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An empirical analysis of fatal crimes against environmental and land activists

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Abstract

This paper demonstrates the presence of an inverted U-shaped relationship between fatal crimes against environmental and land activists and income per capita for a group of 34 countries from 2002-2013. Using panel data estimation techniques, the results are robust to controlling for rule of law, control of corruption, deforestation, homicide rates, and natural resource dependence. We thus provide evidence of a relationship between economic growth and the safety of environmental activists, where at some point in country's economic development environmental murders decrease with additional income. Furthermore, our results offer support to the findings of the Fifth Assessment Report of Working Group II of the Intergovernmental Panel on Climate Change which imply that physical security in the context of environmental disputes is likely an environmental amenity which is increasingly in demand, especially as incomes grow. Additional results suggest that the background level of fatal crimes (excluding environmental murders) is positively related to environmental murders and the relationship between increased forest cover and environmental murders can be positive or negative thereby confounding forestry-based policy recommendations.

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1. Introduction

Between 2002 and 2013, 908 citizens were murdered across 35 countries while "protecting rights to their land and environment," and this is likely an underestimate of the number of such fatal crimes (Global Witness, 2014). Global Witness (GW) notes that these crimes were typically directed at members of indigenous groups, landless groups, and peasant movements as a result of, for example, pollution, deforestation, illegal logging, and wildlife conservation. At the same time, human security and violent conflict are primary concerns associated with global climate change as highlighted within the Fifth Assessment Report of Working Group II of the Intergovernmental Panel on Climate Change (IPCC).[1] In particular, Chapters 12 ("Human Security") and 19 ("Emergent Risks and Key Vulnerabilities") summarize much of the relevant research linking violent conflict to climate change. In Chapter 12, Adger *et al*. (2014, page 758) note that "although there is little agreement about direct causality, low per capita incomes, economic contraction, and inconsistent state intuitions are associated with the incidence of violence," and continue that "[t]hese factors can be sensitive to climate change and variability." Given the prevalence of fatal crimes committed against environmental activists, this paper examines empirically some of the perceived links to the aforementioned economic, natural, and institutional factors.

While low income per capita and economic contractions are associated with a greater incidence of violence, Adger *et al*. (2014, page 772) point out that "[t]here is high agreement that in the specific circumstances where other risk factors are extremely low (such as where per capita incomes are high, and states are effective and consistent), the impact of changes in climate on armed conflict is negligible (Bernauer *et al*., 2012; Koubi *et al*., 2012; Scheffran *et al*., 2012a; Theisen *et al*., 2013)." Although armed conflict is defined as instances where more than 25 battle-related deaths occur in a year (Adger *et al*., page 771), the varied relationship between income per capita and the incidence of violence (in this context) lends itself well to an application of the theoretical and empirical framework of the Environmental Kuznets Curve (EKC). In particular, the model we develop explains variation in fatal crimes against environmental activists stemming from growth in national income per capita while controlling for deforestation, the institutional quality of the state as measured by the rule of law (ROL) and control of corruption (COC), the prevalence of violent crime measured by the homicide rate, and an economy's dependence on natural resources measured by the percent of national income from resource rents.

Although this analysis is related to the EKC, our outcome variable is not a typical measure of environmental harm, like carbon dioxide emissions for example. Based on the above evidence, we instead theorize, and ultimately provide evidence, that fatal crimes committed against environmental activists are a form of environmental harm which initially increase over relatively smaller levels of income per capita and then decrease at relatively higher levels of income per capita. Furthermore, the research contained within Chapters 12 and 19 of the IPCC report implies that physical security in the context of environmental disputes is likely an environmental amenity which is increasingly in demand, especially as incomes grow. This paper provides quantitative evidence of such a relationship using novel data from the GW report.

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[1] See Tol (2015) for an assessment of the Summary for Policy Makers of the Fifth Assessment Report of the IPCC.

An important caveat exists, however, in that the data is relatively sparse and some of the empirical simplifications make it difficult to develop meaningful policy recommendations. We acknowledge, of course, that other factors exist which potentially contribute to an increased (decreased) incidence of fatal crimes against environmental activists and cautiously proceed noting that we find – for this data – robust evidence of an inverted U-shaped relationship between national income per capita and fatal crimes against environmental activists. This relationship persists after controlling for deforestation, existing institutional quality, the prevalence of fatal crimes, and economic dependence on natural resources.

To further explore the previewed results discussed above, the remainder of the paper is organized as follows. Section 2 provides a two brief literature reviews: one covering the EKC and the other covering violent crime and economic development in general. The third section presents the theoretical and empirical model, while Section 4 describes the data. The results are discussed in Section 5 and some robustness checks are presented in Section 6. Section 7 concludes and offers some delicate policy recommendations.

2. Brief Literature Review

2.1 EKC

The standard EKC framework suggests an inverted-U shaped relationship between environmental degradation and national income per capita, where the factors that can lead to the (eventual) negative relationship include a shift from manufacturing to less-polluting service industries (Grossman and Krueger, 1991); adoption of cleaner technologies (de Bruyn, 1997); increased demand for environmental amenities (Antle and Heidebrink, 1995); more stringent regulation (Grossman and Krueger, 1995); and the rule of law (Chen, 2010; Castiglione, Infante, and Smirnova, 2012 and 2015). Bhattarai and Hammig (2001) also show that political institutions can mitigate the income effect (i.e., lead to an earlier turning point) as a result of enhanced citizen participation and increased legal respect for property rights. Jeffords and Minkler (2016) show that the existence, scale, and scope of constitutional environmental rights can also mitigate the income effect, even after controlling for other economic and institutional factors. As many of these studies demonstrate and discuss, the factors that typically lead to an earlier turning point in the EKC are associated with increased economic development.

2.2 Violent Crime and Economic Development

In terms of violent crime in general, Fajnzylber *et al*. (2000) and Soares (2004) find a negative relationship with economic development, although Soares notes a positive relationship in developed countries if there is underreporting of violent crimes. Fajnzylber *et al*. (2002) demonstrate that crime rates tend to increase with income inequality. With respect to the relationship between climate change and violent conflicts and environmental security, Scheffran *et al*. (2012b) note that “[a]lthough some quantitative empirical studies support a link between climate change and violent conflict, others find no connection or only weak evidence (page 869).” In discussing climate change and conflict in general, Nordås and Gleditsch (2007) note that variability in temperature and water availability, for example, can lead to both within and between country conflicts, violence, and war. This point is also echoed by Scheffran *et al*. (2012a and 2012b). Zimmerer (2014) argues that environmental violence within the context of climate change will lead to increased instances of genocide in those areas at greatest risk for genocide.

3. Theoretical and Empirical Models

Let M_{it} represent the number of murders of environmental activists in country i in period t as a percent of total murders in t, and Y_{it} represent national income per capita. As Y_{it} grows, we expect an inverted U-shaped relationship between M_{it} and Y_{it} as such,

$$M_{it} = \alpha Y_{it} - \beta Y_{it}^2. \tag{1}$$

where the turning point is found by maximizing (1) with respect to Y_{it}.

Using strongly balanced panel estimation techniques, we estimate the following basic model and some of its extensions,

$$\ln(M_{it}) = \gamma_i + \alpha \ln(Y_{it}) + \beta \ln(Y_{it})^2 + \boldsymbol{x}_{it}'\delta + \epsilon_{it}, \tag{2}$$

and expect the signs of α and β to be positive and negative, respectively. We take the natural log of each variable to provide estimates of easily interpretable elasticities. The turning point of (1) is found by capturing the estimates of α and β from (2) and substituting them into: $\exp(-\alpha/2\beta)$. Incorporating ROL or COC, the measure of deforestation, the homicide rate, and natural resource dependence, equation (2) is estimated via fixed effects (FE) and random effects (RE). Under FE, γ_i is assumed to be correlated with the right-hand-side variables (RHS), while in RE it is assumed to be purely random and uncorrelated with the RHS. The additional RHS variables are included in $\boldsymbol{x}$.

4. Data

Yearly data from 2002 to 2013 covers the 35 countries listed in GW's "Deadly Environment Report," and the primary dependent variable is the annual number of deaths of land and environmental defenders as a share of the total number of deaths of land and environmental defenders in a given year (GW, 2014). According to GW, these data comprise all "known killings of environmental and land defenders (page 10)" but likely represent an underreporting of environmental murders given that many "often take place in remote areas (page 10)." The data for 2013 is presently incomplete due to a reporting time lag, and we drop Argentina from the analysis because national income data was unavailable for all years. We then treat Brazil, Honduras, Mexico, Peru, Philippines, and Thailand separately and group the remaining 28 countries as "all other countries."[2] The first six countries account for 81% of M, and data for the remaining 28 countries are aggregated to yield more data points compared to separate treatment.[3]

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[2] The remaining 28 countries are Cambodia, Chad, Chile, China, Colombia, Congo (DR), Costa Rica, Ecuador, El Salvador, Ghana, Guatemala, India, Indonesia, Kazakhstan, Kenya, Malaysia, Nepal, Nicaragua, Pakistan, Panama, Papua New Guinea, Paraguay, Russian Federation, Sierra Leone, Sri Lanka, Sudan, Ukraine, and Venezuela.

[3] If the countries are not grouped the resulting panel is severely unbalanced where, in some instances, a country only has one observation for M across the 12 years compared to others that

The summary statistics presented in Table I show considerable variation in murders across countries, in total and on average.

As noted in the summary statistics in Table II, the primary independent variable, Y, is measured as purchasing-power-parity adjusted gross domestic product per capita in constant 2011 international dollars (World Development Indicators Databank). We calculate an aggregate measure of Y for "all other countries" by adding the level of national income across countries within a year and dividing by the sum of the respective populations. To be consistent with the discussion in Section 3, we include a linear income term and a squared income term and expect the signs to be positive and negative, respectively.

GW notes that shining light on these fatal crimes "points to a much greater level of non-lethal violence and intimidation (page 4)," and that additional "principal causes of these deaths are opposition to land-grabbing and unfair land ownership (page 10)." In an effort to control for both of these factors, we include country-level ROL and COC by incorporating data for 2002-2013 from the Worldwide Governance Indicators Project (WGIP, Kaufman *et al*., 2013). According to WGIP, ROL "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," and COC "reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as 'capture' of the state by elites and private interests." Each are measured on a scale of [-2.5,2.5], where the higher the number the stronger the government performance, but we scale ROL and COC to the unit interval and note that the WGIP data are excluded from the empirical specifications with "all other countries." Including these would likely confound the interpretation of said coefficient estimates because the meaning of an average ROL (COC) for 28 countries is unclear, especially since the variables are based on individual perceptions within a country and are subjectively calculated by external researchers. We expect both of these variables to be nonpositively related to M in that the stronger the ROL and COC, the smaller will be M.

In an effort to account for the proclivity of fatal crimes in a given country across time, we include national homicide rate data as an additional control variable. From the homicide count in country i in year t, we subtract the number of environmental murders and then calculate the homicide rate per 100,000 people. For the "all other countries" group, we first added the total homicides in a given year across the 28 countries, then subtracted the corresponding environmental murders, and calculated an aggregate homicide rate per 100,000 people. In some instances, homicide counts (and thus rates) were interpolated using a simple linear interpolation method by country/year. Summarized in Table III, the data are publically available through the Global Study on Homicide published by United Nations Office on Drugs and Crime (2013) and

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have at most 5 but often across disconnected years. Creating a matrix of the 34 countries across the 12 years yields 408 cells, 114 of which contain data on environmental murders, and 61 of the 114 data points are for Brazil, Honduras, Mexico, Peru, Philippines, and Thailand. Given the "count" nature of this variable, one might argue that we could have used a count model to analyze the relationship between M and Y. We instead argue that the sparsity of the data and the lack of any true zeroes combined with the fact that we do not know the left and right truncation values make it increasingly difficult to empirically specify a count model. Furthermore, the simple linear model we offer provides a much easier avenue through which to calculate and provide income turning points.

cover the years 2000-2012. We expect the homicide rate to be nonnegatively related to environmental murders.

We also control for the dependence of a given country's economy on natural resources by including a measure of total natural resource rents as a percent of GDP.[4] These data are also from the World Development Indicators Databank and provide a measure of the rents from oil, natural gas, hard and soft coal, minerals, and forests. For the "all other countries" group, we calculate the actual value of GDP from natural resource rents, add it together across the countries, and then divide this figure by aggregate GDP in that year. We expect this variable to be nonnegatively related to environmental murders, provided that the more natural resource reliant an economy is, the greater likelihood of conflict over natural resources.

Given that GW discusses deforestation as a primary reason for increased fatal crimes against environmental activists and that forest area by country/year is relatively easy to obtain from the World Development Indicators Databank, we include a measure of each country's forest cover as a percent of total land area from 2002-2012 (due to data limitations for 2013). The deforestation variable for the "all other countries" group is an average across the 28 countries. Based on the GW report, we expect this forest cover variable to be nonpositively related to M, where a reduction in forest cover (i.e., deforestation) is associated with more fatal crimes. [5] At the same time, however, it is worth noting that despite the findings of the GW report, it is possible that more forest cover is associated with increased fatal crimes stemming from the fact that there are more natural resources to protect and hence an increased likelihood of conflict over said resources.[6]

5. Estimation, Results, and Discussion

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[4] We thank an anonymous referee for this suggestion.

[5] Instead of percent forest cover, we also implement the percentage change in forest cover from one year to the next as a separate control variable. The results of this specification are discussed in Section 6. See Deacon (1994) for an empirical discussion of factors nonnegatively related to deforestation, such as Guerilla warfare and revolutions, using data for 129 countries in 1980 and 84 countries in 1985. See Chapter (2) from Boekhout van Solinge (2010) for an overview of many factors contributing to (tropical) deforestation, and the relationship between deforestation and violent conflicts.

[6] We thank an anonymous referee for pointing this out, and have had a difficult time finding supporting academic evidence of such a relationship. Using data from the Brazilian Amazon, Araujo *et al*. (2009) find that weak property rights over land leads to increased deforestation. They also cite various studies which find a similar relationship in other contexts. With limited supporting research, perhaps it is possible that reforestation efforts within a country with weak property rights are met with increased deforestation efforts increasing the likelihood of conflict. In other words, as existing and potential "deforesters" notice net increases in forest cover, they may enter these markets and be confronted by environmental activists, hence an increase in the potential for violent conflict. Perhaps a reduction in agricultural output prices associated with reductions in deforestation (Assunção *et al*., 2015) is associated with increased environmental murders as "deforesters" attempt to capture increasingly large shares of forests to make up for lost revenue associated with the sales of agricultural outputs.

We implement two different specifications of the LHS variable in equation (2) and present the results in Tables III and IV. In the first specification, the LHS variable is share of a country's environmental murders in period t as a share of the total environmental murders in period t. The second specification is calculated in the same way but excludes "all other countries" and focuses solely on the top 6 countries. In other words, the denominator in the share calculation is the sum of environmental murders solely from Brazil, Honduras, Mexico, Peru, Philippines, and Thailand.

Table III presents primary results from 10 different FE specifications where each displays a statistically significant inverted U-shaped relationship between M and Y. Said relationship holds when we control for ROL, COC, deforestation, the homicide rate, and natural resource dependence. The coefficient estimate for ROL is positive yet statistically insignificant, while for COC it has the expected sign and is statistically significant. This implies that less perceived corruption is associated with fewer environmental murders. The coefficient estimates for the deforestation variable have the expected sign per the GW report and are statistically significant in each of the specifications. The homicide rate is also statistically significant in each regression where it is included and has the expected sign. It appears that more homicides in general are associated with more environmental murders. The results for resource dependence are mixed, having both negative and positive signs, but none of the estimates are statistically significant. This suggests that for this set of data, an economy's reliance on natural resources perhaps does not directly contribute, either positively or negatively, to the likelihood of environmental murders.

Table IV presents the primary results from 10 different RE specifications where, again, each displays a statistically significant inverted U-shaped relationship between M and Y, that is robust to additional control variables. One important difference found within Table IV is the lack of statistical significance associated with the impact of forest cover on environmental murders. This important finding, which dampens the corresponding findings of the FE specifications, could be a result of the econometric assumptions and differences between FE versus RE. Given that we are using all of the data from the GW report, it could be claimed that we are working with a population dataset and not a sample, which lends credibility to the FE results. At the same time, however, it is plausible that the data in the GW report is only a subset of environmental murders making the RE specification more appropriate. Regardless, the mixed findings relating deforestation to environmental murders make it difficult to interpret the relationship and hence make even cautious policy recommendations. The same can also be said about the relationship between corruption and environmental murders when comparing the result across the FE and RE specifications.

The income turning points range from \$8,574-\$10,460 across the FE models and from \$9,047 to \$9,965 across the RE models. At the same time, the range of Y is \$3,563-\$16,316 with an average of \$9,272 placing the calculated turning points well within the range of observed data and surrounding the sample average. This is an important result because it suggests that the presence of the inverted U-shaped relationship between M and Y is robust to the model specification and included control variables.[7] That is, this results holds across the FE and RE specifications and is robust to various included control variables.

Following the panel model discussion found in Cameron and Trivedi (2005) and given that the country sample included in this analysis is essentially the entire population of countries

[7] This result is further supported below in Section 6 – Robustness Checks.

with reported murders of environmental activists so defined by GW, we think that the FE specification is intuitively appropriate. For example, we are not controlling for the number, quality, implementation, etc. of substantive environmental laws that exist within a country over a period of time. This type of country-level FE is likely to have implications for the extent of deforestation and economic growth as measured by income per capita. Assuming that γ_i is uncorrelated with the RHS is a bit of a strong assumption in this framework, hence we intuitively favor FE over RE.[8]

6. Additional Specifications and Checks

In addition to the above empirical analysis, we also experimented with different model specifications and the inclusion of additional RHS variables.[9] For example, regressions including ROL, COC, and the homicide rate in various combinations do not substantively change the primary results.[10] We also implemented a population averaged panel data regression and found that while the inverted-U relationship between M and Y remained, the statistical significance of the additional covariates weakened. Where applicable, we included a time trend or time fixed effects, and the results remained substantively the same for the FE specifications. In the RE specifications with a time trend, however, the inverted-U relationship between M and Y disappeared and there was evidence of serious estimation issues such as ballooning robust standard errors across multiple coefficient estimates.[11]

Given the potential for a positive or negative relationship between deforestation and environmental murders, we implemented the percentage change in forest cover from period $t-1$ to t as a separate control variable.[12] Using the FE framework, this variable was found to be negatively related to environmental murders and statistically significant in four of the six specifications. In the RE framework, the percentage change in forest cover was found to be statistically significantly related to environmental murders in five of the six specifications, but the relationship was positive in some cases and negative in others. These results lend evidence to

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[8] Having said this, however, we also ran various iterations (approximately 40) of Hausman Tests and Bootstrap Hausman Tests, where the former does not allow for cluster-robust standard errors while the latter does. Despite our intuition about FE versus RE, the test results were mixed. In some instances, using the standard Hausman Test, we rejected the null hypothesis that the RE estimates were consistent while in other cases we failed to reject the null. This was also the case when we applied the bootstrapped version. All of these results can be made available upon request.

[9] These and all other supplemental results are available upon request, as is the Stata Do file and corresponding data.

[10] Due to multicollinearity issues, however, we opted to either include ROL or COC in a given regression, but not both.

[11] In other results available upon request, we included measures of air pollution and population density and found that the inverted U-shaped relationship persists but weakens a bit in statistical significance. We exclude Brazil from the analysis in a separate framework and find weaker evidence of an inverted U, likely due to Brazil's overwhelming share of environmental murders in the data.

[12] We thank an anonymous referee for this suggestion.

the idea that more or less forest cover could lead to increased environmental murders, despite the findings of the GW report.

7. Conclusion

The results suggest an inverted U-shaped relationship between M and Y for this particular group of countries that is robust to various model specifications and control variables, including deforestation, institutional quality, the prevalence of fatal crimes, and economic dependence on natural resources. In particular, the results support the findings of the IPCC report about the way in which physical security within the context of environmental disputes is likely an environmental amenity, especially as incomes grow. These findings are thus important because they provide evidence of a relationship between economic growth and the health and safety of environmental activists, a relationship that policymakers will find difficult to ignore. Policymakers in these countries in particular can perhaps use this information to take steps to mitigate the scope of fatal crimes against environmental activists.[13] As global climate change persists while countries go through different phases of economic growth and contraction, it is increasingly important to consider ways not only to mitigate traditional environmental harm, but also harm perpetrated against individuals as a result of factors related to the use of the natural environment. In a time when information spreads relatively quickly perhaps leading to an increase in the scale and scope of environmental activism, it will become increasingly important to focus on the nexus between climate change, economic growth, and fatal crimes against environmental activists which are perhaps linked to increasing climate and environmental pressures.

We note that the findings are sensitive to the inclusion/exclusion of Brazil given its overwhelming share of environmental murders within the data. The robust positive relationship between the homicide rate and environmental murders suggests that policymakers could focus on reducing fatal crimes through increased policing and/or by improving the rule of law and institutional quality of their respective legal systems as ways to mitigate fatal crimes in general and specifically against environmental activists. As GW discussed, deforestation often leads to violent crimes committed against environmental activists, and the results of the FE specifications empirically support this fact by demonstrating that as the percent of forest area in a country grows, murders of environmental activists decline. This implies that formal and informal policies directed at reducing deforestation or increasing forest cover could lead to fewer murders of environmental activists. But this recommendation is based on a very limited sample of data for 34 countries with known environmental murders and various underreporting issues. Furthermore, the results do not hold within the RE specifications and it is plausible that under certain circumstances reforestation is associated with increased environmental murders, which is a result we discussed in Section 6. If this is the case, policies directed at increasing forest cover could inadvertently engender more environmental murders. It is also possible that the relationship between deforestation and environmental murders is nonlinear and dependent upon additional covariates. In short, the uncertain relationship between forest cover and environmental murders necessitates additional research, especially if the goal is to advocate for a specific policy directed at controlling deforestation and reforestation in general and as it relates to environmental murders.

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[13] See page 7 of the GW report for a full list of additional policy recommendations.

In an effort to reduce environmental murders, the GW report notes the following as possible avenues: (1) country adherence to the Aarhus Convention; (2) giving citizens a larger voice in environmental matters; and (3) more efficient investigations where environmental activists have been targeted. While these recommendations are difficult to empirically test and certainly do not result from our empirical framework, they remain reasonable normative policy recommendations worth qualitatively investigating as methods to reduce environmental murders. Our results instead provide robust evidence of the existence of an inverted U-shaped relationship between environmental murders and income per capita. This primary results thus suggests that as the included countries grow richer M appears to decrease, *ceteris paribus*. Although our results suggest that a country can "grow" out of these particular fatal crimes, the results are relevant for this sample of countries over the respective time period, and in the face of the likely underreporting of environmental murders. The relationship between environmental murders and income per capita is likely sensitive to the idiosyncratic economic, social, demographic, natural, and institutional characteristics of a given country at a given point in time.

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Table I – Summary Statistics for Environmental Murders, 2002-2013

Statistic	Brazil	Honduras	Mexico	Peru	Philippines	Thailand	28 Countries	All Countries
	Count of Murders of Environmental Activists							
Average	37.33	9.08	3.33	4.83	5.58	1.33	16.30	75.00
Standard Deviation	12.41	13.09	3.11	4.61	5.09	1.37	14.89	32.99
Maximum	73	36	10	15	15	4	40	143
Minimum	27	1	1	1	2	1	1	39
Count	448	109	40	58	67	16	163	901
Years with Data	12	9	10	12	10	8	12	12
	Country's Share of All Environmental Murders							
Average	0.577	0.115	0.050	0.062	0.083	0.030	0.146	0.164
Standard Deviation	0.239	0.110	0.033	0.049	0.049	0.028	0.121	0.220
Maximum	0.886	0.281	0.127	0.164	0.209	0.078	0.368	0.886
Minimum	0.219	0.018	0.024	0.012	0.039	0.008	0	0
	Country's Share of Environmental Murders Across Brazil, Honduras, Mexico, Peru, Philippines, and Thailand							
Average	0.653	0.147	0.060	0.074	0.100	0.033	Not Applicable	0.195
Standard Deviation	0.219	0.146	0.038	0.058	0.056	0.026		0.257
Maximum	0.913	0.404	0.146	0.188	0.233	0.080		0.913
Minimum	0.315	0.021	0.025	0.013	0.040	0.011		0.011

Table II – Aggregate Summary Statistics for Control Variables, 2002-2013

Statistic	Brazil	Honduras	Mexico	Peru	Philippines	Thailand	28 Countries	34 Countries
	Purchasing Power Parity Adjusted Gross Domestic Product per Capita (2011 International Dollars)							
Average	$ 12,871.07	$ 4,122.19	$ 15,347.21	$ 8,819.94	$ 5,229.22	$ 11,793.16	$ 6,723.06	$ 9,272.26
Standard Deviation	$ 1,272.22	$ 307.84	$ 723.47	$ 1,626.47	$ 613.64	$ 1,425.37	$ 1,514.55	$ 4,069.92
Maximum	$14,555.08	$4,445.27	$16,316.33	$11,400.42	$6,324.57	$13,931.81	$9,076.46	$ 16,316.33
Minimum	$11,125.38	$3,563.07	$14,243.24	$6,629.58	$4,339.95	$9,398.96	$4,553.46	$ 3,563.08
	Rule of Law (Ranges from 0 to 1)							
Average	0.4429	0.3168	0.3993	0.3707	0.3983	0.4941	Not Applicable	
Standard Deviation	0.0350	0.0229	0.0230	0.0176	0.0162	0.0379		
Maximum	0.4992	0.3514	0.4292	0.3959	0.4283	0.5744		
Minimum	0.4015	0.2658	0.3557	0.3470	0.3802	0.4552		
	Control of Corruption (Ranges from 0 to 1)							
Average	0.4942	0.3345	0.4428	0.4449	0.3674	0.4447	Not Applicable	
Standard Deviation	0.0206	0.0164	0.0162	0.0171	0.0235	0.0199		
Maximum	0.5291	0.3614	0.4695	0.4799	0.4091	0.4797		
Minimum	0.4660	0.3079	0.4180	0.4210	0.3382	0.4160		
	Percent Forest Cover							
Average	63.00	49.62	33.60	53.45	25.16	37.09	35.84	42.43
Standard Deviation	0.96	3.56	0.30	0.36	0.61	0.06	0.43	12.19
Maximum	64.58	54.98	34.09	53.93	26.07	37.19	36.04	63.81
Minimum	61.63	44.26	33.18	52.88	24.24	36.99	34.55	24.24
	Homicide Rate per 100,000 People (Excludes Environmental Murders)							
Average	23.05	64.15	13.52	8.86	7.74	6.48	92.82	30.95
Standard Deviation	1.44	16.82	6.02	2.67	1.04	1.49	7.22	32.44
Maximum	26.69	90.89	22.80	11.62	9.51	9.97	108.17	108.17
Minimum	21.34	44.28	7.81	4.25	6.44	4.43	83.89	4.25
	Natural Resource Rents as a Percent of GDP							
Average	6.11	3.82	7.70	9.57	2.93	4.78	11.46	6.69
Standard Deviation	1.01	0.77	1.96	4.95	1.29	1.23	2.77	3.75
Maximum	8.00	5.58	10.47	14.89	5.04	7.46	17.51	17.51
Minimum	4.69	2.99	3.79	1.87	1.03	2.73	8.18	1.03

Table III – Fixed Effects Regression Results

	(1) ln (Country's Share of All Environmental Murders in Period t)				**(2)** ln (Country's Share of Environmental Murders in Brazil, Honduras, Mexico, Peru, Philippines, and Thailand in Period t)					
ln Income per Capita	75.98**	76.12***	77.35**	75.86***	76.19*	70.97**	78.15**	63.24*	65.56*	61.53*
	(22.51)	(18.76)	(22.46)	(20.25)	(33.36)	(27.09)	(29.39)	(28.23)	(27.11)	(27.58)
(ln Income per Capita)^2	-4.150**	-4.167***	-4.247**	-4.182**	-4.116*	-3.848**	-4.251**	-3.473*	-3.599*	-3.397*
	(1.270)	(1.070)	(1.288)	(1.152)	(1.815)	(1.459)	(1.622)	(1.509)	(1.444)	(1.474)
ln % Forest Area			-9.347***	-7.499***			-10.03***	-8.014***	-8.030***	-7.976***
			(1.653)	(1.934)			(1.821)	(1.558)	(1.714)	(1.558)
ln Rule of Law									0.904	
									(2.107)	
ln Control of Corruption										-3.026***
										(0.640)
ln Homicide Rate		0.973**		0.655**		1.115**		0.781***	0.781***	0.700***
		(0.305)		(0.182)		(0.330)		(0.122)	(0.154)	(0.132)
ln % GDP Resource Rents		-0.0392		0.146		-0.132		0.149	0.183	0.174
		(0.189)		(0.155)		(0.255)		(0.395)	(0.358)	(0.374)
Constant	-349.3**	-352.0***	-362.0***	-354.5***	-354.0*	-331.5**	-369.2**	-298.7*	-308.6*	-291.9*
	(99.59)	(82.28)	(97.15)	(88.11)	(153.1)	(125.6)	(132.6)	(130.3)	(125.7)	(127.6)
Turning Point	$ 9,454	$ 9,262	$ 9,013	$ 8,689	$ 10,460	$ 10,114	$ 9,818	$ 8,996	$ 9,028	$ 8,574
Observations	71	64			61	55				
R-squared (Within)	0.3083	0.3945	0.3803	0.4416	0.2272	0.3621	0.3383	0.4215	0.4261	0.4499
R-squared (Overall)	0.0383	0.2854	0.0914	0.0328	0.0164	0.3488	0.13	0.0909	0.0848	0.1066
All Other Countries	Yes				No					

Notes: Country-clustered robust standard errors in parentheses. P-Values: * p<0.10, ** p<0.05, *** p<0.01

Table IV – Random Effects Regression Results

	(1) ln (Country's Share of All Environmental Murders in Period t)				(2) ln (Country's Share of Environmental Murders in Brazil, Honduras, Mexico, Peru, Philippines, and Thailand in Period t)					
ln Income per Capita	71.55***	73.05***	72.16***	74.50***	64.19***	67.53***	69.66***	98.98***	87.13***	94.64***
	(18.47)	(15.91)	(17.39)	(16.32)	(19.91)	(21.74)	(19.03)	(31.79)	(29.12)	(30.34)
(ln Income per Capita)^2	-3.919***	-3.996***	-3.954***	-4.081***	-3.486***	-3.675***	-3.790***	-5.410***	-4.782***	-5.187***
	(1.047)	(0.896)	(0.996)	(0.923)	(1.104)	(1.188)	(1.056)	(1.723)	(1.591)	(1.657)
ln % Forest Area			-1.173	-2.058			-1.776	-0.921	-0.807	-1.177
			(1.909)	(1.980)			(2.093)	(1.061)	(0.947)	(1.084)
ln Rule of Law									1.821	
									(2.698)	
ln Control of Corruption										1.398
										(2.058)
ln Homicide Rate		0.938***		0.904***		1.144***		1.678***	1.674***	1.718***
		(0.262)		(0.217)		(0.273)		(0.395)	(0.396)	(0.412)
ln % GDP Resource Rents		-0.0660		-0.0167		-0.0912		-0.606	-0.282	-0.524
		(0.124)		(0.140)		(0.158)		(0.467)	(0.341)	(0.407)
Constant	-328.3***	-338.2***	-332.0***	-346.1***	-297.1***	-314.8***	-323.2***	-458.2***	-401.2***	-436.4***
	(81.25)	(70.64)	(74.53)	(70.51)	(89.82)	(99.84)	(84.66)	(146.3)	(132.5)	(138.4)
Turning Point	$ 9,215	$ 9,324	$ 9,181	$ 9,206	$ 9,965	$ 9,777	$ 9,798	$ 9,394	$ 9,047	$ 9,162
Observations	71	64			61	55				
R-squared (Within)	0.3071	0.3943	0.3135	0.417	0.2233	0.3611	0.2649	0.3246	0.3396	0.3001
R-squared (Overall)	0.039	0.2896	0.0022	0.0995	0.0155	0.3869	0.0079	0.4623	0.4764	0.4653
All Other Countries	Yes				No					

Notes: Country-clustered robust standard errors in parentheses. P-Values: * p<0.10, ** p<0.05, *** p<0.01