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Abstract

Oil-dependent countries suffer from bad institutions, but is oil the culprit? Herein we argue that weak institutions lead to resource dependence, and that this form of reverse causality does not merely bias the estimated effect of oil dependence, it is solely responsible for it. We highlight this point in a novel way. We first document a robust inverse relationship between oil dependence and institutional quality across countries. We then re-estimate this relationship holding the value of resource production constant across all countries. The two sets of results are statistically indifferent, meaning that variation in GDP fully explains why oil-dependent economies suffer from bad institutions. This remarkable finding offers broad implications that reach beyond the resource-development literature and speaks generally to the practice of scaling explanatory variables by GDP.

Keywords: Resource Curse; Resource-Dependent Countries; Estimation Bias

JEL Classification: Q3; Q4

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1 Introduction

Resource-dependent economies grow slowly (Sachs and Warner, 1995, 1999, 2001; Papyrakis and Gerlagh, 2004; Mehlum, Moene and Torvik, 2006; James and Aadland, 2011). Since Sachs and Warner's seminal contributions, researchers have expanded this literature beyond growth to include a broader set of development outcomes. Resource-dependent economies suffer from bad education outcomes (Gylfason, 2001; Papyrakis and Gerlagh, 2004; Papyrakis and Gerlagh, 2007[1]; Cockx and Francken, 2015), bad health outcomes (Ross, 2001b; Bulte, Damania and Deacon, 2005), poverty (Ross, 2001b), and poor institutional quality (Leite and Weidmann, 1999; Papyrakis and Gerlagh, 2004; Bulte, Damania and Deacon, 2005; Busse and Gröning, 2013)[2]. These findings reaffirmed the idea that natural resources "curse" economic growth and development. In fact, Sachs and Warner (2001) claim that, "Empirical studies have shown that this curse is a reasonably solid fact". However, the main explanatory variables used in much of this literature, resource dependence, is inherently endogenous to the overall size of the economy. In fact, resource dependence can be thought of as the product of two variables: resource abundance and the inverse of GDP. To the extent that GDP (GDP^{-1}) is positively (negatively) correlated with economic development, we find that the resource curse is explained as a statistical artifact.

The present paper is not the first to recognize the endogenous nature of resource dependence. Brunnschweiler and Bulte (2008) show that after instrumenting for resource dependence using resource abundance[3], there is an insignificant relationship between resource dependence and economic growth. They further find that resource abundance has a direct

[1]Though James (2017) shows that public education is relatively well funded in resource-rich U.S. states, and that private education spending is crowded out as a result.

[2]Mehlum, Moene and Torvik (2006) alternatively treat institutional quality as an exogenous variable, and find that the inverse relationship between resource dependence and growth is specific to countries with poor institutions. However, these results have recently been shown to be sensitive to sample selection (Kaffine and Davis, 2017).

[3]Resource abundance can simply be thought of as the numerator of resource dependence. It is a measure of the value of natural resources.

and positive effect on economic growth. Their measure of resource abundance was however criticized by van der Ploeg and Poelhekke (2010) who, using an arguably more exogenous measure of resource abundance, find no significant relationship between resource abundance and growth. The inverse relationship between resource dependence and growth has also been argued to reflect a resource "drag" rather than a "curse", whereby a slow-growing natural-resource sector slows growth in the aggregate economy (Boyce and Emery, 2011; Davis, 2011; James and James, 2011; James, 2015).[4] Examining a host of education outcomes, Stijns (2006) distinguishes between resource abundance and dependence. He finds that, while measures of resource dependence (e.g., mineral export share) are negatively correlated with educational attainment and life expectancy, measures of resource abundance (e.g., resource rents per capita) tend to be positively correlated with education outcomes and insignificantly correlated with life expectancy. Alexeev and Conrad (2009, 2011) find that resource abundance and dependence are both positively associated with income levels, school enrollment rates, and life expectancy (but only in non-transition economies). They also find that resource abundance is negatively associated with infant mortality but also with one measure of institutional quality (voice and accountability). Use of resource dependence as an explanatory variable has been criticized more recently by others as well, see for example, van der Ploeg and Poelhekke (2017).

In spite of this existing literature, economist's current understanding and appreciation of the depth and breadth of the resulting "resource dependence" bias is incomplete. Recent and ongoing research relating to resource-rich economies continues to use resource dependence in their analysis (see for some examples: Busse and Gröning, 2013; El Anshasy and Katsaiti, 2013; Cockx and Francken, 2014; Farhadi, Islam and Moslehi, 2015; Venables, 2016; Cockx and Francken, 2016; Douglas and Walker, 2017; Ebeke and Etoundi, 2017; Arin and Elias,

[4] James (2015), for example, shows that regressing growth on resource dependence yields a coefficient that is equal to the average growth rate of the natural-resource sector, less the average growth rate of the non-natural-resource sector. But scaling resource production by GDP is not purely to blame for this result. All else equal, oil-*abundant* economies tend to grow slowly during periods in which the price of oil falls.

2018).[5]

To highlight the confounding effect of scaling explanatory variables by GDP, we focus our analysis on the relationship between energy dependence (oil and natural gas production relative to GDP) and institutional quality.[6] We start by estimating the unconditional relationship between energy dependence and institutional quality using a cross section of countries. We then fix the value of energy production (the numerator of resource dependence) for all countries, and estimate the relationship between institutional quality and what is effectively the inverse of GDP. This method reveals whether variation in energy production or GDP is correlated with variation in institutional quality.

Consistent with the extant literature, we find that energy-dependent countries indeed suffer from low levels of institutional quality including a lack of rule of law, political stability, and government effectiveness. However, holding energy production constant across all countries leaves the results virtually unchanged. This remarkable finding means that the observed inverse relationship between oil dependence and institutional quality has little, if anything, to do with oil. In fact, this result is fully explained by variation in the denominator of energy dependence (GDP). All else equal, poor economies tend to have low levels of GDP, weak institutions, and are hence dependent on what is perhaps the only surviving industry: natural-resource extraction.

2 Empirical Methods & Data

The empirical analysis consists of first unconditionally regressing measures of institutional quality on energy dependence. Because we are interested in evaluating the strength of insti-

[5]In some cases, such as in Cockx and Brancken (2014), resource wealth is measured in a variety of ways including resource dependence.

[6]We chose to focus on institutional quality because anecdotal examples of oil-rich, institution-poor countries abound (see, for some examples, Angola, the Democratic Republic of the Congo, or Gabon) and because the extant literature has identified a robust negative relationship between point-resource dependence (dependence on fossil fuels and minerals) and various measures of institutional quality. See for some examples: Ross (2001); Leite and Weidmann, 1999; Bulte, Damania, and Deacon, 2005.

tutions in energy-rich economies, and not in identifying the causal effect of energy wealth, concerns of endogeneity that typically accompany cross-sectional analysis do not apply. The relationship between energy dependence and institutional quality is estimated using equation (1) below:[7]

$$IQ_i = \alpha_0 + \beta_0 \frac{R_i}{GDP_i} + \epsilon_{0,i}, \tag{1}$$

where R_i is the value of resource production and IQ_i is one of six measures of institutional quality in country i. We start by estimating this equation using year 2000 data, though later this will be relaxed. While finding that $\beta_0 < 0$ is consistent with the idea that oil dependence degrades institutions, this could alternatively be explained by reverse causality; low income countries are naturally resource dependent, and may also have weak institutions. In fact, it's possible that the estimate of β_0 is fully explained by variation in GDP^{-1}. We test this by estimating equation (2) below in which resource abundance is fixed across all countries:

$$IQ_i = \alpha_1 + \beta_1 \frac{S}{GDP_i} + \epsilon_{1,i}, \tag{2}$$

where S is a scaling parameter, and is constant across all countries.[8] Without scaling, setting R_i to unity significantly decreases the variance of the explanatory variable. Even if β_0 is perfectly explained by variation in GDP$^-$1, $\beta_0 \neq \beta_1$ because of differences in the variance of the two explanatory variables. The scaling parameter, S, is the standard deviation of resource dependence relative to that for GDP^{-1}.[9] This assures that var(R_i/GDP_i) = var(S/GDP_i).

[7]Energy dependence is defined as the value of oil and natural gas production (a measure of resource abundance) relative to GDP.

[8]Alternatively, one may consider regressing institutional quality on energy production (the numerator of energy dependence), and condition on GDP. But this is invalid as energy production may affect institutional quality through its effect on income. In essence, the effect (or perhaps only part of the effect) of energy production on institutions is captured by GDP. For this reason, Alexeev and Conrad (2009) warn against this approach and instead instrument GDP using purely exogenous factors including latitude, and indicators for European, Latin American, and East Asian populations.

[9]Let the variance of resource dependence be given by σ_1 and let that for GDP^{-1} be given by σ_2. Because S is a constant, the variance of $S \times GDP^{-1}$ is then $S^2 var(\frac{1}{GDP})$. Substitution yields $S^2\sigma_2$ and defining S as

After scaling GDP^{-1}, if $\beta_0 = \beta_1$, we can conclude that the negative correlation between institutional quality and resource dependence is in fact due to variation in GDP—not energy production.

Data on oil and natural gas production was collected from (Ross and Paasha, 2015). This data describes the nominal value of oil and natural gas across many countries and years. In the baseline estimation equation, we measure resource dependence as the value of oil and natural gas production relative to GDP in the year 2000.

Each measure of institutional quality ranges from -2.5 (worst institutions) to 2.5 (best institutions). Control of Corruption (Cont. of Corr.) corresponds to public perception of the extent to which political elites can use their power for personal gain. Rule of Law similarly corresponds to perceptions regarding the quality of contract enforcement and strength of property rights. Regulatory Quality (Reg. Quality) reflects perceptions of the governments ability to implement policies and regulations that support development in the private sector. Similarly, Government Effectiveness (Gov Effect.) reflects perceptions of the governments commitment to quality policy formulation and implementation. Political Stability (Political Stab.) refers to the absence of violence and terrorist attacks and Voice and Accountability (Voice & Acc.) measures perceptions of the quality of democracy, as well as freedom of expression and media. For all measures of institutional quality, data were collected from Worldwide Governance Indicators, produced by Daniel Kaufmann and Aart Kraay.[10]

3 Results

We start by discussing the relevant summary statistics that are provided in Table 1. Averaged across all countries, oil and gas dependence in 2000 was .090. The maximum level of energy dependence was 0.921 (Democratic Republic of the Congo). The scaling parameter S is 304

$\frac{\sigma_1}{\sigma_2}$ yields σ_1 (the variance of resource dependence).

[10]See the appendix for more detailed descriptions of each measure of institutional quality.

million, and, by construction, the standard deviation of $S \times GDP^{-1}$ is equal to that of energy dependence (0.19). Further, the mean of $S \times GDP^{-1}$ (0.111) is similar to that for energy dependence. Figure 1 describes in more detail the distributions of energy dependence and $S \times GDP^{-1}$, which are quite similar.

The six measures of institutional quality are bounded between -2.5 (lowest measure of institutional quality) and 2.5 (the highest measure of institutional quality). The average value of the institutional quality index is close to zero, with minimum and maximum values near -2 and 2, respectively. While the different measures of institutional quality are certainly correlated across countries (the correlation between Voice and Accountability and Political Stability, for example, is 0.728), there is important variation as well. For example, North Korea has a Voice and Accountability measure of -2.13 but a political stability measure of 0.025. Additional examples abound; Cuba has a Regulatory Quality index of -1.27 and a Control of Corruption index of 0.51.

Panel (a) of Figure 2 is a scatter plot describing the relationship between the Voice and Accountability index and energy dependence. Panel (b) of the same figure describes the relationship between that same index and $S \times GDP^{-}1$. Figures 3-7 similarly provide these scatter plots for the five additional measures of institutional quality.

As can be seen from panel (a) of figures 2-7, energy-dependent countries tend to have weak institutions; there is a negative correlation between energy dependence and all six measures of institutional quality. Remarkably however, a similar negative relationship exists between institutional quality and $S \times GDP^{-1}$. In fact, for the majority of indexes, the data distributions appear to be nearly identical regardless of whether the explanatory variable is energy dependence, or the weighted measure of GDP^{-1}.

Table 2 provides the exact slope estimates for each of the best fitting lines given in Figures 2-7. The last column of Table 2 gives the p-value of an F-test of whether the two slope coefficients are different from one another. In all cases, we fail to reject the null hypothesis that the two estimates are the same.

4 Robustness Checks

We carry out a variety of robustness checks. First, we re-estimate all of the baseline regressions using 2010 data, rather than 2000 data. This assures our results do not reflect peculiarities in the data that are specific to the year 2000. Additionally, while our analysis is designed to determine whether oil production is correlated with weak institutions, and not whether oil production degrades institutional quality, we nonetheless condition our results on both latitude and region fixed effects which helps account for meaningful unobserved heterogeneity. Finally, following Alexeev and Conrad (2009), we estimate the relationship between institutional quality and energy *abundance* which we define as 1) energy production relative to population, 2) the natural log of energy production, and 3) an indicator variable for being an energy producer. For each measure of energy abundance, we estimate the unconditional effect on the various institutional indexes and use 2000 data.

We start by re-estimating our baseline results using 2010 data. Rather than providing scatter plots for each institutional index, we instead focus on the estimated slope coefficients which are provided in Table 3. The results are similar to before. Control of Corruption, Rule of Law, and Political Stability are similarly related to both energy dependence and the inverse of GDP. However, inverse GDP is more negatively correlated with both Rule of Law and Government Effectiveness than is energy dependence. This is consistent with the idea that energy wealth actually enhanced the quality of these two types of institutions. Finally, Voice and Accountability is more negatively associated with energy dependence than with inverse GDP. This result is consistent with the idea that energy wealth degraded the quality of this type of institution. This particular finding compliments those of Alexeev and Conrad (2011) which documents a similar result.

We also re-estimate equation 2 (using 2000 data) after controlling for regional and latitudinal fixed effects.[11] These results are given in Table 4. The associated p-values are relatively large, the smallest being 0.407 for the Political Stability index. As with the unconditional results, there is no evidence that energy abundance is correlated with low institutional quality.

Our results are reinforced by a more conventional analysis of the relationship between institutional quality and energy abundance. For context, we start with an examination of the relationship between two measures of energy abundance and dependence. The correlation between energy dependence and energy production per capita (panel (a) of Figure 8) is 0.49. Similarly, the correlation between energy dependence and the natural log of energy production is just 0.47. Table 5 lists the 30 most energy abundant countries. Column 2 of Table 5 gives the country rank according to energy dependence. Note that the five most energy-dependent economies (DRC, Angola, Yemen, Gabon, and Qatar) have low average levels of institutional quality, but these countries are actually not the most heavily endowed with oil and natural gas. In fact, the United States, Russia, Saudi Arabia, Canada, and Iran were the most energy rich countries in 2000, and these countries have relatively high levels of institutional quality.

The estimated unconditional relationship between the various measures of energy abundance and institutional quality are given in Table 6. There is little evidence that energy abundant countries (regardless of how they are defined) suffer from weak institutions. In fact, defining energy abundance as oil and gas production relative to population, energy abundant economies enjoy high levels of Control of Corruption, Rule of Law, Government Effectiveness, and Political Stability. However, these results are not robust to controlling for regional and latitudinal fixed effects (those results are not given but are available from the authors upon request).

[11] Regional fixed effects account for any region-specific error that is correlated with explanatory variables. Latitudinal fixed effects account for the effect of being in the tropics (a well-documented determinant of growth, see for example Sachs, 2001).

5 Bridging Two Literatures

Early research on the resource curse (e.g., Sachs and Warner, 1995, 1999, 2001; Mehlum, Moene and Torvik, 2006; Papyrakis and Gerlagh, 2007; Williams, 2010; James and Aadland, 2011), relied heavily on cross-sectional data sets. Such studies regressed per capita income growth from time t to $t + n$ (where $n \approx 20$) on resource dependence and a host of control variables all measured at time t. The vast majority of this research documents a negative and significant coefficient on resource dependence and interpreted this finding as evidence of a resource curse.

More recently researchers have grown skeptical of this interpretation (see, for example, Van der Ploeg, 2011), citing concerns of endogeneity, omitted variable bias, and reverse causality. In an attempt to avoid some of these confounding issues, many researchers have more recently opted to analyze panels of data with fixed effects, case studies of particular resource discoveries, particular mines, or sub-national regions like U.S. counties. This literature usually finds significant, positive, and persistent economic gains associated with resource booms and discoveries.

Smith (2015) examines the short and long-run effects of hydrocarbon discoveries across countries using a difference in differences approach as well as the synthetic control method. He finds that income per capita spikes in tandem with the timing of major oil discoveries, especially for poor, non-OECD countries. More surprisingly though, the estimated income effects of resource discoveries are persistent, in some cases lasting through the end of the sample period (more than forty years). Smith also finds mixed evidence of positive long-run effects of resource discoveries on capital formation and educational attainment.[12]

Similarly, Michaels (2011) analyzes the long-term effects of resource-based specialization in the southern United States. He finds that oil discoveries made in the 1890s "facilitated long

[12]Utilizing the synthetic control method Mideksa (2013) similarly finds that the long-run economic impact of oil production in Norway was positive and significant.

term local economic development." More precisely, by late in the 20th century, treatment counties (those laying above major oil fields) were more likely to be intersected by a major highway and more likely to have developed a civilian or public airport. He further finds that treatment counties experienced more rapid growth in income and population (which explains some of the added development of infrastructure).[13]

The Appalachian coal boom of the 1970s also generated significant economic gains that were diminished during the subsequent bust of the 1980s. More specifically, Black, McKinnish and Sanders (2005) document significant spill over effects associated with the booming (and later busting) coal industry in Appalachia. As the price of coal rose in the 1970s, non-coal industry employment, earnings, and wages rose in tandem. However, as the price of coal fell from 1980 onward, the spill over effects were maintained such that non-coal industry employment and wages fell.

In summary, the more recent research on the effect of resource discoveries and booms tends to find positive, significant, and often persistent economic effects. What then mollifies the contrasting findings of the earlier cross-sectional research? Some have argued that the culprit is omitted variable bias; there is simply too much unobserved variation across countries that explains growth and development that is correlated with resource wealth. This paper offers an alternative explanation. Cross sectional studies of the resource curse overwhelmingly utilized an endogenous measure of resource abundance, namely, resource dependence. In highlighting this point, this paper comes to the defense of cross-sectional studies of natural resources and development. In fact, cross sectional analyses of resource *abundance* and development are largely consistent with the findings of more recent work that has utilized quasi natural field experiments, case studies, and panel data with fixed effects.

[13]Caselli and Michaels (2015) conversely find that oil windfalls have had a minimal impact on the living standards of local residents in Brazilian municipalities. Jacobsen and Parker (2015) find that the oil boom of the late 1970s

6 Conclusion

A large literature reports evidence that natural resources hinder, rather than promote growth and development. This robust finding has lead many economists and political scientists to consider natural resources a “curse”. However, a large majority of the empirical evidence in favor of a resource curse has utilized a confounding measure of resource wealth: resource dependence.

Typically, resource dependence is defined as the product of resource abundance (e.g., the value of oil or agricultural production) and the inverse of GDP. Because GDP is positively correlated with many development outcomes, the inverse of GDP and hence resource dependence tends to be negatively correlated with development outcomes. This paper is not the first to point this fact out (see Brunschweiler and Bulte, 2008; Alexeev and Conrad, 2009; Alexeev and Conrad, 2011). However, the implications of weighting resource production by GDP are not fully understood or appreciated.

In this paper we show that, consistent with the extant literature, energy (oil and natural gas) dependent countries suffer from relatively low levels of institutional quality. We highlight the confounding influence of energy dependence by holding energy production (the numerator of energy dependence) constant, and re-estimate the relationship between institutional quality and energy dependence. Remarkably, we find that fixing energy production across countries has virtually no effect on the point estimates. In other words, variation in the denominator of energy dependence (GDP) fully explains the observed inverse relationship between energy dependence and institutional quality. We conclude that energy production is largely uncorrelated with institutional quality.

These results offer implications for past and future work. Conclusions drawn from studies of resource dependent economies should be viewed with caution. Future work should measure resource wealth as abundance, such as resource production per capita (as is suggested by Alexeev and Conrad, 2009), or better yet focus on quasi natural field experiments (such as Smith, 2015; Mideksa, 2011; Michaels, 2011; Jacobsen and Parker, 2015). Whether our conclusion applies to a broader set of growth determinants that are often measured relative to GDP (e.g., foreign aid, government spending, capital investments, manufacturing production) is an important area of future research.

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8 Tables and Figures

Table 1: Summary Statistics

Variable	Mean	Std. Dev.	Min.	Max.
S	3.04e+8	0	-	-
Res. Dep.	.090	.191	0	.921
$\text{S}\times\ \text{GDP}^{-1}$	.111	.191	0	1.012
Cont. of Corr.	.006	1.013	-1.516	2.585
Rule of Law	-.093	.989	-2.113	1.937
Reg. Quality	.026	.942	-2.098	2.119
Gov. Effect.	.014	.978	-1.842	2.170
Political Stab.	-.108	.971	-2.281	1.668
Voice & Acc.	-.084	.968	-2.061	1.764

Note. Each measure of institutional quality is bounded between -2.5 (low quality) and 2.5 (high quality). All outcomes in this table are measured in 2000.

Table 2: Coefficient Estimates (2000 Data)

	Cont. Corr.	Rule	Reg. Qual.	Gov. Eff.	Pol. Stab.	Voice
Explanatory Variable: $\frac{R_i}{GDP_i}$						
Coeff.	-1.067***	-1.001***	-1.410***	-1.097***	-.725*	-1.686***
(Std. Err.)	(.321)	(.342)	(.323)	(.293)	(.428)	(.243)
N	158	158	158	158	158	158
R^2	.040	.037	.081	.045	.020	.110
Explanatory Variable: $\frac{S}{GDP_i}$						
Coeff.	-1.398***	-1.551***	-1.770***	-1.752***	-.918**	-1.266***
(Std. Err.)	(.325)	(.373)	(.300)	(.401)	(.420)	(.363)
N	158	158	158	158	158	158
R^2	.069	.089	.128	.116	.032	.062
p-value	0.310	0.142	0.232	0.104	0.645	0.250

Note. This table gives results from 12 different and independent regressions. Below each coefficient is the corresponding standard error. The last row gives the p-value of an F test of whether the two coefficients, for each type of institutional quality, are significantly different from one another.

Table 3: Coefficient Estimates (2010 Data)

	Cont. Corr.	Rule	Reg. Qual.	Gov. Eff.	Pol. Stab.	Voice
Explanatory Variable: $\frac{R_i}{GDP_i}$						
Coeff.	-1.428***	-1.282***	-1.483***	-1.359***	-.456	-2.317***
(Std. Err.)	(.338)	(.339)	(.336)	(.320)	(.380)	(.303)
N	161	161	161	161	161	161
R^2	.063	.053	.076	.061	.007	.176
Explanatory Variable: $\frac{S}{GDP_i}$						
Coeff.	-1.305***	-1.917***	-2.331***	-2.228***	-.300	-1.366***
(Std. Err.)	(.404)	(.411)	(.463)	(.443)	(.424)	(.440)
N	161	161	161	158	161	161
R^2	.028	.064	.102	.089	.001	.033
p-value	0.763	0.123	0.069	0.051	0.714	0.032

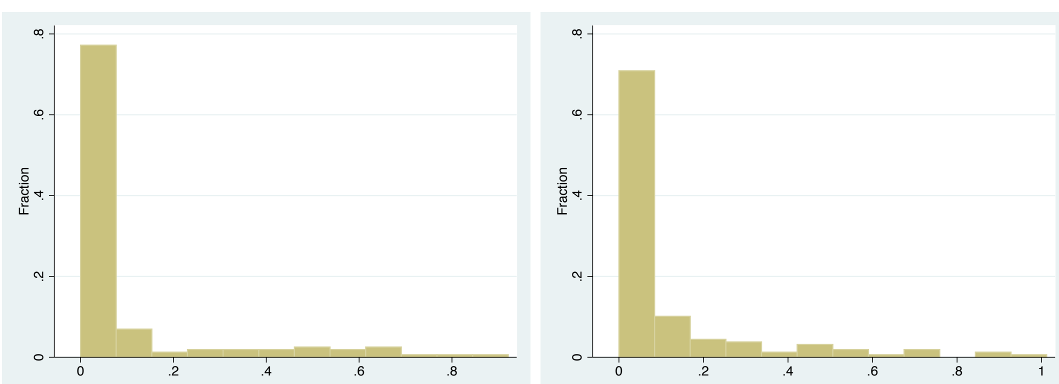
Note. This table gives results from 12 different and independent regressions. Below each coefficient is the corresponding standard error. The last row gives the p-value of an F test of whether the two coefficients, for each type of institutional quality, are significantly different from one another.

Table 4: Conditional Coefficient Estimates (2000 Data)

	Cont. Corr.	Rule	Reg. Qual.	Gov. Eff.	Pol. Stab.	Voice
Explanatory Variable: $\frac{R_i}{GDP_i}$						
Coeff.	-.862*	-.917**	-1.456***	-.955**	-.887*	-1.043**
(Std. Err.)	(.441)	(.435)	(.482)	(.394)	(.644)	(.424)
N	154	154	154	154	154	154
R^2	.654	.674	.642	.666	.564	.655
Explanatory Variable: $\frac{S}{GDP_i}$						
Coeff.	-.651	-.962*	-1.169**	-1.116**	.363	-.839*
(Std. Err.)	(.497)	(.512)	(.486)	(.401)	(.628)	(.458)
N	154	154	154	154	154	154
R^2	.648	.676	.767	.672	.551	.647
p-value	0.674	0.929	0.557	0.753	0.407	0.658

Note. This table gives results from 12 different and independent regressions. Below each coefficient is the corresponding standard error. The last row gives the p-value of an F test of whether the two coefficients, for each type of institutional quality, are significantly different from one another.

Figure 1: Data Distributions



(a) $\frac{R_i}{GDP_i}$ (b) $\frac{S}{GDP_i}$

Note: Panel (a) describes the distribution of energy dependence and panel (b) describes that for $S \times GDP_i^{-1}$. The maximum value of energy dependence is 0.921 (the Democratic Republic of the Congo), and the maximum value of S/GDP is 1.012 (Guinea-Bissau).

Table 5: Rank Order of Dependence and Abundance

Country	Abundance Rank	Dependence Rank	Avg. IQ
United States	1	58	1.522
Russia	2	11	-.863
Saudi Arabia	3	10	-.354
Canada	4	35	1.674
Iran	5	15	-.807
Mexico	6	36	-.034
United Kingdom	7	45	1.654
Norway	8	22	1.690
Venezuela	9	18	-.605
China	10	41	-.449
United Arab Emirates	11	20	.445
Algeria	12	14	-1.080
Kuwait	13	6	.261
Indonesia	14	28	-.761
Nigeria	15	12	-1.005
Brazil	16	48	.078
Libya	17	16	-1.077
Argentina	18	37	.026
Malaysia	19	27	.325
Australia	20	44	1.631
Qatar	21	5	.383
Oman	22	9	.353
India	23	47	-.186
Egypt	24	31	-.285
Kazakhstan	25	13	-.732
Columbia	26	34	-.615
Uzbekistan	27	8	-1.379
Angola	28	2	-1.666
Netherlands	29	55	1.910
Yemen	30	3	-.968

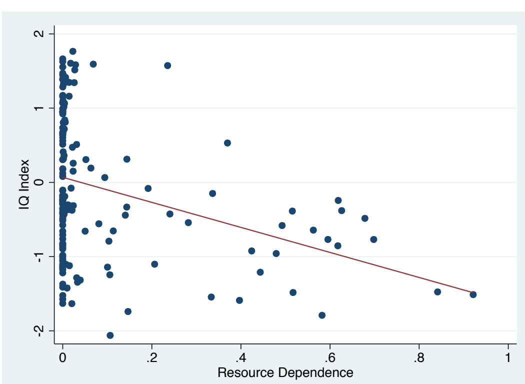
Note. Dependence Rank corresponds to resource dependence in the year 2000. Abundance Rank corresponds to resource abundance (the numerator of resource dependence), also measured in the year 2000. "Avg. IQ" is the average of all six measures of institutional quality.

Table 6: Institutional Quality and Energy Abundance

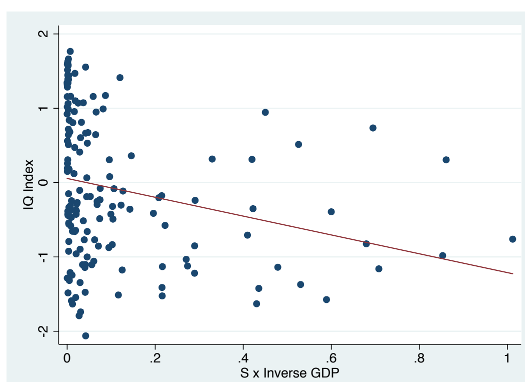
	Outcome Variable					
	Cont. Corr.	Rule	Reg. Qual.	Gov. Eff.	Pol. Stab.	Voice
Explanatory Variable: Energy/Pop						
Coeff.	.065**	.071	.313	.043*	.087***	-.017
(Std. Err.)	(.027)	(.024)	(.363)	(.025)	(.018)	(.025)
N	154	154	154	154	154	154
R^2	.019	.023	.001	.009	.038	.001
Explanatory Variable: ln(Energy)						
Coeff.	-.001	-.003	-.021	-.009	.002	-.045
(Std. Err.)	(.034)	(.036)	(.034)	(.034)	(.039)	(.040)
N	87	87	87	87	87	87
R^2	.000	.000	.004	.000	.000	.019
Explanatory Variable: Energy Producing)						
Coeff.	.205	.243	.151	.350**	.089	.078
(Std. Err.)	(.164)	(.159)	(.150)	(.157)	(.156)	(.153)
N	154	154	154	154	154	154
R^2	.010	.014	.006	.031	.002	.001

Note. This table gives results from 18 different and independent regressions. Below each coefficient is the corresponding standard error. “Energy/Pop” is the value of oil and natural gas production in 2000 relative to population, “ln(Energy)” is the natural log of energy production, and “Energy Prod.” is an indicator variable equal to unity for countries that produced any oil or natural gas in the year 2000.

Figure 2: Voice & Accountability



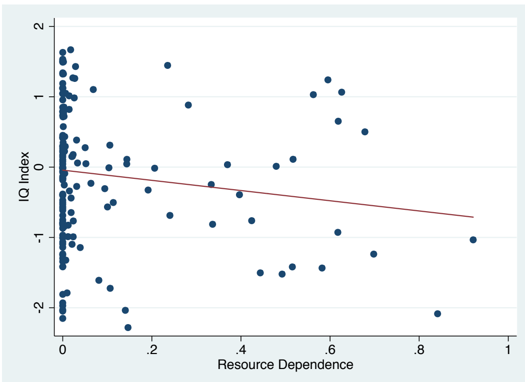
(a) Resource Dependence



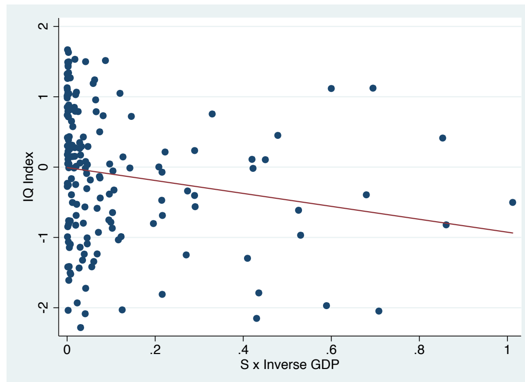
(b) S×GDP^{-1}

Bother panels are constructed using year 2000 data. An OLS best-fitting line is provided in each panel.

Figure 3: Political Stability



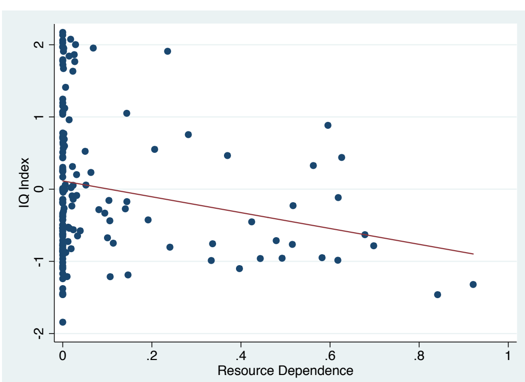
(a) Resource Dependence



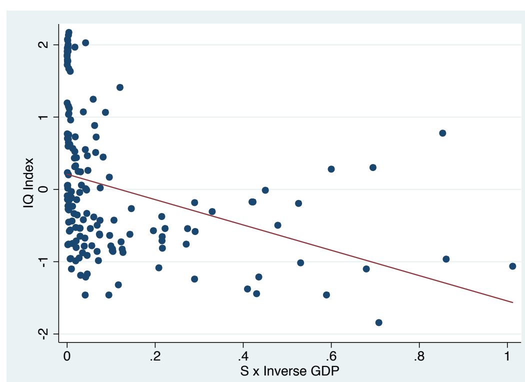
(b) $S \times GDP^{-1}$

Bother panels are constructed using year 2000 data. An OLS best-fitting line is provided in each panel.

Figure 4: Government Effectiveness



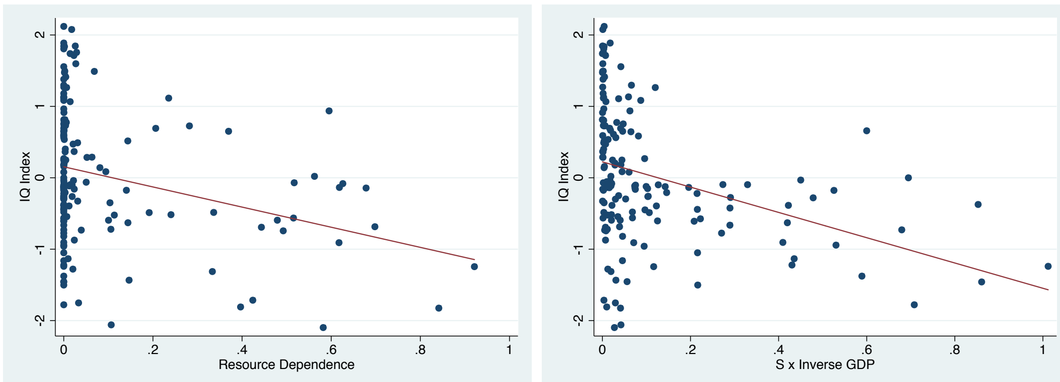
(a) Resource Dependence



(b) $S \times GDP^{-1}$

Bother panels are constructed using year 2000 data. An OLS best-fitting line is provided in each panel.

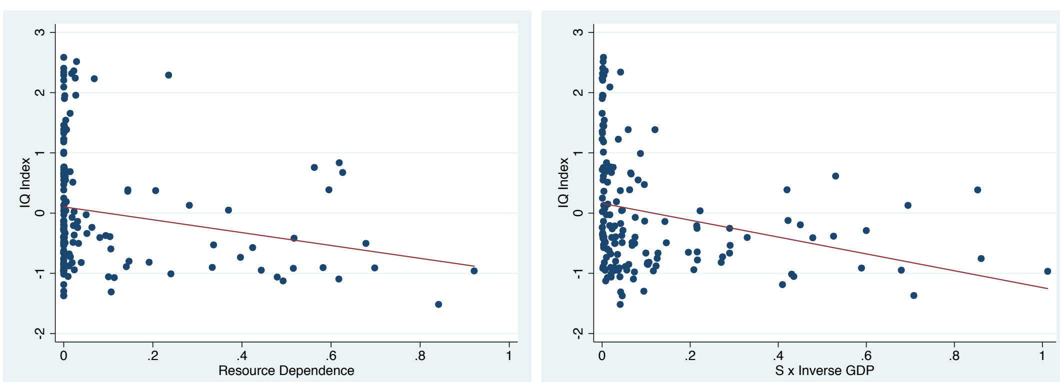
Figure 5: Regulatory Quality



(a) Resource Dependence (b) S$\times$GDP^{-1}

Bother panels are constructed using year 2000 data. An OLS best-fitting line is provided in each panel.

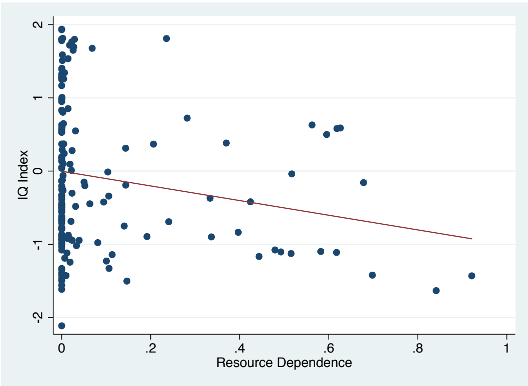
Figure 6: Control of Corruption



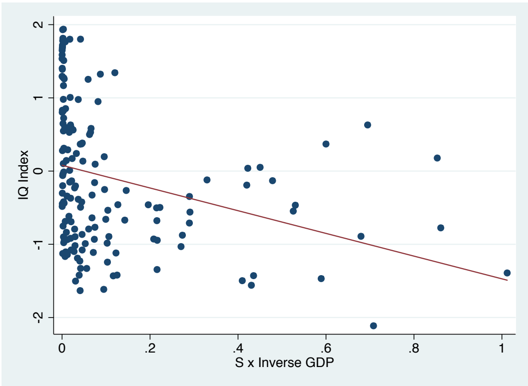
(a) Resource Dependence (b) S$\times$GDP^{-1}

Bother panels are constructed using year 2000 data. An OLS best-fitting line is provided in each panel.

Figure 7: Rule of Law



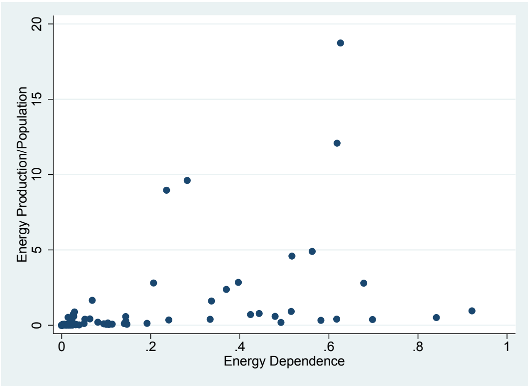
(a) Resource Dependence



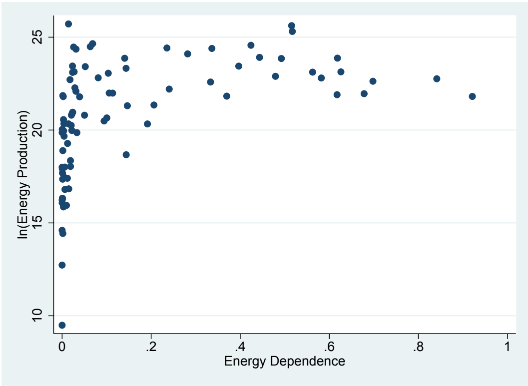
(b) S×GDP^{-1}

Bother panels are constructed using year 2000 data. An OLS best-fitting line is provided in each panel.

Figure 8: Dependence and Abundance



(a) Energy Production/Populatioin



(b) ln(Energy Production)

Note: For panel (a) the correlation between energy dependence and abundance is 0.49. For panel (b) the correlation is 0.47.

9 Appendix

All six measures of institutional quality were collected from the Worldwide Governance Indicators, produced by Danial Kaufmann and Aart Kraay. All measures range from 2.5 (wrong institutions) to -2.5 (weak institutions). Available at:
http://info.worldbank.org/governance/wgi/index.aspx#home

Control Corruption — Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

Rule of Law — Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.

Reg. Quality — Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.

Gov. Effectiveness — Reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

Political Stability — Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism.

Voice & Acc. — Reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.