



# Do rights of nature protect the environment? Macro-level evidence from Ecuador

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## Abstract

Left-leaning populist regimes, such as Rafael Correa’s government in Ecuador (2007–2016), often claim to protect the environment from the negative effects of free-market regimes. This study examines the environmental impact in Ecuador following the 2008 Constitution, which was the first in the world to include rights of nature. We find no statistical evidence that Correa’s constitutional change had any measurable effect on Ecuador’s macro-level environmental outcomes, as captured by forest cover, greenhouse gas emissions, renewable energy output, and carbon intensity of GDP.

**Keywords** Ecuador · Environment · Pollution · Synthetic control · Constitutional reform

## 1 Introduction

Climate change is at the forefront for many countries, as the external cost of emissions has been seen as a threat to society. In response, many countries have enacted policies that try to reduce the negative externalities of production, notably by including environmental protection clauses at the constitutional level. Jeffords (2013) finds

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that well over 60% (125 of 198) of national constitutions have at least one environmental right codified. Ecuador specifically stands out in this regard: the 2008 Ecuadorian Constitution extended legal rights to nature itself, which goes beyond the traditional path that countries addressing climate-related issues have followed.

Constitutions are “meta-rules”, or rules for the rulers. As such, constitutional provisions are more difficult to change relative to more typical policies. They also provide insight into what countries view as most important (Jeffords & Minkler, 2016). On the one hand, this should constrain leader’s discretion in rule-making; on the other hand, it may provide only broad principles that are not actionable, questioning its practical enforcement. For instance, Bjørnskov and Mchangama (2019) find little evidence that including “social rights” – such as education, health, and social security – into constitutions improve the actual provision of such rights.

This novel approach led legal scholars to debate its merits. In order for any law to be actionable in its intended goals, enforceability is key. Unlike traditional human environmental rights – protecting individuals from environmental harm – Ecuador’s rights-of-nature framework provides a different legal construct, which grants legal standing to nature itself. Guim and Livermore (2021) argue that giving rights to non-human entities makes enforceability difficult. This led to many issues in the courts being able to implement these rights; with this comes uncertainty in planning economic activity. However, there have been cases where the courts ruled in “favor” of nature. For example, in the Vilcabamba River Case of 2011 and the Aguarico River Case of 2018, action was taken by the courts, and activities deemed harmful to these rivers ceased. Tănăsescu et al. (2024) found that courts became more successful in interpreting this law once they keyed in on ecological integrity as an actionable item.

Still, it is unclear whether this new approach produces comparable effects at the macro level. Improvements in ecological integrity can reduce emissions, and healthier ecosystems are outcomes to both nature’s rights being upheld and conditions for human environmental rights being fulfilled. Importantly, Article 71 frames the reform as a systematic national commitment, requiring the State to promote and protect these rights and allowing any person to demand enforcement; in turn, the 30 articles Title VII, Chap. 2, and other provisions elsewhere provide more specific goals. For instance, Article 15 establishes that the State shall promote, in the public and private sectors, the use of “environmentally clean technologies” and “non-contaminating alternative energy.”

Indeed, if Ecuador’s constitutional reform generated meaningful environmental improvements, these should be reflected in the same aggregate indicators used to evaluate human-centered environmental provisions. This logic cuts both ways: while localized effects on specific rivers or forest patches might not aggregate up, effects large enough to constitute a meaningful shift in Ecuador’s environmental trajectory should be detectable in national indicators.

In this paper, we directly test the environmental impact of the Ecuadorian “Rights of Nature” clauses in the constitution. Using the synthetic control method (Abadie et al., 2015; Abadie & Gardeazabal, 2003), we construct a counterfactual in which Ecuador did not implement this provision for nature. Our findings suggest that there was little improvement in macro-level environmental outcomes. We focus on four indicators (forest cover, greenhouse gas emissions, renewable energy output, and car-

bon intensity of GDP) that are both well-suited to Ecuador's primary environmental pressures (Amazonian deforestation, oil extractions, and energy transition) and consistent with similar studies on constitutional environmental provisions (Jeffords & Minkler, 2016). We find some, yet non-robust, mild positive effects for forest cover. Greenhouse gas emissions increased after 2008, albeit statistically insignificantly. Similarly, renewable energy output was not drastically impacted (and if anything, decreased), and the carbon intensity of GDP was not affected.

We first discuss the constitutional amendment Ecuador implemented. Then, we present our empirical method, data, and results. We conclude by noting the importance of distinguishing symbolic and anecdotal victories from policy results at the macro level, while acknowledging that effects operating below that level of aggregation remain open to empirical question.

## 2 Ecuador's environmental constitutional amendment

The 2008 constitution of Ecuador is notable for its stance on environmental rights. Inspired by the principles of *Sumak Kawsay* (or "good living"), the reform goes beyond granting Ecuadorians the right to a healthy environment: it extends legal rights to nature itself. Title II, Chapter Seven of the Constitution is titled "Rights of Nature," and its first article, Article 71, states (*italics added*):<sup>1</sup> **Art. 71.** Nature, or Pacha Mama, where life is reproduced and realized, *has the right to* have its existence and the maintenance and regeneration of its vital cycles, structure, functions, and evolutionary processes fully respected.

Any person, community, people, or nationality may *demand that public authorities enforce the rights of nature*. In applying and interpreting these rights, the principles established in the Constitution shall be observed as appropriate.

The State shall encourage individuals, legal entities, and groups to protect nature and shall promote respect for all elements that comprise an ecosystem.

*Pacha Mama*, a Quechua term meaning "Mother Earth" for the indigenous Andean communities, is thus recognized as a living entity with legal rights. This recognition allows any individual, community, or legal entity to initiate legal action on behalf of nature, even if they are not directly affected. This legal right gave Pacha Mama her day in court during the 2011 Vilcabamba River Case. A government road construction project had deposited debris into the Vilcabamba River, increasing flood risks for nearby residents. Supported by environmental activists, local residents filed a lawsuit on behalf of the river, invoking its constitutional rights under Article 71. The court found that the river's rights had been violated and ordered the government to restore it to its original condition.

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<sup>1</sup> Articles 72 to 74 deal with rights to restoration, require the State to apply preventive and protective measures, forbid alterations or appropriations of natural ecosystems, which shall be regulated by the State.

A second prominent case, the Los Cedros Cloud Forest Case, reached Ecuador's Constitutional Court in 2021. Environmental organizations and local communities sued the Minister of the Environment (*Ministro del Ambiente*), arguing that mining activities in the 16,000-acre Los Cedros Forest violated its constitutional rights. The Court agreed, ruling that the mining activities infringed upon the forest's rights and consequently prohibited mining in the area.<sup>2</sup>

These two cases show that the principle could be scaled up to generate large and meaningful impact at the macro-level, especially when considering it in conjunction with other provisions of the Ecuadorian Constitution. Indeed, while Article 71 established the rights-of-nature, the 2008 Constitution also included 30 additional articles – 395 to 415 – under Title VII, Chap. 2 (and several additional articles elsewhere), that translate the broad principle into practical matters. For instance, Morales (2013) argues that rights-of-nature could be invoked along the “principle of the best technology” (Articles 15, 413), demanding the use of productive technologies that have no environmental impact.

As noted earlier, Article 15 establishes the duty to promote the use of clean technologies and alternative energy sources. This new provision required updates in infra-constitutional legislation, which were handled by the constitutional assembly itself. For instance, it promoted a full revision of the 1996 law regulating, terrestrial transportation, traffic, and road safety (*Ley Orgánica de Transporte Terrestre, Tránsito y Seguridad Vial*). Following the environmental clauses in the new constitution, the constitutional assembly create a new law promoting the “reduction of environmental contamination” (Art 88, *h*; Art. 185, *e*), and crucially, the requirement that all vehicles comply with emission standards (Art. 211).<sup>3</sup>

While cases like the Vilcabamba River and Los Cedros Forest and the several changes in infra-constitutional legislation are significant and symbolically powerful, they may be less indicative of a widespread *enforcement* of nature's rights. For instance, Correa himself started the exploitation of oil in a pristine area of a national park in the Ecuadorian Amazon, arguing he hated poverty more. The following section presents a broader empirical analysis to evaluate whether the 2008 constitutional reform constitutes a turning point in Ecuador's environmental quality.

### 3 Empirical results

To measure the causal effect of the 2008 Ecuadorian “Rights of Nature” Constitution on environmental outcomes, we rely on the synthetic control (SC) method for comparative case studies (Abadie et al., 2010; Abadie & Gardeazabal, 2003).<sup>4</sup> This

<sup>2</sup> See Case No. 1149-19-JP/20, Quito D.M., 10 de noviembre de 2021.

<sup>3</sup> The law links these provisions to the constitutional rights to clean air, health, and quality standards (Articles 14, 15, 32, 52, and 66 of the Constitution). Regarding emission standards, see also Article 322 of the *Reglamento a Ley de Transporte Terrestre, Tránsito y Seguridad Vial* (Executive Decree 1196).

<sup>4</sup> See Callais and Mkrtchian (2024) and Cho (2025) for similar applications to constitutional and environmental issues, respectively.

method involves constructing a reliable counterfactual based on a weighted average of similar “donor” countries that closely track Ecuador before the treatment assignment, but that did not undergo treatment (Abadie et al., 2010; Abadie, 2021). Our primary outcomes of interest are (a) the forest area as a percentage of total area, (b) total greenhouse gas (GHG) emissions,<sup>5</sup> (c) the share of total electricity output from renewable sources, (d) and carbon emissions by US\$1,000 of GDP, i.e. the “carbon intensity” of GDP. Data is sourced from the World Bank Development Indicators and covers the period 1998–2018, giving ten years of pre- and post-treatment, with the exception of total energy from renewable sources, which is only available up to 2015.

To create a plausible counterfactual, our donor pool is comprised of 18 Latin America countries, exclusive of Venezuela and very small islands from the Caribbean.<sup>6</sup> The SC algorithm weights the countries in our pool according to their ability to predict Ecuador’s outcomes over the pre-treatment period, starting in 1998, ten years before the intervention. To that end, we match on lags of each of the outcome variables, and also on other variables that can predict changes in the outcomes. These predictors include the share of population in urban areas, the share of industry and agriculture in GDP, and GDP per capita. Table 1 reports our list of donor countries and the associated donor weights.<sup>7</sup>

To assess the significance of our results, we conduct an iterative placebo test that entails constructing a synthetic control for each control unit, *as if* they had received treatment, and comparing the resulting gaps to the actual treated unit’s gap. We standardize these  $p$ -values by accounting for the quality of pre-treatment fit. Intuitively, if these placebo effects are just as large as the estimated treatment effect for Ecuador, we would be less confident that the gaps were not caused by chance alone; likewise, we want to put greater confidence in the placebo tests that have better pre-treatment fits (Galiani & Quistorff, 2017).

Figure 1 reports the results. Panels A through D respectively report the estimated causal effects on forest cover, total greenhouse gas emissions, renewable energy output, and the carbon intensity of GDP. In each case, our synthetic counterfactual closely tracks the performance of Ecuador on each of these indicators. A small exception is in a temporary spike in 2001 in Panel D, but even then, the overall root mean square prediction error (RMPSE) is very low, around 0.006.

Figure 2 reports the placebo tests, and Fig. 3 the associated  $p$ -values. We find little to no evidence of consistent improvements in environmental performance. Our estimated effects are within the range of placebo effects from countries that

<sup>5</sup> We focus on the three main greenhouse gases: carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), and methane (CH<sub>4</sub>), measured as metric tons of CO<sub>2</sub>-equivalent emissions.

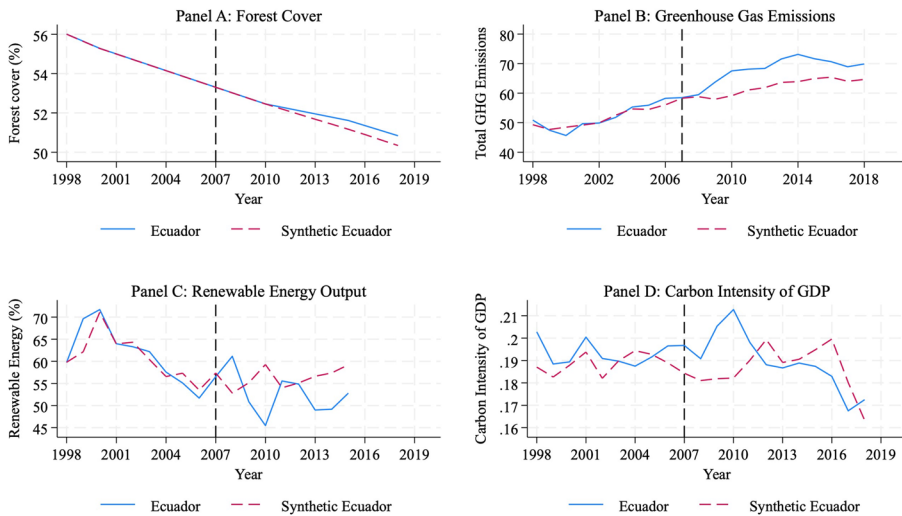
<sup>6</sup> We exclude Venezuela because it suffered a large desindustrialization over the same period (Callais et al., 2024), and Chávez claimed to be doing similar interventions in terms of environmental protections. Small islands, such as the Bahamas and the Cayman Islands, have no large urban centers and very little industrial output, and data availability is also quite limited.

<sup>7</sup> Panels B–D report weights that are concentrated only around a few donors. As explained in Abadie (2021, p. 398), “the sparsity of weights [...] is typical of synthetic control estimators, and is a consequence of the geometric characteristics of the solution to the optimization problem that generates synthetic controls.” For a technical discussion, see pages 407–408 of the same article.

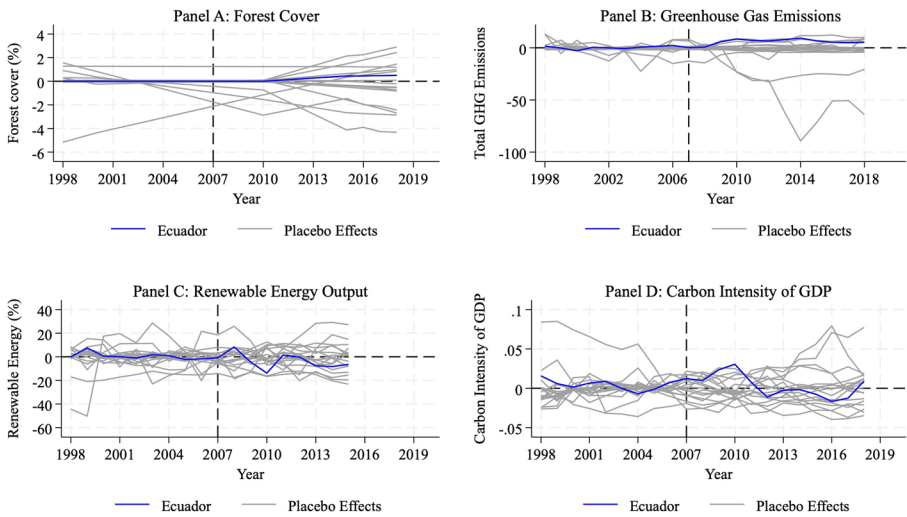
**Table 1** Donor Countries and Weights: Main Results

Donor Country	Country Weights			
	Forest	GHG	Renewable	Carbon
	Cover (Panel A)	Emissions (Panel B)	Energy (Panel C)	Intensity (Panel D)
Argentina	0.033	0.059	0.000	0.000
Belize	0.288	0.000	0.000	0.000
Brazil	0.055	0.003	0.000	0.000
Chile	0.034	0.000	0.000	0.000
Colombia	0.045	0.127	0.000	0.000
Costa Rica	0.043	0.000	0.057	0.000
El Salvador	0.039	0.000	0.000	0.000
Guatemala	0.050	0.000	0.000	0.000
Guyana	0.046	0.000	0.074	0.017
Honduras	0.045	0.811	0.282	0.279
Mexico	0.039	0.000	0.000	0.441
Nicaragua	0.092	0.000	0.000	0.000
Panama	0.046	0.000	0.239	0.000
Paraguay	0.026	0.000	0.000	0.000
Peru	0.042	0.000	0.088	0.000
Suriname	0.046	0.000	0.054	0.263
Uruguay	0.030	0.000	0.205	0.000
RMSPE	0.000	1.338	2.641	0.008

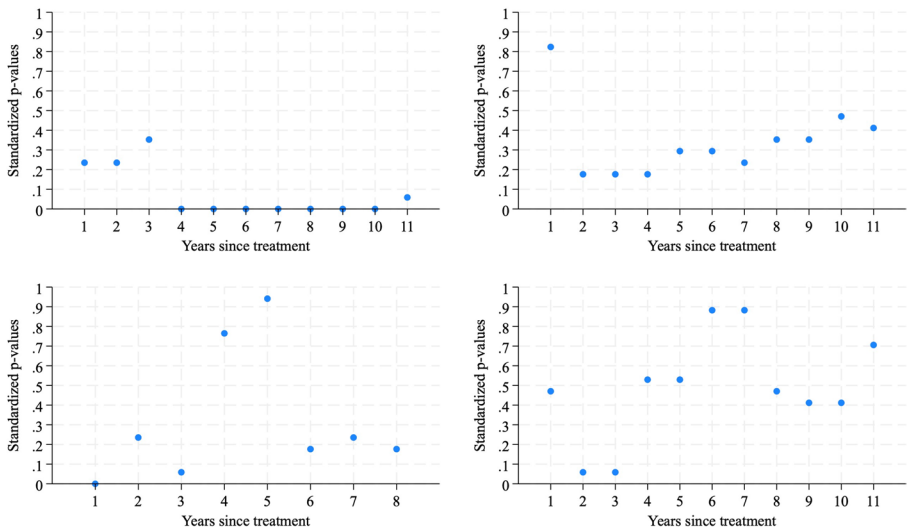
Donor weights associated with Fig. 1. Percentages may not sum to one due to rounding



**Fig. 1** Main results: The effect on constitutional environmental outcomes. *Notes:* Panel **A**: Forest cover as a % of total area. Panel **B**: Total greenhouse gas emissions (in metric tons of CO<sub>2</sub> equivalent). Panel **C**: Renewable energy output as a % of total energy output. Panel **D**: Carbon intensity of GDP (kg of CO<sub>2</sub> per 2021 PPP USD)



**Fig. 2** Placebo effects. *Notes:* Panel A: Forest cover as a % of total area. Panel B: Total greenhouse gas emissions (in metric tons of CO<sub>2</sub> equivalent). Panel C: Renewable energy output as a % of total energy output. Panel D: Carbon intensity of GDP (kg of CO<sub>2</sub> per 2021 PPP USD)



**Fig. 3** Placebo effects. *Notes:* Panel A: Forest cover as a % of total area. Panel B: Total greenhouse gas emissions (in metric tons of CO<sub>2</sub> equivalent). Panel C: Renewable energy output as a % of total energy output. Panel D: Carbon intensity of GDP (kg of CO<sub>2</sub> per 2021 PPP USD)

did not implement any environmental constitutional reform; this means that we cannot distinguish the estimated effects from mere statistical noise. While the results of Panel A of Fig. 1 are statistically significant, they are not robust to further robustness checks, which we discuss below and detail in the online appendix (see Table 2).

### 3.1 Robustness check

We briefly discuss the results of our robustness checks here and provide further details in the appendix.

#### 3.1.1 Alternative donor pool

Empirical applications of the synthetic control aim to construct a donor pool from similar donor units. Because levels of institutional and economic characteristics are usually clustered at the regional level, neighbors or institutionally related countries often make very good donors.<sup>8</sup> However, some of our variables are highly dependent on geography and may result from very specific policy choices. Thus, it is not obvious that geographical neighbors will provide comparable units.<sup>9</sup> In the appendix, we replicate our results using alternative donor pools, in which we select donors through a completely data-driven approach (see Section A1). The estimates using this new pool are reported in Figure A1. Table A1 also shows that although roughly comparable in magnitude, results with this alternative donor pool are not significant for any of the outcomes.

#### 3.1.2 Specification search

As a final robustness check, we tackle the risk of potential bias generated by predictor variables through specification search (Ferman et al., 2020). To address this potential issue, we adopt the “cherry-picking” test proposed by Ferman et al. (2020), which relies exclusively on the complete set of pre-treatment outcome lags, omitting other covariates. By including all lags, covariates become asymptotically irrelevant, thereby reducing the potential for bias arising from specification choices.<sup>10</sup> The results of this procedure are reported in Figure A2, with associated *p*-values in Figure A3 and donor weights in Table A2. Importantly, they are nearly identical to our main results, increasing our confidence in these findings are not driven by a specific specification choice.

<sup>8</sup> For instance, Cahanosky et al. (2025) and Absher et al. (2020) use other Latin American countries as donor for Ecuador’s institutions and income per capita, respectively. Abadie et al. (2015) uses other OCDE countries as donor for Germany’s GDP.

<sup>9</sup> As an example of this feature for energy production, consider the Nordic countries. The share of energy coming from hydropower can range from 0.03% in Denmark, to 18.9% in Finland, 39.7 in Sweden and 88.5% in Norway (Energy Institute, 2024).

<sup>10</sup> For further discussion, see Kaul et al. (2015), Botosaru and Ferman (2019), and Ferman and Pinto (2021).

## 4 Conclusions

Environmental protection has received increasing attention from policymakers and activists alike. Yet, it remains unclear whether broad constitutional provisions such as “environmental rights” can effectively drive improvements in environmental quality. This paper addresses this question by evaluating the impact of Ecuador’s 2008 constitution, which granted legal rights to nature, on several environmental outcomes. Using the synthetic control method, we construct counterfactual scenarios for a series of environmental outcomes. Our findings suggest that there is little to no evidence that the constitutional reform led to significant improvements across these indicators. While forest cover shows mild gains in some specifications, these effects are not robust to alternative specifications. The remaining indicators remained statistically indistinguishable from the counterfactual. We emphasize that this is precisely the question the paper sets out to answer: not whether rights-of-nature frameworks produce localized ecological improvements, but whether Ecuador’s constitutional reform shifted the country’s environmental trajectory at the macro level. This is a meaningful and a policy-relevant question in its own right. Proponents of constitutional environmentalism typically invoke broad, systemic change as the justification for reform, and to large extent the constitutional assembly had this goal, as discussed above in Sect. 2. It is precisely at the macro-level that the evidence is evaluated here. The absence of detectable macro-level effects is therefore a substantive finding, not a limitation of scope.

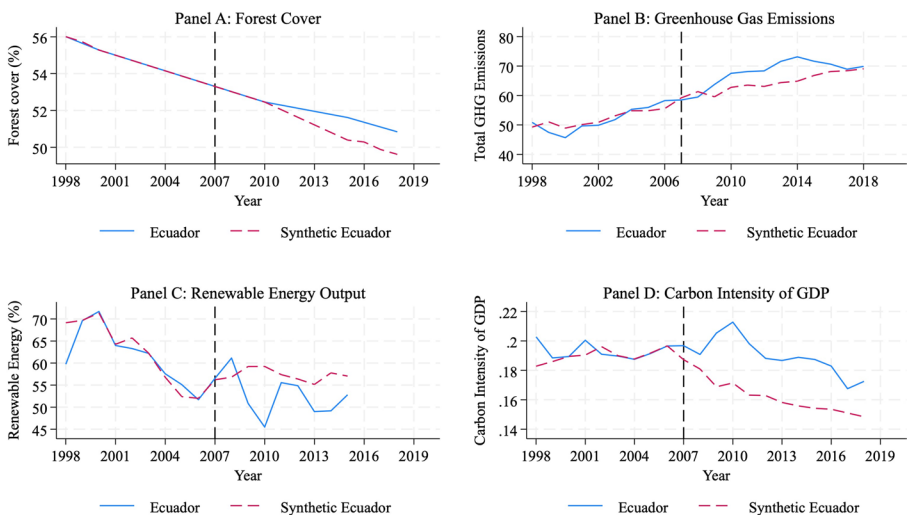
A complementary avenue for future research would be to test the reform using more granular ecological indicators (such as biodiversity, freshwater health, or species-level welfare) that more directly capture nature-centered outcomes. Such indicators would be better suited to detecting localized enforcement effects that may not aggregate to the national level. Unfortunately, data in these categories are either unavailable for consecutive years, not available for the donor pool countries, or do not begin prior to the 2009 treatment date, making them unsuitable for the synthetic control design. Addressing this gap remains an important task for future work.

Our results contribute to the broader debate on the role of constitutional provisions in achieving environmental goals. In line with prior literature, we emphasize that legal recognition alone is insufficient without institutional enforcement. Symbolic victories in the courts, such as the Vilcabamba and Los Cedros cases, are consistent with isolated rather than systematic enforcement (though we note that localized effects, if present, would not necessarily register in national-level aggregates). Our findings raise the hypothesis that aspirational approaches characteristic of the Latin American constitutional tradition (Gargarella, 2011) may be insufficient for environmental protection at the macro level absent strong institutional enforcement mechanisms. Whether this pattern holds across other countries and reforms in the region remains an important question for future research.

## Appendix

### Alternative donor pool

We select an alternative donor pool of countries that are quite similar to Ecuador in the outcome variable, using a completely data-driven approach. We get the mean value and its standard deviation for each outcome for Ecuador over the pre-treatment period. For instance, Ecuador's mean forest coverage is 54.6%, with a standard deviation of 0.893 between 1997 and 2007. We then included any country whose mean forest coverage area was between 51.9 and 57.3.<sup>1</sup> As a result, donors have a mean forest coverage area of 54.2%, with a minimum of 52.1 and a maximum 56.1%. In contrast, the Latin America sample had a mean of 50.2%, ranging from 8.3% (Uruguay) and 95.5% (Suriname). Results are reported in Figure A1; Table A1 compares the effect sizes and their significance between to those of Figure 1. More generally, we set the search as . We chose  $3 \times SD$  because this bandwidth yields roughly between 10 and 30 donors.



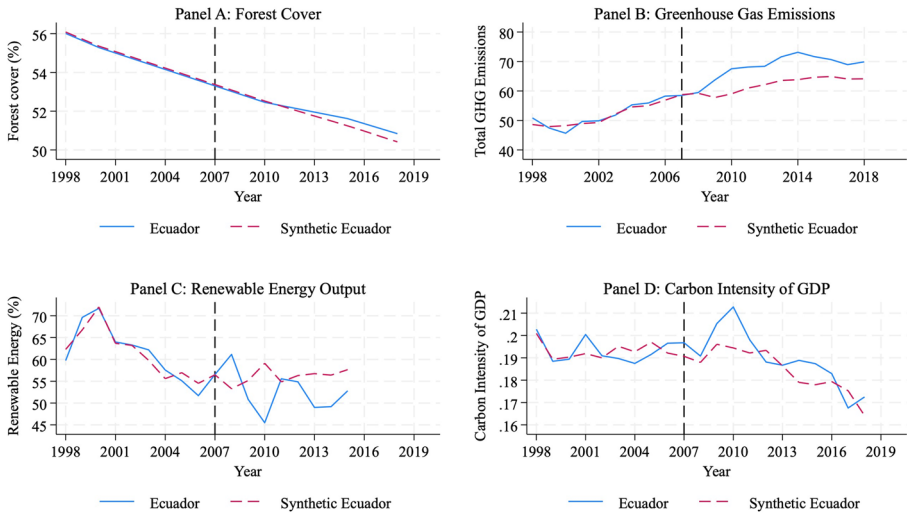
**Fig. 4** Robustness Check: Data-Driven Donor Pool. *Notes:* Panel **A**: Forest cover as a % of total area. Panel **B**: Total greenhouse gas emissions (in metric tons of CO<sub>2</sub> equivalent). Panel **C**: Renewable energy output as a % of total energy output. Panel **D**: Carbon intensity of GDP (kg of CO<sub>2</sub> per 2021 PPP USD)

**Table 2** Effect Sizes and Standardized *p*-values: Main Results

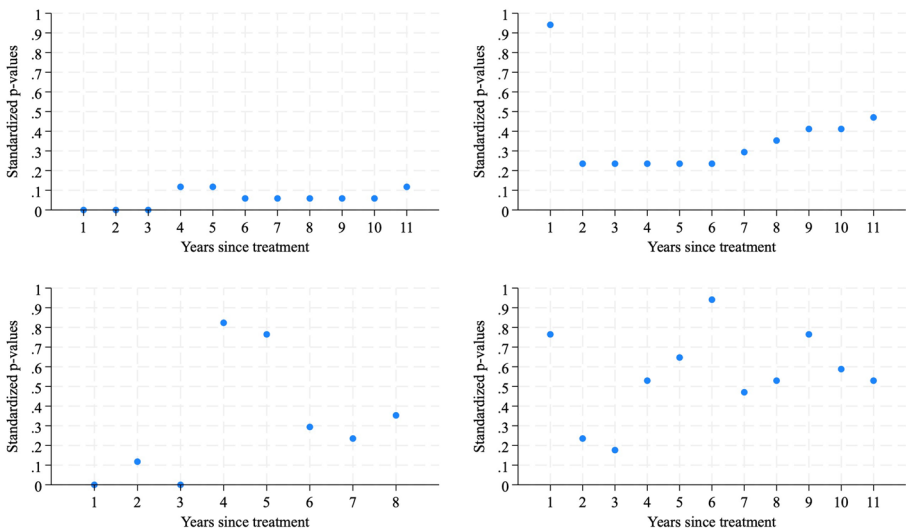
Year	Forest Cover		GHG emissions		% Renewable Energy		Carbon Intensity	
	(Panel A)		(Panel B)		(Panel C)		(Panel D)	
	LatAm	DD	LatAm	DD	LatAm	DD	LatAm	DD
2008	0.002 (0.235)	0.001 (0.889)	0.693 (0.824)	-1.836 (0.727)	8.314 (0.000)	4.272 (0.290)	0.010 (0.471)	0.010 (0.480)
2009	0.002 (0.235)	0.001 (1.000)	5.789 (0.176)	4.178 (0.364)	-4.315 (0.235)	-8.260 (0.258)	0.023 (0.059)	0.037 (0.120)
2010	0.001 (0.353)	0.001 (1.000)	8.404 (0.176)	4.768 (0.364)	-13.789 (0.059)	-13.540 (0.065)	0.031 (0.059)	0.041 (0.080)
2011	0.092 (0.000)	0.246 (0.222)	7.056 (0.176)	4.597 (0.455)	1.538 (0.765)	-1.533 (0.742)	0.008 (0.529)	0.035 (0.160)
2012	0.182 (0.000)	0.491 (0.222)	6.508 (0.294)	5.278 (0.455)	-0.244 (0.941)	-1.385 (0.871)	-0.011 (0.529)	0.025 (0.240)
2013	0.273 (0.000)	0.735 (0.222)	7.938 (0.294)	7.208 (0.455)	-7.629 (0.176)	-5.969 (0.516)	-0.002 (0.882)	0.029 (0.160)
2014	0.356 (0.000)	0.980 (0.111)	9.231 (0.235)	8.277 (0.455)	-8.212 (0.235)	-8.320 (0.387)	-0.002 (0.882)	0.033 (0.080)
2015	0.446 (0.000)	1.225 (0.111)	6.701 (0.353)	4.862 (0.636)	-6.413 (0.176)	-4.041 (0.645)	-0.007 (0.471)	0.033 (0.160)
2016	0.455 (0.000)	1.071 (0.222)	5.278 (0.353)	2.529 (0.818)			-0.017 (0.412)	0.029 (0.240)
2017	0.481 (0.000)	1.223 (0.333)	4.902 (0.471)	0.515 (1.000)			-0.013 (0.412)	0.017 (0.520)
2018	0.496 (0.059)	1.226 (0.333)	5.242 (0.412)	0.808 (1.000)			0.009 (0.706)	0.024 (0.320)
Joint <i>p</i> -val	(0.000)	(0.222)	(0.353)	(0.636)	(0.176)	(0.419)	(0.412)	(0.160)
RMSPE	0.000	0.026	1.338	1.941	2.641	3.121	0.006	0.008
Number of Donors	17	9	17	11	17	31	17	25

RMSPE is the root mean squared prediction error over the pre-treatment period. Joint *p*-val is the combined statistic for all post-treatment years

### Specification test



**Fig. 5** Robustness Check: “Cherry-picking” test. *Notes:* The “cherry-picking” test involves estimating a specification including all lags of the outcome variable and no predictor variables (Ferman et al., 2020). Panel A: Forest cover as a % of total area. Panel B: Total greenhouse gas emissions (in metric tons of CO<sub>2</sub> equivalent). Panel C: Renewable energy output as a % of total energy output. Panel D: Carbon intensity of GDP (kg of CO<sub>2</sub> per 2021 PPP USD)



**Fig. 6** Robustness Check: “Cherry-picking” test, standardized p-values. *Notes:* Standardized p-values associated with Figure A2. See Figure A2 for details

**Author contributions** JPB: Empirics and writingNC: Empirics and writingJC: Data collection and writing.

**Data availability** The data used is public. We can also submit replication files if needed.

## Declarations

**Competing interests** The authors declare no competing interests.

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