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Natural Resources, Democracy and Corruption

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Abstract

We study how natural resources can feed corruption and how this effect depends on the quality of the democratic institutions. Our game-theoretic model predicts that natural resources lead to an increase in corruption if the quality of the democratic institutions is relatively poor, but not otherwise. We use panel data covering the period 1980 to 2004 and 99 countries to test this theoretical prediction. Our estimates confirm that the relationship between resource abundance and corruption depends on the quality of the democratic institutions. In particular, resource abundance is positively associated with corruption only in countries that have endured a non-democratic regime for more than 60 percent of the years since 1956. Our main results hold when we control for the effects of income, time varying common shocks, regional fixed effects and various additional covariates. They are also robust to various alternative measures of natural resources, corruption and the quality of the democratic institutions. These findings imply that democratization can be a powerful tool to reduce corruption in resource-rich countries.

JEL classification: D7, O1

Key words: Natural resources; democracy; political institutions; corruption

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1 Introduction

The finding that natural resource riches are a curse rather than a blessing may seem paradoxical at first and has lead to an extensive literature.[1] One of the main hypotheses put forward is that natural resource riches breed corruption, which, in turn, lower economic performance (e.g., Leite and Weidmann, 2002, Sala-i-Martin and Subramanian, 2003, and Isham et al., 2005).[2] Figure 1 plots the well-known Sachs and Warner (1995) measure of natural resource abundance, the share of primary exports to GNP in 1970, against the Political Risk Service's corruption index in 1990, which is an inverse measure of corruption.[3] It suggests that corruption indeed tends to be higher in resource rich countries.

In this paper, we take a closer look at the relationship between resource abundance and corruption. In particular, we investigate both theoretically and empirically whether and how the quality of the democratic institutions affects this relationship.

In the theoretical part, we present a game between politicians and the people. There are some "good" politicians who primarily care about social welfare and possibly many more "bad" politicians who primarily care about the revenues they can generate by corrupt activities. The people prefer to have a good politician as their president, because such a president acts in their best interest. This provides an incentive for a bad incumbent president to mimic a good president and not to engage in corruption in order to improve the chances that he can remain in power. In equilibrium, a bad incumbent mimics a good incumbent if and only if the democratic institutions are sufficiently sound, i.e., if and only if there is sufficiently large difference between the probability that he can stay in office when supported by the people and the probability that he can stay in office without the

[1] This finding goes back to Corden and Neary (1982) and has been popularized by Sachs and Warner (1995). For an overview of this literature, see, e.g., Gylfason (2001) and Sachs and Warner (2001), or van der Ploeg (2008).

[2] As discussed below, there is a closely related hypothesis that natural resources lead to various forms of rent-seeking, which then lower economic performance.

[3] That is, a low value of the corruption index implies a high level of corruption, and vice versa.

people's support. If this difference is small, a bad incumbent engages in corrupt activities. Moreover, the level of corruption that he chooses in this case increases in the natural resource abundance because resource windfalls are less sensitive to corruption than domestic production. Our model thus predicts that resource abundance increases corruption in countries with poor democratic institutions, but not in countries with comparatively better democratic institutions.

A brief look at the data provides already some support for this theoretical prediction. In figure 2, we split the sample into democratic and non-democratic countries.[4] It suggests that the negative relationship between resource abundance and the corruption index prevails in the sample of non-democratic countries, but not in the sample of democratic countries. In the empirical part of this paper, we test our theoretical prediction more thoroughly using a reduced form model and panel data covering the period 1980 to 2004 and 99 countries. Our estimates confirm that the relationship between resource abundance and corruption depends on the quality of the democratic institutions. In particular, we find that resource abundance is positively associated with corruption only in countries that have endured a non-democratic regime for more than 60 percent of the years since 1956. Our basic results hold when we control for the effects of income, time varying common shocks, regional fixed effects and various additional covariates. It is also robust to various alternative measures of natural resources, corruption and the quality of the democratic institutions, as well as across different samples.

Our contribution in this paper is three-fold. First, we present a theoretical model that clearly demonstrates why we should expect the effect of resource windfalls on corruption to depend on the quality of the democratic institutions. Second, using a reduced form econometric model we show that the effect of resource abundance on corruption indeed depends on the level of democracy. Third, we estimate the threshold level of democracy

[4]Countries are considered democratic if their POLITY2 score is above 0 in 1990. (See section 4 for information about POLITY2.)

below which natural resources have a positive effect on corruption.

The literature that focuses on the effect of natural resources on corruption is rather small. Leite and Weidman (2002) show that natural resources tend to increase corruption, and that this in turn lowers growth. Isham et al. (2005) find that this effect is most pronounced for "point source" natural resources such as oil, minerals, and plantation crops. In a closely related paper to our empirical part, Aslaksen (2007) finds that oil increases corruption in the samples of both democratic and non-democratic countries, whereas minerals increase corruption only in the sample of non-democratic countries. There are a number of differences between our empirical approach and Aslaksen's. First, we use a long run measure of democracy while Aslaksen divides her sample between democracies and non-democracies using data from the year 1982. Second, we introduce an interactive term between natural resources and democracy and also control for the direct effects of democracy on corruption. Therefore, unlike Aslaksen, we do not divide our sample into democracies and non-democracies. Third, we also use a broad overall measure of resource abundance to capture the effects of all possible natural resources and do not distinguish between oil and minerals.

Corruption can be seen as one of many forms of rent-seeking. Our paper therefore is related to the literature which argues that natural resources may lower the economic performance because they foster rent-seeking activities (e.g., Lane and Tornell, 1996, Tornell and Lane, 1999, Baland and Francois, 2000, and Torvik, 2002). In particular, our paper is related to the recent contributions in this literature which emphasize that whether natural resources are a curse or a blessing depends on country-specific circumstances. Mehlum et al. (2006) show that natural resources boost economic performance if institutions are producer-friendly, but dampen economic performance if institutions are grabber-friendly. Similarly, Hodler (2006) shows that natural resources give rise to contrasting effects in ethnically fractionalized and homogeneous societies – intensive rent-seeking, poor institutions

and a decline in output in ethnically fractionalized societies and the opposite in homogeneous societies. Robinson et al. (2006) argue that natural resources can lead to inefficiently high public sector employment unless strong political institutions prevent such patronage. Bulte and Damina (2008) present a model in which entrepreneurs from the natural resource sector lobby for sector-specific public goods when there is no political competition. Collier and Hoeffler (2008) empirically investigate whether the effect of democracy on growth is distinctive in resource-rich societies. They find that strong checks and balances, which are often missing in newly established democracies, would be of particular importance in resource-rich democracies.

The remainder of the paper is structured as follows: Section 2 presents the theoretical model, and section 3 derives the equilibrium and some comparative static results. Section 4 discusses our empirical strategy and the data. Section 5 presents the empirical evidence and various robustness tests. Section 6 concludes.

2 The Model

There is an economy inhabited by an incumbent president, a challenger and the people. The incumbent and the challenger are each a good type $\overline{\theta}$ with probability $\alpha \in (0,1)$ and a bad type $\underline{\theta}$ with probability $1-\alpha$. A politician's type is his private information, but α is common knowledge.[5]

There are two periods $t \in \{1,2\}$.[6] In period one, the incumbent, who is in office for exogenous reasons, chooses the level of corruption $c_1 \in [0,1]$. At the end of period one, the people then observe c_1 and support either the incumbent or the challenger. The people's decision determines the probability of the incumbent staying in office and, hence,

[5]None of our results depends on the value of $\alpha \in (0,1)$. Hence, they hold even if good politicians are very rare.

[6]This assumption is made for simplicity only. Results would remain qualitatively unchanged if there were more than two periods, e.g., an infinite number of periods.

the probability of the challenger getting into office. In period two, the politician in office again chooses the level of corruption $c_2 \in [0, 1]$.

The economy consists of a production and a natural resource sector. Total income is thus given by the sum of domestic production A_t and resource income Ω_t. Domestic production A_t is primarily determined by the individuals' labor-leisure choices and their decisions to accumulate physical and human capital and to invest in better technologies. Corruption lowers the private returns on productive activities and, consequently, the incentives to work hard and to invest in physical and human capital and better technologies. We thus assume that $A_t = A(c_t)$ with $A'(c_t) \leq 0$ and, moreover, that $A(c_t)$ is continuous, $A'(0) = 0$, $A'(1) = -\infty$ and $A''(c_t) < 0$. The resource income Ω_t, on the other hand, depends to a large extent on a country's resource endowment, which is exogenous and hence independent of the level of corruption. Corruption should thus have smaller disincentive effects on the resource income than it has on domestic production. For simplicity, we assume that $\Omega_t = \Omega \geq 0$ in all periods t. This assumption is however overly restrictive; all we need is that the resource income is less sensitive to corruption than domestic production.

The people's welfare is $W_t = W(c_t) \equiv (1 - c_t)[A(c_t) + \Omega]$ in period t, and it decreases in corruption c_t. When deciding which politician to support, the people maximize their expected welfare $E(W_2)$, and we assume that they support the incumbent if they are indifferent between him and his challenger.[7]

A politician in office derives utility from different sources in each period t. On the one hand, he gets the corruption revenues $R_t = R(c_t) \equiv c_t[A(c_t) + \Omega]$. Similar to a Laffer curve, $R(c_t)$ is a hump-shaped function of c_t.[8] On the other hand, he may benefit for several reasons from high social welfare W_t. First, his salary may depend on the performance of the official economy. Second, his status and influence in the international community may

[7]To motivate this tie-breaking rule, we could, e.g., assume that there is a very small probability $\epsilon \to 0$ that the challenger is a complete maniac who would set $c_2 = 1$ such that $W_2 = 0$.

[8]This similarity is not surprising given that we follow common practice and model grand corruption as a tax for which no public good is provided.

depend on the people's welfare and the economy's performance. Third, he may genuinely care about the people's well-being. We therefore assume that a politician of type θ gets the utility θW_t from social welfare W_t when in office, and that $0 < \underline{\theta} < \overline{\theta}$. The reason for the first inequality is that any politician cares about his salary and his status; and the reason for the second inequality is that good politicians care more about the people's well-being than bad politicians. Consequently, the total instantaneous utility of a politician of type θ in office is

$$u_t = u(c_t; \theta) \equiv R(c_t) + \theta W(c_t) = [(1-\theta)c_t + \theta][A(c_t) + \Omega]. \tag{1}$$

We further assume $\overline{\theta} \geq 1 > \underline{\theta}$, such that good politicians in office care for all the various reasons more about social welfare than about corruption revenues while bad politicians care more about corruption revenues. For simplicity, we abstract from discounting and assume that politicians get zero utility when not in office.[9]

A key feature of the model are the democratic institutions which determine the extent to which the people can determine by whom they are governed, i.e., whether or not the incumbent is replaced by the challenger. We assume that the incumbent can remain in office with probability p if the people support him, and with probability q if the people support the challenger, where $0 \leq q \leq p \leq 1$. Democratic institutions are sound when the incumbent is likely to stay in office if and only if the people want him to stay, i.e., if p is high and q low. Democratic institutions are poor if the people's decision has little impact on the chances that the incumbent can stay in office, i.e., if the difference between p and q is small.[10] Hence, we view $D \equiv p - q$ as a natural measure of the quality of the democratic

[9]Note that the strategies of the people and the challenger are independent of the discount factor anyway. Note further that results would remain qualitatively unchanged even if politicians got some utility from social welfare when not in office.

[10]Our approach of modeling democratic institutions allows for two different types of democratic failures. The high q-failure that an authoritarian incumbent is likely to stay in office even without the people's support, and the low p-failure that an incumbent in an anarchic environment is likely to be overthrown

institutions.

The appropriate solution concept for this dynamic game of incomplete information is Perfect Bayesian Equilibria (PBE).

3 The Equilibrium

We start by solving the period two-subgame. The politician who is in office in period two has no strategic incentives and simply chooses the level of corruption c_2 that maximizes his instantaneous utility $u_2 = u(c_2; \theta)$. A good politician in office benefits more from high welfare W_t than from high corruption revenues R_t since $\overline{\theta} > 1$. He therefore chooses $c_2(\overline{\theta}) = 0$. A bad politician in office, who cares more about R_t since $\underline{\theta} < 1$, chooses $c_2(\underline{\theta}) = \hat{c} \equiv \arg\max_{c_t} u(c_t; \underline{\theta})$. It follows:

Lemma 1 *In period two, a good politician in office chooses* $c_2(\overline{\theta}) = 0$ *and a bad politician in office chooses* $c_2(\underline{\theta}) = \hat{c}$*, where* $\hat{c}$ *satisfies* $\hat{c} \in (0, 1)$*, increases in* Ω *and decreases in* $\underline{\theta}$*.*

Proof: It follows from equation (1), $\overline{\theta} > 1$ and $A'(c_t) < 0$ that $c_2(\overline{\theta}) = 0$. The first-order condition

$$(1 - \underline{\theta})[A(c_t) + \Omega] + [(1 - \underline{\theta})c_t + \underline{\theta}]A'(c_t) = 0$$

determines $\hat{c}$. Note that the second-order condition,

$$\Gamma(c_t) \equiv 2(1 - \underline{\theta})A'(c_t) + [(1 - \underline{\theta})c + \underline{\theta}]A''(c_t) < 0,$$

is satisfied since $\underline{\theta} \in (0, 1)$, $A'(c_t) \leq 0$ and $A''(c_t) < 0$, and that $A'(0) = 0$ and $A'(1) = -\infty$ guarantee an interior solution $\hat{c} \in (0, 1)$. The implicit function theorem implies $\frac{d\hat{c}}{d\Omega} = -\frac{1-\underline{\theta}}{\Gamma(\hat{c})}$ and $\frac{d\hat{c}}{d\underline{\theta}} = -\frac{(1-\hat{c})A'(\hat{c})-[A(\hat{c})+R]}{\Gamma(\hat{c})}$. It thus follows from $\underline{\theta} < 1$, $A'(c_t) \leq 0$ and $\Gamma(c_t) < 0$ that $\frac{d\hat{c}}{d\Omega} > 0$ and $\frac{d\hat{c}}{d\underline{\theta}} < 0$. ■

even when supported by the majority.

A bad politician in office therefore chooses a higher level of corruption in period two, the less he benefits from social welfare. Moreover, the level of corruption he chooses also increases in the resource income Ω. The reason is the following: A bad incumbent trades off the advantage of a higher level of corruption, which is a larger share of total income, against its disadvantage, which is a decrease in total income. This disadvantage however is decreasing in the resource income relative to domestic production, because the former is less sensitive to corruption than the latter. The level of corruption which maximizes a bad incumbent's utility therefore increases in the resource income.

When deciding whom to support at the end of period one, the people know that their welfare W_2 in period two will be higher with a good politician in office than with a bad politician in office. They therefore support the incumbent if and only if they believe that he is good with a higher probability than the challenger. That is, they support the incumbent if and only if their updated belief that he is good is $\mu(\overline{\theta}|c_1) \geq \alpha$.

In period one, a good incumbent has two objectives when choosing the level of corruption c_1. First, he would like his instantaneous utility $u(c_1;\overline{\theta})$ to be high. Second, he would like to ensure the people's support. Notice that $u(c_1;\overline{\theta})$ is maximized by $c_1(\overline{\theta}) = 0$. Further, notice that in any PBE a good incumbent must be reelected whatever his equilibrium choice $c_1(\overline{\theta})$ is, because Bayes' rule implies that the people's updated beliefs must satisfy $\mu(\overline{\theta}|c_1(\overline{\theta})) \geq \alpha$ for all possible $c_1(\overline{\theta})$ and $c_1(\underline{\theta})$. Therefore, in equilibrium a good incumbent also receives the people's support when choosing his most preferred corruption level $c_1(\overline{\theta}) = 0$. It seems thus reasonable to focus on the PBE in which he plays $c_1(\overline{\theta}) = 0$.[11]

Given that a good incumbent plays $c_1(\overline{\theta}) = 0$, a bad incumbent is in equilibrium supported by the people whenever he plays $c_1(\underline{\theta}) = 0$, as the people then believe $\mu(\overline{\theta}|0) \geq \alpha$. However, a bad incumbent does not get the people's support when he plays some

[11] As we show in Appendix A, a good incumbent plays $c_1(\overline{\theta}) = 0$ in any PBE that satisfies a plausible refinement on the people's off-equilibrium beliefs. Further, a good incumbent would always choose zero corruption if we assume that he receives a very high disutility from acting corruptly.

$c_1(\underline{\theta}) > 0$ in equilibrium, as the people then know that he must be a bad incumbent, i.e., $\mu(\overline{\theta}|c_1(\underline{\theta})) = 0$. But when he is not supported by the people anyway, it is best for him to choose the level of corruption that maximizes his instantaneous utility $u(c_1; \underline{\theta})$. This is $c_1(\underline{\theta}) = \hat{c}$. His expected lifetime utility from choosing $c_1(\underline{\theta}) = \hat{c}$ and not being supported is

$$V(\hat{c}; \underline{\theta}) = (1 + q)u(\hat{c}; \underline{\theta}),$$

while his expected lifetime utility from choosing $c_1(\underline{\theta}) = 0$ and getting the people's support is

$$V(0; \underline{\theta}) = u(0; \underline{\theta}) + pu(\hat{c}; \underline{\theta}).$$

He therefore chooses $c_1(\underline{\theta}) = \hat{c}$ if

$$V(\hat{c}; \underline{\theta}) - V(0; \underline{\theta}) = (1 - D)u(\hat{c}; \underline{\theta}) - u(0; \underline{\theta}) > 0 \tag{2}$$

$$\Leftrightarrow \quad D < D' \equiv \frac{u(\hat{c}; \underline{\theta}) - u(0; \underline{\theta})}{u(\hat{c}; \underline{\theta})},$$

where $0 < D' < 1$. Otherwise, he chooses $c_1(\underline{\theta}) = 0$.[12] To summarize:

Proposition 1 *There exists a PBE in which a good incumbent chooses $c_1(\overline{\theta}) = 0$, a bad incumbent chooses $c_1(\underline{\theta}) = 0$ if $D \geq D'$ and $c_1(\underline{\theta}) = \hat{c}$ otherwise, and the people support the incumbent if and only if $c_1 = 0$. There exists no other PBE in which a good incumbent chooses $c_1(\overline{\theta}) = 0$.*

Appendix A moreover shows that this PBE is the unique PBE that satisfies a plausible refinement on the people's off-equilibrium beliefs. We therefore focus on this PBE in the remainder of this section.

[12] In the special case in which $D = D'$, a bad incumbent would be indifferent between choosing 0 and $\hat{c}$ and might therefore play a mixed strategy.

The PBE described in Proposition 1 is pooling if $D \geq D'$, and separating otherwise. The reason for the former is that a bad incumbent mimics a good incumbent to ensure the people's support if democratic institutions are sound and the people's support therefore important for staying in power. He has however little disadvantage from revealing his bad type if the people have little impact on whether or not he can stay in office. He therefore rather chooses the corruption level $\hat{c}$, which maximizes his instantaneous utility, if the democratic institutions are poor.

We now analyze how an increase in the resource income Ω affects corruption $c_1(\theta)$ in the PBE described above, and how this effect depends on the democratic institutions D. We thereby focus on the case of a bad incumbent and his corruption choice $c_1(\underline{\theta})$, as a good incumbent always chooses $c_1(\overline{\theta}) = 0$. When democratic institutions are relatively sound, i.e., $D \geq D'$, a bad incumbent chooses $c_1(\underline{\theta}) = 0$ and a marginal increase in Ω has therefore no effect on the level of corruption. But when $D < D'$, a bad incumbent chooses $c_1(\underline{\theta}) = \hat{c}$, which increases in Ω as we know from Lemma 1. Hence:

Proposition 2 *A marginal increase in the resource income Ω raises corruption $c_1(\underline{\theta})$ if and only if $D < D'$, i.e., if the democratic institutions are relatively poor.*

Notice that it holds even more generally that the effect of natural resources on corruption depends on the quality of the democratic institutions. In particular, an increase in the resource income Ω raises the relative attractiveness of high corruption $\hat{c}$, measured by $V(\hat{c};\underline{\theta}) - V(0;\underline{\theta})$, if and only if the democratic institutions $D \equiv p - q$ are relatively poor.[13] The reasons are that the positive effect of a higher Ω on $V(0;\underline{\theta})$ increases in the probability p that the incumbent can stay in office when supported by the people; and that the positive effect on $V(\hat{c};\underline{\theta})$ decreases in the probability q that he can stay in office without the people's support.

[13] To see this, notice that the envelope theorem implies $\frac{du(\hat{c};\underline{\theta})}{d\Omega} = (1-\underline{\theta})\hat{c}+\underline{\theta}$, and that $\frac{du(0;\underline{\theta})}{d\Omega} = \underline{\theta}$. It then follows from equation (2) that $\frac{d[V(\hat{c};\underline{\theta})-V(0;\underline{\theta})]}{d\Omega} = (1-\underline{\theta})\hat{c} - D[(1-\underline{\theta})\hat{c}+\underline{\theta}] > 0$ if and only if $D < \frac{(1-\underline{\theta})\hat{c}}{(1-\underline{\theta})\hat{c}+\underline{\theta}}$.

Therefore, our model predicts that when looking at a sample of countries differing in the quality of their democratic institutions, we should expect the effect of resource abundance on corruption to be negative in countries with poor democratic institutions, but neutral or even positive in countries with strong democratic institutions.

4 Empirical Strategy and Data

We use panel data which covers 99 countries over the period 1980 to 2004.[14] Our basic specification uses five year averages of our measures of corruption and income. Our main proxy measure of natural resources, the share of primary exports in GNP, is from the year 1970 and democracy is the fraction of years a country has been democratic since 1956. To estimate whether the relationship between corruption and resource abundance varies systematically between democracies and non-democracies we use the following model:

$$ci_{srt} = \alpha_r + \beta_t + \gamma_1 sxp_{sr} + \gamma_2 D_{srt} + \gamma_3 D_{srt} sxp_{sr} + \phi_1 y_{srt} + \phi_2 (y_{srt})^2 + X'_{srt}\Lambda + \varepsilon_{srt} \quad (3)$$

where ci_{srt} is the corruption index in country s in region r averaged over years $t-4$ to t, α_r is a region dummy variable covering seven regions of the world which controls for regional fixed effects,[15] β_t is a year dummy variable which controls for time varying common shocks, sxp_{sr} is the share of primary exports to GNP in country s in region r in the year 1970, D_{srt} is our preferred democracy measure for country s in region r in years up to t, y_{srt} is income per capita in country s in region r averaged over years $t-4$ to t, and X_{srt} is a vector of other control variables.

The main variable of interest is sxp_{sr}. The point estimate of the effect of a change in

[14] Due to data limitations, not all specifications cover exactly 99 countries and in most specifications, the panel is unbalanced.

[15] The region dummies cover Europe and Central Asia, East Asia and the Pacific, Latin America, Western Europe and North America, Middle East and North Africa, South Asia, and Sub Saharan Africa.

sxp_{sr} on ci_{srt} is $\gamma_1 + \gamma_3 D_{srt}$. Therefore γ_1 and γ_3 are our focus parameters. We expect γ_1 to be significantly negative and γ_3 to be significantly positive, because high values of the corruption index corresponds to low levels of corruption. This would imply that there is a threshold level of democracy below which the effect of resource abundance on the corruption index is negative (implying more corruption), and above which the effect is positive (implying less corruption).

We use the corruption index (ci_{srt}) from the Political Risk Services (PRS). This measure is predominantly an assessment of corruption within the political system. Therefore it includes actual and potential corruption, and it covers most common forms of corruption.[16] The advantage of using this measure is threefold. First, it suits our purpose as it best captures our notion of corruption in the theoretical model where corruption is part of the political process. Second, it covers the time period 1980 to 2004 and the largest number of countries. This allows us to use panel data and minimize the sample selection bias both across countries and over time. Third, it is also widely used in the literature.[17] As an alternative we use the corruption perception index from Transparency International. This however reduces our sample size.[18]

The PRS corruption index varies between 0 in Bangladesh in 1985 and 1990 and 6 in Finland over the period 1980 to 2004. A higher value of the index indicates a lower level of corruption. The variation in the corruption index between 1980 and 2004 declines from 2.6 to 1.3 suggesting that the corruption gap has declined across countries over this period. The standard deviation of the corruption index is 1.4.

Our main natural resource measure (sxp_{sr}) is primary exports over GNP in 1970 and is from Sachs and Warner (1995). Japan is the least resource intensive country with a share

[16]For example, patronage, nepotism, job reservations, secret party funding, bribes connected with export and import licenses, exchange controls, tax assessments, police protection, loans etc.

[17]See, e.g., Knack and Keefer (1995) and Alesina and Weder (2002).

[18]Even though Transparency International covers more countries than the PRS, the actual number of observations is roughly half that of PRS.

of primary exports to GDP of around 1 percent and Oman is the most resource intensive with a share of 89 percent. The mean resource abundance is 16 percent and the standard deviation is 0.16.

We choose sxp_{sr} as our preferred measure of natural resources for the following reasons. First, it is widely used in the resource curse literature. Hence it facilitates comparisons with previous studies. Second, it is also fairly wide in terms of country coverage. Therefore we are able to minimize the risk of sample selection bias. Third, by choosing sxp_{sr} in 1970, we are able to minimize the risk of an endogeneity related bias as it is quite unlikely that corruption in 1980 to 2004 will affect resource intensity in 1970. Nevertheless, we also use the share of mining; rents from energy, metals and forestry; subsoil wealth; and natural capital as alternative measures of resource abundance and our findings are reasonably robust to the use of these measures.

Our democracy measures (d_{srt} and D_{srt}) are calculated using the Polity IV database. We define a country to be democratic in a particular year if the variable POLITY2 is positive.[19] POLITY2 is defined as the difference between the democracy score and the autocracy score in the dataset, which both vary between 0 and 10 with 10 being the most democratic or most autocratic, respectively. Therefore, POLITY2 is an indicator of net democracy in the country. We define d_{srt} as the fraction of years a country is democratic over a five year period, i.e., in the years $t-4$ to t. This is a short-run measure of democracy.

In principle, one could argue that besides democracy reducing corruption, there could also be a causal effect in the opposite direction. We therefore prefer using a long-run measure of democracy as opposed to five year averages. In particular, we define D_{srt} as the fraction of years a country is democratic since 1956. We would expect reverse causality effects of corruption influencing democracy to be minimal with our long-run measure D_{srt}.[20]

[19] Persson and Tabellini (2006) and many others also use this definition.

[20] An alternative approach towards handling the potential endogeneity problem with democracy is to use the fraction of years a country was democratic between 1956 and 1980 as measure of democracy. This

We find, e.g., that Algeria and Andorra are non-democratic over the entire period and that Australia, the United Kingdom, the United States and others are democratic over this period. Between country variation (78 percent) in the data dominates over within country variation (22 percent). We also use the democracy scores from Freedom House and the democracy index from Cheibub and Gandhi (2004) as alternative measures of democracy.

We use per capita income, legal origin dummies, and several other additional control variables in our study. Detailed definitions and sources of all variables are available in Appendix B. Table 1 reports descriptive statistics of the major variables used in the study.

Endogeneity due to sxp_{sr} may not be a cause of concern for us since it seems unlikely that corruption in 1980 to 2004 will affect resource exports and GNP in 1970. One might however argue that institutions are persistent, such that corruption today is very similar to corruption in 1970 or even earlier. Even though this may be the case with other measures of institutions,[21] the corruption index is not persistent enough to cause alarm. A simple correlation between corruption in 1980 and 2000 is 0.64. Nevertheless, we also use other measures of resource abundance as mentioned earlier.

Another possibility is that a high correlation between sxp_{sr} and D_{srt} could inflate the standard errors of our estimates. Ross (2001) documents that natural resource abundance and oil in particular has antidemocratic properties. This may bring in issues of multi-collinearity in our specification. We find that the correlation between sxp_{sr} and D_{srt} is -0.28 and the correlation between $sxp_{sr} * D_{srt}$ and D_{srt} is 0.63. The magnitude of these correlations is not large enough to cause any serious problem of multi-collinearity.

Finally, we tackle the issue of omitted variables by controlling for unobserved region specific heterogeneity, time varying common shocks, and additional covariates that are

approach is somewhat symmetric to our handling of endogeneity with sxp_{sr}, which is an initial (1970) value. The disadvantage though is that we lose all time series variation in the data and estimate a cross-section model. Our main results are nevertheless robust to this approach.

[21] There is however little consensus on institutional persistence. See, e.g., Glaeser et al. (2004) and Acemolgu et al. (2005) for opposing views.

expected to influence the level of corruption.

5 Empirical Evidence

Table 2 reports the estimate of equation (3). In column 1 we look at the unconditional correlation between natural resources and the corruption index. We notice that there is a negative relationship and the coefficient estimate is statistically significant. This suggests that natural resources are associated with high levels of corruption.[22] But this association may be driven by omitted factors (such as income, political structure, legal structure, culture, geography, time varying common shocks etc.) influencing both natural resources and corruption. To tackle this issue in columns 2 and 3 we add per capita income, legal origin dummies, regional dummies, year dummies, and the short-run democracy measure d_{srt}. We notice that the negative relationship survives however the magnitude of the coefficient falls. To estimate how the effect of natural resources on corruption depends on democratic institutions, in column 4 we add the interaction term $sxp_{sr} * d_{srt}$. We notice that the coefficient on the interaction term is positive and statistically significant. Natural resources feed corruption if and only if the country is democratic in less than 2.9 years of the last five years.

Since d_{srt} is a short-run measure of democracy, it is possible that our estimates in column 4 suffer from reverse causality problems. To account for this problem, in column 5 we use our long-run democracy measure D_{srt} which is the fraction of years the country had been democratic since 1956. We notice that both the negative coefficient on sxp_{sr} and the positive coefficient on interactive variable $sxp_{sr} * D_{srt}$ survive. In an average country, the effect of an increase in the natural resources on the corruption index is negative (implying an increase in corruption) if and only if the country has spent less than 40 percent of

[22]Note that higher values of the corruption index imply less corruption.

its years since 1956 as a democracy. To put this into perspective, the model explains one third of the actual difference in corruption between Nigeria and the Philippines - two low income resource exporting economies.[23] In column 6, we replace regional dummies by country dummies and find that the coefficients on sxp_{sr}, D_{srt} and $sxp_{sr} * D_{srt}$ are no longer statistically significant. This implies that our results are mainly due to cross-country variations. It is however not surprising that within-country variation plays a minor role given that our explanatory variables are either time invariant (sxp_{sr}) or highly persistent (D_{srt}).

Table 3 asks the question where this nonlinear effect is coming from. In column 1 we test whether the effect is driven by a particular year or a group of years. We do this by allowing the interaction term $sxp_{sr} * D_{srt}$ to be different across time and we estimate separate year effects. We notice that the effect is uniform in terms of statistical significance over the period 1980 to 2000. The magnitude of the effect peaks in 1980 and declines over time with a small increase in 2000. The effect is positive but statistically insignificant in 2004. Overall, the effect is also jointly significant. In column 2, we test whether the effect is predominant among any particular country group. Again we do this by allowing the effect to vary across different country groups based on income. We notice that the effect is predominant among high income countries (with per capita income $10,000 or more) and very low income countries (with per capita income $2,500 or less). However, the F-test reveals that the effect is jointly significant across all country income groups.

In table 4 we add further covariates into our specification to address the issue of omitted variables. In column 1 we add ethnic fractionalization as an additional control because ethnically fractionalized countries tend to be more corrupt (Mauro, 1995). The negative coefficient on sxp_{sr} and the positive coefficient on $sxp_{sr} * D_{srt}$ survive. In columns 2 and

[23]The World Bank classifies Nigeria and the Philippines as low income countries. The actual difference in corruption index between the two countries in 2004 is 1 with the Philippines scoring higher. The predicted difference is calculated as $c_{NGA} - c_{PHL} = [-1.69 + 4.29(D_{NGA} - D_{PHL})](sxp_{NGA} - sxp_{PHL}) = 0.32$, because $D_{NGA} - D_{PHL} = -0.38$ and $sxp_{NGA} - sxp_{PHL} = 0.1$.

3 we add total official development assistance (ODA) and ODA from the largest bilateral donor, the United States, as additional controls because there is evidence that foreign aid feeds corruption (Knack, 2001, Alesina and Weder 2002). Our basic results survive in both cases. In columns 4 - 9 we control for real exchange rate distortions, black market premiums, FDI, the Sachs and Warner trade liberalization index, trade shares, and media freedom respectively to check whether these omitted variables are driving our results. Our basic results survive in all instances. In column 10 we control for the statistically significant additional control variables and our basic results survive this test. We also notice that the statistically significant estimated threshold levels of democracy for a positive effect of natural resources on the corruption index varies within the range of 0.35 and 0.51 which is not significantly different from our preferred estimate of 0.40.[24]

Table 5 presents robustness tests of our results with alternative samples. Columns 1 - 5 checks whether our results are influenced by any particular continent. We take out Africa, Neo-Europe[25], Asia, the Americas, and Europe one at a time from our base sample. In all occasions our results survive, but they become insignificant when omitting Asian countries. In column 6 we omit all OECD member countries. Our results remain unaffected. In columns 7 - 9 we omit former British colonies, former French colonies, and former Spanish colonies respectively one at a time. Our basic results remain unaffected except that the interaction term becomes insignificant when omitting British colonies. In columns 10 - 12 we also omit influential observations using Cook's distance, DFITS, and Welsch distance formulas respectively. Our results survive these tests. The democracy threshold estimates in this table varies between 0.37 and 0.46.

In table 6 we subject our results to further scrutiny. We use alternative measures of resource abundance, democracy, and corruption. In columns 1 and 2, we replace sxp_{sr} with the mining share in GDP in 1988, which is another resource measure used by Sachs

[24]An average country spends 40 percent of its years since 1956 as a democracy.
[25]Neo-Europe is Australia, Canada, New Zealand, and the United States.

and Warner (1995), and with the measure of resource rents used by Aslaksen (2007), respectively. We find that our main results hold. In columns 3 and 4, we use natural capital and subsoil wealth, which have been recently used by Brunnschweiler and Bulte (2008).[26] The coefficients still suggest the same relationship between resource abundance, democracy and corruption, but they are no longer statistically significant, which may be due to a reduction in sample size (from 572 to 226 and 178). We also construct a long run democracy measure (since 1972) similar to D_{srt} using the Freedom House democracy status and use the democracy measure from Cheibub and Gandhi (2004) as alternatives. Our estimates are robust to the use of these variables.[27] In column 5 we replace the corruption index from PRS with the corruption perception index from Transparency International. Our results survive this test. Hence, our results seem to be reasonably robust to alternative measures.

Overall these empirical findings support our theoretical prediction that natural resources foster corruption in countries with poor democratic institutions, but make corruption less attractive in well-established democracies. The estimated threshold level of democracy D_{srt} for an average country to have a positive association between natural resources and corruption is 0.40, i.e. 40 percent of years since 1956 spent as a democracy.

6 Conclusions

We study the mechanism through which natural resources feed corruption and the role of democratic institutions in this process. Using a game-theoretic model we show that natural resources increase corruption if and only if the quality of the democratic institutions is below a certain threshold level. To test this prediction, we use a reduced form model and panel data covering the period 1980 to 2004 and 99 countries. We notice that our

[26] Gylfason (2001) was the first paper using natural capital.

[27] Results not reported to save space but available upon request.

theoretical prediction is supported by the data. In particular, resource abundance is positively associated with corruption only in countries that have endured a non-democratic regime for more than 60 percent of the years since 1956. Our main results hold when we control for the effects of income, time varying common shocks, regional fixed effects, legal origin and various additional covariates. It is also robust to various alternative measures of natural resources, corruption and the quality of the democratic institutions.

These findings imply that resource-rich countries have a tendency to be corrupt because resource windfalls encourage their governments to engage in rent-seeking. But this tendency can be checked if the governments are accountable towards its people. Political accountability without doubt is higher in countries with a long history of democracy; for example, in the resource-rich democratic countries Australia and Norway. Therefore, a major implication of our results is that democratization can be a powerful tool for reducing corruption in resource-rich countries.

Appendix A

This appendix introduces a plausible refinement on the people's off equilibrium beliefs and shows that this refinement guarantees the uniqueness of the PBE characterized in Proposition 1.

Definition *The PSE refinement is satisfied when the people's belief after observing some* $c_1 = \tilde{c}$ *which no incumbent* $\theta \in \{\overline{\theta}, \underline{\theta}\}$ *should play in equilibrium is*

1. $\mu(\overline{\theta}|\tilde{c}) = 1$ *if playing* $\tilde{c}$ *is equilibrium-dominated*[28] *for* $\underline{\theta}$*, but not for* $\overline{\theta}$*; and* $\mu(\overline{\theta}|\tilde{c}) = 0$ *if playing* $\tilde{c}$ *is equilibrium-dominated for* $\overline{\theta}$*, but not for* $\underline{\theta}$*.*

2. $\mu(\overline{\theta}|\tilde{c}) = \alpha$ *if playing* $\tilde{c}$ *is not equilibrium-dominated for any* $\theta \in \{\overline{\theta}, \underline{\theta}\}$*.*

Part 1 of this refinement is the Cho-Kreps (1987) intuitive criterion. Part 2 requires that the people's posterior beliefs about the incumbent's type should be equal to their prior beliefs when both types of incumbents could potentially benefit from a deviation $c_1 = \tilde{c}$. This latter requirement relates our refinement to Grossman and Perry's (1986) concept of Perfect Sequential Equilibria.

Lemma 2 *No PBE in which a good incumbent plays* $c_1(\overline{\theta}) > 0$ *satisfies the PSE refinement.*

Proof: We prove Lemma 2 by contradiction. Therefore, suppose there exists a PBE with $c_1(\overline{\theta}) > 0$ which satisfies the PSE refinement. To prevent incumbent $\overline{\theta}$ from deviating and playing $c_1(\overline{\theta}) = 0$, it is necessary that the people support the challenger when observing $c_1 = 0$, which requires $\mu(\overline{\theta}|0) < \alpha$. But playing $c_1 = 0$ is never equilibrium-deviated for incumbent $\overline{\theta}$ (while it may or may not be equilibrium-deviated for incumbent $\underline{\theta}$). The PSE

[28] Playing $\tilde{c}$ is equilibrium-dominated for type θ if his equilibrium payoff exceeds the highest possible payoff that he could possibly get after playing $\tilde{c}$.

refinement thus requires $\mu(\overline{\theta}|0) \geq \alpha$. This is a contradiction. Hence, there exists no PBE with $c_1(\overline{\theta}) > 0$ which satisfies the PSE refinement. ■

Lemma 2 and Proposition 1 imply:

Proposition 3 *The PBE characterized in Proposition 1 is the unique PBE that satisfies the PSE refinement.*

Proof: It follows from Lemma 2 that no PBE with $c_1(\overline{\theta}) > 0$ satisfies the PSE refinement, and from Proposition 1 that there is no other PBE with $c_1(\overline{\theta}) = 0$. ■

Appendix B

B.1 Data description

Corruption Index (c_{srt}): A 7 point (0-6) index with higher values indicating less corruption. *Source:* ICRG, The PRS Group.

Corruption Perception Index: A 11 point (0-10) index with higher values indicating less corruption. *Source:* Transparency International.

Natural Resources (sxp_{sr}): Primary exports over GNP in 1970. *Source:* Sachs and Warner (1995).

Mining Share in GDP in 1988: *Source:* WDI Online, The World Bank Group.

Resource Rent: The value of natural resource (which includes energy, minerals, and forestry) which is the price minus the average extraction cost. *Source:* World Bank Adjusted Net Savings Dataset.

Log avg. natural capital: Log of the average total natural capital in 1994 and 2000 estimated in US$ per capita. *Source:* WDI Online, The World Bank Group.

Log avg. subsoil wealth: Log of the average subsoil assets in 1994 and 2000 estimated in US$ per capita. *Source:* WDI Online, The World Bank Group.

Democracy since $t-4$ (d_{srt}): d_{srt} is generated by using the POLITY2 coding from the Polity IV dataset. A country is democratic if POLITY2 is positive. d_{srt} denotes fraction of democratic years between $t-4$ and t. *Source:* Polity IV.

Democracy since 1956 (D_{srt}): D_{srt} is generated by using the POLITY2 coding from the Polity IV dataset. A country is democratic if POLITY2 is positive. D_{srt} denotes fraction of democratic years since 1956. *Source:* Polity IV.

Per Capita Income (y_{srt}): GDP per capita PPP (constant 2000 international $). *Source:* WDI Online, The World Bank Group.

Legal Origins: Legal Origin dummies - British, German, Scandinavian, and Socialist with others being the omitted category. *Source:* LaPorta et al. (1999).

Ethnic Fractionalization: Probability that two randomly selected individuals from a population belongs to different ethnic groups. *Source:* Alesina et al. (2003).

Trade Share: Total volume of trade as share of GDP. *Source:* WDI Online, The World Bank Group.

FDI: Foreign direct investment as share of GDP. *Source:* WDI Online, The World Bank Group.

ODA: Official development assistance. *Source:* WDI Online, The World Bank Group.

Real Exchange Rate Distortions: Real overvaluation. *Source:* WDI Online, The World Bank Group.

Sachs and Warner Trade Liberalization Index: Fraction of years open between $t-4$ and t. *Source:* Wacziarg and Welch (2003).

Black Market Premium: *Source:* WDI Online, The World Bank Group.

Media Freedom: Fraction of years print and electronic media are free since 1980. *Source:* Freedom House.

B.2 Sample

Algeria, Argentina, Australia, Austria, Bahamas, Bahrain, Bangladesh, Belgium, Bolivia, Botswana, Brazil, Burkina Faso, Cameroon, Canada, Chile, China, Colombia, Dem. Rep. Congo, Rep. Congo, Costa Rica, Cote d'Ivoire, Cyprus, Denmark, Dominican Rep., Ecuador, Egypt, El Salvador, Finland, France, Gabon, The Gambia, Germany, Ghana, Greece, Guatemala, Guyana, Haiti, Honduras, Hong Kong, Iceland, India, Indonesia, Iran, Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kenya, Rep. Korea, Kuwait, Liberia, Madagascar, Malawi, Malaysia, Mali, Malta, Mexico, Morocco, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Paraguay, Peru, The Philippines, Portugal, Saudi Arabia, Senegal, Sierra Leone, Singapore, South Africa, Spain, Sri Lanka, Sudan, Sweden, Switzerland, Syria, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, United Arab Emirates, United Kingdom, United States, Uruguay, Venezuela, Zambia, Zimbabwe.

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Figure 1: Corruption and Natural Resources (all countries)

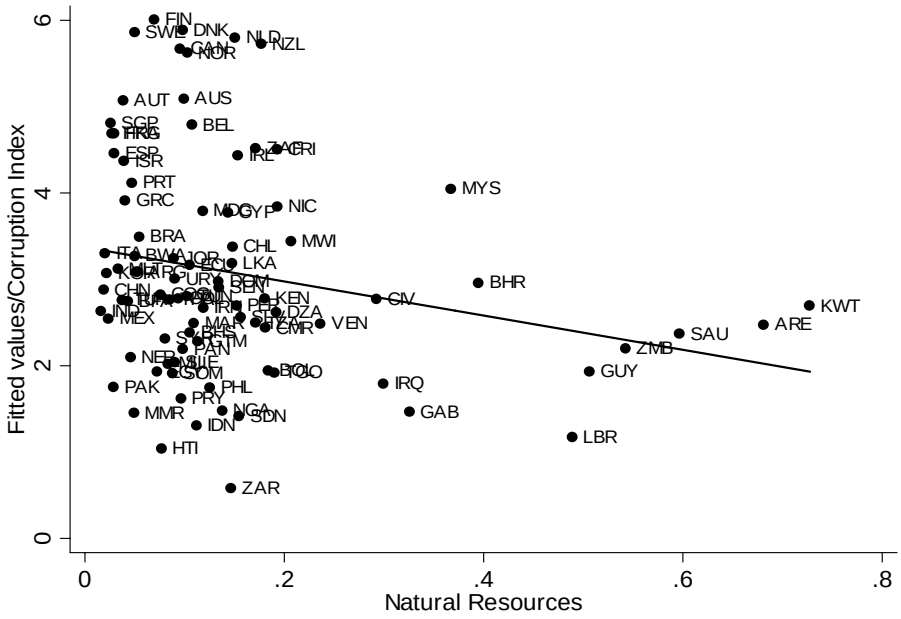
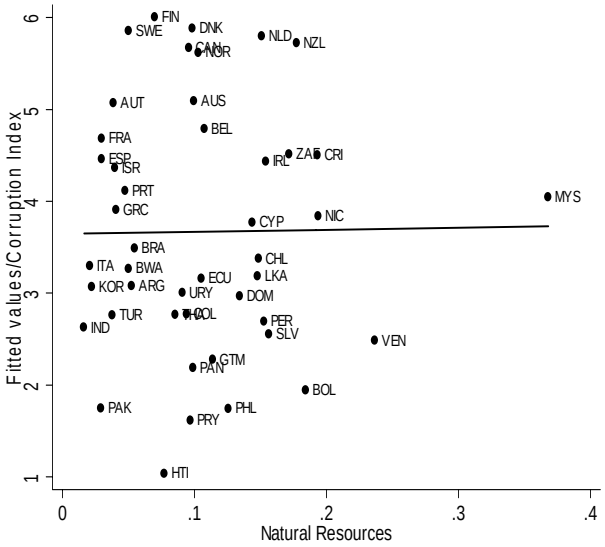
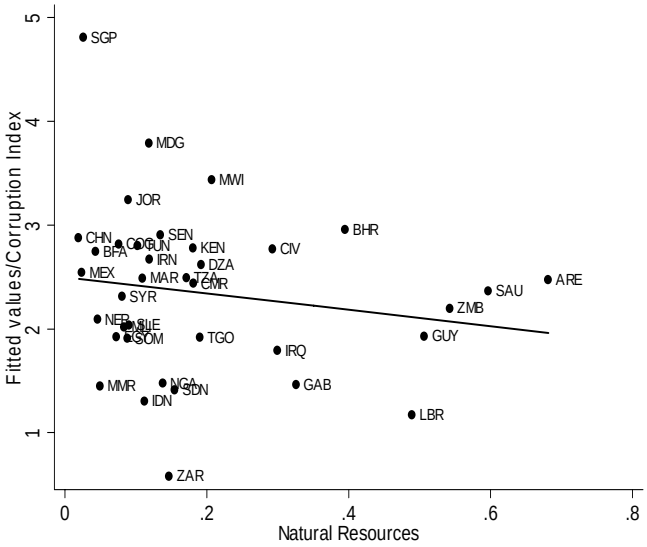


Figure 2: Corruption and Natural Resources (democracies and non-democracies)



(b) Democracies



(c) Non Democracies

Table 1: Summary Statistics

Variable	Number of obs.	Mean	Standard Deviation	Minimum	Maximum
Corruption Index (ci_{srt})	759	3.05	1.44	0	6.03
Natural Resources (sxp_{sr})	1368	0.16	0.16	0.01	0.89
Democracy since $t-4$ (d_{srt})	1523	0.40	0.47	0	1
Democracy since 1956 (D_{srt})	1920	0.25	0.37	0	1
$D_{srt} * sxp_{sr}$	1130	0.04	0.06	0	0.36
Per Capita Income(y_{srt})	1473	5019.35	7674.62	73.78	59182.83

Table 2: Natural Resources, Democracy and Corruption

	Dependent Variable: Corruption Index (ci_{srt})					
	(1)	(2)	(3)	(4)	(5)	(6)
Natural Resources (sxp_{sr})	-1.99*** (0.6013)	-1.25*** (0.4609)	-1.08** (0.4435)	-1.88*** (0.5640)	-1.69*** (0.5768)	0.82 (0.5462)
Democracy since $t-4$ (d_{srt})			0.91*** (0.2108)	0.39* (0.2345)		
Democracy since 1956 (D_{srt})					0.45 (0.3477)	0.33 (1.316)
$d_{srt} * sxp_{sr}$				3.33*** (1.149)		
$D_{srt} * sxp_{sr}$					4.29** (1.816)	7.84 (6.069)
y_{srt}		0.0001*** (0.00003)	0.0002*** (0.00003)	0.0002*** (0.00003)	0.0002*** (0.00003)	-0.0001 (0.00008)
y_{srt}^2		-3.3×10^{-9} *** (8.7×10^{-10})	-3.3×10^{-9} *** (7.7×10^{-10})	-3.8×10^{-9} *** (7.4×10^{-10})	-3.4×10^{-9} *** (7.8×10^{-10})	1.2×10^{-9} (1.7×10^{-9})
Controls:						
Legal Origins	NO	YES	YES	YES	YES	YES
Country Dummies	NO	NO	NO	NO	NO	YES
Region Dummies	NO	YES	YES	YES	YES	NO
Year Dummies	NO	YES	YES	YES	YES	YES
Countries	102	102	95	95	99	99
Observations	596	572	550	550	572	572
Adjusted R^2	0.04	0.92	0.93	0.93	0.93	0.97

Notes: ***, **, and * indicates significance level at 1%, 5%, and 10% respectively against a two sided alternative. Figures in the parentheses are cluster standard errors and they are robust to arbitrary heteroskedasticity and arbitrary intra-group correlation. All regressions except column (1) are carried out without an intercept. Sample years are every fifth year from 1980 to 2004. y_{srt} is the per capita income.

Table 3: Natural Resources, Democracy and Corruption across Time and Income

	Dependent Variable: Corruption Index (ci_{srt})	
	(1)	(2)
Natural Resources (sxp_{sr})	-1.69***	-1.65***
	(0.5759)	(0.5919)
Democracy since 1956 (D_{srt})	0.44	0.36
	(0.3458)	(0.3669)
$D_{srt} * sxp_{sr}$ *Year1980	6.25**	
	(2.876)	
$D_{srt} * sxp_{sr}$ *Year1985	4.81**	
	(2.353)	
$D_{srt} * sxp_{sr}$ *Year1990	3.80**	
	(1.943)	
$D_{srt} * sxp_{sr}$ *Year1995	3.95**	
	(1.946)	
$D_{srt} * sxp_{sr}$ *Year2000	4.28**	
	(2.154)	
$D_{srt} * sxp_{sr}$ *Year2004	3.14	
	(2.049)	
$D_{srt} * sxp_{sr}$ *High Income		4.71**
		(1.969)
$D_{srt} * sxp_{sr}$ *Middle Income		5.58
		(4.162)
$D_{srt} * sxp_{sr}$ *Low Income		0.97
		(3.260)
$D_{srt} * sxp_{sr}$ *Very Low Income		3.28*
		(1.889)
High Income		0.54
		(0.3795)
Middle Income		0.32
		(0.3169)
Low Income		0.49*
		(0.3146)
F-test: *F* value	10.31	1.95
p-value	0.00	0.07
Controls:		
Per Capita Income (y_{srt})	YES	YES
Per Capita Income Squared (y_{srt}^2)	YES	YES
Legal Origins	YES	YES
Region Dummies	YES	YES
Year Dummies	YES	YES
Countries	99	99
Observations	572	572
Adjusted R^2	0.93	0.93

Notes: ***, **, and * indicates significance level at 1%, 5%, and 10% respectively against a two sided alternative. Figures in the parentheses are cluster standard errors and they are robust to arbitrary heteroskedasticity and arbitrary intra-group correlation. All the regressions reported above are carried out without an intercept. Sample years are every fifth year from 1980 to 2004. D_{srt} is the fraction of years democratic since 1956 from Polity IV. Natural Resources is the Sachs and Warner measure of share of primary exports in GNP in 1970. High Income is a dummy for per capita GDP in 2000 being 10, 000 constant 1996 international dollars or more; Middle Income for between 5,000 and 10,000; Low Income for between 2,500 and 5,000; Very Low Income for less than 2,500. The *F*-test is the joint test of significance of the interaction terms between Natural Resources, Democracy, and Year Dummies (for column 1) and interaction terms between Natural Resources, Democracy, and Income Dummies (for column 2).

Table 4: Natural Resources, Democracy and Corruption: Robustness with Additional Covariates

	Dependent Variable: Corruption Index (ci_{srt})									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	10
Natural Resources (sxp_{sr})	-1.77*** (0.5984)	-1.62*** (0.6498)	-1.64*** (0.5950)	-1.02 (1.187)	-1.91*** (0.6445)	-1.34** (0.5496)	-1.99** (0.8937)	-1.54** (0.5961)	-1.56*** (0.5662)	-2.76*** (0.8908)
Democracy since 1956 (D_{srt})	0.45 (0.3479)	0.51 (0.3883)	0.54 (0.3889)	0.32 (0.3922)	0.42 (0.4239)	0.55 (0.3809)	0.05 (0.3217)	0.38 (0.3955)	0.56 (0.3474)	-0.19 (0.3754)
$D_{srt} * sxp_{sr}$	4.32** (1.848)	3.13* (1.801)	3.16* (1.803)	4.06* (2.396)	5.36*** (2.053)	3.78** (1.857)	4.85** (1.987)	4.72** (2.073)	4.10** (1.809)	6.76*** (2.167)
Controls:										
y_{srt}	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
y_{srt}^2	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Legal Origins	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Region Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Dummies*:*	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Additional Controls	Ethnic Frac.	Official Development Assistance (ODA)	ODA from the US	Real Exchange Rate Distortions	Black Market Premium*** (-)	FDI	Sachs and Warner Trade Lib. Index*** (+)	Trade Share	Media Freedom	All Statistically Significant Additional Controls
Countries	98	77	77	87	97	94	91	97	99	89
Observations	566	437	437	494	418	543	529	557	569	388
Adjusted R^2	0.93	0.89	0.89	0.91	0.94	0.93	0.94	0.94	0.93	0.95

Notes: ***, **, and * indicates significance level at 1%, 5%, and 10% respectively against a two sided alternative. Figures in the parentheses are cluster standard errors and they are robust to arbitrary heteroskedasticity and arbitrary intra-group correlation. All the regressions reported above are carried out without an intercept. Sample years are every fifth year from 1980 to 2004. D_{srt} is the fraction of years democratic since 1956 from Polity IV. Natural Resources is the Sachs and Warner measure of share of primary exports in GNP in 1970. In column 10, we include all statistically significant additional controls which are Black Market Premium and Sachs and Warner Trade Liberalization Index.

Table 5: Natural Resources, Democracy and Corruption: Robustness with Alternative Samples

	Dependent Variable: Corruption Index (ci_{srt})											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Natural Resources (sxp_{sr})	-1.57** (0.6803)	-1.62*** (0.5788)	-1.23 (1.041)	-2.19*** (0.6373)	-1.64*** (0.5734)	-1.66*** (0.6024)	-1.25* (0.7258)	-1.49** (0.6331)	-1.95*** (0.6130)	-1.79*** (0.5079)	-1.79*** (0.5079)	-1.85*** (0.5508)
Democracy since 1956 (D_{srt})	0.43 (0.3658)	0.38 (0.3544)	0.66 (0.4469)	0.10 (0.3577)	0.71* (0.3691)	0.57 (0.4142)	0.27 (0.5735)	0.46 (0.3591)	0.33 (0.3729)	0.41 (0.2732)	0.41 (0.2732)	0.34 (0.3010)
$D_{srt} * sxp_{sr}$	4.29** (2.182)	4.17** (1.825)	3.36 (2.710)	5.70*** (1.779)	3.64** (1.866)	3.59* (1.860)	4.85 (4.627)	3.96** (1.866)	5.05*** (1.694)	4.76*** (1.691)	4.76*** (1.691)	4.17** (1.831)
Omitted Observations	Base sample without Africa	Base sample without Neo-Europe	Base sample without Asia	Base sample without the Americas	Base sample without Europe	Base sample without OECD	Base sample without British Colonies	Base sample without French Colonies	Base sample without Spanish Colonies	Obs. Omitted using Cook's Distance	Obs. Omitted using DFITS	Obs. Omitted using Welsch Distance
Countries	70	95	76	74	79	74	61	83	83	99	99	99
Observations	408	584	442	424	454	423	358	481	476	547	547	566
Adjusted R^2	0.95	0.93	0.94	0.94	0.91	0.89	0.94	0.94	0.94	0.95	0.95	0.94

Notes: ***, **, and * indicates significance level at 1%, 5%, and 10% respectively against a two sided alternative. Figures in the parentheses are cluster standard errors and they are robust to arbitrary heteroskedasticity and arbitrary intra-group correlation. All the regressions reported above are carried out without an intercept. Sample years are every fifth year from 1980 to 2004. D_{srt} is the fraction of years democratic since 1956 from Polity IV. Natural Resources is the Sachs and Warner measure of share of primary exports in GNP in 1970. All regressions include y_{srt}, y_{srt}^2, Legal Origins, Region Dummies, and Year Dummies as control variables. In column 2, Neo-Europe includes Australia, Canada, New Zealand, and the United States. In column 10, omit if $|Cooksd_i| > \frac{4}{n}$; in column 11, omit if $|DFITS_i| > 2\sqrt{\frac{k}{n}}$; and in column 12, omit if $|Welschd_i| > 3\sqrt{k}$ formulas are used (see Belsley et al. 1980). Here n is the number of observation and k is the number of independent variables including the intercept. The influential observations according to either the Cook's Distance or the DFITS formula are BHS1985, BHS1990, BGD1980, BGD1985, CHN1985, CHN1990, CHN2000, CYP1985, GMB1985, HKG1980, IRL2000, JPN2000, KOR2004, MWI1980, MYS1980, NIC1990, NIC1995, PHL1980, PHL1985, SGP1980, SGP1985, ZAF1980, ZAF1985, ESP1980, ARE1980, and VEN1980. Influential observations according to the Welsch Distance formula are BHS1985, BHS1990, CHN1990, CHN2000, MYS1980, and PHL1980.

Table 6: Natural Resources, Democracy and Corruption: Robustness with Alternative Measures

	Dependent Variable: Corruption Index (ci_{srt})				Corruption Perception Index
	(1)	(2)	(3)	(4)	(5)
Natural Resources (sxp_{sr})					-2.29**
					(1.169)
Mining Share in GDP in 1988	-3.46***				
	(0.9706)				
Resource Rent		-6.1×10^{-12}***			
		(1.9×10^{-12})			
Log avg. natural capital			-0.25		
			(0.1735)		
Log avg. subsoil wealth				-0.06	
				(0.0827)	
D_{srt}	0.59**	1.27***	-3.24	-0.69	-0.29
	(0.2525)	(0.3169)	(2.189)	(0.7272)	(0.5473)
$D_{srt} * sxp_{sr}$					6.96**
					(3.024)
D_{srt} *Mining Share in GDP in 1988	5.54***				
	(1.664)				
D_{srt} *Resource Rent		1.3×10^{-11}***			
		(4.6×10^{-12})			
D_{srt} *Log avg. natural capital			0.50*		
			(0.2660)		
D_{srt} *Log avg. subsoil wealth				0.16	
				(0.1143)	
Controls:					
y_{srt}	YES	YES	YES	YES	YES
y_{srt}^2	YES	YES	YES	YES	YES
Legal Origins	YES	YES	YES	YES	YES
Region Dummies	YES	YES	YES	YES	YES
Year Dummies*:*	YES	YES	YES	YES	YES
Countries	112	123	76	60	106
Observations	635	641	226	178	234
Adjusted R^2	0.93	0.93	0.96	0.96	0.97

Notes: ***, **, and * indicates significance level at 1%, 5%, and 10% respectively against a two sided alternative. Figures in the parentheses are cluster standard errors. Sample years are every fifth year from 1980 to 2004. The Corruption Perception Index is from Transparency International.