas rents constitute a negligible share of GDP. The interaction with government effectiveness is significant and positive only for low-income countries, suggesting that good governance can unlock the potential of gas rents for growth in these settings by addressing inefficiencies and directing revenues toward productive uses. However, for middle- and high-income countries, where institutional frameworks are stronger, the governance interaction is non-significant, reflecting the relatively diminished role of governance improvements in driving gas-related growth. Meanwhile, the interaction with diversification index is negatively significant for high- and middle-income countries, suggesting diminishing returns from gas rents as these economies diversify and reduce their reliance on gas revenues. In low-income countries, this interaction is non-significant due to their limited diversification and marginal dependence on gas rents.

Mineral Rents positively and significantly contribute to economic growth across all income groups, underscoring their potential to stimulate broader wealth distribution and infrastructure development. This effect is particularly pronounced in low-income countries, where mineral-related investments in infrastructure, such as roads and energy, generate spillover benefits for other sectors. The stability of mineral rents compared to oil and gas rents likely explains their consistently positive impact on growth.The interaction between mineral rents and government effectiveness is significant and positive for all income groups, reflecting the universal role of governance in enhancing the growth benefits of mineral wealth. Good governance ensures that revenues are transparently managed and directed toward productive uses, amplifying the positive effects of mineral rents. On the other hand, the interaction with the diversification index is non-significant across all income groups, suggesting that the economic impact of mineral rents is less dependent on diversification. Minerals may naturally integrate into a variety of economic sectors, making diversification less critical compared to oil and gas rents.

Finally , the findings for commodity price indexes reveal important dynamics related to global market volatility. The fuels price index has no significant effect on growth for any income group, likely because fuel demand is relatively inelastic, limiting the economic impact of price changes. In contrast, the minerals price index negatively impacts growth in high- and low-income countries, reflecting the vulnerability of these economies to volatile mineral prices. High-income countries with advanced industries like manufacturing and construction experience ripple effects from price fluctuations, while low-income countries are exposed to external shocks due to their reliance on mineral exports.

Our results align with previous studies that examine the effects of natural resource wealth on economic growth, reinforcing the arguments made by Sachs and Warner (1995, 2001), Ross (2001, 2012), van der Ploeg and Poelhekke (2009), and Collier and Goderis (2009) regarding oil rents. Additionally, the findings on the positive impact of mineral rents are supported by Auty (2001), Stijns (2006), and Mehlum, Moene, and Torvik (2006), as well as Lederman and Maloney (2007).

6. DISCUSSION OF THE RESULTS AND POLICY IMPLICATIONS

The findings for oil rents in middle and low-income countries strongly support the resource curse hypothesis. These countries tend to suffer from negative growth impacts when they rely heavily on oil wealth, likely due to poor governance, over-reliance on oil, and weak institutions. The negative impact of oil rents in these economies reflects the classic problems associated with the resource curse, such as mismanagement, institutional weaknesses, the Dutch disease effect, and price volatility. Oil and gas rents, in particular, are highly sensitive to global price volatility, which can lead to boom-bust cycles that destabilize growth, especially in economies that are heavily dependent on resource exports.

However, the positive impact of mineral rents across all income groups challenges the resource curse hypothesis. The data suggests that mineral resources may not have the same detrimental effects as oil or gas and could, in fact, contribute positively to growth when managed effectively. The interaction results also suggest that economic diversification and good governance can help mitigate or even overcome the resource curse, particularly for oil and gas in middle-income countries. The interaction results for gas rents and government effectiveness point to the critical role of institutions in shaping the impact of resource wealth. Good governance can help low-income countries leverage gas wealth for growth, but the impact is less clear for oil, which suggests that oil wealth may pose more complex challenges that require more than just good governance to address.

Moreover, commodity price indexes further clarify these dynamics: The fuels price index shows no impact on growth across all groups, likely because fuel demand is inelastic, meaning that price changes have limited effects on growth. In contrast, the minerals price index demonstrates a negative impact on the growth of high and low-income countries but no impact on middle-income countries. Minerals are more volatile and sensitive to economic cycles, particularly in industries like construction, electronics, and manufacturing. High-income countries may experience significant ripple effects due to reliance on these sectors. Meanwhile, low-income countries face vulnerability to external shocks, as their dependence on exports exposes them to global demand fluctuations or price drops.

7. CONCLUSION AND POLICY RECOMMENDATIONS

The results provide mixed support for the resource curse hypothesis. There is clear evidence of a resource curse for oil rents in middle- and low-income countries, where oil wealth leads to negative growth outcomes. However, the positive impact of mineral rents across all income groups, along with the mitigating role of economic diversification and good governance in some cases, suggests that the resource curse is not an inevitable outcome.

In particular, effective governance, economic diversification, and institutional quality can play significant roles in enabling countries to avoid the negative consequences of resource wealth. Moreover the results from the impact of global demand (fuels and minerals price indexes) underline the importance of economic diversification, resource management, and energy transition policies. High-income countries should focus on innovation and securing mineral supplies, middle-income countries should capitalize on value addition and industrialization, and low-income countries need to build resilience through governance and diversification..

Since the resource curse primarily affects low-income developing countries, the immediate policy implication is to focus on reducing resource dependence by diversifying their economies. This involves investing in sectors beyond natural resources, such as manufacturing, agriculture, and services, to decrease reliance on international demand and price fluctuations. Achieving this diversification requires substantial investments and expertise. As many low-income countries lack natural capital, they can leverage foreign investments in these sectors. However, this requires political will, which includes investing in human capital to better exploit opportunities from foreign direct investment (FDI), improving state management (including transparency and democracy), and curbing corruption. Given that many middle- and low-income countries lack access to financial mechanisms, natural capital, and other Western financial tools, we believe the following recommendations are crucial for better managing natural resource wealth and improving economic outcomes:

1.Strengthening Regional Cooperation and Integration: Middle- and low-income countries can benefit greatly from regional cooperation in managing natural resources. By sharing best practices, coordinating resource extraction policies, and collaborating on cross-border infrastructure projects (such as pipelines, roads, and energy grids), these countries can maximize the economic benefits of their natural resources while minimizing potential negative spillovers. i.e regional cooperation in oil or gas extraction can help mitigate price volatility and promote more sustainable resource use. Moreover, integrated economic policies within regions can help reduce dependence on natural resources.

2.Promoting Economic Diversification Through Regional Trade and Infrastructure: Countries can work together to design policies that promote economic integration. Regional trade agreements and joint infrastructure projects can help diversify economies and foster growth in sectors not directly linked to natural resources, thereby reducing overall dependence on resource wealth.

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APPENTIX

Table 1. Resource Rich Countries

Minerals description	Minerals included in the calculation are tin, gold, lead, zinc, iron, copper, nickel, silver, bauxite, and phosphate.
AFRICA	**Natural resource type**
Algeria, Libya, Egypt, Niger, Chad, Nigeria, Ghana, Ivory Coast, Gabon, Cameroon, Sudan, Tanzania, Angola, Botswava, S.Africa, Zimbabue	Petroleum
Botswava	Diamonds, coal, soda ash, copper, nickel, silver, gold, industrial minerals and semi-precious stones.
Congo (DR)	Copper
Kenya	Titanium
Mauritania	Iron
Mali	Gold
Morocco	Phosphates
Burkina Faso	Zinc
Central Asia	**Natural resource type**
Russia	oil and natural gas,
Kazakstan, Kyrgystan	Minerals
Turkmenistan	Minerals
Uzbekistan	Gold, Uuranium
Azerbaijan	Oil
China, Malaysia	Oil
Korea Republic	Minerals (anthracite coal, iron ore, graphite, gold, silver, tungsten, lead, and zinc)
Mongolia	Coal and fluorite (fluorspar) and of copper, gold, silver, and other metallic ores.
India	mineral, coal , iron ore, manganese ore
Indonesia	Nickel, Cooper, Bauxite
Western Asia	**Natural resource type**
Saudi Arabia, Iraq, Kuvait, Iran, Quatar, United Arab Emirates	Oil
North and Central America	**Natural resource type**
Canada	Oil, minerals (such as gypsum, limestone, rock salt, and potash, as well as energy minerals, such as coal and uranium.

USA	Coal, copper, lead, molybdenum, phosphates, rare earth elements, uranium, bauxite, gold, iron, mercury, nickel, potash, silver, tungsten, zinc, petroleum, natural gas, timber, and arable land.1
Mexico	oil, silver, copper, gold, lead, zinc, natural gas and wood
South America	**Natural resource type**
Argentina	natural gas , oil
Brazil	Oil. Uranium, Gold
Venezuela	Iron, Natural Gass Oil
Peru	copper, silver, gold, petroleum, timber, fish, iron ore, coal, phosphate, potash, and natural gas
Chile	copper, iron, molybdenum and lithium.
Bolivia	petroleum, natural gas, gold, silver, tungsten, zinc, lead, and tin.
Colombia	emeralds, gold, platinum, and silver
Ecuador	Petroleum, fish, shrimp, timber, gold
Trinidad & Tobago	Natural gas
Suriname	Bauxite, gold, oil, iron ore, other minerals;
Guyana	gold, bauxite and timber.
European countries	**Natural resource type**
Norwegen	petroleum, natural gas, iron ore, copper, lead, zinc, titanium, pyrites, nickel, fish, timber, and hydropower.
United Kingdom	Natural gas
Australia	Bauxite (aluminium ore), iron ore, lithium, gold, lead, diamond, rare earth elements, uranium, and zinc.

SOURCE -World Bank- World Development Indicators

TABLE 2. RESOURCE RICH COUNTRIES IN THE SAMPLE CLASSIFIED ACCORDING TO INCOME DISTRIBUTION

High Income	Upper Middle Income	Low Middle Income	Low Income
Australia	Algeria	Bolivia	Angola
Canada	Argentina	Cameroon	Chad
Chile	Azerbaijan	Congo Republic	Mali
Korea Republic	Botswava	Egypt	Niger
Norway	Brazil	Ghana	Tajiskistan
Saudi Arabia	China	India	Tanzania
Trinidad & Tobago	Colombia	Indonesia	
United Arab Emirates	Iraq	Iran	
United States	Kazakstan	Kenya	
	Mexico	Kyrgystan	
	Peru	Lao Republic	
	Russia	Libya	
	South Africa	Mauritania	
	Turkmenistan	Mongolia	
	Venezuela	Nigeria	
		Uzbekistan	
		Zimbabue	

SOURCE -World Bank- World Development Indicators

Table 4 Second grouping of initial sample

Group 1.High Income	Group 2. Upper Middle Income	Group 3 Low Middle and Low Income -
Australia	Algeria	Angola
Canada	Argentina	Bolivia
		Cameroon
Chile	Azerbaijan	Chad

Korea Republic	Botswava	Congo Republic
Norway	Brazil	Egypt
Saudi Arabia	China	Ghana
Trinidad & Tobago	Colombia	India
United Arab Emirates	Iraq	Indonesia
	Kazakstan	Iran
	Mexico	Kenya
	Peru	Kyrgystan
	Russia	Lao Republic
		Libya
		Mali
		Mauritania
		Mongolia
		Niger
		Nigeria
		Tajiskistan
		Tanzania
		Uzbekistan
		Zimbabue

SOURCE -World Bank- World Development Indicators

Table 4 Country Classification according to income distribution and natural resource type

GROUP 1 High Income Countries	**Natural resource type**	**GROUP 2 Upper Middle Income Countries**	**Natural resource type**	**GROUP 3 Low Middle and Low Income Countries**	**Natural resource type**
Australia	**Minerals** (Bauxite, iron ore, lithium, gold, lead, diamond, rare earth elements, uranium, and zinc)	Algeria	oil	Angola	oil
Canada	Oil, minerals	Argentina	natural gas , oil		
Chile	**Minerals** (copper, iron, molybdenum and lithium)	Azerbaijan	gas	Bolivia	oil, natural gas, **minerals**
Korea Republic	**minerals** (coal, copper, fluorspar, gold, graphite, iron ore, lead, magnesite, pyrites, salt, tungsten, and zinc).	Botswava	Oil, **minerals**	Cameroon	oil
Norway	oil natural gas, minerals	Brazil	Oil. **Minerals** (Uranium, Gold)	Chad	oil
Saudi Arabia	oil			Congo Republic	oil
Trinidad & Tobago	Natural gas			Egupt	oil
United Arab Emirates	oil	China	Oil	Ghana	oil
USA	**minerals,** gas , oil	Colombia	**Minerals** (emeralds, gold, platinum, and silver)	India	**Minerals** (coal , iron ore, manganese ore)
		Iraq	oil	Indonesia	**Minerals** (Nickel, Cooper, Bauxite)
		Kazakstan	**Minerals**	Iran	oil

		Mexico	oil, minerals, (silver, copper, gold, lead, zinc, and wood), natural gas		
				Kenya	**Minerals** (gold, iron, steel, titanium, gemstones, water, and wildlife)
		Peru	oil, natural gas, **minerals**	Kyrgyz Republic	Minerals
		Russia	oil and natural gas,	Libya	oil
		South Africa	oil	Mali	**Minerals (Gold)**
		Turkmenistan	**Minerals, gas**	Mauritania	**Minerals**
		Venezuela	oil	Niger	oil
				Nigeria	oil
				Tajikistan	oil and gas
				Tanzania	oil
				Uzbekistan	minerals
				Zambia	Oil, **minerals** (coal, natural gas, metals, stone and sand)

Source: World Bank -WDI-and author's calculations

Data Completeness Validation for Statistical Series-Comments on the completeness of the statistical data and the basic type of natural resources by country group:

Group 1 (9 countries) Australia- Canada- Chile- Korea Republic- Norway- Saudi Arabia- Trinidad & Tobago- United Arab Emirates- USA. (The data series are completed -No missing data .Apart from Australia, Chile and Korea which are endowed with minerals, the rest of the countries in the group are endowed with all types of natural resources)

Group 2 (15 countries) Algeria , Argentina , Azerbaijan, Botswava, Brazil, China, Colombia, Iraq, Kazakstan, Mexico, Peru, Russia, South Africa, Turkmenistan, Venezuela.(Exchange rates and interest rates: missing data for 7 out of 15 countries. The main natural resource type for 10 of the 15 countries in the group is oil, followed by natural gas and minerals

Group 3 (22 countries) Angola, Bolibia, Cameroon, Chad, Congo Republic, Egypt, Ghana, India, Indonesia, Iran, Kenya, Kyrgyz, Lao, Libya, Mali, Mauritania, Niger, Nigeria, Tajikistan, Tanzania, Uzbekistan, Zimbabue. (Exchange rates:missing data for 17 countries, interest rates :missing data for 5 countries and many years for other countries , gasrents (missing data for 8 countries.In the third group, the main type of natural resources is oil). The results of the estimations should be interpreted taking into account the above information

Table 5. Variable Description and Sources

VARIABLE	DESCRIPTION	SOURCE
GDP per capita	GDP per capita is a commonly used economic indicator that represents a country's economic output divided by its population	World Bank,, World Development Indicators (WDI)
Oil rents % of GDP	Oil rents are the difference between the value of crude oil production at regional prices and total costs of production.	World Bank , (WDI)

Natural gas rents %of GDP	Natural gas rents are the difference between the value of natural gas production at regional prices and total costs of production.	World Bank , (WDI
Mineral rents % of GDP	Mineral rents are the difference between the value of production for a stock of minerals at world prices and their total costs of production. Minerals included in the calculation are tin, gold, lead, zinc, iron, copper, nickel, silver, bauxite, and phosphate.	World Bank , (WDI)
Commodity price index – Fuels	Includes oil, gas, coal)	UNCTAD -DATA
Commodity price index-minerals	Includes non-precious metals (e.g., copper, aluminum) and precious metals (e.g., gold, silver), as well as ores.	UNCTAD -DATA
FDI (Foreign Direct Investment) net inflows % of GDP	Foreign direct investment are the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors, and is divided by GDP.	UNCTAD
Trade Openness % of GDP	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.	World Bank , (WDI
Corruption Index	Control of Corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.	World Bank-Governance Indicators,
Government Effectiveness: (Estimate)	Government Effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.	World Bank-Governance Indicators,
Diversification Index,	Theil export product concentration index.This index measures, for each country, the degree of concentration of goods exported (it does not include services). It tells us if a large share of a country's exports is accounted for by a small number of commodities or, on the contrary, if its exports are well distributed among many products.	UNCTAD-stat – Data Center
Political stability Index	Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.	World Bank-Governance Indicators, data extracted December 26, 2022
School enrollment, tertiary (% gross)	Gross enrollment ratio is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. Tertiary education, whether or not to an advanced research qualification, normally requires, as a minimum condition of admission, the successful completion of education at the secondary level.	World Bank, (WDI) data

STATIONARITY TESTS -TABLES

Table 5. High Income Countries-Test Method: Levin- Lin -Chu

Variable Combination	Statistic	P-Value	Stationary?
Gdpcap, Gasrents, Oilrents	-10.6325	0.0000	Yes/levels
Mineralrents, FDI,Tradeopeness	-2.52362	0.0058	Yes/levels
Diversification-Corruption, policystability	-7.19195	0.0000	Yes/First-Differences
Commodityprice-(fuels and minerals)	-13.5873	0.0000	Yes/levels

oilrent*diversification index	-8.45999	0.0000	Yes/First-Differences
mineralsrent* diversification index	-6.90495	0.0000	Yes/levels
Gasrent* diversification index	-3.67889	0.0001	Yes/levels
Oilrents*goveffectiveness	-18.6175	0.0000	Yes/First-Differences
gasrents*goveffectiveness	-5.50490	0.0000	Yes/levels
Mineralrents*goveffectiveness	-3.78688	0.0001	Yes/levels

Table 6. Middle Income Countries-Test Method : Levin- Lin -Chu

Variable Combination	Statistic	P-Value	Stationary?
Gdpcap, Gasrents, Oilrents	-5.86790	0.0000	Yes/levels
Mineralrents, FDI,Tradeopeness	-4.05140	0.0000	Yes/levels
Diversification-Corruption, policystability	-20.2744	0.0000	Yes/levels
Commodityprice-(fuels and minerals)	-17.5412	0.0000	Yes/levels
oilrent*diversification index	-11.2595	0.0000	Yes/First-Differences
mineralsrent* diversification index	-11.2059	0.0000	Yes/levels
Gasrent* diversification index	-11.2059	0.0000	Yes/First-Differences
Oilrents*goveffectiveness	-11.8683	0.0000	Yes/First-Differences
gasrents*goveffectiveness	-6.76192	0.0000	Yes/First-Differences
Mineralrents*goveffectiveness	-3.18520	0.0007	Yes/levels

Table 6. Low Income Countries-Test Method: Levin- Lin -Chu

Variable Combination	Statistic	P-Value	Stationary?
Gdpcap, Gasrents, Oilrents	-3.54473	0.0002	Yes/levels
Mineralrents, FDI,Tradeopeness	-6.78471	0.0000	Yes/levels
Diversification-Corruption, policystability	-6.21364	0.0000	Yes/levels
Commodityprice-(fuels and minerals)	-21.2434	0.0000	Yes/levels
oilrent*diversification index	-13.8730	0.0000	Yes/levels
mineralsrent* diversification index	-3.02097	0.0013	Yes/levels
Gasrent* diversification index	-1.71581	0.0431	Yes/levels
Oilrents*goveffectiveness	-9.24462	0.0000	Yes/First-Differences
gasrents*goveffectiveness	-1.84243	0.0327	Yes/levels
Mineralrents*goveffectiveness	-3.71302	0.0001	Yes/levels