

THE IMPACT OF OIL DEPENDENCE ON DEMOCRACY

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ABSTRACT

In this thesis I assess whether the oil dependence of a nation, measured as the percentage of that nation's exports derived from fuel sales, negatively affects a nation's level of democracy as proposed previously in the literature (eg. Ross, 2001). This paper builds upon previous research by using fixed effects models to analyze whether oil dependence is related to levels of democracy. This paper also attempts to identify variables that might confound the relationship between oil dependence and democracy: the Rentier effect, repression, and modernization. Analysis shows little evidence, both statistically and magnitudinally that a nation's dependence on oil negatively affects democracy. Additionally, there is little evidence that any of the three proposed mechanisms have a statistically significant relationship with democracy.

The research and writing of this thesis
Is dedicated to everyone who helped along the way.

Many thanks,
Charles Covel

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INTRODUCTION

It has been well documented that a wealth of natural resources can have unexpected, negative consequences on the economic health of a nation. The natural resource curse, sometimes known as Dutch Disease referring to the adverse effects on the Dutch manufacturing industry following the discovery of natural gas in the 1960s, can result in a nation suppressing manufacturing and technology industries in order to fully invest in the easy money that comes from natural resources. The influx of cash makes imports cheap and exports uncompetitive and the rise in imports drastically hurts the domestic industrial sector, resulting in deindustrialization. This lack of development in other industries can adversely affect the nation's economic health for years to come (Corden, 1984; Krugman, 1987).

More recently, political scientists and economists have begun to look at the relationship between natural resources and democracy. The idea that oil and democracy are contradictory is often used to explain why the high-income states of the Middle East have not become democratic when many studies have shown that when incomes rise, governments tend to become more democratic. Recent studies though suggest that the oil-impedes-democracy claim is both valid and statistically robust (Ross, 2001; Aslaksen, 2010; Vicente 2010). The 2001 paper by Ross found that oil does greater damage in poor states than rich ones and that a rise in oil exports will harm democracy in nations even when exports are relatively small (Ross, 2001). The quality of a country's institutions has also been shown to affect the impacts of natural resources (Mehlum et al., 2006a and 2006b). Ross' study also found that the harmful influence of oil applies not only to nations in the Middle East, but to oil-rich nations throughout the world including Indonesia, Malaysia, Mexico, and Nigeria, and it may have similar effects on the oil-rich nations of Central Asia.

There has been contradicting literature as well. Alexeev and Conrad (2009), for example, claim that the long-term effects of natural resources has been on net positive, and the negative effects on democracy are not valid. Issues of endogeneity are also commonly cited. If nations with high quality institutions better utilize their natural resources, the impact of resource wealth on institutions and democracy is endogenous (Mehlum et al., 2006a and 2006b). There is also evidence that the amount of oil discovered is potentially endogenous (David and Wright, 1997).

The purpose of this thesis is to improve upon previous studies and to resolve the conflict among authors as to whether oil has anti-democratic effects. Most studies have run simple ordinary least squares (OLS) models; this thesis will compare the results of OLS regressions to fixed effects models to take into account nation specific effects. The fixed effects effectively control for the underlying fixed institutional status in each country, otherwise unobserved. Additionally, this thesis will look to identify variables and mechanisms that confound the relationship between oil dependence and democracy. The most commonly cited potential causal mechanisms are the Rentier effect, a repression effect, and a modernization effect which is directly related to Dutch Disease. Many of these effects have been studied, but weak proxies have been used in the past.

The primary data sources for this study come from the World Development Indicators which includes a data set that lists fuel sales as a percentage of gross domestic product (GDP). This measurement can be more specifically seen as a measure of oil dependence. Though this measure is arguably endogenous with democracy (Mehlum et al., 2006a and 2006b) it may more accurately reflect the potential effect of oil on democracy. I argue that it is dependence on oil, not possession of oil that links this natural resource wealth to democracy. The primary research question that will be asked is does oil dependence affect democracy?

In the remainder of the paper I will first review current literature that analyzes the effect of natural resource wealth on nations. I will present the three primary mechanisms – the Rentier effect, the repression effect, and the modernization effect – that have been argued to link oil dependence and democracy. This paper will not look to determine whether they are causal mechanisms but whether they influence the relationship between oil dependence and democracy. I will then present the data and in the Analysis Plan I will in more detail describe the models and the variables that will be analyzed. The Descriptive Statistics will compare, using selected descriptive indicators and proxy variables for the mechanisms described above, nations where more than 50% of exports are from oil products with nations where less than 50% of exports are from oil products. Next, I will present models relating oil dependence to democracy. Tables will present ordinary least squares and fixed effects models to compare the change in the relationship between oil dependence and democracy when holding constant country specific effects. Finally, I will discuss how these results compare to previous studies and the policy implications of this paper.

LITERATURE REVIEW

It has been widely argued that natural resource wealth can have unexpected, negative consequences on the economic health of a nation. Often known as the Dutch disease, referring to the adverse effects on the Dutch manufacturing industry following the sudden discovery of natural gas in the 1960s, a wealth of natural resources can lead to a decreased growth rate. This is due to the appreciation of the exchange rate which reduces the competitiveness of other industries in the nation. The increase in imports can result in deindustrialization and a lack of development, adversely affecting the nation's economic health for years to come (Corden, 1984; Krugman, 1987). There has been research contradictory to the negative impacts of resource wealth as well. Alexeev and Conrad (2009) found that large endowments of oil or minerals enhances long term growth and demonstrated this by focusing on the levels of per capita GDP rather than on growth rates.

This economic issue has more recently become a question of social policy as the role of institutions on the effect of natural resources has become a key question. Mehlum, Moene, and Torvik (2006a; 2006b) use statistical analysis to show that the quality of institutions greatly affects whether natural resources act as a curse. They also showed that when countries with weak institutions have a wealth of resources, they suffer doubly in that there is also a deterioration of institutions which enhances the negative effects of Dutch Disease. A country with strong institutions is likely to invest wisely when resources are discovered. A country with weak institutions is more likely to have to feel the effects of Dutch Disease through poor resource management and investment. This can further deteriorate institutional quality, strengthening the negative effects of the natural resources (Mehlum et al., 2006b). This study was corroborated by

Boschini, Pettersson, and Roine (2007) who found that it is the combination of poor institutions and resource wealth that has a negative effect on economic development.

This research has in many cases focused specifically on the effect that oil has on democracy. Barro (1999) was among the first to study this, using a dummy variable for oil-exporting nations to show that oil wealth negatively affects both electoral rights and civil liberties. Two years later, Ross (2001) confirmed that oil does indeed impede democracy and that the harmful influence of oil is not restricted to the Middle East. He also showed that nonfuel mineral wealth impedes democracy and that a rise in oil exports did more harm in oil-poor states than in oil-rich nations, implying that even states that are not wholly dependent on oil are still negatively impacted by their oil wealth.

Ross' hypothesis has been supported by many others since. Thomas Friedman's article, *The First Law of Petropolitics*, though descriptive and not scientific, discusses specific examples of how the rising price of oil negatively impacted democracy in Iran and Nigeria (Friedman, 2006). Vicente used a difference-in-difference estimator in 2010 comparing Sao Tome and Principe to Cape Verde. Both are island nations in West Africa that gained independence from Portugal in 1975 after having been Portuguese colonies for nearly 500 years. The nations also had very similar political regimes between 1975 and 1997. During the period 1997-1999, the existence of offshore oil in Sao Tome and Principe was announced while no oil has been found in Cape Verde. The natural experiment shows evidence of a political resource curse with corruption rising in Sao Tome and Principe when compared to Cape Verde (Vicente, 2010).

Several studies have brought to the forefront certain issues that have called into question the relationship between oil and democracy. If the quality of institutions affects how natural

resource wealth is utilized as argued by Mehlum, Moene, and Torvik (2006a; 2006b) then there is clearly an issue of endogeneity when looking at the effect that natural resource wealth has on democracy. There is also evidence that the amount of oil discovered is potentially endogenous (David and Wright, 1997). They also argue that exploration efforts are dependent upon the political attributes, both observable and unobservable, of a country. To address some of these concerns, Aslaksen (2010) demonstrates that the relationship between oil and democracy is still negative when using a fixed effects model. Tsui (2011) attempted to use exogenous variables for oil wealth including the size of the oil deposit and the quality and other cost-determining attributes of oilfields. By utilizing these variables, he argues that the case of oil discoveries, rather than oil wealth, is a more credible way to estimate the impact of oil on democracy. His study found that the discovery of 100 billion barrels of oil, approximately Iraq's initial endowment, drove a nation's democracy level almost 20 percentage points below trend (using the Polity IV dataset, Tsui normalized the polity index on a scale of 0-1 resulting in measures of democracy to be measured as percentages unlike the majority of studies). The estimates are less precise when measuring oil abundance per capita rather than on the level.

While there is still controversy concerning whether or not oil wealth affects democracy, most studies conclude that there is indeed a negative relationship between the two. What remains to be researched is the mechanism that links oil dependence and democracy. Three primary mechanisms were posited by Ross (2001): the rentier effect, the repression effect, and the modernization effect. I would also posit that related to the repression effect, the presence of natural resource wealth is correlated with civil wars and insurgency, destabilizing what may have been democratic institutions. This would be due to the higher economic rents coming from the

control of resources. The risk-reward ratio of overthrowing the current government would tilt towards higher rewards, increasing the potential gains from a coup.

The Rentier Effect

Hazem Beblawi defined a rentier state to be one in which the rents are paid by foreign actors directly to the state (Beblawi, 1987). The general argument with regard to how the rentier effect negatively impacts democracy is that governments use the revenues from oil to relieve social pressures on citizens. One way this can be done is through taxation. Due to the size of revenues from oil, governments are able to tax their population less, potentially decreasing the demand for accountability (Ross, 2001). Friedman twists the famous revolutionary phrase “no taxation without representation” for this application, stating “no representation without taxation (Friedman, 2006).” Lower taxes lead to a decreased demand for leadership change.

The second component of the rentier effect is increased government spending (Ross, 2001). Crystal (1989) found the governments of Kuwait and Qatar became less accountable to the merchant class following the discovery of oil. The benefits of oil are distributed to nationals, making them healthier, better housed, and better educated in those two states. Free education and health care, along with subsidized goods and services, directly improve the livelihoods of nationals. The demand for public goods is being met, decreasing the demand for regime change. Ross also has developed a group formation effect in which the government prevents social groups independent from the state from forming, preventing a demand for democracy (Ross, 2001). Ross tested these separate mechanisms for the rentier effect using taxes as a percentage of GDP, government consumption as a percentage of GDP to test the spending effect, and the share

of GDP accounted for by government activity which implies that as governments increase in size relative to the domestic economy the formation of social groups is less likely (Ross, 2001).

The Repression Effect

The repression effect claims that governments use resource wealth to increase security funding. This may be purely in self interest where an authoritarian government wishes to suppress any populist uprisings, or to respond to growing regional or ethnic conflict which may be related to resource wealth (Ross, 2001). Nigeria provides a prime example of the detrimental effects of oil. The Movement for the Emancipation for the Niger Delta (MEND) is an armed group that has staged attacks against the multinational oil companies and the Nigerian governments (CNA, 2009). These civil wars and insurgent groups destabilize what could otherwise be stable institutions. This effect is consistent with Collier's research that suggests that natural resource wealth increases the likelihood of civil war (Collier, 2003). Smith (2004) found that though oil wealth is associated with increased regime durability, repression does not account for this increase.

The Modernization Effect

The modernization theory suggests that social and cultural changes, including increased education and urbanization, lead to a rise in democracy. With increased education levels, the public becomes more articulate and is able to better organize and communicate, forcing a more democratic government. Additionally, when occupational specialization is used as a proxy for modernization, shifts in the workforce to the secondary and tertiary sectors produce a more autonomous workforce with specialized skills that has more bargaining power against elites (Ross, 2001). The oil industry does not require a specialized or highly educated national

workforce and therefore suppresses modernization. It is important to note that the modernization effect is a social mechanism rather than a political one.

One of the goals of this thesis is to understand whether any of the three mechanisms potentially affect the link between resource wealth and democracy. Ross finds that there is support for the three primary causal mechanisms discussed earlier but the focus of his research was to link resource wealth to democracy and not to identify the mechanism. Additionally, this thesis will use fixed effects modeling in addition to OLS regressions to identify whether oil dependence negatively affects democracy. This will control for country specific effects such as institutional quality that otherwise cannot be observed.

CONCEPTUAL FRAMEWORK AND HYPOTHESIS

The primary hypothesis advanced in the literature that this thesis will address is whether oil dependence has a negative impact on democracy. To test this hypothesis, I will use both OLS and fixed effects modeling. Fixed effects models will control for country specific effects such as institutional quality that otherwise cannot be observed. This thesis will additionally attempt to identify whether variables that represent the Rentier effect, repression effect, and modernization effect change the relationship between oil dependence and democracy. Oil wealth is additionally linked to income and growth by bringing money into the country and income has been shown to positively affect democracy (Ross, 2001). Measures of income have also been shown to be affected by democracy, creating potential endogeneity issues (Mehlum et al., 2006b). Finally I plan to control for some demographic variables such as population, regional indicators, development indicators, and religious affiliations. It has been previously suggested that the combination of Islam and oil wealth negatively impacts democracy although Ross (2001) demonstrated that non-Islamic nations were also negatively impacted by oil wealth.

DATA

The data used for this thesis combines variables from three publically available data sets: The World Development Indicators (WDI), the Polity IV Annual Time-Series (Polity IV), and the Major Episodes of Political Violence (MEPV) and Conflict Regions, 1946-2008 from the Center for Systemic Peace (CSP) (Marshall, 2010). The final dataset for this report includes 125 countries with a population of at least five hundred thousand in 2010, the set of nations in the Polity IV dataset. The time period covered is from 1980-2008.

World Development Indicators

The World Development Indicators are a collection of development indicators compiled by the World Bank using a variety of officially recognized international sources including the World Health Organization; the United Nations Educational, Scientific, and Cultural Organization (UNESCO); and the International Energy Agency (IEA). The dataset includes observations from 244 nations, territories, and regions (hereafter referred to as nations) from 1960 to 2010. Observations are made annually for each nation; however, time series for individual countries are not necessarily complete. Because each indicator is collected by different organizations, there are a variety of collection strategies.

The primary variable in this dataset that will be used is *oil dependence* which is measured as the percentage of merchandise exports that are fuel exports. Fuels are defined by SITC section 3 (mineral fuels) and include coal, petroleum and petroleum products, and natural gas. The fuel exports are estimated by the World Bank staff using the Comtrade database maintained by the United Nations.

The primary issue comes from missing data. Certain nations must be dropped entirely due to the underreporting of information. This may cause a selection bias if less developed countries are more likely to be missing information and less developed countries are expected to be less democratic.

Polity IV Annual Time-Series

The Polity IV is an annual, cross-country dataset analyzing levels of democracy and autocracy while indicating regime changes for all independent countries with a total population greater than five hundred thousand in 2010. In total, there are 164 countries in 2010 included in the dataset. The dataset includes observations for nations from 1800-2010 but this paper will only utilize the data from 1980 onwards; many variables from the WDI dataset were not regularly collected before this date.

There are two main variables in the dataset, one rating *democracy* and one rating *autocracy*, both of which are comprised of other indicators. *Democracy* is a composite of three interdependent elements: the presence of institutions and procedures through which citizens can effectively voice their preferences concerning policies and leaders, constraints on the powers of the executive, and the guarantee of civil liberties to all citizens. The *democracy* indicator is on an eleven point scale (0-10). *Autocracy* is similarly on an eleven point scale (0-10) and is comprised of codings of the competitiveness of political participation, the openness and competitiveness of executive recruitment, and constraints on the chief executive. The two indicators are non-overlapping and independent. *Autocracy* is made negative (-10 – 0) and combined with *democracy* to form the overall polity index on a scale from -10 – 10 with -10 representing “most autocratic” and 10 representing “most democratic.” I make further modifications to this index. First, following Ross (2001), I rescale it by adding 10, implying it ranges from 0 to 20 with 20

representing “most democratic.” Second, I normalize the variable by subtracting off the sample mean and dividing by the standard deviation, implying negative values are more autocratic and positive numbers are more democratic. The normalized variable eases interpretation.

The datasets are combined by matching year and countries. This becomes complicated due to differences in identifying what constitutes a nation. While the WDI includes only current countries and identifies them by their current names, Polity IV includes all versions of current countries. Therefore, Germany only exists as a nation beginning in 1990 with East and West Germany existing before 1990. This also holds true for nations that have broken apart including the USSR and Yugoslavia. The possible methods for dealing with this include leaving the nations as separate, adding parent nations (USSR) to only their main breakaway (Russia), or by adding the observations of parent nations to all breakaway states. This analysis utilizes the last approach by adding parent nations to all states so that the data for the USSR from 1980 to 1990 is included for all nations that were once part of the Soviet Union.

Major Episodes of Political Violence (MEPV), 1946-2008

The MEPV dataset is a regularly updated, cross-national dataset. The dataset defines Major episodes of political violence as the use of lethal force by organized groups that result in at least 500 deaths. Episodes are assigned a magnitude-of-impact score on an eleven point scale (0-10) with the score being entered for each year of the designated time span for each country considered directly affected. A country involved in military intervention that takes place solely in a foreign territory is generally not considered to be “directly affected” by the episode. Episodes are separated into seven distinct categories of armed conflict and magnitude scores are considered consistent and comparable across categories (Marshall, 2010). The variable that will

be used in this research combines all seven categories. If more than one episode occurs in a nation in a single year, the episode scores are summed and that sum is entered for that variable in the data set.

ANALYSIS PLAN

In order to test the hypothesis that oil dependence impedes democracy, this paper will conduct a regression analysis using a pooled time-series cross-country data set which includes nations with a population greater than five hundred thousand in 2010. The time period that will be analyzed will cover years 1980 through 2008. Both OLS and fixed effects models will be utilized in the analysis. OLS models have traditionally been used in previous analyses and have shown robust results (Ross, 2001) but fixed effects models help to account for unchanging institutional characteristics that cannot be measured that may be unique to nations. Fixed effects models have also been used to show a statistically significant relationship between oil wealth and democracy (Tsui, 2011).

Relating Oil Dependence and Democracy

The initial regressions will establish whether there is a relationship between oil dependence and democracy holding constant selected descriptive indicators previously shown to affect democracy. This basic model is:

$$Democracy_{i,t} = a_1 + b_1(Oil_{i,t}) + b_2(Income_{i,t}) + b_3(Islam_i) + b_4(OECD_i) + b_5(Region_i) + \varepsilon_{i,t}$$

Where i is the country and t is the year.

Democracy, the dependent variable, comes from the Polity IV data set and is specified on the 0-20 scale described above in the Descriptive Statistics and as the normalized version in the Analysis.

Oil is an independent variable measuring the dependence on oil of a nation. Oil dependence is measured as the percentage of merchandise exports that are fuel exports. Fuels are defined by SITC section 3 (mineral fuels) and include coal, petroleum and petroleum products,

and natural gas. This variable provides a measurement for the relative importance of fuels in the domestic economy.

Income is the first control variable, measured as the natural log of per capita GDP. Per capita income has been shown to be correlated with democracy in a variety of papers (Ross, 2001).

Islam is a control variable that measures the Muslim percentage of the state's population in 2009. Islam has been shown to have a statistically significant influence on a state's regime and is therefore an important variable for which to control (Ross, 2001; Tsui, 2011). The data is from the Pew Research Center and is the percentage of a nation's population that is Muslim (Pew, 2009).

OECD is a dummy variable coded 1 for states that are members of the Organization for Economic Cooperation and Development. Researchers have found that states of the OECD are significantly more likely to be democratic than nations in the developing world although there is no general consensus as to why. Controlling with this dummy variable helps to take into account any effects that come from being a developed, Western state (Ross, 2001).

Region is meant to account for regional effects that cannot be easily measured. It has been argued that nations in the Middle East and Africa are less prone to democracy regardless of their dependence on oil (Ross, 2001).

The Rentier Effect and Democracy

To measure the rentier effect proxy variables will be added to the initial regression. The new model is:

$$Democracy_{i,t} = a_1 + b_1(Oil_{i,t}) + b_2(Income_{i,t}) + b_3(Islam_i) + b_4(OECD_i) + b_5(Region_i) + b_6(Taxes_{i,t}) + b_7(Government\ Consumption_{i,t}) + b_8(Health\ Expenditures_{i,t}) + u_{i,t}$$

Taxes measures the percentage of a government's revenue that comes from taxes. Lower taxes can lead to a decreased pressure to change leaders (Crystal, 1989).

Increased government expenditures have the same impact as lower taxes; governments spend more money to raise employment rates or relieve social pressures, decreasing the pressure to change leaders. *Government Consumption* measured as a percentage of GDP and *Health Expenditures* measured as the percentage of GDP spent on public health will help account for this.

Repression and Democracy

To measure the repression effect proxy variables and variables measuring conflict will be added to the initial regression. The new model is:

$$Democracy_{i,t} = a_1 + b_1(Oil_{i,t}) + b_2(Income_{i,t}) + b_3(Islam_i) + b_4(OECD_i) + b_5(Region_i) + b_6(Military\ Expenditures_{i,t}) + b_7(Conflict_{i,t}) + u_{i,t}$$

Conflict will be measured using the Major Episodes of Political Violence (MEPV) and Conflict Regions, 1946-2008 from the Center for Systemic Peace. This data base identifies all conflicts between 1946 and 2008. This will help identify whether oil wealth leads to more conflict and if it is this added conflict that leads to decreased levels of democracy. A conflict is defined as, "The systemic and sustained use of lethal force by organized groups that result in at

least 500 directly-related deaths over the course of the episode (Marshall, 2010).” Conflicts in bordering states and regional states will also be included as separate variables.

Military Expenditures as a percentage of GDP will help to account for government repression in the form of enhanced military spending that does not necessarily result in conflict.

Modernization and Democracy

To measure the effect of modernization on democracy, proxy variables will be added to the initial regression. The new model is:

$$\begin{aligned} Democracy_{i,t} = & a_1 + b_1(Oil_{i,t}) + b_2(Income_{i,t}) + b_3(Islam_i) + b_4(OECD_i) + b_5(Region_i) + \\ & b_6(Secondary\ Enrollment_{i,t}) + b_7(Cellphones_{i,t}) + b_8(Internet_{i,t}) + b_9(Urbanization_{i,t}) + b_{10}(Men\ in \\ & Industry_{i,t}) + b_{11}(Women\ in\ Industry_{i,t}) + b_{12}(Men\ in\ Service\ Sectors_{i,t}) + b_{13}(Women\ in\ Service \\ & Sectors_{i,t}) + u_{i,t} \end{aligned}$$

Secondary Enrollment will identify what percentage of the population engages in secondary education. As people become more educated it is argued that the pressure for democracy increases. It is measured as the gross enrollment rate in secondary education.

Cellphones is measured as the number of cellphone subscriptions per 100 people. *Internet* is measured as the number of internet users per 100 people. These proxy variables measure the access to technology within a country. It is easy to see how the use of these technologies was critical in the recent Arab Spring with social networking being the primary method of organizing protests.

Urbanization is the percentage of the population that lives in urban areas.

Occupational Specialization will be controlled for using variables for men and women participating in the agriculture, industrial, and service sectors. Each variable is measured as the

proportion of members of each gender who are members of that occupational group. Shifts in the workforce to the secondary and tertiary sectors produce a more autonomous workforce with specialized skills that has more bargaining power (Ross, 2001).

Full Analysis

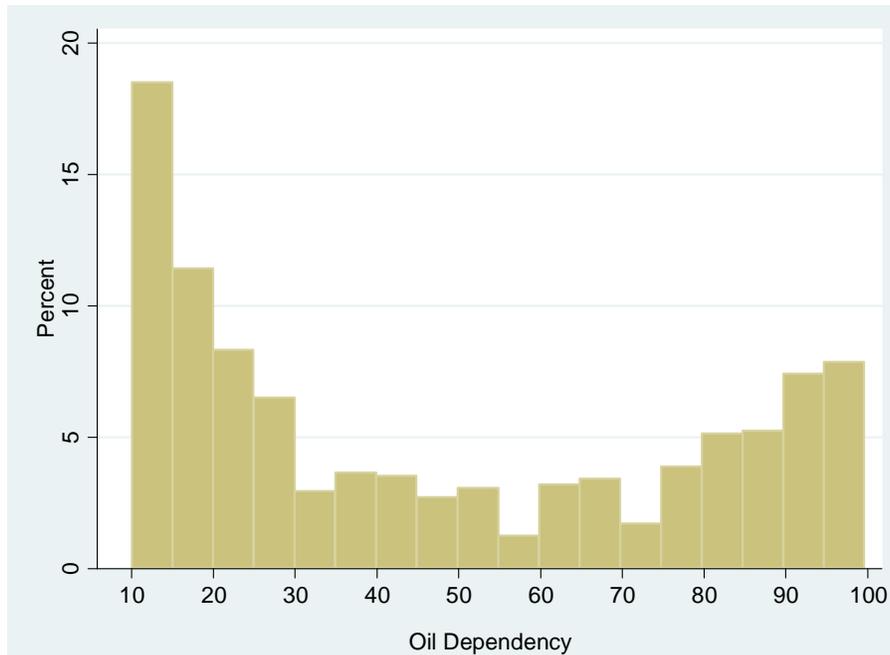
If all three causal mechanisms are shown to be correlated with democracy, a full analysis will be conducted using all of the variables previously discussed. The full model is:

$$\begin{aligned} Democracy_{i,t} = & a_1 + b_1(Oil_i) + b_2(Income_i) + b_3(Islam_i) + b_4(OECD_i) + b_5(Region_i) + b_6(Taxes) + \\ & b_7(Government\ Consumption) + b_8(Health\ Expenditures) + b_9(Conflict) + b_{10}(Military \\ & Expenditures) + b_{13}(Cellphones) + b_{14}(Internet) + b_{15}(Urbanization) + b_{16}(Secondary \\ & Enrollment) + b_{17}(Men\ in\ Industry) + b_{18}(Women\ in\ Industry) + b_{19}(Men\ in\ Service\ Sectors) + \\ & b_{20}(Women\ in\ Service\ Sectors) + u_{i,t} \end{aligned}$$

With this many variables, missing data will become an issue as observations drop out due to missing variables. There is also the potential that the fixed effects model will have problems due to a lack of variation, since many of these variables may not vary much within a nation. When I estimate the “full” analysis, I use a stepwise regression technique to pull out variables that are far from having a significant relationship with $Democracy_{i,t}$.

DESCRIPTIVE STATISTICS

Chart 1: Distribution of Oil Dependence (10-100)



As Table 1 shows fuel consists of less than half of a nation's exports in 2454 observations compared to just 369 observations where fuel consists of more than half of a nation's exports, or for 86% of observations fuel exports consist of less than half of total exports. In fact, fuel exports consist of less than 10% of exports for more than 65% of observations. Chart 1 shows the distribution of nations where fuel exports consist of between 10% and 100% of total exports to better show the relative distribution. It can easily be seen that the majority of nations are either below 30% or above 75%. Because relatively few observations are in the middle, I compare nations where more than 50% of exports are from oil products with nations where less than 50% of exports are from oil products.

For all of the descriptive statistics samples are not weighted; small nations and large nations are weighted equally. This may skew some of the data but the descriptive statistics are meant to be more illustrative and give the reader a reference point to some statistics that may

explain differences among oil dependent and non-oil dependent nations. Population will be an explanatory variable in the analysis section because it is likely that there are differences between large and small nations.

Table 1. Selected Descriptive Indicators of Nations, by Oil Dependence, 1980-2008

	< 50% Exports From Oil Products	> 50% Exports from Oil Products
Polity	15.1 (6.01)	7.67 (7.10)
ln(GDP)	24.3 (2.12)	24.2 (1.25)
ln(Population)	16.3 (1.55)	16.1 (1.65)
OECD (1 = yes)	0.324 (0.468)	0.051 (0.22)
Percentage Islam in 2009	17.5 (32.2)	60.6 (40.5)
<i>Number of Observations</i>	2368	354

Note: Standard deviations in parentheses below the coefficients

As can be seen in Table 1, there is little difference in either the GDP or population on average of nations whose exports from oil total less than 50% of their total exports compared to nations whose exports from oil total more than 50% of their total exports¹. There is a huge difference though in the polity index with nations who have a decreased dependence on oil having 7 more points on a 20 point scale. Also, a far greater percentage of nations with a decreased dependence on oil are members of the Organization for Economic Co-operation and Development (OECD) and have lower percentages of practicing Muslims. These relationships between oil exports and Muslim population and OECD status are not causal in nature but are clearly correlated as will be shown in the results section.

¹ For a description of all variables including means, standard deviations, minimums and maximums, please refer to Table 10 in Appendix A

Table 2. Proxy Variables for the Rentier Effect of Nations, by Oil Dependence, 1980-2008

	< 50% Exports From Oil Products	> 50% Exports from Oil Products
Health Expenditures as a percentage of GDP	4.01 (2.03)	2.86 (1.46)
Taxes as a percentage of government revenue	56.8 (13.3)	38.0 (25.7)
Government Consumption as a percentage of GDP	15.9 (5.16)	16.1 (5.31)
<i>Number of Observations</i>	897	99

Note: Standard deviations in parentheses below the coefficients

Next consider variables that will be used to measure the Rentier effect in Table 2. We find that the average government consumption, measured as a percentage of GDP, does not vary much based on oil dependence. On average though, nations not very dependent on oil exports earn a greater percentage of their total revenue through taxes. This supports the theory that governments exporting large amounts of oil are less beholden to their citizens for support. This statistic though does not describe the tax rates of nations so it does not describe the individual burden each citizen faces, just a government's dependence on taxes to raise revenue.

Table 3. Proxy Variables for the Repression Effect of Nations, by Oil Dependence, 1980-2008

	< 50% Exports From Oil Products	> 50% Exports from Oil Products
Conflicts	0.56 (1.53)	0.75 (1.53)
Conflicts, Bordering Nations	2.67 (4.63)	3.47 (3.99)
Conflicts, Regional Nations	11.7 (9.09)	16.0 (9.44)
Military Spending	2.21 (1.64)	5.40 (8.60)
<i>Number of Observations</i>	1767	234

Note: Standard deviations in parentheses below the coefficients

In Table 3 we consider variables used for measuring the repression effect. A conflict is defined as, “The systemic and sustained use of lethal force by organized groups that result in at least 500 directly-related deaths over the course of the episode (Marshall, 2010).” Table 3 shows that nations for which fuel exports make up a larger amount of their total exports are involved in a greater number of conflicts. Additionally, nations dependent on oil on average have bordering and regional nations in conflicts. This is likely due not to oil dependence but to the observation that the regions in which many oil rich nations have higher rates of conflict. Oil dependent nations also spend on average more than double a percentage of their GDP (5.40%) on military spending than non-oil dependent nations (2.21%).

Table 4. Proxy Variables for the Modernization of Nations, by Oil Dependence, 1980-2008

	< 50% Exports From Oil Products	> 50% Exports from Oil Products
Secondary Education	85.4 (24.8)	75.0 (21.9)
Industry, Female	17.1 (7.18)	12.6 (6.32)
Industry, Male	32.2 (8.99)	28.9 (9.66)
Services, Female	67.6 (19.0)	70.5 (19.3)
Services, Male	48.9 (10.7)	50.2 (9.74)
Cell Phones	28.4 (37.8)	31.7 (40.1)
Internet	13.9 (21.3)	11.7 (19.8)
Urban	65.0 (16.9)	58.1 (27.4)
<i>Number of Observations</i>	1346	122

Note: Standard deviations in parentheses below the coefficients

Next consider variables that measure the modernization effect in Table 4. As Table 4 shows, on average 86% of citizens in nations less dependent on oil exports obtain secondary

education compared to nations greatly dependent on oil wealth where only 76% of citizens earn a secondary education on average. Less oil dependent nations are also more urbanized. However there is not a significant difference in the average composition of the workforce of these two groups of countries. The numbers of cell phone and internet users out of 100 people are also comparable between the two groups. It should be noted that these numbers are very low due to the nature of this study. Because it is a cross-country panel data set dating back to 1980, a significant number of observations will have 0 cell phone or internet users because the technologies were not yet pervasive until the most recent decade.

REGRESSION RESULTS

Relating Oil Dependence and Democracy

The basic OLS models described in Table 5 were performed using Stata which was able to utilize 2820 country-year observations from 125 states. These OLS regressions are used to determine whether *oil dependence* has a significant effect on *democracy* when holding selected indicators constant. The indicator variables selected have been shown previously to significantly affect democracy and include the natural log of GDP, the natural log of population, a dummy variable coded 1 if the nation is a current OECD member and a 0 otherwise, the percentage of the population of a country that was Muslim in 2009, and regional variables coded 1 if a nation resides in either the Middle East or Africa, respectively, and 0 otherwise. *Oil dependence* is measured as the percentage of a nation's merchandise exports that come from fuel sources as defined by SITC section 3 (mineral fuels). *Democracy* is a normalized measure of polity defined in the Polity IV data set.

The results in Table 5 show that *oil dependence* is statistically significant and negative as predicted, even when controlling for religious and regional effects in Model 3. However, though statistically significant, the actual impact of oil dependence is far smaller than other variables. An increase in oil dependence of 1 percentage point is predicted to decrease democracy by only 0.006 standard deviations. A nation that is in the Middle East or Africa is predicted to have a democracy level more than 0.3 standard deviations less than similar nations outside of these regions. A member of the OECD is predicted to have a polity score more than 0.4 standard deviations more than non-OECD states. Perhaps most interesting, a 1% increase in *GDP* is predicted to increase *democracy* by 0.1 standard deviations. Therefore, if oil exports increase

GDP, the effects may offset each other depending on the relationship between oil exports and GDP.

Table 5. The Effect of Oil Dependence on Democracy Controlling for Selected Descriptive Indicators, 1980-2008

	(1)	(2)	(3)
	OLS	OLS	OLS
Oil Dependence	-0.00737*** (0.00272)	-0.00674** (0.00272)	-0.00622** (0.00276)
GDP (log)	0.123** (0.0589)	0.134** (0.0589)	0.102* (0.0614)
Population (log)	-0.116 (0.0750)	-0.138* (0.0765)	-0.116 (0.0774)
OECD	0.373* (0.192)	0.376* (0.197)	0.419** (0.202)
Islam	-0.0108*** (0.00205)	-0.00944*** (0.00221)	-0.00789*** (0.00205)
Middle East		-0.290 (0.224)	-0.398* (0.227)
Africa			-0.343** (0.157)
Observations	2,719	2719	2719
R-squared	0.467	0.473	0.482

* significant at the 0.1 level; **significant at the 0.05 level; *** significant at the 0.01 level

Note: Clustered standard errors are in parentheses below the coefficients. Ordinary least squares regressions are run using Stata 11.0. Each regression is run with dummy variables for every year (but one) covered by the data.

The Rentier Effect and Democracy

Table 6 describes the effect of *oil dependence* on *democracy* when holding constant proxy variables for the rentier effect. Model 1 is an OLS model while Models 2 – 4 are fixed effects models used to control for country specific effects that cannot be measured. Models 1 and 4 hold constant *tax revenue*, *government consumption*, and *health expenditures*. In both of these models *oil dependence* loses its statistical significance. Models 2 and 3 hold constant *tax revenue*

and Model 3 holds constant *government consumption*. In these fixed effects models *oil dependence* is statistically insignificant in the negative direction with very similar predicted effects compared to Table 5. Even in Models 1 and 4 where *oil dependence* is not statistically significant the predicted effect remains relatively unchanged.

Table 6. The Effect of Oil Dependence on Democracy Controlling for the Rentier Effect using Proxy Variables, 1980-2008

Model	(1) OLS	(2) FE	(3) FE	(4) FE
Oil Dependence	-0.00471 (0.003)	-0.00590 (0.004)	-0.00602 (0.004)	-0.00284 (0.004)
GDP (log)	-0.0124 (0.074)	0.0540 (0.067)	0.0524 (0.067)	0.00545 (0.063)
Population (log)	-0.0107 (0.100)	0.114 (0.734)	0.111 (0.742)	0.168 (0.677)
Tax Revenue	0.00308 (0.003)	-0.00472 (0.005)	-0.00474 (0.005)	-0.00333 (0.005)
Government Consumption	-0.0300** (0.013)		-0.00089 (0.008)	0.00666 (0.016)
Health Expenditures	0.132*** (0.046)			-0.0699* (0.035)
Observations	996	1,148	1,139	996
R-squared	0.549	0.080	0.080	0.059
Number of Countries		110	109	108

* significant at the 0.1 level; **significant at the 0.05 level; *** significant at the 0.01 level

Note: Clustered standard errors are in parentheses below the coefficients. Ordinary least squares regressions and fixed effects models are run using Stata 11.0. Each regression is run with dummy variables for every year (but one) covered by the data. OLS models are run with regional dummy variables and dummy variables for OECD status as well as a variable with the proportion of the population that is Muslim.

Repression and Democracy

Table 7 describes the effect of *oil dependence* on *democracy* when holding constant proxy variables for repression. Model 1 is an OLS model while Models 2 – 4 are fixed effects models used to control for country specific effects that cannot be measured. Models 1 and 4 hold constant *military spending*, conflicts that a nation is involved in, conflicts in bordering states, and

conflicts in the region of a nation. Models 2 and 3 hold constant *military spending* while Model 3 holds constant for conflicts that a nation is involved in. In all of the models *military spending* is insignificant and therefore does not affect the relationship between *oil dependence* and *democracy*. Conflicts in bordering and regional nations are also generally insignificant although in the OLS Model 1 conflicts in regional states do have a small negative effect on democracy.

Table 7. The Effect of Oil Dependence on Democracy Controlling for the Repression Effect using Proxy Variables, 1980-2008

Model	(1) OLS	(2) FE	(3) FE	(4) FE
Oil Dependence	-0.00860*** (0.002)	-0.00340 (0.002)	-0.00326 (0.002)	-0.00313 (0.002)
GDP (log)	0.0652 (0.056)	0.0940 (0.064)	0.0585 (0.075)	0.0642 (0.075)
Population (log)	-0.0552 (0.065)	0.432 (0.434)	0.381 (0.437)	0.412 (0.424)
Military Spending	-0.0291 (0.021)	-0.00143 (0.004)	0.000604 (0.004)	-0.000299 (0.004)
Conflicts	0.0574* (0.031)		-0.0553* (0.028)	-0.0573** (0.028)
Bordering Conflicts	-0.0189 (0.021)			0.00139 (0.012)
Regional Conflicts	-0.0119* (0.007)			0.00281 (0.003)
Observations	1,998	2,016	1,998	1,998
R-squared	0.566	0.103	0.113	0.115
Number of Countries		122	121	121

* significant at the 0.1 level; **significant at the 0.05 level; *** significant at the 0.01 level

Note: Clustered standard errors are in parentheses below the coefficients. Ordinary least squares regressions and fixed effects models are run using Stata 11.0. Each regression is run with dummy variables for every year (but one) covered by the data. OLS models are run with regional dummy variables and dummy variables for OECD status as well as a variable with the proportion of the population that is Muslim.

In Models 3 and 4 which account for conflict, the effect of *oil dependence* on *democracy* becomes statistically insignificant. Even when significant as in Models 1 and 2 the magnitudinal effect is very small. The OLS regression in Model 1 though highly significant predicts that for an

increase in *oil dependence* of 1 percentage point, *democracy* will decrease by only 0.009 standard deviations. In the fixed effects models the coefficient on *oil dependence* remains fairly constant and comparable with models in previous tables although the significance changes depending on the model.

The variable *conflicts* obtained from the Major Episodes of Political Violence dataset is worth looking at more closely. Though statistically significant in Models 1, 3, and 4, it changes signs depending on whether the model is Ordinary Least Squares or fixed effects. In Model 1 it is predicted that for each additional conflict a nation's democracy level will increase by 0.057 standard deviations. In Model 4 it is predicted that for each additional conflict a nation's democracy level will instead decrease by 0.057 standard deviations. Model 4, by accounting for country specific effects that are difficult to measure, is a better model, but the sign difference is worth noting.

Modernization and Democracy

Table 8 describes the effect of *oil dependence* on *democracy* when holding constant proxy variables for modernization. Model 1 is an OLS model while Models 2 – 4 are fixed effects models used to control for country specific effects that cannot be measured. Though statistically significant in Model 1, *oil dependence* is not statistically significant in the fixed effects models when holding constant proxy variables for modernization. And again, even when statistically significant, the magnitudinal significance of *oil dependence* on *democracy* is small. There are still some interesting results though.

Models 3 and 4 hold constant occupational indicators for men and women in the industrial and service sectors (the third sector is the agricultural sector which should be larger in

less modern countries). The only of these variables with any significance is *men in industry* which is highly significant in the positive direction in both models. Both models predict that a 1 percentage point increase in *men in industry* will lead to on average a 0.03 standard deviation increase on *democracy*.

Table 8. The Effect of Oil Dependence on Democracy Controlling for Modernization using Proxy Variables, 1980-2008

	(1)	(2)	(3)	(4)
	OLS	FE	FE	FE
Oil Dependence	-0.00578** (0.003)	-0.00362 (0.005)	0.00093 (0.002)	0.00248 (0.004)
GDP (log)	0.192** (0.074)	-0.0850 (0.112)	-0.00654 (0.1105)	-0.124 (0.128)
Population (log)	-0.222*** (0.081)	-0.0113 (0.579)	-0.121 (0.490)	-1.474* (0.814)
Cellphones	-0.000027 (0.003)	-0.00209 (0.001)		-0.00246 (0.002)
Internet	-0.00350 (0.002)	-0.00435* (0.002)		-0.00576* (0.003)
Urban	-0.00414 (0.003)	0.0173 (0.014)		0.0402** (0.018)
Women in Industry	-0.0118 (0.008)		-0.00443 (0.008)	-0.00707 (0.007)
Men in Industry	0.0173** (0.008)		0.0314*** (0.010)	0.0359*** (0.012)
Women in Services	-0.00973* (0.005)		-0.00075 (0.007)	-0.00243 (0.007)
Men in Services	0.0170** (0.008)		0.00132 (0.008)	0.00512 (0.009)
Secondary Education	-0.00284 (0.003)			-0.00415 (0.003)
Observations	1,468	2,719	1,718	1,468
R-squared	0.537	0.230	0.199	0.285
Number of Countries		125	111	107

* significant at the 0.1 level; **significant at the 0.05 level; *** significant at the 0.01 level

Note: Clustered standard errors are in parentheses below the coefficients. Ordinary least squares regressions and fixed effects models are run using Stata 11.0. Each regression is run with dummy variables for every year (but one) covered by the data. OLS models are run with regional dummy variables and dummy variables for OECD status as well as a variable with the proportion of the population that is Muslim.

What is most interesting is that when controlling for occupational variables the coefficient on *oil dependence* becomes positive, though still statistically insignificant. This may be explained by the countries that drop out when holding these variables constant. There are 125 countries in the dataset but only 111 provide these occupational indicators and only 107 provide both occupational indicators and the information required for *secondary education*. It is likely that this is not random and therefore affects the results.

Internet and *urban* are also statistically significant although in opposite directions. An increase in the number of internet users out of 100 is predicted to decrease a nation's democracy score while a more urban nation is predicted to have a higher democracy. Though the magnitudes of the coefficients on these variables are very different it is difficult to compare them due to the way the variables are measured; how does a 1 percentage point increase in *urban* compare to an increase of one internet user per 100 people?

Full Analysis

Table 9 compares an OLS model to a fixed effects model holding constant proxy variables for the Rentier effect, repression, and modernization after removing the least significant variables. The only variable in Model 1 with any significance is *health expenditures* which predicts that for a 1 percentage point increase there will be, on average, a 0.09 standard deviations increase in *democracy*.

Oil dependence is negative but neither statistically nor magnitudinally significant in both Models 1 and 2. The only variables that significantly affect *democracy* when controlling for country specific effects are *population*, *health expenditures*, and *men in services*. The effect of health expenditures changes when using a fixed effects model going from a positive effect to a

negative effect. Model 2 predicts that an increase of 1 percentage point in public spending on health as a percentage of GDP would decrease expected democracy levels by 0.09 standard deviations in support of the Rentier effect. Model 2 also contradicts the modernization effect by predicting that an increase in men in service industries will decrease levels of democracy.

Table 9. Regressions Describing Effect of Oil Wealth on Polity, 1980-2008

	(1)	(2)
	OLS	FE
Oil Dependence	-0.00487 (0.003)	-0.000315 (0.005)
GDP (log)	-0.0766 (0.087)	-0.136 (0.144)
Population (log)	0.108 (0.100)	-1.985* (1.168)
Tax Revenue	0.00305 (0.003)	-0.00587 (0.004)
Government Consumption	-0.00316 (0.008)	0.0176 (0.026)
Health Expenditures	0.0886** (0.038)	-0.0944** (0.047)
Conflicts	-0.00751 (0.030)	-0.0283 (0.054)
Cellphones	0.000245 (0.002)	-0.00164 (0.002)
Urban	-0.00436 (0.004)	0.0561 (0.037)
Men in Industry	0.00283 (0.005)	0.017 (0.011)
Men in Services	0.00532 (0.008)	-0.0156* (0.009)
Observations	732	732
R-squared	0.642	0.176
Number of Countries		93

*significant at the 0.1 level; **significant at the 0.05 level; *** significant at the 0.01 level

Note: Clustered standard errors are in parentheses below the coefficients. Ordinary least squares regressions and fixed effects models are run using Stata 11.0. Each regression is run with dummy variables for every year (but one) covered by the data. OLS models are run with regional dummy variables and dummy variables for OECD status as well as a variable with the proportion of the population that is Muslim.

It should be noted that selection bias may be influencing these results. It is not a random selection of countries that are dropped from the dataset due to underreporting. As can be seen in the Descriptive Statistics, when measuring the Rentier effect 72% of nations highly oil dependent are dropped compared to 62% of nations not dependent on oil exports. For the repression effect 34% of nations highly dependent on oil are dropped compared to 26% and for the modernization effect 66% of nations highly dependent on oil are dropped compared to 44%. Because dropped observations do not appear to be random there may be selection bias.

DISCUSSION

The evidence found in the previous section of this thesis contradicts much of the previous literature on the relationship between oil wealth and democracy. This paper has been modeled after Ross's 2001 paper, "Does Oil Hinder Democracy?" and though the OLS regressions are generally consistent with this prior paper in that there is a statistically significant relationship between oil wealth and democracy, the fixed effects models indicate that there is little or no statistical relationship between oil wealth and democracy once you control for these effects (Ross, 2001).

To directly compare, Table 4 in Ross is comparable to Table 11 which is the same as Table 5 but uses a 21 point scale (0-21) for democracy score opposed to a normalized democracy score and can be found in Appendix A. Ross finds a 1 percentage point increase in oil dependence will result in a 0.0204 point decrease in democracy on an 11 point scale when holding region constant. Table 11 predicts that a 1 percentage point increase in oil dependence will result in a 0.0412 point decrease in democracy on a 21 point scale. Though the models are not exactly the same (Ross uses a lag and also controls for previous democracy score), were I to change the scale to an 11 point scale and change the coefficient accordingly, the predicted decrease would be 0.0215 points, very similar to Ross's predicted 0.0204 points.

When controlling for country specific effects by using fixed effects models, the statistical significance on the coefficient measuring *oil dependence* goes away. None of the ten fixed effects models presented in this paper show *oil dependence* to be related to democracy in a statistically significant manner. Even were *oil dependence* found to be highly statistically significant, the predicted relationship is magnitudinally very small. The largest predicted coefficient on *oil dependence* is Table 6, Model 3 and is -0.00602 which implies that a 1

percentage point increase in *oil dependence* would lead to only a 0.006 decrease in *democracy* standard deviations. Table 12 in Appendix A is the same as Table 6 but uses a 21 point scale for *democracy* and predicts a 0.0399 point drop in *democracy* with a 1 percentage point increase in oil dependence in Model 3.

Since “Does Oil Hinder Democracy?” was published in 2001 there have been articles arguing that oil dependence as measured by Ross and in this thesis is the incorrect measurement to use for oil wealth because of issues with endogeneity. Tsui (2001) attempts to deal with this issue by using exogenous variables including the size of oil deposits and the quality of the oil, as well as other cost-determining attributes of oilfields. Though oil dependence is endogenous with institutional quality as shown by Mehlum et al. (2006a and 2006b) I believe that the endogeneity issue strengthens these results. If a nation with weak institutions is likely to rely more on easy-to-access, highly profitable natural resources, and reliance on natural resources weakens democracy, it would be expected that oil dependence would have a larger negative impact on democracy. The potential bias caused by endogeneity strengthens the finding that there is no significant relationship between oil dependence and democracy.

There is also little support for any of the three causal mechanisms proposed by Ross independent of linking oil dependence to democracy (Ross, 2001). The Rentier effect, repression and modernization do not appear to negatively impact democracy. This result may be due to poor proxy variables. It is difficult to measure repression and modernization and there may be important variables that are being missed. It makes sense that the most important factors are being accounted for by using a fixed effects model to hold constant country specific effects. If variables that truly represent repression or modernization are identified and measured there may be more support for a relationship.

The finding that there is little or no relationship between oil dependence and democracy provides potentially interesting political consequences. One stated goal of the United States over the past 10 years has been to spread democracy. From a foreign policy perspective, were the relationship found to be significant, a focus on decreasing a nation's economic dependence on oil exports and supporting industrial diversity would be a potential method of increasing democracy. Additionally, significant results would advise domestic policy in nations with new oil discoveries. These nations would be advised to use wealth gained from fuel exports to diversify industry.

These results do not imply that the developed world should not support diversified industries in developing nations; the resource curse has long been shown to have detrimental effects on nations. It is possible that these effects can affect the long term democratic prospects of a nation although those impacts are beyond the scope of this paper. The developed world should try to support diversification whenever possible to help build economic stability. However, if democracy is the primary concern in the short term, it does not appear that a nation's dependence on oil is a large contributing factor and therefore developed nations should be more concerned with factors that are much larger contributors to democracy and quality of life.

APPENDIX A: ADDITIONAL TABLES

Table 10. Descriptive Statistics of Select Variables, 1980-2008

Variable	Obs	Mean	Std. Dev.	Min	Max	Variable Definitions
Polity	2727	14.2	6.65	0	20	Polity Score (0-20) with 20 = Most Democratic
Oil Dependence	2722	16.4	27.1	0	99.7	Export value of mineral-based fuels defined by SITC 3 as a percentage of merchandise exports
GDP (log)	2727	24.3	2.03	18.9	30.3	Natural log of the national GDP (billion US\$)
Population (log)	2724	16.3	1.56	12.3	21.0	Natural log of the population of a country
OECD	2727	0.289	0.453	0	1	Dummy variable for whether a country is a member of the OECD
Islam	2727	23.0	36.4	0	99.5	Percentage of a country's population that is Muslim in 2009
Health Expenditures	1627	3.57	1.95	0	11.5	Public Health Expenditures as a percentage of GDP
Taxes	1156	54.0	16.8	0.349	103	Taxes as a percentage of government revenue
Government Consumption	2662	15.8	6.11	2.05	76.2	Government consumption as a percentage of GDP
Conflicts	2703	0.638	1.60	0	10	Total summed magnitudes of all societal and interstate major episodes of political violence
Conflicts, Bordering Nations	2703	3.05	5.08	0	34	Sum of all MEPV magnitude scores for all bordering states
Conflicts, Regional Nations	2703	13.5	10.8	0	53	Sum of all MEPV magnitude scores for all regional states
Military Spending	2024	2.56	3.46	0.083	117	Military spending as a percentage of GDP
Secondary Education	2200	73.8	29.9	5.18	162	Gross enrollment in secondary education
Industry, Female	1718	16.8	7.39	0.400	50.2	Percentage of female workforce in industry
Industry, Male	1718	31.4	9.03	4	58.3	Percentage of male workforce in industry
Services, Female	1718	67.3	19.4	2	98.7	Percentage of female workforce in services
Services, Male	1718	48.8	11.2	12.5	84.4	Percentage of male workforce in services
Cell Phones	2727	19.6	33.0	0	188	Cellphone subscriptions per 100 people
Internet	2727	8.74	17.4	0	90.5	Internet users out of 100 people
Urban	2727	57.5	22.0	8.5	100	Percent of population in urban areas

Table 11. The Effect of Oil Dependence on Democracy Controlling for Selected Descriptive Indicators, 1980-2008

	(1)	(2)	(3)
Oil Dependence	-0.0488*** (0.018)	-0.0446** (0.018)	-0.0412** (0.018)
GDP (log)	0.816** (0.390)	0.890** (0.390)	0.675* (0.407)
Population (log)	-0.769 (0.497)	-0.913* (0.506)	-0.771 (0.512)
OECD	2.470* (1.272)	2.490* (1.303)	2.774** (1.339)
Islam	-0.0716*** (0.014)	-0.0625*** (0.015)	-0.0522*** (0.014)
Middle East		-1.923 (1.48)	-2.634* (1.501)
Africa			-2.274** (1.042)
Observations	2,719	2,719	2,719
R-squared	0.467	0.473	0.482

* significant at the 0.1 level; **significant at the 0.05 level; *** significant at the 0.01 level

Note: Clustered standard errors are in parentheses below the coefficients. Ordinary least squares regressions are run using Stata 11.0. Each regression is run with dummy variables for every year (but one) covered by the data.

Table 12. The Effect of Oil Dependence on Democracy Controlling for the Rentier Effect using Proxy Variables, 1980-2008

Model	(1) OLS	(2) FE	(3) FE	(4) FE
Oil Dependence	-0.0312 (0.021)	-0.0391 (0.024)	-0.0399 (0.026)	-0.0188 (0.028)
GDP (log)	-0.0818 (0.492)	0.358 (0.448)	0.347 (0.444)	0.0361 (0.419)
Population (log)	-0.0709 (0.662)	0.753 (4.861)	0.736 (4.915)	1.110 (4.484)
Tax Revenue	0.0204 (0.023)	-0.0313 (0.035)	-0.0314 (0.035)	-0.0221 (0.033)
Government Consumption	-0.199** (0.084)		-0.00588 (0.053)	0.0441 (0.106)
Health Expenditures	0.875*** (0.305)			-0.397* (0.237)
Observations	996	1,148	1,139	996
R-squared	0.549	0.080	0.080	0.059
Number of Countries		110	109	108

* significant at the 0.1 level; **significant at the 0.05 level; *** significant at the 0.01 level

Note: Clustered standard errors are in parentheses below the coefficients. Ordinary least squares regressions and fixed effects models are run using Stata 11.0. Each regression is run with dummy variables for every year (but one) covered by the data. OLS models are run with regional dummy variables and dummy variables for OECD status as well as a variable with the proportion of the population that is Muslim.

REFERENCES

- Alexeev, Michael and Robert Conrad (2009). "The Elusive Curse of Oil" *The Review of Economics and Statistics*. Vol 9(3), August 2009, pp 586-98
- Aslaksen, Silje (2010). "Oil and democracy: More than a cross-country correlation?" *Journal of Peace Research*. Vol 47(4), pp 421-31
- Barro, Robert J (1999). "Determinants of Democracy." *Journal of Political Economy*. Vol 107(S6), pp S158-S183
- Beblawi, Hazem and Giacomo Luciani (1987). "The Rentier State in the Arab World." *The Rentier State*. New York: Croom Helm, pp 51
- Boschini, Anne D. Jan Pettersson and Jesper Roine (2007). "Resource Curse or Not: A Question of Appropriability" *The Scandinavian Journal of Economics*. Vol 109(3), pp 593-617
- CNA Analysis and Solutions (2009). "Powering America's Defense: Energy and the Risks to National Security."
- Collier, Paul (2003). Breaking the conflict trap: civil war and development policy. World Bank
- Corden, W.M. (1984). "Booming Sector and Dutch Disease Economics: Survey and Consolidation" *Oxford Economic Papers*. Vol 36(3), pp 359-80
- Crystal, Jill (1989). "Coalitions in Oil Monarchies: Kuwait and Qatar" *Comparative Politics*. Vol 21(4) pp 427-44
- David, P.A. and Wright, G. (1997). "Increasing returns and the genesis of American resource abundance" *Industrial and Corporate Change*. Vol 6(2), pp 203-45.
- Friedman, Thomas L (2006). "The First Law of Petropolitics" *Foreign Policy*. Issue 154, pp 28-36
- Krugman, Paul (1987). "The narrow moving band, the Dutch Disease, and the competitive consequences of Mrs. Thatcher: Notes on trade in the presence of dynamic scale economies" *Journal of Development Economics*. Vol 27(1-2), pp 41-55
- Marshall, Monty G. (2010). "Major Episodes of Political Violence (MEPV) and Conflict Regions, 1946-2008." *Center for Systemic Peace*
- Mehlum, Halvor, Karl Moene and Ragnar Torvik (2006a). "Institutions and the Resource Curse" *The Economic Journal*. Vol 116(508), pp 1-20
- Mehlum, Halvor, Karl Moene and Ragnar Torvik (2006b). "Cursed by Resources or Institutions?" *The World Economy*. Vol 29(8), pp 1117-31
- Pew (2009). "Mapping the Global Muslim Population: A report on the size and distribution of the world's Muslim population." *Pew Research Center*

Ross, Michael Lewin (2001). "Does Oil Hinder Democracy?" *World Politics*. Vol 53(3), pp 325-61

Smith, Benjamin (2004). "Oil Wealth and Regime Survival in the Developing World, 1960–1999" *American Journal of Political Science*. Vol 48(2), pp 232–46

Tsui, Kevin K (2011). "More Oil, Less Democracy: Evidence from Worldwide Crude Oil Discoveries" *The Economic Journal*. Vol 121(551), pp 89-115

Vicente, Pedro C (2010). "Does oil corrupt? Evidence from a natural experiment in West Africa" *Journal of Development Economics*. Vol 92(1), pp 28-38