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Legal origin and the evolution of environmental quality

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Abstract

We extend the empirical literature on the environmental Kuznets curve (EKC) by showing the legal origin matters for the evolution of environmental quality. Using observations of ambient sulfur dioxide levels, we find that the EKC for French and British legal origin countries diverge as incomes rise, with the EKC for French legal origin countries lying significantly below that for countries of British legal origin. This finding is robust to the inclusion of proxies for democracy and corruption, the institutional variables emphasized in the current EKC literature. Our results are consistent with the idea that the British common law tradition places a greater emphasis on private relative to collective property rights.

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1. Introduction

Beginning with the seminal work of Grossman and Krueger (1995), a substantial empirical literature investigates the relationship between environmental quality and economic development. The environmental Kuznets curve (EKC) hypothesis, reviewed by Dinda (2004), holds that the level of pollution follows an inverted-U pattern as rising incomes increase the demand for environmental quality. As Arrow et al. (1995, p. 520) have pointed out, the falling portion of the EKC does not occur automatically but rather depends on "institutional reforms … [that] compel private users of environmental resources to take account of their actions." Recent empirical work confirms this argument, finding an important role for democracy and corruption in determining the relationship between income and environmental quality, e.g. Farzin and Bond (2006), Gallagher and Thacker (2008), and Cole (2007). We add to the literature on institutions and the EKC by presenting evidence that the origin of a country's legal system plays a role in the evolution of environmental quality.

The literature on legal origin, reviewed by La Porta et al. (2008), finds that the legal system plays a critical role in the regulation of economic activity, including the regulation of entry, labor markets, financial contracts, and court proceedings. A central distinction in this literature is that between the British common law and the French civil law traditions, both of which have global significance due to colonial transplantation. In empirical work, the French civil law tradition tends to be associated with greater intensity of regulation, lower levels of financial development, and higher levels of corruption, unemployment and informality.

Beck et al. (2003) identify two channels through which the common law-civil law distinction may influence regulation, with different implications for the shape of the EKC. According to the *political channel*, emphasized by La Porta et al. (1998), the common law tradition places greater weight on the protection of private property rights, providing a counterweight to potential government overreach. As related by Beck et al. (2003), following the French revolution, the state sought to reform what was seen as a corrupt and anti-democratic legal system by reducing the independence of the courts and strengthening the role of the central government. In contrast, the British courts sided with Parliament and land owners in their struggle with the Crown, maintained greater independence and emerged as a champion of private property rights. As applied to the regulation of environmental quality, the political channel implies that the EKC should be higher in common law countries due to their greater emphasis on private relative to collective property rights.

According to the *adaptability channel*, emphasized by Hayek (1960), the primary difference in these legal traditions is that the common law legal tradition places greater reliance judge-made law, allowing the courts to serve as an independent source of legal innovation. Theoretical considerations suggest that the evolution of common law jurisprudence is likely to favor increased environmental quality, at least to the degree that this is in keeping with economic efficiency. In part this is because the primary vehicle for common law environmental litigation – the nuisance doctrine – requires the court to weigh the social costs and benefits of the offending conduct in reaching a judgment (Brown and Meiners, 2000). Moreover, as argued by Rubin (1982), because litigation is costly, disputes involving efficient law are more likely to be settled out of court rather than litigated. As a result, legal innovation tends to be concentrated on areas

of inefficient law, such that the general direction of legal innovation is toward greater efficiency.[1]

In contrast, the civil law tradition rejects a central role for jurisprudence as a source of legal innovation and relies instead on statutory law, which tends to be both costly and slow to change in response to evolving economic conditions (Bailey and Rubin, 1994). Moreover, the combination of diffuse benefits and concentrated costs to pollution reduction suggests the potential for significant political market failure with respect to attempts to legislate environmental quality (Olson, 1965). Together, these considerations suggest that the common law tradition may be more responsive to changing preferences and emerging conflicts over environmental property rights, leading the EKC to peak at a lower level of per capita income in common law countries.[2]

To the best of our knowledge Di Vita (2009) is the only other paper to address legal origin as a determinant of environmental quality. Di Vita's approach differs from ours in that he focuses on the indirect relationship between legal origin and environmental quality that operates through the level of financial development and tests for a linear, rather than quadratic, relationship between these variables.

2. Empirical Model, Data and Results

We test the role of legal origin using the following empirical model:

$$pollution_{it} = \beta_0 LO_i + \beta_1 LO_i * income_{it} + \beta_2 LO_i * income_{it}^2 + \phi X_{it} + \varepsilon_{it},$$

where $pollution_{it}$ is a measure of pollution per capita in country *i* and year *t*, $income_{it}$ is the natural log of real income per capita (PPP), LO_i is a dummy variable for a country's legal origin, $year_t$ is the year of the observation, X_{it} is a vector of control variables and ε_{it} is the error term. This specification allows legal origin to influence all three coefficients in the quadratic relationship between income and pollution that characterizes the EKC. We control for country-specific heterogeneity by employing a random effects estimator, since this allows us to estimate the influence of legal origin on the intercept of the EKC.

We test the role of legal origin using annual national observations of the ambient level of sulfur dioxide (SO2) per capita from Stern (2005). We chose sulfur dioxide as our measure of pollution because it is available for a broad sample of countries and years and is well-known to follow an EKC pattern. In addition to legal origin, we consider two measures of institutional quality, *polity2*, a measure of democracy from the *Polity IV* database, and *freedom from corruption*, a measure of property rights protection from the ICRG database, rescaled 0-1, which

[1] According to the Coase theorem, in the absence of transaction costs the allocation of property rights does not affect efficiency. However, environmental quality is typically both non-excludable and non-rival, implying that private contracting will tend to be subject to significant measurement, coordination, information and enforcement costs and, thus, that the allocation of environmental property rights matters.

[2] The relative flexibility of the common law legal system is evident when legislative authorities are slow or reluctant to act. For example, Rosen (2007, p. 314) argues that environmental litigation "played the role of change-driver" in the Jersey City meatpacking industry, "filling a void left by the failure of state and local governments." Similarly, Grad and Rocket (1970) note that the decision in *United States vs. Standard Oil Company* extended the *Rivers and Harbors Act* of 1899 to encompass modern water pollution and, thereby, obviated the need for legislative action.

Table 1: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
lny	1813	7.43	1.66	4.13	10.94
lnso2cap	1813	1.78	1.36	-2.63	6.03
population density	1813	0.97	3.07	0.00	30.94
British	1813	0.41	0.49	0	1
year	1813	1990	6.05	1980	2000
polity2	1729	1.42	7.28	-10	10
freedom from corruption	1082	0.59	0.22	0	1

is available starting in 1984. Legal origin, real per capita income (PPP), and population density are from the *Global Development Network Database*. The dummy variable *British* takes on a value of 1 for British legal origin countries and zero otherwise. We restrict attention to countries of French and British legal origin.

Summary statistics are presented in Table 1. We have observations on income levels and pollution for 90 countries over the period from 1980 to 2000, though our measures of democracy and property rights are available for smaller samples. Roughly 40% of our observations are from British legal origin countries.[3] British legal origin is positively and significantly correlated with democracy, 0.0570, and freedom from corruption, 0.1153.

Table 2 presents our results. In column one, we confirm that the pollution-income path follows an inverted-U pattern for our sample when institutional variables are omitted. Next, we introduce the three interaction terms for British legal origin. Since French legal origin is the omitted category, the EKC for French legal origin countries is given by the first three rows. Note that each of these coefficients is significant at the 1% level, indicating that SO2 levels follow an EKC pattern for French legal origin countries. Note also that all three coefficients for British legal origin are significant at the 1% level, indicating that legal origin plays a statistically significant role in the evolution of environmental quality. As seen in columns three and four, the pattern of coefficient magnitudes and significance is similar when we control for democracy and freedom from corruption. Finally, using a Hausman specification test, we are unable to reject the hypothesis that the random effects estimates in column four are consistent, $p = 0.9998$.

To simplify the interpretation of our findings, we illustrate the EKC curves for French and British legal origin countries in Figure 1 using the coefficient estimates from column four. First, we note that the two income-pollution paths are quite similar at lower income levels and begin to diverge at a per capita income level of around \$1,000 e^7. The divergence of these paths at higher income levels is consistent with the argument that a society's institutional framework affects how it responds to increases in the demand for environmental quality. By the

[3] There are 55 countries in the sample that have a French legal origin: Algeria, Angola, Argentina, Belgium, Brazil, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Chile, Colombia, Congo, Dem. Rep., Congo, Rep., Costa Rica, Cote d'Ivoire, Croatia, Cyprus, Czech Republic, Denmark, Djibouti, Ecuador, Egypt, Arab Rep., El Salvador, Ethiopia, France, Greece, Guatemala, Guinea, Guinea-Bissau, Honduras, Indonesia, Iran, Islamic Rep., Italy, Jordan, Lebanon, Luxembourg, Madagascar, Mali, Mexico, Morocco, Mozambique, Netherlands, Nicaragua, Niger, Panama, Peru, Philippines, Portugal, Rwanda, Senegal, Spain, Syrian Arab Republic, Tunisia, and Venezuela. There are 35 countries in the sample with a British legal origin: Australia, Bahrain, Bermuda, Bhutan, Botswana, Canada, Fiji, Ghana, India, Ireland, Israel, Jamaica, Kenya, Liberia, Malawi, Malaysia, Namibia, Nepal, New Zealand, Nigeria, Pakistan, Papua New Guinea, Saudi Arabia, Sierra Leone, Singapore, South Africa, Sri Lanka, Sudan, Tanzania, Thailand, United Arab Emirates, United Kingdom, United States, Zambia, and Zimbabwe.

Table 2: SO2 and Legal Origin

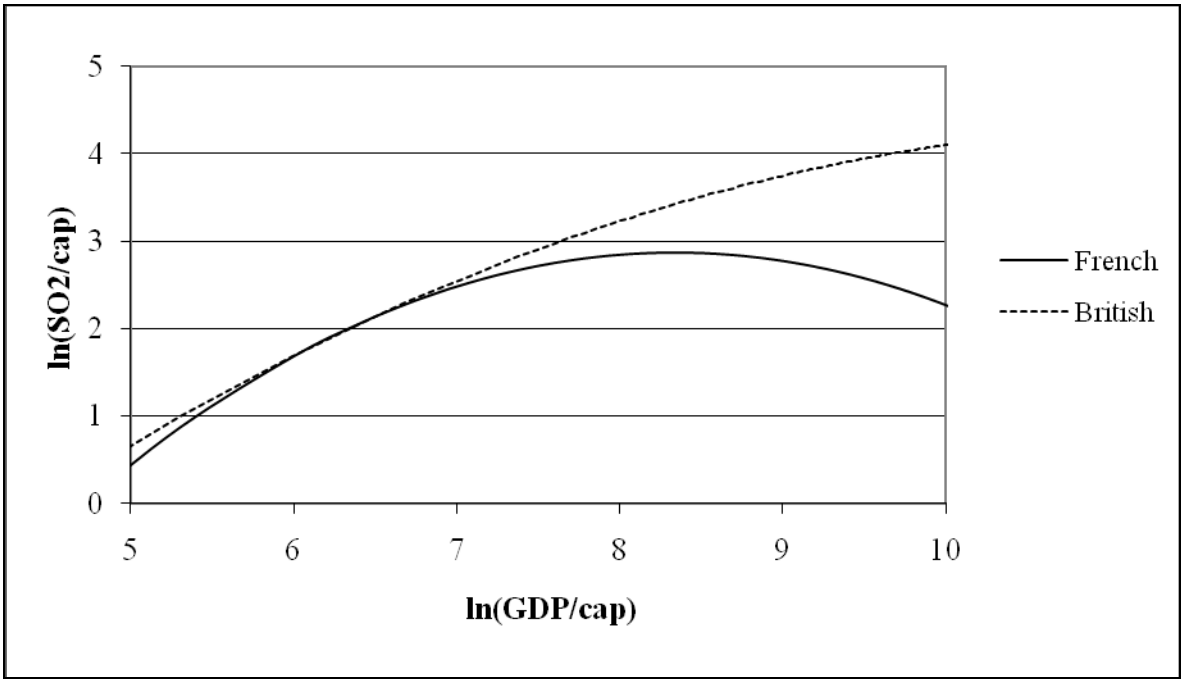
	(1)	(2)	(3)	(4)
	RE WE region omitted	RE WE region and French legal origin omitted	RE WE region and French legal origin omitted	RE WE region and French legal origin omitted
	lnso2cap	lnso2cap	lnso2cap	lnso2cap
constant	38.491	30.467	32.169	15.495
	(7.56)***	(5.79)***	(7.30)***	(3.42)***
income	1.442	3.018	2.250	3.602
	(3.69)***	(7.25)***	(5.51)***	(6.35)***
income2	-0.072	-0.184	-0.127	-0.216
	(2.89)***	(6.28)***	(4.38)***	(5.49)***
British		7.592	5.315	5.188
		(3.74)***	(2.70)***	(2.27)**
income*British		-2.141	-1.447	-1.656
		(3.90)***	(2.65)***	(2.58)***
income2*British		0.154	0.104	0.132
		(4.13)***	(2.75)***	(2.95)***
polity 2			0.007	0.005
			(3.64)***	(2.01)**
freedom from corruption				0.310
				(5.27)***
population density	0.067	0.062	0.053	0.029
	(4.78)***	(4.80)***	(4.89)***	(2.07)**
year	-0.022	-0.020	-0.020	-0.014
	(9.84)***	(8.91)***	(9.88)***	(6.98)***
regions	Yes	Yes	Yes	Yes
Observations	1813	1813	1729	1048
Number of countries	90	90	86	63
Hausman				p = 0.9998
Turning point income level	All = $22,335	FR = $3,645 BR = $2,228,115	FR = $7,032 BR = $38,130,374	FR = $4,180 BR = $107,295
income2 + income2*British = 0		p = 0.6776	p = 0.7350	p = 0.1102

* significant at 10%; ** significant at 5%; *** significant at 1%. Robust z statistics in parentheses.

same argument, these paths should be similar at low levels of per capita income when the demand for environmental quality is low. Second, our finding that the level of pollution is lower for French legal origin countries is consistent with the political channel perspective that common law countries place greater emphasis on private relative to collective property rights. Third, the French EKC has a turning point that lies in the middle income range, while the British EKC is nearly linear, a finding that stands in direct opposition to the claim that the common law system is more adaptable and responsive to changing economic conditions.

The penultimate row of Table 2 reports estimated turning point income levels by legal origin. These estimates confirm that the inclusion of legal origin has a significant effect on the shape of the estimated EKC. In particular, our results from the first regression, in which we do not account for legal origin, imply that the estimated turning point income level is $22,335.

Figure 1: Environmental Kuznets Curves by Legal Origin



Relative to our results from columns two through four, this estimate dramatically overstates the turning point income level for French legal origin countries and dramatically understates the turning point income level for British legal origin countries. These regressions consistently identify the turning point for French legal origin countries as lying in the middle income range. In contrast, our estimate of the turning point income level for British legal origin countries is highly unstable. Indeed, as reported in the final row of Table 2, we cannot reject the hypothesis that the British EKC is linear.

While our results are broadly consistent with the political channel, they contrast with the finding of Beck et al. (2003) that the adaptability channel matters more for financial development, and this contrast raises the question of whether the primary channel of influence depends on the nature of the activity being regulated. In particular, the adaptability channel holds that private litigation plays a central role in legal evolution, but private litigation may matter less for nonpoint source forms of pollution, like SO2, for which it is difficult to identify damages with a specific polluter. By this argument, private litigation may play a greater role in the evolution of point source pollution, such as many types of water pollution. This issue is not resolved by our investigation and remains an important question for future research in this area.

3. Conclusion

This is the first paper to consider the relationship between legal origin and the shape of the environmental Kuznets curve. Using a panel of annual observations of ambient sulfur dioxide levels for 90 countries, we find that legal origin plays a statistically significant role in determining the shape of the EKC for SO2. In particular, while the income-pollution paths of common and civil law countries are similar at lower income levels, they diverge at higher income levels, with levels of pollution and a turning point income level that are significantly

lower for French legal origin countries. These findings are robust to controls for the levels of democracy and corruption, the measures of institutional quality emphasized in the existing literature on the EKC.

Our results are consistent with earlier research on legal origin that finds that the civil law tradition is associated with greater regulation; however, we differ from the existing literature in one important respect. Most work in this area has found that the civil law tradition is associated high social costs in the form of higher unemployment rates, greater corruption, more protracted and costly court proceedings, and a greater share of informal economic activity. While we present no evidence regarding the optimal level of SO2 emissions at different levels of development, it is at least possible that the lower levels of pollution observed in middle and upper income civil law countries is associated with higher welfare.

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