

# The First Law of Petropolitics\*

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## **Abstract**

We examine empirically the relationship between crude oil prices and the ebb and flow of democratic institutions, in order to test the hypothesis that high oil prices undermine democracy. We find strictly no evidence in favor of this so-called "First Law of Petropolitics" (Friedman, 2006).

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# 1 Introduction

Might high oil prices undermine democracy? Autocrats ruling over oil-rich states and controlling oil resources may find it easier to sustain political power when oil prices are high. As the case of Venezuela under Hugo Chavez illustrates, when oil prices are high, more resources are available to purchase political support by offering transfers to citizens. More resources are also available to carry out repressive actions in order to quell opposition through coercive means. The cost of giving up political power is greater when the economic value of this power is larger. For oil rich countries, then, high oil prices may help sustain autocratic regimes, and prevent transitions to democracy. They may also facilitate transitions away from weak democracy into autocracy by raising popular tolerance for autocracy. Such a deleterious effect of oil prices on political regime type was dubbed the "First Law of Petropolitics" by columnist Tom Friedman in a Foreign Affairs article (Friedman, 2006).<sup>1</sup> The negative effect of high oil prices on democracy is often cited as a reason for advocating efforts to wean America from its reliance on foreign oil as a source of energy. Such a reliance is seen as implicitly supportive of autocratic regimes, and conducive to unwanted foreign entanglements that could exacerbate national security threats.

This paper looks for empirical evidence in favor of the First Law of Petropolitics (FLPP). We pursue a simple empirical exercise. Using data on real oil prices going back to 1861 and data on the democratic nature of institutions across the world, we first examine whether oil prices and

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<sup>1</sup>The hypothesis was reiterated in a recent New York Times op-ed and a recent book (Friedman, 2008a, 2008b). Friedman first hypothesized the negative relationship between democracy and oil prices by drawing lines on a napkin at lunchtime: "I laid out my napkin and drew a graph showing how there seemed to be a rough correlation between the price of oil, between 1975 and 2005, and the pace of freedom in oil-producing states during those same years." (Friedman, 2008b, p. 94; Taibbi, 2009, provides an entertaining review). This paper seeks to go a little beyond paper-napkin econometrics.

democracy are inversely related in a time series sense. We first do so for the world as a whole, and then restrict attention to oil producing regions where the effect is most likely to be observed. We also examine whether any relationship might be stronger in the post-1925 and post-1960 periods, when oil became of increasing importance as a source of energy. Second, we use a panel data approach, regressing a country's level of democracy on an indicator of oil prices, other regressors and country fixed effects. In none of these empirical tests do we find any empirical support for the First Law of Petropolitics. Third, we discuss a set of individual country cases to illustrate the large sample results.

This paper is related to a vast and growing academic literature on the resource curse. Sachs and Warner (2001) argued empirically that resource rich countries suffer from inferior economic performance. A large body of work in political science has sought to demonstrate that resource abundant countries have worse institutions (notable references include Ross, 2001, Wantchekon, 2002, and Ramsay, 2007, among many others). An important contribution by Haber and Menaldo (2008), however, recently challenged this conventional wisdom, arguing that resource intensity is not associated with autocracy within countries across time, no matter how resource intensity or democracy are measured. All these papers measure resource intensity using quantity measures, such as the value of resources produced or exported as a percentage of GDP or total exports, or total oil revenues, which may be endogenous to domestic economic and political conditions. Existing contributions do not examine the effect of world prices in isolation.<sup>2</sup> In this short note, in contrast, we focus only on the effects of the price of oil. Unlike quantity-based measures, oil prices are determined on world markets and are less likely to be endogenously affected by a single

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<sup>2</sup>A recent paper by Guriev et al. (2008) examines the impact of oil prices on nationalizations in the oil sector in a panel of countries, finding that high oil prices lead to more nationalizations. They do not investigate the effect of crude oil prices on regime type.

producer's domestic circumstances, particularly at the one year frequency employed in this paper. This is an advantage when trying to identify the effect of the price of a natural resource on regime type. The focus on prices also constitutes a strict empirical test of the FLPP, as formulated in Friedman (2006, 2008a, 2008b).

## 2 A Time Series Approach

Our first approach to evaluating the relationship between democracy and oil prices relies on a time series approach. The methodology is related to that in Haber and Menaldo (2008). While the past literature on the resource curse focused on cross-sectional analysis, they used mainstream time series methods to analyze the relationship between resource abundance and democracy in a within-country sense.<sup>3</sup> Using a historical dataset going back to a period that predates most resource discoveries, they measured resource abundance using three indicators: the percentage of government revenues from oil or minerals, real windfall profits from oil and minerals per capita, and real gross oil revenues per capita. They did not, however, examine the role of oil prices in isolation.

Using data on crude oil prices for several time periods and data on democracy averaged over countries in several regions, we examine the time paths of democracy and world oil prices. The data source for crude oil prices is the June 2008 issue of British Petroleum's Statistical Review of World Energy, the most comprehensive source of available data on oil production and historical oil prices. The crude oil price series covers the 1861 to 2007 period, with prices expressed in constant 2007 dollars.<sup>4</sup> While the discovery and use of petroleum date back to Antiquity, oil refining was

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<sup>3</sup>In particular, they examined the stationarity properties of the series, checked for cointegration, and used a distributed lag model to estimate the relationship between democracy and resource abundance.

<sup>4</sup>The data were retrieved in January 2008 from <http://www.bp.com/statisticalreview>.

invented in Nova Scotia in 1846, the first commercial oil well was drilled in Romania in 1857 and the first oil refinery was built in Baku (Azerbaijan) in 1861. Thus, the series on oil prices covers virtually the entire modern period of oil exploitation. Since oil played a limited economic role early in the period, we focus especially on the post-1925 and post-1961 periods.

The data on democracy are from the Polity IV project (Marshall and Jaggers, 2007), covering an unbalanced panel of countries from 1800 to 2007. Using the combined Polity score, which ranges from  $-10$  (most autocratic) to  $+10$  (most democratic), we construct unweighted measures of average democracy across four regions: the world as a whole, countries in the Middle East region, countries that were ever members of OPEC (after its founding in 1960) and countries that were major oil producers during the 1970-2000 period. To determine the latter set of countries, we use data on oil production from BP's June 2008 Statistical Review of World Energy, and isolate countries that produced more than 150 thousand barrels per day in each of 1980, 1990 and 2000. While this choice is admittedly somewhat arbitrary, results were not sensitive to changes in the criteria for what constitutes a major oil producer. For each of the 1861-2007, 1925-2007 and 1961-2007 periods, we then isolated countries from each region that had available Polity data continuously during the period, and computed the simple average of their democracy scores in each year - that is, averages are constructed from balanced panels within each period.<sup>5</sup> We ended up with 12 time series for average democracy (4 regions times 3 time periods). We expect that any relationship between oil prices and democracy should be more prevalent in more recent periods, and in regions that produce oil rather than the world as a whole.

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<sup>5</sup>The 1925 and 1961 cutoff dates for the two more recent periods were chosen to maximize the number of countries included for the computation of the average democracy scores for each period - more countries are covered with each subsequent year in the Polity IV data, with clear breaks in coverage in 1925 and in 1961. Appendix 1 describes the sample of countries used to compute average democracy scores for each region and period.

To illustrate graphically the relationship between oil prices and democracy, Figure 1 displays the time path of the average polity score for major oil producers and the time path of crude oil prices since 1961 - the graphical analog of Friedman's paper-napkin diagram. Table 1 displays simple time series correlation coefficients between our various measures of average democracy and oil prices since 1961 (similar correlations for the 1861-2007 and 1925-2007 periods do not reveal a substantially different pattern). The last row reveals either statistically weak or in the case of OPEC countries significantly *positive* correlations between oil prices and democracy, contrary to what would be implied by the FLPP.

Our first formal econometric test is to examine the coefficient on crude oil price in a specification of the form:

$$D_{rt} = \alpha + \beta p_t + \varepsilon_t \tag{1}$$

where  $D_{rt}$  denotes the average democracy score for a given region  $r$  at time  $t$  and  $p_t$  denotes the real price of crude oil. This test is the direct econometric analog to Friedman's paper napkin diagram. One difficulty is that oil prices, democracy or both might be non-stationary series, leading to spurious inferences from a levels specification. Table 2 presents conventional Augmented Dickey-Fuller (ADF) tests of the null hypothesis that each of the series is nonstationary. For each series, we consider two specifications: a specification assuming a non-zero drift term under the null and another allowing for both a nonzero drift term and a time trend under the null.<sup>6</sup> Our ADF tests include 4-period lagged differences in all specifications (results are not sensitive to the number of included lagged differences). As Table 2 demonstrates, we find considerable evidence of nonstationarity for most variables in most periods. For instance, using the average World Polity score between 1961

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<sup>6</sup>Conventionally, these correspond to cases 3-4 in Hamilton (1994), p. 529. We also considered a specification assuming that, for each series, the drift term is zero under the null of a unit root (case 2 in Hamilton, 1994), and the results were not materially different.

and 2007, we find an ADF z-statistic of  $-2.7$  with a McKinnon p-value of 0.236, so we fail to reject the null of nonstationarity for this series. In fact, out of 30 series being tested for nonstationarity, we fail to reject the null at the 5% significance level in 24 cases. Two exceptions where the average democracy series appear stationary are for major oil producers and OPEC countries when limiting the sample to 1961-2007.

Given the evidence that our series of interest are likely to be nonstationary, we next conduct tests of cointegration between oil prices and average democracy. If detected, such cointegration would indicate the presence of a significant long term relationship between these variables. We conduct two sets of tests, reported in Table 3. The first set is based on conventional Engle-Granger cointegration tests, running ADF tests on residuals from an OLS regression of average Polity on crude oil prices at various periods and in various regions (these tests allow for a drift term in the residuals, and include 4-period lagged differences). The second set of tests is based on the VAR approach to cointegration (Johansen tests). Table 3 presents the results from both approaches. Turning first to Engle-Granger tests, the p-value on the ADF statistic, testing for the null hypothesis that the residuals from regressing the average Polity score on crude oil prices are nonstationary, generally lead to a rejection of the null. In only 3 out of 12 cases do we fail to reject the null. These cases are for the Polity score averaged over the whole world for periods 1861-2007 and 1961-2007, and for oil producers from 1961 to 2007. In only one of these cases does any evidence of cointegration remain when using the Johansen approach. Johansen's trace statistics suggest evidence of cointegration between oil prices and average democracy at the 95% level (but not at the 99% level) when average democracy is computed over all available countries in the world for the period 1861-2007. This is the period and region for which we least expected to see any evidence of a long term relationship between oil prices and regime type *a priori*, since for most of this period and most of the countries used, oil is an irrelevant part of the economy. To

summarize, we find scant evidence of cointegration between oil prices and regime type

Since we find no evidence of cointegration, the logical next step is to check for the presence of a long term relationship between oil prices and democracy by running our basic specification of (1) in first differences:

$$\Delta D_{rt} = \beta \Delta p_t + \Delta \varepsilon_t \quad (2)$$

This specification allows us to recover  $\beta$ , the coefficient that describes the relationship between oil prices and democracy (in actual regressions, we allow for a constant term in the regression in first-differences). Table 4 presents the results. Again, we find no evidence of a long-term relationship between world oil prices and democracy, for any of the periods or any of the regions. In fact, in line with the raw correlations in levels displayed in Table 1, all of the coefficients are of the wrong sign, suggesting that when oil prices rise, so does average democracy. In all cases, these positive coefficients are significant at the 10% level, and in many cases at higher levels of significance, although their magnitude is generally small.

To conclude, a systematic time series analysis reveals no evidence of a negative relationship between oil prices and democracy in any of the periods and regions under consideration.

### **3 A Panel Data Approach**

#### **3.1 Country fixed effects results**

The time series approach is the most direct test of the First Law of Petropolitics, but also involves several drawbacks. It requires the use of a balanced panel to avoid biases due to composition effects in the computation of average Polity scores across periods and regions. It also fails to control for country-specific factors that might drive political regime type. In this section, we make use of the panel dimension in the data to evaluate the relationship between regime type and oil prices. We



start from the following specification:

$$D_{it} = \gamma p_t + \mu_i + \eta_{it} \tag{3}$$

where  $i$  denotes individual countries.  $\mu_i$  is treated as a country fixed effect, accounting for all the variation in democracy scores attributable to time-invariant country characteristics, such as historical and geographical factors.  $\gamma$  captures the within-country, across-time relationship between crude oil prices and political regime type. Since we account for country fixed-effects, we can estimate equation (3) on an unbalanced panel, in order to maximize the number of countries in the sample.<sup>7</sup>

We estimate equation (3) for subsamples characterized by different regions or periods, as defined in Section 2, and in separate specifications we allow for interaction terms between crude oil prices and region/period indicators. Results are presented in Tables 5 and 6. In Table 5, we estimate equation (1) across different regions. For the world as a whole and for countries that were ever members of OPEC (column 1 and 5), we find a *positive* relationship, inconsistent with the FLPP. For major oil producers (column 3), the relationship is negative but with a small and statistically insignificant coefficient estimate. For Middle Eastern countries (column 7), the relationship is negative and statistically significant. However, in column 8, estimates on the interaction terms between oil prices and period dummies reveals that this negative effect in Middle Eastern countries is entirely driven by the 1861-1924 period, when oil prices were of minimal or no importance to these countries (oil was not discovered in Saudi Arabia until 1938, for instance). In fact, looking across columns of Table 5 reveals that statistically significant negative effects of oil prices on the combined Polity score only arise in the 1861-1925 period, raising suspicions that such negative effects are entirely spurious, since oil was of almost no economic significance to virtually every country in this period.

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<sup>7</sup>The 167 countries used for the panel analysis are listed in Appendix 2.

Table 6 shows results for distinct time periods rather than regions. The simple effect of oil prices is either significantly positive or statistically indistinguishable from zero for all time periods. Considering interactions with region dummies, it appears as before that oil prices may bear a negative relationship with the combined Polity score for major oil producers and Middle Eastern countries (and a positive one for OPEC countries). However, these effects disappear entirely when focusing on the 1961-2007 period, where we would most expect to see them appear strongly.

The regressions in Tables 5 and 6 control for country fixed effects. Thus, they are equivalent to regressions in deviations from country means. While taking deviations from country means may help to eliminate nonstationarity from regime type and oil prices, it is possible that deviations of these variables from their country means remain nonstationary. To address this problem, Table 7 runs fixed effects regressions where regime type and oil prices are entered in first differences. This table focuses on the 1961-2007 period and examines the relationship for various geographic subsamples as defined previously. Again, we find no evidence of an inverse relationship between oil prices and democracy - in fact the relationship, if anything, appears to be positive.

In sum, much like the time series exercise, panel data approach reveals no evidence of any significant association between crude oil prices and democracy.

### **3.2 Discussion of Individual Cases**

Friedman (2006, 2008b, chapter 4) presents simple time series graphs of crude oil prices against measures of economic or political freedom for Iran, Russia, Nigeria and Venezuela, along with a historical narrative describing the relationship between the two variables in the specific contexts of these countries. The chosen measure of freedom as well as the time period under consideration differ across each of these countries, so the graphs reveal what may appear to be a surprisingly

strong inverse association between freedom and crude oil prices.<sup>8</sup> In contrast, we can display the time path of these variables for the same countries using the maximal number of years of available data, and with a consistent definition of political freedom (as before, the combined Polity score). We focus on the maximal number of years of available data in the post-1961 period where the relationship is most expected to appear (for the Russian Federation, data is not available prior to 1992).<sup>9</sup>

Figure 2 displays the time series relationship for these four countries. The correlation is positive across all these countries, suggesting that the inverse relationship between oil prices and democracy in Friedman's graphs was simply the result of an adequate choice of a shorter time span (for Venezuela and Iran) and/ or of alternative measures of freedom (for Iran, Nigeria and the Russian Federation).<sup>10</sup> In addition, the choice of these countries was rather arbitrary, and the graphs were not representative of the larger sample results presented above. To further illustrate the lack of a relationship between oil prices and political regime type, we display the same relationship for Indonesia, Egypt, Gabon and Mexico, all major oil producers. Again, if anything the relationship appears to be positive for three of these countries.<sup>11</sup> If we were to display the same graph for Middle Eastern countries such as Saudi Arabia or the United Arab Emirates, no relationship would

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<sup>8</sup>For Iran and Nigeria, in particular, Friedman's chosen measures of "freedom" were measures of freedom to trade and of economic freedom, instead of measures of political freedom, or democracy.

<sup>9</sup>In a very recent paper, Townsend (2009) reexamines these four case studies in detail at the individual country level, expanding the sample period and critically assessing the choice of Friedman's measures of political freedom, reaching conclusions broadly similar to ours.

<sup>10</sup>The raw correlations between crude oil price and the combined Polity score for available years of data between 1961 and 2007 were 0.183 (Venezuela), 0.396 (Nigeria), 0.231 (Iran) and 0.476 (Russian Federation).

<sup>11</sup>The raw correlations between crude oil price and the combined Polity score from 1961 to 2007 were 0.153 (Indonesia), 0.553 (Egypt), -0.146 (Gabon) and 0.174 (Mexico).

emerge as these countries had constant (and very low) Polity scores in recent decades. This null relationship is reflected in the large sample tests presented above.

## 4 Conclusion

This paper pursued a simple empirical strategy to evaluate the relationship between oil prices and political regime type. Using both a time series and a panel data approach, we evaluated the association between crude oil prices and a measure of the democratic nature of institutions for a variety of regions and periods going back to 1861. None of these empirical tests led to any evidence of an inverse relationship between political freedom and oil prices, in particular for oil producing nations post-1961, where a relationship, if any, would be most expected to exist.

We focused on the price of crude oil. There are ongoing debates on whether natural resource abundance, more broadly, adversely affects the nature of political institutions. If this were the case, we would expect swings in a relatively exogenous factor directly affecting the value of natural resources, such as the price of crude oil, to have some impact on a country's index of democracy. This hypothesis is not, however, supported empirically: there is no such thing as "the First Law of Petropolitics".

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**Table 1 – Simple time correlations between oil prices and world/regional Polity scores, 1961-2007**

	<b>Polity World 1961-2007</b>	<b>Polity Mideast 1961-2007</b>	<b>Polity OPEC 1961-2007</b>	<b>Polity major oil producers 1961-2007</b>
Polity Mideast 1961-2007	0.8941*	1.0000		
Polity OPEC 1961-2007	0.7816*	0.8503*	1.0000	
Polity oil producers 1961-2007	0.9152*	0.9004*	0.9129*	1.0000
World price of crude oil, constant 2007 US\$	0.0260	0.1997	0.3524*	0.2000

**Notes:** Correlations based on 47 observations (years).

\* indicates significance at the 5% level.

World average of Polity2 index is based on 99 underlying countries, Mideast average based on 7 underlying countries, OPEC average based on 8 underlying countries and major oil producer average based on 22 underlying countries for which Polity3 and crude oil price data are continuously available since 1961.

**Table 2 – Augmented Dickey-Fuller Tests of Nonstationarity for Crude Oil Prices and Average Polity Series**

<b>Period:</b>	<b>1861-2007</b>	<b>1861-2007</b>	<b>1925-2007</b>	<b>1925-2007</b>	<b>1961-2007</b>	<b>1961-2007</b>
<b>ADF Specification:</b>	<b>Drift</b>	<b>Drift+Trend</b>	<b>Drift</b>	<b>Drift+Trend</b>	<b>Drift</b>	<b>Drift+Trend</b>
<b>Crude Oil price</b>						
Observations	142	142	78	78	42	42
ADF Z test statistic	-2.3790	-2.3860	-1.3370	-2.1680	-1.5710	-1.6300
McKinnon approximate p-value	0.0094	0.3870	0.0927	0.5080	0.0625	0.7800
R-squared	0.20	0.23	0.04	0.08	0.08	0.09
<b>Polity - World</b>						
Observations	142	142	78	78	42	42
ADF Z test statistic	-0.3910	-1.4060	-0.1160	-1.8560	-0.7660	-2.7000
McKinnon approximate p-value	0.3480	0.8590	0.4540	0.6770	0.2240	0.2360
R-squared	0.05	0.07	0.12	0.18	0.41	0.5
<b>Polity - Major Oil Producer</b>						
Observations	142	142	78	78	42	42
ADF Z test statistic	-1.3160	-2.3530	-0.9600	-2.1620	-0.6790	-4.3880
McKinnon approximate p-value	0.0952	0.4050	0.1700	0.5110	0.2510	0.0023
R-squared	0.18	0.20	0.11	0.16	0.05	0.39
<b>Polity - OPEC</b>						
Observations	142	142	78	78	42	42
ADF Z test statistic	-1.3400	-2.8420	-1.7020	-2.7940	-1.5370	-4.0330
McKinnon approximate p-value	0.0913	0.1820	0.0465	0.1990	0.0665	0.0079
R-squared	0.03	0.07	0.06	0.12	0.09	0.34
<b>Polity - Middle East</b>						
Observations	142	142	78	78	42	42
ADF Z test statistic	-2.7290	-2.7140	-2.1930	-2.1850	-1.2540	-2.4520
McKinnon approximate p-value	0.0036	0.2300	0.0158	0.4980	0.1090	0.3520
R-squared	0.05	0.05	0.06	0.07	0.06	0.17

**Note:** All ADF tests were performed with 4 lagged differences included in the specification.

**Table 3 – Tests for Cointegration between Oil Prices and Average Democracy**

	(1) 1861-2007	(2) 1925-2007	(3) 1961-2007
<b>Average Polity - World</b>			
<b>Engle-Granger cointegration tests</b>			
ADF Z test statistic	-1.032	-1.459	-0.891
McKinnon approximate p-value	0.152	0.075	0.189
<b>Johansen-VAR approach</b>			
Trace stat - null of 0 cointegration relation	19.46	11.09	5.933
Trace stat - null of 1 cointegration relation	1.749	1.406	0.229
Number of cointegration relations (99%)	0	0	0
Number of cointegration relations (95%)	1	0	0
<b>Average Polity - Oil Producer</b>			
<b>Engle-Granger cointegration tests</b>			
ADF Z test statistic	-1.729	-2.033	-1.083
McKinnon approximate p-value	0.043	0.023	0.143
<b>Johansen-VAR approach</b>			
Trace stat - null of 0 cointegration relation	14.690	10.730	5.865
Trace stat - null of 1 cointegration relation	0.041	0.005	0.092
Number of cointegration relations (99%)	0	0	0
Number of cointegration relations (95%)	0	0	0
<b>Average Polity - OPEC</b>			
<b>Engle-Granger cointegration tests</b>			
ADF Z test statistic	-2.037	-2.538	-1.850
McKinnon approximate p-value	0.022	0.007	0.036
<b>Johansen-VAR approach</b>			
Trace stat - null of 0 cointegration relation	13.48	9.083	5.634
Trace stat - null of 1 cointegration relation	1.421	1.534	1.962
Number of cointegration relations (99%)	0	0	0
Number of cointegration relations (95%)	0	0	0
<b>Average Polity - Middle East</b>			
<b>Engle-Granger cointegration tests</b>			
ADF Z test statistic	-2.66	-2.183	-1.514
McKinnon approximate p-value	0.004	0.016	0.069
<b>Johansen-VAR approach</b>			
Trace stat - null of 0 cointegration relation	14.835	6.925	5.712
Trace stat - null of 1 cointegration relation	6.845	2.508	2.111
Number of cointegration relations (99%)	0	0	0
Number of cointegration relations (95%)	0	0	0

**Notes:** Engle-Granger/ADF tests for cointegration include 4-period lagged differences.

VAR test specifications include 4 lags of the variables.

142 observations for 1861-2007 period, 78 observations for 1925-2007 period, 42 observations for 1961-2007 period.



**Table 4 – Regressions in first differences**

	(1) 1861-2007	(2) 1925-2007	(3) 1961-2007
<b>Average Polity - World</b>			
First difference of crude oil prices (2007 \$)	0.0004 [0.003]	0.006 [0.004]	0.004 [0.004]
Constant	0.064** [0.027]	0.076** [0.036]	0.102** [0.042]
Observations	146	82	46
R-squared	0.0002	0.02	0.025
<b>Average Polity - Oil Producer</b>			
First difference of crude oil prices (2007 \$)	0.008* [0.004]	0.015** [0.007]	0.012** [0.005]
Constant	0.041 [0.046]	0.031 [0.055]	0.025 [0.056]
Observations	146	82	46
R-squared	0.022	0.06	0.117
<b>Average Polity - OPEC</b>			
First difference of crude oil prices (2007 \$)	0.022*** [0.008]	0.059*** [0.015]	0.034*** [0.010]
Constant	0.037 [0.077]	0.048 [0.123]	0.013 [0.112]
Observations	146	82	46
R-squared	0.055	0.163	0.191
<b>Average Polity - Middle East</b>			
First difference of crude oil prices (2007 \$)	0.014* [0.007]	0.035** [0.014]	0.013* [0.007]
Constant	0.001 [0.075]	-0.029 [0.114]	0.011 [0.071]
Observations	146	82	46
R-squared	0.024	0.074	0.08

**Notes:** Standard errors in brackets;

\*\*\*:  $p < 0.01$ , \*\*:  $p < 0.05$ , \*:  $p < 0.1$

**Table 5 - Panel fixed effects regressions, by region  
(unbalanced panel, country fixed effects)**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	<b>Full Sample</b>		<b>Oil Producers</b>		<b>OPEC</b>		<b>Middle East</b>	
Price of crude oil, constant 2007 prices	0.004 [0.002]*		-0.004 [0.004]		0.016 [0.006]**		-0.014 [0.004]***	
Crude Oil Price * 1861-1924 dummy		-0.034 [0.004]***		-0.043 [0.007]***		-0.019 [0.014]		-0.032 [0.012]***
Crude Oil Price * 1925-1960 dummy		-0.006 [0.040]		0.080 [0.066]		-0.086 [0.119]		-0.027 [0.084]
Crude Oil Price * 1961-2007 dummy		-0.001 [0.002]		0.009 [0.004]**		0.017 [0.007]**		-0.002 [0.005]
1925-1961 dummy		0.292 [0.616]		-0.175 [1.028]		4.091 [1.858]**		0.200 [1.340]
1961-2007 dummy		2.402 [0.184]***		1.118 [0.313]***		3.845 [0.592]***		-1.502 [0.495]***
# of observations (# of countries)	12,539 (167)	12,539 (167)	2,725 (29)	2,725 (29)	1,015 (14)	1,015 (14)	1,006 (16)	1,006 (16)

Standard errors in brackets; \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%  
Dummy for 1861-1924 omitted due to perfect collinearity.

**Table 6 - Panel fixed effects regressions, by period  
(unbalanced panel, country fixed effects)**

	(1)	(2)	(3)	(4)	(5)	(6)
	1861-2007		1925-2007		1961-2007	
Price of crude oil, constant 2007 prices	0.004 [0.002]*	0.007 [0.002]***	0.016 [0.002]***	0.019 [0.003]***	-0.001 [0.002]	-0.003 [0.003]
Crude Oil Price * Oil Producer dummy		-0.020 [0.006]***		-0.013 [0.007]*		0.007 [0.008]
Crude Oil Price * OPEC dummy		0.038 [0.009]***		0.035 [0.010]***		0.016 [0.011]
Crude Oil Price * Middle East dummy		-0.024 [0.008]***		-0.037 [0.008]***		-0.009 [0.009]
# of observations (# of countries)	12,539 (167)	12,539 (167)	9,246 (167)	9,246 (167)	6,643 (167)	6,643 (167)

Standard errors in brackets; \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Table 7 - First Difference panel fixed effects regressions, by region, 1961-2007 period  
(unbalanced panel, country fixed effects)**

	(1)	(2)	(3)	(4)
	Full Sample	Oil Producers	OPEC	Middle East
FD of price of crude oil, constant 2007 prices	0.003 [0.002]	0.009 [0.004]**	0.019 [0.006]***	0.004 [0.004]
# of observations	6,575	1,311	609	621
# of countries	167	29	14	16

Standard errors in brackets; \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%  
The dependent variable is the first difference of the Combined Polity Score

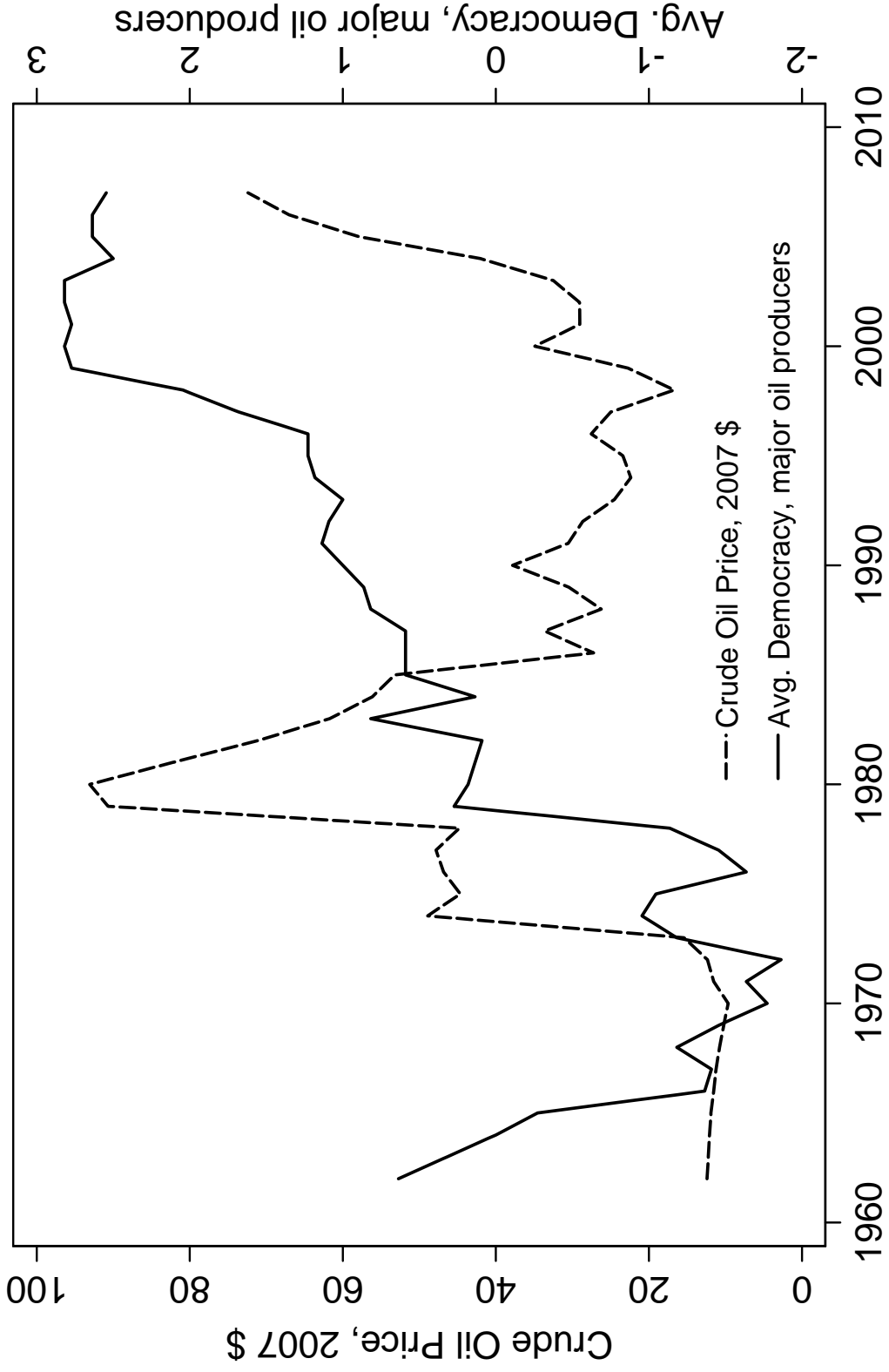
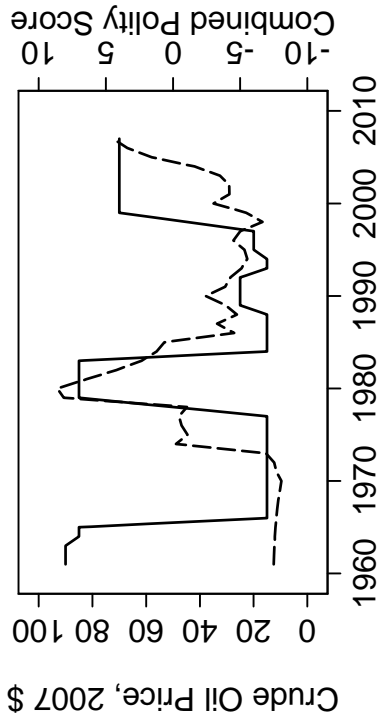
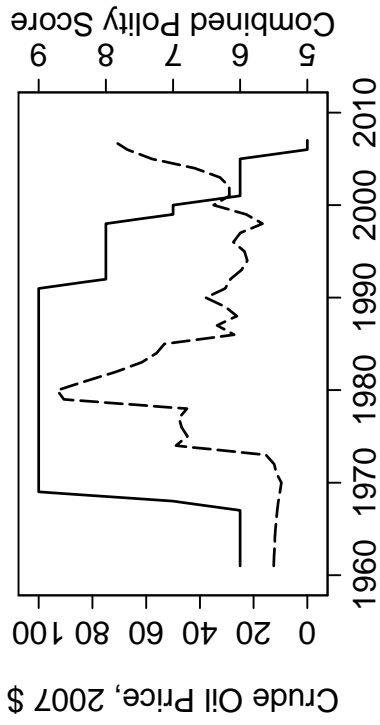
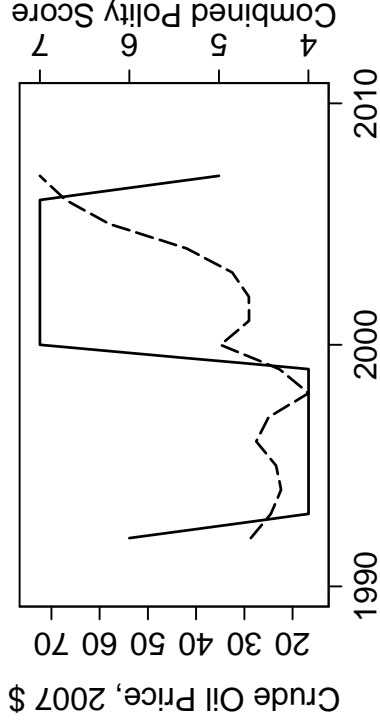
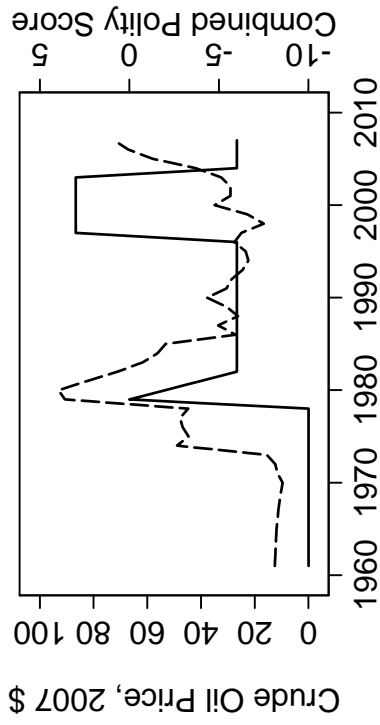


Figure 1 - Oil Prices and Democracy for Major Oil Producers, 1961-2007



Venezuela, 1961-2007

Nigeria, 1961-2007

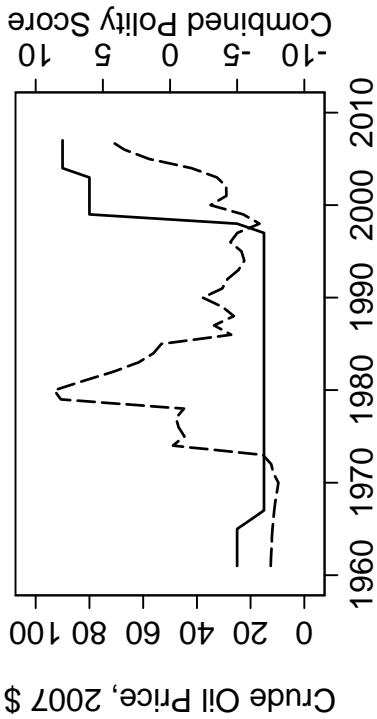


Iran, 1961-2007

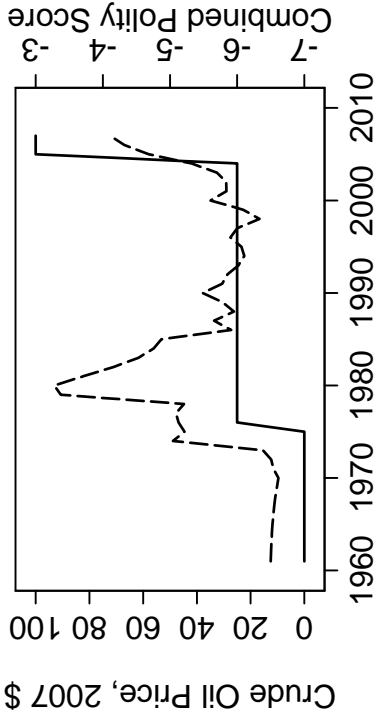
Russian Federation, 1992-2007

Figure 2 - Friedman's country cases

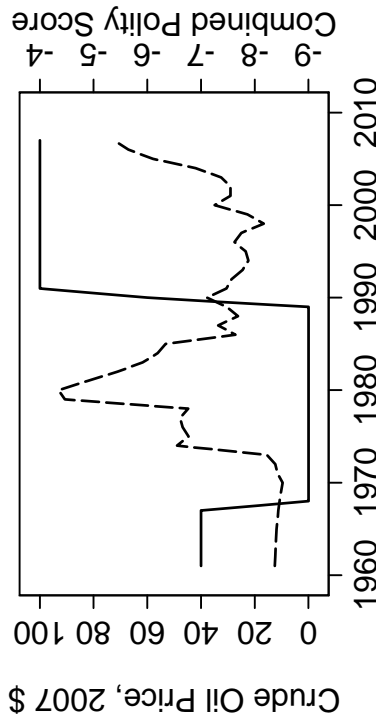
(dashed line = crude oil price ; solid line = combined Polity score)



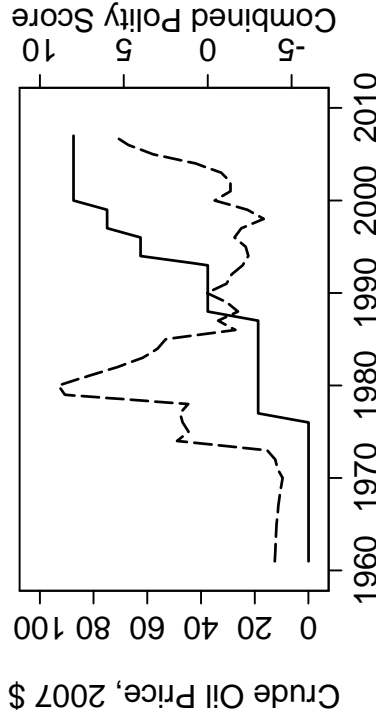
Indonesia, 1961-2007



Egypt, 1961-2007



Gabon, 1961-2007



Mexico, 1961-2007

Figure 3 - Other country cases

(dashed line = crude oil price ; solid line = combined Polity score)

**Appendix 1 – Sample of countries, by period and region  
(balanced panel used for the time series exercise)**

<b>Countries in 1861-2007 sample only</b>	<b>Countries added for 1925-2007 sample</b>	<b>Countries added for 1961-2007 sample</b>	
Argentina <sup>a</sup>	Albania	Belgium	Malaysia <sup>a</sup>
Austria	Australia <sup>a</sup>	Benin	Mali
Bolivia	Bhutan	Burkina Faso	Mauritania
Brazil <sup>a</sup>	Bulgaria	Cameroon	Morocco
Chile	Canada <sup>a</sup>	Central African Republic	Myanmar(Burma)
Colombia	Cuba	Chad	Netherlands
Costa Rica	Dominican Republic	China <sup>a</sup>	Nicaragua
Ecuador <sup>a, b</sup>	Egypt <sup>a</sup>	Congo	Niger
El Salvador	Finland	Cote d'Ivoire	Nigeria <sup>a, b</sup>
France	Greece	Cyprus <sup>c</sup>	Norway <sup>a</sup>
Guatemala	Honduras	Denmark	Pakistan
Iran <sup>a, b, c</sup>	Ireland	Ethiopia	Philippines
Italy	Mexico <sup>a</sup>	Gabon <sup>a, b</sup>	Rwanda
Liberia	Mongolia	Ghana	Saudi Arabia <sup>a, b, c</sup>
Nepal	Panama	Guinea	Senegal
New Zealand	Peru	Hungary	Sierra Leone
Oman <sup>a, c</sup>	Poland	India <sup>a</sup>	Somalia
Paraguay	Romania	Indonesia, <sup>a, b</sup>	Sri Lanka
Portugal	South Africa	Israel <sup>c</sup>	Sudan
Spain	Turkey	Jamaica	Syria <sup>a, c</sup>
Sweden		Japan	Taiwan
Switzerland		Jordan <sup>c</sup>	Tanzania
U.S.A <sup>a</sup>		Korea	Thailand
United Kingdom <sup>a</sup>		Korea, Dem. Rep.	Togo
Uruguay		Laos	Tunisia
Venezuela <sup>a, b</sup>		Libya <sup>a, b</sup>	Zaire
(26 countries)	(46 countries)	Madagascar	(99 countries)

a. Major Oil Producers (as defined in text)

b. Countries that were ever OPEC members.

c. Countries in the Middle East



**Appendix 2 – Sample of countries, by region  
(unbalanced panel used in the panel data analysis)**

Afghanistan	Ghana	Panama
Albania	Greece	Papua New Guinea
Algeria <sup>a, b</sup>	Guatemala	Paraguay
Angola <sup>a, b</sup>	Guinea	Peru
Argentina <sup>a</sup>	Guinea Bissau	Philippines
Armenia	Guyana	Poland
Australia <sup>a</sup>	Haiti	Portugal
Austria	Honduras	Qatar <sup>a, b, c</sup>
Azerbaijan	Hungary	Romania
Bahrain <sup>c</sup>	India <sup>a</sup>	Russian Federation
Bangladesh	Indonesia <sup>a, b</sup>	Rwanda
Belarus	Iran <sup>a, b, c</sup>	Saudi Arabia <sup>a, b, c</sup>
Belgium	Iraq <sup>a, b, c</sup>	Senegal
Benin	Ireland	Serbia/Montenegro
Bhutan	Israel <sup>c</sup>	Sierra Leone
Bolivia	Italy	Singapore
Bosnia	Jamaica	Slovakia
Botswana	Japan	Slovenia
Brazil <sup>a</sup>	Jordan <sup>c</sup>	Solomon Islands
Bulgaria	Kampuchea, Democratic	Somalia
Burkina Faso	Kazakhstan	South Africa
Burundi	Kenya	Spain
Cameroon	Korea	Sri Lanka
Canada <sup>a</sup>	Korea, Dem. Rep.	Sudan
Central African Republic	Kuwait <sup>a, b, c</sup>	Swaziland
Chad	Kyrgyzstan	Sweden
Chile	Laos	Switzerland
China <sup>a</sup>	Latvia	Syria <sup>a, c</sup>
Colombia	Lebanon <sup>c</sup>	Taiwan
Comoros	Lesotho	Tajikistan
Congo	Liberia	Tanzania
Costa Rica	Libya <sup>a, b</sup>	Thailand
Cote d'Ivoire	Lithuania	The Gambia
Croatia	Macedonia	Togo
Cuba	Madagascar	Trinidad and Tobago <sup>a</sup>
Cyprus <sup>c</sup>	Malawi	Tunisia
Czech Republic	Malaysia <sup>a</sup>	Turkey
Czechoslovakia	Mali	Turkmenistan
Denmark	Mauritania	U.S.A <sup>a</sup>
Djibouti	Mauritius	U.S.S.R.

Dominican Republic	Mexico <sup>a</sup>	Uganda
Ecuador <sup>a, b</sup>	Moldova	Ukraine
Egypt <sup>a</sup>	Mongolia	United Arab Emirates <sup>a, b, c</sup>
El Salvador	Morocco	United Kingdom <sup>a</sup>
Equatorial Guinea	Mozambique	Uruguay
Eritrea	Myanmar(Burma)	Uzbekistan
Estonia	Namibia	Venezuela <sup>a, b</sup>
Ethiopia	Nepal	Vietnam
Fiji	Netherlands	Yemen, Arab Republic of, <sup>c</sup>
Finland	New Zealand	Yemen, People's Democratic Republic of, <sup>c</sup>
France	Nicaragua	Yemen, Rep.
Gabon <sup>a, b</sup>	Niger	Yugoslavia
Georgia	Nigeria <sup>a, b</sup>	Zaire
German Democratic Republic	Norway <sup>a</sup>	Zambia
Germany	Oman <sup>a, c</sup>	Zimbabwe
Germany, Federal Republic of	Pakistan	(167 countries)

a. Major Oil Producers (as defined in text)

b. Countries that were ever OPEC members.

c. Countries in the Middle East