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Economic Growth, Economic Freedom, and the Resource Curse

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Abstract
This study examines the relationship between resource abundance, economic freedom, and economic growth. In a cross-sectional analysis, we find that an abundance of energy is only a "curse" if it affects economic freedom and investment. Controlling for economic freedom and investment, an abundance of resources is not negatively related to growth but rather may increase economic growth. However, consistent with the literature, we find an abundance of natural resources has a negative impact on economic freedom and investment, which leads to an observed resource curse.

JEL Codes: O11, O13, O43
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I. Introduction

Many studies have demonstrated the negative relationship between natural resource abundance and economic growth. Countries with a high ratio of natural resource exports to GDP have experienced slow growth, even when controlling for other variables that may affect economic growth (Sachs and Warner, 1997; 1999). Countries with a large share of natural capital as part of their total capital (physical, human, and natural capital) have experienced a low economic growth rate (Gylfason and Zoega, 2006). Even at the state level in the United States, there seems to be a resource curse, as those states that had a high share of their output from the primary sector had a low economic growth rate (Papyrakis and Gerlagh, 2007). Countries that export energy, or rely less on imported energy than other countries, have experienced a low growth rate (shown later in Table 1A). This study tests whether this "resource curse" occurs from natural resources' negative effect on economic freedom.

A resource curse may appear for several reasons. As mentioned in Sachs (1997), those that are endowed with natural resources enjoy easy riches, which may lead to laziness and sloth, whereas those who lack natural resources may be productive by necessity. Natural resource abundance may also lead to what is referred to as the "Dutch Disease," in which a discovery of natural resources (or natural resource boom) negatively affects manufacturing exports via the real exchange rate and loss of labor in the manufacturing sector (Corden and Neary, 1982). If the manufacturing sector is characterized by learning-by-doing, then a country that has a comparative advantage in the natural resource or agricultural sector may not grow as fast as the industrialized nations (Krugman, 1987; Matsuyama, 1992). If the manufacturing sector is characterized by increasing returns to scale with low returns at low levels of investment, a poor country or state may choose to produce primary products because they may not have enough capital or access to enough demand to make investment in the manufacturing sector worthwhile.

Alternatively, the resource curse may work through a political channel, which is the focus of this paper. Tornell and Lane (1999) describe how political groups may create distortionary redistributive activity after a positive price shock. Baland and Francois (2000) describe how a resource boom may increase rent-seeking activities and lower entrepreneurship. Similarly, Torvik (2002) describes how entrepreneurs may engage in rent seeking instead of running productive firms. Political leaders can also be short sighted and over-extract the resources (Robinson, Torvik, and Verdier, 2006). Butkiewicz and Yankkaya (2010) show that developing countries suffer from a mineral resource curse, with evidence that the curse occurs because of rent seeking or weak institutions. Gylfason (2004) shows, among other things, that natural resource "intensity" is positively related to political corruption. Isham et al. (2005) show that those countries exporting "point-source" natural resources have poor institutions.

Collier (2010) describes how natural resources may affect the political structure of a country, and vice versa. For example, natural resource abundance may lead to a less accountable government than a natural resource-scarce government that depends on tax revenue, which can lead to corruption and other adverse consequences. However, poor governance and property rights can lead to violence

and rapid depletion of a resource. Haber and Menaldo (2010) point out that rulers who inherited weak institutions typically have pressing fiscal needs and short time horizons, which encourages them to extract resources at high rates today instead of saving them for tomorrow.

Sometimes the effect of natural resources on government policy can be extreme. As reported by Human Rights Watch (2009), in Zimbabwe

> police coerced local miners to join syndicates that would provide the police with revenue from the sales of diamonds that the miners found. In seeking to end illegal mining and maintain control of the fields, police engaged in killings, torture, beatings, and harassment of local miners in Marange, particularly when police "reaction teams" carried out raids to drive local miners from the diamond fields.

In 1980s Sudan, to clear out farms for oil production, the government sent armed militias to "loot cattle and burn, and to kill, injure, and capture Nuer and Dinka, whose men resisted on foot, mostly with spears" (Human Rights Watch, 2003, p. 51). Other explicit, but less extreme, examples of natural resource abundance involve nationalization, taxation, corruption, regulations, and trade protectionism. Once a country becomes dependent on a natural resource, such as Venezuela's dependence on its oil revenues, the dependence can lead to nationalization of the resource and then subsequently lead to additional government intervention in the economy to control and manage the resource.

The question of whether natural resources affect institutions is similar to the question of whether foreign aid affects institutions. After all, a discovery of a natural resource is akin to receiving a financial gift. In a study by Djankov, Montalvo, and Reynal-Querol (2008), foreign aid led to a decrease in democracy. One distinction, however, is that foreign aid may be given to influence the political structure of a country, whereas a discovery of a natural resource is more of an exogenous event. Therefore, the question in our paper is similar to but distinctly different than the question of whether foreign aid affects institutions.

Because natural resource abundance may cause government to intervene in its economy in many ways, an appropriate measure to

test for a political channel for the resource curse must be a comprehensive measure of government activity. Examples of such broad measures of government intervention in an economy are the economic freedom indices of the world. As a measure of economic freedom, we use the Economic Freedom of the World (EFW) index by the Fraser Institute (Gwartney and Lawson, 2009).[1] The political and institutional difficulties that resource abundance spawns (as discussed above) will be reflected in a country's EFW value. The EFW consists of 42 third-party indicator variables grouped into five broad areas: size of government (expenditures, taxes, and enterprises); legal structure and security of property rights; access to sound money; freedom to trade internationally; and regulation of credit, labor, and business. The index ranges from 0 to 10, with 10 indicating that a country most closely approximates the free market ideal of various institutional measures. For example, whenever a government engages in violence, nationalization, protectionism, or other types of intervention in the economy, it is restricting economic freedom, and that country's EFW value will decline. This paper primarily uses the EFW summary index, a comprehensive index that averages all of those institutional components.

Economic freedom has been shown to be positively related to economic growth. Numerous studies have used the EFW, and they have generally found a positive relationship between economic freedom and economic growth. De Haan, Lundstrom, and Sturm (2006) surveyed the literature that used the Fraser Institute's measure of economic freedom. None of the reports in their summary found that economic freedom is bad for growth. They do find some discrepancies as to whether both the change in economic freedom and the level of economic freedom are good for growth. For instance, Dawson (1998) finds that both the level and change of economic freedom are significantly correlated with economic growth, whereas De Haan and Sturm (2000) find that only the change in economic freedom is significantly correlated with economic growth. Doucouliagos and Ulubasoglu (2006) performed a meta-analysis in which they examined dozens of studies of the relationship between economic freedom and growth. Their analysis showed that there is a

[1] The Heritage Foundation and Freedom House also provide measures of economic freedom that are commonly used. Because these measures are strongly correlated, we use only the EFW measurement.

positive and robust relationship between economic freedom and economic growth, regardless of the sample of countries or measure of economic freedom. They also showed that economic freedom has a positive impact on physical capital formation, which generates economic growth.

One difficulty in analyzing the relationship between economic growth and economic freedom is endogeneity. It is quite possible that as an economy grows, people put more value on economic freedom. Although econometric studies cannot prove that economic freedom causes growth, using Granger causality tests, a few studies have demonstrated that overall economic freedom precedes growth. Dawson (2003) shows that there is evidence that the overall level of freedom causes economic growth, but the changes in freedom appear to be determined jointly with economic growth. Looking at the components of the EFW index, Dawson gets mixed results. For example, property rights appear to cause economic growth, but government size appears to be caused by growth. Heckelman (2000) uses the Heritage Foundation's economic freedom index and finds through Granger causation tests that economic freedom precedes economic growth. One exception found by Heckelman is government intervention (government consumption and ownership), which may come after economic growth, which is consistent with the view of Wagner's law.

This paper extends the literature that seeks to explain the empirically observed energy resource curse through institutional or political channels. We examine whether governments intervene in their economies so as to reduce economic freedom (lower EFW values) because of natural resource abundance. Given the established result that lowered economic freedom decreases economic growth rates, if we find that resource abundance is associated with diminished EFW, we will have identified a broad political channel to explain the resource curse. This finding is useful because of the broad nature of the EFW and direction of causality. Exploitation of energy resources precedes observations of EFW. Based on the arguments of Hayek (1960) and Friedman and Friedman (2002), plus the empirical work of Dawson (2003) and Heckelman (2000), social and political institutions (summarized by the EFW) precede economic outcomes. Having revealed a political channel for the resource curse, we can then test for traditional, "aggregate production function" channels for the resource curse. That is, we look for negative impacts of

resource abundance on capital formation or direct effects of resource abundance on growth in per capita real GDP.

In our data set, we initially observe a resource curse: Energy exporting is associated with a slower rate of economic growth. Through a series of models, we demonstrate resource abundance leads to lessened economic freedom. Slower growth in economic freedom leads to slower economic growth, even after we account for other factors. Most significantly, after controlling for the impact of resource abundance on economic freedom—and the impact of both resources and economic freedom on capital—both the direct effect of energy abundance and its indirect effect via investment are statistically insignificant predictors of economic growth. However, the residual portion of economic freedom still significantly explains economic growth rates. Thus, our evidence supports the argument that energy resource abundance negatively affects economic growth indirectly through its deleterious impact on politics and social institutions. Our evidence generally supports other research, such as Tornell and Lane (1999), Baland and Francois (2000), Torvik (2002), Butkiewicz and Yankkaya (2010), Gylfason (2004), and Isham et al. (2005), that identifies political and institutional channels for the resource curse.

II. Data and Empirical Results

We first examine whether a resource curse exists in our data. The Appendix is a guide to variables and a list of the countries included in our sample. Tables 1A and 1B display the results of a cross-sectional ordinary least squares (OLS) estimation with the growth of real GDP per capita between 1995 and 2007 (difference in logs) as the dependent variable (Penn World Tables 6.3). As a measure of natural resource abundance,[2] we use energy imports (percent of total energy use) in the mid-sample year of 2002, obtained from the World Bank Development Indicators.[3] Negative values indicate that a country is a

[2] As standard in the literature, the word "abundance" is a relative term. For a country to be more abundant in natural resources than another country does not mean it has more natural resources in an absolute sense, but instead it has more natural resources relative to the total amount of natural resources it uses.

[3] We use a cross-country setup instead of a panel for two reasons. First, the difference in natural resource abundance within a country is very small in this timeframe compared to the difference in resource abundance between countries. Second, the EFW measurements are for every 5 years until the 2000s.

net exporter of energy. Model 1 in Table 1A shows the relationship between economic growth and the percentage of imported energy in 2002, without controlling for other variables. The regression suggests a possible resource curse, as the coefficient on energy imports is positive and significantly different from zero. Given the strong possibility of omitted variable bias, the coefficient on energy imports may not represent the independent effect of energy imports on economic growth. However, this result is still useful because the theory suggests that energy abundance affects growth negatively but indirectly.

Model 2 and Model 3 in Table 1A include the initial economic freedom level and initial GDP as explanatory variables for GDP growth. The coefficient on energy imports is again positive and

Table 1A: Is There a Resource Curse?

Dependent Variable: Growth of Real GDP Per Capita 1995–2007			
	Model 1	**Model 2**	**Model 3**
Energy Imports	0.032***	0.033***	0.035***
	2.57	*2.59*	*2.68*
GDP 95		0.000099	0.00025
		0.42	*0.79*
EFW 95			-2.08
			-0.72
Constant	30.65***	29.46***	40.58***
	12.1	*7.74*	*2.55*
Number	104	104	104
R-Squared	0.061	0.063	0.067
Adj R-sq	0.05	0.044	0.039
F-stat	6.62	3.37	2.41
Prob > F	0.011	0.038	0.072
chi2(1)[a]	0.07	0.09	0.02
Prob>chi2	0.79	0.77	0.87

[a]Breusch-Pagan/Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
t-statistics are shown below coefficients. * 10%, ** 5%, and ***1% significance.

significantly different from zero, suggesting a resource curse. A country that produces more of its energy consumption than does another country, controlling for initial GDP and initial freedom, has a lower economic growth rate than the relatively energy-scarce country. The results in Model 2 and Model 3 suggest that that the resource curse is not explained away through initial conditions and that energy abundance may affect economic growth through some mechanism.

Table 1B: "Benchmark" Models of Economic Growth with Energy Resources

Dependent Variable: Growth of Real GDP Per Capita					
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Growth EFW	16.84***	18.58***	20.59***		
	4.89	*4.76*	*5.57*		
Growth PRights				8.98**	*9.73***
				2.13	*2.6*
EFW 95	9.71***	11.65***	12.1***		
	2.84	*2.94*	*3.3*		
PRights 95				*4.8*	*5.51**
				1.43	*1.7*
GDP 95	-0*	-0.005**	-0.0006*	-0.01	-0.001
	-1.8	*-1.84*	*-1.66*	*-1.46*	*-1.55*
GPOP	-0.35	-0.35	-0.53*	-0.23	-0.33
	-1.4	*-1.18*	*-1.92*	*-0.41*	*-0.59*
Investment	0.63**	0.44	0.52	0.75	0.8*
	2.02	*1.16*	*1.46*	*1.54*	*1.69*
Schooling	-0.02	0.13	-0.007	0.18	0.1
	-0.1	*0.6*	*-0.03*	*0.57*	*0.32*
Energy Imports		-0.02		-0.01	
		-0.9		*-0.55*	
Exporter			14.69**		8.14
			2.34		*1.14*
Constant	-46.2**	-60.16**	-59.44**	-10.01	-10.32
	-2	*-2.36*	*-2.45*	*-0.23*	*-0.25*
Number	72	63	64	63	64
F-stat	8.86	6.94	8.7	3.71	4.39
Prob>F	0	0	0	0	0
R-squared	0.45	0.47	0.52	0.32	0.35
Adj R-sq	0.4	0.4	0.46	0.23	0.27
chi2(1)[a]	1.68	2.43	0.59	Robust SE	Robust SE
Prob>chi2	0.2	0.12	0.44	Robust SE	Robust SE

[a]Breusch-Pagan/Cook-Weisberg test for heteroskedasticity.
Ho: Constant variance
t-statistics are shown below coefficients. * 10%, ** 5%, and ***1% significance.

Table 1B continues the regression from Table 1A but adds the standard explanatory variables for economic growth and includes economic freedom. Each model in Table 1B controls for initial GDP per capita (1995), initial EFW value (1995), the growth of EFW between 1995 and 2007 (difference in index values), the growth of population (difference in logs), and the investment share of real GDP in 2002 (Penn World Tables). Model 1 displays the regression with no natural resource variable. As expected in a Solow growth model, initial GDP is negatively correlated with economic growth, whereas investment, initial freedom, and growth of freedom are positively correlated with economic growth. The coefficients on population growth and schooling are not found to be statistically significant. The first regression gives support to the literature that links economic freedom with economic growth. Model 1 says that an increase of one unit in the Economic Freedom index (0–10 scale) from 1995 to 2007 is associated with an increase in real GDP per capita of 16.84% from 1995 to 2007, controlling for other factors that may affect economic growth.

Evidence of a direct resource curse disappears when controlling for growth in economic freedom. Model 2 in Table 1B includes energy imports in 2002 (percentage of energy use) as an explanatory variable to represent natural resource abundance. The coefficient on the energy variable is negative but not significant. A resource curse would result in a positive and significant coefficient, as in Table 1. The signs of the other coefficients do not change when the energy variable is included. The results in Model 3 suggest that not only is there no resource curse when controlling for economic freedom but that natural resources may be good for economic growth. Model 3 includes a dummy variable for natural resources: 0 if the country is a net energy importer or 1 if it is a net energy exporter. The regression results in Model 3 indicate that countries that were exporting energy experienced a 14.69% increase in GDP per capita from 1995 to 2007, controlling for other variables.

Model 4 and Model 5 are the same regression as Model 2 and Model 3 in Table 1B, except the EFW summary index is replaced with the Property Rights and Legal Structure component (also a 0–10 scale) of the index.[4] A measurement of property rights and legal

[4] An anonymous referee pointed out that property rights tends to be the dominant component in the economic freedom measurement.

structure may be a little easier to interpret than the overall economic freedom measurement. The results are similar to the regression results in the other models in the table. An increase of 1 in the security of property rights and legal structure (on a scale from 1 to 10, with 0 being the weakest property rights), is associated with an increase in economic growth of approximately 9% between 1995 and 2007. Natural resources do not harm growth after controlling for property rights, as evidenced by the energy coefficients in Models 4 and 5.[5] All of the results from Table 1B suggest that, independently, energy abundance is *not* an impediment to economic growth but, in fact, may be good for economic growth if it does not affect any other variables.

1. Energy Prior to Economic Freedom

Even though the presence of a resource curse appeared to go away in Table 1B, the curse may occur from natural resources negatively affecting key determinants of economic growth, such as economic freedom and investment. Table 2 tests whether there is a significant relationship between economic freedom and energy imports. In Models 1 through 4 in Table 2, the coefficients on the energy variables are significantly different from zero, and each shows that energy abundance is negatively correlated with growth of economic freedom. The *ZEnergy* variable is the z-score of the *Energy Imports* variable, or the difference between the raw number and the mean, divided by the standard deviation. The z-score tells us how a single observation compares to a normal observation. The *Zexp* variable is a dummy variable; 0 is assigned to the *Zexp* variable if the *ZEnergy* variable is positive, and a 1 is assigned to the *Zexp* variable if the *ZEnergy* variable negative. The *Zexp* variable allows us to divide the sample into those below the average *Energy Imports* observation and those above the average *Energy Imports* observation. The different transformations of the energy variable allow us to more robustly test the evidence of a resource curse. Regardless of how the energy variable is represented, an increase in energy is associated with a decrease in economic freedom. Note that it is possible that we are only capturing a direct resource curse and not a political channel by

[5] Because using the summary economic freedom index variable explains more variation in growth rates than using the property rights component, the summary EFW will be used in the rest of the regressions.

excluding GDP growth. For instance, if the resource curse did not work through the institutions effect but instead directly negatively affected GDP growth, which may be highly correlated with economic freedom, then including GDP growth as an explanatory variable should make the coefficient on energy insignificant. However, in Model 5 in Table 2, energy still has a significant coefficient when holding constant the variation in GDP growth.

Thus, the evidence suggests that natural resource abundance may hurt institutions directly. As mentioned earlier, natural resources may

Table 2: Resource Abundance and Economic Growth

Dependent Variable: Growth of EFW					
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
EFW 95	-0.48***	-0.46***	-0.49***	-0.47***	-0.49***
	-9.54	*-8.55*	*-9.13*	*-9.31*	*-10.7*
ZEnergy	0.2***				
	3.46				
Zexp		-0.38***			
		-2.59			
Energy Imports			0.001***		0.0006**
			3.21		*2.13*
Exporter				-0.37***	
				-2.73	
GDP Growth					0.01***
					6.52
Constant	3.65***	3.66***	3.77***	3.69***	3.32***
	10.59	*10.6*	*11.06*	*10.31*	*11.2*
Number	106	106	105	106	104
F-stat	45.77	39.28	44.11	44.31	56
Prob>F	0	0	0	0	0
R-squared	0.45	0.43	0.46	0.43	0.63
Adj R-sq	0.44	0.42	0.45	0.42	0.62

t-statistics are shown below coefficients. * 10%, ** 5%, and ***1% significance. Models 1 and 4 use robust standard errors.

lead to corruption and violence, as in the case with Sudan and Zimbabwe (Human Rights Watch, 2003; 2009). Violence and corruption will bring down EFW index components, such as property rights and regulation, even if output is held constant. The theory by Tornell and Lane (1999) suggests that natural resources may increase tax rates and redistributive activity, which would also affect components of the EFW index (components of *Size of Government: Expenditures, Taxes, and Enterprises*) at every income level. If natural resources cause rent-seeking governments (Baland and Francois, 2000; Torvik, 2002), then EFW measures will also deteriorate for each income level. Therefore, our evidence supports the theory that natural resources precede poor institutional quality.

Note that it is also possible that causality runs the other way, where poor institutions create a dependency on natural resources. Acemoglu, Johnson, and Robinson (2001) suggest that colonizers created "extractive" institutions in places that had a high European settler mortality rate. Although this may be accurate, it does not mean that natural resources did not cause poor institutions. In fact, it may strengthen our argument that natural resources cause poor institutions. Settlers chose to improve their institutions once settled, but trade and natural resource extraction were the main factors for the original voyages. In North America and Australia, the native population was mostly replaced, so the European institutions had a strong influence, but in African countries poor policies persisted without a sufficient number of European settlers. Therefore, the Acemoglu, Johnson, and Robinson (2001) argument can be restated to say that the Europeans carried similar institutions with them, but set up extractive institutions *where* natural resources were available *and where* they were unable to settle.

In Table 3, we again test the growth equation from Table 1, but we remove the effect of energy imports on the growth of economic freedom (orthogonalize economic freedom to energy imports). Model 1 in Table 3 replaces the growth-of-freedom variable (gefw) with the residuals from Model 1 in Table 2. Similarly, Models 2–4 in Table 3 replace the growth-of-freedom variable with the residuals from Models 2–4 in Table 2. We thereby "purge" the EFW of the effect of resources much as Gwartney, Holcombe, and Lawson (2006) "purge" the output of EFW's effects in economic growth models. The argument is that "institutions" (EFW) precede

Table 3. Energy, Economic Freedom, and Economic Growth

Dependent Variable: Growth of Real GDP Per Capita				
	Model 1	**Model 2**	**Model 3**	**Model 4**
GEFW Resid (1)	19.15***			
	5.08			
GEFW Resid (2)		21***		
		5.66		
GEFW Resid (3)			18.58***	
			4.76	
GEFW Resid (4)				20.59***
				5.57
EFW 95	2.96	3.19	2.53	2.49
	1	*1.13*	*0.85*	*0.88*
GDP 95	-0.0007*	-0.0006*	-0.0007*	-0.0006*
	-1.76	*-1.84*	*-1.84*	*-1.66*
GPOP	-0.4	-0.53**	-0.35**	-0.53*
	-1.42	*-1.93*	*-1.18*	*-1.92*
Investment	0.47	0.44	0.44	0.52
	1.25	*1.26*	*1.16*	*1.46*
Schooling	0.08	0.03	0.13	-0.007
	0.39	*0.16*	*0.6*	*-0.03*
ZEnergy	-0.02			
	-0.01			
ZExp		7.84		
		1.25		
Energy Imports			0.0001	
			0.05	
Exporter				6.99
				1.14
Constant	9.93	12.03	9.83	16.52
	0.47	*0.59*	*0.45*	*0.8*
Number	64	64	63	64
F-stat	69.5	8.83	6.94	8.7
R-squared	0.48	0.52	0.47	0.52
Adj R-sq	0.42	0.47	0.4	0.46
Prob>chi2	0.14	0.43	0.12	0.44

t-statistics are shown below coefficients. * 10%, ** 5%, and ***1% significance.
Note: GEFW Resid (1) corresponds to Table 2, Model 1; GEFW Resid (2) corresponds to Table 2, Model 2, etc.

"outcomes" (economic growth), so there is a clear direction of causality. This procedure is defensible in the present circumstance, given that energy resources were known and exploited prior to our initial observation of economic freedom in 1995. The coefficient on the residuals is positive and significantly different from zero, suggesting that economic freedom may play an important role in economic growth (this is the primary result of the economic freedom literature; see, e.g., Doucouliagos and Ulubasoglu, 2006; de Haan, Lundstrum, and Sturm, 2006; de Haan and Sturm, 2000), even when taking into consideration the influence of energy abundance on economic freedom. Table 3 in conjunction with Table 1B may suggest that the impact of energy resources is primarily indirect, via institutions. In Table 3, after accounting for the dependency of institutions on energy resources (in our sample), institutions remain significantly related to economic growth, whereas energy does not. Initial GDP and population growth are negatively correlated with economic growth, as is expected in a Solow growth model.

2. Energy, Economic Freedom, and Investment

Economic freedom may influence investment. For instance, Bengoa and Sanchez-Robles (2003) find that EFW is directly correlated with foreign direct investment in Latin America. Intuitively, this should be true for all forms of investment. A major component of the EFW measures the strength of property rights. Stronger enforcement of property rights and contracts and minimal risk of state expropriation (leading to a high EFW) should encourage investment. Intuitively, investment may also be related to energy extraction. Indeed, the standard story of the resource curse (resource-rich countries over-invest in extraction and under-invest in other sectors) deals with the mix of investment, if not the level. Natural resource abundance may negatively affect investment in several ways outside of the institutional effects. As mentioned earlier, Dutch-Disease effects may discourage investment, where the manufacturing sector loses competitiveness from an overvalued currency. If the manufacturing sector exhibits increasing returns to scale with positive externalities, then resources devoted to natural resource extraction may hurt the productivity of investment. The volatility of the prices of natural resources may also hurt investment by creating uncertainty. Papyrikis and Gerlagh (2006) demonstrate in a model that natural

resources crowd out investment by increasing future income without savings.

Table 4 explores the influence of energy and economic freedom on investment. Model 1 in Table 4 shows that both initial freedom level and the growth of economic freedom are positively correlated with the investment share of real GDP per capita. Model 2 shows that there may be an energy curse via investment, as the coefficient on the energy import variable is positive and significantly different from zero. Model 3 in Table 4 controls for both energy and economic freedom, and the coefficients are similar to those in Models 1 and 2. Because investment is positively related to economic growth and the coefficients in Models 1–3 may be picking up only their effects on economic growth, growth of GDP per capita can be included as an explanatory variable to identify the independent effects of energy abundance and economic freedom on investment. Model 4 includes growth of GDP per capita as an explanatory

Table 4. Investment, EFW, and Energy

Dependent Variable: Investment Share of Real GDP Per Capita				
	Model 1	**Model 2**	**Model 3**	**Model 4**
Growth EFW	4.47***		4.55***	2.86**
	4.09		*4.6*	*2.12*
EFW 95	5.74***		5.14***	4.41***
	7.43		*6.65*	*4.7*
Energy Imports		0.01***	0.008**	0.007*
		3.42	*2.02*	*1.85*
GDP Growth				0.08***
				2.44
Constant	-17.87***	21.52***	-13.73**	-10.41*
	-3.28	*24.87*	*-2.52*	*-1.68*
Number	122	105	105	104
F-stat	27.96	11.69	18.61	21.4
Prob>F	0	0	0	0
R-squared	0.27	0.1	0.33	0.37
Adj R-sq	0.26	0.09	0.31	0.34

t-statistics are shown below coefficients. * 10%, ** 5%, and ***1% significance. All models use robust standard errors.

Table 5. Generating "Purged" Investment and EFW Variables

D.V.:	GEFW (1)	INV (1)	GEFW (2)	INV (2)	GEFW (3)	INV (3)	GEFW (4)	INV (4)
EFW 95	-0.49***	2.91***	-0.48***	3.02***	-0.46***	3.18***	-0.47***	3.13***
	-9.9	*4.82*	*-9.54*	*5.09*	*-9.11*	*5.33*	*-9.31*	*5.29*
GEFW Resid (1)		4.55***						
		4.6						
GEFW Resid (2)				4.68***				
				4.72				
GEFW Resid (3)						4.76***		
						5.03		
GEFW Resid (4)								4.63***
								5.01
Energy Imports	0.001***	0.01***						
	3.47	*3.36*						
ZEnergy			0.2***	2.45***				
			3.46	*3.31*				
ZExp					-0.38***	-5.41***		
					-2.64	*-2.94*		
Exporter							-0.37***	-5.96***
							-2.73	*-3.47*
Constant	3.77***	3.42	3.65***	2.33	3.66***	2.69	3.69***	3.31
	10.99	*0.84*	*10.3*	*0.58*	*10.16*	*0.68*	*10.31*	*0.83*
Number	105	105	106	106	106	106	106	106
F-stat	49.22	18.61	45.78	19.85	43.15	18.62	44.31	19.18
Prob>F	0	0	0	0	0	0	0	0
R-squared	0.46	0.33	0.45	0.34	0.43	0.34	0.43	0.36
Adj R-sq	0.45	0.31	0.44	0.32	0.42	0.32	0.42	0.34

t-statistics are shown below coefficients. * 10%, ** 5%, and ***1% significance. All models use robust standard errors.

variable (with possible reverse causality). The coefficients of the other variables keep the same sign as in Models 1–3, and they remain significant at the 10% level. Therefore, economic freedom may have a positive influence on the investment share of GDP, whereas energy abundance may have a negative influence on the investment share of GDP.

Given these results, we orthogonalize investment to correct for the effects of energy exports and economic freedom, with "energy" coming first. Table 5, like Table 3, removes the effect of energy

abundance on economic freedom. The second, fourth, sixth, and eighth regressions in Table 5 replace the growth-of-freedom variable with the residuals that are obtained from the first, third, fifth, and seventh regressions. The first model uses growth of economic freedom as the dependent variable, with initial freedom and energy imports as the explanatory variables. The second model uses the residuals from the first model as an explanatory variable, while the dependent variable is the investment share of real GDP per capita. This approach allows us to examine the effects of energy imports on investment while controlling for the variation of growth of economic freedom that is not explained by variation of energy imports. We repeat the process with the rest of the models in Table 5 using the alternative energy variables. In each of the models, there is evidence of a channel through which resource abundance affects economic freedom, and both variables affect investment: energy abundance decreases economic freedom and investment, and depressed economic freedom further retards investment.

Because energy abundance may have an impact on economic freedom and investment, Table 6 tests the relationship of energy and economic growth while controlling for the variation in the growth of freedom and investment that is not explained by energy abundance. The economic freedom residuals and the investment residuals in Models 1 through 4 in Table 6 are taken from Models 1 through 8 from Table 5. Initial freedom, initial GDP, population growth, and school enrollment are also included in every model, but they are not shown on the table. Table 6 shows that energy does *not* play a significant role in explaining economic growth when controlling for the variation in freedom growth and investment that is not explained by energy imports. The independent part of economic freedom growth is positively correlated with economic growth, and the coefficient is significantly different from zero in each model. The coefficient on the independent variation of investment is not significant. When controlling for the initial freedom level, initial GDP per capita is negatively correlated with the growth of GDP per capita. These regressions reinforce the idea that economic freedom is positively related to economic growth, and the natural resource curse plays a role only in explaining growth through its effect on economic freedom and investment. Natural resource abundance does not appear to have a significant independent effect on economic growth.

Table 6. Economic Growth and Energy with "Purged" EFW and Investment[a]

Dependent Variable: Growth of Real GDP Per Capita				
	Model 1	**Model 2**	**Model 3**	**Model 4**
EFWres (1)	20.59***			
	5.39			
EFWres (2)		21.34***		
		5.88		
EFWres (3)			23.1***	
			6.49	
EFWres (4)				22.99***
				6.44
CAPres (1)	0.44			
	1.16			
CAPres (2)		0.47		
		1.25		
CAPres (3)			0.44	
			1.26	
CAPres (4)				0.52
				1.46
Energy Imports	0.006			
	0.35			
ZEnergy		1.12		
		0.31		
Zexp			5.45	
			0.87	
ZExporter				3.9
				0.65
Constant	11.34	11.02	13.21	18.24
	0.52	*0.52*	*0.65*	*0.89*
Number	63	64	64	64
F-stat	6.94	7.5	8.83	8.7
R-squared	0.47	0.48	0.52	0.52
Adj R-sq	0.4	0.42	0.47	0.46
Prob>chi2	0.12	0.2	0.43	0.44

t-statistics are shown below coefficients. * 10%, ** 5%, and ***1% significance.
[a]Note: EFW 95, GDP 95, GPOP, and Schooling are in each model, but they are taken out of the table to reduce the table size.

III. Conclusions

By themselves, natural resources should do no harm to economic growth. However, many studies, including this one, show that there is

a negative relationship between resource abundance and economic growth. The purpose of this paper was to attempt to explain the resource curse by examining the detrimental effects natural resources have on economic freedom. Therefore, this paper extends the literature that seeks to explain the empirical phenomenon of the resource curse through institutional or political channels (see Tornell and Lane, 1999; Baland and Francois, 2000; Torvik, 2002; Butkiewicz and Yankkaya, 2010; Gylfason, 2004; Isham et al., 2005), and not only through "production function" channels (see Sachs, 1997; Corden and Neary, 1982; Krugman, 1987; Matsuyama, 1992). There may be many channels through which natural resources affect economic growth, but the contribution of this study was to examine the negative effect natural resources have on overall economic freedom, as measured by the EFW. EFW provides a very broad measure of political policies and outcomes. EFW is strongly associated with economic growth rates. Observations of the EFW begin after the initial development of energy-extractive industries. Therefore, there is a clear test between a political channel resource curse (resource richness decreases economic freedom, which then suppresses economic growth) and a productive channel resource curse (resource richness depresses investment or directly depresses economic growth).

The resource curse goes away when controlling for other determinants of economic growth, such as economic freedom and investment. In fact, energy abundance appeared to be positively correlated with economic growth. However, the resource curse appeared to exist when the models did not control for those factors. Therefore, to determine the channel through which the resource curse affected economic growth, we regressed economic freedom and investment on energy abundance. We find that the coefficient of energy imports (percent of use) is positive and significant in both equations, which means that energy abundance is negatively related to economic freedom and investment.

There is a large literature on institutions, including economic freedom, and economic growth. However, there is a relatively smaller literature on the causes of those poor institutions. Although this study does not prove causation, it does provide evidence that growth in economic freedom is restricted by high levels of energy abundance. Although certainly there can be some reverse causality where corrupt politicians focus their attention on natural resource extraction, most

natural resources precede the poor institutions. The negative effects of poor institutions, such as lack of property rights, corruption, and overbearing regulations, on economic growth are well established. It may be easy to point to corrupt leaders as selfish or ignorant, as if those in power in the quality institutions are angels with high intellect; however, it may also be useful to further investigate the fundamental characteristics of each country that facilitates and prolongs such poor institutions.

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Appendix

Key

GDP Growth	Growth in real GDP per capita (difference in logs) between 1995 and 2007
Growth EFW	Difference in *Economic Freedom of the World* index (EFW) between 1995 and 2007
EFW 95	1995 *Economic Freedom of the World* Summary Index
Growth PRights	Difference in *Property Rights* component of EFW index between 1995 and 2007
PRights 95	1995 *Property Rights* component of EFW index (0–10 scale)
GDP 95	Real GDP per Capita (ch) in 1995 (Penn World Tables)
GPOP	% Growth in population between 1995 and 2007 (Penn World Tables)
Investment	Investment share of real GDP 2002 (Penn World Tables)
Schooling	Net secondary enrollment percentage in 2002 (World Bank Development Indicators)
Energy Imports	Percentage of energy use that was imported in 2002 (World Bank Development Indicators)
Exporter	0 if importing energy, 1 if exporting energy
ZEnergy	z-score of Energy Imports
ZExp	0 if ZEnergy variable positive, 1 if negative

Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Growth EFW	122	0.74	0.84	-2.85	3.29
Growth Prights	122	-0.09	0.99	-2.70	3.30
GDP Growth	121	26.91	26.64	-87.14	105.23
EFW 95	122	6.07	1.20	3.42	9.08
GDP 95	122	11038.88	10611.32	606.43	49863.74
GPOP	122	16.91	14.01	-11.99	59.57
Investment	122	20.24	10.29	-7.36	43.06
Schooling	73	65.18	25.27	5.34	99.52
Energy Imports	105	-25.44	199.72	-1352.04	100.00
Exporter	106	0.28	0.45	0.00	1.00
Zenergy	106	0.00	1.00	-6.64	0.63
Zexp	106	0.25	0.44	0.00	1.00

List of Countries in Data Set

Albania	Chile	Ghana	Kuwait	Pakistan	Syria
Algeria	China	Greece	Latvia	Panama	Taiwan
Argentina	Colombia	Guatemala	Lithuania	Pap. New Guinea	Tanzania
Australia	Congo, Dem R	Guinea-Bissau	Luxembourg	Paraguay	Thailand
Austria	Congo, Rep	Guyana	Madagascar	Peru	Togo
Bahamas	Costa Rica	Haiti	Malawi	Philippines	Trinidad & Tobago
Bahrain	Cote d'Ivoire	Honduras	Malaysia	Poland	Tunisia
Bangladesh	Croatia	Hong Kong	Mali	Portugal	Turkey
Barbados	Cyprus	Hungary	Malta	Romania	Uganda
Belgium	Czech Rep.	Iceland	Mauritius	Russia	Ukraine
Belize	Denmark	India	Mexico	Rwanda	Unit. Arab Em.
Benin	Dominican Rep.	Indonesia	Morocco	Senegal	United Kingdom
Bolivia	Ecuador	Iran	Namibia	Sierra Leone	United States
Botswana	Egypt	Ireland	Nepal	Singapore	Uruguay
Brazil	El Salvador	Israel	Netherlands	Slovak Rep	Venezuela
Bulgaria	Estonia	Italy	New Zealand	Slovenia	Zambia
Burundi	Fiji	Jamaica	Nicaragua	South Africa	Zimbabwe
Cameroon	Finland	Japan	Niger	Spain	
Canada	France	Jordan	Nigeria	Sri Lanka	
Central Afr. Rep.	Gabon	Kenya	Norway	Sweden	
Chad	Germany	Korea, South	Oman	Switzerland	