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Oil Rents, Corruption, and State Stability: Evidence from Panel Data Regressions

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Abstract: We examine the effects of oil rents on corruption and state stability exploiting the exogenous within-country variation of a new measure of oil rents for a panel of 30 oil-exporting countries during the period 1992 to 2005. We find that an increase in oil rents significantly increases corruption, significantly deteriorates political rights while at the same time leading to a significant improvement in civil liberties. We argue that these findings can be explained by the political elite having an incentive to extend civil liberties but reduce political rights in the presence of oil windfalls to evade redistribution and conflict. We support our argument documenting that there is a significant effect of oil rents on corruption in countries with a high share of state participation in oil production while no such link exists in countries where state participation in oil production is low.

Key words: Oil rents; corruption; state stability; state participation

JEL codes: C33, D73, D74, D72, H21

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1. Introduction

A popular belief in the political science and political economy literature is that oil rents are associated with corruption and state instability. Ross (1999b) reviews the political aspects of why resource rich countries tend to manage their economies poorly, arguing that state ownership of the resource industry leads politicians to abuse political power for private purposes. More specifically, Karl (2004) argues that countries dependent on oil are often characterized by corruption and exceptionally poor governance, a culture of rent-seeking, and high incidences of civil conflict and inter-state war.[1] The empirical evidence on the link between oil rents, corruption, and state stability is however scarce at best. Most of the literature has been either anecdotal or is plagued by endogeneity biases related to difficult-to-measure (and often unobservable) cross-country differences in institutional arrangements, culture, tastes, or other deep historical factors that are often neglected in cross-country analysis. As a consequence, it is not possible to state with great confidence, typically required for policy action to be justified, that oil windfalls posit a political economy problem and hence require swift policy responses.

The purpose of this paper is to examine with rigorous panel data techniques the link between oil rents, corruption, and various measures of state stability. Our empirical analysis differs from existing cross-sectional studies (see Svensson, 2005; or Treisman, 2007, for a review), as we emphasize fixed effects specifications that link within-country variation in oil rents to within-country variation in corruption and state stability. This allows us to circumvent an important endogeneity bias that arises because of unobserved cross-country heterogeneity. Using country fixed effects has moreover the advantage of circumventing country-specific perception biases and difficulties in comparing cross-country corruption scores due to non-homogeneity of survey methodologies applied across countries by surveying institutions. From a policy perspective, the relevant question in terms of risk management is also what happens to corruption and state stability

1 See also Fearon (2005) who argues that oil states are exposed to a significantly higher risk of suffering from civil war because oil producers have relatively low state capabilities and because oil makes state or regional control a tempting price.

in countries in the presence of windfalls from oil rents, which is a question inherently related to within-country variation in oil rents and therefore well addressed by our econometric framework.

Our main finding is that increases in oil rents significantly increase corruption, significantly deteriorate political rights, but have no significant effects on measures of state instability. At the same time, we find that increases in oil rents significantly improve civil liberties. Focusing on the distributional conflict between the political elite and the masses, we argue that our findings are well explained by the political elite having an incentive to reduce political rights to evade a loss of the rent income that accrues to the political elite in the presence of oil windfalls. While a reduction in political rights reduces the risk of a loss of the rent income due to redistribution, reducing political rights potentially also increases the likelihood of violent conflict as the masses could try to capture part of the oil rents through violent means. To therefore quell the masses the political elite must extend civil liberties in order to evade costly intra-state conflict. We support our argument documenting that there is a significant effect of oil rents on corruption, political rights, and civil liberties in countries with a high share of state participation in oil production while no such link exists in countries where state participation in oil production is low.

The remainder of the paper is organized as follows. Section 2 places our paper into the context of the related resource curse literature. Section 3 describes our oil rent data. Section 4 explains the estimation strategy. Section 5 discusses the main empirical results. Section 6 concludes.

2. Related Literature

There exist a number of empirical studies that have investigated the impact of resource rents on corruption, political institutions, or state stability (e.g. Hamilton and Clemens, 1999; Gilmore et al., 2005; Djankov et al., 2008; Collier and Hoeffler, 2009; Bhattacharyya and Hodler, 2010; Haber and Menaldo, 2010; Tsui, 2010). These studies have typically relied on measures of resource rents that

are based on time-series variation in the international commodity prices as well as variations in the quantity of the commodity extracted and the extraction costs. While for most countries variations in the commodity prices are a plausibly exogenous source of variation in resource rents, it is likely that variations in the quantity of the resource extracted changes in response to within-country changes in corruption and state stability. Indeed, Robinson et al. (2006) provide a theoretical framework where politicians over-extract natural resources relative to the efficient extraction path because they discount the future too much. Also, the security component associated with the cost of extraction is likely to be endogenous to civil conflict rendering the use of the latter measure of resource rents ineffective in isolating the effect of rents on conflict. In contrast, the within-country time-series variation of our measure of oil rents is more plausibly exogenous as it is driven by the international oil price and made country-specific by exogenous cross-country differences in geology. Therefore, we are able to identify in a more credible way the causal effect that within-country variation of oil rents has on corruption and state instability.

The focus of our paper is exclusively on oil rents, which ensures the homogeneity in the effects of resource rents on corruption and state stability. A recent literature has shown the importance of not pooling commodities when analyzing the effects of resource rents on governance and growth. For instance, Isham et al. (2005) show using cross-country regressions that while point source exporting countries do relatively poorly across an array of governance indicators countries with natural resource exports that are diffuse (e.g. livestock and agricultural products) do not show the same strong effects and have had more robust growth recoveries. On the conflict side, Dube and Vargas (2008) show that while positive income shocks from international coffee prices significantly reduce the risk of civil conflict in Columbia, positive oil price shocks significantly increase it.[2]

A related literature also looks at the effects of resource rents on political systems and on state stability. While Ross (1999a) shows that oil rents significantly undermine democracy, Haber

2 See also Bruckner and Ciccone (2010) who find that in Sub-Saharan Africa the risk of civil war outbreak is significantly lower during times of commodity price induced recessions than during times of commodity price induced booms.

and Menaldo (2010) find that oil does not significantly foster authoritarianism. Several scholars have also offered different theories of the impact of natural resource wealth on civil conflict: mineral wealth could foster conflicts by funding rebel groups (Collier and Hoeffler, 2004); weakening state institutions (Fearon and Laitin, 2003; Snyder and Bhavnani, 2005); making the state a more attractive target for rebels (Fearon and Laitin, 2003); facilitating trade shocks (Humphreys, 2005); making separatism financially attractive in resource rich regions (Le Billon, 2005; Collier and Hoeffler, 2004); or through other processes (Ross, 2006; Humphreys, 2005). We also contribute to that literature focusing again on the relationship between within-country variation of oil rents and within-country variation in political systems and civil conflict.

Finally, studying the impact of oil rents on corruption is also relevant to understanding the economic performance of resource rich countries. Indeed, our paper is related to the literature on the impact of natural resources on economic growth, also known as the resource curse (see Van der Ploeg, 2010, for a survey). Moreover, our paper is related to the literature on corruption and growth performance. Among others, Mauro (1995) attempts using cross-sectional regressions to isolate the exogenous effect of corruption on economic growth and investment. He finds that corruption has a statistically significant negative impact on both growth and investment. More recently, Beck and Laeven (2006) also find that dependence on natural resources and the historical experience of these countries with socialism was a major determinant of institution building during transition. Using natural resource reliance and the years under socialism to extract the exogenous component of institution building, Beck and Laeven show the importance of institutions in explaining the variation in economic development and growth in transition economies.

Beyond the fixed effects regression framework that allows us to circumvent important identification issues related to unobserved cross-country heterogeneity, a further important contribution of our paper is that we exploit a unique dataset of oil rents that satisfy quite plausibly the important requirement of exogeneity of oil rents to corruption and state instability. Specifically,

we rely on the unit export value of oil, collected through IMF surveys conducted by desk economists, as a proxy for oil rents. The unit export value of oil is constructed using the international oil price interacted with a country-specific discount factor that captures the quality of oil in a given country. The producibility and quality of oil are in part exogenously determined by country-specific geological factors. These geological factors in turn determine the chemical properties of oil (such as oil viscosity, sulfur content, and acid number), which in turn determine the price at which the oil can be sold on the competitive international oil market. In the next section we explain in detail the construction of our oil rent data.

3. Oil Rent Data

Our proxy for oil rents is the oil export unit value taken from Ossowski et al. (2008). The oil export unit value is available for 30 oil-producing countries during the 1992 to 2005 period. The data was collected through IMF internal surveys of country desk economists for all oil-producing countries where fiscal oil revenue accounted for at least 20 percent of total fiscal revenue in 2004 and for which sufficient information was available.[3]

Specifically, the unit export value of oil was constructed using the international crude oil price interacted with a country-specific discount factor that captures the quality of oil in a given country. The oil export unit value can therefore be decomposed into two components: (i) the international crude oil price that is common to all oil producing countries, and (ii) the country-specific discount factor that captures the quality of the crude oil. Because we control in our empirical analysis for common year fixed effects (see Section 4 below) identification of the impact of oil rents on outcome variables comes from the interaction between the international oil price and the country-specific discount factor. Any variation in oil rents that are exclusively due to variation

3 The countries included in the sample are Algeria, Angola, Azerbaijan, Bahrain, Brunei, Cameroon, Chad, Republic of Congo, Ecuador, Equatorial Guinea, Gabon, Indonesia, Islamic Republic of Iran, Kazakhstan, Kuwait, Libya, Mexico, Nigeria, Norway, Oman, Qatar, Russia, Saudi Arabia, Sudan, the Syrian Arab Republic, Trinidad and Tobago, United Arab Emirates, Venezuela, Vietnam, and the Republic of Yemen.

in the international oil price will therefore be fully captured by the common year fixed effect.

Kilian (2009) documents that there is little evidence for coordinated behavior of OPEC in systematically affecting the international oil price. While this may be true for the international oil price, domestic economic conditions will affect the country-specific *quantity* of oil produced.[4] In contrast, the country-specific *quality* of oil that drives the discount factor used to construct our oil revenue measure is determined by geology (such as the detailed structure of the oil field, its depth or whether the oil is located in deep water). The combination of these geological factors in turn determines the chemical properties of the oil (e.g. gravity, viscosity, sulfur content, and acid number), which in turn determines the price at which the oil can be sold on the international oil market. Hence, country-specific geological factors affect country-specific oil rents by affecting the country-specific unit price at which domestic oil production can be sold. Tables 1 and 2 provide a description of all variables used in our empirical analysis as well as some summary statistics. In Appendix Table 1 we also list the average country-specific discount factors and the respective country-specific average corruption and polity scores.

4. Estimation Strategy

We now explain our estimation strategy that allows us to estimate the effect of country-specific changes in oil rents on country-specific changes in corruption (and other outcome variables of interest). Specifically, we estimate the model:

$$\Delta \text{Corruption}_{it} = \alpha_i + \gamma_t + \beta \Delta \text{Oil Rents}_{it} + \Gamma X_{it} + u_{it}$$

where α_i are country fixed effects that capture unobservable time-invariant country characteristics, and γ_t are year fixed effects that capture shocks common to all countries. The parameter estimate β reflects therefore the marginal effect that country-specific changes in oil rents have on country-specific changes in corruption. Other control variables (X_{it}) varying at the country-year level that

4 Similarly, the discovery of new oil fields which constitute an important source of oil rents cannot be treated as exogenous as corruption and state instability affect exploration costs and hence the likelihood that an oil field will be discovered.

we include in our empirical analysis as a robustness check are the first difference in non-oil GDP (Δ Non-Oil GDP_{it}), which controls for the change in income unrelated to the oil sector; the first difference in oil production (ΔOil $Production_{it}$), which controls for the change in the quantity of oil produced; and lagged corruption (Lagged $Corruption_{it-1}$), which captures convergence effects in the level of corruption as corruption scores are bounded. We present estimates using least squares estimation but also system-GMM estimation (Blundell and Bond, 1998) to deal with possible biases arising from dynamic panel data estimates in the presence of fixed effects. The error term u_{it} is clustered at the country level and may hence be arbitrarily serially correlated within countries.

As a note, we would like to point out that a key advantage of the above fixed effects estimation strategy is that it addresses criticisms related to perception biases in the coding of corruption scores. Such perception biases usually prevent the consistent estimation of the effect that resource rents have on corruption. For instance, one may imagine that the relative difference in historical ties between two oil producing countries vis-à-vis the country where the rating agency is based can lead the rating agency to perceive that the country more distant in historical ties to the rating agency based country is more corrupt. Also, increases in international oil prices could lead to the perception that corruption is increasing over time in all oil producing countries. Both of these biases are fully captured by our country and year fixed effects, and hence do not lead to biased estimates of the marginal effect that increases in oil rents have on corruption.

5. Main Results

Oil Rents and Corruption. Table 3 summarizes our estimation results of the link between within-country variation in oil rents and within-country variation in corruption. Column (1) shows the least squares estimates where control variables are country fixed effects as well as year fixed effects (both jointly significant at the 1% level). The obtained point estimate on our oil rents measure is 0.460, which is statistically significant at the 5% level. The point estimate in column (1) implies

that a 1 standard deviation increase in the unit export value of oil increases corruption by about 0.32 standard deviations. In column (2) we show that this adverse link between oil rents and corruption remains statistically significant when controlling for within-country variation in non-oil per capita income. Column (3) shows that this continues to be the case when controlling for the quantity of oil produced, which enters as statistically insignificant.

We furthermore document the robustness of our static panel estimates to dynamics in corruption scores by including the lagged corruption score as a right-hand-side regressor, see columns (4) and (5). We present both least squares estimates as well as system-GMM (Blundell and Bond, 1998) estimates as least squares estimates of dynamic panel data models are biased in the presence of country fixed effects. We find however that regardless of whether least squares or system-GMM estimation is used that the lagged dependent variable enters as highly statistically negative, implying a half-life of (transitory) shocks to corruption scores of about 1.4 years. We also find that within-country increases in oil rents continue to exhibit statistically significant and quantitatively large adverse effects on within-country changes in the level of corruption.[5]

In Table 4 we show, using instrumental variables techniques, that increases in corruption are associated with significantly lower levels of oil production in our sample (columns (1)-(3)). Importantly, columns (4)-(6) of Table 4 show that increases in corruption do not significantly affect our measure of oil rents that is based on variation in the quality rather than the quantity of oil. We note that the quality of our instrumental variables (lagged corruption and the Polity2 score) is reasonable, as the Hansen test does not reject the validity of the excluded instruments and the first-stage yields a highly significant relationship between the instruments and the endogenous regressor. The significant negative response of oil production to corruption is an important result in the sense that it can explain why least-squares estimation of the effect of oil production on corruption is insignificant (there is a negative reverse causality bias) while our measure of oil rents produces a

5 We have also checked whether our results are sensitive to outliers by applying the Grubbs test. Dropping those observations deemed as outliers by the Grubbs test yielded highly statistically significant point estimates on our oil rent measure that were quantitatively larger than the estimates reported in Table 3 (results not shown).

significant positive average effect on corruption.

To explore potential cross-country heterogeneity in the impact that oil rents have on corruption, we present in Table 5 estimates of an interaction model where we allow the marginal effect of oil rents on corruption to vary as a function of country-specific characteristics. In particular, we check whether cross-country differences in institutional democracy lead to heterogeneous effects of oil rents on corruption by including an interaction effect between our oil rents measure and the Polity2 score (column (1)) as well as the checks and balances score (column (2)). We find that these interaction terms are quantitatively small and statistically insignificant. Hence, we do not find evidence that cross-country differences in democratic institutions significantly affect the marginal impact that oil rents have on corruption.[6] While perhaps surprising given the findings of the empirical institutions literature that emphasizes political institutions as key determinants for long-run economic development (e.g. Acemoglu et al., 2001, 2002), the easiest reading of these results is that oil rents have a statistically significant average effect on corruption while the insignificance on the interaction term could be due to a variety of factors such as for example measurement error in political institutions. In columns (3)-(5) we also document that cross-country differences in ethnic fractionalization, the share of Protestants in the population, and colonial origin do not significantly affect the negative marginal effect of oil rents on corruption that we documented in Table 3. Interestingly, we also do not find evidence that African oil exporters are more prone to suffer from corruption due to increases in oil rents than non-African oil exporters (see column (6) of Table 5).

Oil Rents and Polity Outcomes. In order to foster our understanding of the negative effect of oil rents on corruption, it is useful to investigate whether oil rents have a significant direct effect on political institutions. We explore this question in Table 6 by examining how a variety of polity

6 Interestingly, we find that stronger checks and balances have an individually positive effect on corruption, significantly reducing corruption levels as documented for instance by Keefer and Knack (2007).

measures respond to changes in country-specific oil rents. A key issue here is whether oil rents directly undermine political procedures as captured for instance by the Polity2 score and the checks and balances score, or whether oil rents just affect political outcomes as captured predominantly by the Freedom House political rights and civil liberties score. In columns (1) and (2) we therefore estimate, using our panel fixed effects regression framework, the effect that oil rents have on the Polity2 score and the checks and balances score; in columns (3) and (4) we do the same for the Freedom House political rights and the civil liberties score. As can be seen from columns (1) and (2) of Table 6, there are no significant effects of within-country changes in oil rents on within-country changes in the Polity2 and checks and balances scores. However, we do find a significant effect of within-country variations in oil rents on both political rights and civil liberties scores. In particular, we find that while increases in oil rents significantly deteriorate political rights they lead to significant improvements in civil liberties: a 1 standard deviation increase in the unit export value of oil reduces political rights by about 0.21 standard deviations and increases civil liberties by about 0.33 standard deviations.

What explains this asymmetry in the response of political rights and civil liberties to oil rents? There could clearly be a number of possible reasons but a useful way in answering this question is to focus on the distributional conflict between the political elite and the masses. Extending political rights to the masses implies for the political elite a loss in oil rents due to redistribution. The political elite therefore has an incentive to keep political rights low in the presence of oil windfalls in order to prevent the masses from sharing in on the pie. The reduction in political rights, which impedes the masses from sharing in on the rents may however trigger substantial discontent. In particular, if the masses cannot share in on the oil rents via redistribution then violence in form of civil conflict may emerge as the masses struggle to capture direct control over the oil resources (see for instance Hirshleifer, 2001). One of the instruments available to the elite to quell the masses in the presence of such oil windfalls is to extend civil liberties. By doing

so, the political elite significantly reduces the risk of civil conflict while at the same time preserves its rent income from oil revenues by reducing political rights.

In Table 7 we document this conflict channel by showing that while both increases in civil liberties and political rights significantly reduce the likelihood in our sample of civil conflict incidence as well as civil conflict onset, there are no significant effects of oil rents on either civil conflict incidence or civil conflict onset.[7] This is consistent with our argument above that the political elite has an incentive to reduce political rights in order to evade a loss of rent income due to redistribution and extend civil liberties to evade the outbreak of civil conflict. Increases in oil rents must therefore not necessarily increase the risk of civil conflict on average as long as the political elite optimally quells the masses by increasing civil liberties. In the Appendix we present a simple reduced form model to illustrate our argument in an also more formal way.

To provide some empirical support for the implicit assumption made in our argument above that oil rents accrue to a high degree to the political elite, we document in Table 8 that there is a significant link between oil rents and corruption, and oil rents and political rights as well as civil liberties in those countries with a high share of state participation in oil production. In countries where the share of state participation in oil production is on the other hand relatively low within-country variation in oil rents does not have a significant effect on corruption, political rights, or civil liberties. This finding matches well with what Ross (1999b) suggests as one of the more promising explanations for the resource curse – the state ownership of natural resources. Because rent income accrues in petrostates directly to the government budget, oil rents are easily diverted by the political elite into their own pockets. When extending political rights, the political elite looses control over the rent income and therefore refrains from extending political rights in the presence of oil windfalls. Instead, the political elite extends civil liberties and thereby significantly reduces the

7 We present logit fixed effects estimates for the effect that oil rents have on the civil conflict incidence and onset indicator variable to take into account the non-linear nature of the dependent variable. Because our oil measure is plausibly exogenous to within-country variation in the risk of conflict, presenting logit fixed effects is appropriate but this is not the case for political rights and civil liberties because political rights and civil liberties are clearly endogenous to the presence of civil conflict. We therefore present for the political rights score and civil liberties score GMM estimates and show for comparison purposes also the GMM estimates for oil rents.

risk of intra-state conflict. On net, increases in oil rents are therefore associated with a significant increase in corruption, lower political rights, greater civil liberties and no overall increase in the risk of civil conflict.

6. Conclusion

Obtaining a consistent estimate of the causal effect that oil rents have on corruption and state stability is complicated by difficult-to-measure and often unobservable cross-country heterogeneity, perception biases, and the endogenous response of oil production to corruption. Our paper addresses these important issues by using panel fixed effects regressions and a new measure of country-specific oil rents that is driven by cross-country differences in geology. Our main finding is that within-country increases in oil rents lead to significant within-country increases in corruption, significant within-country decreases in political rights, as well as significant within-country increases in civil liberties. On the other hand, we find that on average within-country increases in oil rents did not have a significant overall effect on the risk of civil conflict.[8]

While our results therefore confirm the common held belief that oil rents are associated with corruption and a worsening of political rights, they reject the hypothesis that oil rents are a direct threat to state stability. From the policy perspective it is hence not the case that investors have to fear that windfalls from oil rents are a threat to their investment projects because oil windfalls make civil conflict more likely.[9] Instead, what policy makers should be aware of and concerned about is that oil rents significantly increase corruption, which bears a substantial welfare loss due to the misallocation of resources and the costs associated with secrecy (Murphy et al. 1991, 1993; Shleifer and Vishny, 1993).

On the policy front, a relatively recent international initiative named Extractive Industry

8 We have also examined the effect of within-country changes in our oil rent measure on other forms of state instability such as the risk of coup d'etats, revolutions, assassinations, purges, strikes, as well as riots and did not find a significant relationship (results not shown).

9 The destructive forces and threat to economic development of civil conflicts are now well recognized among policy makers, see for instance World Bank (2003).

Transparency Initiative (EITI) is pushing for further transparency in the oil, gas and minerals extractive industries. This appears a promising initiative as EITI requests governments and companies that operate in participating countries to declare the amount of money received from oil exports. At this stage it is too early to assess econometrically whether the countries that have voluntarily decided to participate have reduced their level of corruption.[10] An interesting direction for future research is therefore to examine using rigorous econometric techniques whether EITI participating countries have significantly lower levels of corruption due to the presence of oil windfalls than those countries that did not sign the transparency initiative. In addition, it may be of interest to compare whether home-grown initiatives for creating transparency in public resource administration are more or less effective than international initiatives such as EITI.

10 To date, Azerbaijan is the only country that has completed EITI validation and become EITI compliant.

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Appendix. A Simple Model of Corruption, Political Rights, and Civil Liberties

We present here a simple reduced form model where the political ruler maximizes expected utility from resource income (*R*) by choosing the optimal level of corruption (*C*), the optimal level of political rights (*POL*), and the optimal level of civil liberties (*CL*). The political ruler can provide public goods (*G*), which are financed from the resource income (*R*). Alternatively, the political ruler can divert part of the resource income (*R*) for private (consumption) purposes (*C*). For simplicity we abstract from tax revenues, so that the budget constraint for public good provision can be written as:

(1) $$G + C = R$$

We assume that the probability (*p*) for the political ruler to stay in power is increasing in civil liberties (*CL*), political rights (*POL*), and public goods (*G*). More formally, the probability (*p*) of staying in power is:

(2) $$p = \mathrm{f}(CL, POL/C, R\text{-}C)$$

where the third argument on the right-hand side of the above equation follows from the budget constraint in equation (1). The *POL*/*C* term captures that political rights, in contrast to civil liberties, have the feature that with more political rights the political ruler is increasingly accountable to the public, and that increases in corruption lower the probability (*p*) of staying in power the stronger the political rights.

The expected utility of a risk-neutral political ruler who derives utility from personal income *C,* and disutility from extending political rights (*POL*) and civil liberties (*CL*) is

(3) $$Expected\ Utility = p^{*}C - g(POL,CL)$$

which yields the first-order conditions:

(4) $$p = -\frac{\partial p}{\partial (C)} C$$

(5) $$\frac{\partial p}{\partial (POL)} C = \frac{\partial g}{\partial (POL)}$$

(6) $$\frac{\partial p}{\partial (CL)} C = \frac{\partial g}{\partial (CL)}$$

To obtain a closed form solution and to further simplify the model as much as possible we consider a linear probability function $p = POL/C+CL+R-C$ and focus on the case where *POL*, *CL*, *R*, and *C* are such so that *p* is on the unit intervall. Under a quadratic and additive cost function $g(POL,C) = 1/2(POL*R)^2 - 1/2(CL)^2$, where the multiplicative term $R*POL$ reflects that extending political rights is particularly costly for the political ruler when resource rents are high, the optimal level of C^{opt}, POL^{opt} and CL^{opt} as a function of *R* can be obtained by solving the system of equations of the first-order conditions provided in equations (4)-(6). This yields that:

(7) $$C^{opt} = R$$

(8) $$POL^{opt} = 1/R^2$$

(9) $$CL^{opt} = R$$

Hence, political rights decrease in response to an increase in resource rents while civil liberties and corruption increase.

Table 1. Description of Variables

Variable	Description	Source
Oil Rents	Oil rents are proxied for by the unit export value of oil/gas exports in US$ per barrel. The data is constructed from surveys of IMF desk economists. See also Section 3 for further details.	Ossowski et al. (2008)
State Participation	State participation is captured by a dummy variable that takes the value of 0 if state ownership in national oil companies is on average below 30 percent. The variable is equal to 1 if state ownership in national oil companies is on average above 30 percent.	McPherson (2009)
Oil Production	Oil production is measured by the production of crude oil, natural gas plant liquids (NGPL) and other liquids (such as biodiesel and ethanol) in thousand barrels per day.	Energy Information Administration (2006)
Non-Oil GDP	Non-oil GDP is measured as total GDP minus oil revenues in constant international US$ dollar.	Ossowski et al. (2008)
Corruption	The corruption score captures the likelihood that government officials will demand special payments and the extent to which illegal payments are expected throughout government tiers. The score ranges from 1 to 6, with higher values indicating less corruption. For the empirical analysis, we multiply the score by -1 so that higher values denote more corruption.	Political Risk Services, (2009)
Polity2	The Polity2 score is based on the constraints placed on the chief executive, the competitiveness of political participation, and the openness and competitiveness of executive recruitment. The score ranges from -10 to +10, with higher values indicating stronger democratic institutions.	Polity IV database (Marshall and Jaggers, 2005)
Checks and Balances	The checks and balance score is based on the number of veto players in a political system, adjusted for whether these veto players are independent of each other as determined by the level of electoral competitiveness in a system, their respective party affiliations, and the electoral rules. The score ranges between 1 to 5, with higher values indicating stronger checks and balances.	Database of Political Institutions (Keefer and Stasavage, 2003)
Political Rights	The political rights score captures the electoral process, political pluralism and participation, and the functioning of government. The score ranges from 1 to 7. For comparison purposes we rescale the score so that higher values indicate more political rights.	Freedom House (2009)
Civil Liberties	The civil liberty score measures freedom of expression and belief, associational and organizational rights, the rule of law, and personal autonomy and individual rights. The score ranges from 1 to 7. For comparison purposes we rescale the score so that higher values indicate more civil liberties.	Freedom House (2009)
Civil Conflict	Indicator variable that is unity if the country experiences a civil conflict. A civil conflict is defined as an incompatibility which concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle deaths.	PRIO/UPSALLA (2009)
Ethnic Fractionalization	The ethnic fractionalization index measures the probability that two randomly selected individuals in a country will not belong to the same ethnic group. The index ranges between 0 and 1 and is strictly increasing in the number of groups.	Alesina et al. (2003)
British Colonial Origin	Indicator variable that is unity if the country is of British colonial origin.	Treisman (2007)
Protestants in Population	Share of protestants is measured as the share of the population that is of protestant belief.	Barro and McCleary (2003)

Table 2. Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max	Obs.
Δ Oil Rents	0.091	0.256	-0.631	0.702	332
Δ Non-Oil GDP	-0.013	0.098	-0.374	0.338	287
Δ Oil Production	0.050	0.172	-0.186	1.554	332
Δ Corruption	-0.059	0.369	-1	2	301
Δ Checks and Balances	0.125	1.343	-11	11	320
Δ Polity2	0.037	0.509	-3	3	324
Δ Political Rights	-0.015	0.415	-2	2	332
Δ Civil Liberties	-0.015	0.400	-2	1	332
Civil Conflict	0.151	0.358	0	1	332

Table 3. Oil Rents and Corruption

	ΔCorruption				
	(1)	(2)	(3)	(4)	(5)
	LS	LS	LS	LS	GMM
Δ Oil Rents	0.460**	0.565**	0.544**	0.446*	0.449**
	(0.209)	(0.244)	(0.234)	(0.240)	(0.230)
Δ Non-Oil GDP		0.063	0.063	0.128	0.091
		(0.314)	(0.312)	(0.271)	(0.256)
Δ Oil Production			-0.232	-0.143	-0.125
			(0.225)	(0.221)	(0.195)
Lagged Corruption				-0.416***	-0.389***
				(0.070)	(0.067)
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes
Common Time Effect	Yes	Yes	Yes	Yes	Yes
Observations	301	269	269	269	269

Note: The method of estimation in columns (1)-(4) is least squares; column (5) system-GMM (Blundell and Bond, 1998). Huber robust standard errors (in brackets) are clustered at the country level. The dependent variable is the change in the PRS corruption score. The corruption score is re-scaled so that higher values denote more corruption. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 4. The Endogenous Response of Oil Production to Corruption

	ΔOil Production			ΔOil Rents		
	(1)	(2)	(3)	(4)	(5)	(6)
	2SLS	2SLS	GMM	2SLS	2SLS	GMM
ΔCorruption	-0.116* [0.07]	-0.082* [0.07]	-0.076** [0.04]	0.014 [0.87]	0.017 [0.84]	-0.006 [0.41]
Lagged ΔOil Production		0.373*** (0.07)	0.325*** (0.11)			
Lagged ΔOil Rents					0.372*** (0.11)	0.317*** (0.11)
Overidentification, p-value	0.23	0.17	0.20	0.74	0.75	0.74
Underidentification, p-value	0.00	0.00	0.00	0.00	0.00	0.00
First-Stage, F-Statistic	7.62	6.59	4.21	7.62	6.59	4.21
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Common Time Effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	289	273	256	289	273	256

Note: The instrumental variables for corruption are the change in the Polity2 score and lagged corruption. Columns (1), (2), (4), and (5) present two-stage least squares estimates; columns (3) and (6) present GMM estimates. P-values [in square brackets] are based on the Ánderson-Rubin test of statistical significance of the endogenous regressor (Δcorruption). The PRS corruption score is re-scaled so that higher values denote more corruption. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 5. Oil Rents, Country Characteristics, and Corruption

	ΔCorruption					
	(1)	(2)	(3)	(4)	(5)	(6)
	LS	LS	LS	LS	LS	LS
Δ Oil Rents	0.516** (0.231)	0.312* (0.188)	0.482** (0.228)	0.467** (0.208)	0.459** (0.212)	0.455** (0.244)
Δ Oil Rents* Polity2	-0.005 (0.010)					
Polity2	-0.004 (0.017)					
Δ Oil Rents* Checks and Balances		0.054 (0.054)				
Checks and Balances		-0.061** (0.024)				
Δ Oil Rents*Ethnic Fractionalization			0.054 (0.451)			
Δ Oil Rents*Share of Protestants in Population				-0.065 (0.272)		
Δ Oil Rents*British Colonial Origin					0.012 (0.188)	
Δ Oil Rents*Africa Dummy						0.014 (0.275)
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Common Time Effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	289	295	288	301	301	301

Note: The method of estimation is least squares. Huber robust standard errors (in brackets) are clustered at the country level. The dependent variable is the change in the PRS corruption score. The corruption score is re-scaled so that higher values denote more corruption. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 6. Oil Rents and Polity Outcomes

	ΔPolity2	ΔChecks and Balances	ΔPolitical Rights	ΔCivil Liberties
	(1)	(2)	(3)	(4)
	LS	LS	LS	LS
Δ Oil Rents	0.072 (0.987)	-0.106 (0.222)	-0.334** (0.168)	0.507** (0.202)
Country Fixed Effect	Yes	Yes	Yes	Yes
Common Time Effect	Yes	Yes	Yes	Yes
Observations	320	324	332	332

Note: The method of estimation is least squares. Huber robust standard errors (in brackets) are clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 7. Oil Rents, Political Rights, Civil Liberties, and Civil Conflict

	Civil Conflict Incidence				Civil Conflict Onset			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Logit FE	GMM	GMM	GMM	Logit FE	GMM	GMM	GMM
Δ Oil Rents	-4.215 (4.278)	0.009 (0.125)			2.614 (4.842)	0.127 (0.122)		
Δ Political Rights			0.044* (0.027)				0.050* (0.027)	
Δ Civil Liberties				0.058* (0.033)				0.052* (0.028)
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Common Time Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	332	332	332	332	332	332	332	332

Note: The estimation model in columns (1) and (5) is the conditional logit fixed effects model; columns (2)-(4) and (6)-(8) use system-GMM estimation (Blundell and Bond, 1998) assuming a linear probability model. The dependent variable in columns (1)-(4) is civil conflict incidence; columns (5)-(8) civil conflict onset. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 8. Oil Rents, Corruption, and the State Ownership of Oil Production

	ΔCorruption	ΔPolitical Rights	ΔCivil Liberties
	Panel A: Countries with High State Ownership		
	(1)	(2)	(3)
	LS	LS	LS
Δ Oil Rents	-0.312*	-0.389*	0.629***
	(0.181)	(0.209)	(0.200)
Country Fixed Effect	Yes	Yes	Yes
Common Time Effect	Yes	Yes	Yes
Observations	194	207	207
	Panel B: Countries with Low State Ownership		
	(1)	(2)	(3)
	LS	LS	LS
Δ Oil Rents	-1.059	0.082	0.071
	(0.682)	(0.420)	(0.477)
Country Fixed Effect	Yes	Yes	Yes
Common Time Effect	Yes	Yes	Yes
Observations	81	99	99

Note: The method of estimation is least squares. Huber robust standard errors (in brackets) are clustered at the country level. *Countries with High State Ownership* (Panel A) refers to countries where the average state ownership in national oil companies is above 30 percent; *Countries with Low State Ownership* (Panel B) refers to countries where the average state ownership is below 30 percent. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Appendix Table 1. List of Countries

Country	Discount Factor	Corruption	Polity2
Algeria	0.96	2.50	-3.14
Angola	0.90	2.36	-2.07
Azerbaijan	0.91	2.00	-5.64
Bahrain	0.87	3.00	-8.43
Brunei	1.00	3.64	.
Cameroon	0.85	2.43	-4.00
Chad	0.55	.	-2.57
Congo	0.85	3.07	-1.43
Ecuador	0.77	2.93	7.64
Equatorial Guinea	0.88	.	-5.14
Gabon	0.89	1.00	-4.00
Indonesia	0.90	1.86	-0.07
Iran	0.89	3.21	-1.50
Kazakhstan	0.71	2.38	-4.36
Kuwait	0.81	2.64	-7.00
Libya	0.93	.	-7.00
Mexico	0.79	2.57	5.57
Nigeria	0.95	1.50	-0.71
Norway	0.92	5.36	10.00
Oman	0.89	3.00	-8.71
Qatar	0.91	2.07	-10.00
Russia	0.83	2.00	5.43
Saudi Arabia	0.87	2.00	-10.00
Sudan	0.95	1.36	-6.57
Syria	0.87	3.14	-8.14
Trinidad and Tobago	0.99	2.79	9.64
UAE	0.92	2.00	-8.00
Venezuela	0.81	2.71	7.14
Vietnam	0.97	2.36	-7.00
Yemen	0.92	2.64	-2.07

Note: The table lists the country-specific average discount factor, the country-specific average PRS corruption score (higher values denote less corruption), and the country-specific average Polity2 score.