Survival of the Greenest:  
A Statistical Analysis of Constitutional Environmental Rights

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Introduction

Why do some countries have constitutional environmental rights while others do not? In this essay I conduct survival analysis using a Cox regression model on UN-recognized countries over the time period 1983-2010 in order to respond to this inquiry. The analysis proceeds as follows: (1) I review relevant literature and describe theories which may explain state behavior regarding the adoption of constitutional environmental rights; (2) I conduct statistical tests on six independent variables—International Civil Society Influence, Regional Diffusion, Human Rights Legacy, Natural Resource Dependency, Monetary Incentives, and Level of Democracy—to determine which factors offer the greatest explanatory value for the phenomenon observed; and (3) I summarize results of the analysis and offer conclusions. I argue that norm socialization and transnational activism offer more explanatory purchase than domestic politics and rationalist-materialist considerations in understanding the trend toward constitutionalization of environmental rights. I find that the enactment of constitutional environmental rights is most significantly associated with International Civil Society Influence and a country’s Level of Democracy, and best explained by theories based on norm socialization and transnational activism.

Theoretical Background

Four bodies of literature inform the analysis of constitutional environmental rights—environmental rights, constitutional design, human rights, and international
norms. Literature on environmental rights consists mainly of normative legal arguments in favor of expanding human rights to include environmental rights and case study analyses that chronicle the development of environmental rights provisions in constitutions throughout the world (i.e. Brandl & Bungert, 1992; Bruch, Coker, & VanArsdale, 2001; Gormley, 1990; Hodkova, 1991; May & Daly, 2009; Osofsky, 2005; Sax, 1990; Shelton, 1991; Thorme, 1991). Scholarship on constitutional design entails empirical studies that describe the trend in global constitutionalism and provide descriptive accounts of the constitution-making process in post-colonial and post-communist states (i.e. Brown, 2003; Elster, 1995; Ghai & Galli, 2006; Go, 2003; Ludwikowski, 1993; Osiatynski, 2003). Recent work on human rights focuses on why states sign international human rights treaties and how ratification affects state human rights performance and the impact of constitutional human rights provisions (i.e. Goodman & Jinks, 2003; Hafner-Burton & Tsutsui, 2005; Hathaway, 2002; Hathaway, 2007; Heyns & Viljoen, 2001; Keith, 2002; Lutz & Sikkink, 2000; Neumayer, 2005). Finally, scholars of international norms have suggested that the domestic and international legal contexts in which states operate facilitate the adoption of international norms (i.e. Boyle et. al. 2002, Dommen, 1998; Finnemore & Sikkink, 1998; Lutz & Sikkink, 2001; May, 2006; Sandholtz, 2008; Simmons, 2000). However, none of the bodies of literature described above offer an explanation for the global expansion of constitutional environmental rights.

What theories might explain why countries adopt environmental rights? Current social science scholarship on the subject is sparse, and those researchers who do discuss the phenomenon do so without additional empirical probing. Many authors recognize the
emergence of a trend toward legalization of environmental rights but fail to attribute its existence to anything other than growing international concern for environmental issues since the 1960s (i.e. Bándi 1992, Ebeku 2007, Popović 1996, Shelton 1991). Therefore, in this section I develop alternative explanations for the adoption of environmental rights.

First, a theory of norm socialization, based on world society theory and a constructivist approach to international relations, may explain why certain states adopt environmental rights. On this question, world society theory (Meyer et al. 1997) is instructive and comports with the constructivist approach to international relations. World society theorists argue that structural similarities at the national level are due at least in part to the widespread influence of a dynamic global culture. In this theory, states are “exogenously constructed entities” created by and constantly redefined through interactions with actors at all levels of governance in international society (Meyer et al. 1997, 150). Yet, while states may act and be reconstructed in response to the behavior of actors such as other states, transnational activists, and intergovernmental organizations, this redefinition is more the result of being entrenched within a broader world culture as opposed to internal rational calculation. In world society theory, it is world culture that shapes and constrains states. Similarly, constructivists claim that “the actions of states contribute to making the institutions and norms of international life, and these institutions and norms contribute to defining, socializing, and influencing states” (Hurd 2008, 304). States both act upon international society and are constituted by it, becoming socialized to desire certain things in the process (Finnemore 1996, 2). Unlike rationalists, constructivist scholars argue that the formation of an identity occurs prior to the
formulation of interests.\(^1\) Identities are “relatively stable, role-specific understandings and expectations about self” (Wendt 1992, 397). These understandings and expectations, socially constructed through a framework of discourse, inform interests that actors pursue. Therefore, world society theorists and constructivists might speculate that a country would be socialized through interactions in international society to adopt environmental rights as a “symbol of national identity and democratic commitment” (Ackerman 1997, 783).

Second, a rationalist-materialist account of international relations may provide an explanation for the phenomenon of interest. Rationalists argue that “norms [are] reflections of fixed preferences of the most powerful states” (Florini 1996, 366). For example, rationalists might argue that states adopt environmental rights as a result of coercion, pressure, or incentives offered by a hegemon (Ikenberry and Kupchan 1990). Another rationalist explanation for the phenomenon may be that a state wishes to send a signal to potential investors about the strength of the rule of law in the country in order to secure foreign direct investment. Empirical research has demonstrated that government respect for physical integrity rights and political rights and civil liberties increases as the level of foreign direct investment in a country grows (Richards et al. 2001, 219). One scholar explains the causal linkages inherent to this line of thought:

> “Because rights operate as trumps over normal governmental interests, they have an inherent cost. Consequently, by entrenching protection for human rights, governments can signal a willingness to give up power in the short term to obtain long-term benefits. Investors can infer from this that the government has a low

\(^1\) Fearon and Wendt (2002) argue that rationalism and constructivism are not incompatible. For instance, scholars of both analytical perspectives generally agree that ideas matter in international politics; “[i]n rationalism the main explanatory role of norms is ‘regulative’ of the behavior of exogenously given agents, whereas in constructivism norms are ‘constitutive’ of actors’ identities and interests in the first place” (Fearon and Wendt 2002, 61). Ideas are only subjugated where material concerns are deemed to possess more explanatory value. Therefore, materialism may be said to more definitively oppose constructivism than does rationalism.
discount rate and is less likely to pose a threat of expropriation. Similarly, when courts vigorously enforce human rights, they dramatize their judicial independence, which is valuable to investors, who themselves may have no interest in human rights. Thus, human rights enforcement may help encourage investment and thereby indirectly foster economic growth” (Farber 2002, 83).

Similarly, states may enact certain rights to appease donor countries seeking to offer financial support to countries that take measures to promote the protection of human rights. For example, previous work has shown that the distribution of U.S. foreign aid is positively associated with a recipient country’s efforts to safeguard human rights (Abrams & Lewis 1993, 819). In the present study, environmental rights, which are often classified as third-generation human rights, may be viewed as elements of the broader human rights initiative undertaken by a country to solicit support in the form of aid or investment. A related but opposite argument, that firms looking to invest abroad flock to so-called “pollution havens” where environmental regulations are weak or non-existent, is generally not supported by empirical studies on the topic (Petrović-Randjelović 2007, 188; Zarsky 1999, 47). Therefore, under a rationalist-materialist explanation states might adopt environmental rights to satisfy the demands of a hegemon, fall in line with other countries in the region to avoid appearing like a laggard and thus losing a competitive edge in attracting investment, or pursue self-interested goals such as increasing foreign assistance.

Third, a theory based on transnational activism may help to describe why states adopt environmental rights. Mainly, transnational advocacy networks may play a central role in raising consciousness about environmental injustice within a state, and promoting institutional changes to address the problem. Transnational advocacy networks “are networks of activists, distinguishable largely by the centrality of principled ideas or
values in motivating their formation” (Keck and Sikkink 1999, 89), that engage in the exchange of information and services centered around advancing a particular cause. Transnational advocacy networks may effect change proactively by drawing attention to an issue currently unattended to by decision makers and demanding action, or reactively by compelling compliance with legal obligations already adopted but not adequately implemented and enforced. The latter of these approaches is referred to as the “paradox of empty promises” (Hafner-Burton and Tsutsui 2005), whereby a state may ratify human rights treaties with no intention of enforcing them only to find that members of global civil society ultimately pressure the government to comply with their legal obligations to protect human rights. In short, a theory of transnational activism suggests that borderless advocacy groups leverage resources that would otherwise be unavailable to domestic groups in order to promote the protection of environmental rights.

Fourth, a theory focused on domestic politics may assist in answering the main research question. For champions of domestic politics, the legalization of environmental rights might be a function of public opinion on environmental issues among the citizenry of a state (Calvert 1979), the efforts of domestic social movement organizations (Rucht 1999, 215), the policy decisions of governmental leadership, or a combination of these factors (see Agnone 2007). Pressure to adopt environmental rights may come from a range of actors within a state who seek to right historic wrongs or improve the quality of the natural environment. These actors may utilize a variety of tactics, such as protests, letter writing campaigns, lobbying, litigation, or voting to encourage domestic leaders to
address the issue of environmental justice through the enactment of environmental rights.²

Indeed, several of these theories may necessarily overlap. For instance, norm socialization may function simultaneously with a rationalist-materialist rationale (Simmons 2000); transnational activism may promote the legalization of international norms through socialization (Risse and Sikkink 1999, 5); transnational advocacy networks may provide resources to assist domestic pressure groups (Keck and Sikkink 1999, 89); domestic interest groups may operate under rationalist-materialist considerations (Olson 1965); and international norms may be invoked by domestic groups (Cardenas 2004, 215). Therefore, throughout this research it will be important to consider the potential interaction between possible theoretical explanations for the adoption of environmental rights, and the likelihood that any resulting explanation may be complex and multi-level.

Due to resource constraints inherent among countries that elect to instantiate these rights, the flexibility, specialization, and network capacity of transnational advocacy groups, and the relative lack of importance afforded to environmental rights compared to more substantial institutional innovations and reforms desired by donor countries, I argue that norm socialization and transnational activism offer more explanatory purchase than domestic politics and rationalist-materialist considerations in understanding the trend toward constitutionalization of environmental rights.

² The preceding analysis is not meant to foreclose on the possible importance of an interactive approach to answering the research question. Indeed, some scholars find explanatory purchase in analyzing the dynamism between the domestic and international levels of governance. Writers in this tradition view state policymaking as the outcome of a “two-level game” in which international norms are translated through domestic structures (see Finnemore and Sikkink 1998, 893; Florini 1996, 379). For these theorists, decisions regarding the adoption environmental rights may be the result of simultaneous pressure from a domestic public and a donor state attaching purse strings to certain democratic reforms.
Research Design

Hypotheses

In this research project, I test the efficacy of domestic politics, norm socialization, rationalism-materialism, and transnational activism explanations for the phenomenon of interest. Specifically, I hypothesize the following:

H1: The greater the number of international civil society organizations to which citizens are a party, the more likely a state will be to adopt environmental rights

H2: The greater percentage of other countries in the region with environmental rights, the more likely it is that a country will adopt environmental rights

H3: The poorer a country’s human rights legacy, the more likely it is to adopt environmental rights

H4: The greater a country’s reliance on natural resources for its economic productivity, the less likely it is to adopt environmental rights

H5: The more external financial support a country receives, the more likely it is to adopt environmental rights.

H6: The more democratic a country is, the more likely it is to adopt constitutional environmental rights.

H1 is based on the idea that International Non-Governmental Organizations (INGOs), serving as advocates of global human rights norms, urge states to adopt formal legal commitments to protect human rights regardless of the level of institutional support available to achieve compliance (Hafner-Burton and Tsutsui 2005, 1378, 1385). Previous research already demonstrates that governments placed in a negative spotlight are more likely to continue engaging in human rights abuses or increase violations of some human rights while reducing the incidence of abusing others (Hafner-Burton 2008). Here the focus is on adoption, not performance. States, seeking to avoid being “named and shamed” by INGOs for not adequately addressing human rights issues, will respond to
pressure by engaging in the relatively low cost action of adopting a constitutional environmental right. This hypothesis rests on the suggestion that normative suasion can produce certain institutional reforms.

H₂ is rooted in the notion that countries within the same geographic region will tend toward isomorphism with regard to legal commitments due to socialization and policy transfer (Dolowitz and Marsh 2000) or possibly in order to avoid appearing like laggards and enhance their reputation to compete intra-regionally for investment (Simmons 2000, 832). Countries writing new constitutions often borrow certain design elements from a limited number of exemplars and many of the same people (i.e. foreign constitutional law scholars) who helped write one new constitution within a region may be called upon to assist another country within the same geographic area. In addition, especially in the developing world, decision makers in one region who participate in the creation of a new constitution may have all received the same special training from regional or international bodies working to promote democracy and development. Relatedly, countries within a given region may solicit expertise and technical advice from members of an epistemic community during the constitution drafting process. An epistemic community refers to “a network of professionals with recognized expertise and competence in a particular domain and an authoritative claim to policy-relevant knowledge within that domain or issue area” (Haas 1992, 3). Alternately, states may simply copy the provisions contained within the constitution of another country from

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3 Here I extend Hathaway’s argument regarding the reasons why a country might ratify a human rights treaty to the case of adopting a constitutional environmental right: “where compliance is least likely, commitment is often relatively costless” (Hathaway 2007, 613).

4 This phenomenon is known as constitutional borrowing, which occurs “when drafters of new constitutions encounter a particular problem and look to other constitutions for solutions,” (Osiatynski 2003, 244). Also see Davis 2003, Epstein & Knight 2003.
within the region so that they do not appear to lack contemporary human rights laws that would make them seem less committed to the rule of law and thus riskier prospects for foreign investment.

H₃ is suggested by the observation that countries with a history of insufficient protection of human rights, especially former communist states in Eastern Europe, are more likely to adopt individual rights guarantees as a way to correct for the inadequate protection of such rights under the rule of previous governments (Osiatynski 1994, 112). In this way, the adoption of new human rights functions as a signal to the domestic polity that the state is dedicated to repairing relations with its citizenry, preventing backsliding from occurring, and promoting democratization through the enactment of progressive policies.

H₄ is predicated on the idea that a country that is highly dependent upon natural resources for its economic productivity will be less likely to develop strong governing institutions (Barbier 2005). Such countries may shy away from promulgating legal commitments that could be used to hamper the exploitation of natural resources in the event economic development results in environmental degradation which causes human rights to be violated.

H₅ is based on the empirical finding that countries dependent on external financial assistance will adopt certain institutional reforms, such as codifying environmental rights, to satisfy the demands of donor countries desiring to see such reforms implemented (Alesina and Dollar 2000, 33). More precisely, the adoption of a constitutional environmental right may in fact be epiphenomenal to the implementation of institutional reforms required under the terms of an aid package. In addition, countries may adopt
environmental rights in order to appear committed to the protection of human rights and transparent for the purpose of attracting foreign investment (Law 2008, 46-48 n142, 50).

H₆ relates to the argument that “democracies as a whole…are more likely to join human rights treaties” (Hathaway 2007, 613). In particular, Hathaway (2007) contends that democracies are more likely to contain constituencies which favor the adoption of human rights treaties, enabling leaders in such countries to reap collateral benefits from participating in international human rights instruments. Collateral benefits may include, for example, the attainment of certain policy goals that might be difficult to achieve otherwise. It may also be the case that the obligations stipulated in human rights treaties hold normative value for states which privilege restrictions on government authority. More broadly, the protection of human rights is considered an important element of good governance, and good governance remains strongly associated with democracy (Reif 2000, 18). Therefore, analogizing human rights treaties to constitutional environmental rights, countries which tend toward greater levels of democracy may be more inclined to entrench such rights in their respective governing charters.

A table summarizing the aforementioned hypotheses and the theories to which they apply is provided below (Table 1).

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Theory(ies)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H₁: International Civil Society Influence</td>
<td>Norm Socialization &amp; Transnational Activism</td>
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<tr>
<td>H₂: Regional Diffusion</td>
<td>Norm Socialization &amp; Rationalism-Materialism</td>
</tr>
<tr>
<td>H₃: Human Rights Legacy</td>
<td>Domestic Politics</td>
</tr>
<tr>
<td>H₄: Natural Resource Dependency</td>
<td>Rationalism-Materialism</td>
</tr>
<tr>
<td>H₅: Monetary Influence</td>
<td>Norm Socialization &amp; Rationalism-Materialism</td>
</tr>
<tr>
<td>H₆: Level of Democracy</td>
<td>Domestic Politics &amp; Norm Socialization</td>
</tr>
</tbody>
</table>

Table 1. Hypotheses and the theory or theories to which they correspond.

Data
In this study I analyzed countries across the time period from 1983 through 2010, nine years after the first environmental rights were enacted up through some of the most recent additions of countries with environmental rights (i.e. Dominican Republic in 2010).

I analyzed the relationship between six independent variables and one dependent variable. The first independent variable is International Civil Society Influence (ICSI), which I measured by counting the number of international non-governmental organizations (INGOs) in which citizens of a state are members in a given year. Values range from 0-64,000+ organizations that might have a presence in a country. I catalogued the number of INGOs in a given country during a certain year using annual data from the *Yearbook of International Organizations* as my primary resource. This variable serves as a measure of the explanatory value of the norm socialization and transnational activism perspectives.

The second independent variable, Regional Diffusion (RD), was approximated by recording the percentage of states within the geographic region in which a country is located, as defined by the World Bank, that have constitutional environmental rights in place in a given year. I determined the percentage of countries within a region that have environmental rights by accessing data compiled in the *Comparative Constitutions Project*, Boyd’s (2010) *Environmental Rights Revolution*, and by searching ECOLEX, an environmental law database, using the search terms “environmental right” and “right to environment.” This variable serves as a measure of the strength of the norm socialization and rationalism-materialism perspectives.
The third independent variable is Human Rights Legacy (HRL). This variable was evaluated using a three-year moving average of a country’s human rights record. Data pertaining to a country’s human rights record was drawn from Freedom House, which provides country-level data on government respect for human rights from 1973-2012. I separately analyzed two measures offered by Freedom House, Political Rights (PR) and Civil Liberties (CL), both scored on a scale from 1 (greatest level of protection afforded) to 7 (lowest level of protection afforded). This variable serves as a measure of the relevance of the domestic politics perspective.

The fourth independent variable, Natural Resource Dependency (NRD), was assessed using two different measures. First, I used World Bank data on the amount of Total Natural Resource Rents (NR) a country obtains in a given year, expressed as a percentage of GDP (0-100%). The amount of total natural resource rents represents the sum of a country’s coal, forest, mineral, natural gas, and oil rents. Second, I used World Bank data on Agricultural Land (AL), defined as the percent of a country’s land area that is arable, under permanent crops, and under permanent pastures (0-100%). These measures test the viability of the rationalism-materialism perspective in explaining the phenomenon observed.

The fifth independent variable, Monetary Incentives (MI), was estimated using three measures taken from the World Bank. First, I used Net Bilateral Aid (NBA) flows from Development Assistance Committee (DAC) donors in current US dollars. Second, I used net inflows of Foreign Direct Investment (FDI) expressed as a percentage of GDP (0-100%). Third, I used Net Official Development Assistance (ODA) received expressed as a percentage of Gross National Income (GNI; 0-100%). These measures also serve to
evaluate the applicability of the rationalism-materialism perspective as a means of understanding the emergence of constitutional environmental rights.

The sixth independent variable, Level of Democracy (LD), was recorded using Regime Characteristics from the *Polity IV Project*. Specifically, I used the Polity2 measure, a time-series analysis compatible version of the Polity measure, from Polity IV’s Regime Characteristics and Transitions data set. Polity2 is a scale variable combining separate measures of autocracy and democracy that capture the extent to which a country’s governing regime tends toward autocracy or democracy. Values range from -10 (strongly autocratic) to 10 (strongly democratic).

The dependent variable in the first stage is the presence or absence of environmental rights in a country during a given year. For the purposes of measurement, a constitution was considered to include an environmental right if it featured a justiciable provision expressing the positive right of an individual to a healthy, clean, ecologically balanced, or pleasant environment (or some reasonable variant thereof). Country-years in which an environmental right appears in a constitution were coded “1,” while the absence of environmental rights during a given country-year was coded “0.” I identified constitutional environmental rights using data from the *Comparative Constitutions Project*, specifically variable 627, [ENVREF_3], which codes for constitutions that include an environmental rights provision, and data from Boyd (2010).

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5 Republic of Chad Constitution, Title II, Chapter I, Article 47.
6 Colombia Constitution, Title II, Chapter III, Article 79.
7 East Timor Constitution, Part II, Title III, Article 61(1).
8 Republic of Korea Constitution, Chapter II, Article 35(1).
9 This coding scheme is designed to differentiate a fundamental environmental right from related substantive rights (i.e. “the right to health”) and procedural environmental rights (i.e. “the right to environmental impact assessment”).
In addition to the variables and measures listed above, I also utilized several control variables in the analysis. These variables were GDP, GDP per capita (GDPpc), Land Area (square kilometers; LA), Population (POP), and Population Density (people per square kilometer of land area; PD). The data for all of the aforementioned controls come from the World Bank.

Method

I conducted statistical analyses, specifically survival analysis, on time-series cross-section data in order to understand the relationship between various domestic and international conditions and the presence or absence of environmental rights. I employed a method of modeling survival data useful for measuring the effect of a treatment on the hazard rate of an event (i.e. adopting a constitutional environmental right)—the Cox model. Also known as the proportional hazards model or Cox regression model, this model is semi-parametric in that the model is based on the assumption of proportional hazards, although no particular form of probability distribution is assumed for the survival times (Collett 2003, 56). The Cox model is particularly well suited to handle multivariate regression with dichotomous outcomes and time-dependent variables, which makes it an ideal statistical technique for this project. Using this model I analyzed the variation in the times-to-event across countries for measures of the five independent variables described earlier. The formula for the full Cox model used in this analysis is as follows:

\[
h_i(t) = h_0(t)e^{\beta_{\text{ICCSI}}X_{\text{ICCSI}}+\beta_{\text{RD}}X_{\text{RD}}+\beta_{\text{HRL}}X_{\text{HRL}}+\beta_{\text{HRL}}X_{\text{HRL}}+\beta_{\text{NRD}}X_{\text{NRD}}+\beta_{\text{NRD}}X_{\text{NRD}}+\beta_{\text{NRD}}X_{\text{NRD}}+\beta_{\text{MI}}X_{\text{MI}}+\beta_{\text{FDI}}X_{\text{FDI}}+\beta_{\text{ODA}}X_{\text{ODA}}+\beta_{\text{RC}}X_{\text{RC}}+\beta_{\text{GDP}}X_{\text{GDP}}+\beta_{\text{GDP}}X_{\text{GDP}}+\beta_{\text{GDP}}X_{\text{GDP}}+\beta_{\text{GDP}}X_{\text{GDP}}+\beta_{\text{LA}}X_{\text{LA}}+\beta_{\text{POP}}X_{\text{POP}}+\beta_{\text{PD}}X_{\text{PD}},}
\]

where \( i \) refers to the country, and \( t \) signifies a time-dependent variable.
Analysis

The aforementioned hypotheses will either be confirmed or disconfirmed based on the regression coefficients and hazard ratios realized through analysis of the data using the Cox model. For \( H_1 \), a positive coefficient for the ICSI variable will indicate that the greater the presence of INGOs in a country, the more likely it is to adopt environmental rights. For \( H_2 \), a positive coefficient for the RD variable will suggest that the greater the percentage of countries within a given region with environmental rights, the more likely a country will be to adopt environmental rights of its own. The hazard ratio for the RD variable will instruct that with every increase of 1\% in the percentage of countries with a constitutional environmental right the estimated likelihood of another country adopting a constitutional environmental right is either increased or reduced by a certain percentage. For \( H_3 \), a negative coefficient on either measure of the HRL variable would indicate that countries are less likely to establish environmental rights if they have a positive human rights record, and thus more likely to do so the worse their human rights record. For \( H_4 \), a negative coefficient on either measure of the NRD variable would support the idea that the greater a country’s dependency on natural resources for its economic productivity, the less inclined the country is to adopt a constitutional environmental right. For \( H_5 \), a positive coefficient produced for any of the three measures of the MI variable will suggest that the greater a country’s reliance on external financial support, the more likely the country will be to adopt environmental rights. For \( H_6 \), a positive coefficient for the RC measure would indicate that the more democratic a country is, the more likely it is to adopt a constitutional environmental right during a given year. The hazard ratio for the Level of Democracy variable will offer the insight
that with every additional point in a country’s Polity IV score (i.e. a country tends more toward democracy than autocracy), the likelihood that a country may enact a constitutional environmental right is either enhanced or diminished.

**Model Selection**

Due to the utilization of different sources of data in this study and the unique features of each dataset, two distinct approaches to model selection were employed in the analysis in order to test variables of theoretical importance while also managing data issues such as missingness. First, I conducted an analysis oriented toward maximizing the number of cases included. This necessarily entailed removing those measures and variables that suffered from severe missingness, which I determined to mean a condition where greater than 5% of the data was absent. All variables (with the exception of Regional Diffusion) were initially treated with extrapolation in order to fill in missing values of the data, but those measures for which the number of missing data exceeded 5% were selected for exclusion from the model. The employment of this strategy resulted in the removal of four measures featured in the full model. Next, I used backward elimination to remove additional measures that failed to achieve statistical significance at the .05 level. This procedure resulted in the elimination of six additional measures. This approach to model selection allowed me to retain 148 total cases, 62 of the original 75 cases in which constitutional environmental rights were adopted, and five statistically significant variables.

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10 Missing data in this study was considered to fall into the category “missing at random,” since the missing values were not likely to be related to the outcome of interest. In some cases, the missingness pattern may be described as “file matching” because certain years of data were not collected for more than one measure. 11 The measures removed from analysis due to missingness were foreign direct investment (6.9% missing data), natural resource dependency (5.2% missing data), net bilateral aid (22.2% missing data), and net official development assistance (38.6% missing data).
Second, because it was necessary to test the full model, I conducted another analysis focused on maximizing the number of variables to be tested. Again, all measures were subjected to extrapolation prior to the removal of any cases. This process required the deletion of cases that suffered from severe missingness, construed here as a situation in which a case lacked data for 50% or more of the years under observation on any given measure. Upon completing the removal of cases with severe missingness, the data set was comprised of 113 total cases, 45 of the original 75 cases in which constitutional environmental rights were adopted, and all 15 measures in the full model.

Next, in order to construct the most robust statistical model, I followed the four-step model selection procedure advocated by Collett (2003, 80-83). In the first step, I ran a Cox model regression for each of the 15 measures independently. In the second step, I retained only those measures that produced both statistically significant results and a log-likelihood value one-unit or more greater than the log-likelihood for the null model. Then I computed the change in the value of the log-likelihood for the tested model when I omitted, one at a time, each of the previously retained measures. In the third step, I reintroduced, one by one, each of the measures I had discarded at the beginning of step two to observe whether bringing back any of these measures produced a one-unit or greater reduction in the log-likelihood of the tested model. Three such measures, each statistically significant at the .10 level, were identified. In the fourth step, I conducted a final model check by running Cox model regressions on three models, each of which

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12 The removal of certain measures due to missingness was a function of variable endogeneity since most developed countries did not receive any kind of foreign financial assistance. This fact resulted in the elimination of most European countries from the data set, for example. Therefore, the maximum-variable model necessarily contains far fewer developed countries than does the maximum-case model.

13 Collett (2003) recommends using a 10% significance level as the appropriate standard for identifying measures worthy of reintroduction into the model.
included a different pairing of two of the measures brought back into the analysis in step three. The log-likelihoods of each of these paired analyses were then compared to the log-likelihood for the model tested with all seven measures. The purpose here was to determine if omitting any of the reacquired measures caused a significant increase (i.e. reduction in model skill) in the log-likelihood of the tested model.

The two model selection methods described above were employed in order to balance the competing interests of case maximization and variable maximization. As will be discussed below, the two strategies produced mostly consistent results, thus allowing for greater confidence in the validity of the conclusions subsequently drawn from the analysis.

Results

For the maximum-case model, five measures—Civil Liberties, GDP per capita, International Civil Society Influence, Population Density, and Regime Characteristics—were found to produce a statistically significant effect on the likelihood that a country will adopt a constitutional environmental right.14 The statistical output from this model is included below (see Table 2).15

<table>
<thead>
<tr>
<th>Measure</th>
<th>Hazard Ratio</th>
<th>Coefficient</th>
<th>Z-score</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil Liberties</td>
<td>1.38</td>
<td>0.32</td>
<td>2.09</td>
<td>0.04</td>
</tr>
<tr>
<td>GDP per capita</td>
<td>0.99</td>
<td>-0.01</td>
<td>-3.33</td>
<td>0.00</td>
</tr>
<tr>
<td>International Civil Society Influence</td>
<td>1.08</td>
<td>0.07</td>
<td>2.57</td>
<td>0.01</td>
</tr>
<tr>
<td>Population Density</td>
<td>0.47</td>
<td>-0.76</td>
<td>-3.71</td>
<td>0.00</td>
</tr>
<tr>
<td>Regime Characteristics</td>
<td>1.16</td>
<td>0.15</td>
<td>3.68</td>
<td>0.00</td>
</tr>
</tbody>
</table>

14 Values for the GDP per capita, International Civil Society Influence, and Population Density measures were adjusted by dividing each observation by 100 in order to improve the interpretability of the results.

15 Several interactions, along with the introduction of a linear spline to the model equation, were tested, but none yielded statistically significant results. Using Stata’s stepwise function, which eliminates variables that exceed p-values of 0.05, the following measures were excluded from the resulting full model: Agricultural Land, GDP, Land Area, Political Rights, Population, and Regional Diffusion. For full statistical output from the maximum-case model, see Appendix A.
The hazard ratio for Civil Liberties suggests that with every one-unit increase in a country’s civil liberties score, the likelihood that a country will entrench a constitutional environmental right in its governing charter increases by 38%. The hazard ratio for GDP per capita signifies that with an increase of $100 in a country’s GDP per capita, the likelihood that the country will adopt a constitutional environmental right decreases by 1%. The hazard ratio for International Civil Society Influence suggests that for every 100 INGOs with a membership presence in a country, the likelihood that a state enacts a constitutional environmental right increases by 8%. The hazard ratio for Population Density indicates that with the addition of 100 people per square mile, the likelihood that a country promulgates a constitutional environmental right decreases by 53%. Finally, the hazard ratio for Regime Characteristics purports that for every one-unit increase in a country’s Polity IV score (i.e. a country tends more toward democracy than autocracy), the likelihood that such a country will instantiate a solidarity environmental right in its constitution increases by 16%. In the maximum-case model, countries that scored 3 or higher on the Polity IV scale were 128% more likely to enact a constitutional environmental right than countries that scored below 3. This result suggests that developing countries in the process of democratization may be the most likely group of states to institutionalize the protection of broadly articulated environmental rights.

For the maximum-variable model, while the model with the greatest log-likelihood included seven measures, only four of the measures—GDP per capita, Net Bilateral Aid, Population Density, and Regime Characteristics—were found to be
statistically significant at the .05 level. The results of the analysis for this model are depicted below (see Table 3).

<table>
<thead>
<tr>
<th>Measure</th>
<th>Hazard Ratio</th>
<th>Coefficient</th>
<th>Z-score</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP per capita</td>
<td>0.98</td>
<td>-0.02</td>
<td>-2.10</td>
<td>0.04</td>
</tr>
<tr>
<td>Net Bilateral Aid</td>
<td>1.00</td>
<td>5.24e-11</td>
<td>3.06</td>
<td>0.00</td>
</tr>
<tr>
<td>Population Density</td>
<td>0.52</td>
<td>-0.01</td>
<td>-2.94</td>
<td>0.00</td>
</tr>
<tr>
<td>Regime Characteristics</td>
<td>1.10</td>
<td>0.09</td>
<td>3.20</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Table 3. Statistical output from the maximum-variable Cox model analysis.

The hazard ratio for GDP per capita indicates that with an increase of $100 in a country’s GDP per capita in a given year, the likelihood that the country will adopt a constitutional environmental right decreases by 2%. The hazard ratio for Net Bilateral Aid, while statistically significant, is not empirically informative because the statistic suggests that the effect of the measure is virtually nonexistent. The hazard ratio for Population Density signifies that with the addition of 100 people per square mile, the likelihood that a country enacts a constitutional environmental right decreases by 48%. Finally, the hazard ratio for Regime Characteristics demonstrates that for every one-unit increase in a country’s Polity IV score, the likelihood that a country will incorporate an environmental rights provision into its constitution increases by 10%. In addition, countries that scored -2 or above were 184% more likely to entrench a solidarity environmental right in their constitution.

It is important to note that despite the use of all variables and measures for which data was collected and included in the initial version of this model, the fact that this model was analyzed using 24% fewer total cases and 27% fewer cases in which

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16 The three measures not included in the final model were Foreign Direct Investment (z = -1.48), International Civil Society Influence (z = 1.64), and Political Rights (z = 1.56).

17 For the full statistical output for the maximum-variable model, see Appendix B.

18 Indeed, the standard error of the Net Bilateral Aid measure was 5.24e-11 and the 95% confidence interval was (1, 1).
constitutional environmental rights were enacted than the maximum-case model likely reduced the overall model skill by a non-trivial amount.

Upon completion of the analysis, I completed diagnostic tests on both the maximum-case and maximum-variable models to establish whether or not the major assumption underlying the Cox model—that of proportional hazards—had been violated. In particular, I conducted two kinds of tests: (1) visual assessments of graphic plots and (2) Chi-square tests comparing model output with the Schoenfeld residuals of the data. To develop plots for both models, the median values for each of the measures were calculated and dummy variables were created to separate observations above (coded “1”) and below (coded “0”) the median. Then each measure was plotted in three ways: (1) separately using the dummy variable in a log-log plot; (2) adjusted for the presence of the other statistically significant measures in a dummy variable log-log plot; and (3) separately in a survivor plot. For the maximum-case model, the plots did not show evidence that the proportional hazards assumption had been violated. Similarly, for the maximum-variable model, a visual inspection of the plots failed to reveal any obvious departures from the proportional hazards assumption.

The results of the Chi-square tests are presented below (see Table 4).

<table>
<thead>
<tr>
<th>Measure</th>
<th>Max-Case Model ($X^2$ values)</th>
<th>Measure</th>
<th>Max-Variable Model ($X^2$ values)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil Liberties</td>
<td>1.05</td>
<td>GDP per capita</td>
<td>0.17</td>
</tr>
<tr>
<td>GDP per capita</td>
<td>1.13</td>
<td>Population Density</td>
<td>0.93</td>
</tr>
<tr>
<td>International Civil Society Influence</td>
<td>5.51</td>
<td>Net Bilateral Aid</td>
<td>2.05</td>
</tr>
<tr>
<td>Population Density</td>
<td>1.84</td>
<td>Regime Characteristics</td>
<td>0.73</td>
</tr>
</tbody>
</table>

Collett (2003, 144) explains: “Hazards are said to be proportional if ratios of hazards are independent of time. If there are one or more explanatory variables in the model whose coefficients vary with time, or if there are explanatory variables that are time-dependent, the proportional hazards assumption will be violated.”
Table 4. Output from Chi-square tests of maximum-case and maximum-variable models by measure.

The above table lists Chi-square test statistics for measures found to be statistically significant in both of the models analyzed. These tests were conducted by comparing the observed values against the Schoenfeld residuals in order to discern whether or not the null hypothesis—that the hazard rate between the two groups does not differ—can be rejected. With the exception of the ICSI variable, all of the other measures obtained Chi-square values that preclude rejecting the null hypothesis, meaning that it is likely that the proportional hazards assumption was not violated. In the case of the ICSI variable, however, the null hypothesis can be rejected at the .05 level but not the .01 level, meaning that there is a 1% probability that deviation from the expected values is due to chance alone. Therefore, it is likely, given the data for the ICSI variable, that the observed differences in hazard rates are not due to chance alone.

Discussion

The results of the statistical analysis with respect to the hypotheses enumerated earlier are summarized below (see Table 5).

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H_1$: International Civil Society Influence</td>
<td>Support</td>
</tr>
<tr>
<td>$H_2$: Regional Diffusion</td>
<td>No Support</td>
</tr>
<tr>
<td>$H_3$: Human Rights Legacy</td>
<td>Partial Support</td>
</tr>
<tr>
<td>$H_4$: Natural Resource Dependency</td>
<td>No Support</td>
</tr>
<tr>
<td>$H_5$: Monetary Influence</td>
<td>Inconclusive</td>
</tr>
<tr>
<td>$H_6$: Level of Democracy</td>
<td>Support</td>
</tr>
</tbody>
</table>

Table 5. Summary depicting results of hypothesis testing.

First, the analysis suggests that the greater the international civil society influence present in a country, the more likely it is to adopt a constitutional environmental right. Second, the percentage of countries within a region that have constitutional environmental rights...
did not have a statistically significant impact on the likelihood that another country would enact a constitutional environmental right in either of the models tested.\textsuperscript{20} Third, in accordance with expectations, I found that the worse a country’s human rights record in terms of its protection of civil liberties, the more likely it is to promulgate a solidarity environmental right in its constitution. Fourth, the extent to which a country is dependent upon natural resources for its economic vitality was not found to be significantly related to the propensity of a country to include a solidarity environmental right in its governing charter. Fifth, the relationship between a country’s reliance on foreign financial assistance and the likelihood that it will adopt a constitutional environmental right was ultimately deemed to be inconclusive since only one measure of the Monetary Incentives variable proved to be statistically significant and its hazard ratio did not indicate a positive or negative effect on the outcome of interest. Sixth, in congruence with the final hypothesis, the results of the analysis suggest that the more democratic a country is, the more likely it is to adopt a constitutional environmental right during a given year.

The statistical analysis conducted in this study provides the greatest support for the norm socialization and transnational activism explanations for the trend toward constitutionalization of environmental rights beginning in the 1970s. Moderate support was also found for the domestic politics explanation (see Table 6 for full results).

<table>
<thead>
<tr>
<th>Theory</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norm Socialization</td>
<td>Support</td>
</tr>
<tr>
<td>Rationalism-Materialism</td>
<td>No Support</td>
</tr>
<tr>
<td>Transnational Activism</td>
<td>Support</td>
</tr>
<tr>
<td>Domestic Politics</td>
<td>Partial Support</td>
</tr>
</tbody>
</table>

Table 5. Evaluation of theoretical explanations.

\textsuperscript{20} When analyzing the Regional Diffusion variable on a regional scale by testing the hypothesis in the three regions of the world in which constitutional environmental rights are most prevalent, Gellers (2012) found that the percentage of countries within a region with constitutional environmental rights actually had a statistically significant negative effect on the likelihood of further adoption of such rights.
It may be the case that the presence of INGOs in a country results in the introduction of ideas, networks, resources, and leadership necessary to promote and institutionalize emerging norms of the world society. In-depth case study research will be required to determine the precise mechanisms by which INGOs successfully integrate new norms, such as environmental rights, into new and existing governing institutions, especially in developing countries where resources are scarce. The partial support for the domestic politics theory obtained through the analysis hints that perhaps the global emergence of constitutional environmental rights is due to factors both internal and external to the state. For example, international norms pertaining to human rights may be promoted domestically by INGOs who find a suitable audience among those who have suffered human rights violations in the past and/or have reason to support measures which offer citizens legal protection for issues involving environmental quality.

In addition to examining the variables of interest, several control variables were tested as well. Of those controls included in the analysis, GDPpc and PD were found to be statistically significant. Specifically, countries with a lower GDP per capita and lower population densities were more likely to adopt constitutional environmental rights. These results suggest that constitutional environmental rights are more common among less crowded developing countries.

Countries that have yet to adopt constitutional environmental rights may be reticent to do so for at least two reasons. First, rather than being laggards, these countries may have positioned themselves to simply “wait and see” the effects of including these kinds of provisions in constitutions. This perspective may be founded on the premise that
it is best to observe how these situations played out in other states before promulgating an environmental rights provision in one’s home constitution. Some countries may wait in order to observe the experience of those states with constitutional environmental rights (i.e. number of cases filed, number of issues resolved, costs of litigation, etc.) before deciding to enact such a right. As the data is right-censored, more countries may adopt constitutional environmental rights in a new constitution or as an amendment to the existing constitution in the near future.\textsuperscript{21}

Second, developing states may have deliberately avoided instantiating environmental rights in their respective constitutions cognizant of the lack of resources these countries have to adequately protect such a broad right. Resources necessary to the successful protection of an environmental right may include an environmental agency with sufficient personnel, budget, and discretion to investigate environmental problems; a legal system with the capacity and integrity to adjudicate cases involving environmental harms committed by state and private actors; and well-functioning organizations with the financial capacity to help bring cases on behalf of marginalized and indigent members of society who would otherwise have little legal recourse to the alleged violations of their constitutional rights. It may be the case that some countries establish an environmental agency to oversee the implementation of environmental objectives but do not have constitutional environmental rights. However, in some instances the converse may also be true; that is, countries may adopt a solidarity environmental right absent the institutional resources necessary to fulfill the legal imperative. More research is needed to

\textsuperscript{21} Interestingly, at the time of writing, none of the draft constitutions proposed in Arab Spring countries feature environmental rights.
determine the motive(s) behind pursuing one or more avenues for protecting environmental rights.

In spite of the reasons why countries may have avoided adopting constitutional environmental rights and the effect of methodological choices on the analysis, it stands to reason that the expansion of these rights will be a topic worthy of attention as states create and ratify new constitutions. For example, the world’s newest state, South Sudan, has opted to include a solidarity environmental right in Article 41 of its transitional constitution.

**Conclusion**

This study is designed to help explain the trend toward constitutionalization of environmental rights. In particular, I conducted a statistical analysis to determine the extent to which five independent variables provide a suitable explanation for the proliferation of constitutions featuring environmental rights since the mid-1970s. Using a Cox model for analyzing survival data, I found that International Civil Society Influence and Level of Democracy both had a statistically significant positive relationship to the phenomenon observed. Further research on the topic would benefit by conducting qualitative case study analyses to gain additional analytical leverage regarding causal mechanisms which led to the adoption or neglect of these rights, improving the coverage and quality of data used to operationalize relevant theoretical perspectives, and testing new variables, such as the adoption of international treaties or judicial independence, which may offer greater explanatory value than the ones analyzed here. As environmental concerns continue to increase in importance and the dynamic international legal context continues to influence the form and content of governing charters throughout the world,
the study of environmental rights will remain a compelling area of research for the foreseeable future.

References


**Appendix A**

Full statistical model output for the maximum-case model using Stata’s stepwise function for model building.
begin with full model
p = . >= 0.0500 removing gdp_i
p = 0.7440 >= 0.0500 removing landarea_i
p = 0.7242 >= 0.0500 removing agland_i
p = 0.4529 >= 0.0500 removing fhpma
p = 0.2529 >= 0.0500 removing pop_i
p = 0.2844 >= 0.0500 removing regin

Cox regression -- Breslow method for ties
No. of subjects = 3245 Number of obs = 3245
No. of failures = 62
Time at risk = 73602
Log likelihood = -398.55004 LR chi2(5) = 56.43
                         Prob > chi2 = 0.0000

<table>
<thead>
<tr>
<th></th>
<th>Haz. Ratio</th>
<th>Std. Err.</th>
<th></th>
<th></th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>fhclma</td>
<td>1.378621</td>
<td>.2113206</td>
<td>2.09</td>
<td>0.036</td>
<td>1.020868 1.861747</td>
</tr>
<tr>
<td>polity2_i</td>
<td>1.161598</td>
<td>.0472587</td>
<td>3.68</td>
<td>0.000</td>
<td>1.072569 1.253017</td>
</tr>
<tr>
<td>gdpc100</td>
<td>.9903167</td>
<td>.002895</td>
<td>-3.33</td>
<td>0.001</td>
<td>.9846589 .996007</td>
</tr>
<tr>
<td>ngo100</td>
<td>1.1075071</td>
<td>.0302288</td>
<td>2.57</td>
<td>0.010</td>
<td>1.017428 1.135979</td>
</tr>
<tr>
<td>popdensity_i</td>
<td>.9924358</td>
<td>.0020304</td>
<td>-3.71</td>
<td>0.000</td>
<td>.9884642 .9964234</td>
</tr>
</tbody>
</table>

Appendix B

Full statistical model output for the maximum-variable model prior to reducing model to only significant variables.
failure _d: conright
analysis time _t: year

<table>
<thead>
<tr>
<th>Iteration</th>
<th>Log likelihood</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-298.52997</td>
</tr>
<tr>
<td>1</td>
<td>-295.43362</td>
</tr>
<tr>
<td>2</td>
<td>-281.38056</td>
</tr>
<tr>
<td>3</td>
<td>-276.11164</td>
</tr>
<tr>
<td>4</td>
<td>-273.34558</td>
</tr>
<tr>
<td>5</td>
<td>-272.8215</td>
</tr>
<tr>
<td>6</td>
<td>-272.80627</td>
</tr>
<tr>
<td>7</td>
<td>-272.80625</td>
</tr>
</tbody>
</table>

Refining estimates:
Iteration 0: log likelihood = -272.80625

Cox regression -- Breslow method for ties

No. of subjects = 2563
No. of failures = 45
Time at risk = 57984

Log likelihood = -272.80625

| _t | Haz. Ratio | Std. Err. | z      | P>|z| | [95% Conf. Interval] |
|----|------------|-----------|--------|------|---------------------|
| ngo100 | 1.094905 | 0.0739044 | 1.34   | 0.179 | 0.9592276   | 1.249773 |
| regn  | 0.9310219 | 0.0097127 | -0.92  | 0.357 | 0.972167   | 1.010242 |
| fhclma | 0.9359648 | 0.270926  | -0.23  | 0.819 | 0.706084   | 1.65063  |
| fhprma | 1.36313  | 0.332154  | 1.27   | 0.204 | 0.875108   | 2.174803 |
| agland_i | 0.9990527 | 0.0080541 | -0.12  | 0.906 | 0.806362   | 1.104964 |
| nrrent_i | 1.006386 | 0.0092877 | 0.69   | 0.490 | 0.9883456  | 1.024755 |
| netbiaid_i | 1.011e-11 | 1.11e-11 | 0.016  | 1    | 1         | 1        |
| fdi_gdp_i | 0.9811764 | 0.0249027 | -0.75  | 0.454 | 0.8098762  | 1.174322 |
| netoda_i | 0.9767928 | 0.0184486 | -1.24  | 0.214 | 0.9412954  | 1.013629 |
| gdp_i  | 1.2.44e-12 | 1.42 | 0.154  | 1    | 1         | 1        |
| gdppc100 | 0.9656623 | 0.0131055 | -2.57  | 0.010 | 0.9403146  | 0.9916934 |
| landarea_i | 1.157e-07 | 0.777 | 0.439  | 1    | 1         | 1        |
| pop_i  | 1.05e-08  | -1.58  | 0.114  | 1    | 1         | 1        |
| popdensity_i | 0.9945309 | 0.0026555 | -2.05  | 0.040 | 0.9893399  | 0.9997491 |
| polity2_i | 1.189139 | 0.0654488 | 3.15   | 0.002 | 1.087539   | 1.324591 |