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Does Oil Hinder Democratic Development?: A Time-Series Analysis

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Abstract: The resource curse is a topic studied intensively in both economics and political science. Much of the focus is now on whether oil affects democratic institutions. We further the debate through the use of additional measures of democracy and multiple time-series estimation strategies. We find no robust long-run effect of oil rents per capita on Polity, Civil Liberties, or Political Rights. Many comparable studies were restricted to Polity. We also use different country and period samples to respond to the findings that the effects of oil abundance may differ in Latin America, the Middle East, in mature oil producers, or that the effects become significantly negative post-1980. In each case we do not find a significant relationship. Long-run effects are well placed to address this question because they are estimated separately from short-run fluctuations (important given the slow pace of institutional change), and are consistent even in the presence of reverse causality.

Keywords: *resource curse, democracy, oil, natural resources, long-run relationships.*

JEL Classification: *O13, P16, H11, P59, O11*

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I. Introduction

The resource curse is a topic studied intensively in both economics and political science. The original discussion centered on why countries with large resource industries, typically measured by the share of natural resource exports in GDP, seemed to have slower rates of GDP growth than other countries. Many different reasons for this phenomenon have been offered. One prominent view traces the growth shortfalls experienced in natural resource-rich countries, to their weak political and other institutions. The question then becomes whether countries with substantial natural resources happen to have weak institutions or if natural resources retard the development of political institutions like democracy. Consequently, much of the resource curse literature has shifted to focus on the latter question.

The purpose of this paper is to take a fresh look at the long-term effect of natural resources in the form of oil rents on political institutions. In particular we ask, do changing oil rents affect an overall measure of democratic development (Polity), or either of two important dimensions of democratic development, Civil Liberties and Political Rights? Most comparable studies have focused on Polity, yet there are reasons to expect differences across each measure.

We find that oil rents do not have robust long-term effects on Polity, Civil Liberties, or Political Rights. This finding is supported by the results generated from multiple estimation strategies and holds also for different country groups. Our analysis differs from many others in that it focuses on the long-run effects of oil on democracy obtained from two time-series econometric models. Our primary model is an autoregressive distributed lag (ARDL) model, parameterized in error-correction form, which estimates the long-run effects separately from short-run fluctuations. Similar models have been used before, but unlike others, we do not assume the relationship between oil and democracy is common across countries, and we control for omitted common correlated effects. Our sample also differs. It is comprised only of those 61 countries that produce oil but did not start to develop their oil industries after fully developed democratic institutions were already in place such as Norway, the US, and UK.

Our analysis concludes with a comment on the recent work of Haber and Menaldo (2011) (henceforth "HM") and the reply to HM by Andersen and Ross (2014) (henceforth "AR"). These papers highlight the current democratic resource curse debate. To maximize comparability, we use similar data and techniques. Using the Polity score as an indicator for democratic institutions, HM provide evidence that suggests that oil abundance does not have a long-term effect on

democratic development. In contrast, AR reevaluate the relationship using the same data and mostly similar methodology, but find a negative relationship between oil and democracy during the post-1980 period. However we find that the AR finding for that post-1980 period is not robust, suggesting a conclusion more like that of HM, where there is no evidence of a democratic resource curse.

II. Background

The oil as blessing or curse literature has generated many variants, which have been of great interest to both economists and political scientists. For economists the most debated one concerns the effect of oil endowments on long-term growth. Do they raise long-term growth grates or lower them? This question prompted a great deal of empirical research. In the year 2000 Doppelhofer et al. (2000) assessed the empirical evidence available at that time and declared that the repeated findings of a negative relation confirmed the oil curse effect on growth to be one of the most robust empirical relationships in the entire empirical growth literature. Recent research, however, has suggested that the link between natural resources and growth is less clear-cut, and may depend on whether or not various adverse links through the quality of institutions (especially democracy) are realized.

Much of the attention on the resource curse, therefore, has shifted to analyzing the effect of oil endowments on democracy. Following some earlier work by Barro (1998) showing that countries with substantial oil (measured by an oil dummy) had a negative effect on democracy, Acemoglu et al. (2006) and Haber and Menaldo (2011) and Menaldo (2013) provided a rationale in terms of state capabilities, which includes the ability to collect taxes. For citizens to be willing to pay taxes, they are likely to insist that the state agrees to let them have a say in what the state does, i.e. by adopting democratic institutions. If the state has an alternative means of sustaining itself, such as by selling off its oil or other natural resources, it can avoid the costly process of developing the capability to tax its citizens and giving those citizens more say over what the government does. Only when the oil-endowed country adopts institutions like the effective rule of law and democracy can such countries use oil to their advantage. The political version of the oil curse (Mahdavy, 1970; Beblawi and Luciani, 1987; Przeworski et al, 2000; Ross 2001, and 2012), however, argues that this is quite unlikely. Oil rents lead to rent-seeking behavior, rent grabbing and rivalries that retard the development of democracy.

The number of studies on this political version of the resource curse has grown significantly. Ahmadov (2014) has conducted a meta–regression analysis on the basis of data taken from 29 existing publicly available studies on the relation between oil rents and democracy. After controlling for the many different methodological differences, time periods and country coverage, Ahmadov (2014) finds the overall effect of oil rents on democracy to be small, negative, and significant, but with considerable heterogeneity across regions, being somewhat more negative among countries of the Middle East and North Africa but positive and highly significant in Latin America.

III. Data

A. Variables, Data, and Sample Coverage

Oil abundance is measured as oil rents per capita (World Bank, 2011). Oil rents are defined as the difference between the unit price and production cost multiplied by production. Rents are used because their determinants are more exogenously determined than production or exports. While production and exports of oil may be affected by institutional conditions, reserve quality, an important determinant of rents, is determined by luck, the quality, depth, pool size and other geological conditions. For purposes of estimation, the natural logs of real oil rents per capita are used (henceforth "Oil Rents").

We use three different measures of democratic institutions, Polity, Civil Liberties, and Political Rights. Polity is perhaps the most commonly used indicator of democracy because it is "an index of the competitiveness of political participation, the openness and competitiveness of executive recruitment, and the constraints on the chief executive" (HM, 4). While much of the literature has focused on Polity, BenYishay and Betancourt (2014) have emphasized that its aggregate character might conceal different trends that might characterize different components of democracy, such as Civil Liberties and Political Rights. They argue that Civil Liberties are more persistent than Political Rights and tend to encourage the development of Political Rights to a greater extent than Political Rights to Civil Liberties. For this reason, Civil Liberties would seem to be more important in the promotion of democracy in the long run. Political Rights relate to free and fair elections, while Civil Liberties refer to protection of individual rights such as freedom of speech, freedom of assembly and equal treatment under the law (Freedom House,

2013).

By looking at the long-run effect of Oil Rents not only on Polity but also on Civil Liberties and Political Rights, our analysis extends the work of HM and AR on the oil-democracy link. We also extend the analysis of Omgba (2015), which studies the oil-democracy relationship in the context of colonization experiences (discussed in next section), by examining a larger sample of oil exporting countries (61 compared to 35) over a longer period of time (at least 30 years compared to a maximum of 10).

The period of analysis was based on data availability for the key variables, Oil Rents[1] and the measures of political institutions. The Civil Liberties and Political Rights measures become available beginning in 1974. A sample of 61 countries is constructed based on the availability of suitable data from 1974 to 2008. The analysis, discussed in the Methods section, allows for significant heterogeneity across countries, which requires a sufficient number of time periods to estimate country-specific coefficients (Mohaddes et al. 2013, 26). To this end, countries with less than 30 years of coverage or that lacked measurable change in either Oil Rents or political institutions were dropped. A further nine countries had to be dropped for the Polity analysis (bringing the sample to 52 countries), because the Polity score did not change over the sample period in these countries.[2] These restrictions should be remembered before generalizing the results, because relaxing them would attenuate the sample average effects of Oil Rents. Among the excluded countries, there are producers such as the United States and Norway that mechanically show no oil-democracy relationship because they were fully democratized at the beginning of the sample period.

B. Subsample Definitions

Once the sample was determined for our base analysis, two further classifications were used. First, we break the sample into countries that have mature oil industries and countries with less experience. We also break the sample into three regional classifications, Middle East and North Africa (MENA), Latin America and Caribbean, and the rest of the world (ROW). The rationale for using these categories is discussed below.

[1] Oil Rents data were prepared by the World Bank Wealth of Nations (World Bank, 2011), and are unavailable after 2008.

[2] Dropped countries include China, Cuba, Italy, Japan, Libya, Papua New Guinea, Qatar, Saudi Arabia, and the United Arab Emirates.

Industry Tenure Motivation.—The timing of oil discovery is likely to affect how oil rents affect institutions. Countries that discovered oil before 1956 were considered mature. The year of oil discovery is available from *The World History of Oil and Gas* (Geo-Help Inc, 2011). According to Tsui (2010), to examine the long-term effects of oil on democratic institutions, it is necessary to account for the heterogeneity in both the initial level of democracy, and the magnitude and the timing of the major oil discoveries. While there was a general trend toward democracy in the world as a whole, among countries which were non-democratic some forty years before, he found that those which had experienced major oil discoveries early in that period were about 10 percentage points below the trend of those that did not discover oil. By contrast, among countries that were at least somewhat democratic early on, he found no difference in trends further up the democracy scale.

Two recent analyses that consider the maturity of the oil industry are Blanco et al. (2015) and Omgba (2015). Blanco et al. (2015) found that the number of years since peak oil discovery had a positive effect on government stability and a negative effect on bureaucratic quality, but oil had no causal effect on democracy itself. Omgba (2015) finds the direct effect of oil on democracy (measured by Polity 2) to be at most of marginal significance, at least after controlling for other factors such as health (captured by European settlers in 1900, latitude and a malaria index). The main finding from Omgba (2015), however, is that both Polity and the Voice and Accountability index (the most democracy-oriented measure from the World Bank's World Governance Indicators) are positively related to the period of time between the beginning of oil production and a country's political independence.

Geographic Differences.—Treating the Middle East and North African and Latin American groups separately is important because they are both oil abundant regions but differ significantly in the level of political institutions in 1974 and in the degree to which their economies depend on oil. There are also important differences between them in their historical experience, culture, and socio-economic conditions. Not surprisingly, and as noted above, much of the existing literature has shown that the relationship between democracy and oil varies substantially across different parts of the world. In particular, the Middle East and North Africa has long been identified as a region with both substantial amounts of oil and little democracy. When oil was discovered in the Middle East and North Africa between 1930 and 1965, these countries were extremely low on

educational attainment, state capacity, and urbanization, which helps explain their low initial levels of democracy. While democracy has been on the rise throughout much of the world since then, its level has remained low in MENA (Huntington, 1991; Prezworski et al., 2000).

The low levels of democracy in MENA were partially attributed to oil. Barro (1998) used pooled international cross-sections to show that urbanization, education, life expectancy and lagged democracy all had positive effects on subsequent democracy and that an oil dummy variable had a significant negative effect. More recent studies have continued to highlight the failure of MENA countries to democratize over time Ross (2012, 75) and Hertog (2007). Herb (2005) too showed that MENA countries had the lowest democracy scores in the world but attributed much of this to the influence of regional neighbors, because it also applied to MENA countries without oil.

Other scholars, however, have pointed to another distinctive pattern in Latin America. For example Dunning (2008) pointed to the fact that in Latin America oil seemed to be positively related to the adoption of democracy. Even Ross (Ross, 2012, pp. 74, 85-86), conceded to Latin American exceptionalism with respect to the oil curse. Dunning provided a rationale saying that the emergence of oil rents would make wealthy elites less fearful that democracy would result in higher taxation and confiscation of their private wealth.

Recent work (such as of Dunning, 2008; Ross, 2010; Haber and Menaldo, 2011; Sinnott et al., 2010) conclude that oil rents have not led to lower democracy in Latin America because of its high level of inequality.[3] The rationale for arguing that Latin America is an anomaly is that in this region the state has been good at controlling and redistributing resource rents, which contributed to mass political support, and also because Latin America has been less dependent on natural resource rents than Middle Eastern and African countries (Sinnott et al., 2010).[4]

Is Latin America an exception to the political resource curse as previous work has found? In our analysis the Latin America and Caribbean group includes Trinidad and Tobago Argentina, Bolivia, Brazil, Chile, Colombia, Cuba, Ecuador, Guatemala, Mexico, Peru, and Venezuela. Among this group of countries, the major oil producers are Venezuela, Ecuador, and Mexico,

[3] Sinnott et al (2010) provide a review of the impact of natural resources on institutions in the Latin American context.

[4] However, Sinnot et al. (2010) note that recent resource booms seem to have led to the weakening of democracy in Latin America, especially with respect to press freedom and rule of law, and call attention to the need for further research based on more recent data.

which have oil exports representing between 84 percent and 29 percent of total exports during the period 1975-2004 (Blanco and Grier, 2012).

Our sample of MENA oil countries consists of the following 16 countries (Algeria, Bahrain, Egypt, Iran, Iraq, Kuwait, Libya, Oman, Qatar, Saudi Arabia, Sudan, Syria, United Arab Emirates, and Yemen)[5] and the remaining countries (Rest of the World) are from Sub Sahara Africa, Asia and the Pacific, Eastern Europe and Central Asia. Countries like Norway, US and UK have been excluded because they have been classified as fully democratic throughout the period. Certain others have had to be removed according to data availability limitations identified above.

Appendix Table A1 includes summary statistics for the sample as a whole, and for each country group separately. The list of countries in each group is included in Appendix Table A.

IV. Methods

To estimate the effects of Oil Rents on institutional development we use two forms of an error-correcting autoregressive distributed lag (ARDL) model and a distributed lag model. Before introducing the specific models, it is helpful to understand the assumed data generating process presented below.

$$Inst_{it} = \sum_{j=1}^{p} \lambda_{ij} Inst_{i,t-j} + \sum_{j=0}^{q} \delta_{ij} Oil_{i,t-j} + \mu_i + \varepsilon_{it} \qquad (1)$$

$Inst_{it}$ represents the institutional measure (Polity, Civil Liberties, or Political Rights) for country i at time t. Each institutional level is assumed to depend on a set of its past levels, on $Oil_{i,t}$ (Oil Rents), and its past levels. Country heterogeneity is allowed for by using country-specific coefficients and fixed effects μ_i. For the present analysis Oil Rents are used as the sole explanatory variable because oil is theorized to have sweeping economic and social effects (as in Ross, 2012), and other controls might well have the effect of capturing some of the various possible channels through which Oil Rents affect institutions. As such, our empirical method aims to estimate the full effects of Oil Rents on institutions, but not the channels through which they operate.

[5] Qatar, Saudi Arabia, and the United Arab Emirates are dropped from the Polity analysis because the Polity score did not change over the sample period in these countries.

For estimation, we reparameterized Equation (1) into an error correction form. In error correction form, the long-run relationship between oil and institutions can be consistently estimated separately from short-term fluctuations. The error correction form is appropriate because annual fluctuations in Oil Rents are unlikely to have lasting impacts on institutions while sustained increases over a few years may have such effects. Estimates from Equation (1) could be confounded by noise from annual fluctuations, while Equation (1) in differences would limit the interpretation of the results to the short-term changes.

An error correction form of an ARDL model is presented below as Equation 2.

$$\Delta Inst_{it} = \phi_i\left(Inst_{i,t-1} - \theta_i Oil_{it}\right) + \sum_{j=1}^{p-1} \lambda_{ij}^{*} \Delta Inst_{i,t-j} + \sum_{j=0}^{q-1} \delta_{ij}^{*} \Delta Oil_{i,t-j} + \mu_i + \varepsilon_{it} \quad (2)$$

Where: $\phi_i = -(1 - \sum_{j=1}^{p} \lambda_{ij})$; $\theta_i = \sum_{j=0}^{q} \delta_{ij} / (1 - \sum_k \lambda_{ik})$;

$\lambda_{ij}^{*} = -\sum_{m=j+1}^{p} \lambda_{im}$; and $\delta_{ij}^{*} = -\sum_{m=j+1}^{q} \delta_{im}$.

The short-run relations are captured by δ_{ij}^{*}, while the long-term relationship is captured by θ_i. With a large change in Oil_{it}, the response in the dependent variable might overshoot the long-run equilibrium relationship. When this happens, the error correction term, ϕ_i, serves to bring the relationship back to the long-run (hence the term "error correction"). The lag orders p and q were selected using Akaike and Schwarz's Bayesian information criteria.[6]

For an error correction model to be appropriate, (1) the error correction term should be statistically significant and with a negative value greater than negative two[7], and (2) there must be a long-run cointegrating relationship between the level variables. Both institutional development and Oil Rents are likely to be persistent and have trends of integration order one (I(1)), and the cointegrating relationship, θ_i, must exist for the term $\left(Inst_{i,t-1} - \theta_i Oil_{it}\right)$ to be stationary. Stationarity is necessary for the equation to balance when ϕ_i is statistically significant.

ARDL models have several advantages. The long-run effects are consistent regardless of whether the level variables are stationary or trended, and they are consistent in the presence of

[6] The lag order was selected separately by country and variable, and then averaged within country group. Group averages were between one and two for each group and variable and then rounded up to two. The results are also not very sensitive to lag order.

[7] This condition is met in all estimations (see Appendix for estimates of the error correction term).

endogeneity (Mohaddes et al. 2013, 26). We use two different error correction ARDL models that differ in the amount of restrictions applied. The most restrictive model assumes the relationships are common across panels (basic dynamic model with panel fixed effects, called "DFE"). We focus on the most flexible model, the mean group (MG) model, which simply estimates the ARDL model separately for each panel (allowing for heterogeneous short-term and long-term effects) and then reports the mean coefficients across panels. This model loses efficiency compared to the DFE model but is more appropriate when the estimated relationships are heterogeneous across countries.

There is another ARDL model that is a hybrid of the MG and DFE models, called the pooled mean group (PMG). It allows the short-run effects to differ across countries, but assumes the long-term effects are common. The PMG model should be more efficient than the MG, but less efficient than the DFE and possibly still subject to bias. Consequently we focus on the more consistent MG model, but present the most efficient (DFE) results as robustness, and also because DFE models are common in the literature (e.g. HM).

Our specifications also correct for cross-sectional dependence using a common correlated effects approach, which simply adds cross-sectional means of the dependent and independent variables and their lagged values to the ARDL specification (as suggested by Chudik and Pesaran, 2013). Cross-sectional dependence arises when the error terms are correlated across observations. In the present analysis, cross-sectional dependence could be caused by an omitted common correlated effect, e.g. oil prices. Controls for oil prices, subtracting the cross-sectional mean of each variable, clustering errors, or simply using year fixed effects could partially account for common correlated effects, but these approaches have limitations (Westerlund, 2007).

Equation 3 below presents the same error correction model as in Equation 2, but adds the modification for cross-sectional dependence (CS-ECM).

$$\Delta Inst_{it} = \phi_i\left(Inst_{i,t-1} - \theta_i Oil_{it}\right) + \sum_{j=1}^{p-1} \lambda_{ij}^{*} \Delta Inst_{i,t-j} + \sum_{j=0}^{q-1} \delta_{ij}^{*} \Delta Oil_{i,t-j} + \mu_i + \sum_{l=0}^{3} \psi_{il} \bar{Z}_{t-l} + \varepsilon_{it} \qquad (3)$$

Where $\bar{Z}_t = (\overline{Inst}_t, \overline{Oil}_t)$; $\overline{Inst}_t = N^{-1} \sum_{i=1}^{N} Inst_{it}$; $\overline{Oil}_t = N^{-1} \sum_{i=1}^{N} Oil_{it}$

Using the common correlated effects approach, the effects of Oil Rents are estimated from the relationship between idiosyncratic deviations from mean Oil Rents levels and idiosyncratic institutional deviations from the mean. $\bar{Z}_t$ captures the average relationships, observed and unobserved.[8] Average levels of factors that affect institutions are captured, such as regional institutional change, economic development, and urbanization. Factors affecting Oil Rents, such as oil prices are also captured. Lagged cross-sectional means capture any serial correlation in omitted factors. The lag order is set as the integer value of the cube root of the number of time periods, in our case three lags are used (Mohaddes et al. 2013).

We also use a cross section augmented distributed lag (CS-DL) model. It differs from the CS-ECM models, is considered complementary, and possibly superior when using highly persistent variables, such as Polity, Civil Liberties, or Political Rights. The specification is similar to the CS-ECM model, but the dependent variable is modeled in levels, and the specification does not include lags of the dependent variable as explanatory variables (in levels or changes).

$$Inst_{it} = \theta_i Oil_{it} + \sum_{j=0}^{q-1} \delta_{ij}^{*} \Delta Oil_{i,t-j} + \mu_i + \psi_i^0 \overline{Inst}_t + \sum_{l=0}^{3} \psi_{il}^1 \overline{Oil}_{t-l} + \varepsilon_{it} \quad (4)$$

As in the CS-ECM model, the lag order on $\overline{Oil}_{t-l}$ is set as the integer value of the cube root of the number of time periods (three). However, unlike the CS-ECM model, the lag order on the cross-sectional mean of $\overline{Inst}_t$ is set to zero (Mohaddes et al. 2013, 15).

Each of the models, the two CS-ECM models and the CS-DL, are used in estimating the results. It shoulld be remembered that the CS-ECM models are each specified in error correction form and differ simply in whether or not the short-run and long-run relationships are assumed to be homogeneous across countries. Of the CS-ECM models, the mean group, cross-sectionally augmented, error correction model (MG CS-ECM) is the least restrictive, allowing for heterogeneous short- and long-run relationships. The DFE CS-ECM model is the most restrictive, assuming homogeneous short- and long-run relationships. The MG CS-DL model differs from the MG CS-ECM model because it uses the distributed lag specification (instead of an error correction), but is similar in that it allows for heterogeneous short- and long-run relationships.

[8] Bove et al. (2015, 8) identify another benefit of the common correlated effects approach. It has similarities to counterfactual analysis because the cross-sectional averages are similar to predicted counterfactuals.

V. Results

A. Polity, Civil Liberties, Political Rights, and Oil Rents Over Time

Figure 1 illustrates how the levels of institutions (in this case Civil Liberties and Political Rights) and of Oil Rents have moved over time in the full sample of 61 countries and in each of the various country groups identified above. The annual means have been smoothed to help reduce annual fluctuations and more closely represent long-run trends. In most of the country groups, Oil Rents declined from the mid to late 1970s until the early 1990s when rents began to increase again. Civil liberties and Political Rights, like democracy (studied by Ross, 2012, and most others investigating the political curse hypothesis), were generally increasing, but there are important exceptions. Most importantly, in the Middle East and North African countries, both Civil Liberties and Political Rights were declining until the mid-1990s before starting to recover after that.

(Insert Figure 1 Here)

B. Statistical Analysis

Table 1 presents the long-run effects of Oil Rents on each of the three institutional variables. The absence of a relationship is demonstrated using the CS-ECM and CS-DL specifications discussed in the methods section. The column heads indicate the models used, and the full regression results for the CS-ECM models are available in the Appendix (Tables A2, A3, and A4). The results are consistently insignificant for the full sample and in each of the country groups. Even in the countries with less-experience with oil and the MENA region, the effects are insignificant. Hence, so far at least, we conclude that Oil Rents do not have statistically significant long-run effects on Polity, Civil Liberties, or Political Rights.

(Insert Table 1 Here)

The results are generally still statistically insignificant when assuming the short- and long-run relations are the same across countries. Table 2 presents the homogenous effects of oil on each institutional variable from the DFE model. In each country group except for the Mature and

Latin America group, the effects are insignificant. The result is somewhat surprising too because we would expect the mature countries would be better able to manage oil rents, and Latin America has also been shown to be an exception to the oil curse. Overall, however, the results suggest there is no long-run relationship between the Oil Rents and Polity, Civil Liberties or Political Rights during the period 1974 - 2008.

(Insert Table 2 Here)

Robustness.—Next we proceed to carry out a series of robustness tests for changes in specifications, based on the MG CS-ECM models[9]. The specification changes are as follows: (a) a change in the measure of oil abundance from the natural log of oil rents per capita to oil rents as a percent of GDP, (b) changing the sample from 1974 – 2008 to post 1980 as in most of the AR results, and (c) the addition of non-oil GDP per capita as a control to account for the "modernization" or "development" impact on political development.[10] The results are presented in Table 3 for each institutional variable. Estimates obtained from the alternative specifications are shown one change at a time. The first column reports the results from the base models in Table 1. The results from change (a) are reported in the second column and changes (b) and (c) in the third and fourth columns, respectively.

We expected the results to be similar across the different tests, but with some changes. Oil rents as a share of GDP could be argued as less of a measure of oil abundance and more of a measure of dependence, in which case, they might be expected to be more negatively associated with democratic institutions than Oil Rents (natural logs of oil rents per capita). AR argue that oil should be more negatively associated in the post-1980 period. Lastly, including non-oil GDP may affect the results because GDP per capita has a modernizing influence and could be one of the channels through which oil affects institutions. If oil reduces growth, and growth is positively related to institutional development, then controlling GDP would reduce any negative effects of

[9] The MG CS-ECM models were used as the base model for robustness tests because the ECM models are more common in the literature than CS-DL models.

[10] We previously excluded GDP per capita as a control because oil production is directly included in GDP, and because oil may also affect non-oil GDP. To account for the first problem we estimated GDP per capita excluding the portion due to oil revenues and used the adjusted non-oil measure of GDP per capita as a control. If oil also affects non-oil GDP, we may expect the relation between oil and institutions to change, which is discussed further below. GDP data are from World Bank (2013).

oil on institutions. Specifically, our expectations are that the changes (a) and (b), in the second and third columns, would result in more negative relations, while change (c), in the fourth column, would result in a more positive relation.

(Insert Table 3 Here)

The long-run effect of Oil Rents on democracy is statistically insignificant in the full sample and in each of the country groups, with a couple exceptions. When the control for non-oil GDP is added, there are significant (at ten percent) negative long-term effects of Oil Rents on Civil Liberties in Latin America and positive effects in the ROW. There are also negative long-term effects of Oil Rents on Polity that are significant at the five percent level in the full sample. This result is unexpected. Controlling for non-oil GDP was expected to reduce any negative long-term effects of oil, not to increase them as is the case here. The specifications using oil rents as a percent of GDP or the post-1980 period also did not systematically increase the negative effects. For example, there's a positive (at ten percent) long-term effect of Oil Rents on Polity in the MENA region during the post-1980 period, but the effect is smaller or negative in the other specifications. Note that the estimated long-run effects of oil rents as percent of GDP are often large negative numbers. That may reflect the presence of an outlier country biasing the average effect for a country group.

Cointegration.—For the error correction models to be appropriate, there must exist a cointegrating relationship between Oil Rents and Polity, Civil Liberties, or Political Rights because the variables are not stationary in levels. If two series are unrelated, but non-stationary, it is likely that a regression of one on the other will yield a statistically significant and spurious result. However, if a linear combination of the two unit root processes is stationary, then the variables are said to be cointegrated and the relationship is not spurious (Engle and Granger, 1987).

Appendix Table A5 presents the test results for integration order and stationarity. In most instances, the results suggest each variable exhibits a unit root process. The first section of each panel shows the results from unit root tests of the variables in levels. They are performed using Dickey Fuller, Fisher type panel tests (Choi, 2001), where the null hypothesis is that all panels contain a unit root. The second section of each panel shows the test results performed on the

variables in first differences. Generally, we fail to reject unit root in levels, but reject unit root in first differences. However, there are some exceptions. For example, in the Latin America and Caribbean group, the tests show Oil Rents may exhibit a unit root process, yet the institutional variables are likely stationary in levels. When each of these has a different integration order, it casts doubt on whether they could be cointegrated.

Given the presence of unit roots, the cointegration tests become necessary. Appendix Table A6 presents the results of Westerlund panel cointegration tests. Bootstrapped critical values were used to allow for cross-sectional dependence (Westerlund, 2007). In most instances we fail to reject no cointegration, so there is little to no evidence of cointegration. This implies that any significant long-run relations from the error correction models are spurious, because (consistent with HM) there exists no long-run relationship between Oil Rents and Polity, Political Rights, or Civil Liberties.

VI. Comment on Recent Analysis

Illustrated by the quotes shown below, from Andersen and Ross (2014) (AR) and Haber and Menaldo (2011) (HM), these two references are essential for understanding the current debate over the existence of a political resource curse:

"The Haber–Menaldo article has had a powerful impact on the resource curse debate, calling into question widely held beliefs about the politically malignant effects of petroleum wealth" (AR, p. 994). Using the Haber and Menaldo data and models, AR showed from 1800 to the 1970s there was no evidence of a resource curse (confirming the finding of HM) but that "since the late 1970s—the period that is the focus of most other studies—oil wealth has strongly inhibited democratization." (AR, 994)

Our primary analysis, presented above, and analysis of the valuable data prepared by HM lead us to agree largely with HM, there was no long-run relation between oil and Polity, even for the post-1980 period. Specifically, we replicate the most convincing analysis performed by AR, Table 2, p.1006, which itself first replicated the analysis of HM. AR then expand HM's analysis by adding an interaction term between their oil measure and a post-1980 dummy variable.

The convincing rationale for the addition of the post-1980 dummy was the fact that by 1980, in most developing countries, the relationship between governments and oil companies had changed radically due to the nationalization movement during the 1970s that was prompted by

the preceding jump in oil prices (1971-1974). In the AR analysis (see Table 2, Column 2 in their paper) the effect of oil on the change in Polity was positive but small prior to 1980. Post 1980, however, the effect was statistically significant and negative, because the large negative interaction term for the post-1980 period more than offset the small positive main effect of oil. The argument seems intuitive, given that the early developers like the US have continued to rely on private oil companies and Norway was already democratic long before its oil boom. By contrast, in the Middle East and in many other developing countries, oil production was nationalized and most of the countries remained highly autocratic.

For the AR theory to be persuasive, however, their empirical finding should be robust to changes in the empirical specification. Yet, as we show in Table 4 below, in fact it is not. In Column (1) we first replicate the AR analysis for estimating the long-run effect of oil on Polity with the HM data set for the full period 1800-2006, including the interaction term for the post-1980 period. The results match AR's finding of a negative long-run effect of oil during the post period (obtained as the sum of the main effect and interaction term divided by the negative of the coefficient on the lagged value of Polity). In Column (2), we present the results for the corresponding specification based on the post-1980 period alone, and after dropping the no longer necessary interaction term. In contrast to AR's results, the main effect of oil, and hence the long-run effect, is positive and statistically significant at the five percent level. This result is inconsistent with AR's theory, suggesting that the long-run effect of oil is not robust.[11]

(Insert Table 4 Here)

Two methodological issues also warrant notice. First, for there to be a long-run relationship between Polity and oil, the two variables must be cointegrated because, as shown by HM, they are integrated variables (HM, 14). While we agree with AR that, because of the structural break attributable to oil nationalization, we might not expect a long-term relationship, or cointegration,

[11] Additional results are consistent with the finding reported in Column (2) of our Table 1. The long-run effect of oil is not robustly negative and statistically significant even during the post-1980 period. For example, in AR's Table 2, Column (4), AR replicates HM's analysis using fiscal reliance as an alternative measure to total oil income. They again find the interaction term for the post-1980 period to be negative and significant, however, the total effect during the post-1980 period (the addition of the main effect and interaction term) is not statistically significant. We also replicated the AR analysis in Tables 4 and 5 using the post-1980 period alone, and similarly found the effect of total oil income on Polity was not negative and statistically significant. These results are available on request.

over the whole period (AR, 1003), this does not preclude the necessary cointegrating relationship for the post-1980 period alone.

Second, another important point discussed by AR is that the theoretical relationship between oil and institutions is one between countries not within countries. This is to say, countries with more oil may be expected to develop democratic institutions at a different rate than those with less oil. The within country relationship, in contrast, estimates the relationship between oil and governance institutions as they change over time within a country. While the initial research on the subject focused on the between-country relationship (e.g. Barro 1995), an important problem was recognized with this research. Between-country analysis omits country fixed effects and suffers from omitted variable bias. As noted above, it is an unfortunate statistical fact that we cannot estimate between-country relationships and at the same time also include country fixed effects.

VII. Conclusion

We find no robust long-run effect of oil abundance on democratic institutions using three different indicators associated with democracy (Polity, Civil Liberties, and Political Rights), estimating our model using different methods and samples, including non-oil GDP in our model, restricting the sample to the post-1980 period, and considering oil rents both as a share of GDP and per capita. Our work continues the debate on the link between institutions and oil. Haber and Menaldo (2011) similarly find no long-run effects of oil on Polity, while Andersen and Ross (2014) reevaluate the relationship using the same HM data, and provide evidence for the existence of long-run effects for the post-1980 period. AR is of course not the only study that shows a negative relation. The results from the meta-study, Ahmadov (2014), finds the overall effect of oil rents on democracy to be small, negative, and significant, but with considerable heterogeneity across regions - somewhat more negative among countries of the Middle East and North Africa but positive and highly significant in Latin America. The present study, by not finding a robust, significant, long-term relationship (in Latin America, MENA, among mature producers, or less mature producers), contributes further to the debate.

We also replicated the results from AR and show a simple change to their models challenges the robustness of their findings. We expanded the empirical work done by HM to include two different aspects of democracy, Civil Liberties and Political Rights, and also to use the most

updated time-series econometric methods. Like HM, the regressions separately estimated long-run effects from short-run, but our models also allowed for country-relationship heterogeneity, corrected for correlation across countries, and used an alternative model that is better suited for persistent dependent variables like democracy. In general, the results from the different models were insignificant. Moreover, the cointegration tests failed to find evidence of a long-term relationship between Oil Rents and any of the democracy measures, and there are additional countries that would attenuate the results because they were fully democratized at the beginning of the sample and show no long-run effects of oil.

It is important to note that although we are unable to identify robust long-run negative effects of Oil Rents on democracy within countries on average, it may still be the case that oil may have significant negative effects, in the short- or long-run, in individual countries. AR also points out that the oil curse theory is about between-country levels of oil. Unfortunately, we know of no statistical methods that capture not only between-country differences but also capture important omitted characteristics. Until such a method is developed, country case studies investigating both the dynamics of the oil industry and the development of political institutions may be the best method for resolving this debate.

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Figure 1. Civil Liberties, Political Rights, and Oil Rents per capita
Lowess Smoothed Trends (1974 – 2008)

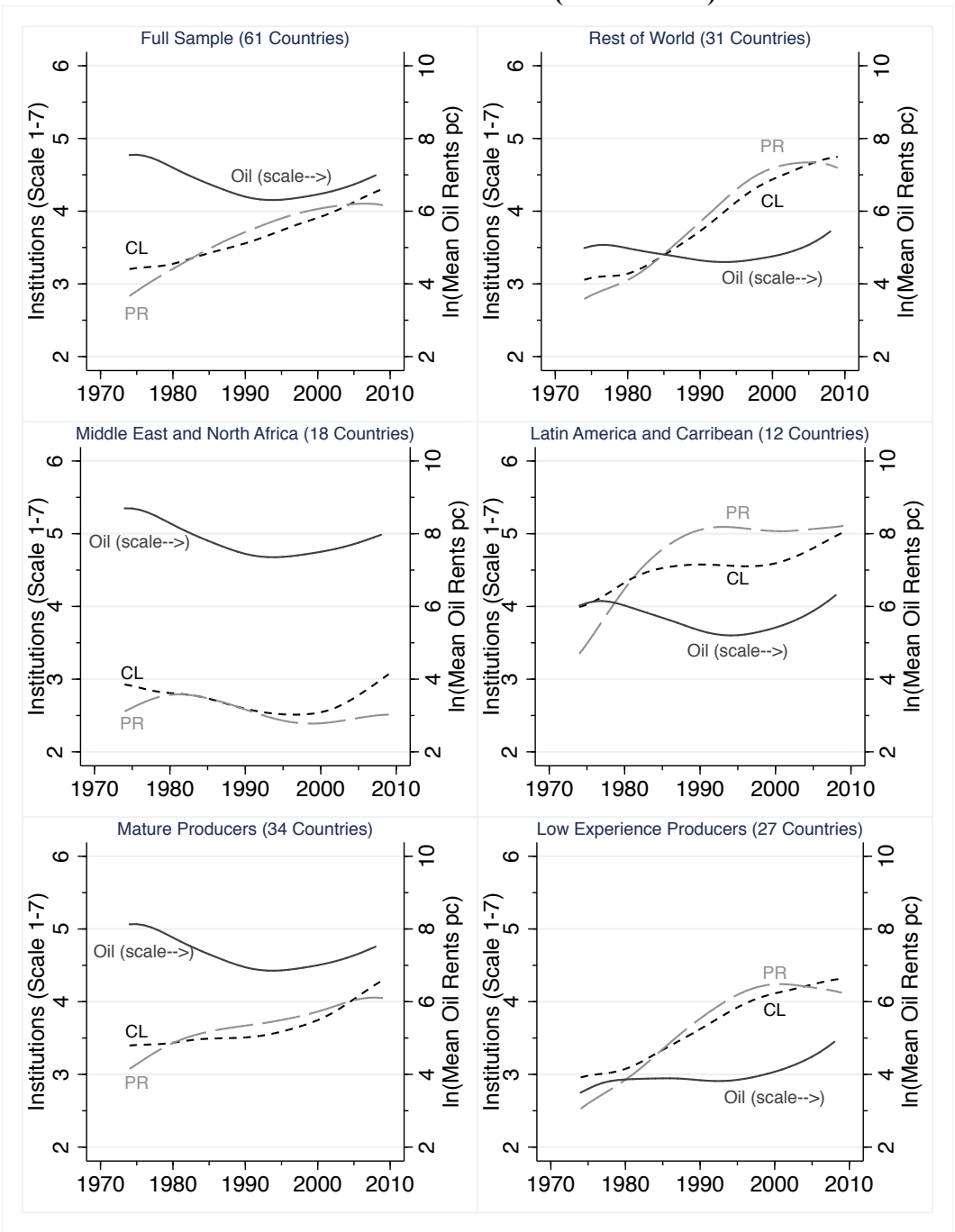

Table 1: Long-Run Multiplier for Oil Rent's Impact on Democracy.
Two Mean Group Models. Various Indicators and Country Groups.

	Civil Liberties		Political Rights		Polity	
Country Group	CS-ECM	CS-DL	CS-ECM	CS-DL	CS-ECM	CS-DL
Full	-0.140	0.045	0.150	-0.021	1.643	0.018
	[-0.595]	[0.406]	[0.568]	[-0.140]	[1.391]	[0.026]
Mature	0.500	0.147	0.279	-0.059	16.362	0.091
	[1.361]	[0.530]	[0.184]	[-0.130]	[1.200]	[0.085]
Non-Mature	0.108	-0.003	0.089	-0.004	0.841	0.207
	[0.978]	[-0.040]	[0.465]	[-0.025]	[1.200]	[0.241]
Latin America	-0.914	-0.646	-0.155	-0.309	-1.372	-3.619
	[-1.460]	[-1.224]	[-0.220]	[-0.370]	[-0.474]	[-1.503]
Middle East and North Africa	-0.019	0.045	-0.018	0.010	0.811	-0.238
	[-0.114]	[0.423]	[-0.199]	[0.092]	[1.097]	[-1.212]
Rest of World	0.202	0.205	0.162	0.238	0.928	0.451
	[0.809]	[1.555]	[0.624]	[0.980]	[0.840]	[0.416]

t statistics in brackets; + p<0.10 * p<0.05 ** p<.01 *** p<.001.
Mean group allows heterogeneous short- and long-run relations by country.
CS-ECM – cross-sectionally augmented error correction model (Equation 3 in the text). CS-DL – cross-sectionally augmented distributed lag models (Equation 4 in the text). Oil rents per capita are used in natural log form. Civil liberties and Political Rights are scaled from 1 to 7 with more 7 indicating greater civil liberties or political rights. Polity scaled from -10 (autocracy) to 10 (democracy). Group composition presented in Table A7. Polity sample reduced from 61, excluding the countries: China, Cuba, Italy, Japan, Libya, Papua New Guinea, Qatar, Saudi Arabia, and the United Arab Emirates. The complete CS-ECM regression results are presented in Appendix Table A2.

Table 2: Long-Run Multiplier for Oil Rent's Impact on Democracy. CS-ECM Fixed-Effects Models. Various Indicators and Country Groups.

Country Group	CL	PR	Polity
Full	-0.041	-0.066	-0.092
	[-0.898]	[-1.193]	[-0.520]
Mature	-0.375*	-0.560*	-1.628*
	[-2.192]	[-2.362]	[-2.030]
Non-Mature	-0.044	-0.066	-0.107
	[-0.822]	[-1.167]	[-0.620]
Latin America	-0.304	-0.595*	-0.029
	[-1.384]	[-2.072]	[-0.026]
Middle East and North Africa	-0.003	0.008	0.103
	[-0.076]	[0.210]	[0.808]
Rest of World	-0.087	-0.117	-0.300
	[-1.327]	[-1.497]	[-1.167]

t statistics in brackets; + p<0.10 * p<0.05 ** p<.01 *** p<.001.
Fixed effects models allow for heterogeneous intercepts by country, but restrict slopes to be common across countries. CS-ECM – cross-sectionally augmented error correction model. Oil rents per capita are used in natural log form. Civil liberties and Political Rights are scaled from 1 to 7 with more 7 indicating greater civil liberties or political rights. Polity scaled from -10 (autocracy) to 10 (democracy). Group composition presented in Table A7. Polity sample reduced from 61, excluding the countries: China, Cuba, Italy, Japan, Libya, Papua New Guinea, Qatar, Saudi Arabia, and the United Arab Emirates. The specification is based on Equation 3 in the text, but simplified to restrict the short- and long-run relations to be the same across countries.

Table 3: Long-Run Multiplier for Oil Rent's Impact on Democracy.
CS-ECM Mean Group with adjustments. Various Indicators and Country Groups.

Panel A: Civil Liberties

Country Group	Base	Oil Rent % of GDP	Post 1980	GDP Control
Full	-0.140	-3.363	-0.333	-0.399
	[-0.595]	[-0.145]	[-0.905]	[-0.712]
Mature	0.500	-2.173	0.357	2.612
	[1.361]	[-0.794]	[0.753]	[1.134]
Non-Mature	0.108	81.576	0.065	0.058
	[0.978]	[1.169]	[0.675]	[0.651]
Latin America	-0.914	0.010	0.065	-0.930+
	[-1.460]	[0.034]	[0.151]	[-1.679]
Middle East and North Africa	-0.019	-9.464	0.975	-0.349
	[-0.114]	[-0.993]	[1.292]	[-1.254]
Rest of World	0.202	-51.773	-0.898	0.597+
	[0.809]	[-1.519]	[-0.861]	[1.653]

Panel B: Political Rights

Country Group	Base	Oil Rent % of GDP	Post 1980	GDP Control
Full	0.150	-7.961	0.526	-0.076
	[0.568]	[-0.310]	[0.832]	[-0.073]
Mature	0.279	2.249	-0.407	-3.119
	[0.184]	[1.097]	[-0.344]	[-0.809]
Non-Mature	0.089	-38.380	-0.018	0.648
	[0.465]	[-0.446]	[-0.070]	[0.558]
Latin America	-0.155	-0.184	0.147	-0.187
	[-0.220]	[-0.840]	[0.140]	[-0.313]
Middle East and North Africa	-0.018	-4.139	-0.004	-0.993
	[-0.199]	[-1.090]	[-0.041]	[-1.466]
Rest of World	0.162	-30.812	0.149	0.696
	[0.624]	[-0.589]	[0.367]	[1.463]

Panel C: Polity

Country Group	Base	Oil Rent % of GDP	Post 1980	GDP Control
Full	1.643	-242.782	1.696	-2.745*
	[1.391]	[-1.151]	[1.242]	[-2.123]
Mature	16.362	26.187	4.641	3.464
	[1.200]	[0.978]	[1.077]	[1.121]
Non-Mature	0.841	-355.292	0.651	-4.547
	[1.200]	[-1.295]	[0.766]	[-1.627]
Latin America	-1.372	0.293	-4.190	-2.236
	[-0.474]	[0.585]	[-1.290]	[-0.512]
Middle East and North Africa	0.811	-7.054	1.273+	-0.652
	[1.097]	[-0.397]	[1.701]	[-0.663]
Rest of World	0.928	-258.391	3.656	12.986
	[0.840]	[-1.230]	[1.164]	[1.183]

t statistics in brackets; + p<0.10 * p<0.05 ** p<.01 *** p<.001.
See notes from Table 1. Base model from Table 1 (MG CS-ECM).
Italy and Spain were dropped from post-1980 analysis due to lack of change in the dependent variable. Angola, Iraq, Italy, Spain, and Yemen were also dropped from the Polity post 1980 analysis for the same reason. The GDP control specification used only one lag of the cross-sectional means because three reduced the degrees of freedom too much for the model to run for every country.

Table 4: Replication of Andersen and Ross (2014) Table 2, Column 1, and Sample Adjustment Long Run Effects on Polity

	(1)	(2)
	DKSE	DKSE Post80
Long Run Effect (Post)	-1.140*	0.752*
	[-2.033]	[2.642]
Lag Polity	-0.087***	-0.157***
	[-11.613]	[-5.488]
Lag Total Oil Income	0.045*	0.118*
	[2.035]	[2.507]
Lag Total Oil Inc. X Post	-0.144***	
	[-3.748]	
Δ Total Oil Income	-0.023	-0.163
	[-1.008]	[-1.517]
Δ Total Oil Inc. X Post	-0.340***	
	[-3.457]	
Lag log(GPD pc)	-0.276	-2.313***
	[-0.870]	[-4.538]
Lag Civil War	0.063	-0.252
	[0.140]	[-0.363]
Lag Reg. Democracy	0.025***	0.045*
	[3.411]	[2.610]
Lag World Democracy	0.059*	0.657***
	[2.048]	[6.910]
Δ log(GPD pc)	1.322	2.013
	[0.762]	[0.863]
Δ Reg. Democracy	0.375***	0.464***
	[5.368]	[4.538]
Δ World Democracy	-0.278*	1.482***
	[-2.568]	[6.300]
Constant	2.552	0.000
	[1.358]	[.]
Total Observations	10195	3891
Number of Countries	163	163

Same model as used in Andersen-Ross (2014). Dependent variable: Δ Polity.
Driscoll Kray standard errors are used to allow for cross-sectional dependence. Data from Haber and Menaldo.
t statistics in brackets; * p<0.05 ** p<.01 *** p<.001.

Table A1. Summary Statistics

		Polity[a]		CL		PR		Oil Rents pc		GDP pc	
Group	Countries	1975	2005	1975	2005	1975	2005	1975	2005	1975	2005
Full Sample	61	-4.04	3.98	3.15	4.25	2.86	4.18	1,690	985	5,313	5,847
Mature	34	-3.31	4.42	3.32	4.21	3.21	4.09	3,000	1,689	8,010	7,728
Less-Experience	27	-4.82	3.52	2.93	4.30	2.43	4.30	40	99	1,918	3,478
Latin America	12	-0.73	7.91	4.08	5.00	3.58	5.00	373	407	3,097	4,263
MENA	18	-5.86	-1.69	2.83	2.89	2.42	2.56	5,243	2,772	11,060	8,970
ROW	31	-4.44	5.11	2.97	4.74	2.84	4.81	136	172	2,834	4,647

a. Reduced country sample excludes: China, Cuba, Italy, Japan, Libya, Papua New Guinea, Qatar, Saudi Arabia, and the United Arab Emirates.
Oil was discovered before 1956 in Mature countries.

Table A2. Oil Rent's Impact on Civil Liberties by Country Group
CS-ECM Mean Group Regressions

	(1) Full Sample	(2) Mature	(3) Low-Exp.	(4) Latin America	(5) MENA	(6) ROW
ln(Oil Rents pc)	-0.140	0.500	0.108	-0.914	-0.019	0.202
	[-0.595]	[1.361]	[0.978]	[-1.460]	[-0.114]	[0.809]
Short Run						
Error Correction Term	-0.568***	-0.481***	-0.714***	-0.587***	-0.571***	-0.583***
	[-12.929]	[-7.886]	[-12.345]	[-5.162]	[-9.926]	[-11.263]
Lag ΔCL	0.124***	0.035	0.193***	0.122*	0.145**	0.085*
	[3.679]	[0.921]	[3.943]	[2.397]	[2.909]	[1.968]
Δ ln(Oil Rents pc)	-0.038	-0.219	-0.068	0.332	0.075	-0.105
	[-0.453]	[-0.943]	[-0.856]	[1.016]	[0.892]	[-0.847]
Lag Δln(Oil Rents pc)	-0.046	0.029	-0.031	0.243	-0.027	-0.103
	[-0.650]	[0.140]	[-0.675]	[0.671]	[-0.442]	[-1.219]
CL Mean	0.852***	0.969***	1.119***	0.823*	0.952***	1.077***
	[4.597]	[4.880]	[5.948]	[2.023]	[3.863]	[10.705]
Lag CL Mean	-0.402*	-0.558**	-0.408**	-0.500+	-0.480	-0.447**
	[-2.332]	[-3.048]	[-2.684]	[-1.855]	[-1.640]	[-3.200]
Lag2 CL Mean	-0.040	-0.066	0.187	0.183	0.169	0.043
	[-0.283]	[-0.373]	[0.964]	[1.074]	[0.650]	[0.334]
Lag3 CL Mean	0.009	-0.017	0.068	0.026	-0.105	0.080
	[0.063]	[-0.112]	[0.390]	[0.130]	[-0.486]	[0.617]
lnRents Mean	0.105	0.205	0.002	0.314	-0.036	0.023
	[1.169]	[0.871]	[0.029]	[1.136]	[-0.287]	[0.328]
Lag lnRents Mean	-0.017	-0.257	-0.095	0.098	0.087	-0.014
	[-0.171]	[-0.672]	[-1.391]	[0.279]	[0.508]	[-0.113]
Lag2 lnRents Mean	-0.052	0.007	-0.019	0.229	0.010	-0.115
	[-0.529]	[0.033]	[-0.190]	[0.646]	[0.069]	[-1.113]
Lag3 lnRents Mean	-0.037	0.037	0.014	0.013	0.055	0.020
	[-0.620]	[0.462]	[0.158]	[0.106]	[0.609]	[0.292]
Constant	0.184	-0.436	-0.979	0.078	-0.853+	-1.017
	[0.254]	[-0.941]	[-0.783]	[0.066]	[-1.674]	[-1.316]
Total Observations	1951	1088	863	384	576	991
Number of Countries	61.000	34.000	27.000	12.000	18.000	31.000
Periods - Avg.	31.984	32.000	31.963	32.000	32.000	31.968

t statistics in brackets; * p<0.05 ** p<.01 *** p<.001
Mean group allows heterogeneous short- and long-run relations by country.
CS-ECM – cross-sectionally augmented error correction model (Equation 3 in the text). Oil rents per capita are used in natural log form. Civil liberties are scaled from 1 to 7 with more 7 indicating greater civil liberties. Group composition presented in Table A7.

Table A3. Oil Rent's Impact on Political Rights by Country Group
CS-ECM Mean Group Regressions

	(1) Full Sample	(2) Mature	(3) Low-Exp.	(4) Latin America	(5) MENA	(6) ROW
ln(Oil Rents pc)	0.150	0.279	0.089	-0.155	-0.018	0.162
	[0.568]	[0.184]	[0.465]	[-0.220]	[-0.199]	[0.624]
Short Run						
Error Correction Term	-0.475***	-0.471***	-0.608***	-0.455***	-0.629***	-0.611***
	[-14.409]	[-9.795]	[-9.794]	[-7.084]	[-9.748]	[-11.395]
Lag ΔPR	0.140***	0.133***	0.144**	0.143*	0.202***	0.163***
	[5.396]	[3.339]	[3.274]	[2.449]	[5.225]	[3.676]
Δ ln(Oil Rents pc)	-0.099	-0.127	-0.025	0.016	0.092	-0.126
	[-1.067]	[-0.510]	[-0.337]	[0.047]	[1.010]	[-1.208]
Lag Δln(Oil Rents pc)	-0.012	0.043	-0.041	0.159	0.073	-0.043
	[-0.150]	[0.176]	[-0.741]	[0.446]	[1.023]	[-0.467]
PR Mean	0.874***	1.213***	0.818**	1.100***	0.956**	0.865***
	[3.650]	[4.291]	[3.161]	[3.706]	[2.982]	[3.763]
Lag PR Mean	-0.575*	-0.682*	-0.466	-0.680**	-0.628*	-0.437
	[-2.190]	[-2.563]	[-1.596]	[-2.594]	[-2.340]	[-1.591]
Lag2 PR Mean	0.211	0.228	0.369+	0.252	0.298	0.194
	[0.905]	[0.807]	[1.925]	[1.272]	[1.374]	[0.789]
Lag3 PR Mean	-0.110	-0.006	-0.221	-0.017	0.028	-0.053
	[-0.573]	[-0.023]	[-1.147]	[-0.082]	[0.186]	[-0.263]
lnRents Mean	0.040	-0.026	-0.032	0.155	-0.086	-0.025
	[0.304]	[-0.088]	[-0.428]	[0.367]	[-0.795]	[-0.217]
Lag lnRents Mean	-0.152	-0.194	0.006	-0.104	0.016	-0.140
	[-0.880]	[-0.555]	[0.061]	[-0.191]	[0.095]	[-0.933]
Lag2 lnRents Mean	-0.012	0.066	-0.046	0.136	0.044	0.001
	[-0.082]	[0.237]	[-0.495]	[0.335]	[0.263]	[0.006]
Lag3 lnRents Mean	-0.027	-0.058	0.018	-0.016	-0.058	-0.028
	[-0.362]	[-0.648]	[0.184]	[-0.138]	[-0.492]	[-0.293]
Constant	0.483	-1.133	-0.268	-1.297	0.211	-0.334
	[0.550]	[-1.010]	[-0.345]	[-1.027]	[0.306]	[-0.369]
Total Observations	1951	1088	863	384	576	991
Number of Countries	61.000	34.000	27.000	12.000	18.000	31.000
Periods - Avg.	31.984	32.000	31.963	32.000	32.000	31.968

t statistics in brackets; * p<0.05 ** p<.01 *** p<.001
Mean group allows heterogeneous short- and long-run relations by country.
CS-ECM – cross-sectionally augmented error correction model (Equation 3 in the text). Oil rents per capita are used in natural log form. Political Rights are scaled from 1 to 7 with more 7 indicating greater political rights. Group composition presented in Table A7.

Table A4. Oil Rent's Impact on Polity by Country Group
CS-ECM Mean Group Regressions

	(1) Full Sample	(2) Mature	(3) Low-Exp.	(4) Latin America	(5) MENA	(6) ROW
ln(Oil Rents pc)	1.643	16.362	0.841	-1.372	0.811	0.928
	[1.391]	[1.200]	[1.200]	[-0.474]	[1.097]	[0.840]
Short Run						
Error Correction Term	-0.495***	-0.403***	-0.506***	-0.500***	-0.382***	-0.693***
	[-12.311]	[-8.644]	[-7.854]	[-5.804]	[-6.667]	[-8.655]
Lag Δ(Polity2)	0.185***	0.044	0.272***	0.071	0.183***	0.321***
	[4.632]	[0.867]	[4.819]	[1.221]	[3.755]	[5.719]
Δ ln(Oil Rents pc)	-0.078	-0.503	-0.366	2.391	0.152	-0.384
	[-0.170]	[-0.584]	[-1.212]	[1.373]	[0.910]	[-0.661]
Lag Δln(Oil Rents pc)	-0.209	-0.694	-0.081	0.335	-0.179	-0.432
	[-0.734]	[-0.836]	[-0.561]	[0.318]	[-0.778]	[-1.421]
Polity Mean	1.129***	1.063***	1.196***	1.176***	0.993+	1.025***
	[5.168]	[4.290]	[4.791]	[3.586]	[1.676]	[5.253]
Lag Polity Mean	-0.704*	-0.678**	-0.775*	-0.438*	-0.942	-0.538+
	[-2.148]	[-2.981]	[-2.278]	[-2.434]	[-1.423]	[-1.933]
Lag2 Polity Mean	0.267	0.028	0.138	-0.060	0.307*	0.278
	[0.889]	[0.137]	[0.341]	[-0.278]	[2.099]	[1.256]
Lag3 Polity Mean	-0.041	0.101	0.071	-0.091	0.272	0.089
	[-0.223]	[0.622]	[0.334]	[-0.333]	[1.022]	[0.610]
lnRents Mean	-0.826*	-1.105	-0.195	-1.591	-0.498	-0.465+
	[-2.197]	[-1.520]	[-0.478]	[-0.797]	[-0.951]	[-1.675]
Lag lnRents Mean	0.132	0.203	-0.443	1.846	0.102	-0.051
	[0.288]	[0.236]	[-1.038]	[0.940]	[0.263]	[-0.106]
Lag2 lnRents Mean	-0.136	-0.751	0.246	0.396	-0.384	-0.233
	[-0.304]	[-0.861]	[0.585]	[0.456]	[-0.738]	[-0.579]
Lag3 lnRents Mean	0.036	-0.095	0.029	0.097	-0.386	0.187
	[0.125]	[-0.252]	[0.087]	[0.173]	[-1.001]	[0.503]
Constant	-0.069	0.295	-1.158	0.199	2.985	-1.117
	[-0.051]	[0.128]	[-1.350]	[0.084]	[1.322]	[-0.625]
Total Observations	1657	858	799	352	442	863
Number of Countries	52.000	27.000	25.000	11.000	14.000	27.000
Periods - Avg.	31.865	31.778	31.960	32.000	31.571	31.963

t statistics in brackets; * p<0.05 ** p<.01 *** p<.001
Oil rents per capita are used in natural log form. Polity scaled from -10 (autocracy) to 10 (democracy). Group composition presented in Table A7. Sample reduced from 61 to exclude the countries: China, Cuba, Italy, Japan, Libya, Papua New Guinea, Qatar, Saudi Arabia, and the United Arab Emirates, because the Polity score did not change over the sample period in these countries.

Table A5: Test for Integration Order of Polity, Civil Liberties, Political Rights, and Oil Rents

Variable	Test Statistic (p-values)	Full Sample	Mature	Low-Exp.	LAC	MENA	ROW
Oil Rents	Chi-Squared P	0.004	1.000	0.000	0.000	1.000	0.001
	Inverse Logit L	1.000	1.000	0.004	0.909	1.000	0.967
	Inverse Normal Z	1.000	1.000	0.806	0.999	1.000	1.000
	Modified Inverse Chi-Sq.	0.002	1.000	0.000	0.000	0.998	0.000
	Unit Root Support	Yes	Yes	Low	Yes	Yes	Yes
Δ Oil Rents	Chi-Squared P	0.000	0.000	0.000	0.005	0.000	0.000
	Inverse Logit L	0.000	0.000	0.000	0.004	0.000	0.000
	Inverse Normal Z	0.000	0.000	0.000	0.008	0.000	0.000
	Modified Inverse Chi-Sq.	0.000	0.000	0.000	0.001	0.000	0.000
	Stationary in Diffs	Yes	Yes	Yes	Yes	Yes	Yes

Variable	Test Statistic (p-values)	Full Sample	Mature	Low-Exp.	LAC	MENA	ROW
Polity	Chi-Squared P	0.000	0.888	0.000	0.000	0.759	0.419
	Inverse Logit L	0.045	0.812	0.001	0.000	0.876	0.699
	Inverse Normal Z	0.620	0.815	0.322	0.013	0.881	0.829
	Modified Inverse Chi-Sq.	0.000	0.880	0.000	0.000	0.770	0.444
	Unit Root Support	Low	Yes	Low	No	Yes	Yes
Δ Polity	Chi-Squared P	0.000	0.007	0.000	0.000	0.024	0.000
	Inverse Logit L	0.000	0.003	0.000	0.000	0.012	0.000
	Inverse Normal Z	0.000	0.002	0.000	0.000	0.009	0.000
	Modified Inverse Chi-Sq.	0.000	0.003	0.000	0.000	0.013	0.000
	Stationary in Diffs	Yes	Yes	Yes	Yes	Yes	Yes

Variable	Test Statistic (p-values)	Full Sample	Mature	Low-Exp.	LAC	MENA	ROW
CL	Chi-Squared P	0.055	0.853	0.001	0.000	0.902	0.958
	Inverse Logit L	0.263	0.869	0.014	0.000	0.922	0.762
	Inverse Normal Z	0.613	0.859	0.219	0.010	0.920	0.780
	Modified Inverse Chi-Sq.	0.049	0.850	0.000	0.000	0.890	0.946
	Unit Root Support	Yes	Yes	Low	No	Yes	Yes
Δ CL	Chi-Squared P	0.000	0.000	0.000	0.000	0.000	0.000
	Inverse Logit L	0.000	0.000	0.000	0.000	0.000	0.000
	Inverse Normal Z	0.000	0.000	0.000	0.000	0.000	0.000
	Modified Inverse Chi-Sq.	0.000	0.000	0.000	0.000	0.000	0.000
	Stationary in Diffs	Yes	Yes	Yes	Yes	Yes	Yes

Variable	Test Statistic (p-values)	Full Sample	Mature	Low-Exp.	LAC	MENA	ROW
PR	Chi-Squared P	0.000	0.897	0.000	0.000	0.816	0.000
	Inverse Logit L	0.000	0.875	0.000	0.000	0.859	0.001
	Inverse Normal Z	0.195	0.894	0.003	0.027	0.856	0.206
	Modified Inverse Chi-Sq.	0.000	0.890	0.000	0.000	0.817	0.000
	Unit Root Support	Low	Yes	No	No	Yes	Low
Δ PR	Chi-Squared P	0.000	0.000	0.000	0.001	0.000	0.000
	Inverse Logit L	0.000	0.000	0.000	0.000	0.000	0.000
	Inverse Normal Z	0.000	0.000	0.000	0.000	0.000	0.000
	Modified Inverse Chi-Sq.	0.000	0.000	0.000	0.000	0.000	0.000
	Stationary in Diffs	Yes	Yes	Yes	Yes	Yes	Yes

Dickey Fuller, Fisher style panel unit root tests (Choi 2001). The null hypothesis is that all panels contain a unit root.

Table A6: Cointegration Results, Westerlund Panel Tests

Polity	Full Sample	Mature	Low-Exp.	LAC	MENA	ROW
Group Mean Test t	0.48	0.52	0.54	0.80	0.48	0.46
Group Mean Test a	0.24	0.62	0.04	0.74	0.52	0.04
Panel Test t	0.66	0.28	0.88	0.84	0.32	0.58
Panel Test a	0.46	0.34	0.60	0.82	0.30	0.42
Cointegration Support	No	No	No	No	No	No

Civil Liberties	Full Sample	Mature	Low-Exp.	LAC	MENA	ROW
Group Mean Test t	0.14	0.20	0.18	0.16	0.26	0.34
Group Mean Test a	0.26	0.28	0.38	0.14	0.30	0.58
Panel Test t	0.16	0.20	0.40	0.28	0.66	0.46
Panel Test a	0.10	0.10	0.46	0.30	0.28	0.50
Cointegration Support	No	No	No	No	No	No

Political Rights	Full Sample	Mature	Low-Exp.	LAC	MENA	ROW
Group Mean Test t	0.04	0.06	0.04	0.14	0.08	0.10
Group Mean Test a	0.22	0.20	0.32	0.20	0.22	0.34
Panel Test t	0.22	0.18	0.86	0.24	0.22	0.52
Panel Test a	0.16	0.14	0.72	0.16	0.16	0.26
Cointegration Support	No	No	No	No	No	No

Group tests, rejecting H0 suggests that there is cointegration between oil rents per capita and the relevant institution for at least one country.
Panel tests, rejecting HO suggests that the panel as a whole is cointegrated.

Table A7. List of Countries and Group Composition

Mature Countries	LAC	MENA	ROW	Less-Exp. Countries	LAC	MENA	ROW
Albania			X	Bangladesh			X
Algeria		X		Bulgaria			X
Angola			X	Chile	X		
Bolivia	X			China			X
Cuba	X			Congo, Rep.			X
Egypt, Arab Rep.		X		Congo, Dem. Rep.			X
Indonesia			X	Ecuador	X		
Iran, Islamic Rep.		X		Guatemala	X		
Iraq		X		Jordan		X	
Kuwait		X		Mongolia			X
Libya		X		Philippines			X
Mexico	X			Senegal			X
Nigeria			X	Sudan		X	
Peru	X			Tunisia		X	
Poland			X	Cameroon			X
Qatar		X		Cote d'Ivoire			X
Romania			X	Korea, Rep.			X
Syrian Arab Republic		X		Morocco		X	
United Arab Emirates		X		Spain			X
Bahrain		X		Benin			X
Brazil	X			Chad			X
Gabon			X	Yemen		X	
Hungary			X	Greece			X
Saudi Arabia		X		Pakistan			X
Argentina	X			Israel		X	
Trinidad and Tobago	X			Papua New Guinea			X
Turkey		X		South Africa			X
Venezuela, RB	X						
Colombia	X						
India			X				
Italy			X				
Japan			X				
Malaysia			X				
Thailand			X				

Source: Author Calculations