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Avoiding the Resource Curse: The Role of Institutions

Malebogo Bakwena, Philip Bodman, Thanh Le*, Kam Ki Tang

School of Economics, The University of Queensland, St Lucia, QLD 4072, Australia

* Corresponding author, Tel: 61-7-3346 7053, Fax: 61-7-3365 7299, Email: t.le2@uq.edu.au

Abstract

This paper investigates empirically whether the natural resource curse exists and if institutions can help alleviate this curse. Both cross-country and dynamic panel regressions confirm the important role of institutional quality (measured by either institutional design or institutional performance) in turning natural resources into an economic boon. In terms of influencing the impact of natural resource abundance on growth, a democratic governance system is better than a non-democratic one, a parliamentary democracy is superior to a presidential democracy and, although a majoritarian system tends to contribute more to growth, it suffers more from the resource curse than a proportional system.

Keywords: economic growth, natural resources, institution design, institution performance, world, resource rich countries.

JEL classifications: O11, O13, O43, O47, O50, O57

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Abstract

This paper investigates empirically whether the natural resource curse exists and if institutions can help alleviate this curse. Both cross-country and dynamic panel regressions confirm the important role of institutional quality (measured by either institutional design or institutional performance) in turning natural resources into an economic boon. In terms of influencing the impact of natural resource abundance on growth, a democratic governance system is better than a non-democratic one, a parliamentary democracy is superior to a presidential democracy and, although a majoritarian system tends to contribute more to growth, it suffers more from the resource curse than a proportional system.

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1- Introduction

Prior to the twentieth century, natural resources, usually comprising primary commodities, played a pivotal role in world trade. Many countries, such as Australia, the United States, and Canada, benefited greatly from significant primary commodity exports in the early stages of their economic development (North and Thomas, 1973; Auty and Mikesell, 1998). However, since the turn to the twentieth century, natural resources have often been treated as less important than labour and capital in generating economic growth and development. In fact, there is a growing body of evidence suggesting that natural resource abundance may be harmful to the economic development of low and middle income countries. This counter-intuitive result underpins the so-called *resource curse* puzzle (Nankani, 1979; Sachs and Warner, 1995, 1997, 2001).

Several conjectures have been offered towards explaining the natural resource curse puzzle. The *Dutch disease* theory postulates that natural resource abundance leads to a decline in the production and export of the manufacturing sector which possibly leads to de-industrialisation and lower economic growth. The reason for this is that the export of natural resources generates a substantial inflow of foreign capital which in turn causes an appreciation of the domestic currency and a decline in domestic competitiveness. The damaging consequences are even higher if resource proceeds are mainly used for consumption instead of investment (Burnside and Dollar, 2000; Sachs, 2007). The *rent seeking* synthesis, e.g. Torvik (2002), suggests that highly resource abundant countries have a higher incidence of firms engaging in rent seeking activities, leaving only a few to engage in productive ventures. Such rent seeking activities tend to be more popular among firms working in countries that have low quality institutions since, as explained by Lane and Tornell (1996), Tornell and Lane (1999), and Mehlum *et al.* (2006a), low quality institutions are less likely to draw entrepreneurs into productive activity than are good institutions. In other words, having good institutions will cure the resource curse.

Most studies that attempt to empirically validate/refute the resource curse hypothesis are derived from the seminal works by Sachs and Warner (1995, 1997). These studies typically assume the existence of an *unconditional* resource curse – resource abundance is correlated with measures of economic development without accounting for other economic, social and institutional factors that may affect this relationship. This approach is clearly not adequate since it does not explain why countries like Botswana, which is rich in diamonds, is not resource cursed while Sierra Leone, also abundant in diamonds, does seem to be cursed. Similar comparisons can also be made between, for example Norway and Nigeria, the two oil endowed countries. Thanks to the proper utilisation of the oil discovery, Norway has transformed itself from one of the poorest countries in Europe during the early 1900s into the country of highest quality of life today (UNDP, 2009). On the other hand, Nigeria is notorious for its mismanagement of resource proceeds as well as general corrupt tendencies, hence little economic growth (e.g. Sala-i-Martin and Subramanian, 2003).

In view of the fact that earlier studies fail to account for such divergent growth experiences, despite similar resource type and abundance, more plausible explanations have recently been proposed in the literature (e.g. Mehlum *et al.* , 2006b; Arezki and van der Ploeg, 2007; Boschini *et al.,* 2007; Humphreys *et al.,* 2007). These studies have identified institutional quality as the main conduit through which natural resource abundance affects economic growth. Specifically, natural resource abundant economies have the potential to escape the resource curse provided they have good institutions. Therefore, the conclusion arising from these studies is "to abandon the stylised fact that natural resource abundance is bad for growth" (Lederman and Maloney, 2007, p. 33) and, instead, to understand under what circumstances the resource curse does or does not hold.

Unfortunately, whilst this more recent literature provides a richer analysis and promises to be more relevant to policy makers, arguments can be made that it is still deficient in several directions. One deficiency relates to the estimation methods used in the typical empirical analysis. Evidence provided using cross-country Ordinary Least Squares (OLS) approaches to examining the existence of the unconditional resource curse does not survive the use of panel instrumental variable estimation techniques. For instance, Lederman and Maloney (2002, 2007) allowed for endogeneity among explanatory variables, by using a Generalised Method of Moments (GMM) system estimator in an attempt to add more precision to the estimates and found no evidence of Sachs and Warner's (1995; 1997) resource curse.[1] Manzano and Rigobon (2001, 2007) also confirmed that Sachs and Warner's results were not robust after using a *fixed-effects* panel estimation technique. The differences in the results might be expected because cross-country OLS estimation fails to take into consideration endogeneity, heterogeneity and omitted variables biases - problems that are prevalent in empirical growth models but that an instrumental panel estimator is capable of alleviating (Islam, 1995; Hoeffler, 2001). Notwithstanding, the latest literature examining the conditionality (on institutional quality) of the resource curse tends to use the same cross-country OLS empirical methodology that predicted incorrectly that all resource abundant economies are destined to be cursed. An empirical examination of the conditional resource curse hypothesis using such a panel (instrumental) estimator is clearly merited.

A second deficiency concerns the natural resource abundance indicator used in the more recent literature. The problem arises from the perpetual use of Sachs and Warner's (1995; 1997) resource indicator (e.g. Manzano and Rigobon, 2007; Mehlum *et al.*, 2006b), which is the share of primary exports (sum of exports of primary agriculture, fuels and metals, energy) in GDP or exports. This indicator is problematic in the sense that it merely captures the lack of non-resource sectors, rather than indicating whether a country is resource-based or not. For instance, using the indicator for countries such as Norway and Australia that have a high resource abundance per capita, but also have a relatively large non-resource sector will incorrectly suggest that they are resource poor (as reflected by relatively small shares of primary exports). If anything, the dominance of primary exports is an indication of how specialised a country is, and this may be related to the structure of the economy rather than to the resource curse.

The goal of this paper is to address the above mentioned deficiencies in the current literature. In particular, it tests the hypothesis that the effect of resources on growth is conditional on the type and quality of institutions using a sample of 53 countries over the period of 20 years (1984-2003). This is done by further building on Boschini *et al.*'s (2007) and Mehlum *et al.*'s (2006) influential works on the role of institutions in abating the resource curse. Advances are made in the following directions: (i) using a panel for a large number of countries with different levels of development, institutional quality, and natural resource abundance over an extended period of time; (ii) applying a two-step system GMM estimation that eliminate biases associated with omitted variables, endogeneity and unobserved heterogeneity that potentially affect cross-sectional OLS growth results in the current literature; (iii) supplementing results of the commonly used International Country Risk Guide (ICRG) institutional performance indicators with those of institutional design indicators; and (iv) using a resource abundance indicator that focuses on non-renewable resources rather than the share of primary exports.

From an econometric point of view, by utilising a panel estimation technique the current paper is related to work by Bravo-Ortega and de Gregio (2007) and Collier and Goderis (2007). The first one uses random and fixed effects estimators to explain the conditionality on human capital of the resource curse, while the second one uses a panel cointegration technique to explain the conditionality on institutional quality (and investment levels) of the resource curse. The current paper uses instead a panel two-step system GMM estimator. In so doing, the paper is more closely related to the work of Lederman and Maloney (2007). However, the latter research assumes an unconditional resource curse.

Finally, the analysis in the paper considers institutional design as well as institutional performance, in order to examine the sensitivity of the conditionality of the resource curse evidence to the use of different, non-standard institutional measures. In doing so, the paper supplements the only study as far as the resource curse is concerned by Andersen and Aslaksen (2008), that considers the role of this institutional quality measure. Whilst the research in this paper and their study are similar in terms of using institutional design instead of institutional performance, they clearly differ in their econometric approach and resource abundance measures. Whilst Andersen and Aslaksen (2008) uses a single cross country regression along with Sachs and Warner's (1995,1997) indicator, the current paper uses a panel setting and an exclusively non-renewable resource indicator.

The key hypothesis that natural resource economies are not destined to be cursed if they have good institutions is confirmed by the empirical results of this paper. Specifically, the results suggest that (a) adopting a democratic regime is better than a non-democratic one, in terms of generating growth from resource abundance; (b) the electoral rules that a country adopts matter: having a democratic majority rather than a democratic proportional regime increases the growth benefits of resource abundance; and (c) as far as the form of government adopted is concerned, a democratic parliamentary regime rather than a democratic presidential regime is found to be more growth enhancing in the presence of abundant natural resources. Therefore, the lessons for policy makers who struggle to overcome the impediments to economic development that potentially accompany the 'curse of resource abundance' are a need to develop and maintain better institutions and to adopt improved management strategies of the financial proceeds coming from such abundance.

The rest of this paper is structured as follows. Section 2 documents the cross-sectional evidence on natural resources and institutions. Section 3 presents the results of the dynamic regressions. Section 4 compares results when different measures of institutions are used. Section 5 ends the paper with some concluding remarks. Detailed variable description, data source, and a list of countries in the sample can be found in the Appendices.

2- Resource curse and institutions in a cross-section of countries

The first step this paper takes is to examine the relationship between the resource curse and institutions in a context of a cross-section of countries. The framework is similar to those of Mehlum *et al.* (2006b) and Boschini *et al.* (2007) which are based on the earlier work by Sala-i-Martin (1997). The underlying hypothesis is that the resource curse does exist, but that having a good institutional setting will help to abate this curse. The general regression equation is:

$$g_i = \beta_0 + \beta_1 \log Y_{i,0} + \beta_2 NR_{i,T} + \beta_3 INSTQ_{i,T} + \beta_4 (NR_{i,T} * INSTQ_{i,T}) + \emptyset X_{i,T} + \epsilon_{i,T} \quad (1)$$

where $g_i = \frac{\log Y_{i,T} - \log Y_{i,0}}{T}$ is the growth rate over year 0 and T, $Y_{i,T}$ is real per capita GDP for country i at year T, $Y_{i,0}$ is the real GDP per capita at the beginning of the period, $NR_{i,T}$ is an indicator capturing natural resource abundance, $INSTQ_{i,T}$ is the quality level of institutions, $NR_{i,T} * INSTQ_{i,T}$ is an interaction term between natural resources and institutions, and $X_{i,T}$ is the set of other control variables including trade openness, investment, and regional dummies.

In this study, a growth framework is chosen over a levels framework in order to capture the conditional convergence effect (through the log of initial income) which is often found in empirical growth models, e.g. Mankiw *et al.* (1992).[2] In addition, using equation (1), it can be shown that the levels regression is nested within the growth regression. From this framework, the partial impact of an increase in natural resource abundance on growth can be derived as follows:

$$\frac{\partial g}{\partial NR} = \beta_2 + \beta_4 * INSTQ$$

To simplify the notation, the country and time indices are removed. The resource curse hypothesis implies that $\beta_2 < 0$ while the view that good institutions help alleviate the resource curse implies that $\beta_4 > 0$. In addition, the resource curse will be completely eliminated (i.e. $\beta_2 + \beta_4 INSTQ \geq 0$) when institutional quality is greater than the required threshold which is equal to $-\beta_2 / \beta_4$.

To compute the measure of natural resource abundance, this paper employs data on per capita resource intensity, provided by the World Bank, which comprise of mineral, forestry, and energy resources. To focus specifically on non-renewable resources, forestry rents are excluded. The constructed indicator, which is identical to the one used in Rambaldi *et al.* (2005) and Stijns (2006), is a more appropriate measure than others for two main reasons. First, it captures the fact that the resource curse is mostly concerned with non-renewable resources: non-renewable resources may be exhausted if extraction is too excessive whereas this issue of sustainability does not arise with renewable resources. Second, it helps overcome the 'circularity and bias' problems arising from regressing real GDP per capita growth on the ratio of resource rents to GDP, which is commonly used as a proxy for natural resource abundance in the literature. As pointed out by Rambaldi *et al.* (2005), it is very likely that natural resource abundance is affected by historic transformation in economic growth since GDP appears in both the dependent variable and the denominator of the explanatory variable. Ideally, an indicator that measures stock rather than flow of natural resources should be used because a stock measure reveals the amount of resource *wealth* a country possesses while a flow variable is a measure of *income generated* from the resource endowment for a particular year. However, the unavailability of data prevents this paper from using such a stock measure.

To measure institutional quality, this paper uses an indicator constructed based on Knack's (2000) method. The raw data used for this calculation come from the ICRG survey. The constructed indicator is an unweighted average of quality of law and order, corruption, and bureaucratic and it ranges from 0 to 1. The higher the index, the better are the institutions.

This paper recognises several other available measures of institutional quality in the literature, for example, the governance composite index by Kaufmann *et al.* (2007). Another example is the aggregate index of economic freedom of the Fraser Institute (Gwarteny and Lawson, 2008). However, these data sets have a very limited time-series dimension which can hardly be used for panel estimation.[3] As a result, this paper opts for the above mentioned constructed index for its wide range of coverage, long time-series dimension, and broad scope of definition.

As for other variables, this paper measures the real GDP per capita in US dollars (at 2000 constant price level). Trade openness is measured by total trade as a share of GDP. Investment is proxied by the gross fixed capital formation as a share of GDP. All these data are collected from the World Development Indicators database. The two dummy variables representing countries in Latin America and Africa are denote as 'Latin' and 'Africa' respectively.

Table 1 provides results estimated by simple OLS regressions for a cross-section of countries in the period 1984-2003. In the first column, average growth of GDP per capita is regressed on the log of initial GDP per capital in 1984, the natural resource abundance indicator, the institutional quality, an interaction term of these two variables, the log of trade share, the log of investment share, and the two dummy variables characterising Latin American and African countries. In the next column, the dummy variables are excluded. In the third column, the regression is run on a subset of the original sample – those African countries are excluded. This is done to test if the resource curse is mainly an 'African phenomenon' as pointed out by Mehlum *et al.* (2006) and Boschini *et al.* (2007). In the last two columns, the variable measuring trade openness is excluded.

(Insert Table 1 about here)

It can be seen that the coefficient on the initial income term is always negative and highly significant which confirms the convergence predictions of Neo-classical growth theory. The expected positive and significant impact of investment on growth is confirmed in this paper. However, trade openness does not have the expected sign. Its coefficient is always negative, though insignificant.

Turning to the variables of interest, it is found that the results obtained are in line with those by Mehlum *et al.* (2006) and Boschini *et al.* (2007). The coefficient on natural resource abundance is negative and statistically significant while that on the interaction term is always positive and significant. Institutional quality has a positive and significant impact on growth as expected. These results are stable and robust across different specifications. Overall, the results indicate that countries with stronger institutions and lower level of natural resource abundance are likely to grow faster. In addition, higher level of institutional quality will alleviate the negative impact of natural resources on growth. The results are true for the whole sample indicating that the resource curse (and its institution cure) is not just an African (or Latin American) phenomenon.

The partial growth impact of a marginal increase in resource abundance (holding all other variables constant) implied by regression (1.1), for instance, is:

$$\frac{\partial g}{\partial NR} = -0.002 + 0.004 * INSTQ$$

The regression results indicate that the institutional threshold for not having the resource curse is $-(\beta_2/\beta_4) = 0.5$. Above this threshold, the partial contribution of natural resource abundance on growth is higher for a high resource endowed country than a low endowed one, whereas the reverse holds below the institutional threshold. In short, countries with institutional quality above 0.5 are not going to be resource cursed. As indicated in the Appendix, Dominican Republic and other countries ranked above it all pass this threshold.

However, as discussed extensively in the literature, there might be some potential problems associated with OLS regressions of this kind. The first concerns the fact that OLS cross-country analysis often ignores unobserved country-specific effects, which may result in omitted variable bias. The second is the issue of endogeneity and measurement error bias. For instance, it is difficult to capture resource abundance as a stock variable, forcing researchers to utilise a flow variable instead .The latter may just be measuring resource dependence rather than abundance. Therefore, measurement error might be present and the incorrect inferences may be drawn as a result. The third one is the potential endogeneity problem due to reverse causality between institutional quality and economic growth. This is called the 'halo effect' as per Dollar and Kraay (2003): countries may have good institutions because they are rich. To address these problems, this paper employs a two-stage least squares (2SLS) estimation procedure using instruments used previously in the literature. In particular, a latitude variable is used to instrument institutions and latitude interacted with resource abundance is used to instrument the interaction term. The use of latitude as an instrument for institutions is initiated by Hall and Jones (1999) who argue that the distance to the equator is related to 'western influence' which in turn leads to good institutions. The data on latitude are collected from Treisman (2007).

An exogeneity test performed on institutions variable reveals that the endogeneity is not a significant problem. This implies that there is some confidence in the initial OLS results. However, this paper still carries out the 2SLS estimation to compare its results with the OLS results, bearing in mind that the 2SLS estimate is less efficient than the OLS when explanatory variables are exogenous. The results are reported in Table 2.

(Insert Table 2 about here)

The upper panel of Table 2 presents the results from re-running the regressions underlying the results presented in Table 1 but instead employing an instrumental variable

(IV) technique. All regressions contain an unreported constant. The 2SLS results, in general, are similar to OLS estimation results of **Error! Reference source not found.**, although the significance level is much higher. The only exception is that the magnitude of the coefficient on institutional quality is much larger in the 2SLS case. This is consistent with Boschini *et al.*'s (2007) results. All regressions confirm the importance of institutions and natural resources in explaining the cross-countries variation in growth performance.

The first stage regressions in the lower panel offer some interesting results. It is shown that latitude is positively and significantly correlated with institutional quality. Additionally, the instrument for the interacted term is positively and highly correlated with the interacted term. In short, both the OLS and 2SLS cross sectional results are consistent with the hypothesis that countries with good institutions will not be resource cursed.

3- Resource curse and institutions in a dynamic framework

In the last section, cross-sectional regressions showed that very long-run growth is significantly and negatively affected by natural resource abundance but also that this negative effect is alleviated by high level of institutional quality. A disadvantage of those cross-sectional regressions is that it is difficult to separate the pure effects of those variables from potential unobserved factors, such as geographic or climate conditions, that explain differences in growth rates across countries but vary very little over time. To overcome this limitation, a dynamic framework that relates the growth rates of real GDP per capita over time to changes in variables of interest will be used in this section. To begin, the following panel regression using *income levels* is considered:

$$\log Y_{i,t} = \beta_i + \beta_1 \log Y_{i,t-k} + \beta_2 NR_{i,t} + \beta_3 INSTQ_{i,t} + \beta_4 \left(NR_{i,t} * INSTQ_{i,t}\right) + \emptyset X_{i,t} + \gamma_t + \varepsilon_{i,t}$$

where β_i is a country fixed effect that does not vary over time, γ_t is a period effect that is common across countries, k is the number of years lagged, and others are as previously defined. A three-year lag is used because we use three-year moving average growth rates as the dependent variable in order to mitigate short run business cycle effects.[4] The inclusion of the country fixed effects is expected to pick up omitted time invariant country characteristics like geographical factors, while the period specific effect will help pick up omitted shocks occurring in all countries similarly like the world business cycle effect.

An estimation technique developed by Caselli *et al.* (1996) suggests the transformation of the level regression to regression in differences as follows:

$$\log Y_{i,t} - \log Y_{i,t-k} = \beta_1(\log Y_{i,t-k} - \log Y_{i,t-2k}) + \beta_2(NR_{i,t} - NR_{i,t-k}) + \beta_3(INSTQ_{i,t} - INSTQ_{i,t-k}) + \beta_4(NR_{i,t} * INSTQ_{i,t} - NR_{i,t-k} * INSTQ_{i,t-k}) + \emptyset(X_{i,t} - X_{i,t-k}) + (\gamma_t - \gamma_{t-k}) + (\varepsilon_{i,t} - \varepsilon_{i,t-k}) \quad (2)$$

This regression equation can be estimated by a differenced GMM estimation method in which lagged levels are employed as instruments for the differences. However, as natural resource abundance and institutions show little variation with time, these levels can be weak instrument. As a result, this paper follows Arellano and Bover (1995) and Blundell and Bond (1998) in using a system GMM estimation method that includes the regression equation in levels and uses lagged differences of the endogenous variables as instruments. Using this technique and focusing on changes in GDP per capita over different 3-year periods, it is expected that more informative results about the partial effects of changes in natural resource abundance, and institutions on growth will be obtained. All results obtained are presented in Table 3.

In Table 3, regression (3.1) includes all explanatory variables as well as regional dummies. Regression (3.2) is a more parsimonious presentation in the sense that it excludes the regional dummies. Regression (3.3) excludes African economies as well as regional dummies, while regression (3.4) excludes the trade openness variable as well as regional dummies. In all the regressions, even though not reported, time dummies and constants have been included.

It can be seen that the coefficient on natural resource abundance is always negative and statistically significant. By contrast, the coefficient on the interaction term between institutional quality and natural resource is always significant and positive. Interestingly, the impact of the institution variable on growth is positive only in regression (3.4), but is insignificant across all four regressions. However, the most important thing is that the story on resource curse continues to hold with panel regression results. Basically, it says that countries with high institutional quality seem to obtain higher growth rates from their resource endowment than those with poor institutions. For instance, the growth impact of a marginal increase in resource implied by regression (3.1) is:

$$\frac{\partial g}{\partial NR} = -0.003 + 0.005 * INSTQ$$

It can be shown that the institutional threshold for not having the resource curse increases to 0.6 from 0.5 in the previously obtained OLS cross-country regressions. This result stays qualitatively the same even with the exclusion of regional dummies (Latin and Africa). Result of regression (3.3) in which African economies are excluded confirms that the results are not driven by African countries or the resource curse is not mainly an 'African phenomenon'.

(Insert Table 3 about here)

Comparing to the OLS cross sectional results in the previous section, the magnitudes of the coefficients are higher for the panel case. The increase in the point estimate of the institution quality threshold from 0.5 to 0.6 reduces the number of countries that can avoid being resource cursed by almost half, from 31 to 16, a sample that consists of mostly developed countries.

As a robustness test, we have also investigated each individual component of the ICRG indicator separately to check if the previous analysis is still robust to different measures of institutions.[5] These components include the rule of law, corruption in government, and bureaucratic quality. The results for each of the components are qualitatively the same as those of the ICRG indicator in that better institutional quality can mitigate the negative effect of resource abundance on growth, but only countries of the best institutions can fully abate resource curse.[6]

4- Institutional performance versus institutional design

The ICRG indicator and its components used thus far are measures of *institutional performance*, which concerns itself with institutional accomplishment, such as endured levels of corruption. One criticism of the use of institutional performance measures is that they are likely to be endogenous in growth in the sense that the more economic growth enables a country to invest more in institutional infrastructure, hence an improvement in the quality of institutions (Hall and Jones, 1999; Dollar and Kraay, 2003). To address this problem, we follow Andersen and Aslaksen (2008) to use measures of *institutional design* as alternative measure of institution quality. Institutional design such as the electoral rule (e.g. simple majority versus proportional regime) or the form of government (e.g. parliamentary versus presidential system) rarely changes and therefore relatively less prone to endogeneity problems compared to institutional performance measures.

This paper employs a number of institutional measures that fall into the group of institutional design. Data are collected from the World Bank's Database on Political Institutions except for the 'democracy' index, which is obtained from the Fraser Institute.

Details on the construction of those variables, data used, and results obtained are presented below.

Democracy versus non-democracy

The presence of democratic institutions offers a review process of government power that curbs the potential of public officers to accrue personal wealth and prevents them from coming up with unfavourable policies (Barro 1996). Therefore a more democratic country is considered of better institutions than a less democratic one. In this paper, countries are classified as either democratic or non-democratic, based on Alesina and Perotti's (1994) definition of democracy. A country is considered a democracy if its citizens are granted with sufficient civil and economic liberties. Data for this classification are the Fraser Institute indices of political rights and civil liberties, or the GASTIL indices as commonly known. To give an idea, each of the two indices runs from 1 to 7; a score of 1 to 2 means 'free', 3 to 5 'semi-free' and 6 to 7 'not free'. Following Persson (2002) and Andersen and Aslaksen (2008), a simple average of the two indices is calculated and if the average turns out to be less than or equal to 3.5, then the country is classified as democratic, otherwise it is not. On this basis, a dummy variable, DEM, is created such that it takes the value 1 for a democratic regime and 0 for a non-democratic regime. The coefficient on DEM is expected to be positive.

Table 4 presents all the results comparing democracies with non-democracies. The results suggest that democracies outperform non-democracies in terms of economic growth. Ceteris paribus, for a democratic country, a one standard deviation increase in resource abundance is estimated to increase growth by 932.84*[-0.002 + (0.004*1)] = 1.87 %. Conversely, the same one standard deviation change in resource abundance results in a decline in growth of the same magnitude for a non-democratic country.

(Insert Table 4 about here)

Electoral rules

Democratic countries can differ vastly in their voting systems. Therefore, we further stratify the democratic countries according to their electoral rules: *proportional rule* or *majority rule*. Under proportional rule, seats are given in proportion to the vote share, whereas under the majority rule, seats are allocated according to politicians with the highest vote. As majority rule politicians are more accountable to the larger population that voted for them in the first place, it is expected that the rents extracted by politicians in this regime will be less than the proportional regime (Persson, 2002; Persson *et al.*, 2003; Kunicova´ and Rose-Ackerman, 2005).

To capture the above mentioned features of institutions, this paper constructed two dummy variables named MAJ and Non-DEM respectively. The dummy MAJ is equal to 1 for a democratic majority system and 0 otherwise. The Non-DEM is set to 1 for a non-democratic country and 0 otherwise. In this way, economies with a democratic proportional rule represent the control group.

(Insert Table 5 about here)

Results in Table 5 show that democratic majorities have a statistically significant positive effect on economic growth relative to their proportional counterparts. However, this system benefits less from its resource abundance as compared to its proportional counterpart and the non-democratic system (as indicated by the negative sign of the coefficient on interaction term between MAJ and natural resource variable across different regressions). There are several plausible explanations. First, as much as extending more political rights and civil liberties, a democratic majority system may bring about conflicts over issues of distribution (Alesina and Perotti, 1994). Although modest personal accruement of resource wealth is expected under a democratic majority, the need to adopt policies that satisfy the majority of the population/electorate may lead to projects that are inefficient, hence hindering economic growth (e.g. Cuddington, 1989; Sachs and Warner, 2001). The government in power could find it difficult to adjust welfare commitments fearing that such a decision may be unpopular with the electorate. Hence, politicians may allocate resources in a way that can enhance their chances of being re-elected without any regard to allocation efficiency (Robinson *et al.*, 2006; Stevens and Dietsche, 2008). Second, a Botswana-type democratic majority with very weak opposition may lead to less-than-anticipated checks and balances as well as competitiveness of the regime. This is probably because the ruling party in Botswana has never lost an election since independence in 1966 so politicians may become too comfortable due to the lack of competition from other parties.[7]

Forms of the government

One aspect of legislation is the maintenance of power. Whether or not the executive needs continuous support from the majority of the assembly to stay in power will matter for its accountability and for the implementation of its policies. A regime can either be *presidential* or *parliamentary*. In the former, the president can hold onto power without gaining support from the assembly whereas in the latter, the government's existence depends on the continuous backing of the majority of congress. Under the parliamentary regime, politicians need continuous confidence of the assembly so they are less likely to abuse their power and hence they will extract relatively less rent (Persson, 2002; Kunicova´ and Rose-Ackerman, 2005). Based on this argument, Andersen and Aslaksen (2008) hypothesise that parliamentary democracies will be less resource cursed than their presidential counterparts.

Taking into account the idea about how the form of government may affect the natural resource – growth nexus, this study divides the group of democratic countries into democratic presidential and democratic parliamentary sub-groups. As a result, there will be three categories of countries: countries under democratic presidential regime, countries under democratic parliamentary regime, and non-democratic countries. Accordingly, two dummy variables are generated: the dummy PRES is equal to 1 if a country is under the presidential regime and 0 otherwise; Non-DEM is equal to 1 if a country is non-democratic and 0 otherwise. Countries with a democratic parliamentary regime represent the control group.

(Insert Table 6 about here)

The results in Table 6 suggest that, relative to parliamentary democracies, non-democracies tend to have lower growth rates while presidential democracies tend to have higher growth rates. The inclusion of interaction terms in regression (6.3) and (6.4) change the sign of the resource indicator from negative to positive, implying that there is a significant positive effect of resource abundance on growth in a parliamentary regime. Generally, a presidential democracy with abundant resources performs worse than its parliamentary counterpart, while non-democratic nations are not statistically different from parliamentary regimes.

Such results are not unusual in the growth literature. For instance, Kunicova´ and Rose-Ackerman (2005) find that presidential democracies are typically more corrupt than their parliamentary counterparts. However, Persson and Tabellini (2000) argue that a US form of presidential regime is expected to be less corrupt because of checks and balances in place as well as its competitiveness. Even then, they could not empirically validate such an assertion for all countries in their sample, except for well-established democracies. Kunicova´ and Rose-Ackerman (2005) argue that checks and balances are not a typical characteristic of such presidential regimes and they are sceptical that Persson and Tabellini’s results may be misleading due to potential endogeneity and inability to solve it in cross sectional data. In such cases, it is possible that corrupt governments *choose* presidentialism so that they are able to extract more rent or countries may be more corrupt because they choose presidentialism.

Our panel estimation, which has taken into account of endogeneity, yielded results that support the argument of Kunicova´ and Rose-Ackerman (2005).

5- Conclusion

This paper examines whether the theory of resource curse is supported in the data. It also investigates whether institutional quality, and what type of institutional setting, matters most in terms of abating the resource curse. Overall, no matter what form of institutional design or which individual components of institutional performance are considered, or what econometric technique used (cross-sectional OLS, 2SLS or panel system GMM), the results suggest that the resource curse exists, but that the quality of institutions can help abate this resource curse. In other words, the finding is very robust across different estimation techniques that natural resource abundance can be a boon rather than a curse, provided that a country has sufficiently good institutions (and policy settings).

The research presented here provides a useful lesson for governments and policy makers on how they might take advantage of their abundant natural resources and pursue higher economic growth rates against the inherent impediments that can potentially come with resource abundance i.e. the resource curse. Specifically, the following policy recommendations are worth considering:

(a) Pay attention to the quality of institutional setting, such as corruption levels, law and order, and bureaucracy. Good institutional setting could diminish rent seeking activities, and ensure the security of property and contractual rights. In turn this would encourage investment.

(b) Be democratic. A democratic country is one that grants its nation adequate civil and economic liberties. This is important because the more liberty is granted to citizens, the more market and entrepreneurial activities, hence economic growth, will occur.

(c) Adopt a majoritarian rather than proportional electoral system. Any system that requires backing by the majority of the population ensures less rent seeking tendencies. This is mainly because in such regimes, the politicians are concerned about their re-election, hence future political career. Therefore, a democratic majority regime is certainly better than a proportional equivalent.

(d) Adopt a parliamentary, rather than a presidential regime. A parliamentary regime, one where the government needs continuous support of the majority of assembly, is better than a presidential regime, where a president can still be in power without parliamentary backing. A parliamentary regime reduces rent seeking as well as personal accrual of resources due to checks and balances. Furthermore, the regime encourages the government to be transparent and accountable, failing which they lose power.

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[1] In both instances, Lederman and Maloney use samples different from Sachs and Warner (1995; 1997), 19 to 37 countries in 2002 and 65 in 2007.

[2] The economic intuition behind this is the steady state distribution of income levels. If economies are not in their steady states, the transitional dynamics of the Neo-classical model are captured by the addition of the 'initial' income level in a growth regression.

[3] The World Bank's governance indicators are only available for 1996, 1998, 2000 and annually from 2002 onward. Although the Fraser Institute's index is available annually between 2000 and 2006, it was released once every five years between 1970 and 2000.

[4] This paper also runs a set of regressions using 5-year period data averages. The results are qualitatively the same.

[5] The procedure has been used in the literature to test for robustness (Mehlum *et al.*, 2006a*;* Boschini *et al.*, 2007). In fact, some of the studies in the literature (such as, Gylfason and Zoega, 2006; Nili and Rastad, 2007; Brunnschweiler, 2008; Kolstad, 2009), instead of coming up with an index, use individual components as measures of institutional quality.

[6] To save space, we do not report the results here, but they are available on request.

[7] As in October 2004, out of 57 seats in parliament, 44 are for the ruling Botswana Democratic party, 12 for the main rival, the Botswana National Party, one for Botswana Congress Party and none for the remaining five opposition parties.

Table 1 – *Natural resources, institutions, and growth: OLS regressions (cross section)*

Variable	(1.1)	(1.2)	(1.3)[a]	(1.4)	(1.5)
Initial income level	-0.0001 (0.00005)**	-0.0001 (0.0001)**	-0.0001 (0.0001)*	-0.0001 (0.0001)**	-0.0001 (0.0001)**
Resource Abundance	-0.002 (0.001)**	-0.003 (0.001)**	-0.002 (0.001)**	-0.002 (0.001)**	-0.002 (0.001)***
Institutional quality	3.38 (2.10)	4.37 (1.93)**	3.46 (1.90)***	4.45 (1.98)**	3.60 (2.12)*
Interaction term	0.004 (0.001)***	0.004 (0.002)***	0.003 (0.001)**	0.004 (0.001)***	0.004 (0.001)***
Openness	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.008)		
Investment	0.17 (0.06)***	0.19 (0.07)***	0.21 (0.10)**	0.17 (0.06)***	0.16 (0.06)***
Latin	-0.74 (0.86)				-0.43 (0.69)
Africa	-1.03 (0.70)				-0.90 (0.63)
R^2	0.52	0.49	0.52	0.48	0.50
Countries	53	53	33	53	53

Notes: Dependent variable is real GDP per capita growth. *, **, *** indicate statistical significance at 10, 5 and 1% respectively. The figures in parentheses are robust standard errors. All regressions include an unreported constant. (a) African countries are excluded.

Table 2 – *Natural resources, institutions, and growth: 2SLS regressions (cross section)*

Variable	(2.1)	(2.2)	(2.3)
Initial income level	-0.0001 (0.0001)*	-0.0002 (2.98)*	-0.0001 (0.0001)*
Resource abundance	-0.002 (0.001)*	-0.002 (0.001)**	-0.002 (0.001)*
Institutional quality	6.16 (2.93)*	5.67 (2.98)*	6.11 (2.95)**
Interaction term	0.004 (0.002)*	0.004 (0.002)**	0.004 (0.002)*
Openness	-0.01 (0.07)	-0.01 (0.01)	-0.01 (0.01)
Investment	0.19 (0.07)***	0.17 (0.06)***	0.19 (0.07)***
Latin		-0.53 (0.80)	-0.07 (0.64)
Africa		-0.74 (0.62)	
N	53	53	53
R^2	0.47	0.50	0.47
Exogeneity test [a] (*p* - value)	0.77	0.68	0.78
First stage: Institutions equation			
Latitude	0.62 (0.16)***	0.60 (0.14)***	0.64 (0.16)***
INTERINSTRUMENT	-0.0002 (0.0001)	-0.0002 (0.0001)	-0.0002 (0.0001)
R^2	0.78	0.78	0.78
Institutions interacted with resources equation			
Latitude	49.96 (112.28)	36.72 (108.82)	55.91 (118.88)
INTERINSTRUMENT	0.81 (0.12)***	0.82 (0.12)***	0.82 (0.12)***
R^2	0.99	0.99	0.99

Notes: The figures in parentheses are standard errors. *, **, *** indicate statistical significance at 10, 5 and 1% respectively. (a) The null hypothesis is that institutions are exogenous. Dependent variable is real GDP per capita. Institutional quality and interaction term are instrumented. External instruments: latitude and resource multiplied by latitude. Investment, openness and initial income are internal instruments. INTERINSTRUMENT = latitude interacted with natural resource abundance. Institutions are the dependent variables for the upper part of the first stage regressions while the interaction of resources and institutions is in the lower part. All regressions include an unreported constant.

Table 3 - *Natural resources, institutions, and growth: panel two-step system GMM regressions*

Variable	(3.1)	(3.2)	(3.3)	(3.4)
Initial income level	-0.00005 (0.001)	0.00005 (0.00004)	-0.00001 (0.0002)	-0.00004 (0.00004)
Resource abundance	-0.003 (0.001)**	-0.004 (0.001)***	-0.01 (0.003)*	-0.005 (0.001)***
Institutional quality	-2.06 (2.16)	-1.78 (1.91)	-1.77 (4.08)	1.26 (1.64)
Interaction term	0.005 (0.002)**	0.01 (0.002)***	0.01 (0.01)*	0.01 (0.002)***
Openness	-0.04 (0.02)	-0.02 (0.01)*	-0.02 (0.04)	
Investment	0.17 (0.04)***	0.17 (0.003)***	0.21 (0.08)***	0.13 (0.03)***
Latin	-4.86 (6.43)			
Africa	-3.04 (2.39)			
Countries	53	53	33	53

Notes: All regressions include time dummies and constants (not shown). Dependent variable is real GDP per capita growth. The figures in parentheses are standard errors. *, **, *** indicate statistical significance at 10, 5 and 1% respectively.

Table 4 - *Natural resources, institutions, and growth: democracies vs. non-democracies (panel GMM regressions)*

Variable	(4.1)	(4.2)	(4.3)	(4.4)
Initial income level	-0.0001 (0.0001)**	-0.0001 (0.00004)**	-0.0001 (0.00003)**	-0.0001 (0.00004)***
Resource abundance	-0.002 (0.001)***	-0.002 (0.001)**	-0.002 (0.001)***	-0.002 (0.001)***
DEM	2.80 (1.03)***	2.58 (0.63)***	2.23 (0.67)***	1.63 (0.67)**
Interaction (DEM × Resource)	0.004 (0.001)***	0.004 (0.001)***	0.004 (0.001)***	0.004 (0.001)***
Openness	-0.01 (0.01)	-0.01 (0.01)		
Investment	0.11 (0.04)***	0.12 (0.04)***	0.03 (0.05)	0.01 (0.04)
Latin	-3.60 (3.95)			-3.05 (0.51)***
Africa	-1.45 (1.15)			-2.00 (0.50)***
Countries	53	53	53	53

Notes: A dummy variable, DEM = 1 for democracy and 0 otherwise is the measure of institutional design. All regressions include time dummies and constants (not shown). Dependent variable is real GDP per capita growth. The figures in parentheses are standard errors. *, **, *** indicate statistical significance at 10, 5 and 1% respectively.

Table 5 - *Natural resources, institutions, and growth: electoral rules (panel GMM regressions)*

Variable	(5.1)	(5.2)	(5.3)	(5.4)	(5.5)	(5.6)
Initial income level	-0.00001 (0.00003)	0.00003 (0.00002)	0.00003 (0.00002)	-0.00004 (0.00002)*	0.00002 (0.00002)	-0.00005 (0.00001)*
Resource abundance	-0.001 (0.0003)***	-0.001 (0.0002)**	-0.0002 (0.001)	-0.0004 (0.001)	-0.0003 (0.0002)	-0.0002 (0.0002)
MAJ	0.60 (0.36)*	0.77 (0.29)*	1.23 (0.32)***	1.03 (0.30)***	1.16 (0.33)***	1.36 (0.29)***
Non-DEM	-0.18 (0.21)	-0.35 (0.21)	-0.09 (0.26)	-0.30 (0.24)		
Interaction (MAJ *Resource)			-0.001 (0.001)*	-0.001 (0.001)	-0.001 (0.002)***	-0.001 (0.003)***
Interaction (Non-DEM *Resource)			-0.0002 (0.001)	0.00005 (0.001)		
Openness	-0.01 (0.01)	-0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.001 (0.01)	0.003 (0.01)
Investment	0.08 (0.05)*	0.10 (0.04)**	0.12 (0.1)*	0.08 (0.04)*	0.08 (0.05)*	0.09 (0.04)**
Latin	-1.33 (0.70)*		-0.08 (0.66)		-0.64 (0.61)	
Africa	-1.19 (0.51)*		-0.31 (0.52)		-0.82 (0.43)*	
Countries	49	49	49	49	49	49

Notes: The following countries are excluded due to lack of data: Oman, Saudi Arabia, USA, and China. All regressions include time dummies and constants (not shown). Dependent variable is real GDP per capita growth. The figures in parentheses are standard errors. *, **, *** indicate statistical significance at 10, 5 and 1% respectively.

Table 6 - *Natural resources, institutions, and growth: forms of the government (panel GMM regressions)*

Variable	(6.1)	(6.2)	(6.3)	(6.4)
Initial income level	-0.00002 (0.00002)	0.00001 (0.00002)	-0.000002 (0.0002)	-0.00003 (0.00001)*
Resource abundance	-0.0004 (0.0002)*	-0.0003 (0.0002)	0.0003 (0.0002)*	0.0003 (0.0002)**
PRES	0.90 (0.40)**	-0.21 (0.39)	1.04 (0.46)**	0.46 (0.44)
Non-DEM	-0.34 (0.25)	-0.83 (0.21)***	-0.57 (0.29)*	-0.68 (0.29)*
Interaction (PRES * Resource)			-0.001 (0.0003)***	-0.001 (0.0002)***
Interaction (Non-DEM * Resource)			-0.0003 (0.0004)	-0.0003 (0.0003)
Openness	-0.02 (0.01)	-0.01 (0.01)	-0.02 (0.001)*	-0.01 (0.01)
Investment	0.10 (0.05)**	0.10 (0.05)**	0.12 (0.05)**	0.06 (0.05)
Latin	-2.11 (0.67)***		-1.81 (0.66)*	
Africa	-1.47 (0.45)***		-0.83 (0.39)**	
Countries	52	52	52	52

Notes: China is excluded from the analysis since there is no data indicating whether it is a presidential or parliamentary regime. All regressions include time dummies and constants (not shown). Dependent variable is real GDP per capita growth. The figures in parentheses are standard errors. *, **, *** indicate statistical significance at 10, 5 and 1% respectively.

Appendix

Table A1 - *Summary of variables, description, and sources*

Variable	Description	Definition	Source
Resource abundance	Natural resource rents (US$ per capita)	Non-renewable resource rents per capita. Sum of mineral, forestry and energy resources, excluding forestry rents.	Rambaldi *et al. (*2005), World Bank (2006)
Investment	(% GDP)	Gross capital formation (formerly gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Fixed assets include land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. Inventories are stocks of goods held by firms to meet temporary or unexpected fluctuations in production or sales, and "work in progress." According to the 1993 SNA, net acquisitions of valuables are also considered capital formation. Data are measured as percentage of GDP.	World Development Indicator (WDI) database
Openness	Trade (% GDP)	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.	WDI database
Institutional quality		Unweighted average of quality of bureaucracy, corruption and law and order. It ranges from 0 (bad institutions) to 1 (good institutions).	Generated based on Knack's (2000) definition. Data from Political Risk Services
Latitude		Latitudinal distance from the equator, in absolute degrees terms	Treisman (2000, 2007)
Latin	Regional dummy	Latin = 1 for Latin American countries = 0 otherwise	Coding based on World Bank's country classifications
Africa	Regional dummy	Africa = 1 for African countries = 0 otherwise	Coding based on World Bank's country classifications
GDP per capita	Income level	Gross domestic product divided by midyear population (constant 2000 US$).	WDI database

RULE	Rule of law	Measure of law and order. It ranges from 1 (weak law and order) to 6 (strong law and order). The law component measures the potency and fairness of the legal system. Whilst the order component is intended to measure the general adherence to the law (Data available for the period 1984-2005).	Political Risk Services
BUREAUCRACY	Bureaucratic quality	The maximum point is 4, which is given to countries where the bureaucracy has the power and capability to govern without radically adjusting policy or interrupting government services. (Data available for 1984-2005).	Political Risk Services
CORRUPT	Corruption in government	Measures the level of corruption within the political system. The form of corruption measured here covers bribes, nepotism, bribing of public servants etc. (Data available for the period 1984-2005).	Political Risk Services
MAJ	Majority regime	A dummy variable for majority regime. MAJ = 1 plurality or majority regime = 0 proportional regime	Generated based on data from Beck *et al.* (2001)
PRES	Presidential regime	A dummy variable for presidential regime. PRES = 1 presidential regime = 0 parliamentary regime	Generated based on data from Beck *et al.* (2001)
DEM	Democratic regime	A dummy variable for democratic regime. DEM =1 democratic regime = 0 non-democratic regime	Fraser Institute (http://www.freetheworld.com)

Table A2 - *List of countries in the sample: averaged 1984 – 2003*

Country	Institutional quality	Resource abundance	Real GDP per capita growth
Finland	1.00	5.33	2.15
Sweden	1.00	40.03	1.70
Denmark	1.00	83.56	1.90
Netherlands	0.99	164.68	2.25
Iceland	0.99	37.74	1.65
Canada	0.99	681.23	2.05
New Zealand	0.98	126.06	1.40
Norway	0.96	1147.03	2.60
Australia	0.93	480.49	2.25
USA	0.91	329.93	2.15
Bahrain	0.65	3184.14	1.73
Malaysia	0.65	264.92	3.58
Botswana	0.65	39.55	5.44
Chile	0.64	231.71	-0.18
South Africa	0.64	119.31	-0.18
Oman	0.60	2488.93	2.11
Brazil	0.58	62.17	1.03
China	0.57	29.53	8.75
Saudi Arabia	0.57	2957.60	-0.95
Morocco	0.57	8.98	1.83
Trinidad and Tobago	0.56	1071.98	1.20
Jordan	0.56	11.90	-0.01
India	0.54	11.37	3.73
Ecuador	0.54	197.74	0.60
Papua New Guinea	0.53	182.93	0.64
Tunisia	0.53	81.05	2.48
Madagascar	0.53	0.01	-1.03
Iran	0.52	395.75	0.87
United Arab Emirates	0.52	5157.65	-2.16
Venezuela	0.51	838.77	-1.01
Dominican Republic	0.51	14.73	2.09
Mexico	0.49	244.63	0.91
Zimbabwe	0.47	16.92	-1.17
Guinea	0.47	23.58	0.99
Egypt	0.47	57.93	2.21
Cameroon	0.46	74.04	-0.95
Senegal	0.44	0.93	0.14
Jamaica	0.44	52.17	1.49
Ghana	0.44	3.35	1.99
Algeria	0.43	355.83	0.07
Gabon	0.42	747.21	-1.04
Niger	0.41	0.19	-1.41
Zambia	0.40	25.63	-1.09
Suriname	0.40	160.40	0.18
Peru	0.40	63.80	0.60
Guyana	0.36	51.66	1.95
Sierra Leone	0.35	63.53	3.55
Indonesia	0.34	63.53	3.55
Togo	0.32	2.35	-0.39
Bolivia	0.32	50.03	0.49
Nigeria	0.32	116.99	0.91
Sudan	0.27	7.43	1.99

Congo Rep.	0.12	210.46	-1.72

Table A3 - *Cross Country Summary Statistics Data* ***(NOT for publication)***

Variable	Observations	Mean	Std. Dev.	Min	Max
Initial income level	53	5898.30	8396.43	45.23	34845.57
Growth	53	1.20	1.95	-2.16	8.75
Investment	53	20.22	5.31	7.06	32.63
Openness	53	69.53	35.71	18.74	186.04
Resource abundance	53	429.79	952.25	0.01	5157.65
Institutional quality	53	0.57	0.22	0.12	1.00

Source: Authors' calculations based on WDI data.

Table A1 - *Panel Summary Statistics Data* ***(NOT for publication)***

Variable	Observations	Mean	Std. Dev.	Min	Max
Initial income level	954	5898.30	8321.20	45.23	34845.57
Growth	954	1.19	3.26	-12.06	13.37
Investment	954	20.20	6.21	4.38	45.05
Openness	954	69.74	37.90	12.85	256.30
Resource abundance	954	413.02	932.84	0.00	6410.08
Institutional quality	954	0.57	0.23	0.09	1.00
BUREAUCRACY	954	2.29	1.12	0.00	4.00
RULE	954	3.63	1.54	0.56	6.00
CORRUPT	954	3.27	1.45	0.00	6.06

Source: Authors' calculations based on WDI data.