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Impact of Giant Oil discoveries on Democracy

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Abstract

This study investigates the impact of sustained oil production on democratic governance in 78 oil-producing countries from 1932 to 2014. By constructing a unique dataset that integrates information on giant oil discoveries with comprehensive oil production data, the analysis employs an instrumental variable (IV) approach using latitude as an instrument for oil production to address potential endogeneity concerns. The results show a significant negative relationship between oil production levels and democratic governance, as measured by the Polity Index, indicating that higher levels oil production levels are associated with slower transitions to democracy. These results highlight that continuous oil production can have a long-term negative effect on democratic development.

Abstract

Diese Studie untersucht den Einfluss einer anhaltenden Ölproduktion auf die demokratische Regierungsführung in 78 ölproduzierenden Ländern von 1932 bis 2014. Durch die Erstellung eines einzigartigen Datensatzes, der Informationen über große Ölfunde mit umfassenden Daten zur Ölproduktion integriert, verwendet die Analyse einen Instrumentalvariablenansatz (IV), bei dem die geographische Breite als Instrument für die Ölproduktion genutzt wird, um potenzielle Endogenitätsprobleme zu adressieren. Die Ergebnisse zeigen eine signifikante negative Beziehung zwischen Ölproduktionsniveau und demokratischer Regierungsführung, gemessen am Polity-Index, was darauf hinweist, dass höhere Ölproduktionsniveaus mit langsameren Übergängen zur Demokratie verbunden sind. Diese Ergebnisse verdeutlichen, dass eine kontinuierliche Ölproduktion langfristig negative Auswirkungen auf die demokratische Entwicklung haben kann.

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1 Introduction

Oil is a major fuel source in the world and thus plays a vital role in the global economy. It is informally referred to as “black gold” — “black” because of its appearance when it comes out of the ground, and “gold” because it has historically made many people involved in the industry wealthy. In contrast, OPEC founder Juan Pablo Perez Alfonzo referred to oil as “the devil’s excrement,” reflecting the view that oil wealth brings severe socio-economic and political challenges: “We are drowning in the devil’s excrement.” These contradictory views capture the tension found in the academic literature on oil’s impact. While the discovery of large petroleum reserves has spurred rapid economic growth in resource-rich countries, as demonstrated by Maddison (1995), others have argued that such wealth is associated with negative outcomes, often referred to as the “resource curse.”

The term “resource curse” was introduced by Auty (1993) in the second half of the twentieth century to describe the negative effects of natural resource abundance on the political, social, and economic well-being of a country. While economic theory provides no clear explanation for why resource-rich countries show different patterns of economic and political development, a substantial body of political economy literature suggests that dependence on petroleum, natural gas, and minerals fosters authoritarian regimes. This concept traces back to Mahdavy (1970), who observed that in Middle Eastern countries, revenues from petroleum serve as an external rent source that governments can capture directly. This access to unearned income reduces the need for accountability to the citizenry, thereby facilitating the entrenchment of authoritarian rule.

The idea that natural resource dependence leads to authoritarianism forms the foundation of a significant and influential body of literature, including numerous country-specific case studies, popular books, and articles on global politics and economics. For example, Friedman (2006) proposes the “first law of petropolitics,” which suggests that there is an inverse relationship between oil prices and democratic governance. The argument that natural resources and democracy are incompatible is often linked to parallel research that identifies correlations between natural resources and slower economic growth or the onset of civil conflicts. Collectively, these works have contributed to the widely accepted notion of a “resource curse.”

Research on the “resource curse” hypothesis, which suggests that countries with abundant natural resources often experience less democratic governance, has utilized various econometric techniques to address concerns about causality and endogeneity. A foundational study by Ross (2001) employed cross-country Ordinary Least Squares (OLS) regression to demonstrate that oil wealth is negatively correlated with democracy, suggesting that resource-rich countries are more likely to experience authoritarian rule.

However, Ross (2001) acknowledges potential endogeneity issues, where both oil wealth and democracy might be influenced by other unobserved factors.

To address such endogeneity concerns, subsequent studies have employed Instrumental Variables (IV) methods to isolate the causal impact of resource wealth on political outcomes. Tsui (2011) uses global oil price shocks as an instrument for oil revenue, finding a significant negative effect on democratic governance. Similarly, Caselli and Michaels (2013) use geographic and historical instruments, such as the proximity of municipalities to oil fields and the timing of oil discoveries, to isolate the exogenous impact of oil windfalls on local governance in Brazil. While these studies focus on the impact of new discoveries or fluctuations in global oil prices, this study relies on oil production data from sources like the BP Statistical Review of World Energy and the U.S. Energy Information Administration (EIA).

By using oil production data, this study captures the actual output levels of oil, reflecting the revenue-generating capacity of countries over time, rather than the potential wealth indicated by new discoveries. This approach aligns with methods used by Dunning (2008) and Ross (2012), who analyze the effects of oil production levels on political regimes, but it introduces an innovative IV approach using latitude to address endogeneity. This methodology enables a clearer understanding of how sustained oil production, rather than individual oil discoveries, influences democratic outcomes, providing new insights into the conditions under which resource wealth affects political development.

This study builds on methodologies employed by Tsui (2011), who uses data on worldwide oil discoveries from 1930 to 2003 and employs global oil price shocks as an instrument to capture the exogenous variation in oil revenue and its impact on democratic governance. By employing an instrumental variable approach, Tsui isolates exogenous variation in oil revenues to establish causality. This research further extends the analysis by using latitude as an instrument for oil production.

In this study, I have constructed a dataset specifically focusing on giant oil discoveries and the corresponding oil production data for 78 oil-producing countries. This dataset includes detailed information on the size and timing of these significant oil discoveries, alongside the associated oil production volumes during those years. The oil production data has been sourced from the dataset compiled by Toss and Mahdavi (Mahdavi 2015), which comprehensively documents the volume and value of oil and gas production for all countries between 1932 and 2014.

Additionally, this new dataset incorporates critical variables necessary for a thorough analysis of the impact of oil discoveries on political and economic outcomes. The main dependent variable, the Polity score, is derived from the Polity database (Marshall, Gurr, and Jaggers 2019), and providing a measure of a country's level of democracy. To account for potential confounding factors, several control

variables have been included: income, population, the proportion of the Muslim population, ethnic fractionalization, and a dummy variable to denote whether a country was formerly a British colony.

A key aspect of this study is the application of an instrumental variable (IV) approach using latitude as an instrument for oil production, marking its first use in the literature of political economy. This method helps to address potential endogeneity issues that have long complicated analyses of the relationship between natural resource wealth and political outcomes. By leveraging latitude as an instrument, I aim to isolate the exogenous variation in oil production that is independent of other factors influencing political regimes. This approach offers a stronger framework for understanding the causal relationship between oil production and democratic governance, providing new perspectives on the dynamics of the resource curse.

My analysis provides compelling evidence that giant oil discoveries are causally linked to slower transitions to democracy. The negative coefficient for oil production quantified at -0.356, indicates a significant inverse relationship between the level of oil production and democratic governance, as measured by the Polity Index. This suggests that countries experiencing large oil discoveries are more likely to encounter impediments to democratic development, reinforcing the resource curse hypothesis.

The utilization of latitude as an instrumental variable for oil production in this analysis is particularly noteworthy. Latitude serves as a proxy for geological factors that influence the likelihood of oil discovery and production, yet it is exogenous to contemporary political outcomes. By employing this instrumental variable, the analysis effectively addresses potential endogeneity concerns, ensuring that the estimates of oil production's impact on democracy are not biased by unobserved confounding factors. This methodological approach strengthens the causal inference, providing more reliable and robust estimates of the relationship between oil wealth and political regime type.

Furthermore, the analysis highlights the broader implications of these findings within the context of global political economy. The negative relationship between oil production and democracy suggests that the benefits of resource wealth may be offset by the weakening of democratic institutions and processes. This can occur through various channels, including the concentration of economic power in the hands of political elites, the reduction of accountability mechanisms due to rent-seeking behavior, and the erosion of civic engagement as governments rely more on resource revenues than on taxation.

These findings underscore the importance of understanding the conditions under which resource wealth can hinder democratic development. They also suggest that policy interventions aimed at promoting transparency, accountability, and good governance in resource-rich countries are crucial for mitigating the potential negative effects of oil wealth on democracy. Establishing robust institutional frameworks

that can manage resource revenues effectively and equitably is essential for ensuring that the economic benefits of oil discoveries translate into positive political and social outcomes.

In summary, the analysis not only confirms the adverse effects of giant oil discoveries on democratic transitions but also provides a methodological advancement in the study of the resource curse by using latitude as an instrumental variable, thus offering new insights into the intricate relationship between natural resource wealth and political regimes.

The paper is organized as follows: the next section provides relevant data sources, detailing the databases used to collect information for the empirical evaluation. Section 3 presents the empirical strategy and the main regression results. Section 4 concludes.

2 Data

The hypothesis presented in the Introduction posits that the massive volume of revenue generated by oil, coupled with a relatively straightforward extraction and commercialization processes, renders it a highly attractive asset for autocratic regimes to consolidate their control over national resources. To thoroughly investigate this hypothesis, a detailed investigation of the determinants of oil wealth was conducted, as outlined in the Appendix. I introduce the dataset to help resolve identification and measurement issues.

2.1 Data sources

Giant Oil and Gas Discoveries Dataset by Horn

The oil discovery data are collected from Giant oil and Gas Discoveries Dataset, which offers revised and expanded information on major oil discoveries from 1868 to 2018. The key feature of this dataset is that it includes new discoveries made between 2010 up to 2018. These estimates are derived from estimated ultimate recoveries (EUR) volumes of oil and gas, calculated in both nominal and real US dollars, based on the oil price at the time of discovery. The latest dataset includes the year, size and type of every giant oil and gas discovery since 1868. Giant oil and gas field are defined as those larger than 500 million barrels of ultimately recoverable oil or gas equivalent, so the dataset leaves out smaller discoveries.

- Giant – EUR are between 500 and 4,999 MMBOE
- Supergiant – EUR are between 5,000 and 49,999 MMBOE
- Megagiant – EUR are more than 50,000 MMBOE

The recent dataset includes the size classes and years of oil discoveries for the 78 oil-producing countries. This dataset covers only countries with large oil and gas discoveries. In contrast, the oil endowment in the rest of the world is considered minimal or non-existent. The estimated ultimate recovery is determined by adding the proven reserves at a particular point in time to the cumulative production up to that date.

Ross-Mahdavy Oil and Gas Dataset (1932-2014)

Compiled by Michael Ross and Paasha Mahdavi, this dataset includes data on the volume and value of oil and gas production for all countries from 1932 to 2014. Dataset was pulled from 3 different databases: US Geological Survey Minerals Yearbook, World Bank's 'Wealth of Nations' database, US Energy Information Administration website. It includes variables like, oil and gas prices, oil and gas exports,

population, sovereign, inflation multipliers. Data on oil prices are taken from the BP Statistical Review 2015, and on gas prices from the Energy Information Administration database on US natural gas prices from 1932-2012, and from BP for 2013-2014. These two sources – the BP Statistical Review and EIA – are used for the entire continuous period, 1932-2014. The purpose of this dataset is to provide a measure of oil wealth, calculated as the value of oil and gas production, which is used as the dependent variable in the first-stage regression to predict the impact of oil wealth on democracy.

Democracy Index and Other Variables.

In political economy literature, one of the widely practiced measures is the Polity Project. Polity IV (Marshall, Gurr, and Jaggers 2019) dataset provides regime data for 232 countries starting as early as 1800 and ending in 2018. The index spans between full autocracy -10 to full democracy +10 and thus distinguish between different degrees to which political regimes show autocratic and democratic characteristics. The project dataset includes historical data on political regimes and state authority governance indicators for many countries, enabling researchers to analyse long-term political trends and changes. Other controls include income, population size, the proportion of Muslim population, ethnic diversity, a binary variable indicating whether the country was a former British colony. Income (GDP per capita) as well as population records are derived from Maddison Project Database (Bolt et al. 2020). Data on Muslims are obtained from the “World Christian Database” (2007). Ethnic diversity estimates are taken from Alesina et al. (2003). Legal origin data are from Easterly (2001).

2.2 Descriptive statistics

This section provides a comprehensive overview of the basic time series patterns observed in our dataset, which includes data for 78 countries. The goal is to offer readers an understanding of the general trends and characteristics of the data before delving into more sophisticated analysis.

Before diagnosing the time series properties of the data, and reviewing the results, I first report some basic time series pattern abductured by inspecting and graphing the data for the 78 countries in the dataset. I want to clarify that I am not making causal inferences based solely on a basic visual inspection of the data. Instead, this exercise aims to give readers an overview of the data trends over time for each country. Additionally, it serves to offer an initial categorization of countries based on whether they seem to benefit from or suffer due to their circumstances.

The first graph “Distribution of Discovery Years” illustrates the annual number of giant oil and gas discoveries from 1900 to 2000. The graph is a time-series line chart, with the x-axis representing the years from 1900-2000 and the y-axis representing the number of discoveries each year. Each data

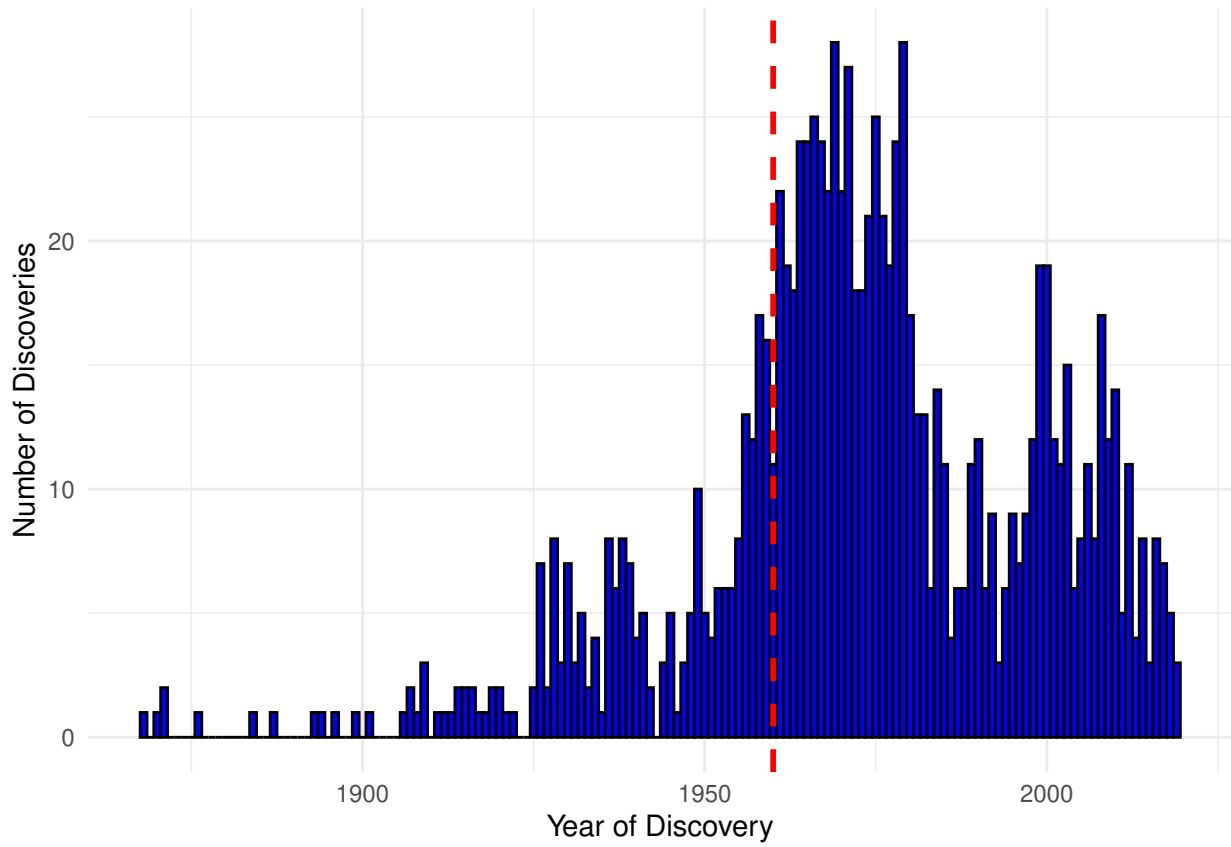


Abbildung 1: Distribution of Discovery Years

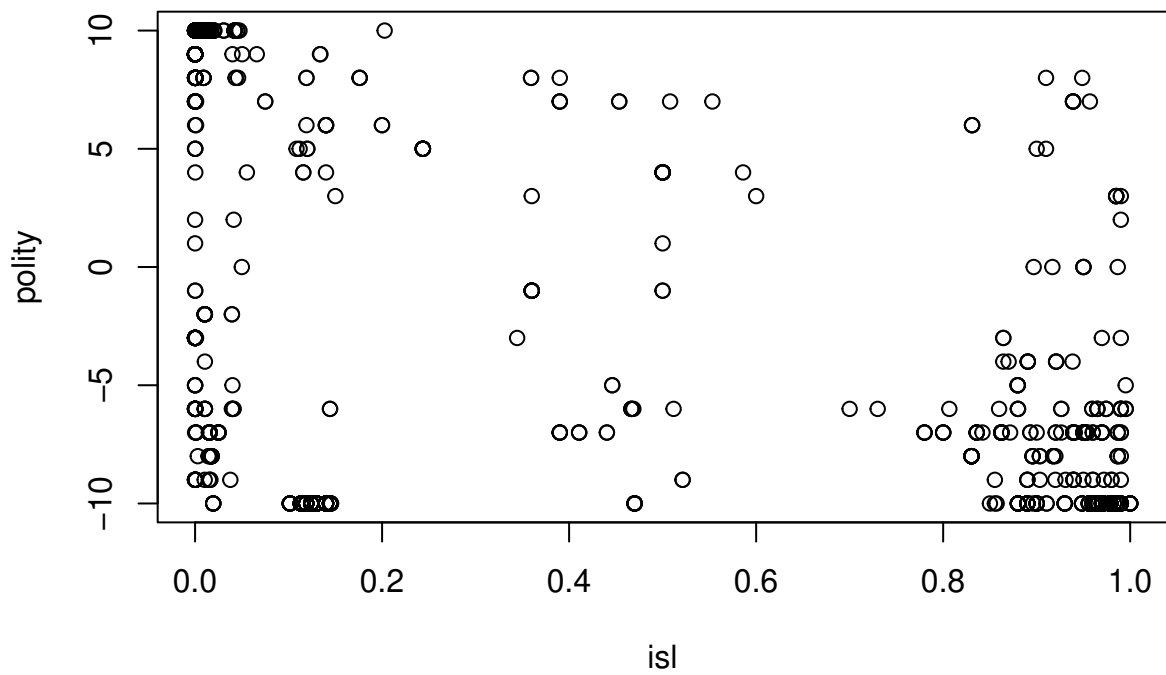


Abbildung 2: Islam and democracy

point on the graph corresponds to the count of giant oil discoveries in a given year, with the line connecting this points to illustrate trends over time. in the yearly 20th century (1900-1930) the number of discoveries remained relatively stable. This period marks the early states of modern oil exploration, characterized by limited technological capabilities and nascent global demand for oil. Between 1930-1970 there is a gradual increase in the number of discoveries , particularly from 1940s onwards. Notable peaks occur around the late 1940s and 1950, corresponding with the post-World War II economic boom and subsequent increased demand for energy resources. The number of discoveries peaked in the early 1970s, coinciding with the oil crisis of 1973 and 1979. These crises highlighted the strategic importance of oil, prompting heightened exploration activities. After the peak in the early 1970s, a notable decline in the number of discoveries is observed, continuing into the late 20th century. This decline maybe attributed to the maturation of existing oil fields, depletion of easily accessible reserves, and a shift in focus towards maintaining and enhancing production from already discovered oil fields rather than discovering new ones.

Understanding the temporal distribution of oil discoveries is crucial for analyzing their impact on political regimes. The periods of intense discovery activity may have different implications for democracy compared to periods of decline. For instance, countries experiencing a surge in discoveries might face increased government revenues and potential shifts in political power dynamics, as suggested by the resource curse hypothesis. The decline in new discoveries could also influence political stability and governance as countries adapt to changing resource availability.

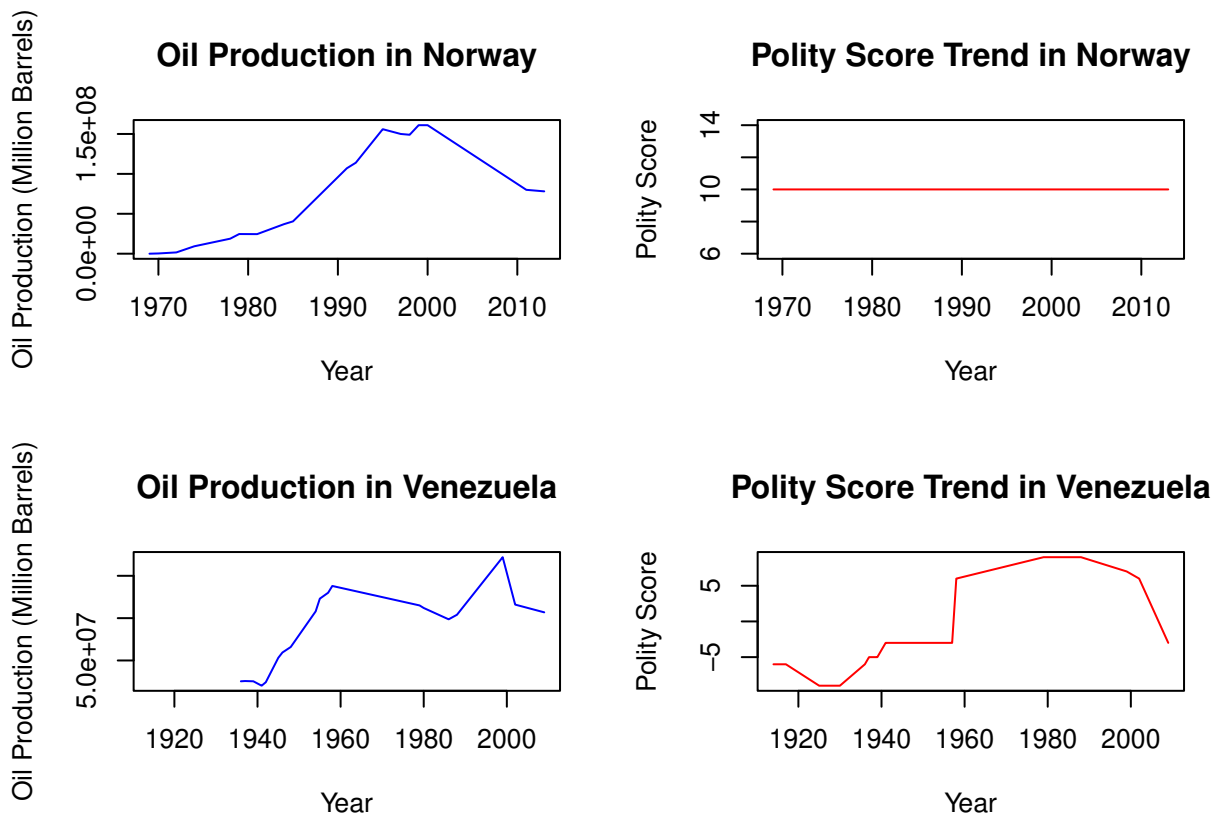
The graph “Islam and democracy” provides a visual representation of the relationship between the proportion of Muslim population in a country and its Polity Score, which measures the level of democracy on a scale from -10 (full autocracy) to 10 (full democracy). Each point on the graph represents a country, positioned according to its proportion of the Muslim population and its corresponding Polity score. The graph reveals a general trend where countries with higher fraction of Muslim population tend to have lower Polity scores. There is a considerable variation around the trend line, indicating that while the overall trend is negative, there are countries with significant Muslim populations that have higher Polity scores (more democratic), and vice versa. Outliers in the data represent countries that do not fit the general trend, providing interesting case studies for further analysis. For example, some predominantly Muslim countries might have relatively high Polity scores due to unique historical, cultural, or political factors. Historically, many predominantly Muslim countries are located in regions with abundant natural resources, such as the Middle East and North Africa (MENA). These regions have often exhibited autocratic governance structures, partly due to the rentier state dynamics. Rentier state theory suggests that governments in resource-rich countries can rely on resource rents instead of

taxes, reducing the need for broad-based taxation and diminishing state accountability to its citizens. Many Islamic countries fall into this category, where substantial revenues from oil and gas resources have facilitated the entrenchment of authoritarian regimes. These rents allow leaders to maintain control through patronage, suppression of opposition, and limiting democratic pressures.

2.2.1 Graphical Analysis of Governance and Resource Wealth

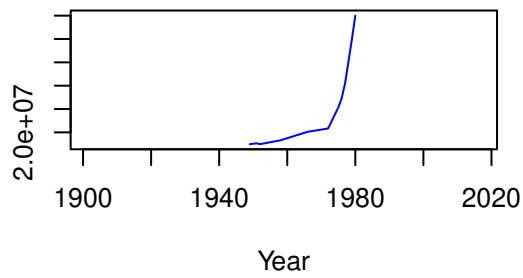
In this study, I utilize a series of graphs to visualize the relationship between oil production and democratic governance across selected countries. These graphs represent key political and economic indicators, such as Polity scores and oil revenues, from 1960 to 2020. They provide an empirical basis for examining whether the patterns observed align with the theoretical expectations of the resource curse or blessing. For instance, countries like Nigeria and Venezuela demonstrate declining Polity scores alongside rising oil revenues, suggesting a potential resource curse, while Norway and Indonesia show stable or improving Polity scores, indicating a different dynamic.

All graphs presented in this section share common structure. The x-axis represents the years from 1960 to 2020, while left y-axis displays the Polity scores (ranging from -10 for full autocracy to +10 for full democracy), and the right y-axis represents oil revenues in billion dollars USD.

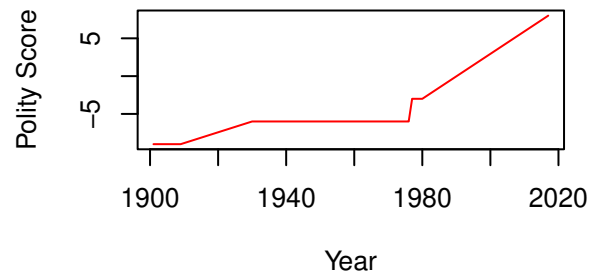


Oil Production (Million Barrels)

Oil Production in Mexico

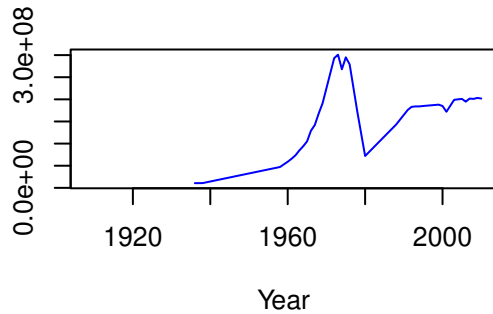


Polity Score Trend in Mexico

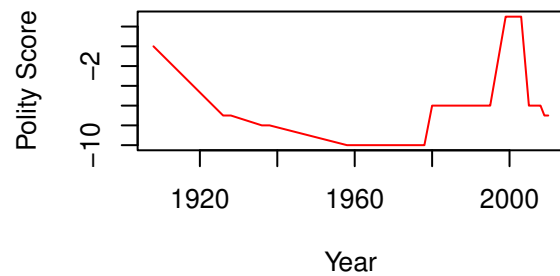


Oil Production (Million Barrels)

Oil Production in Iran

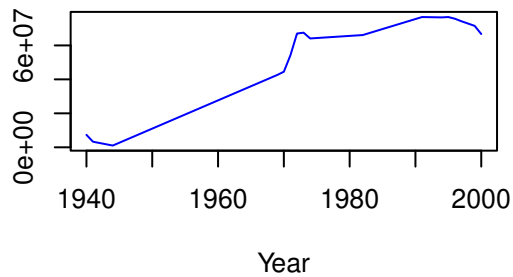


Polity Score Trend in Iran

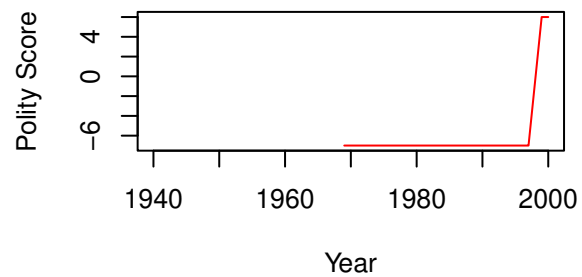


Oil Production (Million Barrels)

Oil Production in Indonesia

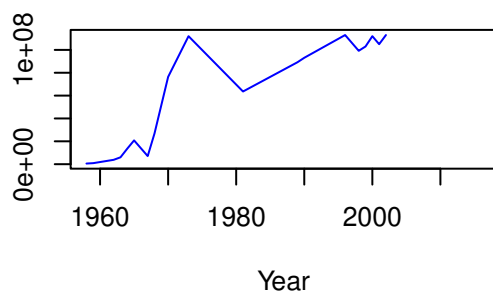


Polity Score Trend in Indonesia

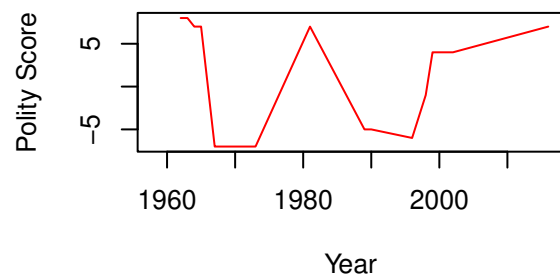


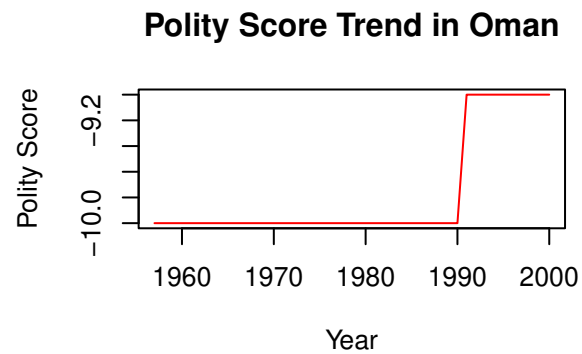
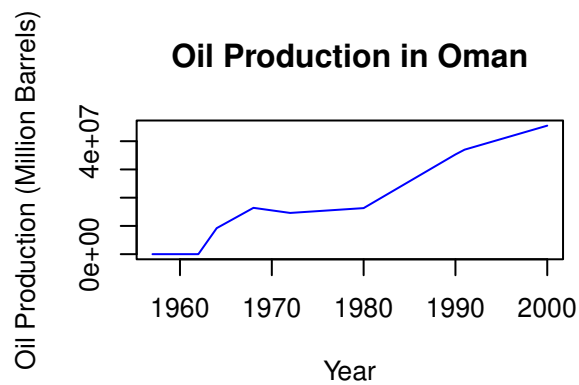
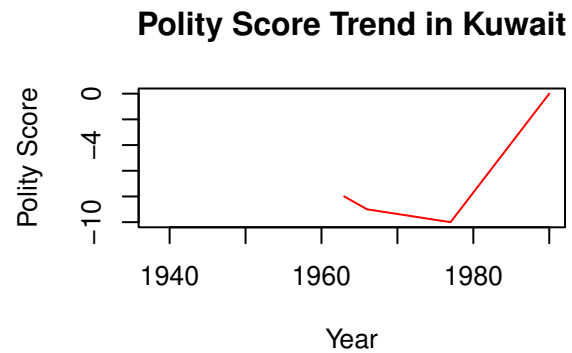
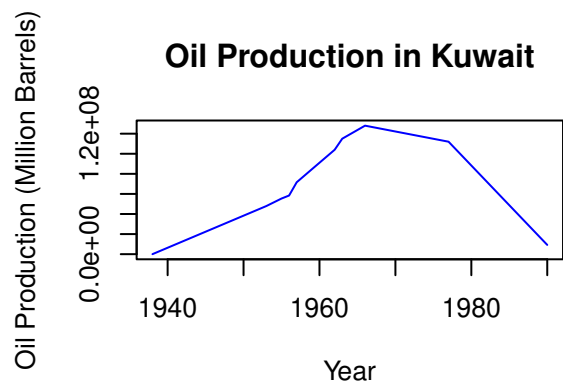
Oil Production (Million Barrels)

Oil Production in Nigeria



Polity Score Trend in Nigeria





Norway

This graph shows consistently high Polity scores despite substantial increases in oil production since the late 1960s. Norway's experience, characterized by robust institutions and transparent management of oil revenues, aligns with the "resource blessing" hypothesis. The stability of democratic governance in Norway, as depicted in this graph, supports arguments by Mehlum, Moene, and Torvik (2006) and Dunning (2008) that strong institutions can mitigate the negative effects of natural resource wealth.

Nigeria

The graph illustrates a sharp decline in Nigeria's Polity scores starting in the mid-1970s, coinciding with a significant increase in oil production. This trend supports the "resource curse" hypothesis, suggesting that oil wealth has been associated with declining democratic governance and increased political instability (Ross 2012). The decline reflects how oil revenues have undermined political accountability and fostered authoritarian practices, particularly during periods of military rule.

Venezuela

The graph reveals a dramatic decline in Venezuela's Polity scores beginning in the early 1970s, following the oil price boom. This drop aligns with significant increases in oil revenues and reflects the authoritarian shift during the presidencies of Hugo Chávez and Nicolás Maduro Corrales and Penfold (2011). The data

supports the broader literature that suggests resource wealth can foster authoritarianism, especially in contexts of weak governance structures (Ross 2012).

Indonesia

This graph displays fluctuations in oil production alongside a general trend of increasing Polity scores, particularly following the transition to democracy in the late 1990s. Indonesia's experience suggests that a combination of political reforms and institutional development can moderate the negative effects of resource wealth, transforming it into a "resource blessing" Aspinall (2013).

3 Regression analysis

This chapter presents the regression analysis conducted to examine the relationship between oil production and democracy, as measured by the polity score, within the context of the resource curse hypothesis. Specifically, I investigate how oil production influences political regimes in countries with significant oil discoveries, using both OLS and Instrumental Variables (IV) regression methods.

The initial analysis involves an OLS regression to model the relationship between the polity score and oil production, alongside other control variables. The model is specified as follows:

$$\text{polity} = \alpha + \beta_1(\text{oil_prod}) + \beta_2(\text{Pop}) + \beta_3(\text{sov}) + \beta_4(\text{GDP}) + \beta_5(\text{isl}) + \beta_6(\text{bcd}) + \beta_7(\text{lat}) + \epsilon \quad (1)$$

polity: Dependent variable representing the Polity score

oil_prod: Independent variable representing oil production

Pop: Population

Larger populations can lead to greater demand for democratic representation and governance due to increased diversity and political engagement. Controlling for population size helps to account for the effect of population dynamics on democratic outcomes.

sov: Sovereign Status

Fully sovereign countries have complete control over their governance and political institutions, which can significantly influence their democratic outcomes. Controlling for sovereign status helps to distinguish the effects of oil production from the impacts of political autonomy. Countries with colonial or dependent histories may have different political and economic trajectories compared to fully sovereign states. Including sovereign status as control variable accounts for these historical differences.

GDP: Gross Domestic Product per Capita

Economic development is often correlated with democratic governance. Higher GDP per capita indicates better economic conditions, which can support the development of democratic institutions. By controlling for GDP per capita, the analysis accounts for the economic context in which oil production occurs. Wealthier countries may have more resources to invest in political and social institutions that foster democracy. Controlling for GDP per capita helps to isolate the impact of oil production from the broader effects of economic development.

isl: Proportion of Muslim population

The proportion of the Muslim population can influence a country's democratic trajectory. Including this variable as a control helps to account for these cultural and religious factors.

bcd: British colonial dependence

Former British colonies often inherit legal and political institutions that can influence their current governance structures. Controlling for British colonial history helps to account for the institutional frameworks established during colonial rule, which can impact democratic outcomes. By including British colonial history as a control variable, the regression analysis ensures that the observed effects of oil production are not confounded by the historical legacies of colonialism.

lat: Latitude

Latitude can affect a country's climate, natural resource endowments, and agricultural productivity, all of which influence economic development and governance structures. Controlling for latitude accounts for these geographical factors.

Tabelle 1: Ordinary Least Squares

	Estimate	Std.Error	t value	Pr(> t)	2.5%	97.5%
(Intercept)	-4.2234099	0.5670893	-7.4475223	0.0000000	-5.3364048	-3.1104149
oil_prod	0.0000000	0.0000000	-8.1785401	0.0000000	0.0000000	0.0000000
Pop	-0.0000066	0.0000008	-7.8240601	0.0000000	-0.0000082	-0.0000049
sov	8.0741568	0.4789122	16.8593684	0.0000000	7.1342222	9.0140914
GDP	0.0001752	0.0000153	11.4602340	0.0000000	0.0001452	0.0002052
isl	-11.2599619	0.4265498	-26.3977649	0.0000000	-12.0971278	-10.4227960
bcd	-0.9392541	1.0945539	-0.8581159	0.3910605	-3.0874750	1.2089668
lat	0.0015082	0.0077481	0.1946492	0.8457122	-0.0136986	0.0167149

In Table 1, the Ordinary Least Squares (OLS) regression results, the coefficient for oil_prod (oil production) is estimated at -0.00000001 (or -1,18e-08), indicating that a unit increase in oil production is associated with a very small decrease in the Polity score. Given that the Polity score ranges from -10 (full autocracy) to 10 (full democracy), this effect size is extremely small, suggesting that oil production has a minimal impact on democratic governance within this model.

The coefficient for Pop (population) is -0.000005 (or -6.5e-06), also showing very small negative effect on the Polity score. While this effect is statistically significant, its magnitude is quite modest, implying that changes in population size do not substantially alter the democratic outcomes.

Conversely, the coefficient for sov (sovereign status) is 8.07, which represents a substantial positive impact on the Polity score. This suggests that countries with full sovereign status are likely to have much

higher Polity scores, reflecting a more pronounced effect of sovereignty on democratic governance.

The coefficient for GDP (Gross Domestic Product per Capita) is 0.0002, indicating a positive association with the Polity score. Although this coefficient is small in absolute terms, the effect becomes meaningful when considering the larger range of GDP values observed in the data, suggesting that economic development plays notable role in enhancing democratic governance. The negative coefficient for the proportion of the Muslim population suggests that cultural and religious factors significantly influence governance structures. This finding reflects the complex interplay between cultural context and democratic outcomes. The non-significant coefficient for British colonial history and latitude are not statistically significant since their confidence intervals include 0. This means that there is no clear effect of colonial history and latitude on current democratic governance, at least within the context of this model. Following the results of the OLS regression, diagnostic tests were conducted to assess the validity of the OLS assumptions, including checks for the normality of residuals and heteroskedasticity. The Table 2 presents the results of diagnostic tests conducted to assess the validity of the Ordinary Least Squares (OLS) regression assumptions.

Normality of Residuals: The Lilliefors test is used to assess whether the residuals of the regression model follow a normal distribution. A p-value much less than 0.05, indicates that the null hypothesis of normally distributed residuals is rejected. This suggests that the residuals are not normally distributed, which may imply issues such as model misspecification or the presence of outliers. Non-normal residuals can lead to invalid inference, as the standard errors and test statistics may not be reliable.

Heteroskedasticity: The Breusch-Pagan test is used to detect the presence of heteroskedasticity in the regression model. A p-value less than 0.05 indicates that the null hypothesis of homoskedasticity (constant variance of residuals) is rejected. This suggests that the residuals exhibit heteroskedasticity, meaning their variance is not constant across observations. Heteroskedasticity can lead to inefficient estimates and biased standard errors, which can compromise the reliability of hypothesis tests and confidence intervals. Given these results, the OLS model assumptions are violated, implying potential inefficiencies and biased standard errors in the estimates.

Tabelle 2: Lilliefors Test Results for Normality of Residuals

Test	Statistic	P.value
D Lilliefors (Kolmogorov-Smirnov) normality test	0.0890345	0

Tabelle 3: Breusch-Pagan test Results for Heteroskedasticity

Test		Statistic	P.value
BP	Breusch-Pagan test	71.29045	0

3.1 Addressing Endogeneity

Following the results of the OLS regression, diagnostic tests revealed issues such as non-normality of residuals and heteroskedasticity, highlighting the need to address potential endogeneity through the use of more robust techniques, such as Instrumental Variables (IV) regression, to ensure the validity and reliability of the model’s estimates.

In the context of oil production and polity, there might be a an endogeneity issue due to omitted variable bias or Simulateneous Causality. For example, there might be unobserved factors like political history or geographic features that influence both oil production and polity scores. Or in the case of Simultaneous Causality, the level of democracy might influence oil production policies and vice versa.

To solve the problem of endogeneity I apply instrumental variable approach, where latitude (LAT) is used as an instrument for oil production (oil_prod). The rationale is that while latitude can influence oil production due to geological distribution, it is unlikely to be directly correlated with the polity score (a measure of democracy), except through its effect on oil production. This helps address potential endogeneity issues, where oil production might be influenced by other factors that also affect the polity score.

Latitude affects geological formations and climate, which in turn influence the distribution and accessibility of natural resources, including oil. Regions at certain latitudes are more likely to have oil reserves due to historical geological processes (Sovey and Green 2011). Latitude affects the historical patterns of colonization,agriculture, and settlement, which indirectly influence economic and institutional development. However, these historical influences are mediated through their effects on natural resources and economic development rather than having a direct impact on contemporary political outcomes like democracy (Acemoglu, Johnson, and Robinson 2001).

Sovey and Green’s paper, “Instrumental Variables Estimation in Political Science: A Readers’ Guide”, offers an extensive review of the instrumental variables (IV) approach in political science. The paper examines over 100 studies published in top-tier journals, including *American Journal of Political Science*, the *American Political Science Review*, and *World Politics* , spanning a 24-year period (@ Sovey and Green 2011). In their paper, Sovey and Green do not provide empirical proof of the exogeneity of

specific instruments but rather discuss the general principles and conditions under which instrumental variables (IVs) are considered valid. Latitude and other geographical variables are determined by natural and historical processes that are independent of contemporary political and economic outcomes. For example, the distribution of natural resources like oil is influenced by geological formations that occurred millions of years ago, which are unrelated to current political structures. In addition, geographical features cannot be influenced or manipulated by current political regimes. This isolation from political decision-making processes supports their use as exogenous instruments. In their paper they highlight several papers that successfully implemented geographical variables as instruments.

For example, Hall and Jones (2003) use proximity to the equator as an instrumental variable for social infrastructure. The reasoning behind it is that, distance from the equator affects disease burden and colonial history, which in turn impact institutions and economic performance.

One of the critical assumptions for a valid instrument is that it should not be directly correlated with the dependent variable, except through its effect on the endogenous explanatory variable. Latitude is considered exogenous to political outcomes like the Polity Score. While it influences oil production, it is unlikely to have a direct effect on democratic governance, making it a suitable instrument.

In the paper by Miguel, Satyanath, and Sergenti (2004) rainfall variations are used as instrument for economic growth in Sub-Saharan Africa. Rainfall shocks affect economic growth, which in turn impacts the likelihood of civil conflict, but rainfall itself is not directly related to political conflict. This approach exemplifies the use of natural and geographical variables as valid instruments in political economy studies, demonstrating their effectiveness in isolating causal impacts.

Using latitude as an instrument aims to provide more reliable estimates of the causal effect of oil production on democracy by removing biases due to omitted variable bias or reverse causality.

I first perform first-stage regression to evaluate if latitude is a good instrument for oil-production.

3.1.1 First stage regression

[1] “Instrument is sufficiently strong.”

In Table 4 The coefficient for latitude is 0.034 with a standard error of 0.009. This coefficient is statistically significant at the 1 % level. This indicates that for each unit increase in latitude, oil production increases by 0.034 units. The model is based on 917 observations, providing a substantial sample size for the regression analysis. The F statistic for the regression is 13.865 with 1 and 915 degrees of freedom, which is significant at the 1 % level. This high F statistic suggests that latitude is a

Tabelle 4: First stage regression

	<i>Dependent variable:</i>
	oil_prod
lat	0.034*** (0.009)
Constant	13.292*** (0.355)
Observations	917
R ²	0.015
Adjusted R ²	0.014
Residual Std. Error	7.080 (df = 915)
F Statistic	13.865*** (df = 1; 915)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

sufficiently strong instrument for predicting oil production. Overall, table 2 provides robust evidence supporting the use of latitude as an instrumental variable in the regression analysis of oil production. The significant coefficients and the high F statistic validate the relevance and strength of latitude, ensuring its suitability for addressing endogeneity concerns in the subsequent stages of the analysis.

Latitude also satisfies the second condition of exogeneity. Latitude is a geographical variable and exogenous to political and economic variables.

Scatter plot “Actual vs Fitted Values” shows the relationship between latitude and oil production, with a fitted regression line. There is a positive correlation as indicated by the upward slope of the blue regression line. The data points are clustered more densely around certain latitudes, particularly between 0 and 50 degrees. This could suggest that oil production is higher in these regions. The presence of a fitted line with a positive slope and the confidence interval suggests that latitude is a significant predictor of oil production, but the spread of data points indicates that it is not the sole determinant. The strength of the instrument (latitude) in predicting oil production is supported by the statistical significance of the F-statistic from the first-stage regression.

3.1.2 Second stage regression

Table 3 presents the results of the second stage regression analysis of an Instrumental Variables (IV) approach. The model is based on 853 observations, providing a robust sample size for the analysis. In the second stage regression analysis, the oil production is -0.356 suggesting a negative relationship

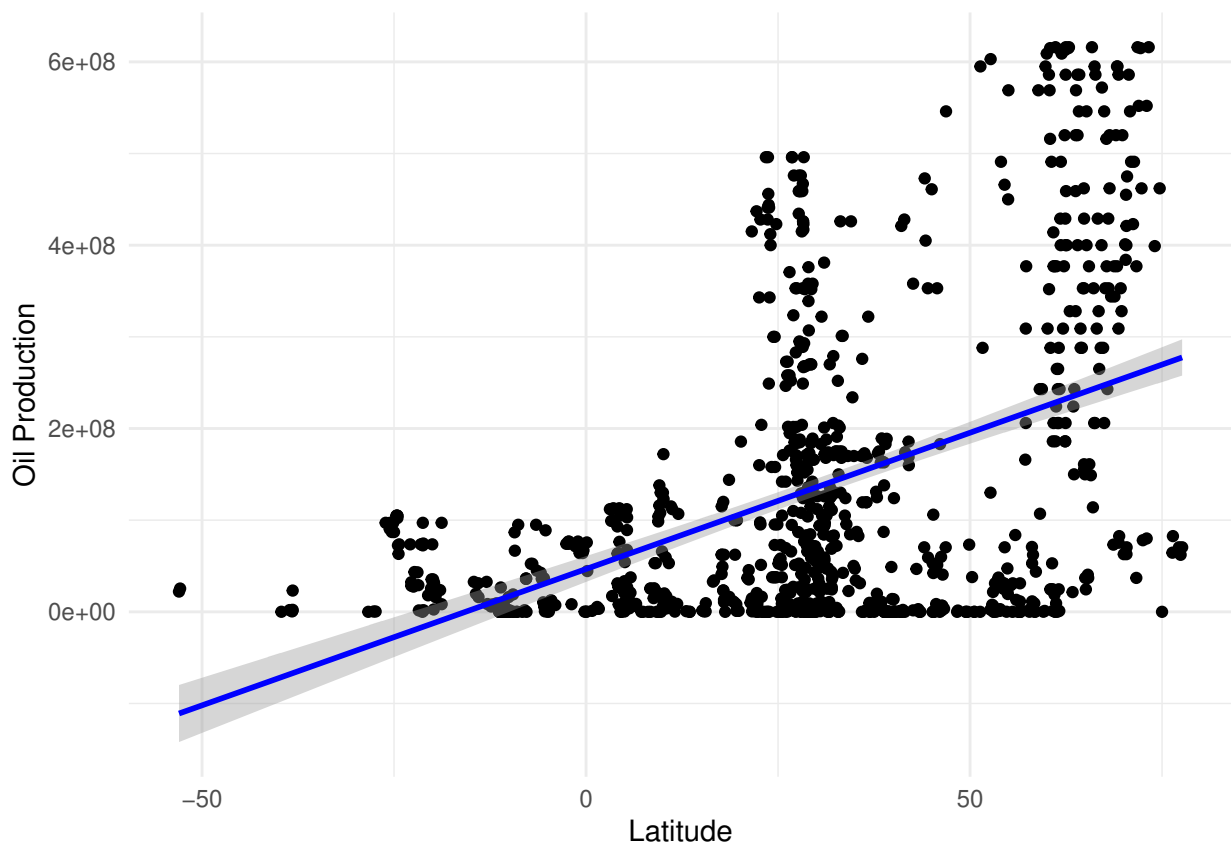


Abbildung 3: Actual vs Fitted Values

between oil production and polity. The coefficient is statistically significant. GDP per capita and Population have a positive coefficient, indicating that higher values of these variables are associated with higher Polity scores. The sovereign variable has a large positive coefficient, suggesting a strong positive relationship with Polity. Islam and british colony dummy have negative coefficients indicating a negative relationship with polity. The R^2 value is 0.576 suggests that about 57.6% of the variance in polity is explained by the model. Table 3 provides comprehensive insights into the factors influencing democratic governance using an Instrumental Variables approach. The results highlight the negative causal impact of oil production on democracy, the positive role of economic development, and the significant effects of sovereignty and cultural factors.

Tabelle 5: Second stage regression

	<i>Dependent variable:</i>	
	polity	
	<i>OLS</i>	<i>instrumental variable</i>
	(1)	(2)
oil_prod	−0.000*** (0.000)	−0.356*** (0.118)
Pop	−0.00001*** (0.00000)	0.109 (0.189)
sov	8.074*** (0.479)	10.844*** (0.672)
GDP	0.0002*** (0.00002)	0.0002*** (0.00002)
isl	−11.260*** (0.427)	−10.315*** (0.551)
bcd	−0.939 (1.095)	−1.665 (1.299)
lat	0.002 (0.008)	
Constant	−4.223*** (0.567)	−4.932*** (1.551)
Observations	894	853
R ²	0.648	0.576
Adjusted R ²	0.645	0.573
Residual Std. Error	4.882 (df = 886)	5.346 (df = 846)
F Statistic	232.541*** (df = 7; 886)	

Note:

*p<0.1; **p<0.05; ***p<0.01

4 Conclusion

This thesis investigates the impact of sustained oil production on democratic governance across 78 oil-producing countries from 1932 to 2014, employing an instrumental variable (IV) approach to address potential endogeneity concerns. The analysis shows a clear negative relationship between oil production and democratic governance, based on the Polity Index. These results suggest that higher levels of oil production are associated with slower transitions to democracy, thereby reinforcing the “resource curse” hypothesis that natural resource wealth can hinder democratic development.

The results of this study are consistent with and add to the broad literature on the political consequences of natural resource wealth. Earlier works, such as Ross (2001) and Tsui (2011), have demonstrated that countries with abundant oil resources are more likely to experience authoritarian regimes and slower democratic transitions. Ross (2001) employed cross-country regression techniques to show a negative correlation between oil wealth and democracy, while Tsui (2011) utilized global oil price shocks as an instrument to capture the exogenous variation in oil revenue. This thesis builds upon these foundations by using oil production data, which reflects the revenue-generating capacity of countries over time, rather than relying solely on oil price shocks or new discoveries.

Furthermore, this study introduces a novel methodological contribution by using latitude as an instrumental variable to isolate the causal impact of oil production on political outcomes. Latitude is a geographical variable that influences the distribution of natural resources, such as oil, but is exogenous to contemporary political outcomes. This innovation allows for a clearer understanding of how sustained oil production, rather than mere discoveries or price fluctuations, influences democratic development. This approach is consistent with the arguments made by Mehlum, Moene, and Torvik (2006) and Dunning (2008), who emphasize the role of institutional quality in mediating the effects of resource wealth. By employing an innovative IV strategy, this thesis offers a more robust examination of the relationship between oil wealth and democratic governance.

To ensure the validity of the instrumental variable approach, this study conducted both first-stage and second-stage regressions. The first-stage regression was essential in establishing that latitude is a strong instrument for oil production. The results showed a statistically significant coefficient for latitude and a high F-statistic, confirming that latitude is a relevant predictor of oil production. This is important because it demonstrates that the chosen instrument is not weak, thereby satisfying one of the key conditions for a valid IV approach. The strength of latitude as an instrument is attributed to its impact on the geological distribution of oil reserves, which is independent of contemporary political outcomes.

The second-stage regression utilized latitude as an instrument to estimate the causal effect of oil production on democratic governance. The results indicated a significant negative coefficient for oil production, confirming that higher oil production levels are causally linked to lower Polity scores. This finding is consistent with the “resource curse” hypothesis and reinforces the arguments made by Ross (2001), Tsui (2011), and others regarding the negative impact of resource wealth on democratic outcomes. The use of an instrumental variable approach addresses endogeneity concerns, such as reverse causality and omitted variable bias, which have been significant challenges in previous research. By leveraging this methodology, the study provides more reliable and unbiased estimates of the impact of oil production on democratic governance.

The findings of this study have important policy implications. They suggest that the negative effects of oil wealth on democracy are likely to be exacerbated in countries with weaker institutional frameworks. In such contexts, oil revenues can concentrate economic power in the hands of political elites, reduce accountability mechanisms, and erode civic engagement, as governments rely more on resource revenues than on taxation. This highlights the critical need for policy interventions that promote transparency, accountability, and good governance in resource-rich countries. Establishing robust institutional frameworks capable of managing resource revenues effectively and equitably is essential to mitigate the potential negative effects of oil wealth on democratic governance.

Moreover, the results underscore the importance of context-specific approaches to managing resource wealth. For instance, countries like Norway, which have strong institutions and transparent management of oil revenues, have avoided the negative political consequences often associated with the “resource curse.” In contrast, countries with weaker governance structures, such as Nigeria and Venezuela, have experienced significant declines in democratic governance in tandem with rising oil revenues. These contrasting cases suggest that policy measures tailored to enhance institutional capacity, enforce the rule of law, and ensure fair distribution of resource wealth can help mitigate the adverse effects of oil production on democracy.

This thesis contributes to the existing literature by providing new empirical evidence on the causal impact of sustained oil production on democratic governance. By using a novel instrumental variable approach, it advances the methodological rigor of studies on the resource curse, offering a more robust understanding of the intricate relationship between natural resource wealth and political regimes. It demonstrates that the adverse effects of oil wealth on democracy persist even after accounting for potential confounders, such as economic development, population size, cultural factors, and historical legacies.

Future research could build upon these findings by exploring the mechanisms through which oil production affects democratic governance in more detail. For example, qualitative case studies could provide deeper insights into how specific institutional arrangements, political dynamics, and governance practices influence the relationship between resource wealth and democracy. Additionally, future studies could examine other forms of natural resource wealth, such as natural gas or minerals, to determine if similar patterns appear across other resources.

In summary, this thesis confirms the adverse effects of giant oil discoveries on democratic transitions and offers new insights into the complex relationship between natural resource wealth and political regimes. By employing a robust instrumental variable approach using latitude, the study provides more reliable and unbiased estimates of the impact of oil production on democratic governance. It highlights the conditions under which resource wealth can hinder democratic development and underscores the importance of policy interventions aimed at promoting transparency, accountability, and good governance. Ultimately, this research contributes to a deeper understanding of the dynamics of the resource curse and suggests pathways for mitigating its negative effects on democracy.

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