Democracy, Autocracy, and Everything in Between:
Understanding How Domestic Institutions Affect Environmental Protection

1. Introduction

As the ecological challenges of the 21st century broaden and intensify, which domestic institutions will best enable countries to take decisive environmental action? This question is all the more urgent in light of recent scientific assessments that climate change is already having serious impacts that will leave some populations with no choice but to adapt (IPCC 2014, 2018). As citizens become more alarmed by adverse climate events, worsening air quality, and other environmental problems, the argument goes, leaders who are held to account will respond in ecologically responsible ways (Looney 2016). This aligns comfortably with the view that 'democracy[1]' is the best route to socially desirable policies (Bueno de Mesquita et al. 2005; Deacon 2009; Lake and Baum 2001).

Others disagree sharply. Indeed, some now echo earlier arguments (e.g., Heilbroner 1974) that the gravity of many environmental problems requires the *opposite* of democracy. Democratic politics involves deliberation, which requires time we no longer have. Furthermore, it obliges leaders to be responsive to citizen demands that might undercut environmental objectives (Jamieson 2014). In contrast, when quick, decisive, and (possibly) unpopular action is needed, authoritarianism might be the best answer. Some look to China's recent climate change policies – which involve top-down edicts, limited consultation[2], and personal liberties restrictions that

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[1] I define this term and its counterpart, autocracy, later in the article. Note: I use the terms autocracy and authoritarian interchangeably throughout this article.

[2] But see Moore 2014, discussed later, for interesting nuance.

Westerners would find unacceptable – and conclude that 'authoritarian environmentalism' might provide a more viable way forward (Beeson 2010; Gilley 2012).

These debates extend well beyond the walls of academia. The idea that citizen involvement and accountable domestic institutions are crucial to sustainability is enshrined in the 1992 Rio Declaration, which states, "environmental issues are best handled with the participation of all concerned citizens," who should have easy access to information, the opportunity to participate in decision-making, and effective access to courts and redress/remedy if needed (UNEP 1992, principle 10; see also Looney 2016). Others place far less faith in democratic institutions. For instance, scientist-turned-activist James Lovelock laments the environmental impacts of "a sort of cheeky, egalitarian world where everyone can have their say." We may, he says, have to "put democracy on hold for a while," instead adopting a system in which a few trusted authorities make eco-decisions (Lovelock 2010).

Is there a 'democratic advantage' when it comes to environmental protection, or do autocracies win out? Existing answers to this question have been mixed, for two main reasons. First, as is common among scholars and in public discourse more broadly, the term democracy often means different things to different people. Second, quantitatively-oriented studies have typically relied on measures that are too general to gauge the specific mechanism, and/or do not control for competing institutional explanations. The result is that we are not really certain whether democracy 'matters'; nor are we sure specifically why or how.

This article overcomes these limitations in two chief ways. First, it unpacks the main mechanisms behind the idea that democracy affects environmental outcomes – engaging with examples from around the world (not just the entrenched democracies) and exploring nuance and, at times, indeterminacy, in theoretical expectations. More specifically, I explore three causal stories that underpin most research on democracy and environmentalism: (1) electoral accountability incentivizes leaders to provide better eco-outcomes for their citizens; (2) protection of civil liberties and civil society helps to ensure environmental awareness and learning, as well as successful environmental activism; and (3) political constraints provide a check on majority will and limit individual government actors' ability to unilaterally define environmental policy. Each is a distinct causal story, and as I explain in greater detail in the article, each has important caveats that are crucial to understanding debates about democracy and the environment.

The second main contribution of this article is empirical: having articulated the three causal mechanisms (and counter-arguments), I put these ideas to the test, recent data from around the world. I focus on a wide range of problematic environmental practices: emissions of harmful gases, energy consumption, and conservation failures. While by no means an exhaustive list, these collectively account for a huge portion of human damage to the global ecosystem. Three main findings emerge. First, electoral accountability is linked to significantly inferior environmental outcomes much of the time, but it improves countries' conservation efforts and has mixed impacts on greenhouse gas emissions. Second, robust civil society protections have substantially beneficial impacts on a wide variety of environmental practices. Third, political constraints do not reliably affect eco-outcomes. Overall, these findings indicate that encouraging and protecting civil society, not promoting electoral accountability or an eco-authoritarian model of limited political constraints, is the key to better environmental outcomes.

This article proceeds as follows. In the following section, I provide an overview of the existing literature on domestic politics and environmental outcomes. Section 3 focuses on theory, unpacking the three main causal mechanisms outlined above and discussing caveats; section 4 explores the considerable extent to which these vary within the autocratic world. Section 5 focuses chiefly on measurement, from two main angles: tying in the theories to data that can properly test them, and focusing on a range of practices that account for a large portion of human harm to the environment. Section 6 describes the modeling technique – joining other recent work in embracing the use of hierarchical modeling in the cross-national study of environmental politics – and presents the findings. Finally, section 7 presents conclusions.

2. Democratic Politics, Autocratic Politics, and Environmental Protection: What Do We Know?

Empirical research on democratic/autocratic politics and environmental protection can be grouped in three broad categories. A first and now well-developed strand, is chiefly interested in comparing democracies with autocracies.[3] The starting point for much of this work is the well-known proposition that democracies are better than autocracies at providing public goods (c.f., Bueno de Mesquita et al. 2003; Lake and Baum 2001). Applying that logic to the eco-arena, many studies find strong evidence that democracies outperform autocracies, across a range of environmental challenges: air pollutants like sulfur dioxide (SO_2) (Barrett and Graddy 2000; Bernauer and Koubi 2009); clean water (Deacon 2009; Li and Reuveny 2006); public sanitation (Deacon 2009); renewable energy measures (Bayer and Urpelainen 2016), lead in gasoline (Fredriksson et al. 2005); carbon dioxide (CO_2), nitrogen oxide (NO_X), forest protection, land degradation (Li and Reuveny 2006), and various other environmental measures.

Qualifications to these findings are plentiful. While often supportive of eco *policies* such as treaty participation and 'weak' sustainability measures (Wurster 2013), democracies do not necessarily achieve superior environmental *outcomes* (Bättig and Bernauer 2009; Midlarsky

[3] The definition and measurement of these terms are crucial. I discuss these in the next section.

1998; Neumayer 2002; Ward 2008; Wurster 2013). Others lodge notable scope conditions: democratic institutions only matter in combination with other factors like institutional stability/capacity (Cao and Ward 2015), low corruption (Povitkina 2018), or sufficient wealth (Farzin and Bond 2006). Others call into question the public goods provision argument. For instance, Fredriksson and Wollscheid (2007) find that only parliamentary democracies fare better than autocracies.[4] Bayer and Urpelainen (2016), focusing on renewable energy initiatives, find that democracies outperform autocracies *only* for programs that have attractive redistributive impacts. Occasionally, studies even find that autocracies fare *better* – when countries are very poor (Farzin and Bond 2006) or for select environmental outcomes (Midlarsky 1998).

A second group of scholars focuses specifically on democracies, exploring why some have more sustainable policies than others. Consistent with the idea that systems with larger winning coalitions are better at providing public goods, some studies report that presidential democracies are better than their parliamentary counterparts at curbing air pollution and at creating protected nature areas (Bernauer and Koubi 2009; Wurster 2013). But presidential and parliamentary systems do not differ when it comes to a host of other outcomes (Wurster 2013), and some work suggests that parliamentary regimes often perform *better* (Ward 2008; Fredriksson and Wollscheid 2007).[5] Bayer and Urpelainen (2016) find that democracies whose institutions give

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[4] But see Bernauer and Koubi 2008, and Wurster 2013, who – comparing different country subsets and somewhat different environmental outcomes – generally find the converse.

[5] Wurster (2013) looks at renewable energy, energy efficiency/consumption, climate emissions, and municipal waste. Ward (2008) uses two common metrics of weak and strong sustainability. Fredriksson and Wollscheid (2007) examine climate emissions, an index of environmental sustainability, plus a variety of other metrics.

disproportionate weight to rural constituencies adopt renewable energy policies that promote rural development and distribute electricity generation to independent producers. In contrast, they are no more (or less) prone to adopt renewables policies that have diffuse benefits.

Private actors – whether domestic or international – have long been involved in environmental policymaking and implementation (Bernauer and Betzold 2012; Gemmill and Bamidele-Izu 2002). There is fairly good evidence that civil society groups with pro-environment agendas exert positive environmental influence in democracies. Indeed, democracies with stronger green parties have better air quality (Bernauer and Koubi 2009) and a smaller environmental footprint (Ward 2008); those with more environmental non-governmental organizations (NGOs) tend to have cleaner gasoline (Fredriksson et al. 2005). The flip side of this coin is that private actors with anti-conservation agendas can also influence policy. For instance, democracies with stronger labor unions have inferior air quality (Bernauer and Koubi 2009), and those with stronger automotive lobbies have less stringent gasoline standards (Fredriksson et al. 2005).

Finally, a third strand of generally more recent research on environmental protection peers *inside* the autocratic state. Some scholars ask whether particular institutional arrangements foster environmental protection. China's recent environmental turn has received substantial attention in this vein, with scholars arguing that there and in East Asia more generally, a strong central state has made it possible to implement sustainability measures that might be difficult to implement when multiple veto points are present (Beeson 2010, 2018; Gilley 2012). Similarly, Deacon (2009) finds that a concentration of executive power aids in the phase-out of lead from gasoline. Additionally, Deacon (2009) finds no evidence that power concentration improves other outcomes like sanitation and clean water. Findings are mixed for autocratic regime-type, too. There is some evidence that military regimes fare particularly poorly on 'weak sustainability' while monarchies fail on 'strong sustainability' (Wurster 2013). Yet for SO_2, it is single-party regimes that pollute most (Ward et al. 2014). For many environmental outcomes, there are no differences between autocratic regime-types (Deacon 2009; Ward et al. 2014).

Researchers have explored three other main reasons why autocracies' environmental performance might differ. Among non-democracies, evidence of an environmental Kuznets curve, where economic growth only leads to eco-improvements above a critical threshold, is fairly mixed (Deacon 2009; Ward and Cao 2012; Ward et al. 2014). Others focus on state capacity and/or political stability, arguing that in autocracies, these enable governments to continue with or even worsen unsustainable practices (Ward 2008; Ward et al. 2014). Both sets of findings stand in contrast to what we generally find in democracies. Finally, a handful of studies explores how civil society efforts drive environmental outcomes in autocracies. Two main messages emerge from them. First, grassroots/civil society groups can have meaningful impacts on environmental practices in these countries (Dai and Spires 2017; Geall 2018; Sowers 2007). Second, whether these groups have real autonomy remains hotly contested: some see them as largely government-driven and controlled, whereas others view them as carving out meaningful impacts through strategic and norm-based maneuvers (Dai and Spires 2017; Doyle and Simpson 2006; Moore 2014; Spires et al. 2016).

Overall, three key points emerge from the above discussion. First, in general, democracies fare better than autocracies when it comes to protecting the environment – but this does vary by environmental outcome (Ward 2008). Second, we know less about autocracies' than democracies' environmental practices, but this is improving (c.f., Sonnenfeld and Taylor 2018). Finally, while prevalent in the literature and in the environmental policy arena more generally (Gore 1992; UNEP 1992), the term 'democracy' means different things to different people. It is not uncommon for scholars to test different conceptualizations using the same measure, and rarely are these different causal stories pitted against each other empirically.

3. Unpacking 'Democracy': Accountability, Rights, and Constraints

Public goods are central to theories that underscore the democratic advantage in environmental outcomes (Bayer and Urpelainen 2016). But under this rubric of 'democracy,' there are several different causal stories. This section focuses on the three most prevalent and plausible: electoral accountability, rights and civil society, and constraints.[6]

Electoral Accountability

Electoral accountability is core to most theories of democratic governance: as Schmitter and Karl (1991: 76) argue, democracy is a system "in which rulers are held accountable for their actions in the public realm by citizens, acting indirectly through the competition and cooperation of their elected representatives." The theoretical link between accountability, which relies in large part on free and fair elections, and environmental governance is intuitive. Electoral accountability incentivizes leaders to be responsive what citizens, particularly the median voter, want. Because all citizens – or at least a large portion – have a say in who governs, it is typically more efficient for leaders in this context to provide environmental and other beneficial policies to everyone (the selectorate) rather than furnishing it privately to the subset of people needed to maintain rule (the minimum winning coalition) (Bättig and Bernauer 2009; Bernauer et al. 2010; Bueno de Mesquita et al. 2005; Farzin and Bond 2006; Deacon 2009; Barrett and Graddy 2000;

[6] For others, which are more controversial, see Payne 1995. A discussion of the vast literature on the meaning of 'democracy' is well beyond the scope of this article. See Schmitter and Karl 1991. In the environmental context specifically, see Li and Reuveny 2006.

Li and Reuveny; Ward et al. 2014; Wurster 2013). Without genuine electoral accountability, leaders do not have the same incentives to be responsive to the population writ large. Instead, they typically provide private or group-specific goods (Geddes et al. 2018).

There are two main caveats or critiques to raise here. First, if electoral accountability is to deliver better environmental outcomes, citizens must know about environmental degradation and its causes, want greener policies, and make these electorally consequential.[7] These are substantial contingencies. Relatedly, although electoral accountability helps to ensure that governments act in the interests of the governed, the latter are not necessarily the ones to bear the cost of environmental degradation. Some argue that systems that rely on electoral accountability are indeed poorly prepared to respond to environmental problems that harm individuals in other countries, animals, and future generations (Jamieson 2014). A second caveat is that electoral accountability incentivizes leaders to provide public goods in ways that have attractive distributive profiles (Bayer and Urpelainen 2016). Hence, the provision of environmental policies depends not only on what citizens want, but also on whom the electoral system favors and whether it is possible to channel the economic benefits of eco-policies to those voters.

Civil liberties/Civil Society

Others emphasize the fundamental link between environmentalism and the protection of rights and civil society (Barrett and Graddy 2000; Bhattarai and Hamming 2001; Dasgupta and Mäler

[7] Others such as Bättig and Bernauer (2009) argue that it also requires the median voter in democracies to have greener preferences than does the median elite in autocracies. I disagree. Consistent with theories of autocratic politics (Geddes et al. 2018), I argue that it simply requires that they be able to "buy off" elites who have strong pro-environment policies.

1995; Farzin and Bond 2006; Li and Reuveny 2006; Payne 1995). I emphasize two mechanisms here. First, protection of civil liberties such as expression helps to ensure that citizens can gather and disseminate information, which in turn can promote learning (Midlarsky 1998) and improve public awareness about the environment (Payne 1995). In contrast, when people are fearful of or prevented from voicing opinions or providing expertise, they do not give the kind of honest, critical, feedback that enables others to establish informed views or for leaders to make well-founded decisions (Shahar 2015). Instead, a dearth of accurate information might enable administrators to lock themselves in narrow, rigid ways of thinking (Shahar 2015) or to cover up poor ecological performance (Croissant and Wurster 2013).

Second, as policymakers regularly emphasize (UNEP 2019), civil society protections including the right to form associations help to ensure successful environmental activism (Sonnenfeld and Taylor 2018). In addition to providing information and input into policymaking (as discussed above), civil society groups including NGOs play important roles in policy implementation (Gemmill and Bamidele-Izu 2002). In biodiversity and in carbon credit schemes, for example, governments have found it more cost-effective to outsource implementation to civil society groups (Bernauer and Betzold 2012). Finally, to the extent they are able, these groups advocate for environmental justice.

With regard to civil liberties and civil society, too, there are notable caveats. Allowing multiple ‘stakeholders’ to express views and to be involved in the policy process takes time, which is hard when we need quick, decisive, action. It also means giving a voice diverse goals, which may undercut sustainability. Nor does giving all parties the opportunity to participate guarantee that the most sensible, or the most sustainable, outcome will prevail. If corporate interests dominate, it may be difficult for environmental groups to gain a seat at the table even if they have the right (in theory) to be there (Dryzek 1987). Finally, usurping individual rights may sometimes enhance environmental protection. For example, several Chinese cities have decided to combat pollution by prohibiting car use once per week (Gilley 2012). Such policies would likely fall under stiff criticism and be unworkable in countries where individual civil liberties prevail.

(Political) Constraints

As Madison noted in *The Federalist Papers* #51 (1788), in framing a government administered by people over people, a fundamental challenge is that the government must be able to control both the governed and itself. Even with electoral accountability, Madison argued, a well-functioning system requires institutions to place a check on majority will, and limits on individual government actors' ability to unilaterally formulate/change policy. The constant goal "is to divide and arrange the several offices in such a manner as that each may be a check on the other that the private interest of every individual may be a sentinel over public rights" (Madison 1788).

(Even) more so than for electoral accountability or civil liberties/society, there is deep disagreement about whether constraints are a boon or a bane for environmental protection. Proponents argue that the fractious process of having to get multiple government actors to forge agreement often leads to better, more durable, policies. Furthermore, a lack of constraints makes policy pendulum swings more likely: for example, in Mubarak's Egypt, this enabled the rapid deterioration of an initially very successful Sinai nature protection scheme when the leadership's interests shifted (Sowers 2007). Others, while not denying the environmental success of China's limited-constraints model, argue that the decisions of one "reasonably enlightened" group of leaders (Friedman 2009) tell us little about whether other countries will generate similarly competent individuals with similar objectives. Instead, leaders who shield themselves from the will of the populace have a fairly dismal track-record of producing policies that actually make the nation worse-off (Shahar 2015).

Others point to the benefits of a no- or minimal-constraints model. For instance, the Sinai nature protection scheme discussed above initially came into existence and thrived because authority was concentrated in a few executive institutions, whose members had an interest in it (Sowers 2007). In another vein, scholars have long argued that the severity and intractability of environmental problems call for drastic measures that are impossible in a system that requires multiple actors' consent (Ophuls 1977). 'Eco-authoritarianism' – the idea that the solution to today's eco-challenges, most notably climate change, might lie in governments or their expert agencies having power to unilaterally do whatever is necessary to mitigate environmental disaster – has gained notable traction recently, particularly in light of China's recent environmental actions (Beeson 2010, 2018; Gilley 2012; Shearman and Smith 2007).

4. Electoral Accountability, Civil Liberties/Civil Society, and Constraints in Autocracies

The previous section argued that rather than thinking about environmental outcomes in terms of what democracies do vs. what autocracies do, we should unpack the causal processes. It articulated and scrutinized three mechanisms behind the idea that there is a democratic advantage in environmental outcomes. In this section, I explore the extent to which electoral accountability, civil liberties/civil society, and constraints vary within the autocratic world.[8] My main objective

[8] Making this point requires clarity about what countries are 'autocracies.' As with 'democracy,' there is wide disagreement on this question, and a full discussion of it is beyond the scope of this article. See

is to demonstrate that even among autocracies, there is substantial variation in electoral accountability, civil liberties/civil society, and constraints on what individual government actors can do. I consider each in turn, with applications from the environmental politics literature when available.[9]

Autocracies vary substantially in the degree to which elections are competitive and impose accountability on leaders (Hyde and Marinov 2012). 'Pure' electoral authoritarianism, where elections do not exist or involve no serious contestation, lies on one side of the spectrum. North Korea is an extreme example. On the opposite side lie 'competitive' electoral authoritarians (Levitsky and Way 2002), which hold elections that are regular, involve opposition candidates, and are usually devoid of massive fraud. In between, there is huge diversity. What distinguishes them all from electoral democracies is that in the former, elections are not genuinely open, free, and fair. Even in competitive authoritarian systems, incumbents take actions often enough, and severely enough, that the playing field is not even (Levitsky and Way 2002).

In China, the rise of environmentalism – both grassroots and state-led – has coincided with the introduction of local elections. But have the latter *caused* (or at least facilitated) the former? Some argue that China's electoral system is too closed to provide a viable mechanism for the exercise of environmental preferences (Li and van der Heijden (2010: 56). In policy discussions, the Chinese leadership's ability to curb pollution is often tied to its ability to maintain power and

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Ghandi 2008 for an overview. Following much of the literature, I am referring to countries that do not hold genuinely free and fair elections (c.f., Cheibub et al. 2010; Ghandi 2008).

[9] This is by no means the only way to 'unpack' autocracies. See Art 2012 and Frantz 2019 for an overview of other approaches. Future environmental politics research may gain insight by exploring these.

legitimacy (Corne and Browaeys 2017). A similar message emerges from Vietnam's recent Formosa marine life disaster (Hutt 2017). Yet, beyond the industrialized democracies, there is virtually no systematic research on whether elections play a part in this process. An exception is Martinez-Bravo et al. (2017), who show that the introduction of village elections in China led to better public goods provision, including environmental standards.[10] Still, this cannot provide an explanation for China's greenhouse gas improvements, since there are no national elections.

While every autocracy restricts civil liberties and civil society mobilization to some degree, the variation is wide. Sowers (2007) shows that even in the early 1980s, when limits on Mubarak's power were minimal, conservation scientists and other local groups were at the forefront of efforts to establish designated Sinai protected areas, with some success. In Iran, the government deliberately encouraged the growth of green NGOs, as long as their work was apolitical and aligned with state objectives (Doyle and Simpson 2006). The result was a top-down, state-dominated 'civil society' sector that had some success. Yet, the Iranian case also demonstrates the perils of civil society action in autocracies: as green activists have become more critical, they have encountered serious government backlash (Human Rights Watch 2018).

Similarly, there has been a dramatic growth in environmental NGOs and eco-activism in China over the past two decades, but there is wide disagreement on their impact. Spires et al. (2014: 65) document an "associational revolution" in Yunnan, Guangdong, and Beijing. Furthermore, Dai and Spires (2017) argue, these grassroots groups influence local eco-policy even in the absence of civil liberties protections by cultivating relationships with officials, and through framing and media engagement. Moore (2014) is more circumspect, arguing that despite

[10] Unfortunately, the study does not parse out environmental protection from other public goods provision such as schools.

mounting pluralization, the Chinese government is now very adept at using a mixture of coercion and persuasion to pursue its own political goals under the guise of 'environmental' projects.

Political constraints, too, vary notably in the autocratic world, across time and space. Consider Morocco. In the 1990s and 2000s, reforms to its electoral system were meager at best: the monarchy still largely controlled who could enter politics; vote rigging persisted and was then replaced with vote-buying; and the masses, understanding that the "game is fixed," did not take elections seriously (Maghraoui 2001: 80). Yet, constitutional reforms led to the creation of a bicameral legislature in 1996; and the opposition party won the leadership in 1997. These enabled the first *gouvernement d'alternance* (change of government) since 1960. The result was a greater heterogeneity of preferences and, arguably, greater constraints in Morocco's governing institutions for a while, but without fundamentally undermining the monarchy's authority (Sater 2001). Interestingly, the demise of *alternance* may have facilitated environmentalism in the Moroccan case. With a technocrat taking over as Prime Minister in 2002, and the monarchists back in the majority in 2007, the King soon launched a 'pet project' to create the world's largest solar power facility. Despite its complex socio-economic implications, the project has moved forward with great expediency (Cantoni and Rignall 2019).

5. Measuring the Key Variables

Accountability, Civil Liberties/Civil Society, and Constraints

Previous studies of democracy and sustainability have relied chiefly on the Polity2 data (Marshall et al. 2017), or Freedom House's Political Rights/Civil Liberties variables (Freedom House various years). These have been useful in moving a burgeoning literature forward, but they do not necessarily test the mechanism scholars intended them to. For instance, Li and Reuveny (2006: 936) provide an insightful discussion of several ways in which democracy might affect sustainability, but they ultimately rely on the Polity2 variable as a gauge of their "overall or net effect." This article joins other recent studies that aim to hone in on the specific causal story/ies at play, through the use of more refined data (c.f., Bernauer and Koubi 2009; Cao and Ward 2015; Wurster 2013).

To gauge the idea that *electoral accountability* affects environmental protection, I use V-Dem's Clean Elections Index, which gauges the presence or absence of "registration fraud, systematic irregularities, government intimidation of the opposition, vote buying, and election violence" (Coppedge et al. 2018a: 44). For my purposes, it is superior to Cheibub et al.'s (2009) because it covers more years and employs a continuous approach to measuring the degree to which elections are free and fair. Some countries fit quite obviously on one side of the spectrum or the other (e.g., in 2017, Saudi Arabia vs. Norway). But this variable is by no means bimodal. It is adept at gauging similarities and differences 'in the middle' where others do not. For instance, for Cheibub et al. (2010), 2008 Namibia and Malaysia were both autocracies; for Marshall et al. (2017) these countries both had Polity2 scores of 6 for the same year. In contrast, V-Dem perceives Namibia as having far 'cleaner' elections.

Operationalizing *civil liberties/civil society* is complex because there are actually two mechanisms at play (free expression/association, and robustness of civil society). For the sake of parsimony, I use one measure – core civil society – which gauges the robustness of civil society, defined as one that "enjoys autonomy from the state and in which citizens freely and actively pursue their political and civic goals" (Coppedge et al. 2018b: 237). It is highly correlated with the Clean Elections Index[11], a point to which I return later. Nonetheless, a non-competitive electoral process does not always preclude relatively robust civil liberties and/or civil society. In

[11] $\rho = .786$.

Fiji, for instance, the 2006 coup was followed by almost a decade of 'postponed' elections and a massive crackdown on press freedoms (Fraenkel and Lal 2009). Yet, most other aspects of Fijian civil society carried on unfettered, particularly in the realms of youth and domestic violence. The V-Dem data capture many of these differences.

For *constraints*, I use the Henisz's Political Constraints variable, which measures the feasibility of policy change, given "the structure of a nation's political institutions … and the preferences of the actors that inhibit them" (Henisz 2017). This variable is also fairly highly correlated with Free/Fair Elections and Core Civil Society[12], a point to which I return later. However, they do not always align or necessarily even move in the same direction. For instance, in early 2011, the Democratic Republic of the Congo amended its electoral law to eliminate the requirement of a presidential runoff, thereby favoring the incumbent. Elections later that year were marred with serious and widespread fraud and violence (Freedom House 2012). Despite this deterioration in electoral accountability, political constraints increased somewhat (Henisz 2017). Early 1990s Senegal was, in some respects, the opposite: despite improvements in the electoral commission's autonomy and an already vibrant civil society, political constraints on government were minimal (Castro-Cornejo et al. 2013).

Environmental Protection

Beyond greenhouse gas emissions (arguably), there is little agreement on what global eco-challenges are the most important for policymakers and scholars to understand. I take a broad approach, focusing on three core categories of environmental degradation: pollution, energy consumption, and (non)conservation. Combined, these are by far the most prevalent in the

[12] $\rho = .711$ and $.721$, respectively.

literature on domestic politics and environmental degradation, and they also account for the lion's share of damage to the global ecosystem.

I analyze three main pollutants. The first is greenhouse gases, which include CO_2, as well as methane (CH_4) and nitrous oxide (N_2O) (Janssens-Maenhout et al. 2017). Readers are no doubt aware of how these gases harm the earth's climate system, with flow-on consequences too numerous to list here. Second, I examine SO_2, a key air toxin that causes acid raid. Third, I look at NO_x, a family of chemical compounds that forms an important air pollutant itself, and also reacts in the atmosphere to form fine particles, harmful ground-level ozone, and acid rain (Environmental Protection Agency 1999). Both SO_2 and NO_x contribute to respiratory, heart, and lung disease (Pope et al. 2002), and the acid rain they create harms vegetation, lakes, buildings, and agricultural production (Bernauer and Koubi 2009).

Energy consumption is at the core of many current environmental challenges (Bayer and Urpelainen 2016). Following much of the literature (Harrison and Kostka 2014; Wurster 2013), I focus on two aspects of this question. First, I look at countries' per capita energy consumption, since this is one of the core mechanisms through which humans cause harm to the environment. Second, I look at the use of renewable sources in energy production/consumption, such as geothermal, hydro, solar, and wind power, and biomass. Renewables are key to many countries' efforts to tackle climate change (Harrison and Kostka 2014). While use of renewables is booming in some countries (Bayer and Urpelainen 2016), it has stagnated or even dropped (as a percentage of total energy consumption) in others.[13]

[13] For ease of comparison and discussion, the analyses focus on the percentage of energy consumption that comes from non-renewables. See the Table 1a (Appendix) for greater detail on measurement.

Finally, I look at conservation efforts. Ideally, one would look here at the variety of ways in which governments, citizens, and other actors make (or do not make) efforts to preserve and shelter the ecosystem, including wildlife and biodiversity protection; designating land, lakes, and oceans as off-limits to harmful human activity; and so on. In practice, it is difficult to obtain reliable data for a sufficient number of countries and years for most of these conservation efforts. Following others (Wurster 2013), I employ a measure of land protection, which is available for up to 156 countries from 1990 to 2012 (World Database on Protected Areas various years).[14]

6. Quantitative Analyses

It is well known that time-series-cross-sectional (TSCS) data like those used here violate classical regression assumptions – particularly heteroskedasticity, serial correlation, and contemporaneous correlation.[15] Following Beck and Katz 2007, Shor et al. 2007, Western 1998, and others, I use a mixed effects model, using R's lme4 package (Bates et al. 2015). These models, which are a type of hierarchical (AKA multilevel), have a long history in other fields, but their use in political science has been more sporadic historically (Beck and Katz 2007). A key exception is Western 1998, who analyzes the impact of domestic institutions on OECD countries' growth rates. He forcefully argues that these models present a richer picture of the causal heterogeneity that we typically see in TSCS data, and provide a more realistic accounting of uncertainty. Shor et al. 2007 and Bell and Jones 2015 echo this point and, further, emphasize

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[14] As with Use of Non-Renewables and for the same reasons, I invert this variable, generating Land Non-Protection (see Table 1a, Appendix).

[15] Many scholars have written about the challenges of analyzing TSCS data. See Beck and Katz 2011 for an overview.

the greater flexibility in modeling the complex error structures that are common in these data. Povitkina's recent (2018) analysis of CO_2 emissions provides a nice application of this approach.

Mixed effects models have two main components.[16] The first is the 'fixed' (sometimes called 'between') portion – a linear model in which the group means are fixed, i.e., non-random. The second is the 'random' (sometimes called 'within') portion, in which group means are a random sample from the population, which is integrated into the error term (discussed below). To understand the potential benefits of a mixed effects approach, consider a common alternative – a model that controls for heterogeneity via country-specific intercepts.[17]

$$y_{jt} = \alpha_j + \gamma_t + \beta x_t + \varepsilon_{jt} \tag{1}$$

where y_{jt} is the dependent variable, x_t is an independent variable, β a parameter of interest to be estimated, γ_t an indicator for each year (because the data are all yearly), α_j country-specific intercepts, and ε_{jt} an error term.

In TSCS settings, **(1)** usually yields less flawed standard errors than does a model that simply specifies a single intercept (and hence assumes no country-level variability), but it does not allow sharing of potentially important information across countries (Shor et al. 2007). Mixed effects accomplishes this by estimating the following model:

$$y_{jt} = \alpha_j + \gamma_t + \beta x_t + \varepsilon_{jt}, \tag{2}$$

$$\text{where } \alpha_j = \alpha_0 + \eta_j, \text{ and } \eta_j \sim N\left(0,\ \sigma_\eta^2\right) \tag{3}$$

[16] For more involved statistical discussions, see Bates et al. 2015, Shor et al. 2007, and Western 1998.

[17] Political scientists regularly call this a fixed effects model, although one can alternatively/additionally 'fix' (i.e., include dummies) by year, region, … To avoid confusion between this and the fixed portion of the mixed effects model, I use the term 'country-specific intercepts.'

where α_0 is the average intercept across countries, and η_j is the unique effect of country j on α, which we assume to be a random shock from a normal distribution. This approach enables us to estimate the variance of the unit effects, α_j, conditional on the data and parameters at each level. By modeling the error structure at different levels of the equation, we estimate a within-unit and a between-unit variance (Shor at al. 2007).

In comparative politics and IR, surveys of individuals in multiple countries over multiple years are perhaps the most obvious situation where a hierarchical model would be sensible. There, we have observations over multiple years for micro-units (individuals), which are embedded in macro-units (countries). Yet as others have argued, TSCS data also lend themselves to hierarchical modeling, as time-periods are nested within countries (Franzese 2005; Bell and Jones 2015), which in turn are nested in regions (or other units of interest). Mixed effects models can be estimated in a Bayesian or a maximum likelihood (ML) framework (Bates et al. 2016). I estimate both and find little difference in the results.[18]

I begin by checking for unit roots in the dependent variables. All tests are significant at $p < .05$, and therefore I am able to reject the null hypothesis; the data appear to be stationary for all dependent variables. As is standard practice, I lag each independent variable one year in order to avoid the risk of simultaneity bias. Following Bates et al. (2015), I test whether each level (year, country, region) 'belongs' in the model. In all models, these are significant at $p < .01$, strongly suggesting that the inclusion of three levels of hierarchy significantly improves model fit.[19]

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[18] I report the Bayesian results. The ML results are available upon request.

[19] In three of the 24 models reported here – all involving subsets of the data in which the dependent variable is non-renewable use –including year in the hierarchical model leads the estimated variance-

Table 1 reports the first set of analyses, which estimate each environmental degradation outcome as a function of free/fair elections, core civil society, political constraints, and several other commonly-used variables.[20] Figure 1 displays the results graphically for each outcome. Four core findings of interest emerge. First, countries with free and fair elections have significantly higher emissions of all types explored here, consume more energy per capita, and rely more heavily on non-renewables. Second, and in contrast, countries with more robust civil societies fare significantly better on all of those environmental outcomes. Third, in only one case do political constraints reliably affect environmental practices. Finally, the last model, which explores land non-protection, paints a different picture when it comes to these key variables. There, it is countries with free/fair elections that have the most responsible practices; neither civil society nor political constraints have reliable effects.

As mentioned earlier, Free/Fair Elections, Core Civil Society, and Political Constraints are fairly highly correlated. It is well-known that multicollinearity can lead to unstable estimates and invalid inferences. On the other hand, looking at each variable's impact individually across the full dataset without controlling for the other variables' effect would raise omitted variable bias problems. A good solution here is to look at cases when the other two institutional features are not present (or are minimal). That is, we want to gauge the effect of competitive elections in

covariance matrices to be of less than full rank. This type of problem is not uncommon in mixed effects models, particularly when sample sizes become small. I estimate these models without including year in the hierarchy (instead, I only include country and region). Robustness checks confirm that including year as a predictor in the 'fixed' part of the model does not alter the findings.

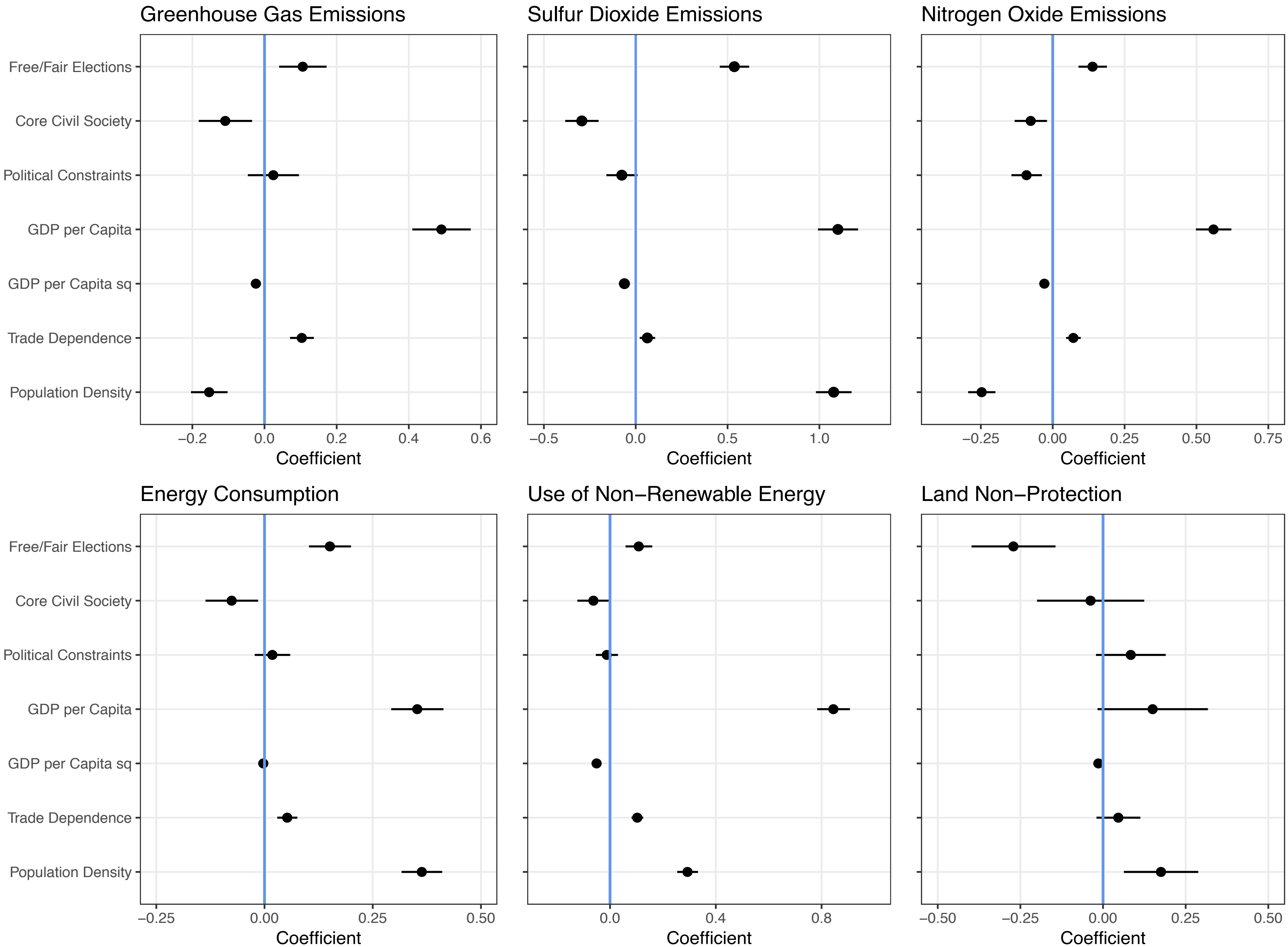
[20] I generate p-values (which lme4 does not provide) in R using tab_model, which uses Wald statistic approximation.

Table 1. Political Institutions and Environmental Degradation: Mixed Effects Model

	Greenhouse Gases		Sulfur Dioxide (SO_2)		Nitrogen Oxides (NO_X)		Energy Use		Non-Renewable Use		Land Non-Protection	
	Coeff	*p*	*Coeff*	*p*	*Coeff*	*p*	*Coeff*	*p*	*Coeff*	*p*	*Coeff*	*p*
Free/Fair Elections	**.106**	**.001**	**.537**	**<.001**	**.139**	**<.001**	**.241**	**<.001**	**.109**	**<.001**	**-.271**	**<.001**
Core Civil Society	**-.109**	**.004**	**-.293**	**<.001**	**-.077**	**.007**	**-.173**	**<.001**	**-.063**	**.042**	-.038	.647
Political Constraints	.024	.497	-.076	.077	**-.091**	**.001**	-.044	.093	-.012	.563	.084	.117
GDP per Capita	**.490**	**<.001**	**1.101**	**<.001**	**.559**	**<.001**	**.374**	**<.001**	**.845**	**<.001**	.150	.077
GDP per Capita^2	**-.024**	**<.001**	**-.062**	**<.001**	**-.029**	**<.001**	**-.004**	**.024**	**-.051**	**<.001**	**-.014**	**.010**
Trade Openness	**.103**	**<.001**	**.063**	**.002**	**.072**	**<.001**	**.059**	**<.001**	**.103**	**<.001**	.046	.168
Population Density	**-.154**	**<.001**	**1.078**	**<.001**	**-.247**	**<.001**	**.343**	**<.001**	**.293**	**<.001**	**.175**	**.002**
Constant	**13.49**	**<.001**	.238	.566	**4.442**	**<.001**	**2.800**	**<.001**	**-.997**	**<.001**	**-2.595**	**<.001**
σ^2	.09		.11		.05		.04		.02		.13	
ICC (year/country/region)	.01/.59/.29		.04/.62/.32		.02/.73/.17		.02/.55/.39		.001/.50/.46		.01/.80/.12	
Observations	5227		4881		5365		4840		3757		3295	
Fixed Portion R^2	.110		.390		.209		.321		.249		.037	
Random Portion R^2	.789		.594		.727		.654		.721		.906	

Findings significant at $p < .05$ appear in bold. See Table 1a (Appendix) for greater detail on variables. ICC = Intra-class-correlation.

Figure 1. Coefficient Plots from Table 1: Political Institutions and Environmental Degradation



countries where civil society is sclerotic and political constraints are minimal; the impact of civil society in countries with minimally-competitive elections and limited political constraints; and the effect of political constraints in countries with minimally-competitive elections and sclerotic civil society. Tables 2, 3, and 4 and their corresponding figures display the results of those analyses.

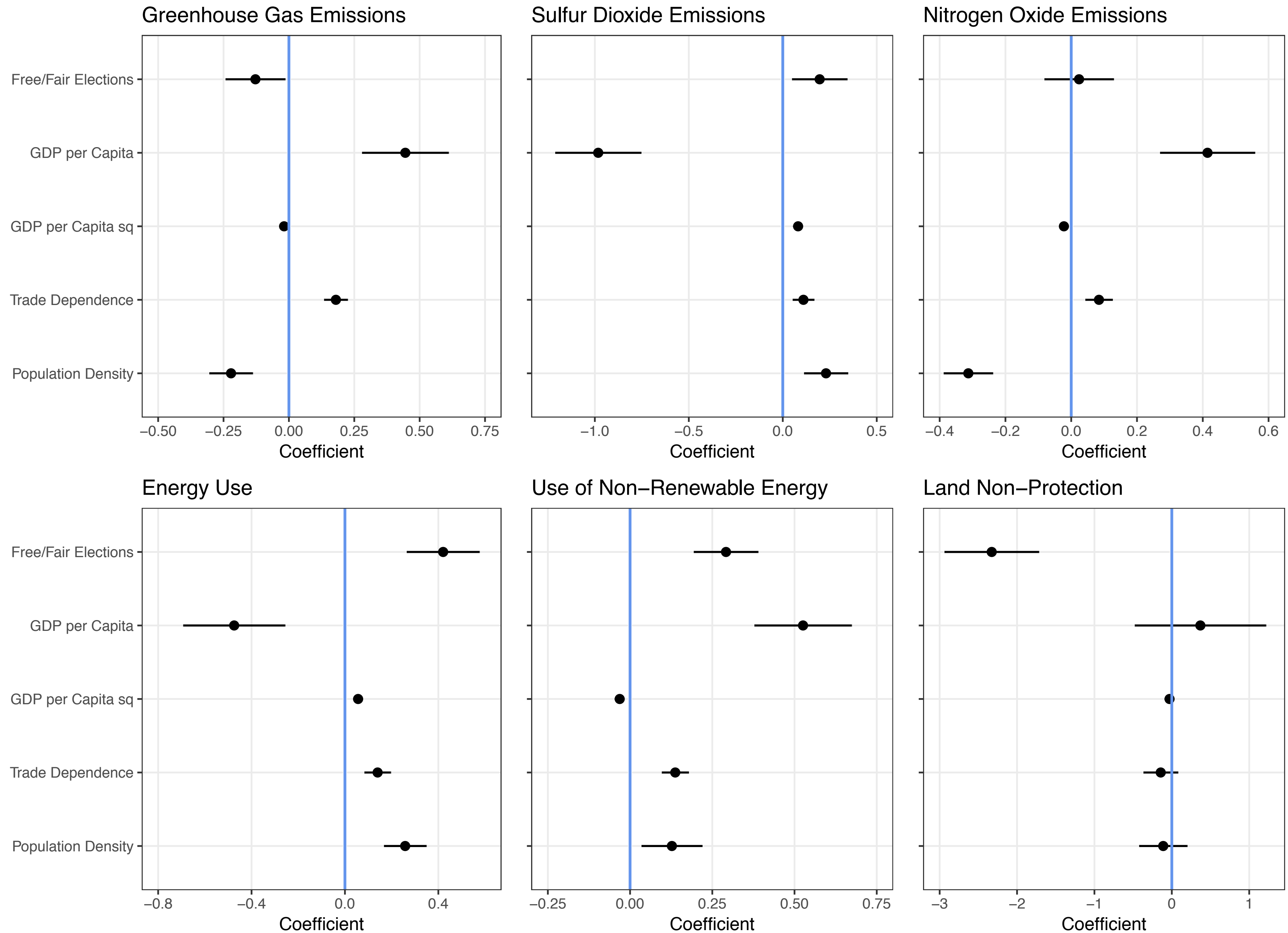
The findings are largely consistent with those in Table 1. Across four of the six outcomes in Table 2, democratic elections are linked to more environmental degradation. To illustrate these results in a real-world scenario, consider a comparison of Iran in the late 1980s to Oman in the early 2000s. Both countries' civil society and political constraints were similarly limited during the dates indicated, but Iran's elections were substantially less free/fair (~.29 in Coppedge et al. 2016) than Oman's (~.64 in Coppedge et al. 2016). This example represents a one standard-deviation increase around the population mean of Free/Fair Elections. Holding all other variables at their means, Table 2 predicts that such an improvement in electoral competition would result in a .7% increase in per capita SO_2 emissions, a .1% rise in per capita NO_x emissions (non-statistically significant), a 2.1% surge in per capita energy consumption, and a 2.6% increase in use of non-renewables. As in Table 1, land non-protection adheres to a different logic. In our comparison, Oman would have 9.2% *lower* rates of land non-protection than would Iran, all else equal. The one notable difference in comparison to Table 1 is greenhouse gases, where elections are now associated with a *decrease* in emissions in Table 2. Returning to our Iran/Oman example, the latter would have .1% lower greenhouse gas emissions – not a substantively large impact, but a statistically significant one.

Table 2. Political Institutions and Environmental Degradation: Mixed Effects Model, Countries With Minimal Civil Society and No Political Constraints

	Greenhouse Gases		**Sulfur Dioxide (SO_2)**		**Nitrogen Oxides (NO_X)**		**Energy Use**		**Non-Renewable Use**		**Land Non-Protection**	
	Coeff	*p*	*Coeff*	*p*	*Coeff*	*p*	*Coeff*	*p*	*Coeff*	*p*	*Coeff*	*p*
Free/Fair Elections	**-.128**	**.027**	**.196**	**.009**	.024	.656	**.421**	**<.001**	**.292**	**<.001**	**-2.327**	**<.001**
GDP per Capita	**.445**	**<.001**	**-.982**	**<.001**	**.414**	**<.001**	**-.475**	**<.001**	**.526**	**<.001**	.369	.394
GDP per Capita^2	**-.018**	**.002**	**.082**	**<.001**	**-.022**	**<.001**	**.056**	**<.001**	**-.032**	**<.001**	-.029	.308
Trade Openness	**.180**	**<.001**	**.110**	**<.001**	**.084**	**<.001**	**.140**	**<.001**	**.137**	**<.001**	-.143	.207
Population Density	**-.221**	**<.001**	**.230**	**<.001**	**-.313**	**<.001**	**.258**	**<.001**	**.127**	**.007**	-.111	.483
Constant	**13.333**	**<.001**	**1.139**	**<.001**	**5.185**	**<.001**	**5.607**	**<.001**	4.258	.218	-1.171	.551
σ^2	.05		.07		.04		.06		.01		.41	
ICC (year/country/region)	.01/.63/.31		.01/.45/.50		.00/.83/.11		.03/.67/.19		*/.58/.41		.01/.70/.14	
Observations	1157		1098		1193		927		441		398	
Fixed Portion R^2	.212		.086		.241		.430		.061		.074	
Random Portion R^2	.742		.884		.717		.507		.928		.794	

Findings significant at $p < .05$ appear in bold. See Table 1a (Appendix) for greater detail on variables. Countries of interest have a Core Civil Society value in the bottom tercile and a Political Constraints value in the bottom tercile. For Political Constraints, this value is 0. *YEAR between-group variance not included in this model because the estimated variance-covariance matrices are of less than full rank. ICC = intra-class-correlation.

Figure 2. Coefficient Plots from Table 2: Political Institutions and Environmental Degradation: Countries With Minimal Civil Society and No Political Constraints



Turning to Table 3 and Figure 3, the results confirm the that civil society is linked to more sustainable environmental practices, across all environmental outcomes (except – again – land non-protection). Here, consider two countries with similarly-low electoral competition and political constraints, but substantially different (1 standard-deviation around the mean) civil society protections: Kenya in 1991 and Nigeria around the same time. They had Core Civil Society values ~.42 and ~.72, respectively. Holding all other factors at their means, such a surge in civil society protection is linked to .54% lower greenhouse gas emissions, 2.3% lower SO_2 emissions, 1.2% lower NO_X emissions, 2.2% lower energy consumption, and 1.3% lower non-renewables use. Finally, Table 4 and Figure 4 show that political constraints have minimal impacts on environmental outcomes, the only exception being non-renewable use. Given the generally null results, I do not provide a two-country comparison here.

While my main interest in using mixed effects is to control for sources of heterogeneity in the data, it is also useful to explore some of the other model parameters. σ^2 is simply the (residual) variance of the fixed portion of the model (discussed earlier in the article). The intra-class correlation (ICC) is of particular interest: it indicates how much of the overall model variance is explained by the model's grouping structure. In all models, the ICC is very large, specifically for country and region. This provides additional support for the idea that employing a complex hierarchical error structure is sensible. (For year, the ICC is much smaller and in some cases minute, but the tests discussed earlier in the article confirm that they do 'belong' in each model except for non-renewable use in certain models). Finally, comparison of the two sub-models' R^2s is insightful. The fixed part of the models provides an important contribution to overall model fit,

Table 3. Political Institutions and Environmental Degradation: Mixed Effects Model, Countries With Minimally Free/Fair Elections and No Political Constraints

	Greenhouse Gases		**Sulfur Dioxide (SO_2)**		**Nitrogen Oxides (NO_X)**		**Energy Use**		**Non-Renewable Use**		**Land Non-Protection**	
	Coeff	*p*	*Coeff*	*p*	*Coeff*	*p*	*Coeff*	*p*	*Coeff*	*P*	*Coeff*	*p*
Core Civil Society	**-.258**	**<.001**	**-.658**	**<.001**	**-.224**	**<.001**	**-.472**	**<.001**	**-.201**	**.030**	-.067	.803
GDP per Capita	**.324**	**.001**	**-.379**	**<.001**	**.506**	**<.001**	**-.259**	**.011**	**1.193**	**<.001**	-.073	.818
GDP per Capita^2	-.011	.135	**.040**	**<.001**	**-.028**	**<.001**	**.042**	**<.001**	**-.076**	**<.001**	-.000	.996
Trade Openness	**.161**	**<.001**	.055	.056	**.057**	**.004**	**.076**	**.003**	**.282**	**<.001**	.006	.944
Population Density	**-.214**	**<.001**	**.157**	**.001**	**-.397**	**<.001**	**.103**	**.015**	**.310**	**<.001**	-.177	.188
Constant	**13.745**	**<.001**	**8.631**	**<.001**	**5.207**	**<.001**	**5.680**	**<.001**	**-10.67**	**.040**	-.008	.996
σ^2	.07		.08		.04		.05		.04		.28	
ICC (year/country/region)	.01/.67/.23		.00/.60/.35		.00/.90/.03		.03/.68/.18		*/.57/.39		.00/.78/.12	
Observations	1303		1243		1338		983		595		553	
Fixed Portion R^2	.192		.067		.351		.398		.216		.020	
Random Portion R^2	.742		.886		.607		.535		.752		.894	

Findings significant at $p < .05$ appear in bold. See Table 1a (Appendix) for greater detail on variables. Countries of interest have a free/fair elections value in the bottom tercile and a political constraints value in the bottom tercile. For Political constraints, this value is 0. *Year between-group variance not included in this model because the estimated variance-covariance matrices are of less than full rank. ICC = intra-class-correlation.

Figure 3. Coefficient Plots from Table 3: Political Institutions and Environmental Degradation: Countries With Minimally Free/Fair Elections and No Political Constraints

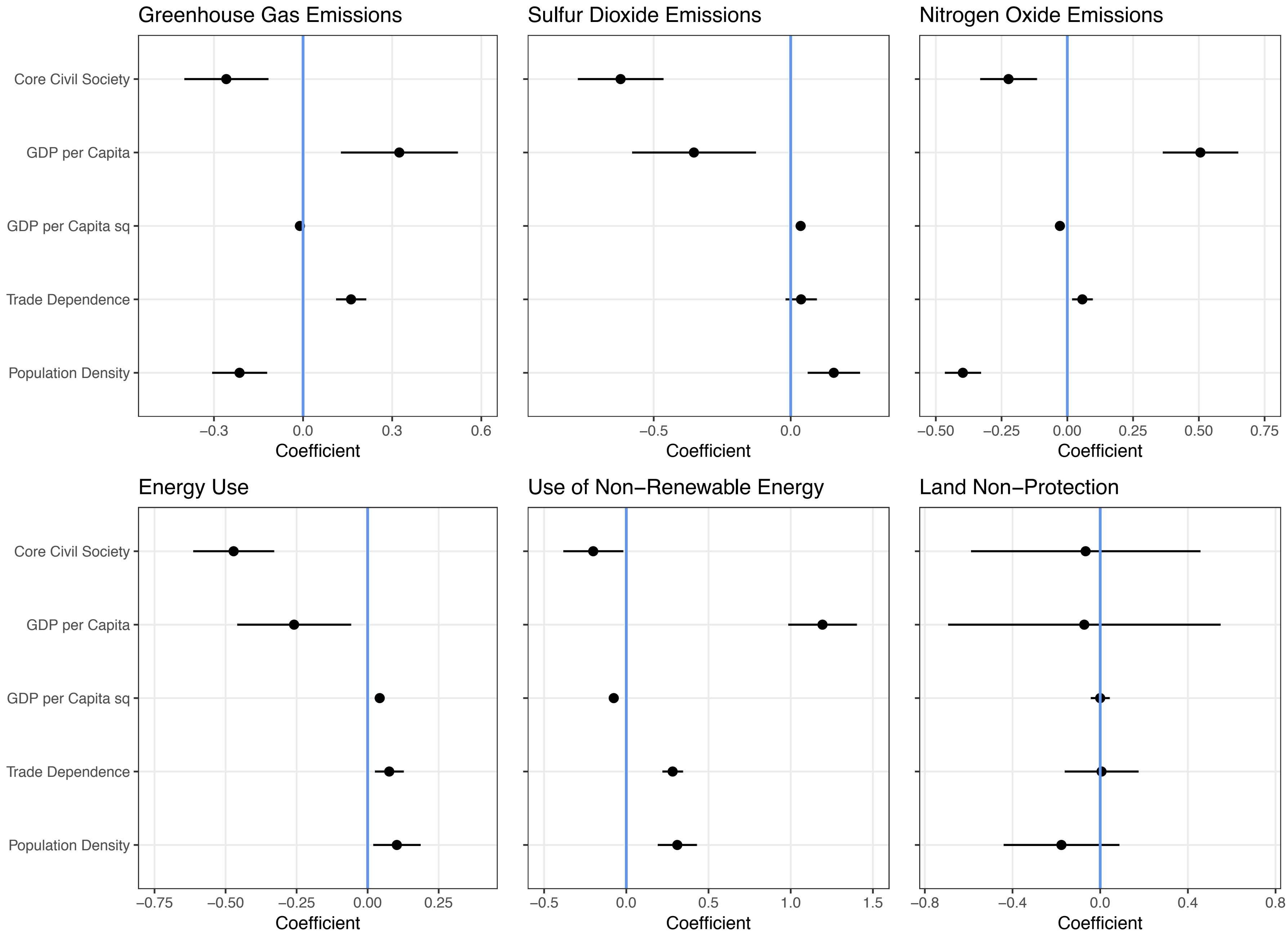
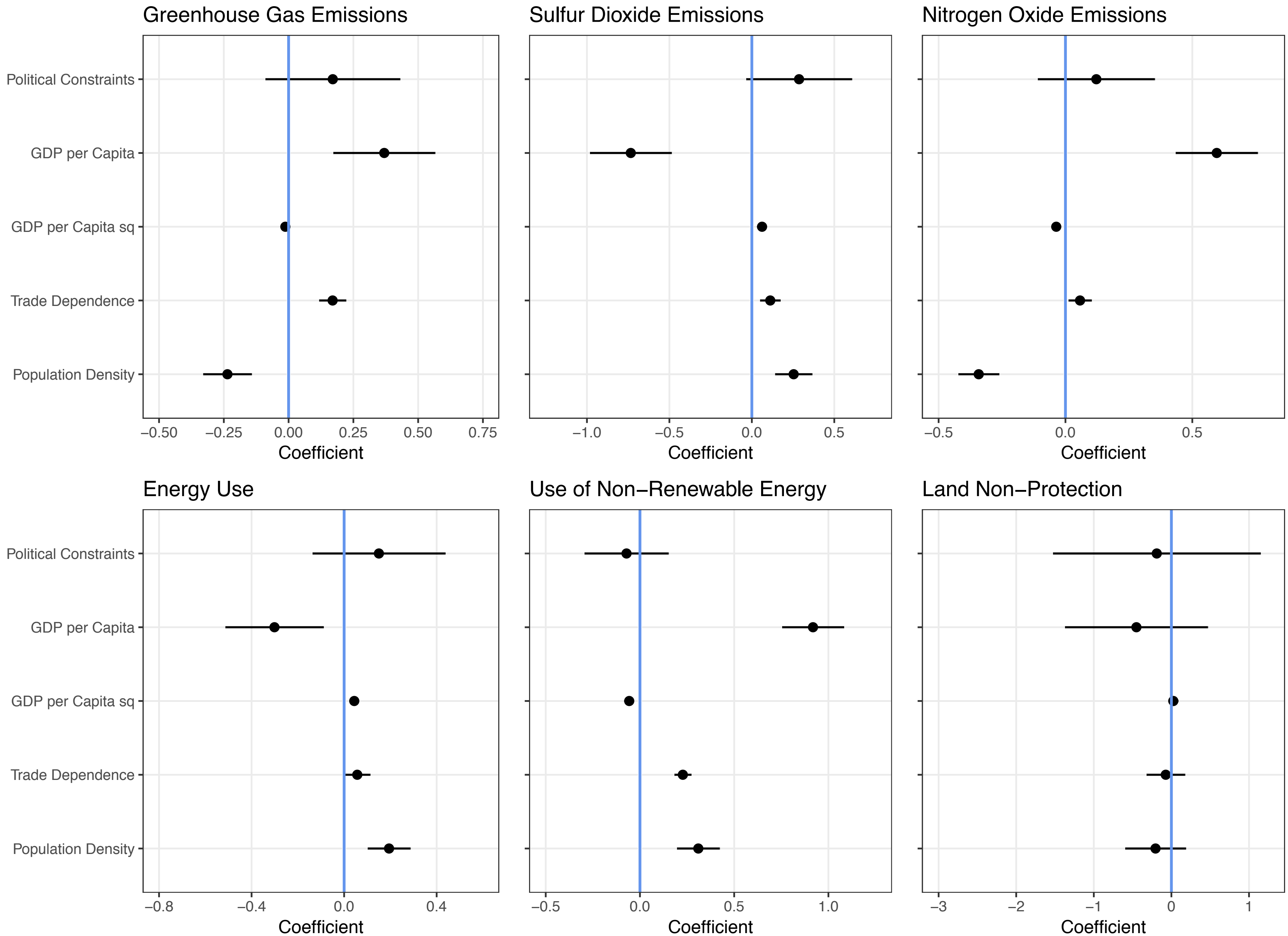


Table 4. Political Institutions and Environmental Degradation: Mixed Effects Model, Countries With Minimal Civil Society and Minimally Free/Fair Elections

	Greenhouse Gases		Sulfur Dioxide (SO_2)		Nitrogen Oxides (NO_x)		Energy Use		Non-Renewable Use		Land Non-Protection	
	Coeff	*p*	*Coeff*	*p*	*Coeff*	*p*	*Coeff*	*p*	*Coeff*	*p*	*Coeff*	*p*
Political Constraints	.073	.494	.189	.150	.079	.384	.094	.416	**-.227**	**.027**	-.010	.986
GDP per Capita	**.367**	**<.001**	**-.603**	**<.001**	**.521**	**<.001**	**-.321**	**.002**	**1.073**	**<.001**	-.388	.325
GDP per Capita^2	**-.014**	**.046**	**.053**	**<.001**	**-.030**	**<.001**	**.045**	**<.001**	**-.068**	**<.001**	.020	.468
Trade Openness	**.176**	**<.001**	**.081**	**.006**	**.062**	**.003**	**.074**	**.006**	**.275**	**<.001**	-.055	.618
Population Density	**-.127**	**.007**	**.190**	**<.001**	**-.369**	**<.001**	**.166**	**<.001**	**.380**	**<.001**	-.202	.248
Constant	**13.224**	**<.001**	**9.129**	**<.001**	**5.090**	**<.001**	**5.645**	**<.001**	-2.640	.588	1.386	.440
σ^2	.06		.08		.04		.05		.02		.40	
ICC (year/country/region)	.01/.67/.26		.00/.49/.47		.00/.88/.06		.03/.72/.15		*/.62/.36		.02/.64/.23	
Observations	1199		1138		1234		912		488		444	
Fixed Portion R^2	.128		.060		.291		.321		.257		.022	
Random Portion R^2	.816		.902		.667		.617		.726		.875	

Findings significant at $p < .05$ appear in bold. See Table 1a for greater detail on variables. Countries of interest have a free/fair elections value in the bottom tercile and a core civil society value in the bottom tercile. *Year between-group variance not included in this model because the estimated variance-covariance matrices are of less than full rank. Coefficient plots available upon request. ICC = intra-class-correlation.

Figure 4. Coefficient Plots from Table 4: Political Institutions and Environmental Degradation: Countries With Minimally Free/Fair Elections and Minimal Civil Society



depending on the environmental outcome (e.g., land non-protection consistently has poor model fit, whereas most other outcomes have respectable if imperfect R^2s). But overall, it is clear that the random portion of the model is doing much of the explanatory work, consistent with other environmental politics studies using this method (Povitkina 2018). This is neither a good nor a bad thing – it simply tells us that, for these data, much of the explanatory power is in the model's complex, hierarchical, error structure.

Turning briefly to the control variables, there is strong, generally consistent evidence of an environmental Kuznets curve: wealth initially leads to an increase in environmental harm, but eventually fosters more responsible behavior. Countries that trade more consistently have poorer environmental practices, consistent with Bayer and Urpelainen's (2016) findings as well as some others (e.g., Li and Reuveny 2006).[21] More densely-populated countries have lower greenhouse gas and NO_x emissions, which is sensible to the extent that these areas rely more heavily on public transportation rather than cars (Li and Reuveny 2006). Conversely, these areas have higher SO_2 emissions, consume more energy, and depend more extensively on non-renewables. This variability in findings is present in other studies that explore the impact of population density on environmental outcomes as well (c.f., Li and Reuveny 2006; Povitkina 2018; Wurster 2013).

I conduct three main robustness checks. First, I consider alternate operationalizations of two of the main independent variables of interest.[22] For an alternative gauge of electoral

[21] Some studies find no impact of trade on environmental practices, or even a positive relationship (c.f., Bernauer and Koubi 2009). Differences likely owe to the inclusion of more recent data in the present study, and/or different approaches to operationalizing variables.

[22] No viable alternative is available for Political Constraints.

accountability, I use Coppedge et al.'s (2018a: 39) Electoral Democracy Index. For an alternate operationalization of the civil society mechanism, I employ Coppedge et al.'s (2018a: 47) Civil Society Participation Index. As Table 4a (Appendix) demonstrates, the results using these alternate measures are highly similar to those in Table 1. Second, I add more independent variables to the models: latitude, year (and, in additional analyses, year + $year^2$ to gauge non-linear time trends), industry as a percentage of GDP, and GDP growth.[23] The results are highly similar to those reported in this article; in no case do the findings differ notably. Third, I explore an alternative modeling approach. Arguably the most common alternative in the environmental politics literature is country-specific (and, possibly year-specific) intercepts, also known as fixed effects. Tables 5a-8a (Appendix) demonstrate that the results are highly similar using that approach.

7. Conclusion

Is democracy a boon or a bane for the environment? Public goods theories have long held that electoral accountability is the key to a better environment, and the evidence confirms this to be the case for land conservation programs. But the record is more problematic for a host of other environmental outcomes. Elections have an indeterminate impact on greenhouse gas emissions, and there is ample evidence – controlling for other factors such as civil society and political constraints – that countries with free/fair elections behave *less* responsibly, pumping more SO_2 and NO_x into the atmosphere, consuming more energy, and relying more heavily on non-renewables. Elections, then, are no panacea for the environment. A simple but plausible

[23] See Table 1a (Appendix) for information on measurement and sources. The results are available upon request, and could be added to the Appendix.

explanation is that if citizens prioritize goals that involve eco-unfriendly behaviors, democratically-elected leaders face stronger incentives to pursue those objectives.

In contrast, the results of this article strongly indicate that civil society is the more reliable route to better environmental practices. Indeed, I find that a robust civil society reduces emissions of various harmful gases – including, perhaps most notably – those that contribute to climate change, and also steers countries toward lower, and more sustainable, energy consumption. 'Democracies,' then, may have an environmental advantage because of how their civil societies, rather than their elections, operate.

What, then, of eco-authoritarianism? While there can be little doubt that China's top-down model has yielded some environmental successes, a broader analysis lends virtually no support to this as a template for the world. Egypt and Morocco's experiences demonstrate that limited political constraints put the ecosystem at the mercy of one or a handful of leaders, who may or may not place priority on environmental protection. More generally, cross-national data simply do not support the contention that fewer political constraints are better for the environment. Eco-authoritarianism, simply put, is not the answer.

This article has focused on the link between domestic institutions and various types of environmental harm. This is a standard approach, based on the premise that mitigation – reducing harmful activities and developing alternatives – is the linchpin of good environmental policy. While mitigation remains crucial, adaptation is a pressing reality, particularly in the climate change arena. Adaptation involves a wide variety of activities, including infrastructure development to cope with sea-level rise and extreme weather, responding to biodiversity endangerment and loss, and reducing impacts on sources of food and livelihood (IPCC 2014).

Which domestic institutions will be most adept at responding to these challenges? This is a fundamental question that should interest scholars and policymakers alike.

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APPENDIX

Table 1a. Data Sources and Measurement

Variable	Measurement	Transformation	Source
Free/Fair Election	v2xel_frefair (V-Dem codebook v. 9, page 44)	--	V-Dem (www.v-dem.net)
Core Civil Society	v2xcs_ccsi (V-Dem codebook v. 9, page 275)	--	V-Dem (www.v-dem.net)
Political Constraints	Polconiii	--	Henisz 2017 (mgmt.wharton.upenn.edu/faculty/heniszpolcon/polcondataset/
GDP per Capita	GDP per capita in current LCU	Logged due to skewness	World Bank (data.worldbank.org)
Trade Openness	Trade/GDP	Logged due to skewness	World Bank (data.worldbank.org)
Population Density	Population/Land area	Logged due to skewness	World Bank (data.worldbank.org)
Region	United Nations Geoscheme	--	https://unstats.un.org/unsd/methodology/m49/
Electoral Democracy Index	v2x_polyarchy (V-Dem codebook v. 9, page 39)	--	V-Dem (www.v-dem.net)
Civil Society Participation Index	v2x_cspart (V-Dem codebook v. 9, page 47)	--	V-Dem (www.v-dem.net)
Latitude	Latitude	--	worldmap.harvard.edu/data/geonode:country_centroids_az8
Industry as % of GDP	Value-added industry (including construction) as a percentage of current GDP	Logged due to skewness	World Bank (data.worldbank.org)
GDP Growth	Yearly change in GDP, averaged over previous two years	--	Penn World Table (www.rug.nl/research/ggdc/data/pwt)
Greenhouse Gas Emissions	CO_2, CH4, N_2O, in tonnes of CO_2 equivalent per capita	Logged due to skewness	Emissions Database for Global Atmospheric Research (edgar.jrc.ec.europa.eu); World Bank (data.worldbank.org)

Variable	Measurement	Transformation	Source
Sulfur Dioxide Emissions	SO_2, in tonnes per capita	Logged to due skewness	Yale Environmental Performance Index (epi.envirocenter.yale.edu); World Bank (data.worldbank.org)
Nitrogen Oxide Emissions	NO_X, in tonnes of CO_2 equivalent per capita	Logged due to skewness	World Bank (data.worldbank.org)
Energy Use	Kg of oil equivalent per capita	Logged due to skewness	World Bank (data.worldbank.org)
Use of Non-Renewables	% of total final energy consumption not from renewable sources	Logged due to skewness	World Bank (data.worldbank.org)
Land Non-Protection	100- Terrestrial protected areas (% of total territorial area)	Logged due to being a percentage	World Database on Protected Areas (www.iucn.org)

Table 2a. Descriptive Statistics

Variable	Observations	Mean	Std Deviation	Min	Max
Free/Fair Elections	7,512	.459	.348	0	.990
Core Civil Society	7,520	.573	.315	.010	.979
Political Constraints	7,953	.225	.218	0	.726
(Logged) GDP per Capita	7,361	7.701	1.636	4.054	12.129
(Logged) GDP per Capita^2	7,361	61.982	26.032	16.436	147.111
(Logged) Trade Openness	6,680	4.181	.641	-3.863	6.090
(Logged) Population Density	8,452	3.943	1.492	-.195	9.860
Electoral Democracy	7,510	.435	.291	.011	.940
Civil Participation	7,520	.567	.285	.023	.988
Year	9,142	1992.45	13.296	1970	2015
GDP Growth	7,186	3.764	6.489	-64.047	149.973
(Logged) Industry	6,245	3.206	.466	.730	4.506
(Logged) Greenhouse Gas Emissions	7,305	15.463	1.129	11.518	18.907
(Logged) Sulfur Dioxide Emissions	7,015	9.003	1.654	1.047	13.558
(Logged) Nitrogen Oxide Emissions	7,687	6.047	1.248	-1.683	10.606
(Logged) Energy Use	5,632	7.126	1.101	2.260	9.997
(Logged) Use of Non-Renewables	4,758	3.971	.808	.505	4.605
(Logged) Land Non-Protection	4,301	1.608	1.543	-4.605	2.834

Table 3a. Correlations (Independent Variables)

	Free/ Fair Election	Core Civil Society	Pol Con-straints	GDP per Capita	GDP per Capita^2	Trade Depen-dence	Popula-tion Density	Elec-toral Democ	Civil Partic-ipation	Year	GDP Growth	Industry
Free/Fair Elections	1											
Core Civil Society	.788	1										
Political Constraints	.686	.682	1									
GDP per Capita	.639	.448	.445	1								
GDP per Capita^2	.639	.446	.444	.994	1							
Trade Openness	.181	.167	.116	.322	.308	1						
Population Density	.196	.125	.169	.151	.159	.042	1					
Electoral Democracy	.940	.883	.743	.611	.613	.156	.160	1				
Civil Participation	.758	.924	.684	.458	.464	.121	.138	.849	1			
Year	.316	.400	.320	.440	.431	.245	.175	.350	.416	1		
GDP Growth	-.091	-.096	-.059	-.071	-.080	.031	.001	-.102	-.095	-.026	1	
Industry	.007	-.111	-.005	.307	.269	.159	-.141	-.039	-.111	.022	.088	1

Table 3a (continued). Correlations (Dependent Variables)

	(Logged) Greenhouse Gas Emissions	(Logged) Sulfur Dioxide Emissions	(Logged) Nitrogen Oxide Emissions	(Logged) Energy Use	(Logged) Use of Non-Renewables	(Logged) Land Non-Protection
(Logged) Greenhouse Gas Emissions	1					
(Logged) Sulfur Dioxide Emissions	.496	1				
(Logged) Nitrogen Oxide Emissions	.642	.186	1			
(Logged) Energy Use	.750	.664	.342	1		
(Logged) Use of Non-Renewables	.286	.661	.006	.057	1	
(Logged) Land Non-Protection	.149	-.089	.184	.136	-.144	1

Table 4a. Political Institutions and Environmental Degradation (Alternative Operationalizations): Mixed Effects Model

	Greenhouse Gases		Sulfur Dioxide (SO_2)		Nitrogen Oxides (NO_X)		Energy Use		Non-Renewable Use		Land Non-Protection	
	Coeff	*p*	*Coeff*	*p*	*Coeff*	*p*	*Coeff*	*p*	*Coeff*	*p*	*Coeff*	*p*
Electoral Democracy	**.164**	**.002**	**.523**	**<.001**	**.091**	**.020**	-.045	.243	**.227**	**<.001**	**-.240**	**.022**
Civil Society Participation	**-.152**	**.001**	**-.272**	**<.001**	-.018	.605	**.083**	**.021**	**-.129**	**<.001**	-.011	.904
Political Constraints	.005	.894	-.080	.074	**-.091**	**.001**	-.018	.495	-.032	.138	.066	.230
GDP per Capita	**.501**	**<.001**	**1.075**	**<.001**	**.562**	**<.001**	**.360**	**<.001**	**.840**	**<.001**	.149	.080
GDP per Capita^2	**-.025**	**<.001**	**-.058**	**<.001**	**-.029**	**<.001**	-.003	.168	**-.051**	**<.001**	**-.014**	**.009**
Trade/GDP	**.101**	**<.001**	**.069**	**.001**	**.072**	**<.001**	**.060**	**<.001**	**.101**	**<.001**	.046	.175
Population density	**-.153**	**<.001**	**1.130**	**<.001**	**-.245**	**<.001**	**.347**	**<.001**	**.313**	**<.001**	**.175**	**.003**
Constant	**13.454**	**<.001**	.031	.940	**4.385**	**<.001**	**2.780**	**<.001**	**-.988**	**<.001**	**-2.685**	**<.001**
σ^2	.09		.12		.05		.04		.02		.13	
ICC (year/country/region)	.001/.59/.29		.04/.62/.31		.03/.73/.16		.01/.54/.41		.00/.50/.46		.01/.87/.05	
Observations	5226		5062		5364		4839		3756		3294	
Fixed Portion R^2	.112		.400		.209		.316		.270		.036	
Random Portion R^2	.787		.584		.727		.659		.701		.904	

Findings significant at $p < .05$ appear in bold. See Table 1a (Appendix) for greater detail on variables. Electoral democracy and civil society participation are alternative operationalizations to those used in Table 1. Coefficient plots available upon request. ICC = intra-class-correlation.

Table 5a. Political Institutions and Environmental Degradation: Fixed Effects Model

	Greenhouse Gases		Sulfur Dioxide (SO_2)		Nitrogen Oxides (NO_x)		Energy Use		Non-Renewable Use		Land Non-Protection	
	Coeff	*P*	*Coeff*	*p*	*Coeff*	*P*	*Coeff*	*p*	*Coeff*	*p*	*Coeff*	*P*
Free/Fair Elections	**.105**	**.002**	**.546**	**<.001**	**.134**	**<.001**	**.239**	**<.001**	**.094**	**<.001**	**-.278**	**<.001**
Core Civil Society	**-.110**	**.004**	**-.291**	**<.001**	**-.059**	**.038**	**-.151**	**<.001**	**-.084**	**.008**	-.021	.804
Political Constraints	.017	.017	-.076	.076	**-.094**	**<.001**	-.044	.087	-.024	.246	.089	.095
GDP per Capita	**.487**	**<.001**	**.983**	**<.001**	**.547**	**<.001**	**.327**	**<.001**	**.815**	**<.001**	.095	.271
GDP per Capita^2	**-.021**	**<.001**	**-.051**	**<.001**	**-.026**	**<.001**	.002	.266	**-.048**	**<.001**	-.006	.274
Trade Openness	**.127**	**<.001**	**.090**	**<.001**	**.096**	**<.001**	**.084**	**<.001**	**.106**	**<.001**	**.076**	**.028**
Population Density	.021	.631	**1.450**	**<.001**	**-.104**	**.001**	**.534**	**<.001**	**.441**	**<.001**	**.448**	**<.001**
Constant	**12.824**	**<.001**	-.393	.154	**4.075**	**<.001**	**2.218**	**<.001**	**-1.564**	**<.001**	**-3.633**	**<.001**
σ_u, σ_e	.874, .298		2.375, .338		.802, .223		1.127, .202		.853 ,155		1.509, .362	
ρ	.896		.980		.928		.969		.968		.945	
Observations	5,227		4,881		5,300		4,840		3,757		3,295	
R^2 within/overall	.083/.300		.311/ .040		.229/.241		.554/.220		.334/.097		.188	

Findings significant at $p < .05$ appear in bold. See Table 1a (Appendix) for greater detail on variables. Coefficient plots available upon request.

Table 6a. Political Institutions and Environmental Degradation: Fixed Effects Model, Countries Without Free/Fair Elections or Political Constraints

	Greenhouse Gases		**Sulfur Dioxide (SO_2)**		**Nitrogen Oxides (NO_x)**		**Energy Use**		**Non-Renewable Use**		**Land Non-Protection**	
	Coeff	*P*	*Coeff*	*p*	*Coeff*	*P*	*Coeff*	*p*	*Coeff*	*p*	*Coeff*	*P*
Core Civil Society	**-.395**	**<.001**	**-.582**	**<.001**	**-.248**	**<.001**	**-.505**	**<.001**	**-.218**	**.030**	.231	.448
GDP per Capita	**.276**	**.014**	-.230	.077	**.589**	**<.001**	-.156	.204	**1.449**	**<.001**	-.183	.605
GDP per $Capita^2$	-.010	.188	**.034**	**<.001**	**-.030**	**<.001**	**.036**	**<.001**	**-.093**	**<.001**	.007	.768
Trade Openness	**.143**	**<.001**	**.091**	**.003**	**.077**	**<.001**	**.092**	**.001**	**.292**	**<.001**	.028	.766
Population Density	**-.443**	**<.001**	**1.040**	**<.001**	**-.360**	**<.001**	**.366**	**<.001**	**.759**	**<.001**	-.219	.514
Constant	**14.982**	**<.001**	**4.997**	**<.001**	**4.789**	**<.001**	**4.136**	**<.001**	**-5.646**	**<.001**	.376	.855
σ_u, σ_e	.888, .260		1.8556, .281		.802, .204		.809, .227		1.263, .189		1.723, .525	
ρ	.921		.978		.939		.927		.978		.915	
Observations	1303		1243		1338		983		595		553	
R^2 within/overall	.212 / .361		.205 / .016		.240 / .177		.466 / .504		.415 / .081		.112 / .001	

Findings significant at $p < .05$ appear in bold. See Table 1a (Appendix) for greater detail on variables. Countries of interest have a free/fair elections value in the bottom tercile and a political constraints value in the bottom tercile. For political constraints, this value is 0.

Table 7a. Political Institutions and Environmental Degradation: Fixed Effects Model, Countries With Minimal Civil Society and No Political Constraints

	Greenhouse Gases		**Sulfur Dioxide (SO_2)**		**Nitrogen Oxides (NO_x)**		**Energy Use**		**Non-Renewable Use**		**Land Non-Protection**	
	Coeff	*P*	*Coeff*	*p*	*Coeff*	*p*	*Coeff*	*p*	*Coeff*	*p*	*Coeff*	*P*
Free/Fair Elections	**-.135**	**.022**	**.219**	**.003**	.027	.615	**.473**	**<.001**	**.280**	**<.001**	**-2.341**	**<.001**
GDP per Capita	**.574**	**< .001**	**-.814**	**< .001**	**.605**	**< .001**	**-.291**	**.026**	**.475**	**<.001**	.109	.836
GDP per Capita^2	**-.027**	**< .001**	**.075**	**< .001**	**-.030**	**< .001**	**.047**	**<.001**	**-.027**	**<.001**	-.015	.677
Trade Openness	**.178**	**< .001**	**.144**	**< .001**	**.111**	**< .001**	**.156**	**< .001**	**.129**	**<.001**	-.100	.443
Population Density	**-.184**	**.023**	**.978**	**< .001**	-.074	.307	**.709**	**< .001**	**.120**	**.035**	-.214	.615
Constant	**12.944**	**< .001**	**6.837**	**< .001**	**3.586**	**< .001**	**3.338**	**< .001**	**1.031**	**.032**	.521	.868
σ_u, σ_e	.944, .217		1.802, .254		.942, .120		1.098, .242		.981, .109		1.689, .640	
ρ	.889		.981		.957		.954		.988		.875	
Observations	1157		1098		1193		927		441		398	
R^2 within/overall	.242 / .481		.325 / .004		.191 / .018		.595 / .232		.247 / .316		.267 / .068	

Findings significant at $p < .05$ appear in bold. See Table 1a for greater detail on variables. Countries of interest have a core civil society value in the bottom tercile <u>and</u> a political constraints value in the bottom tercile. For political Constraints, this value is 0. Coefficient plots available upon request.

Table 8a. Political Institutions and Environmental Degradation: Fixed Effects Model, Countries With Minimal Civil Society and Minimally Free/Fair Elections

	Greenhouse Gases		Sulfur Dioxide (SO_2)		Nitrogen Oxides (NO_x)		Energy Use		Non-Renewable Use		Land Non-Protection	
	Coeff	*P*	*Coeff*	*p*	*Coeff*	*p*	*Coeff*	*P*	*Coeff*	*p*	*Coeff*	*P*
Political Constraints	.107	.423	**.333**	**.035**	.096	.421	.128	.386	-.106	.367	-.130	.852
GDP per Capita	**.285**	**.023**	-.247	.093	**.723**	**<.001**	-.233	.088	**.996**	**<.001**	-.525	.387
GDP per Capita^2	-.009	.266	**.035**	**<.001**	**-.041**	**<.001**	**.040**	**<.001**	**-.061**	**<.001**	.041	.308
Trade Openness	**.137**	**<.001**	**.212**	**<.001**	**.085**	**.001**	**.066**	**.030**	**.233**	**<.001**	.028	.842
Population Density	**-.468**	**<.001**	**1.470**	**<.001**	**-.201**	**.036**	**.425**	**<.001**	**.399**	**<.001**	-.473	.371
Constant	**14.897**	**<.001**	**3.156**	**<.001**	**3.727**	**<.001**	**4.231**	**<.001**	**-2.291**	**<.001**	2.600	.500
σ_u, σ_e	.852, .232		2.157, .253		.867, .207		.794, .222		.990, .118		2.024, .678	
ρ	.931		.986		.946		.927		.986		.899	
Observations	1014		962		1048		810		410		374	
R^2 within/overall	.253 / .384		.328 / .001		.199 / .086		.555 / .380		.474, .137		.216 / .072	

Findings significant at $p < .05$ appear in bold. See Table 1a for greater detail on variables. Countries of interest have a core civil society value in the bottom tercile and a free/fair elections value in the bottom tercile.