Oil and Democracy Revisited

Prof. Michael Ross
UCLA Department of Political Science
Los Angeles, CA 90095
mlross@polisci.ucla.edu
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PRELIMINARY DRAFT; COMMENTS WELCOME

Abstract: Recent studies have disputed the claim that 'oil hinders democracy,' or raised questions about the causal mechanisms behind it. I re-examine this question, using an improved measure of petroleum wealth, and a dataset that covers all countries from 1960 to 2002. I also explore other types of evidence on oil and authoritarian rule, including data on public opinion and gasoline prices. The results suggest a) oil wealth strongly inhibits democratic transitions in authoritarian states; b) oil's anti-democratic effects seem to vary over time and across regions: they have grown stronger over time, but do not hold in Latin America; and c) there is little support for most of the alleged causal mechanisms, including two of the three mechanisms suggested by Ross [2001].

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A 2001 article by Ross alleges that "oil hinders democracy," and suggests three causal mechanisms behind this pattern. His was not the first study to make this argument, or test it statistically [Crystal 1990; Barro 1999]. Still, it helped spur many subsequent studies that reached a variety of conclusions: some supported the central finding [Jensen and Wantchekon 2004; Epstein et al. 2006; Ulfelder 2007; Gassebner, Lamla, and Vreeland 2008], or extended the argument in new directions [Egorov, Guriev, and Sonin 2007; Dunning 2008; Goldberg, Wibbels, and Mvukiyehe 2009; Morrison 2009]. Dissenters argued that oil's impact on government accountability does not stand up in alternative statistical tests [Haber and Menaldo 2009; Acemoglu et al. 2008; Horiuchi and Wagle 2008], is true but for different reasons than Ross claimed [Boix 2003; Fish 2005; Tsui 2007], or that oil has both positive and negative effects on the likelihood of democratic transitions, which makes its net impact ambiguous [Herb 2004; Dunning 2008].

The Ross [2001] study had many shortcomings: the model conflated two distinct issues, the survival of authoritarianism and the survival of democracies[1]; its key explanatory variable was not a country's oil wealth, but its dependence on oil exports – a measure that was probably biased in favor of the argument; and the regression results were weakened by missing data, and the use of variables that poorly measured the concepts in the theory.

Here I revisit the central claims in the Ross study, using a more exogenous measure of oil wealth, separating democratic transitions from democratic survival, adding new robustness tests, and employing a dataset that extends from 1960 to 2002 and covers up to 170 states – more than doubling the number of country-year observations available for scrutiny. I find evidence that oil wealth strongly inhibits democratic transitions in authoritarian states, that this pattern is reasonably robust, and that regardless of any possible countervailing pro-democracy effects, oil's net impact on democratic transitions is strongly negative. I also find, however, that oil's undemocratic effects are uneven: they seem to have grown stronger over time, which I argue is due to the rising prevalence of state ownership; but in Latin America, oil has not inhibited democratic transitions, as Dunning [2008] has rightly showed.

I also find that most of the alleged causal mechanisms – including two of the three mechanisms suggested by Ross – either lack statistical support, or are logically unpersuasive. The only one that seems to account for the oil-autocracy link is the 'rentier effect' – the combination of low taxes and high government spending that seems to dampen support for democratic transitions. [2]

The paper begins by introducing the improved measure of oil wealth. Section two provides some observations about the oil-democracy relationship based on a simple analysis of the data. Section three shows that the central pattern – linking higher oil income to a reduced likelihood that authoritarian states will become democratic – holds in a multivariate framework and survives a number of robustness tests. The final section

[1] This point was well made by Ulfelder [2007].

[2] Although it is not the focus of this paper, I find no evidence that non-fuel mineral wealth – when measured as 'mineral rents per capita,' instead of 'mineral exports over GDP' – has any affect on democratic transitions or democratic failures.

explores the evidence for six possible causal mechanisms, but finds empirical support for just one – the rentier effect.

Measuring Oil Wealth

The 2001 Ross paper – like several others before and many since – took as its central variable a country's dependence on hydrocarbon exports, measured as oil, gas, and coal exports as a fraction of GDP. But the measure has two key shortcomings – one conceptual, the other a bias that may have caused a spurious correlation between oil and authoritarian rule.

The measure is flawed conceptually because it only accounts for fuel that is exported – and it is hard to see why fuel that is sold domestically should not be counted. According to the causal mechanisms that I and others have suggested, extracting oil is harmful because of the revenues it generates, either for the government or private elites; but revenues can come from both domestic and foreign sales.

The measure was also biased upwards in poorer countries; since poverty also tends to be correlated with authoritarian rule, this raised the possibility that the link between oil dependence and autocracy was spurious. The ideal measure of a country's oil wealth should be uninfluenced by all other variables of interest. The oil-exports-to-GDP ratio contains biases in both its numerator and its denominator that tend to inflate its value in countries that are poorer, more corrupt, and more conflict-ridden – and which might thereby cause a false correlation with authoritarianism.

Even if two countries produce the same quantity of oil, the numerator – a country's oil exports – will typically be larger in poorer countries. Most oil-producing countries use a fraction of their oil domestically and export the surplus. Rich countries will consume more of their own oil, while poor countries will consume less of it, and hence, export more. For example, on a per-capita basis, the US produces more oil than Angola or Nigeria, but Angola and Nigeria export more than the US – because the US is wealthier than Angola or Nigeria and consumes more of its oil domestically. When we measure oil exports, we are indirectly measuring the size of a country's economy.

A similar problem occurs in the denominator. Even if two countries export the same quantity of oil, the poorer country will have a smaller GDP, and hence, higher oil-exports-to-GDP ratio. This opens the door to several endogeneity problems. For example, having a high oil exports-to-GDP ratio might cause slow economic growth (or corruption, or civil war), but it could also be a result of these ailments, since they tend to reduce a country's GDP. If democracy is influenced by economic growth and violent conflict, this might again bias any estimations.

Here I measure the total value of production instead just exports, and divide it by a country's population, not its total exports or GDP. The resulting measure, *Oil Income per capita,* can be used to test the starkest version of the 'oil hinders democracy' claim: does the value of a country's geological endowment – regardless of how well it is

managed, and how it influences the rest of the economy – affect the accountability of the government?

The *Oil Income* variable also has a more intuitive meaning than the oil exports-to-GDP ratio. If two countries with similar populations produce similar quantities of oil and gas – for example, Angola and the Netherlands – they will have similar levels of *Oil Incomes per capita* (in this case, about $500 per capita in 2003). If we measured them by their oil-exports-to-GDP ratios, however, we'd find Angola's measure (.789) much higher than the Netherlands' (.056), because Angola is too poor to consume much of its own oil (making the numerator larger), and because its GDP is much smaller (making the denominator smaller).[3]

Is *Oil Income* truly exogenous to a country's regime type? The *Oil Income* variable is a function of two underlying factors: a country's geological endowment, which determines the quantity and quality of petroleum that is available; and the investments made in extracting it, which determine how much will be discovered, and commercially exploited, at any given time. The geological endowment should be exogenous, but the investments made in its exploitation will be influenced by a country's economy and government: countries that are wealthier, more open to foreign investment, and provide better legal protections for investors, are likely to have more investment in their petroleum industries [UNCTAD 2007].

Since there is a better investment climate in the advanced industrial countries (which also tend to be more democratic), we should expect, *ceteris paribus*, to see higher levels of *Oil Income* in countries that also more democratic. This suggests the *Oil Income* variable should have a spurious but positive correlation with democracy.[4] The *Oil Income* variable should hence provide a stringent test of the 'oil hinders democracy' hypothesis.

Five Patterns

Before embarking on a regression analysis, it is useful to look at five patterns in the data, which cover 170 countries between 1960 and 2004.

1. Oil Income and Nonoil Income Have Opposite Effects

There is a broad, negative relationship between the income a country receives from petroleum, and the likelihood it will transit to democracy. One way to highlight the strangeness of this pattern is to compare it with the "normal" relationship between income and democratic transitions. In general, income from sources other than petroleum is strongly and positively correlated with the likelihood that an authoritarian state will become (and stay) democratic.

[3] Dunning [2008] uses an almost-identical measure of oil income, covering the same period. Where our models are similar, so are our results. For more on the sources for my measure, see Ross [2008].

[4] Perhaps the preferences of political leaders also influences the extraction rate. If they do, we should expect democratic leaders – who face regular political competition and should normally have higher discount rates – to favor faster extraction than dictators. This again suggests that *Oil Income* will be larger, *ceteris paribus,* in democracies than autocracies.

Figure 1 illustrates this relationship by looking at all 114 countries that were under authoritarian rule in 1960, the first year of the dataset, or became independent after 1960 and were under authoritarian rule in their first year of independence.[5] The values on the x-axis represent a country's average non-oil income between 1960 and 2002; values on the y-axis denote the percentage of the time, between 1960 and 2002, that each country dwelt under a democratic government. Those that were continuously authoritarian have a score of "zero"; and those that transited between democracy and authoritarianism during these years have scores that represent the fraction of this period that they spent under democratic government. The upward-sloping line suggests the general relationship between these two factors: the higher a country's non-oil income, the greater the time it probably spent under a democratic government.[6]

But if we look at income from oil, we see the *opposite* pattern. Figure 2 is identical to Figure 1 in all respects but one: the x-axis now measures a country's income from the production of oil. The fitted line now slopes downward, suggesting that income from oil is *negatively* correlated with democratic transitions.

The broad correlation between oil and authoritarian persistence can also be seen in the cross-tabulations in Table 1. The numbers in the cells represent the percentage of authoritarian states in each category that transited to democracy each year. The first column shows the oil-producing states, and the second shows the non-oil states. I define as "oil states" countries that produce at least $100 per capita, in constant 2000 dollars, of oil and natural gas.

The first row shows that democratic transitions were about 50 percent more likely among the non-oil states than the oil states; the difference is statistically significant at the .05 level in a t-test. This is noteworthy because some studies suggest the net impact of oil wealth (or oil dependence) is ambiguous: while it may hinder democratic transitions through some channels, it allegedly promotes democratization through others [Herb 2004; Dunning 2008; Goldberg, Wibbels, and Mvukiyehe 2009]. Whether or not oil has countervailing pro-democracy effects, these figures suggest oil's net impact on democratic transitions is negative.

2. Oil and Democratic Failure

There are two possible ways that oil might be bad for democracy: it could strengthen authoritarian governments, and it could weaken democracies. This paper focuses on the first effect, but it is worthwhile to briefly examine the second. Table 2 shows the annual rate of democratic failures in oil-producing and non-oil countries across several income and regional categories. Among low-income countries, democratic failures were more

[5] Here and elsewhere, I use the codings developed by Alvarez et.al., and updated by Cheibub and Gandhi [2004], to determine if a country is 'democratic' or 'autocratic.' The dataset includes all 170 states that were sovereign in 2000 and had populations of at least 200,000. For states not coded by Cheibub and Gandhi, I used data from Polity IV, coding as democracies all countries with scores above 5 on the -10 to 10 scale.

[6] There is a great deal of debate about how to interpret this relationship: whether higher incomes promote democracy, whether democracy promotes higher incomes, or whether the two are the joint product of a third, unmeasured variable. For our purposes, however, this debate is irrelevent.

than twice as frequent among the oil producers; among middle and high income countries, there was no strong pattern. The failure of oil-producing democracies seemed most prevalent in Sub-Saharan Africa – a pattern noted by Jensen and Wantchekon [2004] – perhaps because the region includes a large fraction of the world's low-income countries.

Figures 3 and 4 illustrate these patterns by plotting the relationship between oil income and democracy for all countries that were democracies in 1960, or were democratic in their first year of post-1960 independence. Among the high-income states (i.e., states with above-median incomes) shown in Figure 3, the relationship between oil rents and democracy seems to be weakly positive: more oil is associated with greater stability in wealthy democracies. Among low-income countries (Figure 4), the opposite pattern seems to hold: the more oil income these countries accrued, the less time they spent under democratic rule. As the width of the 95 percent confidence interval implies, however, this pattern is based on just a handful of cases. There are probably too few low income democracies – both with and without oil – to draw strong conclusions about this relationship.

3. Oil Producers Missed the Third Wave of Democratic Transitions

The "third wave" of democratic transitions had little effect on oil-producing countries. As Figure 5 shows, between 1978 and 2001 there was a global rise in the number of democracies and a corresponding drop in autocracies, as part of the third wave of democratic transitions. But Figure 6, covering only the 35 countries that can be classified as 'long-term oil producers,' shows little evidence of a third wave, and only a slight democratizing trend. Almost all of the increase in global democracy since 1978 has come from the non-oil states.[7]

Among the petrostates, successful transitions to democracy are rare. Table 3 lists the top ten countries, by oil income, to move from authoritarian to democratic rule since 1945. Venezuela's 1958 transition is at the top of the list. The next four leading producers to democratize were Russia (1991), Nigeria (1979), Ecuador (1979) and the Congo Republic (1992); but all of these transitions were later reversed.[8] This highlights the unusual quality of Venezuela's success: since Venezuela's 1958 transition, no country with more oil income than Mexico in 2000 has become *sustainably* democratic.

One result of this pattern is that since the early 1980s, oil states have made up a growing fraction of the world's remaining authoritarian states. In 1982, long-term oil producers made up about 22 percent (27 of 122) of the world's autocracies; by 2002, this same group of oil producers made up about 34 percent (24 of 71) of the remaining autocratic states. For democracy advocates, the effects of oil have become increasingly salient [see, for example, Diamond 2007].

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[7] I classify countries as "oil producers" if they generated at least $100 per capita (in constant 2000 dollars) in petroleum income for two-thirds of the years between 1960 and 2006; or if they became sovereign after 1960, for two-thirds of their sovereign years. This classification identifies 35 countries as long-term oil producers; they are listed in Appendix 1.

[8] Nigeria and Ecuador later returned to democracy, but after oil income fell to much lower levels.

Another result is that the oil and non-oil states have diverged since the third wave began around 1980. This is evident in Figure 7, which displays the mean Polity scores of the oil and non-oil states over time. Until 1983 the scores were virtually identical; since then, a gap has appeared between the two groups.

Does this imply that oil had no anti-democratic effects before the third wave? That is one way to interpret the cross-tabulations in Table 1, which suggest that oil hindered democratization from 1983 to 2002, but not between 1960 and 1982. Note, however, that the democratization rate among the oil states changed little between the two periods; what changes was the democratization rate among non-oil states. I return to this issue below.

4. Oil Helps Explain the Islamic Democracy Deficit

Many studies argue that states with large Muslim populations are less likely to become democracies [Midlarsky 1998; Fish 2002; Donno and Russet 2004]. This is evident in Figure 8, which shows the Polity scores over time of the world's Muslim and non-Muslim states; the Muslim-majority states have consistently lower scores.[9]

But many Muslim countries are also significant oil producers, which makes it easy to confuse the effects of Islam with the effects of oil production. The problem is compounded by the concentration of major oil producers in the Middle East and North Africa; conceivably it is the region's culture and history, not its oil wealth, that makes it persistently undemocratic.

But the data suggest that oil is an important reason the Islamic countries have been slow to democratize. Figure 9 displays the Polity scores of long-term oil producers, and non-oil producers, in the Islamic world, from 1960 to 2004. The non-oil Islamic states have both higher scores, and show a stronger turn towards democracy since the mid-1980s, than the oil countries. In fact, the non-oil Islamic countries have democratized at roughly the same pace as the non-Islamic countries – thanks to democratic transitions in Senegal, Turkey, Bangladesh and Indonesia. But the Islamic world's oil states have lagged behind.

The pattern is evident in the cross-tabulations in Table 1: Muslim non-oil states have democratized at a rate of 1.9 percent – just slightly below the rate for all non-oil states.[10] But between 1960 and 2002, not a single Muslim oil producer transited to democracy.

This pattern holds both within the Middle East (Figure 10) and outside of it. Although democracy is scarce in the Muslim Middle East, the non-oil countries – such as Jordan,

[9] I define 'Muslim states' as countries with a majority of Muslim citizens. In 2006, forty states had Muslim majorities; seventeen of them were in the Middle East or North Africa.

[10] If we exclude Latin America, the Islamic countries without oil have precisely the same democratization rate (1.9 percent annually) as all other countries without oil.

Lebanon, Morocco, and Djibouti – have been consistently more democratic than the oil-rich countries.[11]

This does not imply that Islamic culture has no effect: both groups of Muslim states – the oil producers and the non-oil producers – have lower Polity scores than the typical non-Muslim state. But oil helps explain why many Muslim-majority countries are less democratic than their non-Muslim counterparts.

5. The Latin American Exception

An important study by Dunning [2008] shows that Latin America seems to be unaffected by the anti-democratic powers of petroleum. Consider once again Table 3, which displays the ten top oil producers that have transited to democracy since 1950. All of the countries that made successful transits were in Latin America: Venezuela (1958), Mexico (2000), Argentina (1983), and Bolivia (1982). Conversely, all of Latin America's oil producers (like almost all of its non-oil producers) are now democracies. In fact, Latin America's long-term oil producers (Argentina, Ecuador, Mexico, Trinidad, and Venezuela) have generally been more democratic than its non-oil producers, although today there is little difference [Figure 11].[12] The cross-tabulations in Table 1 tell the same story: oil-rich autocracies were more likely to democratize in Latin America, but less likely to democratize in the rest of the world.

There are several ways to account for the Latin American anomaly. Dunning [2008] argues that oil only impedes democratization in countries with low levels of inequality; but in countries with high inequality levels, like those in Latin America, oil hastens democratization by alleviating the concern of wealthy elites that democracy will lead to the expropriation of their private wealth.

Although this argument is compelling, it is hard to test with much precision, since global data on inequality are scarce, and often, measured in ways that differ from country to country. Moreover, inequality data are missing for most of the world's oil-dependent countries; in fact, there is a strong *negative* correlation between a country's oil income, and the amount of data it discloses about its inequality levels (Figure 12).

An alternative explanation is the neighborhood effect: maybe any democracy-impeding effects caused by oil were overcome by democratic pressures from neighboring non-oil

[11] Here and elsewhere I use the World Bank's definition of the Middle East and other world regions. It does not include Turkey or Israel – the region's most democratic states, neither of which have oil. Their inclusion would further strengthen the association between oil and authoritarianism in the Middle East. The inclusion of Turkey would also produce a larger democracy gap between the region's Muslim oil producers and Muslim non-oil producers.

[12] In addition to these six long-term oil producers, four other Latin American states (Bolivia, Brazil, Chile, Colombia, Peru and Surinam) have produced significant quantities of oil and gas for briefer periods.

states.[13] But this cannot explain why Latin America's oil producers democratized more quickly than its non-oil producers.[14]

Perhaps timing also matters. May if oil wealth arrives in a country whose citizens have never been politically mobilized, it blocks any movement towards democracy; but if it has already passed a certain threshold of political mobilization – in which political parties, unions, and interest groups have formed and begun to place demands on the government – then the arrival of oil does little to prevent full democratization.[15] Many of Latin America's oil producers – including Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador and Peru – had spells of democracy before they were oil producers. The largest African oil producer to transit to democracy – Nigeria – also had democratic experience before it was a significant oil producer.

Whatever the cause, Dunning is right: oil is broadly associated with more democracy in Latin America. Still, in the rest of the developing world oil is associated with less democracy both across regions and within them – including in the Middle East and North Africa [Figure 13], Sub-Saharan Africa [Figure 14], the former Soviet Union [Figure 15], and Asia [Figure 16].

Regression Analysis

To see whether oil wealth still influences democratic transitions after controlling for other factors, I use both a pooled logit model, with a dichotomous dependent variable to indicate transitions from authoritarian to democratic rule, and a pooled OLS model, using the familiar 21-point Polity scale as the dependent variable.

The claim that 'oil hinders democracy' can be stated in hypothesis form as:

H_1: If authoritarian countries have more income from oil, they are less likely to transition to democracy.

The logit model allows us to estimate the likelihood of a discrete event; this makes it a more appropriate way to determine whether oil income has the predicted effect – reducing the likelihood that an authoritarian state will transit to democracy. The OLS model does not distinguish between oil's hypothesized impact on authoritarian states, and its possible impact on democracies. Still, it is useful to include as a robustness check, to see if oil is still associated with less democracy when using a different measure of regime type.[16]

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[13] On neighborhood effects on democratic transitions, see O'Loughlin et al. [1998]; Gleditsch [2006].

[14] Three of Latin America's oil autocracies (Argentina, Ecuador, and Peru) also shared another distinctive feature: they were all under military rule, and Geddes [1998] has shown that military dictatorships are more likely to transit to democracy than one-party or personalistic dictatorships.

[15] I am grateful to Tulia Faletti for proposing this idea.

[16] The pooled OLS model is much like the OLS model in Ross [2001], which also had a lagged dependent variable, the same control variables, a series of period dummies, and a five-year lag for the right-hand side variables. There are three key differences: the data now cover more countries (170 instead of 113) and years (1960-2004 instead of 1971-1997); the causal variable is now *Oil Income,* rather than oil exports as a

Dependent Variable

For the pooled logit estimations, the dependent variable is *Democratic Transition,* a dummy variable that takes the value "one" in the year that a country changes from authoritarian to democratic rule, and "zero" otherwise. It is derived from the dichotomous democracy-autocracy measure developed by Przeworski et al. (2000) and updated by Cheibub and Gandhi (2004). [17] To fill in missing countries, I use data from Polity IV.[18] The resulting dataset covers all 134 countries that, between 1960 and 2002, were under authoritarian rule for at least one year.

For the pooled OLS estimations, the dependent variable is *Polity,* which is drawn from the Polity IV dataset and represents a country's democracy score minus its autocracy score [Marshall and Jaggers 2008]. To simplify the interpretation, I have rescaled the values to run from 1 to 10, with higher values indicating greater democracy. The Polity data cover all 170 countries, both authoritarian and democratic, that were sovereign in the year 2000 and had populations greater than 200,000.

To reduce serial correlation in the OLS models, I employ an AR(1) process, and take observations from every fifth year, beginning in 1960 [see Acemoglu et al. 2008, Bobba and Covielo 2007, and Aslaksen forthcoming].

Independent Variable

The independent variable of interest is *Oil Income per capita;* it denotes the value of a country's oil and gas production, in constant 2000 dollars, divided by its midyear population.

Control Variables

In both the logit and OLS models, I include the variable *Income,* which measures the natural log of income per capita based on data from the World Development Indicators, with missing observations filled in with adjusted figures from Heston, Summers, and Aten [2004]. Most prior studies of democratization suggest that income is a critical factor: when incomes rise, so does the likelihood that an authoritarian state will become democratic [Londregan and Poole 1996; Barro 1999; Boix and Stokes 2003; Epstein et al 2006].[19]

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fraction of GDP; and instead of using annual observations, I take observations from every fifth year, to reduce autocorrelation.

[17] They define regimes as democracies if they meet all of the following conditions: the chief executive is elected; the legislature is elected; there are at least two political parties; and at least one incumbent regime has been defeated.

My analysis in many ways follows Ulfelder [2007], who uses an event history design to test a similar pair of hypotheses, but develops his own dichotomous autocracy-democracy measure. Our substantive results are similar.

[18] I code missing countries as democracies if they receive scores of '7' or above on the 1-10 Polity scale described below.

[19] Not all studies agree that incomes matter. Przeworski et al. [2000] argue that higher incomes have no effect on the probability that autocratic states will become democracies; Acemoglu et al. [2008] argue that income and democracy may be jointly determined by unobserved factors, like the political institutions that stem from colonial rule. Once they control for these unobserved factors with country fixed effects, they

Both the logit and OLS models also include a series of period dummies – one for each five-year period, beginning in 1960 – to control for temporal patterns and contemporaneous shocks.

The logit model has several additional control variables to model the transition process from authoritarian to democratic rule. The first is *Economic Growth,* which is measured as the year-to-year change in a country's income per capita; according to several studies, economic growth helps autocracies survive [Haggard and Kaufman 1995, Przeworski et al. 2000; Epstein et al. 2006; Gassebner, Lamla, and Vreeland 2008].[20]

The second additional control accounts for a country's history of regime changes. Several studies suggest that when states have prior experience with democracy, it boosts the likelihood of a subsequent transition to democracy [e.g., Gassebner, Lamla, and Vreeland 2008]. To capture this effect, I include *Previous Transitions,* a variable that measures the number of previous democratic transitions a country has undergone since 1946.[21]

Finally, the logit model also includes a variable to account for duration dependence. *Regime Duration* is the natural log of the number of continuous years since 1946 that a country has been under authoritarian rule; it represents the underlying hazard rate. In the robustness section, I show that the *Oil Income* variable is unaffected by differing assumptions about the base hazard rate.[22]

Results

Table 4 displays the pooled logit estimation results. To facilitate comparisons, all of the variables are standardized. To simplify the display, I do not show the coefficients for the period dummies.

Column one includes only the control variables, and shows they are strongly linked to the likelihood of a democratic transition: states with higher incomes, slower growth in the previous year, and prior transitions are more likely to become democratic. Column two includes *Oil Income,* and shows it is negatively correlated with the likelihood of a democratic transition, and statistically significant at the .05 level.

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find that income has no impact on either democratic transitions or democratic failures. See my comment on this debate below.

[20] Conceivably, *Oil Income* may reduce the likelihood of democratic transitions by boosting economic growth; if so, the inclusion of *Economic Growth* should artificially reduce the size and statistical significance of the *Oil Income* variable through a post-treatment effect. Dropping the *Economic Growth* variable indeed boosts the size and significance of *Oil Income* in most specifications. But since *Oil Income* remains significant in the presence of *Economic Growth,* I leave it in the model to help deter omitted variable bias.

[21] I also tested a dummy variable indicating whether a country has had any democratic transitions since 1946; all of the results I report below were unchanged.

[22] None of the additional controls in the logit model are statistically significant in the OLS model, and their inclusion has little substantive effect on the other variables.

In column three, I add the variable *Islam,* which represents the Muslim fraction of the population and is taken from Barrett [1982]. The *Islam* variable is negative and significantly correlated with *Democratic Transitions,* and its addition to the model causes a 20 percent (?) drop in the size of the *Oil Income* coefficient. Still, *Oil Income* remains negatively linked to *Democratic Transitions* at the $p<0.10$ level.

In columns 4 and 5 I look separately at the 1960-1982 and 1983-2002 periods. In the first period (column 5), the size of the *Oil Income* coefficient drops sharply and loses all statistical significance; in the second period, the *Oil Income* coefficient becomes larger and regains statistical significance. This is consistent with Figure 7 and Table 1, which suggest that the oil-producing states did not look much different than the non-oil states before the early 1980s. I explore this issue further below.

Table 5 shows the estimation results from the pooled OLS models. The first column includes only the control variables; all are highly significant, as are the period dummies (not shown). In column two, I add the *Oil Income* variable; it is highly significant, and remains so when the *Islam* variable is included (column three), although the size of the coefficient drops by just under thirty percent. When country fixed effects are introduced (column four), the *Oil Income* loses significance – as do all of the other explanatory variables, including all of the period dummies.[23]

Robustness

Table 6 shows the values, and statistical significance, of the oil variable in both the logit and OLS models, under a variety of conditions. Each model includes controls for *Income* and *Islam,* and a full set of period dummies. The logit models also include the variables *Economic Growth, Regime Duration,* and *Previous Transitions.* The OLS models include a lagged dependent variable.

Row one displays the *Oil Income* coefficients in the core models described above. In rows two and three, I change the base hazard rate in the logit models – first replacing the log of *Regime Duration* with the simple number of years of continuous authoritarian rule (row two); and adding the square of the number of continuous authoritarian years (row three). The *Oil Income* variable is unaffected.

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[23] Parenthetically, the results in columns one and two may cast light on the debate over the relationship between income and democratic transitions. There is much disagreement about whether the broad association between high incomes and democracy is caused by the positive effect of income on the likelihood of democratic transitions [e.g., Boix and Stokes 2003; Epstein et al. 2006], or by the positive effect of income on the survival of democracies [e.g., Przeworski et al. 2000; Gassebner, Lamla, and Vreeland 2008].

This dispute *may* have been caused by a composition problem in the 'income' variable: income from oil seems to retard democratic transitions, but income from other sources may encourage them. The reason why some studies find that income has no effect might be that they fail to address this composition problem by controlling for income from oil. Przeworski et al. [2000], who found that income had no effect on democratic transitions, failed to control for oil; Boix and Stokes [2003] and Epstein et al. [2006] controlled for oil and found that income had a strong effect on democratic transitions.

In Table 4, the value of the *Income* coefficient in column one – when *Oil Income* are excluded – is .345 and significant at the $p<0.10$ level. When *Oil Income* is added in column two, the *Income* coefficient more than doubles to .882, and becomes significant at the $p<0.01$ level.

Perhaps the oil-authoritarianism correlation is driven by a handful of oil-rich authoritarian countries in the Persian Gulf and does not represent a broader, global pattern. To see if this is true, in row four I drop all observations of the seven oil-producing authoritarian states on the Arabian Peninsula: Saudi Arabia, Kuwait, Qatar, United Arab Emirates, Bahrain, Oman, and Yemen. In both the logit and OLS models, *Oil Income* remains statistically significant.

A related concern is that the distribution of *Oil Income* across countries and years is non-normal, and hence violates the standard assumptions underlying both maximum likelihood and OLS regressions. I address this problem by using alternative ways to measure a country's oil income: in row 5, I employ a dichotomous measure of *Oil Income* that indicates countries with greater than $100 per capita of oil income; in row six I use the log of *Oil Income*.

The dichotomous measure of *Oil Income* is significantly correlated with authoritarianism in both the logit and OLS models. The log of *Oil Income* is statistically significant in the OLS model, but not the logit model. When I restrict the sample to the 1983-2002 period in row seven, however, the log of *Oil Income* attains significance in both models.

Conceivably the association between oil and dictatorships is not causal, but produced by the concentration of oil wealth in the Middle East and Africa, regions where democracy also happens to be rare. I explore this in rows eight and nine by adding a series of dummy variables for six of the world's regions: the Middle East and North Africa, Sub-Saharan Africa, Latin America, Asia (including East, South, and Southeast Asia), the former Soviet Union, and the OECD states of Western Europe and North America, and Japan, Australia, and New Zealand.

In the OLS model, *Oil Income* remains statistically significant. In the logit model, the *Sub-Saharan Africa* and *Asia* variables are significant, and their inclusion causes *Oil Income* to lose statistical significance at the .10 level. The *Sub-Saharan Africa* and *Asia* variables, however, are not robust: when the other, non-significant regional dummies (*Middle East, OECD,* and *Latin America)* are dropped from the model in row nine, the *Sub-Saharan Africa* and *Asia* variables lose significance, and *Oil Income* regains significance.

To summarize, the *Oil Income* variable is statistically correlated with authoritarian rule in both the logit and OLS models under a range of conditions. Oil loses statistical significance in two instances – in the logit model only – but regains significance when the sample is restricted to the 1983-2002 period, and when the non-significant regional dummies are dropped from the model.

Discussion

Oil Income is associated with authoritarianism under a wide range of conditions. Yet there are two interesting anomalies.

First, the correlation disappears when country fixed effects are added the OLS model (Table 5, column x). There are several ways to explain this. *Oil Income* may have long-term effects on regime type, which are readily apparent in cross-national comparisons but harder to detect in the short-term, and hence do not appear in the within-country correlations.

It may also be caused by a well-known drawback of fixed-effects models: they make it difficult to detect correlations when the dependent variable changes very slowly – as does the *Polity* variable [Beck, Katz and Tucker1998]. Indeed, the inclusion of country fixed effects causes *all* explanatory variables – including the period dummies – to lose statistical significance.

To address this problem, Aslaksen [forthcoming] suggests using the system GMM estimator developed by Blundell and Bond [1998], which outperforms the more-common first-difference GMM estimator in Monte Carlo simulations when the key variables change slowly. Using this estimator, Aslaksen finds that a country's oil income is indeed correlated with authoritarian rule, even in the presence of country fixed effects.[24]

It is also possible that there is no real relationship between oil and authoritarianism – that the fixed effects model correctly finds no correlation over time within countries, and that the widely-observed cross-national variation is wholly a result of omitted variable bias. If this were true, oil and authoritarianism would only be correlated because each was independently affected by a third, omitted variable – something that caused countries to simultaneously produce more oil and gas per capita, and to have more repressive governments. I find this unlikely: it is hard to identify omitted variables that would foster both more oil income and less democracy. As I suggest above, the opposite is more likely: oil income may be spuriously correlated with democracy, since omitted variables like the rule of law, sound property rights, and higher education levels should simultaneously boost oil income (by encouraging investments in the petroleum sector) and foster democratic rule,.

The other anomaly is that in the logit model *Oil Income* is associated with authoritarian persistence from 1983 to 2002 but not from 1960 to 1982. This is consistent with Figure 7, which suggests that until the beginning of the third wave of democratic transitions, the incidence of authoritarianism was more or less the same in the oil and non-oil states.

There are two possible explanations for this pattern; both may be valid. The first is that oil's anti-democratic powers have been consistently strong over time, but until the 1980s were masked by other undemocratic forces, like the effects of the Cold War. The cross-tabulations in Table 1 are consistent with this interpretation: oil states were slightly more likely to democratize than non-oil states from 1960 to 1982, but dramatically less likely

[24] Haber and Menaldo [2009] find that the relationship between oil wealth and democracy disappears in models that include country fixed effects and a lagged dependent variable; to mitigate the bias created by the lagged dependent variable, they use the Arellano-Bond GMM estimator. Aslaksen suggests that when the key variables – like oil income and democracy – are highly persistent, the Arellano-Bond estimator suffers from a weak instruments problem and is inferior to the system GMM estimator.

to democratize from 1983 to 2002. But this change is entirely driven by the sharp rise in democratic transitions in the non-oil states: the oil producing states democratized at about the same rate in both periods. This implies that the undemocratic powers of oil did not increase after 1982; other types of anti-democratic forces decreased, which exposed the latent effects of oil wealth.

The second explanation is that oil's ability to block democratic transitions did increase after the 1970s. Although though the rate of democratic transitions did not change among the oil states, there may have been greater pressures on the oil producers to democratize after 1980; to maintain the existing, low transition rate, oil must have become a more potent anti-democratic force.

There were two sources of growing pressure to democratize. The first was external: during the third wave, 'demonstration' or 'neighborhood' effects created heightened democratic pressures on authoritarian regimes – making it harder to maintain authoritarian rule after 1980 than it was before.

The other source was internal: the oil states probably faced stronger domestic pressures to democratize after 1980 due to their economic troubles. From 1950 to 1980, oil-producing states in the developing world grew much faster than other developing states [Figure 17].[25] If the convention wisdom is correct – that economic growth helps authoritarian regimes survive – this high growth made it relatively easy for autocratic regimes to stay in power.

Yet from 1980 to 1999, most oil-producing developing states had terrible growth records: from 1980 to 1989, the average income levels among the 24 long-term oil producers in the developing world fell by about half; from 1990 to 2000 their incomes were flat. Only eight of them had higher incomes in 1999 than in 1980. After 1980, it should have been much harder for these autocrats to avoid democratization.

There are also good reasons to believe that governments derived more political power from their oil wealth after 1980 than they did before. Until the mid-1970s, the governments of most oil-producing states in the developing world had relatively little control over their oil sectors, which were owned and operated by a handful of enormous, vertically-integrated petroleum firms based in the US and Western Europe – known colloquially as the "seven sisters."[26] But in the 1960s and 1970s, almost all developing countries nationalized their petroleum industries and established state-owned companies to manage them [Jodice 1980; Kobrin 1980; Minor 1994]. By the end of the 1970s, the governments of oil-producing states had accumulated far greater control over their country's economies, and a much larger share of the industry's profits; the result was a greater concentration of political power in the hands of the state.

[25] This figure shows the mean income per capita of the OPEC 14 – all countries that have, at one time or another, been members of OPEC – compared to the mean income per capita of all other states outside of the OECD. To facilitate comparisons, I set the mean income for each set of states equal to 100 in 1950.
[26] They were Standard Oil of New Jersey (later Exxon), Standard Oil of California (later Chevron), Anglo-Iranian Oil Company (later BP), Mobil, Texaco, Gulf, and Royal Dutch Shell.

It is not easy to know which of these two explanations is correct. But a series of cross-national OLS estimations suggests they may both have some validity. Table 7 shows cross-national estimations for each of the four decades in the dataset (1960-69, 1970-79, 1980-89, 1990-99). The *Oil Income* variable has significant explanatory power in each decade, which is consistent with the first argument, that oil had latent anti-democratic powers throughout the period. The *Oil Income* coefficient is also about the same size in each decade, though it is slightly smaller before 1970 than after.

Causal Mechanisms

It is relatively easy to show that oil is correlated with authoritarianism; it is much harder to explain why. A key problem is that in the affected countries we must figure out why something does *not* happen: why they *fail* to become democratic.

To infer that oil tends to lengthen authoritarian rule through a given mechanism, three things must be true: first, *Oil Income* should be correlated with an intervening variable that indicates the presence of the causal mechanism; for example, if oil leads to authoritarianism by fostering repression, then *Oil Income* should be statistically linked to higher values on some measure of repression. Second, the intervening variable should be correlated with prolonged authoritarian rule. Finally, the inclusion of the intervening variable in the core democracies models should reduce the size and statistical significance of the *Oil Income* coefficient. While passing the first two tests is not sufficient to establish the validity of the causal mechanism, failing either of them is sufficient to disprove their validity.

In Ross [2001], I argued that there were three mechanisms that tied oil wealth to authoritarianism: a rentier effect, through which governments use low tax rates and high spending to dampen pressures for democracy; a repression effect, by which governments build up their internal security forces; and a modernization effect, in which the failure of the population to undergo certain social changes renders them less likely to push for democracy.

More recently, others have suggested alternative mechanisms: Fish [2005] faults corruption; Boix [2003] points to asset specificity; and others emphasize international factors. Of these six possible mechanisms, I find statistical support for just one: the rentier effect.

The Modernization Effect

Ross [2001] argues that oil inhibits democratization through a 'modernization' effect, by retarding certain social changes that tend to produce more accountable government. The modernization argument drew on the work of earlier scholars – most importantly Inglehart [1997], but also Lipset [1959] and Deutsch [1961] – who suggested that democratization comes about when a society is transformed by higher education levels, urbanization, the development of modern communications, and greater occupational specialization. If oil wealth inhibits these social changes, it could also impede the democratization process.

Using more complete data, and more careful statistical methods, I no longer find compelling statistical evidence of a modernization effect. Table 8 shows the logit models, and Table 9 shows the OLS models, that explore the effects of five measures of socioeconomic 'modernization': female labor force participation, the prevalence of televisions, urbanization, and the fraction of the workforce in industry, and in services. To make sure that changes in the *Oil Income* coefficient are not caused by changes in the sample, I first display the estimation results without the intervening variable, using only observations for which the intervening variable is not missing.

The results show that none of the measures of socioeconomic modernization can help account for the oil-authoritarianism link. Of the five variables, only one is significantly associated with authoritarian rule: employment in the service sector. But its effect run in the opposite direction that is predicted by the theory, and its inclusion has no significant impact on *Oil Income.*

Oil production *can* powerfully affect social development – reducing female labor force participation, and increasing fertility rates [Ross 2008]. And Inglehart and others may be right that certain social changes lead to democratic transitions. But there is not compelling evidence that oil's impact on social modernization helps explain its impact on democracy.

Repression

In Ross [2001], I showed that oil-rich dictators spent an unusually large fraction of their budgets on the military; from this I inferred that oil helps authoritarian rulers stay in power by funding greater repression. Smith [2007] argued there was no evidence of a repression effect, when repression is measured by a country's Polity score. Since neither study used variables that measured government repression directly, the debate was unresolved.

Fortunately, a direct measure of government repression is now available from the invaluable Cingranelli-Richards dataset [2008]. Using annual human rights reports from the US State Department, Cingranelli and Richards construct a measure called *Physical Integrity Rights*, which gauges the annual incidence of torture, extrajudicial killing, political imprisonment, and disappearances that are attributable to the government.

When the *Physical Integrity Rights* variable is placed in either the logit or OLS models (Tables 10 and 11, cols x and x), it is unrelated to authoritarian rule and its inclusion has no impact on the *Oil Income* variable. There is no *prima facie* evidence of a repression effect.[27]

[27] Using the *Physical Integrity Rights* measure, oil producers appear to be more repressive than non-oil producers, but only because they are more frequently ruled by dictators, and dictatorships are more repressive than democracies. Among authoritarian states, and among democracies, oil producers are no more repressive than non-oil producers. Once regime type is controlled for, *Oil Income* and *Physical Integrity Rights* are uncorrelated.

There is still evidence that many oil-producing states spend large sums on their armed forces, but this can be better explained by other factors. States on the Arabian Peninsula that invest heavily in their armed forces – like Bahrain, Oman, Kuwait, and Saudi Arabia – do so to protect themselves against external threats from their neighbors, and internal threats from terrorist groups. Iran, Venezuela, and Gabon have made direct transfers from their oil sector to the military – probably as a form of patronage, to maintain the loyalty of the armed forces.[28] Algeria spends an unusual sum on its military because it is fighting an insurgency.

I hence no longer see convincing evidence that repression helps explain why oil-producing autocracies are so durable.

Foreign Support

All of these arguments suggest oil wealth strengthens authoritarian regimes through a domestic mechanism; but perhaps foreign influence also plays a role.

Some might plausibly argue that oil-rich governments are less accountable to their citizens because they receive exceptionally strong backing from foreign powers, like the US, Britain, France, and (during the Cold War) the Soviet Union. To assure a steady flow of hydrocarbons, oil-importing governments may use their influence to help friendly autocrats stay in power – either by intervening on their behalf, like the US and British intervention in Iran in 1953 that restored the Shah to power – or by augmenting their military and police forces through arms transfers and training, enhancing their ability to ward off popular uprisings and military coups [sources?].

If this were true, we should see a correlation between oil and foreign intervention: countries with oil wealth should be more frequently subjected to foreign interventions than non-oil states. Indeed, many oil producers have been the subject of foreign interventions, both covert and overt. Yet oil exporters are *not* more likely to face military interventions than non oil exporters, according to the best available data. Between 1946 and 1996, the US staged military interventions – using the broadest possible definition – on 83 occasions; the target was an oil producer in just eight cases (Kuwait twice, Iraq twice, plus Iran, Libya, and Gabon). France carried out 50 interventions, but just three in oil producers (Gabon twice and Libya once). Britain, with the longest history of engagement in the volatile Persian Gulf, had the largest number of oil-related interventions: nine out of its 38 interventions were in petroleum-rich states (Oman three times, Brunei twice, plus Kuwait, Libya, Iraq and Malaysia). Still, out of 171 instances of US, French, and British military interventions, only 20 occurred in oil-producing countries. Major powers are far more likely to intervene in non-oil countries.[29]

This does not mean that oil is *never* a factor in military interventions. Sometimes it is: Iraq's enormous oil reserves were almost certainly a factor in the Bush administration's

[28] On Iran, see Amuzegar [2005]; on Gabon, see Yates [1996]; on Venezuela, see International Crisis Group [2007].

[29] These figures are based on an analysis of the military interventions dataset compiled by Pickering and Kisangani [2007]. Also see the fine analysis by Sarbahi [2005].

decision to topple Saddam Hussein in March 2003. But in general, oil-rich nations are no more likely to be invaded than oil-poor ones. The most frequent targets of US interventions have been oil-poor countries in the Caribbean, Central America, and Southeast Asia. The number of interventions in oil-rich countries may not be particularly low, but the number of interventions in oil-poor states is surprisingly high.

Another way to test this claim is by looking at international arms transfers, which are commonly used by great powers to help friendly regimes stay in office. Data on arms transfers is collected by the Stockholm International Peace Research Institute and available from 1960 to 2005 for 157 countries. If foreign military support helps oil-rich governments stay in power, we should observe a correlation between a country's *Oil Income* and a variable called *Arms Imports*, which measures the market value of all arms a country receives – regardless of how much they pay – on a per capita basis.[30]

Oil Income is indeed robustly correlated with *Arms Imports,* even in the presence of controls for *Income* and regional effects. But *Arms Imports* are not associated with the duration of authoritarian rule, and adding the *Arms Imports* variable to the core *Democratic Transitions* model has no effect on the *Oil Income* variable in either the pooled logit [Table 10] or pooled OLS [Table 11] models.

Perhaps foreign support from great powers nonetheless helps authoritarian rulers stay in power, but through more subtle pathways. Still, there is no clear evidence for this mechanism.

Corruption

Fish [2006] argues that corruption can help explain why the connection between petroleum (and other mineral wealth) and the absence of political freedom, both in Russia and around the world. He suggests [133],

> Not only may massive official malfeasance reduce popular demand for democracy; it also undermines elites' interest in democracy. The more corrupt the public official, the greater his or her interest in avoiding public scrutiny and thwarting popular control of politics.

Measures of government corruption are admittedly poor. Perhaps the most careful is the World Bank's 'control of corruption' measure [see Kaufman and Kraay 2008]. When added to the core logit [Table 10] and OLS [Table 11] models, however, it is uncorrelated with either dependent variable, and its inclusion has no effect on the *Oil Income* coefficient.

The Rentier Effect

The 'rentier effect' appears to be the main – perhaps only – channel through which oil prolongs authoritarian rule. Ross [2001] suggests that the rentier effect can be decomposed into three related pieces: oil wealth may boost the government's revenues,

[30] I am grateful to Phil Potter for both suggesting this variable as a way to test the 'foreign support' mechanism, and for sharing the formatted SIPRI data.

and hence its ability to buy support, through a *spending effect*; reduce the tax burden that falls on citizens, and hence reduces their demand for democratic accountability, through a *taxation effect*; and weaken social organizations that might otherwise counterbalance the state's power, through a *group formation effect*.

These mechanisms – which collectively make up the rentier effect – can be easily transposed onto standard theories of democratization. Many theories posit that societies are composed of "elites" and "masses"; that in authoritarian states, the government is controlled by the elite; and that in democracies, the elites and the masses share control of the government. Some theories emphasize the interests of these two groups, while others look at their capabilities.

Collectively, this suggests four possible routes through which countries may democratize – through some change to the interests or capacities of the elite, or the interests or capacities of the masses. Several key studies, for example, suggest it is sometimes in the interest of an elite to share control of the government with the masses, and thus facilitate democratization [O'Donnell, Schmitter, and Whitehead 1986; Boix 2003; Acemoglu and Robinson 2005; Dunning 2008]. Another class of theories suggests the masses sometimes have the capacity to produce – and the elite lack the capacity to block – a democratic transition [Moore 1966, Rueschemeyer et al. 1992].

The rentier effect may inhibit democratization through three of these four possible routes:

- it may boost the capacities of state elites to thwart democracy though the spending effect;
- it may reduce the interests of the masses in democracy through the taxation effect;
- and it may reduce the capacity of the masses to instigate democracy through the group formation effect.

Below I show that the two measurable parts of the rentier mechanism – more government spending and lower taxes – are directly correlated with *Oil Income,* and that in combination they help account for the link between oil and democracy.

The spending effect

There is good evidence that oil-producing governments spend a lot more than similar governments without oil.

High-quality data on government revenues, and government size, is surprisingly difficult to obtain in oil-rich states: they sometimes run a large fraction of their governments through off-budget accounts, or through their national oil companies. In Azerbaijan, for example, about half of all government spending runs through SOCAR, the national oil company; since SOCAR is not treated as part of the state budget, the government's expenditures appear to be half their actual size. In Iraq under Saddam, more than half the national budget was funneled through the national oil company [Alnaswari 1994]. In Angola in the 1990s, about 40 percent of government spending was off-budget [Human Rights Watch 2004].

As a result, official sources tend to understate the true level of spending in oil-producing states. Yet even with low-quality data, there is still a strong correlation between a country's oil income per capita, and the size of government spending – with or without country fixed effects.

The taxation effect

There is ample evidence that a rise in a country's oil income tends to reduce its reliance on taxes.[31] The gist of the pattern is illustrated by Figure 18, which is based on data from 134 states between 1990 and 2006. The vertical axis shows the percentage of each government's revenues that comes from taxes on goods and services; the horizontal axis displays oil income per capita. The downward-sloping line suggests that countries with more oil income are less reliant on taxes. In the Middle East, for example, oil-rich governments in Algeria, Oman, Kuwait, and Iran get ten percent or less of their revenues from taxing goods and services; oil-poor governments in Jordan, Lebanon, and Tunisia get 25 percent or more of their revenues this way.[32]

The Civil Society Effect

The production of oil and gas may also weaken civil society – though since there is no good cross-national data on the strength of civil society groups, this argument must remain speculative.

The civil society effect occurs when rulers use their oil wealth to stifle or suppress independent organizations that might otherwise favor democratization. Scholars have long suggested that democracies emerge through the efforts of social institutions that are independent from the state. Some, like Putnam [1993], emphasize civil society organizations, like bowling leagues and choral societies. Others, like Moore [1966], focus on the role of independent economic classes, whose interests diverge from the government's and hence wish to constrain the government's power.

As incubators for democracy, independent civic organizations are a natural target for authoritarian leaders, whether or not their countries have oil. Dictators often ban these organizations; those with access to enough revenues, however, can use a subtler strategy, creating state-funded organizations to displace independent ones. According to Chaudhry [1994, 9], oil-rich governments in the Middle East have used their revenues to "develop programs that were "explicitly designed to depoliticize the population…In all cases, governments deliberately destroyed independent civil institutions while generating others designed to facilitate the political aims of the state."

[31] For a more theoretical, and historical, discussion of the ways that higher taxes are linked to demands for greater government accountability, see Ross [2001, 2003], Hoffman and Norberg [1994], and Brautigam, Fjelstad, and Moore [2007].

[32] Taxes on goods and services only constitute a fraction of relevent tax burden, and is hence a crude measure for evaluating the taxation effect. I use it here because the other readily-available measure of tax collection – taxes on income – includes corporate taxes that governments collect from oil companies.

The civil society effect can be seen as a variant of the spending effect: dictators can use patronage to simultaneously win the support of key constituencies, and to forestall the formation of independent social organizations. For example, Angolan President Eduardo dos Santos has channeled oil income into the Eduardo dos Santos Foundation (FESA), a nominally private, philanthropic organization under his personal control; it sponsors a wide range of organizations, conferences, and professional associations that both purchase the servility of many influential actors, and crowd out organizations that might otherwise have formed independently, and pushed for democratic reforms [Messiant 2001].

Similarly, authoritarian governments use gasoline subsidies as both a public good, which helps boost their popularity, and to avoid protests, which can be seen as spontaneous, politically independent civil society movements. The September 2007 protests in Burma, for example, began with rallies against the reduction of fuel subsidies; these rallies quickly turned into demonstrations against the military junta. Similarly, the February 2008 riots in Cameroon began with protests against the removal of fuel subsidies; they soon escalated into a campaign to stop a constitutional amendment that would allow the incumbent president to remain in office.

We might näively expect to find these subsidies in democratic countries, where politicians must cater to the whims of the public, rather than authoritarian countries, where the government is more insulated from public opinion. Yet the opposite is true: more oil wealth tends to produce higher gasoline subsidies from authoritarian governments than in democratic ones.

Figure 19 plots a country's *Oil Income* against the price (in dollars) of a gallon of gasoline; undemocratic countries are represented by squares, and democratic countries by diamonds. In both types of states, countries with more oil wealth tend to subsidize the price of gas more heavily. But the trend is stronger among authoritarian states, and gasoline prices are lower overall. The most extreme example is Turkmenistan, where a highly repressive government provides the public with gasoline at two cents a gallon, plus free electricity.[33]

The rentier mechanism can only be tested crudely, due to data limitations: as noted above, government spending is almost certainly underreported in oil-rich states, and it is hard to identify data on taxes that reliably exclude the taxes on the oil industry. Still, it is possible to construct a simple measure that combines the spending and taxation effects: taxes as a proportion of government spending. Both variables are drawn from the World Development Indicators; the numerator covers taxes on goods and services, the denominator all government expenditures.

The *Taxes-over-Spending* measure cannot be tested in the logit model because the data are too scarce: in the reduced sample of countries and years for which the variable is available, *Oil Income* is not correlated with democratic transitions. But it can be tested in the OLS model. Table 12 column 1 shows the baseline model, including only

[33] Data on gasoline prices is taken from GTZ [2007].

observations for which the *Taxes-over-Spending* variable is not missing. The *Taxes-over-Spending* variable is added to the model in column 2, and is significantly and positively correlated with *Polity:* a higher ratio of taxes to government spending is associated with higher democracy scores, following a five year lag. Moreover, the inclusion of the tax variable causes the *Oil Income* coefficient to fall by about 20 percent and lose statistical significance. The results are similar in columns 3 and 4 when a dummy variable for the OECD region is included, and columns 5 and 6 when a Middle East dummy is also added, although the *Oil Income* variable falls short of statistical significance in the baseline model.

Asset Specificity

Boix [2003] offers an alternative argument about the role of oil, using a formal model to specify the conditions under which democratization should occur. Like other models of democratization, it posits that when countries move from dictatorship to democracy, political rights are extended from a wealthy elite to the rest of the citizenry.[34] In the Boix model, however, the elite will only agree to democratize if they can protect their wealth from seizure by the newly-empowered masses. If their wealth comes from assets that are mobile – and hence can be easily transferred abroad – they need not worry about having their assets seized, and will hence agree to democratize. The masses, realizing they cannot expropriate this mobile wealth, agree to restrain their demands. But if their wealth is based on oil, they will oppose democratization since oil is a 'fixed' asset and hence subject to seizure by a newly-democratic government. Since they cannot protect their wealth by sending it abroad, they will oppose democratization.

Boix's statistical results are similar to those of many other studies: when states have more oil, they are less likely to democratize. But is the purported mechanism – an elite's fear that a democratic government will deprive them of their oil wealth – correct?

The asset specificity has several weaknesses. The most important is that the wealth derived from oil deposits is not "fixed" or "immobile." True, petroleum deposits themselves cannot be relocated – but money from the sale of these assets can be sent abroad just as easily as money from any other source. Hence any autocrats or tycoons in petroleum-rich countries, who fear that democratization will deprive them of their influence over their nation's oil sector, can simply sell off exploration and drilling rights and deposit the proceeds in the foreign bank accounts.

In fact, many of the world's most notorious kleptocrats – Nigeria's Sani Abacha, the Congo's Mobutu Sese Seko, Equatorial Guinea's Teodoro Obiang – have embezzled hundreds of millions, even billions, of dollars from their country's oil, gas, and mineral sectors and sent the money abroad.[35] None of this would be possible if oil wealth was 'immobile.'

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[34] As Boix notes, his model is an extension of the seminal Meltzer-Richard [1981] model.

[35] This same ability to turn immobile petroleum deposits into cash allows oil-producing governments to create sovereign wealth funds, to invest their oil revenues abroad. In 2008, eight of the world's twelve largest sovereign asset funds were owned by oil-producing countries; a ninth was owned by the oil-rich state of Alaska [Economist 2008].

Boix's model also suggests that natural resource wealth is owned by an elite, who oppose democratization because they fear it will be expropriated. But almost all of the oil wealth in the developing world was expropriated by governments – usually authoritarian governments – during the 1960s and 1970s [Kobrin 1980; Minor 1993]. There may be a handful of historical cases that fit the Boix profile: as Dunning [2008] points out, in 1952, Bolivia's mineral wealth was privately owned by a wealthy elite, who fiercely opposed democratization. But such cases are few.

In most ways, the asset specificity mechanism is observationally equivalent to the rentier mechanism: in each case, we should (and do) observe higher oil income associated with more durable authoritarian regimes. But the two theories have different implications for public opinion.

If the rentier mechanism is at work, oil wealth should reduce public support for democracy in authoritarian states, since the government is using high spending and low taxes to purchase the acquiescence of its citizens. But if the asset specificity mechanism is at work, higher oil income should lead to stronger public support for democracy, since democratization would give citizens access to the oil rents captured by the elite.

These opposing implications can be assessed with public opinion data gathered by the World Values Survey, which asked respondents in 79 countries whether they agree with the following statement: "democracy has its problems, but it is better than other systems of government." [WVS source].

Oil Income is strongly and negatively correlated with a less favorable view of democracy. The pattern can be seen in Figure 20, which plots *Oil Income* against the fraction of respondents in each country that agreed, or strongly agreed, with the statement supporting democracy. The downward-sloping line represents the overall trend: higher levels of oil income per capita are correlated with less support for democracy.

This pattern holds across regions of the world: in Africa, Latin America, the Middle East and North Africa, and the Former Soviet Union, citizens in oil-rich states have less affection for democracy than citizens in oil-poor states [Figure 21.[36]

We can further explore this correlation with simple OLS regressions [Table 13]. Column one shows that *Oil Income* is strongly and negatively linked to support for democracy. We might expect people in more repressive states to be more reluctant to express support for democracy. But this turns out to be untrue: neither a standard measure of democracy (the Polity score), nor a separate measure of human rights violations (the Cingranelli-

[36] In Venezuela, 91 percent of respondents favored democracy, making it a notable anomaly. But there may be something misleading about these survey results. In 1992, 62 percent of surveyed Venezuelans supported an attempted military coup against their democratically-elected government [Montaner 2008]. According to the annual Latinobarometer survey, the number of Venezuelans who reported they were "satisfied" or "very satisfied" with the way democracy was working in their country rose from 35 percent in 1998 to 59 percent in 2007 – while the government of Hugo Chavez became notably less democratic.

Richards measure of government respect for "physical integrity") is correlated with views about democracy (columns 2 and 3). Respondents were equally likely to support democracy in repressive states and democratic ones. The results are consistent with the rentier effect, but not the asset specificity effect.

The broad relationship between oil and views of democracy are also robust to the inclusion of regional dummies (column 4).

Conclusion

This paper revisits the analysis in Ross [2001], and offers several improvements, including better measures of the key variables and a wider data set. Despite flaws in the earlier analysis, and many challenges from other scholars, there is strong evidence that oil wealth tends to prolong authoritarian rule. But there are also intriguing anomalies: the undemocratic effects of oil seem to have grown over time, and to have no impact in Latin America.

It is harder to explain *why* oil income impedes democratization. I no longer find support for two of the three mechanisms I discussed by Ross [2001]; nor is there evidence to support mechanisms alleged by others. The only mechanism that seems to matter is the rentier effect – which is also consistent with public opinion data.

Even if this analysis is correct, it is still just the beginning of a deeper understanding of natural resources and regime types. As Dunning [2008] suggests, this type of analysis tells us something about the average effect that oil wealth has on democracy, but surely the ultimate effect of oil wealth will vary under different conditions – and identifying these conditions lies at the frontier of research on this problem. So does a deeper understanding of how different types of government revenues can affect governance [Morrison 2009; Brautigam, Fjeldstad, and Moore 2008]; the relationship between oil's effect on regime types, and its effects on economic performance and violent conflict; and the effectiveness of policy interventions to help countries overcome the resource curse [Humphreys, Sachs, and Stiglitz 2007].

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Table 1: Annual Likelihood of Transition to Democracy, 1960-2002 (percentage)

	Oil Producers	Non-Oil Producers
All countries and periods **	1.4	2.2
1960-1982	1.5	0.9
1983-2002 ***	1.3	4.1
Muslim majority	0.0	1.9
Latin America only **	10.1	4.8
Outside Latin America ***	0.7	1.9

Figures indicate the annual likelihood that a state will transit from authoritarian to democratic rule, expressed as a percentage. I categorize states as "Oil Producers" if they produced at least $100 in oil and gas per capita.
*** significant at .01 level in a t-test
** significant at .05 level in a t-test
* significant at .10 level in a t-test

Table 2: Annual Likelihood of Democratic Failure, 1960-2002 (percentage)

	Oil Producers	Non-Oil Producers
All countries and periods	1.2	1.9
Low Income (below $1000)	7.4	4.2
Middle Income ($1000 to 5000)	2.4	2.5
High Income (above $5000)	0.3	0.3
Sub-Saharan Africa *	13.3	5.0
Everywhere Else	0.8	1.5

Figures indicate the annual likelihood that a state will transit from democratic to authoritarian rule, expressed as a percentage.
* significant at .10 level in a t-test

Table 3: Democratic Transitions by Oil Income, 1950-2002

Country	*Year*	*Oil Income*	*Outcome*
Venezuela	1958	1717	Success
Russia	1991	1049	Failure
Nigeria	1979	1007	Failure
Ecuador	1979	773	Failure
Congo Republic	1992	563	Failure
Mexico	2000	442	Success
Argentina	1983	428	Success
Peru	1980	336	Failure
Bolivia	1982	307	Success
Bolivia	1979	264	Failure

Table 4: Democratic Transitions, Pooled Logit, 1960-2002

	(1)	(2)	(3)	(4)	(5)
Previous Transitions	0.613***	0.509***	0.494***	0.830***	0.482***
	(0.115)	(0.112)	(0.113)	(0.214)	(0.160)
Income (log)	0.345*	0.882***	0.764***	0.759*	0.777**
	(0.182)	(0.228)	(0.226)	(0.415)	(0.303)
Economic Growth	-0.345***	-0.393***	-0.394***	-0.623***	-0.292**
	(0.106)	(0.108)	(0.108)	(0.185)	(0.133)
Oil Income		-4.990**	-4.054*	-1.694	-5.947*
		(2.145)	(2.098)	(2.570)	(3.255)
Regime Duration	-0.290	-0.249	-0.266	1.100	-0.573*
	(0.274)	(0.270)	(0.270)	(0.755)	(0.320)
Islam			-0.398**	-0.298	-0.441**
			(0.175)	(0.353)	(0.223)
Observations	3106	3106	3106	1488	1618
Number of Countries	127	127	127	98	120

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Polity, Pooled OLS, 1960-2004

	(1)	(2)	(3)	(4)
Polity (lagged)	2.216***	2.152***	2.020***	
	(0.0784)	(0.0796)	(0.0817)	
Income (log)	0.530***	0.659***	0.611***	-0.138
	(0.0823)	(0.0849)	(0.0840)	(0.470)
Oil Income		-0.313***	-0.223***	0.109
		(0.0646)	(0.0654)	(0.0902)
Islam			-0.444***	
			(0.0772)	
Observations	1026	1026	1026	882
Number of Countries	170	170	170	167

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Robustness Tests

	Coefficients with Pooled Logit	**Coefficients with Pooled OLS**
1. Core Model	-4.054*	-.313***
2. Simple Regime Duration	-4.170**	-
3. Add Regime Squared	-4.086*	-
4. Drop Key Countries	-3.610	-.250***
5. Dichotomous Oil Income	-0.898**	-.250***
6. Log of Oil Income	-0.233	-.330***
7. Log of Oil Income (post 1982)	-0.438*	-.306***
8. Add Regional Dummies	-2.832	-.116*
9. Add Regional Dummies (significant only)	-4.083*	-.154**

*** p<0.01, ** p<0.05, * p<0.1

These figures are the standardized coefficients of the "oil income" variable in each of the models described. The 'core models' include: *Income (log), Islam,* and period dummies; the logit core model also includes *GDP Growth, Prior Transitions,* and *Regime Duration (log),* while the OLS core model also includes a lagged dependent variable. In row four, all seven countries on the Arabian Peninsula have been dropped: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, and Yemen. In the eighth row, the models include regional dummies for the Middle East, Sub-Saharan Africa, Latin America, the OECD states, and Asia. In row nine, those dummies not statistically significant in the previous model (OECD, Latin America, and in the logit model only, the Middle East) are dropped.

Table 7: Cross-national OLS by Decade

	(1)	(2)	(3)	(4)
PERIOD	1960-69	1970-79	1980-89	1990-99
Income (log)	1.702***	2.129***	2.124***	1.467***
	(0.249)	(0.213)	(0.159)	(0.157)
Islam	-0.538*	-0.383	-0.658***	-1.101***
	(0.308)	(0.288)	(0.209)	(0.211)
Oil Income	-0.885***	-1.156***	-1.005***	-1.003***
	(0.0937)	(0.174)	(0.146)	(0.137)
Observations	106	125	157	169
R-squared	0.360	0.445	0.494	0.540

*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses

Table 8: Causal Mechanisms: Modernization Effect, Pooled Logit

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Previous Transitions	0.492***	0.485***	0.406***	0.408***	0.449***	0.468***	0.652*	0.887**
	(0.114)	(0.121)	(0.122)	(0.123)	(0.120)	(0.121)	(0.343)	(0.359)
Income (log)	0.759***	0.740***	0.699***	0.654**	0.734***	0.827***	1.594**	2.118**
	(0.233)	(0.264)	(0.263)	(0.322)	(0.245)	(0.282)	(0.805)	(0.976)
Oil Income	-4.062*	-4.068*	-3.936*	-3.940*	-4.101*	-3.853*	-8.815	-8.848
	(2.114)	(2.112)	(2.165)	(2.164)	(2.152)	(2.115)	(6.904)	(5.954)
Regime Duration	-0.257	-0.269	-0.368	-0.339	-0.219	-0.248	-0.852	-0.742
	(0.272)	(0.283)	(0.279)	(0.306)	(0.282)	(0.282)	(0.560)	(0.499)
Economic Growth	-0.389***	-0.389***	-0.353***	-0.352***	-0.390***	-0.395***	-0.540**	-0.489**
	(0.108)	(0.108)	(0.120)	(0.120)	(0.110)	(0.110)	(0.258)	(0.244)
Islam	-0.396**	-0.408**	-0.426**	-0.431**	-0.452**	-0.446**	-0.581	-0.398
	(0.175)	(0.191)	(0.185)	(0.187)	(0.185)	(0.184)	(0.421)	(0.382)
Female Labor		-0.0359						
		(0.229)						
TVs				0.0949				
				(0.400)				
Urbanization						-0.151		
						(0.226)		
Employment in Industry								0.456
								(0.351)
Employment in Services								-1.162**
								(0.509)
Observations	3067	3067	1987	1987	2837	2837	485	485
Number of Countries	126	126	123	123	125	125	114	114

*** p<0.01, ** p<0.05, * p<0.1
Standard errors in parentheses

Table 9: Causal Mechanisms: Modernization Effect, Pooled OLS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Polity (lagged)	1.804***	1.803***	1.713***	1.728***	1.793***	1.795***	1.940***	1.930***
	(0.0873)	(0.0873)	(0.107)	(0.106)	(0.0913)	(0.0911)	(0.154)	(0.157)
Income (log)	0.503***	0.483***	0.495***	0.521***	0.465***	0.552***	0.241	0.123
	(0.121)	(0.123)	(0.138)	(0.160)	(0.124)	(0.141)	(0.205)	(0.250)
Economic Growth	0.00265	0.00118	0.00201	0.00233	0.0146	0.0124	-0.0926	-0.0928
	(0.0556)	(0.0556)	(0.0673)	(0.0673)	(0.0573)	(0.0573)	(0.109)	(0.109)
Oil Income	-0.146**	-0.150**	-0.136**	-0.138**	-0.136**	-0.142**	-0.0391	-0.0279
	(0.0666)	(0.0669)	(0.0676)	(0.0678)	(0.0670)	(0.0671)	(0.0855)	(0.0864)
Islam	-0.122	-0.135	-0.315***	-0.310***	-0.213**	-0.218**	-0.494***	-0.495***
	(0.100)	(0.102)	(0.115)	(0.115)	(0.103)	(0.103)	(0.158)	(0.160)
Female Labor		-0.0788						
		(0.105)						
TVs				-0.0565				
				(0.146)				
Urbanization						-0.143		
						(0.109)		
Employment in Industry								0.0513
								(0.175)
Employment in Services								0.120
								(0.143)
Observations	1014	1014	683	683	928	928	370	370
Number of Countries	169	169	169	169	168	168	149	149

*** p<0.01, ** p<0.05, * p<0.1
Standard errors in parentheses

Table 10: Causal Mechanisms: Repression, Foreign Support, Corruption, Pooled Logit

	(1)	(2)	(3)	(4)	(5)	(6)
Previous Transitions	0.552***	0.538***	0.477***	0.468***	0.582	0.549
	(0.159)	(0.162)	(0.115)	(0.113)	(0.457)	(0.483)
Income (log)	0.596**	0.610**	0.678***	0.768***	0.183	0.563
	(0.259)	(0.261)	(0.231)	(0.242)	(0.662)	(0.952)
Oil Income	-5.018*	-5.101*	-3.174*	-2.977	-10.44	-13.94
	(2.820)	(2.862)	(1.929)	(1.928)	(16.54)	(19.80)
Regime Duration	0.283	0.255	-0.206	-0.159	1.546	1.424
	(0.497)	(0.499)	(0.287)	(0.286)	(2.045)	(2.075)
Economic Growth	-0.383***	-0.371**	-0.361***	-0.357***	-0.940*	-0.938
	(0.142)	(0.145)	(0.112)	(0.113)	(0.567)	(0.584)
Islam	-0.294	-0.291	-0.372**	-0.336*	-0.153	-0.162
	(0.206)	(0.205)	(0.177)	(0.175)	(0.425)	(0.444)
Physical Integrity		-0.0698				
		(0.185)				
Arms Transfers				-0.847		
				(0.735)		
Corruption						-0.676
						(1.151)
Observations	1508	1508	2934	2934	213	213
Number of Countries	115	115	118	118	80	80

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 11: Causal Mechanisms: Repression, Foreign Support, Corruption, Pooled OLS

	(1)	(2)	(3)	(4)	(5)	(6)
Polity (lagged)	2.057***	2.074***	1.855***	1.855***		
	(0.125)	(0.128)	(0.0882)	(0.0883)		
Income (log)	0.460***	0.479***	0.514***	0.514***	1.202***	0.754*
	(0.155)	(0.157)	(0.123)	(0.123)	(0.323)	(0.421)
zgdpgrowth_alt_5	0.0765	0.0790	0.0168	0.0168		
	(0.0957)	(0.0958)	(0.0555)	(0.0555)		
Oil Income	-0.688***	-0.673***	-0.141**	-0.141**	-2.406***	-2.346***
	(0.203)	(0.204)	(0.0667)	(0.0681)	(0.463)	(0.443)
Islam	-0.162	-0.165	-0.103	-0.103	-0.535*	-0.526*
	(0.128)	(0.128)	(0.103)	(0.103)	(0.287)	(0.284)
zphysint_5		0.0723				
		(0.102)				
ztiv_cap_5				0.000318		
				(0.0650)		
corrupt						0.628
						(0.411)
Observations	408	408	960	960	167	167
R-squared	.	.	.	.	0.527	0.537
Number of Countries	156	156	157	157	167	167

*** p<0.01, ** p<0.05, * p<0.1
Standard errors in parentheses

Figure 1: Non-oil Income and Time Under Democratic Rule (for countries that were initially authoritarian), 1960-2002

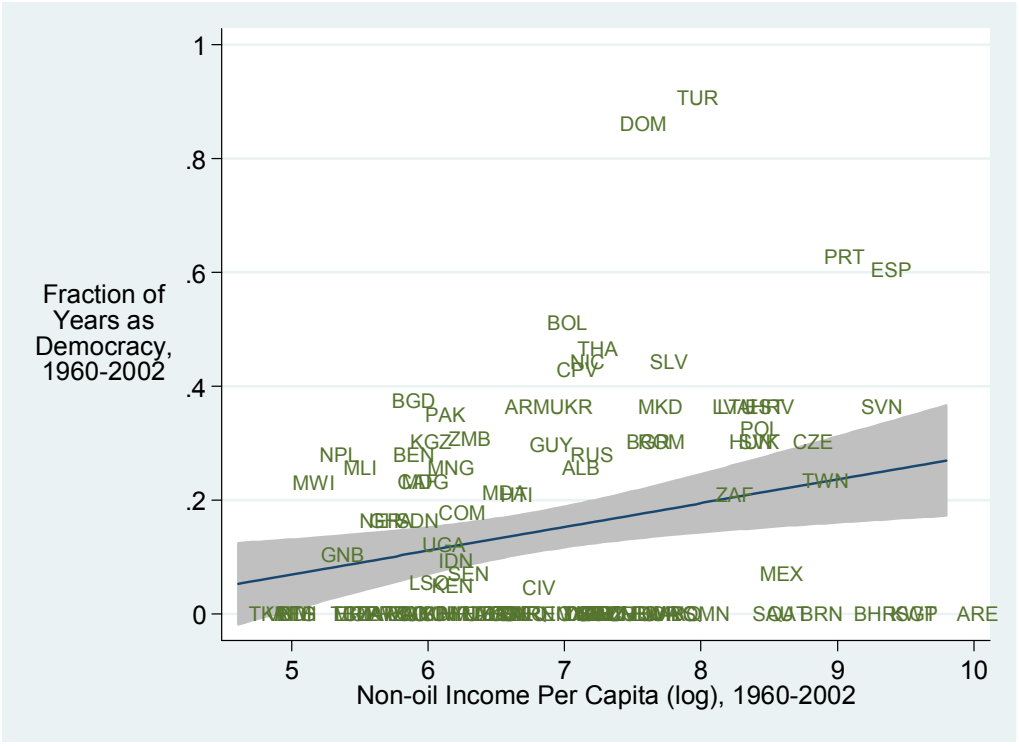


Figure 2: Oil Income and Time Under Democratic Rule (for countries that were initially authoritarian), 1960-2002

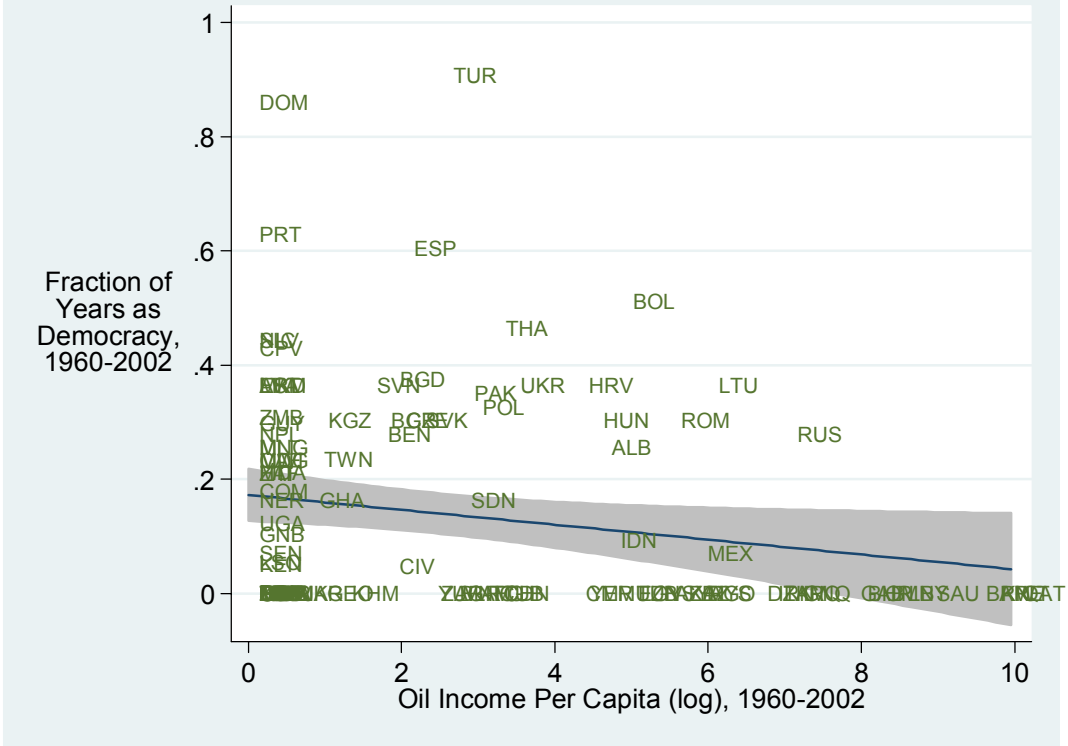


Figure 3: Oil Income and Time Under Democratic Rule, Above-median incomes (for countries that were initially democratic), 1960-2002

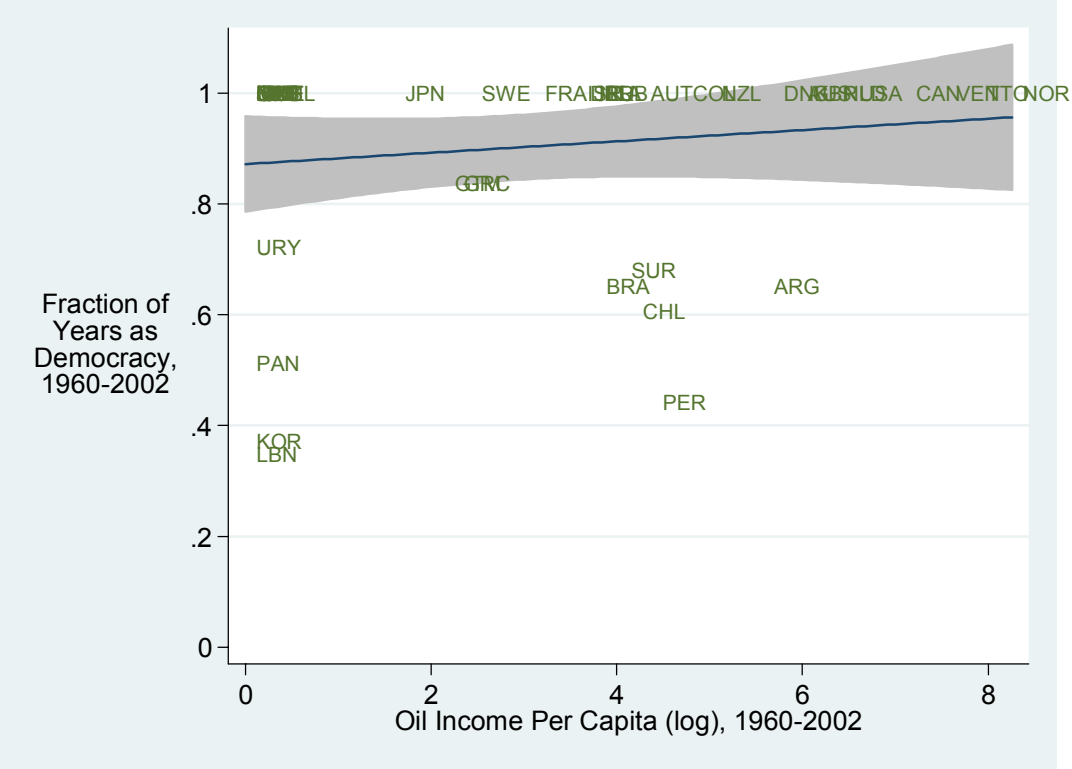


Figure 4: Oil Income and Time Under Democratic Rule, Below-median incomes (for countries that were initially democratic), 1960-2002

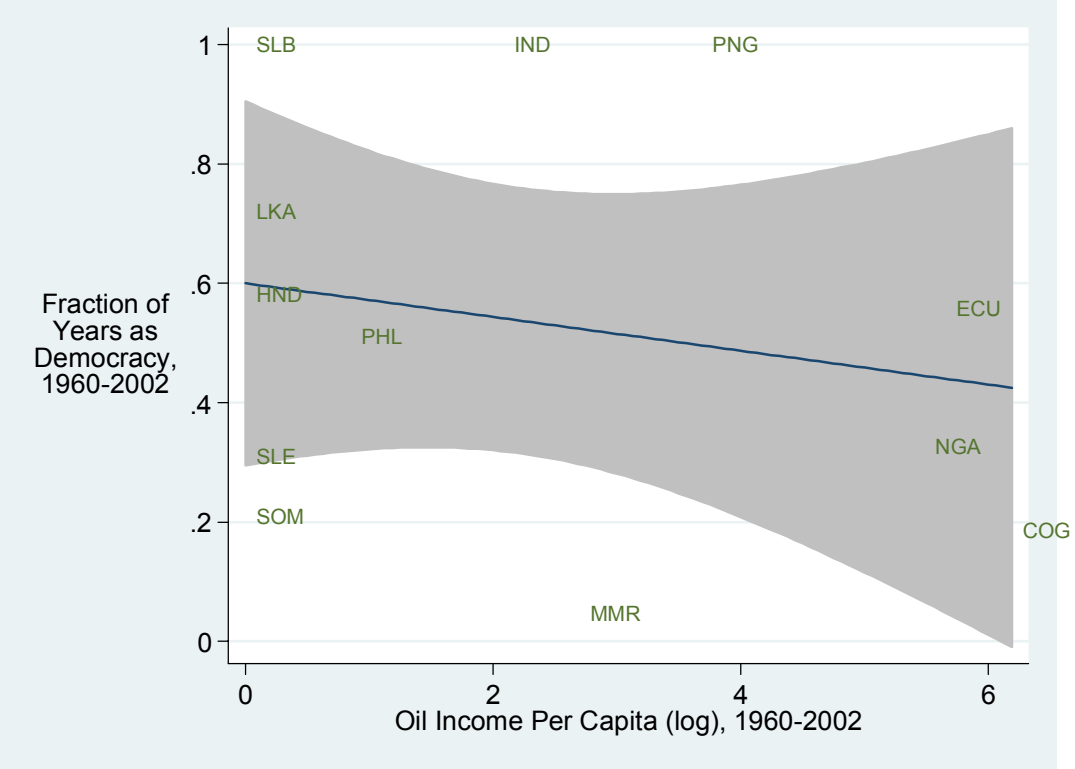


Figure 5: Democracies and Autocracies, 1960-2002

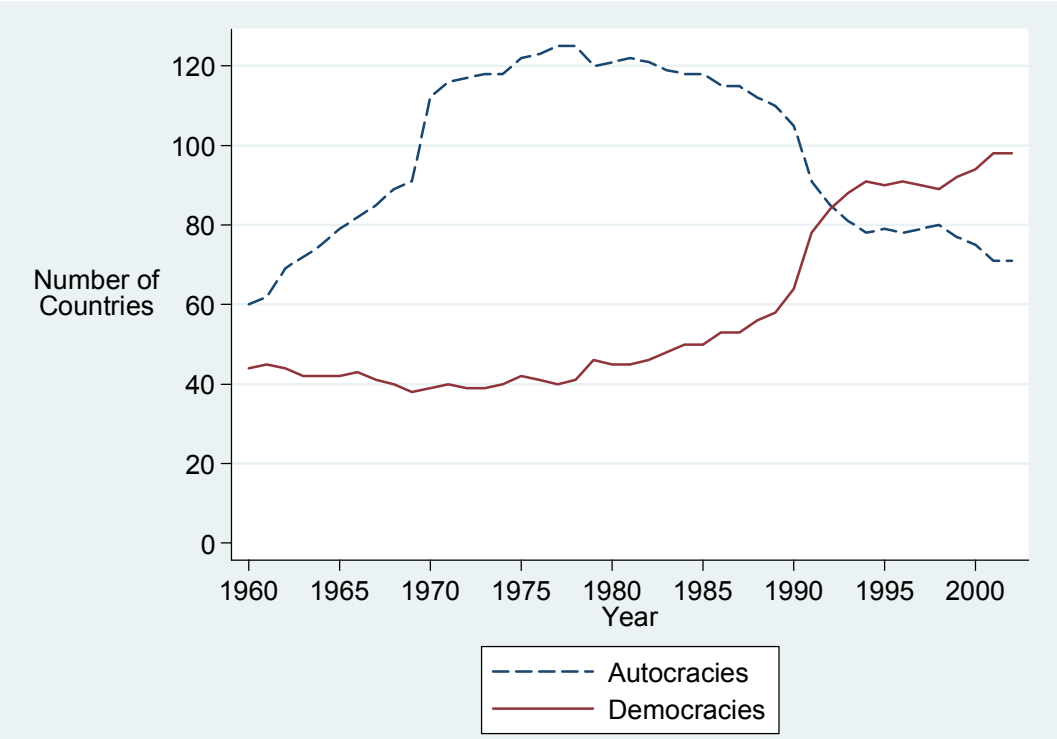


Figure 6: Democracies and Autocracies (oil producers only), 1960-2002

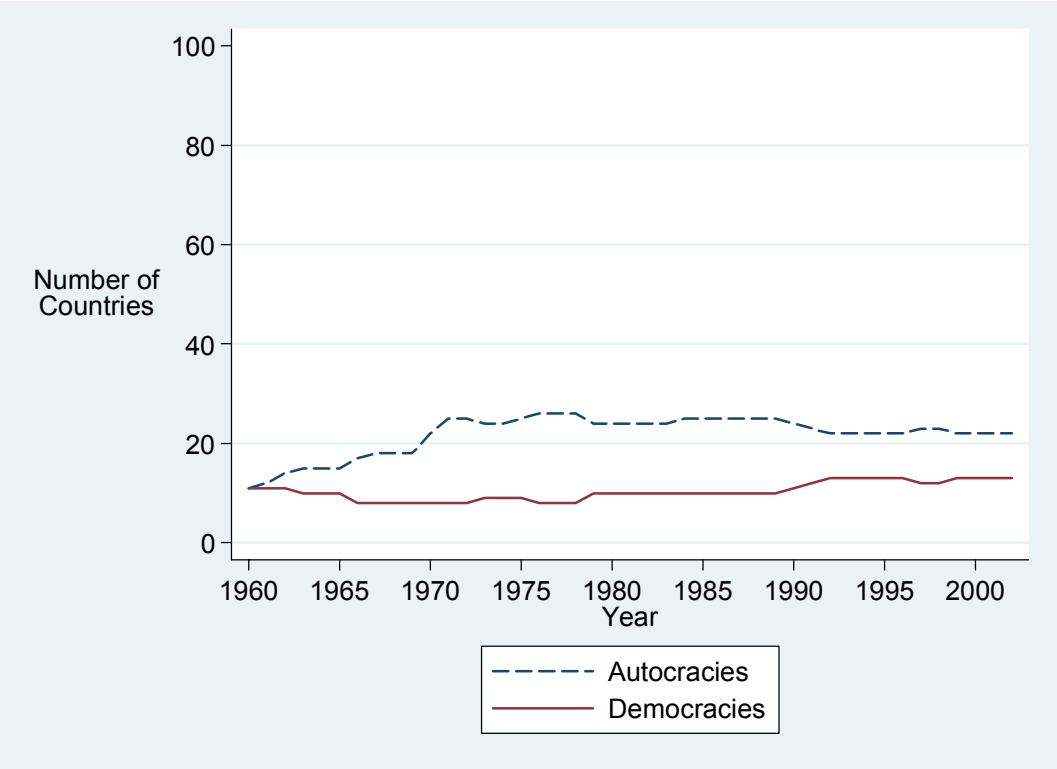


Figure 7: Democracy Scores Among Oil and Non-oil Countries, 1960-2004

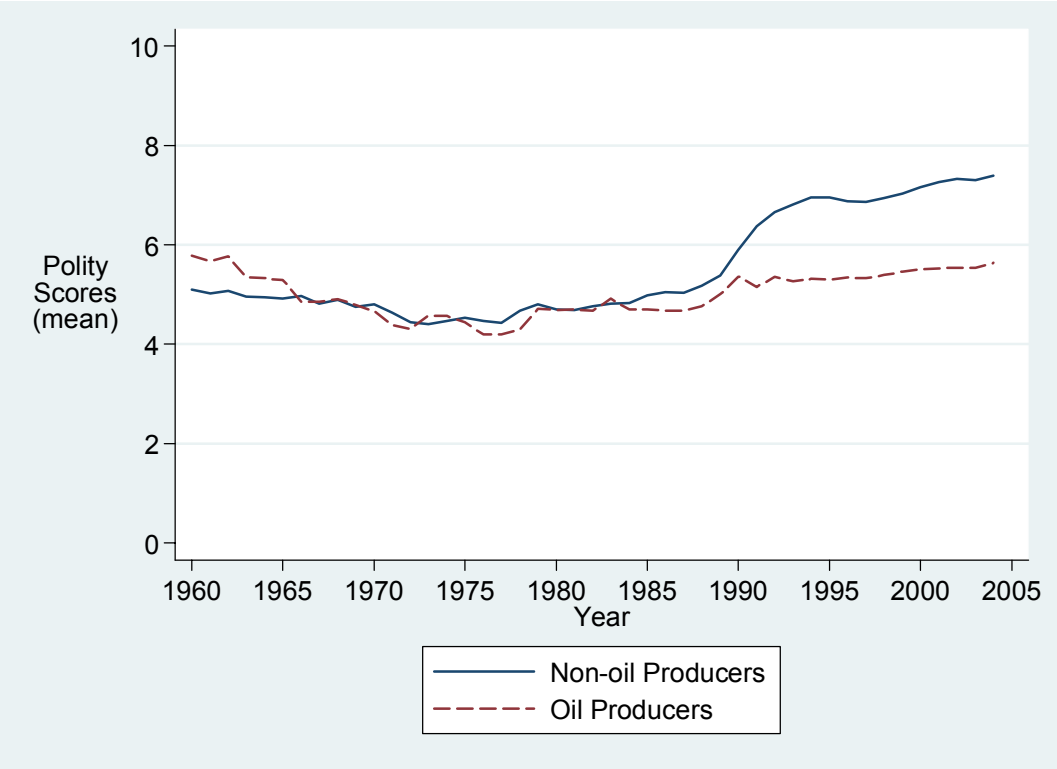


Figure 8: Polity scores among Muslim & non-Muslim states, 1960-2004

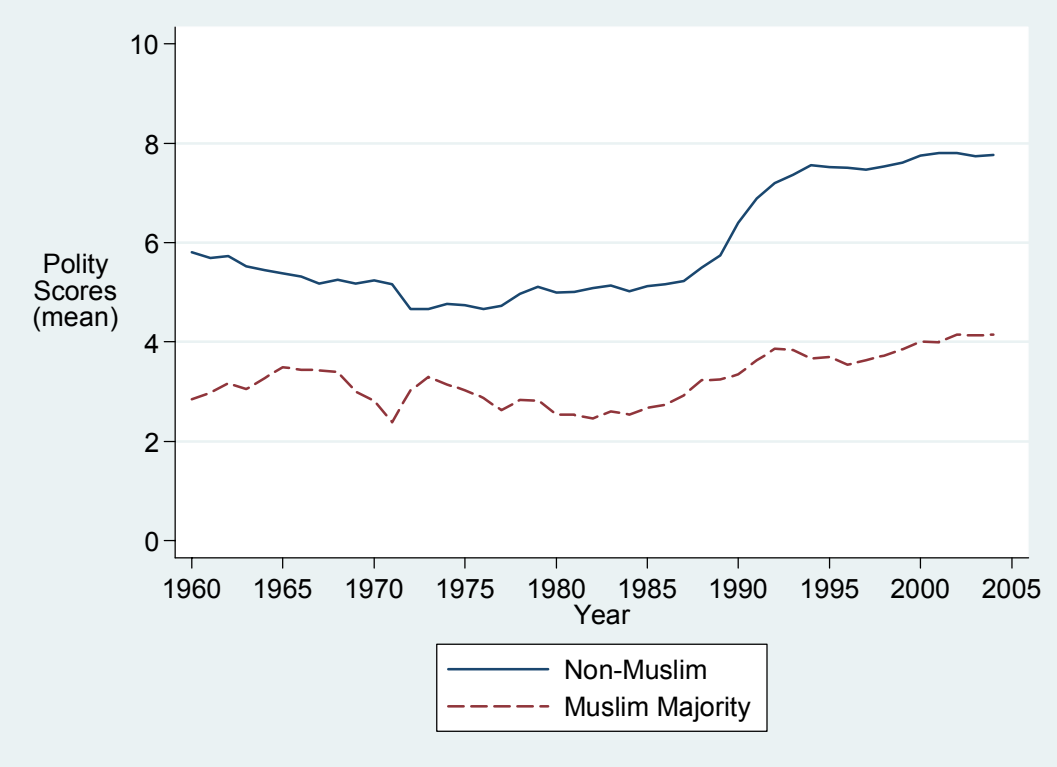


Figure 9: Polity scores among Muslim states, with & without oil, 1960-2004

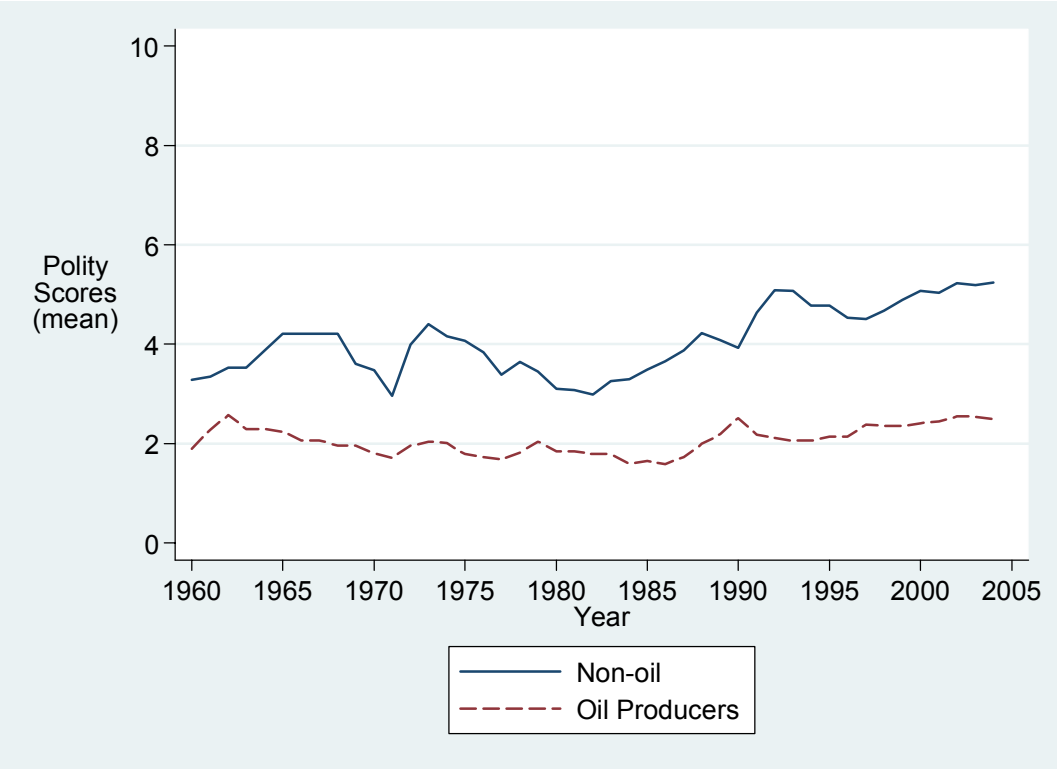


Figure 10: Polity scores in the Muslim Middle East, with & without oil, 1960-2004

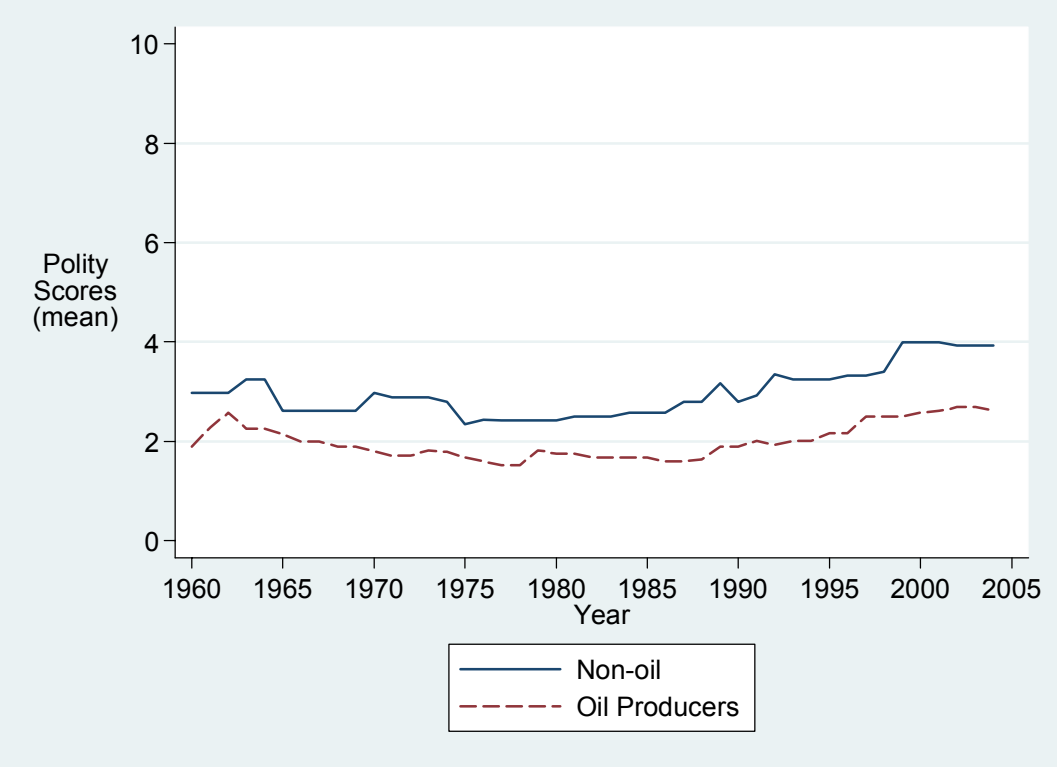


Figure 11: Democracy Scores in Latin America, 1960-2004

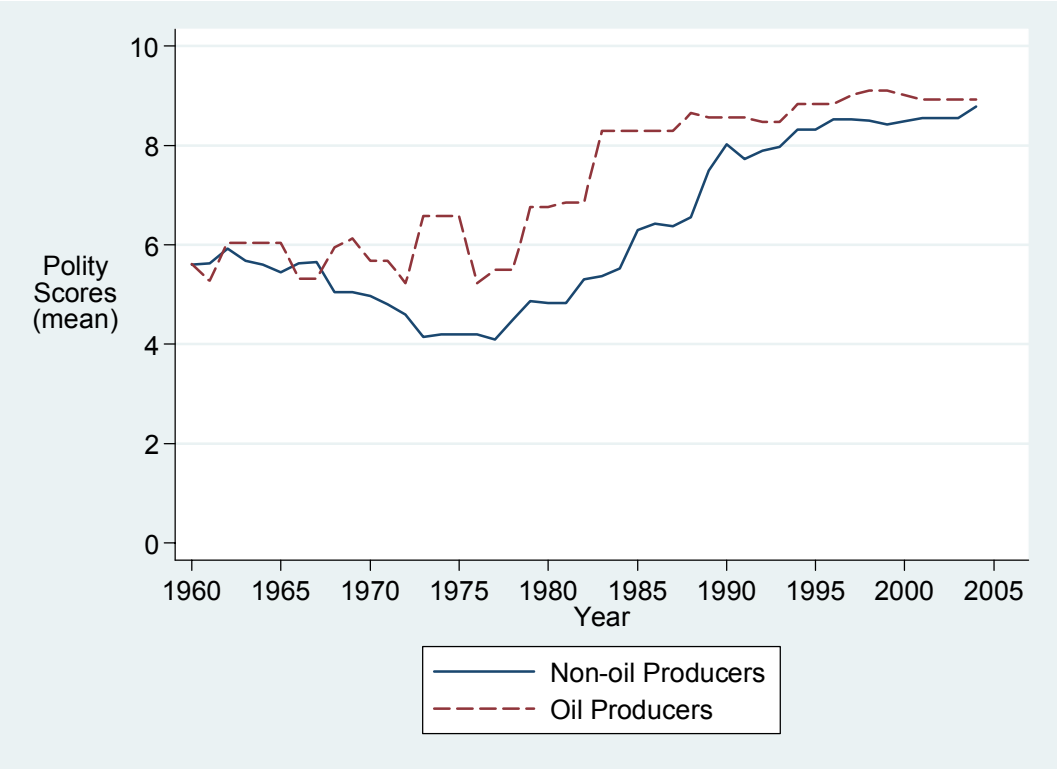


Figure 12: Gini observations vs. Oil Income, 1970-2000

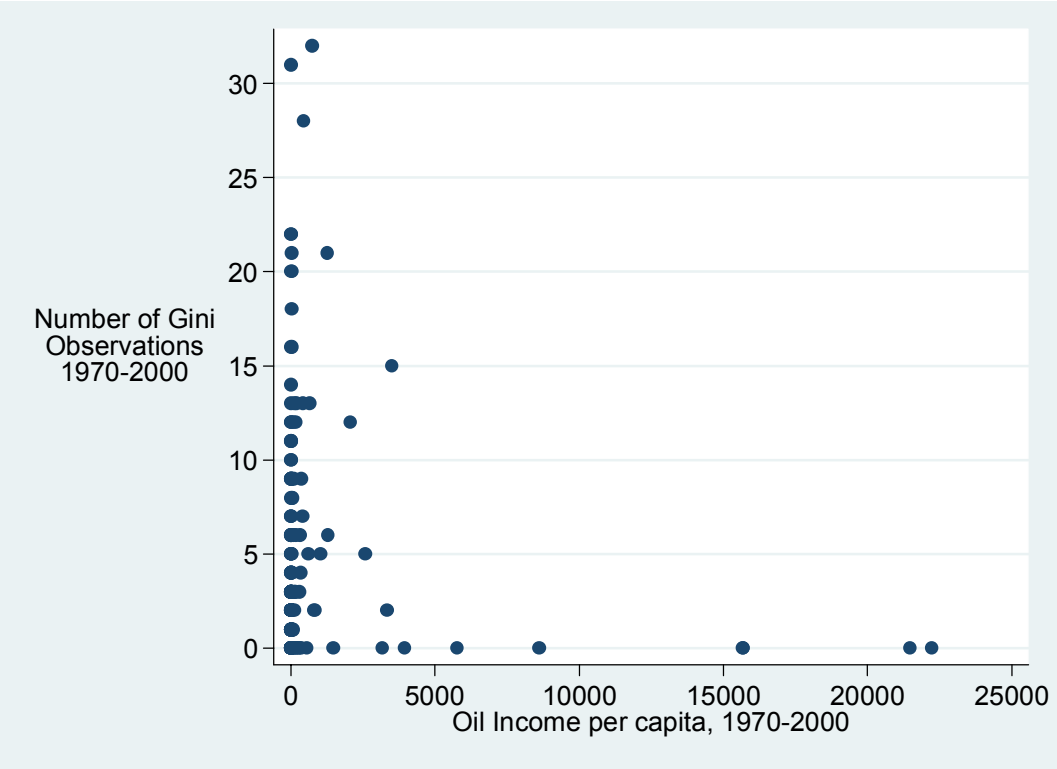


Figure 13: Oil and Democracy Scores in the Middle East, 1990-2004

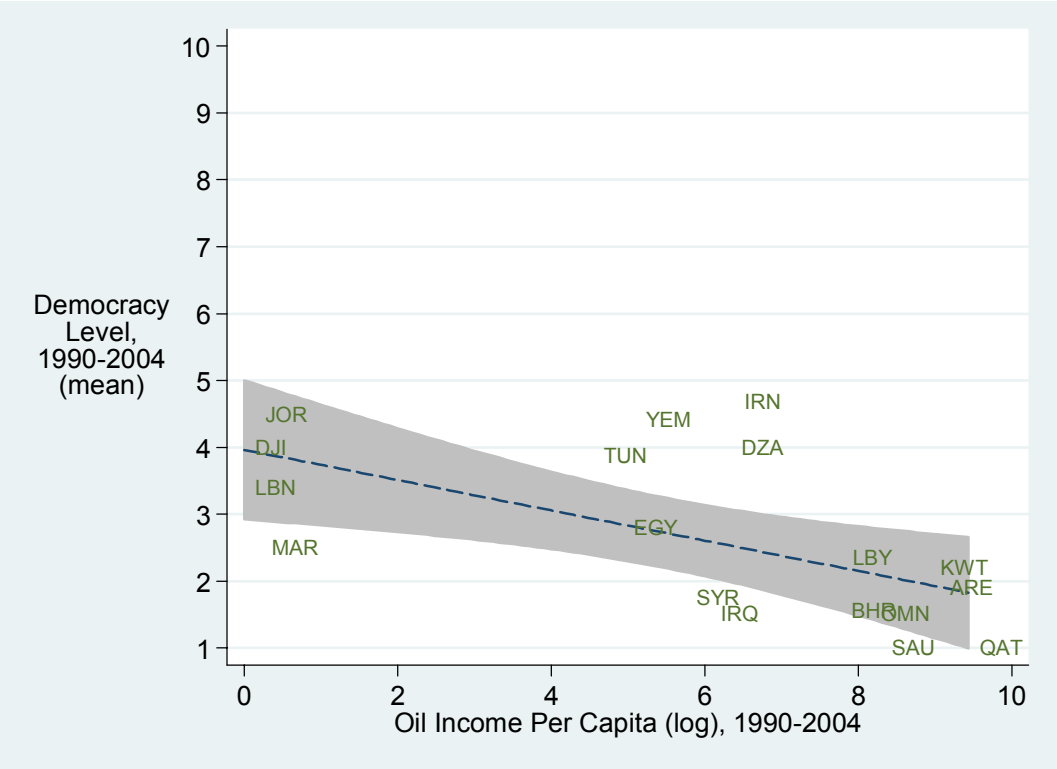


Figure 14: Oil and Democracy Scores in Sub-Saharan Africa, 1990-2004

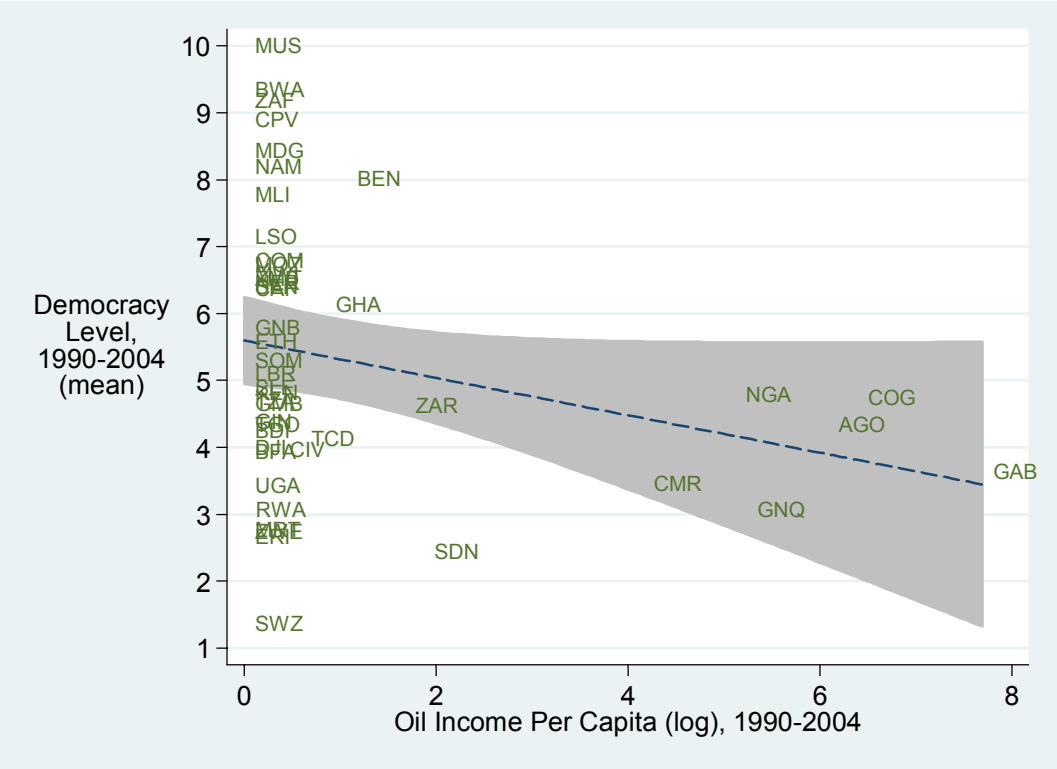


Figure 15: Oil and Democracy Scores in the Former Soviet Union, 1990-2004

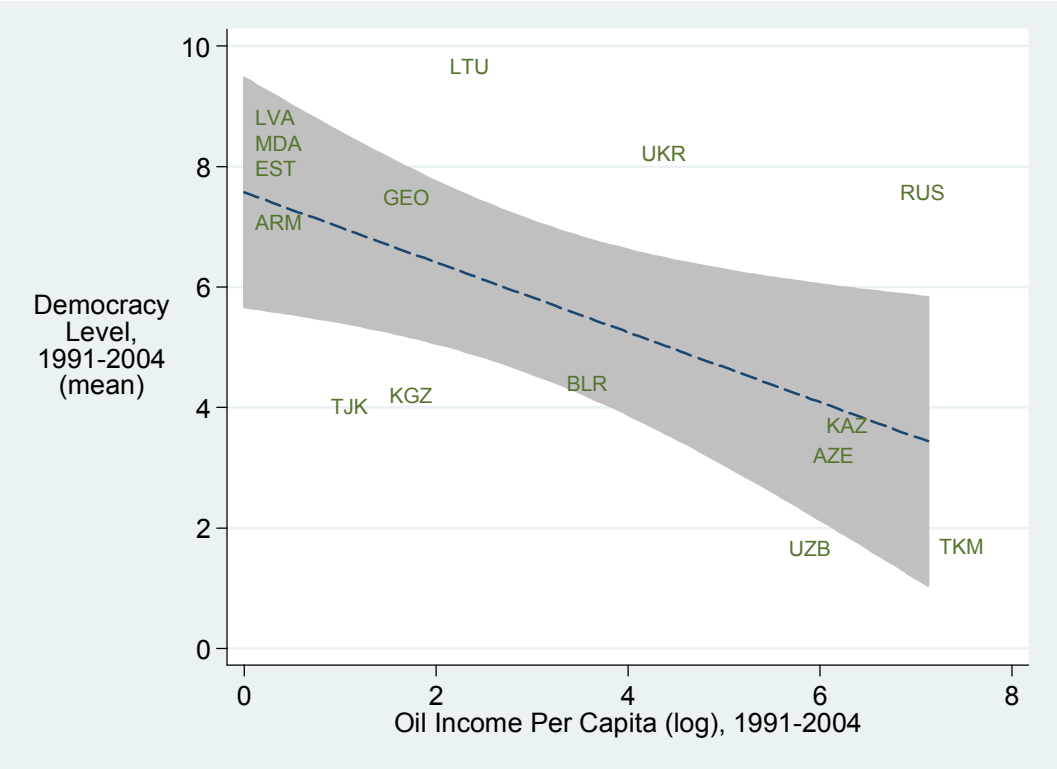


Figure 16: Oil and Democracy Scores in Asia, 1990-2004

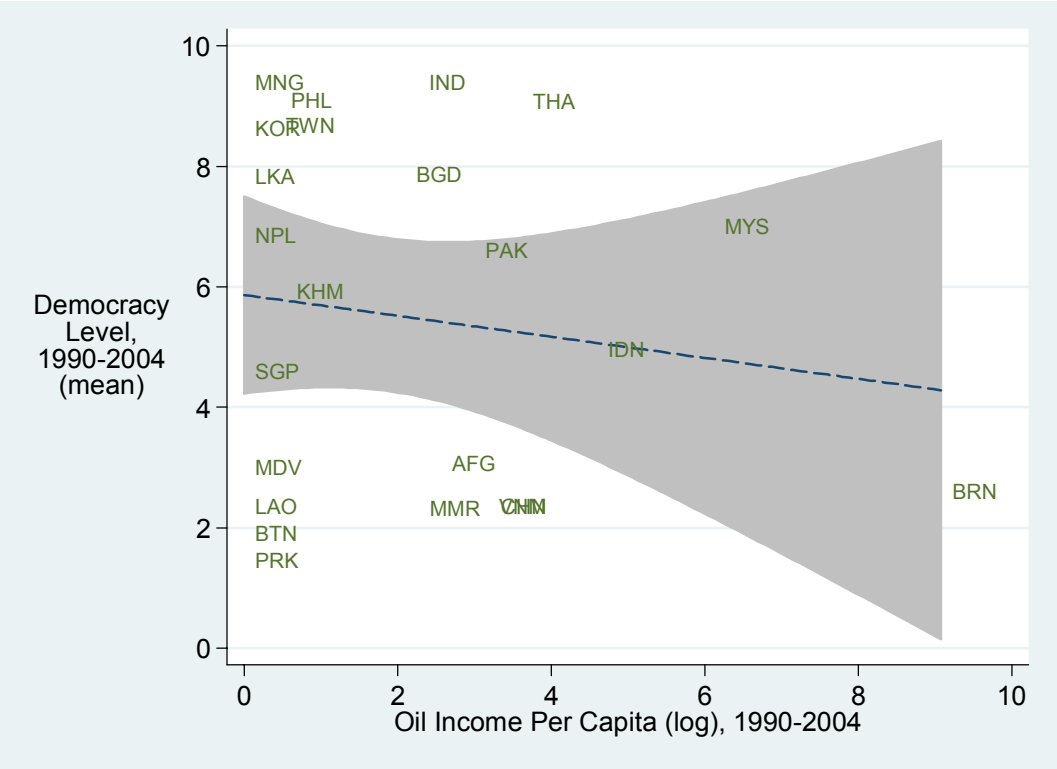


Figure 17: Economic Growth in the Developing World, 1950-2001

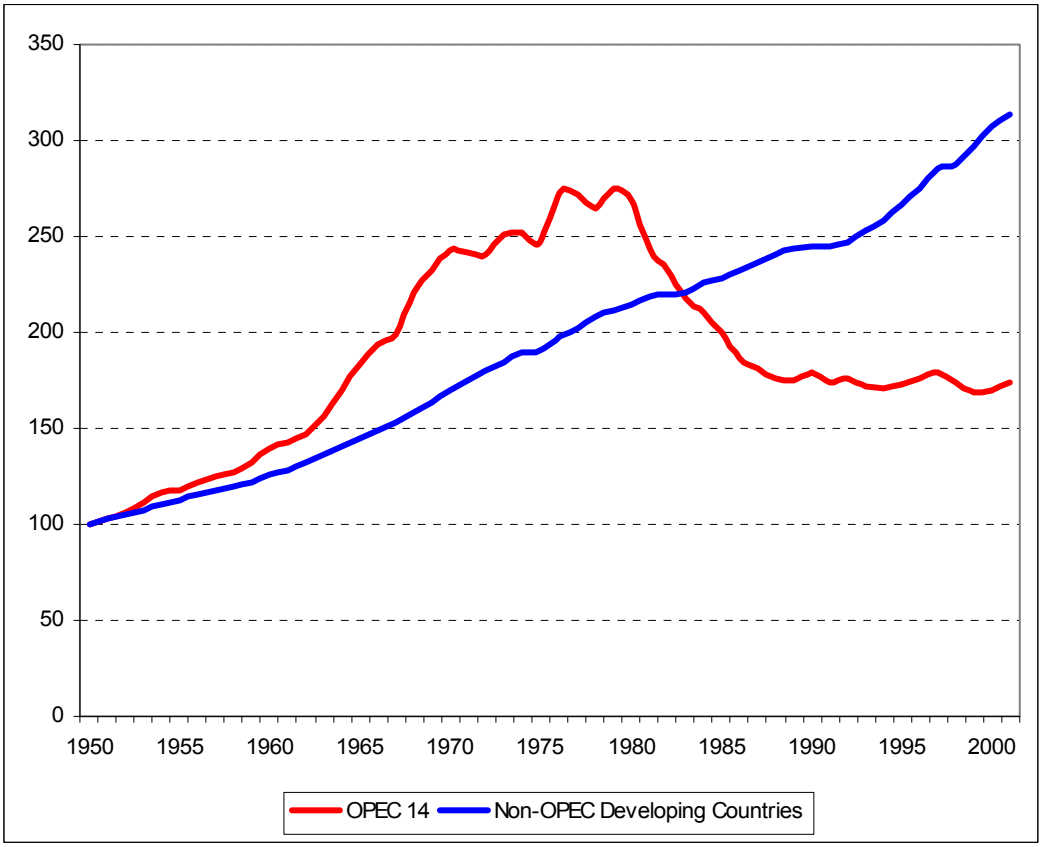


Figure 18: Oil Rents and Taxes on Goods and Services, 1990-2006

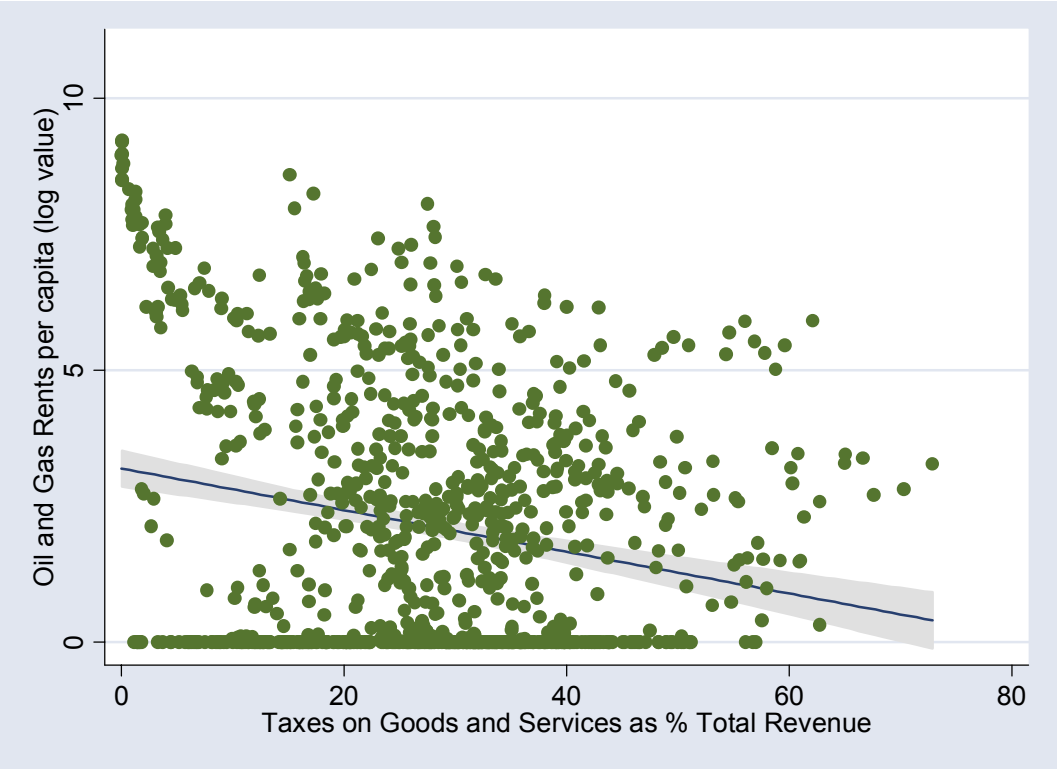


Figure 19: Oil Income and Gasoline Prices in Democracies & Autocracies, 2006

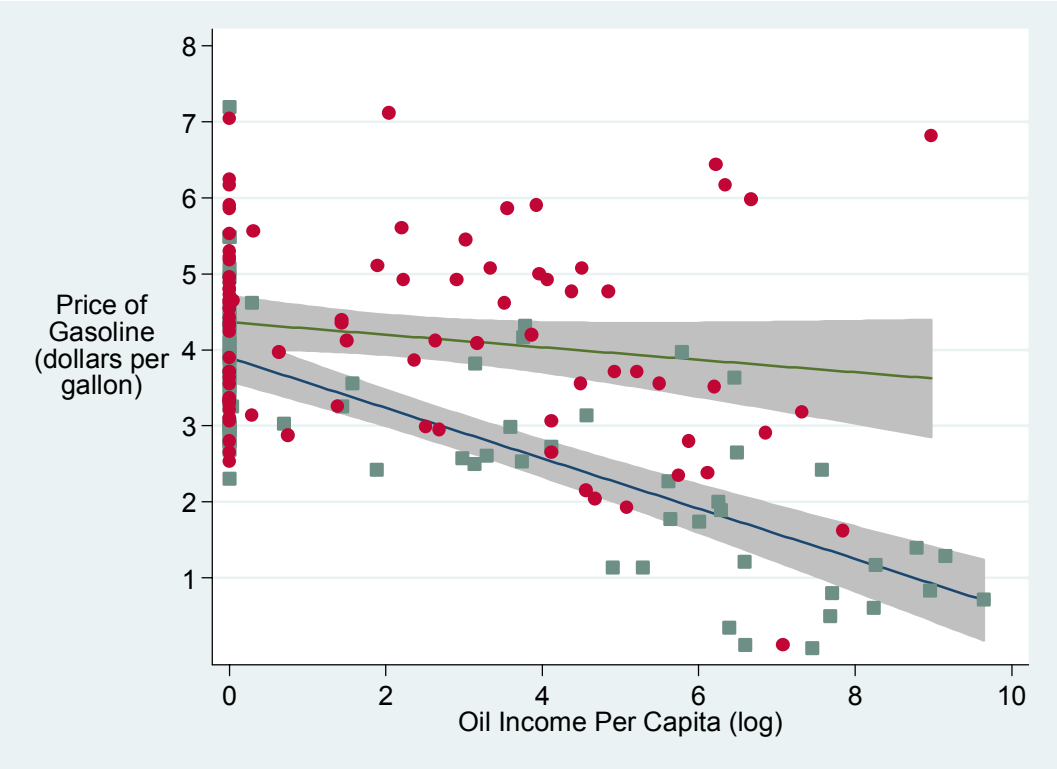
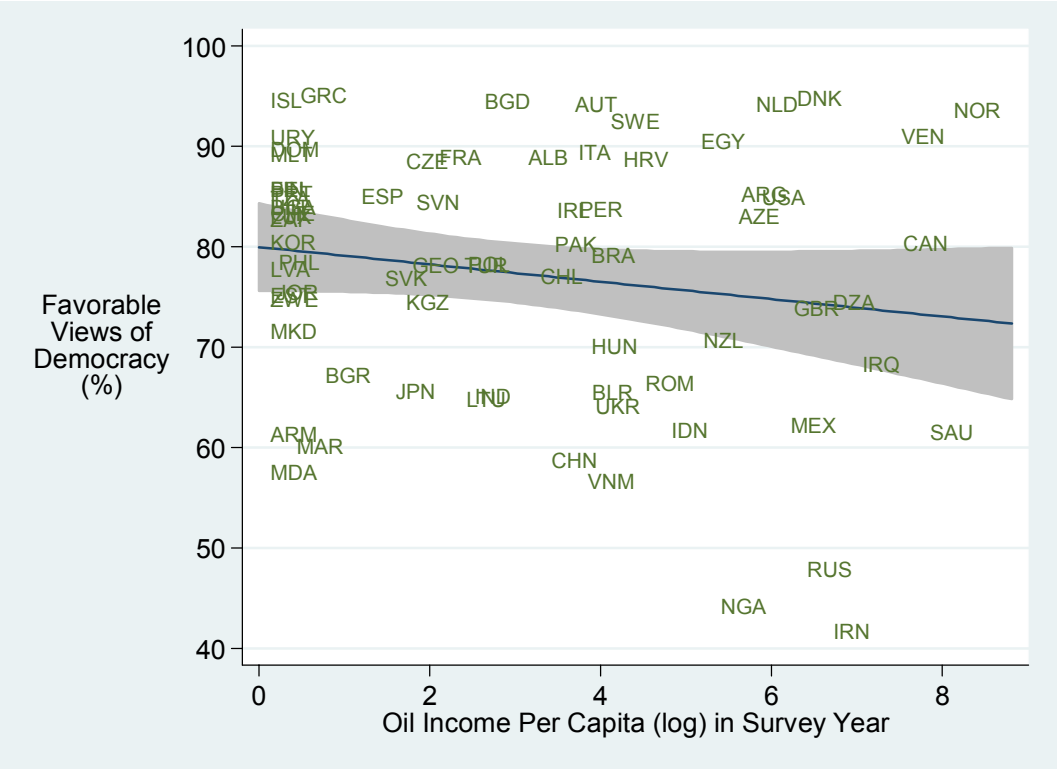


Figure 20: Favorable Views of Democracy (%) and Oil Income



The Y-axis records the percentage of survey respondents who either agree, or strongly agree, with the statement that "democracy has its problems but it is better than other forms of government," from the World Values Survey. Responses are from the most recent survey in each country; surveys were carried out between 1995 and 2004. The X-axis reports the oil rents per capita (log value) in each response country, in the year the survey was conducted.

Figure 21: Support for Democracy in Selected Countries