Do Constitutions Matter? The Effects of Constitutional Environmental Rights Provisions on Environmental Outcomes

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Abstract

We use a novel data set within an instrumental variables framework (IVF) to test whether the presence and legal strength of constitutional environmental rights (CER's) are related to environmental outcomes. We employ an IVF to account for the fact that a country which takes steps to protect the environment might also be more likely to constitutionalize environmental rights. Controls include: (1) gross domestic product per capita (2) whether the country is a party to the International Covenant on Economic, Social, and Cultural Rights; (3) rule of law; (4) population density; and (5) regional fixed effects. The inclusion of income means that our study is directly related to the Environmental Kuznets Curve literature. The results demonstrate that our instruments are valid and significantly related to whether or not a country includes an environmental rights provision in its constitution. Moreover we find evidence that constitutions do indeed matter for positive environmental outcomes, which suggests that we should not only pay attention to the incentives confronting polluters and resource users, but also to the incentives and constraints confronting those policymakers who initiate, monitor, and enforce environmental policies.

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1 Introduction

Are constitutional environmental rights (CER's) provisions necessary for good environmental outcomes? CER's are clearly not sufficient for good environmental outcomes. Intelligent policy design, financial resources and supporting institutions, like quality legal and political systems, are also required to some degree. Geography also matters. But the question of necessity becomes increasingly important as we search for solutions to regional problems like water scarcity and pollution, and universal issues like global warming. Nevertheless, to our knowledge, this topic has not been systematically studied before.

Constitutional provisions that create CER's could matter because rights-holders achieve an elevated status. Donnelly (2003, p.8) frames it this way:

> To have a right to x is to be *entitled* to x. It is owned to you, belongs to you in particular. And if x is threatened or denied, right-holders are authorized to make special claims that ordinarily "trump" utility, social policy, and other moral or political grounds for action. (Dworkin, 1977: xi 90).

In principle at least, CER's enable rights-holders to hold policymakers accountable if their entitlements are violated. The added degree of accountability is what gives rights their bite, as opposed to just individual (citizen) policy preferences. A person prefers that authorities respect her property, but only if she has property rights are they absolutely required to do so. Similarly, policymakers may or may not prefer to put effort and resources into good environmental policy, but if environmental rights-holders exist and they press their demands, policymakers are ostensibly required to do so.

There are different kinds of rights. Human rights are special rights that everyone has just by virtue of our humanity. We do not have human rights to all things that are good or desirable; instead human rights seek to ensure the minimal conditions necessary for a dignified life (Donnelly, 2003). Though human rights scholars have called for a class of "emergent rights" that includes general environmental rights (ER's), they have not yet achieved the status of legal human rights in the principal international human rights documents (though property rights have) (Hiskes, 2009). As a specific exception, in 2010 the human right to water and sanitation was legally established by the UN General Assembly.[2]

Yet we know that significant conventional and human rights violations occur daily throughout the world. So those skeptical about the importance of CER's could first point to that simple fact. The argument could proceed by acknowledging that there are places that don't have CER's but do have a good environmental record. For instance, according to the Environmental Performance Index (EPI) created by the Yale Center for Environmental Law and Policy, the United Kingdom (UK) ranked nine while Iceland ranked 13 out of 132 countries in 2012.[3] We will use this index and its components as our key dependent variables, however the point is that the UK does not even have a constitution, and Iceland does not have any CER's in

[2] http://www.un.org/waterforlifedecade/human_right_to_water.shtml accessed December 19, 2013.
[3] http://epi.yale.edu/epi2012/rankings accessed December 19, 2013. The United States is a middling performer, ranked at 49. The US constitution does not contain any CER's.

its constitution. But they do have comparatively good environmental performance records, so, the argument goes, constitutions are not necessary.

In order to test the hypothesis that CER's are necessary for good environmental outcomes, we construct new CER variables from the dataset compiled in Jeffords (2013). Constitutions from 198 countries were coded for CER's into seven different categories. Perhaps surprisingly, 125 countries have at least one CER. Those CER variables serve as the primary explanatory variables on the EPI and its components, as just mentioned. To account for the idea that a country may be able to grow out of its environmental problems we include income as a central control, which means that our study relates directly to the Environmental Kuznets Curve (EKC) literature. Furthermore, we implement an instrumental variables (IV) framework to account for the fact that a country which takes steps to protect the environment might also be more likely to constitutionalize ER's. Ultimately we find evidence that constitutions do indeed matter, which suggests that we should not only pay attention to the incentives confronting polluters and resource users, but also to the incentives and constraints confronting those policymakers who initiate, monitor, and enforce environmental policies.

2 Literatures

Our research question cuts across two distinct literatures, one in environmental economics and one in constitutional political economy. Consider each in turn.

2.1 Environmental Kuznets Curve

While environmental economists are perhaps most concerned with the effects of specific policy instruments on specific environmental outcomes, a sizable literature does investigate the effects of economy wide characteristics more generally. The literature on the EKC examines the extent to which environmental degradation is related to growth. An inverted U-shaped curve, with environmental degradation on the vertical axis and income on the horizontal axis, exists if at some point in a country's development environmental degradation decreases with additional income. The factors identified for that negative relationship include the (1) shift to service industries, (2) increased demand for environmental amenities, and (3) stringent regulation, all of which are associated with higher levels of economic development.[4]

The empirical literature on the EKC initially examined the effect of income on various water and air pollution measures in cross-country and panel studies. As Thompson (2012) notes, some studies find evidence for the EKC (but with vastly different turning points), while others do not. The more recent trend relevant for our study is the inclusion of additional explanatory variables, and in particular those that proxy for political institutions.

Bhattarai and Hammig (2001) aggregate the civil and political rights indices from Freedom House to create a political institutions explanatory variable. Freedom House analysts create the indices by subjectively evaluating criteria regarding issues like election fairness, the role of the opposition party, the freeness of the press, the independence of the judiciary, and the rule of law. The authors use this variable in their study on the associates of deforestation in

[4] See Thompson (2012) for a comprehensive review of the EKC literature.

Latin America, Africa and Asia. The idea is that good political institutions may weaken the income effect because of enhanced citizen participation and more secure property rights. Bhattarai and Hammig (2001) do find evidence for the existence of the EKC and also that improvements in political institutions do significantly reduce deforestation.

Both Chen (2010) and Castiglione, Infante, and Smirnova (2011) represent recent attempts to capture the effects of the rule of law into empirical EKC analyses. Both use the same rule of law variable from The World Bank's World Governance Indicators, as well as similar regression techniques and identification strategies. The subjective rule of law variable reflects views on the protection of property and human rights, the quality of contract enforcement and the judicial system, and trust in police and politicians. Chen (2010) finds that both income and the rule of law have positive effects on environmental policy stringency in 71 countries in the year 2000. Castiglione, Infante, and Smirnova (2011) find that the rule of law has differential effects on carbon emissions in 28 European countries, partly based on the country's sector composition, and whether or not it had a Socialist past.

Somewhat similar to the political institutions variable used by Bhattarai and Hammig (2001), the rule of law variable tries to capture the willingness of a country to establish good environmental policies and then advance and enforce those chosen. This literature is agnostic on the exact policies chosen. In contrast, most environmental economists working on policy want to know specifically the costs and benefits that various environmental instruments (e.g., emission taxes, subsidies, and tradable allowances, and performance standards and mandates) imply for specific environmental problems (Goulder and Parry, 2008). But policy efficacy requires more than just clever design, it also requires policymaker willingness. The question is if constitutionalization of environmental rights can "enhance" that willingness.

2.2 Constitutions

Most modern constitutions contain three main parts: a bill of rights, provisions on government structure and regulation, and procedures for amendment (Elster, 1995). Influential economists pioneered the notion that constitutions matter because they establish rules that constrain policymakers (Buchanan and Brennan, 1981; North and Weingast, 1989). Politicians are not just passive implementers of constituent interests, instead, just like everyone else, they have their own utility functions. So even if a politician really did prefer to dedicate time and scarce resources to environmental policymaking during an election, actual environmental constitutional rules would provide constraints on elected politicians should their preferences change over time.

In principle, statutory law could also establish these constraints (as well as positive directives) for policymakers. But the rights granted in statutory law only constrain policymakers as defined by the statute, and such rights can be altered or eliminated by even transitory majorities. In contrast, those constitutional rights that are legally enforceable, are often broader and protected even from the majority by the judiciary and constitutional courts (Osiatynski, 2007). Because constitutions are difficult to change, they represent what is most enduringly important to a country.

Constitutional language does matter. A common distinction, especially when it comes to human rights, separates constitutional provisions into "directive principles" or enforceable law.

Directive principles refer to aspirational policy goals, whereas enforceable law means legally binding. Nevertheless, even constitutional provisions regarded as directive principles can pose soft constraints on policymakers in the sense that breaching the underlying policy goals can reduce a policymaker's credibility and reduce reelection chances—or worse (Minkler, 2009). It turns out that most of the world's countries seem to view environmental rights as enduringly important. After examining 198 national constitutions, Jeffords (2013) finds 125 that contain at least one environmental right. That study provides the basis for our key constitutional law variable, with the number and strength of rights supplying additional variation.

While there has been a recent surge of work on the effects of institutions (generally) on economic outcomes, primarily economic growth, very little has been done on the effects of constitutional provisions on economic outcomes.[5] The notable exception is Persson and Tabellini (2000). Those authors try to identify the major effects of two constitutionally mandated political institutions: presidential versus parliamentary governing systems, and majoritarian electoral rules versus proportional representation. They find that presidential and majoritarian systems have smaller governments (as measured by government spending divided by gross domestic product), majoritarian systems have smaller welfare state spending and budget deficits, and that parliamentarian government spending increases during downtimes and are not reversed during booms.[6] At best this study only tangentially relates to environmental outcomes.

To summarize, a large literature on the EKC exists which is just beginning to explore the importance of institutional effects on environmental outcomes. A small constitutional political economy literature also exists in economics that has yet to consider either ER's or environmental outcomes. Our objective is to bring the insights of this latter literature to the EKC literature by adding an objective, targeted, ER's constitutional variable that transcends the weaknesses of the institutional variables currently used. We know that environmental constitutional provisions are not sufficient to assure environmental policy efficacy, but are they necessary?

3 Variable Descriptions

The following sections outline the variables used in the empirical analysis.[7]

3.1 Dependent Variables

Our main dependent variables, also called environmental outcome/objective (EO) variables, include EPI and its two objective categories/components of Ecosystem Vitality (EV) and

[5] This is especially curious if, following Douglas North, institutions are formal and informal constraints on behavior that facilitate purposeful action. Some well known examples in the institutions literature include Sokoloff and Engerman (2000), Acemoglu, Johnson, and Robinson (2001), and La Porta, Lopez-de-Silanes, and Shleifer (2008). See Spolaore and Wacziarg (2013) for a recent review.

[6] See Acemoglu (2005) for a review of this book.

[7] Summary statistics for the dependent, control, and instrumental variables are listed in Table 2.

Environmental Health (EH).[8] These components are also referred to as policy objective categories. EPI is an "outcome-oriented performance index" which "track[s] national environmental conditions on a quantitative basis by measuring proximity to policy targets using the best data available (Emerson et. al., 2012, Appendix II, pp. 1)." According to the EPI Summary for Policymakers produced by the Center for Environmental Law and Policy (Yale University) and the Center for International Earth Science Information Network (Columbia University), the 2012 EPI ranks 132 countries on 22 performance indicators across ten categories: child mortality; water (effects on human health); air pollution (effects on human health); water resources (ecosystem effects); biodiversity and habitat; forestry; fisheries; agriculture; and climate change. Each policy category of the index is used to track performance and progress on EV and EH.

The index is calculated by applying a 70% weight to the EV component and a 30% weight to the EH component.[9] The EV component is comprised of 17 indicators including change in water quantity, forest loss, carbon dioxide emissions per capita, and the overexploitation of fish stocks, while the EH component is comprised of five indicators ranging from child mortality to indoor air pollution to access to sanitation and drinking water. Each indicator is vetted for relevance; performance orientation; established scientific methodology; data quality; time series availability; and completeness (Emerson et. al., 2012, pp. 14). EV and EH are then formed by considering target levels and weights for each indicator, where the levels and weights are subjected to sensitivity analysis. The indicators and the corresponding weights are illustrated in *Figure 1* in the appendix.

[Insert Figure 1 About Here]

Although the current revision of EPI lists the data year as 2012, the most recent data available is for 2010. The 2012 EPI is thus a recalculation of the 2010 EPI to reflect the (new) 70-30 weighting scheme and a reduction in performance indicators from 25 to 22. In 2010, EPI was calculated by equally weighting both component categories. EPI is interpreted in the following way: the higher the index value between 0-100, the greater the country's performance and progress on the EV and EH policy objectives categories.

3.2 Primary Independent Variables

The primary independent variables of interest are (1) the presence of a CER, and (2) a simple measure of the legal strength of a given CER based on its language. These data come from

[8] To better connect to the EKC literature, we also explored specifications using specific environmental outcome variables such as metric tons per capita carbon dioxide (CO2) emissions, per capita nitrous oxide emissions (measured in thousand metric tons of CO2 equivalent), and methane emissions (measured in kilotons of CO2 equivalent). One set of empirical results for CO2 emissions is available in Tables 10, 11, and 12 in the Supplementary Material. Of course, under these specifications, many of the hypothesized signs on the estimated coefficients will be different.

[9] For a complete description of how the index is calculated see the full report of the 2012 EPI available at http://epi.yale.edu.

Jeffords (2013), where the first is operationalized by a simple indicator variable noting if a constitution has a CER provision (denoted by a "1") or does not (denoted by a "0"), and the second specification is an additive index of seven keyword categories. Jeffords (2013) examined the constitutions of 198 countries as of 2010 for instances of CER provisions and found that 125 constitutions contain a uniquely written provision.[10] Each provision was then examined for the presence of seven keyword categories endemic to the literature that defines and outlines ER's.[11] At the conclusion of the keyword analysis, each constitution was given a simple additive score across the seven categories. For example, a score of three indicates the presence of three out of the seven categories.[12] The seven keyword categories are listed in the *Table 1* for simplicity.

[Insert Table 1 About Here]

Consider as an example, the CER provision found within the constitution of Mali (1992): Every person has the right to a healthy environment. The protection and defense of the environment and the promotion of the quality of life is a duty of everyone and of the state." The underlined phrases denote the presence of categories 4, 6, and 1, respectively.

Drawing from the constitutions literature, we hypothesize a nonnegative relationship between CER provisions and the EO variables. CER's supply incentives and constraints that should increase policymaker effort in the direction of better environmental outcomes.

3.3 Control Variables

To control for the effects of income on environmental outcomes, we use the natural log of purchasing power parity adjusted gross domestic product per capita in constant 2005 international dollars. The data are from The World Bank's World Development Indicators database. We also include the square of this variable to account for potential nonlinearties in protecting the environment as per capita income grows. For example, it could be the case that a relatively young and poor country begins with some EPI score but as income grows, the country pollutes at a faster rate than it can protect the environment and its ranking falls. At

[10] Of particular additional importance is the fact that out of these 125 countries, approximately 20 constitutions contained "negating statements." These are statements that immediately precede or follow a CER provision, as well as additional constitutional provisions, and mitigate or negate the legal strength of the provisions. These negating statements typically note that the following or preceding language is not to be construed as enforceable law but rather as guiding principles for constructing policy. We have not yet empirically accounted for these negating statements because it is not immediately clear if they should be included or excluded instruments, but also and perhaps more importantly, the negating statements often apply to additional provisions beyond the environmental ones.

[11] See Jeffords (2013) for a complete description of this process.

[12] We understand that such a simple additive index equally weights the (legal) importance of each keyword category, whereas in practice some language is likely more important than other language in giving the CER provision legal "teeth." It is also possible that we can reduce the size of the index by using principal components analysis. We leave these specification issues for our future research.

some threshold income per capita, however, the country might take steps to protect the environment and the EPI rank begins to climb. In other words, because the main dependent variables are environmental "goods" and not "bads," we do not expect the typical inverted U-shape found in the EKC literature, but rather a U-Shape. As a result of this "inverted, inverted-U" hypothesis, we expect the sign on the natural log of purchasing power parity adjusted gross domestic product per capita to be negative, and positive on the squared term.

To control for a country's willingness to integrate international law into domestic law, we include a dummy variable that indicates if a country is a "state party" to the United Nations International Covenant on Economics, Social, and Cultural Rights (ICESCR).[13] Articles 11 and 12 of the ICESCR delineate the rights to an adequate standard of living and the enjoyment of the highest attainable standard of physical and mental health, respectively. These two articles often form part of the foundation for defining ER. For example, General Comment 15 ("The Right to Water") of the Committee on Economic, Social, and Cultural Rights (CESCR) is written in part by relying on the fact that having a minimum quantity of water of at least potable quality fulfills aspects of Articles 11 and 12. We expect being a state party to the ICESCR will be nonnegatively related to the EO variables.

In an attempt to control for the quality of legal institutions and also to conform with recent EKC studies, we include the *rule of law* measure. The data for *rule of law* are from the Worldwide Governance Indicators project of The World Bank (Kaufmann, et. al, 2010).[14] According to the variable description, *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." The original values range from -2.5 (signifying weak government performance) to +2.5 (signifying strong government performance), however we normalize the variable to the unit interval. We expect *rule of law* to be nonnegatively related to the environmental outcome variables.[15]

We also control for the population density of each country using population divided by land area (in square kilometers) data from The World Bank's World Development Indicators database. We take the natural log of population density and expect this variable to be nonpositively related to environmental outcomes. In other words, for a given land area, the more people there are per square kilometer, the more likely it is that the country experiences relatively poorer environmental outcomes at the national level. This could stem from a

[13] Being a state party implies accession and/or ratification of the ICESCR, both of which imply the covenant has (in part or in full) been integrated into the law of the country.

[14] This is calculated with data from 23 distinct sources such as the Cingranelli-Richards Human Rights Database and Political Terror Scale, World Justice Project Rule of Law Index, and The World bank Country Policy and Institutional Assessments. See Kaufmann, et al (2010) for a full description of methodology behind the Worldwide Governance Indicators project.

[15] We also considered using another variable from the Worldwide Governance Indicators project called *government effectiveness*. This variable "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." The results do not significantly change if we use *government effectiveness* instead of *rule of law*, in part because the two variables are highly positively correlated at 0.9329.

resource scarcity problem, for example, or perhaps from an increased likelihood of negative environmental externalities in densely populated areas.

Finally, because we expect the presence of unobserved regional heterogeneity associated with environmental outcomes, we include regional fixed effects in certain model specifications. We divide the globe into eight regions: North Africa, Sub-Saharan Africa, North America, South America, Eastern Europe and Central Asia, (the rest of) Europe, Asia and the Pacific, and the Middle East. To avoid the dummy variable trap in the regional fixed effects specifications, we maintain the regression constant and use Middle East as the base category.[16] We do not have any sign expectations with respect to the regional dummies and suppress the coefficient estimations in the results tables, and we simply note if the model includes regional fixed effects or not.

4 Data and Methodology

The data consists of observations for 169 countries. Out of these countries, 110 include ER provisions in their constitutions and 59 do not.[17] Owing to various missing data either for the dependent or independent variables, the observation count across the model specifications ranges from 109 to 147.

Our identification strategy begins with simple ordinary least squares (OLS) regressions of the CER provision variables and control variables on the EO variables. Simple linear regressions of this sort, however, could suffer from a serious endogeneity problem. Because we are concerned about the instances where a country that constitutionalizes ER is also more likely to take better care of the natural environment, we implement a two-stage IV approach. This approach not only controls for measurement error as discussed below, but it also allows us to account for unobservable cultural factors, social norms, and political inclinations that would cause a country to include an ER provision in its constitution but would not directly impact environmental outcomes. If this form of endogeneity exists, we expect the coefficient estimates on the CER variables to be biased toward zero in the simple OLS specifications. In what follows we first discuss the simple linear regression framework and then the IV approach.

4.1 Simple OLS Regression

We utilize a cross-sectional approach that accounts for simultaneous causality by regressing explanatory variables in period t on dependent variables in period $t+1$, where $t = 2010$. The basic specification for country i in year $t+1$ is as follows:

$$Y_{it+1} = \beta_o + E'_{it}\beta_1 + \boldsymbol{W'_{it}\alpha} + \boldsymbol{D'_i\delta} + \epsilon_{it}, \quad (1)$$

[16] We tried every region as the base and the primary estimation results did not change. Of course, the size, sign, and significance of the regional dummies and the constant term fluctuated as measured against the base region.

[17] We thus lose 15 out of the 125 countries with CER provisions in the original dataset.

Where E is one of the two specifications of the CER provision variable and W is a vector of country-specific explanatory variables. We also implement regional fixed effects in certain model specifications, which are represented by D.[18] The term ϵ_{it} is the typical, independently and identically distributed, normal disturbance term. We estimate Equation (1) with OLS and to find the estimate of β_1.

4.2 Instrumental Variables Regression

Our IV approach adopts the included/excluded instruments language to note that included instruments are those explanatory variables which appear in both the first and second stage regressions, and excluded instruments are those that appear only in the first stage regression. Because we expect E is correlated with u, we estimate the following first-stage expression with a vector of excluded instruments, Z, and the vector of included instruments W:

$$E_{it} = \pi_o + \boldsymbol{Z'_{it}\theta} + \boldsymbol{W'_{it}\gamma} + \boldsymbol{D'_i\eta} + u_{it}, \quad (2)$$

to obtain the predicted values of E_{it} called $\widehat{E_{it}}$.

In the second stage, we augment Equation (1) by replacing E_{it} with $\widehat{E_{it}}$, and estimate the following:

$$Y_{it+1} = \beta_o + \widehat{E_{it}}'\beta_1 + \boldsymbol{W'_{it}\alpha} + \boldsymbol{D'_i\delta} + \epsilon_{it}. \quad (3)$$

Adjusting for the relatively small sample size of the cross-sectional data, equations (2) and (3) are estimated within a generalized method of moments (GMM) framework using a heteroskedastic-robust weighting matrix and a robust variance-covariance matrix (i.e., robust standard errors).

4.3 Instruments

Our IV approach includes three exogenous instruments. The reasoning for our instruments draws of the work of Elkins, Ginsburg and Simmons (2013) who show that International Bill of Human Rights has provided a powerful coordination effect on national constitution makers.[19] Newer constitutions in particular draw from those sources, and those that do should be more likely to incorporate or add environmental rights. Our first instrument is a count variable of the number of CER provisions in existence prior to a county writing its own CER provision into its constitution. The second is a count variable of the number of other economic and social rights in a country's constitution. The last is the minimum of the age of the constitution or the CER provision. We explain each of these in turn.

[18] The regression constant is maintained and the base region is Middle East.

[19] The International Bill of Human Rights includes the Universal Declaration of Human Rights (adopted by the UN General Assembly in 1948), and the International Covenant on Economic, Social, and Cultural Rights and the International Covenant on Civil and political Rights (1976).

Based on the timing of including a CER provision in a given constitution – either at the date the constitution was written or at a later date via amendment – we create a variable that is the sum of the number of constitutions which include a CER provision prior to the current country writing its own CER provision. The fundamental premise for creating and using this variable as an excluded instrument is that the bodies forming a constitution or an amendment for a country tend to read the constitutions of other countries to formulate the language for their own constitution/amendment. We expect that the mere number of CER provisions in existence prior to a country writing its own will not affect the EO variables in the country in question, but that the higher the number, the more likely a country is to include an ER provision in its constitution. This may be a strong assumption, however, as pollution (for example) does not respect political, temporal, or geographic boundaries, and it could be that the polluting activities within a country with a CER provision do affect the natural environment of other countries which may or may not yet have a CER provision.

Created from proprietary data collected by Minkler, our second instrument is a count variable which indicates the presence of other economic and social rights in a country's constitution. These rights include the right to primary education, the right to social services, the right to work, the right to public employment, the right to just and favorable remuneration, a ban on child labor, the right to social security in the event of unemployment, and the right to social security in the event of old age. Using a dummy variable to denote the presence of each right, we sum across the eight rights to create the count variable that has a minimum of zero, a maximum of eight, and a mean value of 3.6.[20] We assume that the more economic and social rights a country's constitution has, the more likely it is to constitutionalize ER. There is no immediate reason to assume that these specific rights will affect the EO variables in a given country. If, however, we included rights such as a guaranteed adequate standard of living or the right to adequate food/nutrition, we could not make such an exclusionary assumption.

Our last instrument is the minimum of the age of the constitution or the CER provision. First, we expect that any lingering temporal effects of the age of the country/constitution on environmental outcomes are accounted for by the size of income per capita and the regional fixed effects. Second, because countries that have CER provisions tend to be younger (in constitutional age) than their non-CER counterparts, we expect that the age of a country/constitution is nonpositively related to the inclusion of a CER provision. In other words, the newer the constitution, the more likely it is to have a CER provision and, in the data, 86 out of the 110 CER provisions are 20 years old or younger (as of 2010).

5 Results

The primary estimation results are illustrated in Tables 3-8. Model specifications denoted by a "#.A" are the simple linear regression analogs of the instrumental variables regressions ("#.B").

5.1 Simple OLS Regression Results

[20] It is important to note that some of these eight rights may be more important than others when considered as mere indicators for the presence of a CER, but we leave this question for our future research.

For each of the EPI and EV specifications in Tables 3-6, the coefficient estimates on each of the explanatory variables have the expected sign. These models include 1.A, 2.A, 3.A, 4.A, 5.A, 6.A, 7.A, and 8.A.[21] The CER variable, however, is only significant in two out of the eight specifications (3.A and 7.A). With respect to the EH outcome variable, the models perform well in terms of R-squared and adjusted R-squared as illustrated in Tables 7 and 8, but the coefficient estimate on the CER variable often has a negative sign and is significant only in Model 10.A. This is perhaps not surprising for a few reasons. First, the weight placed on the child mortality indicator within the EH component is relatively high compared to the other indicators, and child mortality rates depend on a host of factors in addition to environmental reasons. And secondly, access to sanitation and access to drinking water reports tend to be inaccurate because countries like the United States typically report 100% access across these categories yet there exist many pockets of water-related poverty in urban, rural, and mountainous regions of Colorado, for example (Wescoat, et. al., 2007).

Perhaps surprisingly, the income per capita variables are mostly insignificant despite having the expected signs in most cases. Population density is also relatively unimportant across the EPI and EV specifications and the coefficient estimate also has an unexpected sign in many cases. Being a state party to the ICESCR and the rule of law have the expected signs and are significantly related to environmental outcomes in many specifications. Although not shown in the tables, a majority of the regional dummies are significant at the 1% level. This could perhaps explain the lack of significant of the other covariates in the fixed effects specifications.

5.2 Instrumental Variables Regression Results

Across each of the IV specifications for EPI and EV, the coefficient estimates on the CER variables increase in size and significance. These results are consistent with the assumed downward bias on the CER variable coefficients in the simple OLS specifications. The coefficient estimates within the instrumental variables framework for EH are insignificant. Again, we think this is because of the choice and weighting of the indicators that form the EH component. The coefficient estimates, signs, and significance levels remain relatively stable across the other explanatory variables when compared to the simple OLS analogs.

A few questions remain. First, are the instruments significant predictors of the CER variables? This is a basic question that is answered by examining the coefficient estimates from the first stage regressions. Second, are the three instruments valid? That is, are the instruments uncorrelated with the error term in Equation (1)? And third, are they "weak" instruments?[22] The former is addressed by performing Hansen's test of overidentifying restrictions where the null hypothesis is that all instruments are valid. The so-called "J-Statistic" has a chi-squared distribution with degrees of freedom equal to the number of overidentifying restrictions. In this

[21] We also tested around 20 simpler specifications which built up (step-wise) to the results presented here. The results were largely the same, with very few instances of the CER variables being significant. Nonetheless, the empirical results of these specifications are available from the authors upon request.
[22] A weak instrument is a poor predictor of the endogenous variable which, in this case, is the CER variable in each specification.

case, the number of overidentfying restrictions is equal to the number of instruments - 1 = 2. The latter is addressed by applying an F-test of the joint significance of the instruments. The answers to all three of these questions are found in Table 9 for each instrumental variables model (1.B – 12.B).[23]

In models 1.B to 8.B, each of the coefficient estimates on the instrumental variables is significant at either the 1% or 5% level.[24] The coefficient on each instrument also has the expected sign. Based on the p-values for Hansen's J-Statistic, we do not reject the null hypothesis of valid instruments and conclude that the overidentfying restriction is valid. Finally, based on the p-values for the Robust F-Statistic, we reject the null hypothesis of weak instruments.

In short, and with respect to the CER variables, the comprehensive conclusions we can draw from these results are: (1) our instruments are significant predictors of why a country includes an ER provision (and of a certain language) in its constitution; (2) all three of our instruments are valid and not weak; (3) the presence of a CER leads to improved environmental outcomes as measured by EPI and EV; and (4) the presence and strength of the CER language lead to improved environmental outcomes as measured by EPI and EV.

6 Policy Implications

If one believes that EPI and its components measure country-level performance of environmental outcomes, then CER provisions do lead to increased performance. This is important information for a country considering amending an ER provision into its existing constitution and for a country currently forming its constitution. These results are also important for the citizens of a country that has yet to consider adding such a provision. Furthermore, by constitutionalizing ER, countries can take steps toward better protecting the environment and this may be an important avenue for mitigating the harmful effects of climate change, for example. We do not mean or wish to exaggerate or overstate the policy implications, in part because there is much research to be done, but the results clearly indicate the need to further explore the role of CER provisions as a means to improve environmental outcomes.

7 Caveats

There are some caveats associated with our framework and results. First, we are using a cross-section of countries that yields a relatively small observation count compared to extending the framework to panel data. Second, the dependent variables, while calculated by expert panels and founded in mostly objective data, are subjectively compiled and calculated. To determine if our framework is robust to many environmental outcomes, we will likely need to use traditional dependent variables in the spirit of the EKC and extend our framework to one of simultaneous

[23] The same is true of Table 12 for the CO2 specifications in the supplementary material.

[24] Because the results of the instrumental variables regression for the EH outcome variable were largely insignificant, we do not discuss the first stage results and statistics but merely present them in Table 9.

equations to account for the joint determination of income and environmental degradation.[25] Third, the CER count instrumental variable may need to be geographically refined to account for the fact that it is possible that the presence of a CER in a neighboring country's constitution could somehow impact the neighbor's environmental outcomes. Fourth, our CER index variable is perhaps a bit too simple. In future specifications, we will have to consider the differences in keyword categories to see if some are more important than others in providing the CER provision with legal teeth. As it stands, our count index equally weights all keyword/language categories. Fifth, we may also need to account for additional institutional, sociodemographic, and economic factors at the country level. These include, but are not limited to, the country's legal origins, governmental and non-governmental organizations tasked with protecting the environment, type of government, natural resource endowments, and aspects of international trade.

[25] We have done this, in part, by providing some preliminary results of the cross-sectional framework using metric tons per capita CO2 emissions as the dependent variable.

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Appendix of Supporting Figures and Tables

Figure 1 – EPI Indicator Framework with Weights for Aggregation

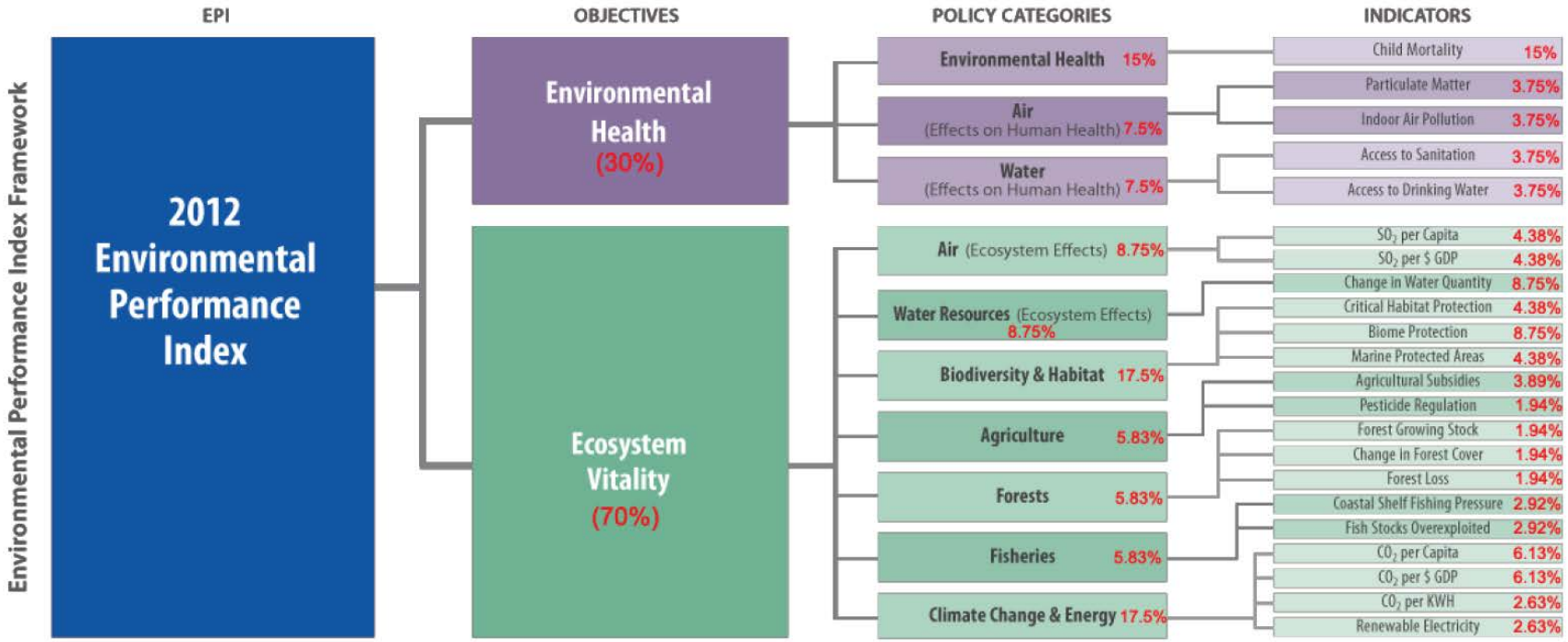

Table 1 – Descriptions of the Seven Keyword Categories

Category	Brief Description	General Keywords (Non-Exhaustive List)
1	Strong language associated with state/government responsibility	Duty, obligation, protection, etc.
2	Weak language associated with state/government responsibility	Shall ensure, take measures, fundamental objective, etc.
3	Right of citizen's to be informed about the status of the environment	Informed, information, etc.
4	Citizen's right to a clean or health environment	Clean, pure, healthy, right, etc.
5	Concern for future generations and/or sustainable development	Future, generations, sustainable, etc.
6	Citizen's and "everyone's" responsibility to protect the environment	Citizen, duty, everyone, etc.
7	Explicit human right to water	Water, right, clean, pure, etc.

Table 2 – Descriptive Statistics for the Dependent, Control, and Instrumental Variables

	Summary Statistics				
	Observations	Mean	Standard Deviation	Minimum	Maximum
Dependent Variables					
Environmental Performance Index	116	52.90	9.95	25.32	76.69
Ecosystem Vitality	117	47.55	12.29	14.84	69.61
Environmental Health	153	59.03	27.29	12.31	100.00
Primary Independent Variables					
Has CER Provision	169	0.651	0.478	0	1
Index 0-7	169	1.527	1.402	0	5
Control Variables					
ln GDP/Capita	157	8.72	1.24	5.77	11.12
ln GDP/Capita Squared	157	77.49	21.44	33.35	123.59
Party to ICESCR	169	0.805	0.398	0	1
Rule of Law	167	0.487	0.193	0.119	0.894
ln Pop. Density	169	4.220	1.408	0.542	9.807
North Africa	169	0.024	0.152	0	1
Sub-Saharan Africa	169	0.237	0.426	0	1
North America	169	0.124	0.331	0	1
South America	169	0.059	0.237	0	1
Eastern Europe and Central Asia	169	0.095	0.294	0	1
Europe, The Rest of	169	0.183	0.388	0	1
Asia and the Pacific	169	0.207	0.406	0	1
Middle East	169	0.071	0.258	0	1
Instrumental Variables					
EHR Count Before	169	36.88	39.27	0	116
Count of Other ESR	167	3.56	2.34	0	8
Constitution/Provision Age	169	24.34	27.79	1	223

Table 3 – Full Environmental Performance Index and Has/Doesn't Have CER Index

	LHS Variable: Environmental Performance Index			
	Model (1.A)	**Model (1.B)**	**Model (2.A)**	**Model (2.B)**
Has CER Provision	1.278	5.839***	0.0621	5.041**
	(1.604)	(1.943)	(1.595)	(2.324)
ln GDP/Capita	-6.783	-5.121	-8.975	-5.957
	(8.752)	(9.379)	(8.607)	(9.384)
ln GDP/Capita Sq.	0.390	0.294	0.600	0.436
	(0.543)	(0.582)	(0.511)	(0.554)
Party to ICESCR	6.878***	6.825**	2.729	3.249
	(2.405)	(2.693)	(2.428)	(2.830)
Rule of Law	31.66***	34.12***	15.56*	19.51**
	(7.788)	(8.287)	(7.934)	(8.111)
ln Pop. Density	0.165	0.195	0.0784	0.202
	(0.575)	(0.627)	(0.624)	(0.679)
Constant	58.12	46.52	63.48*	44.51
	(36.37)	(38.84)	(37.85)	(41.25)
Observations	110	109	110	109
Region Fixed Effects	No	No	Yes	Yes
R-squared	0.453	0.411	0.586	0.544
Adjusted R-squared	0.421	0.377	0.529	0.482

Note(s): LHS variable as of 2010. RHS variables as of 2009 (where applicable).
Models with ".B" notation are the second stage results from IV regression.
Fixed effects base category is "Middle East."
Standard errors in parentheses
P-Value Notation: * p<0.10, ** p<0.05, *** p<0.01

Table 4 – Full Environmental Performance Index and CER Index 0-7

	LHS Variable: Environmental Performance Index			
	Model (3.A)	**Model (3.B)**	**Model (4.A)**	**Model (4.B)**
Index 0-7	1.259**	2.182***	0.716	1.910**
	(0.533)	(0.706)	(0.574)	(0.911)
ln GDP/Capita	-5.250	-2.918	-7.621	-2.955
	(8.781)	(8.874)	(9.082)	(9.464)
ln GDP/Capita Sq.	0.308	0.172	0.529	0.264
	(0.544)	(0.546)	(0.535)	(0.548)
Party to ICESCR	6.695***	7.013***	2.913	3.265
	(2.510)	(2.644)	(2.534)	(2.783)
Rule of Law	33.08***	35.12***	17.08**	20.17***
	(7.609)	(7.472)	(7.710)	(7.315)
ln Pop. Density	0.314	0.417	0.134	0.292
	(0.579)	(0.595)	(0.633)	(0.660)
Constant	48.75	35.57	55.56	32.12
	(36.72)	(36.89)	(40.08)	(42.10)
Observations	110	109	110	109
Region Fixed Effects	No	No	Yes	Yes
R-squared	0.476	0.461	0.592	0.573
Adjusted R-squared	0.446	0.429	0.537	0.514

Note(s): LHS variable as of 2010. RHS variables as of 2009 (where applicable).
Models with ".B" notation are the second stage results from IV regression.
Fixed effects base category is "Middle East."
Standard errors in parentheses
P-Value Notation: * p<0.10, ** p<0.05, *** p<0.01

Table 5 – Ecosystem Vitality Component/Objective and Has/Doesn't Have CER Index

	LHS Variable: Ecosystem Vitality Component			
	Model (5.A)	**Model (5.B)**	**Model (6.A)**	**Model (6.B)**
Has CER Provision	1.814	7.130**	1.207	7.486**
	(2.434)	(2.900)	(1.987)	(3.099)
ln GDP/Capita	-20.99*	-18.16	-14.62	-11.01
	(11.87)	(12.36)	(12.34)	(12.71)
ln GDP/Capita Sq.	0.798	0.628	0.718	0.533
	(0.727)	(0.758)	(0.721)	(0.740)
Party to ICESCR	7.429**	7.832**	2.833	2.873
	(3.003)	(3.463)	(3.085)	(3.511)
Rule of Law	31.86***	35.26***	3.372	6.224
	(10.86)	(11.64)	(10.11)	(10.39)
ln Pop. Density	-1.169	-1.157	-0.486	-0.510
	(0.867)	(0.924)	(0.798)	(0.856)
Constant	151.4***	133.9**	101.0*	78.48
	(49.26)	(51.29)	(53.89)	(55.94)
Observations	111	110	111	110
Region Fixed Effects	No	No	Yes	Yes
R-squared	0.243	0.199	0.526	0.479
Adjusted R-squared	0.199	0.152	0.463	0.408

Note(s): LHS variable as of 2010. RHS variables as of 2009 (where applicable).
Models with ".B" notation are the second stage results from IV regression.
Fixed effects base category is "Middle East."
Standard errors in parentheses
P-Value Notation: * p<0.10, ** p<0.05, *** p<0.01

Table 6 – Ecosystem Vitality Component/Objective and CER Index 0-7

	LHS Variable: Ecosystem Vitality Component			
	Model (7.A)	Model (7.B)	Model (8.A)	Model (8.B)
Index 0-7	1.443*	2.588**	0.932	2.867**
	(0.805)	(1.088)	(0.769)	(1.248)
ln GDP/Capita	-19.37	-15.83	-13.14	-6.816
	(12.36)	(12.71)	(13.00)	(13.75)
ln GDP/Capita Sq.	0.712	0.501	0.639	0.298
	(0.754)	(0.770)	(0.755)	(0.787)
Party to ICESCR	7.251**	7.830**	2.993	3.035
	(3.159)	(3.426)	(3.157)	(3.545)
Rule of Law	33.28***	36.41***	4.497	7.199
	(10.93)	(10.88)	(9.954)	(9.682)
ln Pop. Density	-0.989	-0.842	-0.429	-0.331
	(0.881)	(0.901)	(0.804)	(0.844)
Constant	141.5***	122.2**	93.32	60.57
	(51.95)	(53.36)	(57.15)	(60.81)
Observations	111	110	111	110
Region Fixed Effects	No	No	Yes	Yes
R-squared	0.261	0.239	0.532	0.495
Adjusted R-squared	0.219	0.194	0.469	0.427

Note(s): LHS variable as of 2010. RHS variables as of 2009 (where applicable).
Models with ".B" notation are the second stage results from IV regression.
Fixed effects base category is "Middle East."
Standard errors in parentheses
P-Value Notation: * p<0.10, ** p<0.05, *** p<0.01

Table 7 – Environmental Health Component/Objective and Has/Doesn't Have CER Index

	LHS Variable: Environmental Health Component			
	Model (9.A)	**Model (9.B)**	**Model (10.A)**	**Model (10.B)**
Has CER Provision	-1.493	-0.367	-3.712**	-3.531
	(1.884)	(2.610)	(1.634)	(2.286)
ln GDP/Capita	15.44	9.908	-5.120	-5.124
	(10.29)	(10.21)	(8.565)	(8.762)
ln GDP/Capita Sq.	0.0859	0.438	0.864	0.870
	(0.623)	(0.618)	(0.526)	(0.536)
Party to ICESCR	5.158*	4.335	4.086**	3.675*
	(2.622)	(2.741)	(2.035)	(1.970)
Rule of Law	25.04***	22.32***	41.57***	41.48***
	(8.377)	(8.325)	(8.157)	(8.035)
ln Pop. Density	2.165***	1.987***	1.574***	1.549***
	(0.644)	(0.628)	(0.515)	(0.517)
Constant	-106.1**	-83.15*	14.57	14.06
	(43.46)	(42.79)	(35.56)	(36.32)
Observations	147	145	147	145
Region Fixed Effects	No	No	Yes	Yes
R-squared	0.859	0.854	0.921	0.918
Adjusted R-squared	0.853	0.847	0.913	0.910

Note(s): LHS variable as of 2010. RHS variables as of 2009 (where applicable).
Models with ".B" notation are the second stage results from IV regression.
Fixed effects base category is "Middle East."
Standard errors in parentheses
P-Value Notation: * p<0.10, ** p<0.05, *** p<0.01

Table 8 – Environmental Health Component/Objective and CER Index 0-7

	LHS Variable: Environmental Health Component			
	Model (11.A)	Model (11.B)	Model (12.A)	Model (12.B)
Index 0-7	0.224	0.0991	-0.364	-1.139
	(0.675)	(0.924)	(0.536)	(0.842)
ln GDP/Capita	15.60	9.856	-5.419	-5.665
	(10.59)	(10.29)	(9.313)	(9.380)
ln GDP/Capita Sq.	0.0760	0.441	0.885	0.903
	(0.640)	(0.623)	(0.571)	(0.574)
Party to ICESCR	4.736*	4.107	3.855*	3.329
	(2.628)	(2.700)	(2.146)	(2.048)
Rule of Law	26.14***	22.63***	43.57***	41.76***
	(8.279)	(8.322)	(8.241)	(8.544)
ln Pop. Density	2.212***	2.018***	1.615***	1.571***
	(0.643)	(0.634)	(0.532)	(0.535)
Constant	-108.6**	-83.38*	12.82	15.03
	(44.74)	(43.17)	(38.81)	(38.97)
Observations	147	145	147	145
Region Fixed Effects	No	No	Yes	Yes
R-squared	0.858	0.854	0.918	0.914
Adjusted R-squared	0.852	0.847	0.910	0.905

Note(s): LHS variable as of 2010. RHS variables as of 2009 (where applicable).
Models with ".B" notation are the second stage results from IV regression.
Fixed effects base category is "Middle East."
Standard errors in parentheses
P-Value Notation: * p<0.10, ** p<0.05, *** p<0.01

Table 9 – Selected First-Stage Instrumental Variables Results and Test Statistics

	Selected Instrumental Variables Results											
LHS Variable	**Environmental Performance Index**				**Ecosystem Viability Component**				**Environmental Health Component**			
Model Number	**1.B**	**2.B**	**3.B**	**4.B**	**5.B**	**6.B**	**7.B**	**8.B**	**9.B**	**10.B**	**11.B**	**12.B**
Instrumental Variables					**P-Values**							
CER Count Before	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Count of Other ESR	0.003	0.022	0.001	0.015	0.003	0.019	0.001	0.019	0.000	0.001	0.000	0.001
Constitution/Provision Age	0.002	0.009	0.017	0.023	0.002	0.009	0.018	0.022	0.005	0.002	0.040	0.071
					Coefficient Signs							
CER Count Before	+	+	+	+	+	+	+	+	+	+	+	+
Count of Other ESR	+	+	+	+	+	+	+	+	+	+	+	+
Constitution/Provision Age	-	-	-	-	-	-	-	-	-	-	-	-
Test Statistics					**P-Values**							
Hansen's J-Statistic	0.9566	0.3833	0.7528	0.2411	0.5533	0.1759	0.3463	0.0937	0.1587	0.5816	0.1586	0.4869
Robust F-Statistic	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note(s): The p-values for the instrumental variables are from the first stage of the IV regressions. Each model number above is the IV extension of the corresponding "#.A" model. The null hypothesis for Hansen's J-Statistic is that all instruments are valid. The null hypothesis for the Robust F-Statistic is that the instruments are weak. The F-Statistic values range from 31.3295 (8.B) to 134.288 (5.8).

Supplementary Material

Table 10 – Carbon Dioxide Emissions and Has/Doesn't Have CER Index

	LHS Variable: Metric Tons Per Capita Carbon Dioxide Emissions			
	Model (13.A)	**Model (13.B)**	**Model (14.A)**	**Model (14.B)**
Has CER Provision	0.861	0.395	1.499**	1.792
	(0.846)	(1.190)	(0.693)	(1.112)
ln GDP/Capita	-26.49***	-24.16***	-27.28***	-24.61***
	(5.666)	(5.162)	(5.201)	(4.501)
ln GDP/Capita Sq.	1.855***	1.691***	1.885***	1.692***
	(0.363)	(0.322)	(0.338)	(0.280)
Party to ICESCR	-3.313***	-3.165***	-1.603**	-1.935***
	(0.995)	(1.051)	(0.736)	(0.711)
Rule of Law	-16.37***	-13.81***	-9.313*	-5.559*
	(4.713)	(3.448)	(4.776)	(3.103)
ln Pop. Density	0.00842	-0.156	-0.0599	-0.214
	(0.264)	(0.232)	(0.220)	(0.180)
Constant	102.1***	93.92***	106.0***	97.01***
	(23.21)	(21.41)	(20.41)	(18.31)
Observations	156	154	156	154
Region Fixed Effects	No	No	Yes	Yes
R-squared	0.659	0.651	0.727	0.714
Adjusted R-squared	0.645	0.637	0.702	0.687

Note(s): LHS variable as of 2010. RHS variables as of 2009 (where applicable).
Models with ".B" notation are the second stage results from IV regression.
Fixed effects base category is "Middle East."
Standard errors in parentheses
P-Value Notation: * p<0.10, ** p<0.05, *** p<0.01

Table 11 – Carbon Dioxide Emissions and Has/Doesn't Have CER Index

	LHS Variable: Metric Tons Per Capita Carbon Dioxide Emissions			
	Model (15.A)	**Model (15.B)**	**Model (16.A)**	**Model (16.B)**
Has CER Provision	0.732	0.408	1.343**	1.722*
	(0.816)	(1.075)	(0.659)	(0.976)
ln GDP/Capita	69.56**	69.96*	43.72	41.56
	(34.22)	(35.54)	(27.15)	(26.63)
ln GDP/Capita Sq.	-9.607**	-9.554**	-6.590*	-6.204*
	(4.242)	(4.412)	(3.386)	(3.317)
ln GDP/Capita Cu.	0.450**	0.442**	0.333**	0.310**
	(0.174)	(0.180)	(0.140)	(0.136)
Party to ICESCR	-3.023***	-2.873***	-1.494**	-1.826***
	(0.825)	(0.825)	(0.684)	(0.601)
Rule of Law	-17.09***	-14.73***	-9.979**	-6.268**
	(4.526)	(3.341)	(4.764)	(2.970)
ln Pop. Density	0.00673	-0.143	-0.0420	-0.182
	(0.261)	(0.230)	(0.221)	(0.179)
Constant	-162.3*	-165.0*	-89.69	-85.36
	(90.58)	(94.01)	(71.77)	(70.43)
Observations	156	154	156	154
Region Fixed Effects	No	No	Yes	Yes
R-squared	0.680	0.674	0.738	0.725
Adjusted R-squared	0.665	0.658	0.712	0.697

Note(s): LHS variable as of 2010. RHS variables as of 2009 (where applicable).
Models with ".B" notation are the second stage results from IV regression.
Fixed effects base category is "Middle East."
Standard errors in parentheses
P-Value Notation: * p<0.10, ** p<0.05, *** p<0.01

Table 12 – Selected First-Stage Instrumental Variables Results and Test Statistics

	Selected Instrumental Variables Results			
LHS Variable	**CO2 Emissions / Capita**			
Model Number	**13.B**	**14.B**	**15.B**	**16.B**
Instrumental Variables	**P-Values**			
CER Count Before	0.000	0.000	0.000	0.000
Count of Other ESR	0.000	0.000	0.000	0.000
Constitution/Provision Age	0.005	0.021	0.002	0.010
	Coefficient Signs			
CER Count Before	+	+	+	+
Count of Other ESR	+	+	+	+
Constitution/Provision Age	-	-	-	-
Test Statistics	**P-Values**			
Hansen's J-Statistic	0.532	0.4725	0.607	0.553
Robust F-Statistic	0.000	0.000	0.000	0.000

Note(s): The p-values for the instrumental variables are from the first stage of the IV regressions. Each model number above is the IV extension of the corresponding "#.A" model.
The null hypothesis for Hansen's J-Statistic is that all instruments are valid. The null hypothesis for the Robust F-Statistic is that the instruments are weak.