PhD Politics

The Effects of Institutional Gender Makeup and Gender Equality on Climate Change Policies and Outcomes

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This thesis is the result of the author's original research. It has been composed by the author and has not been previously submitted for examination which has led to the award of a degree.

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Abstract

This thesis investigates the impacts of women's representation and gender equality on climate change policy, outputs, and outcomes from a comparative perspective. As a basis for my empirical analyses, I first set out a review of the literature on the topic of gender and climate change.

Then, in my first empirical chapter, I investigate the effects of increased women's representation in democratic parliaments on renewable energy consumption. I add to existing literature by specifically investigating a) the role of state wealth, particularly because much literature indicates that gender differentials in environmental attitudes hold up mostly in developed states and b) how long renewable energy outcomes take to materialise as a result of increased women's representation. Analysis of time series cross-sectional data shows that increased women's representation is associated with increased renewable energy consumption over time in both high- and middle-income states.

Next, I investigate if the benefits of increased women's representation on environmental outcomes are contingent on governance norms, such as corruption. I investigate how corruption can restrict, tokenise, and marginalize women representatives, inhibiting their impact on environmental policy. Analysing time series cross-sectional data, I use moderation analyses to demonstrate that only in contexts of low corruption does women's representation correlate with improved environmental outcomes.

Finally, I expand my analysis outside of women's representation to suggest a research agenda exploring the role of economic and political gender equality more generally on environmentalism with specific regard to the heavily male-dominated fossil fuel industry. Using time series cross-sectional data, I show that women indeed have lower

rates of labour force participation (WLFP) and political empowerment (WPE) in high fuel-exporting countries. Additional analysis shows descriptive correlations between a) global trends of increased democracy & women's representation, economic diversification, and internet access, b) both WLFP and WPE, and c) subsequent reductions in fuel exports in high-exporting countries. This preliminary analysis may serve as a basis for the continued research agenda I put forth in this chapter.

Finally, I offer a concluding synthesis and a path for future research.

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Chapter 1

Introduction: The Effects of Institutional Gender Makeup and Gender Equality on Climate Change Policy and Outcomes

1.1 Introduction

In March 2023, the Intergovernmental Panel on Climate Change (IPCC) published a report drawing "out the key insights from six previous reports, written by hundreds of expert authors, [spanning] many thousands of pages [and] informed by hundreds of thousands of comments by governments and the scientific community" (Jotzo & Howden, 2023), which details the current and future state of climate change. This Synthesis Report lays out that global warming has "unequivocally" (IPCC, 2023, p. 1) been caused by human activities through greenhouse gas emissions, with global surface temperatures increasing "faster since 1970 than in any other 50-year period over at least the last 2000 years" (IPCC, 2023, p. 1). The results of the report bode poorly for global health, with predicted warming likely to drive "widespread and rapid global changes, including sea level rise and climate extremes resulting in widespread harm to lives, livelihoods and natural systems" (Jotzo & Howden, 2023).

Such dramatic changes in the global climate have prompted attempts from all governance levels to adapt to environmental changes and mitigate future warming. The climate policies and planning processes of more than 170 countries include measures for climate change mitigation (IPCC, 2023, p. 8), while many effective adaptation measures have been taken already including "cultivar improvements, on-farm water management and storage, soil moisture conservation, irrigation, agroforestry, community-based adaptation, farm and landscape level diversification in agriculture, sustainable land management approaches, use of agroecological principles and practices and other approaches that work with natural processes" (IPCC, 2023, p. 8). Yet, while coordinated, collaborative, and synergistic global initiatives are needed, "most observed adaptation responses are fragmented, incremental, sector-specific and unequally distributed across regions" (IPCC, 2023, p. 8).

The realities of global climate change laid out by the IPCC report, as well as decades of preceding climate science, paint a picture of the environmental consequences if effective climate action is not taken; yet, the dangers that come with global warming are already playing out. Record-breaking heatwaves, storms, forest fires, and other disasters have taken hold across the world. Extreme weather events caused by global warming often have knock-off impacts that cause further disasters, like the record-breaking heat wave across British Columbia in June of 2021 that maximised rainfall well into November of that year, "causing more landslides—which have destroyed highways and railroads—than would otherwise have happened" (Thompson, 2021). Such extreme weather events continue to drive increases in environmental refugees—those who are forced to migrate due to environmental changes or climate disasters which contribute to "undermining the insecurities pertaining to food, water, and finances" (Mishra & Singh, 2023, p. 20). While "migration is possibly the most direct adaptation strategy to global warming (Merlemann & Steinhardt, 2017, p. 354), international law only recognizes instances of rights violated or unprotected by states and as such does not yet recognize refugee status of those who have their rights violated by climate change (Sciaccaluga, 2020). Thus, individuals' ability to adapt to climate change by way of relocation is complicated by existing political and legal frameworks, with many changes

still required to make the law conform to the needs of climate refugees.

While a majority of citizens in most countries see climate change as a major threat (Fagan & Huang, 2019), attacking the issue of climate change can be considered one of the most difficult collective action problems faced by the global community. With varying responsibilities for mitigation falling to states, governments, private corporations, and individuals, many barriers may prevent effective climate action. The IPCC identifies a lack of citizen engagement as one such barrier to increased climate change adaptation and mitigation (IPCC, 2023, p. 9). Researchers find that climate change can be so hugely anxiety-inducing that, rather than spurring public attention, citizens often avoid engagement with environmental issues or activism (Lundstrom, 2022). "Climate doomism" can be counteracted by presenting the daunting reality of climate change to the public in a way that focuses on the actions that can be taken, and actions that have already been taken with success, in order to promote feelings of self-efficacy (Lundstrom, 2022; Hart & Feldman, 2016). This, in turn, increases the chances that individuals will take action (Lundstrom, 2022).

Yet, citizens themselves are limited in their ability to influence climate policy. As such, another barrier to sufficient climate change mitigation and adaptation, and that which is a main concern of the field of political science with regard to climate change, is governance. While international and state governments have recognized the need to legislate on climate change for decades, these attempts have, overall, been insufficient (Stoddard et al., 2021). Oil and gas industries continue to play a major role in influencing climate change policy such that "the stringency of carbon taxes and ETS [Emissions Trading Systems] is inversely correlated to the size of the fossil fuel and energy-intensive sectors that are exposed to trade" (Stevens, 2018, p. 280). Governments around the world continue to provide fossil fuel subsidies, which amounted to over $325 billion in 2015 (Skovgaard & van Asselt, 2018), while industrialised countries pledged only $100 billion per year in climate finance to support developing countries (Skovgaard & van Asselt, 2018, p. 4). These interests remain so influential in the policymaking process that the industry's "resistance against measures deemed necessary to tackle the climate crisis... [may] require the exclusion of the oil and gas industry in

climate change and energy policy processes" (Viens, 2022, p. 8) in order for effective policies to be implemented.

The principle of common but differentiated responsibilities (CBDRs) acknowledges that countries' responses to climate change are impacted by "states' wealth, power, and historical contribution to environmental problems" (Peel, 2016, p. 247) and calls on developed states to "offer suitable conditions" (Peel, 2016, p. 247) to developing countries in their participation in global climate change governance. Thus, countries' responses to climate change should be proportionate to their ability, wealth, and responsibility for contributions to environmental damage. Yet, with five decades of legislation from the local, state, and international levels which has attempted to limit global warming, "the sum total of policies in place now will take us to a world hotter by 2.7 [degrees Celcius] and perhaps a catastrophic 3.6 [degress Celcius] above pre-industrial levels" (Figueres et al., 2022). Thus, investigating the factors which impact climate change governance remains an important goal of climate change research in the field of political science.

As a result, a key question to be answered by political science as a field is not only *what policies* are most environmentally impactful, but *what factors in the political process* impact the policies put forth (or not put forth), and the policy outcomes that result. Because large scale changes—far outside the control or power of environmentally-minded individuals—are needed to sufficiently govern climate change to prevent catastrophic levels of warming, ensuring that democratic institutions are governed by environmentally-minded parties and representatives is a critical political step in the politics of climate change adaptation and mitigation.

Although insufficient thus far, effective climate action may result from increased "political commitment, well-aligned multilevel governance, institutional frameworks, laws, policies and strategies and enhanced access to finance and technology" (IPCC, 2023, p. 34) which draws on diverse knowledge. All of these factors are impacted by initiatives taken by institutions at the local, municipal, subnational, and national level, the public support of which is hugely impacted by various civil society actors, including the politically-important yet marginalized demographic— women (IPCC, 2023). While parties often define ideological lines upon which policy is made, with left-leaning parties

being far more likely to favour environmental issues (Neumayer, 2004), a growing body of literature in the academic and policy communities has exposed the role that women, who display more environmental preferences than their male counterparts especially in higher income countries (Bush & Clayton, 2023), play in the global movement to combat climate change and prevent environmental disaster (Ergas & York, 2012; Fredriksson & Wang, 2011; Lv & Deng, 2018; McGee et al., 2020; Norgaard & York, 2005; Nugent & Shandra, 2009; Ramstetter & Habersack, 2019; Salahodjaev & Jarilkapova, 2020).

Thus, a subfield of political science sometimes called 'gender and climate change' has asserted that there is a clear connection between women's roles as political and social actors and improved environmental outcomes. In this original research, I engage with this literature and seek to contribute greater understandings as to *how, why,* and *in what contexts* gender equality impacts environmentalism. Below, I explore the status of gender equality today and the policy implications of increased women's political and economic participation. I then set forth a theoretical basis for the relationship between gender equality and improved environmental outcomes.

1.2 Gender Inequality: The Political and Social Reality

Women play a unique role in global society and politics as a historically marginalized majority, displaying both a) many gendered political preferences which differ from men's and b) the ability to impact policy and outcomes in a uniquely gendered way. Gender inequality contributes to these gender differences. Women are systematically excluded from positions of power and governance, making up just a quarter of parliamentary seats globally (IPU, 2023). Women face gender-based violence at high rates: nearly a third of all women in the world have experienced sexual violence by men (The World Bank Gender Data Portal, 2022) while over 80 percent of American women have experienced sexual harassment (National Sexual Violence Resource Center, 2023). Globally, women and girls make up 60 percent of the chronically hungry and are disproportionately impacted by poverty (UN Women, 2023). Women face gendered economic violence and are systematically excluded from both inclusion in measurements of the traditional

economy as well as economic compensation for their labour compared to men. Linda Scott (2020) finds that the 'Double X Economy', or the economic value of women's work which is devalued or uncounted due to "economic impediments, combined with the cultural constraints usually imposed on women—limited mobility, reproductive vulnerability, and the ever-present threat of violence" (p. 5), is so large that if the Double X Economy of the United States alone "were its own nation, that country's economy would be big enough to join the G7" (Scott, 2020, p. 12). Women are paid less than men "in every type of work in every sector, every occupation, and every country; ... every source of pay information, collected by every method, ends in this conclusion" (Scott, 2020, p. 15). Men are more than 85 percent more likely to win venture capital funding in Britain than women (Scott, 2020, p. 261) and globally, men hold "99 percent of the procurement contracts in the world, and consequently, they control 99 percent of international trade" (Scott, 2020, p. 268). Thus, while gender inequality has been a historical reality for recorded history, it persists in a significant way today.

Particularly important to investigations of the role of gender inequality in climate change outcomes is the existing literature establishing a theoretical link between descriptive representation in government and the potential for subsequent substantive representation of the interests of these descriptive groups (Childs & Krook, 2006; Mansbridge, 1999; Phillips, 1995). Increased descriptive representation often improves substantive representation of marginalized groups like women (Mansbridge, 1999; Hero & Tolbert, 1996) by increasing the volume of women participating in governance and therefore increasing the resonance of women's preferences (Phillips, 1995) as well as by putting forth critical actors who can initiate policies which align with women's preferences (Child & Krook, 2006). Scholars theorize that representatives may represent constituents with whom they share descriptive characteristics in various ways. First, women representatives and constituents may share similarly gendered life experiences which encourage similar political preferences (Phillips, 1995). Second, women representatives may seek to represent women specifically to counteract the historical gendered imbalance of power in politics, whether they agree with other women's preferences or

not (Franceschet & Piscopo, 2008). Third, socialization theory posits that women may develop similar preferences by way of the social roles they are conditioned to play (Boas & Smith, 2019; Stoddart & Tindall, 2011). Finally, women representatives may seek to represent women in order to win their votes (Lloren et al., 2015).

Due to the unique disparities faced by women within this social and political system of global gender inequality, it is perhaps unsurprising that a) women have different political preferences to men which reflect their own gendered needs and b) that these preferences tend to be better represented when women are more involved in governance. Research consistently finds that women representatives are "more likely to care about, sponsor, and/or vote for 'women's issue' bills" (Wittmer & Bouché, 2013, p. 246). Women are more likely than men representatives to put forward legislation dealing with traditionally "women's issues" (Dolan, 1997) even in states in which women make up less than 15 percent of state legislatures (Bratton, 2005). Women representatives in Sub-Saharan Africa are more likely to "prioritize poverty reduction, health care, and women's rights" (Clayton, 2019, p. 69) than men representatives, while women legislators in Latin America prioritize women's issues and children and family policy more than their male counterparts (Schwindt-Bayer, 2006). Similarly, women representatives in the Swedish Parliament prioritize issues of social welfare more than their male counterparts, and "it is almost exclusively female politicians who pursue issues of equality between the sexes" (Wängnerud, 2000, p. 68).

Research shows that when women's power in decision-making circles grows, outcomes for women, and issues prioritized by women, improve (Wittmer & Bouché, 2013; Ennser-Jedenastik, 2017; Freidenberg et al., 2022; Tremblay, 1998) "in every polity for which we have a measure" (Mansbridge, 2005, p. 622). Increases in women's representation in 27 OECD countries correlates with increased social expenditures (Ennser-Jedenastik, 2017); in Mexico, legislative proposals aligned with feminist issues were almost twice as likely to be proposed by women representatives than by men representatives (Freidenberg et al., 2022). While left-leaning women representatives have helped lead the fight for abortion rights, Reingold et al. (2020) find that right-leaning women representatives in the United States frame their anti-abortion stances more often "in

terms of protecting women's health and safety rather than foetal life or religious/moral principles" (Reingold et al., 2020, p. 404), indicating that even when women seem to be acting against women's own interests, they may rather be "representing women's interests *as they define them*" (Reingold et a., 2020, p. 404, original emphasis).

1.3 Linking Gender with Environmental Preferences and Policies

The growing understanding of both gender differences in political preferences and resulting political outcomes from growing gender equality in governance has inspired increased academic interest into the role that women play as representatives for political issues which are not traditionally delegated as "women's issues", like environmentalism. More than three decades of literature theorizing and empirically measuring the links between gender inequality and environmental outcomes has questioned a) the role of gender inequality on environmental degradation and b) women representatives' roles in shaping climate policy. The idea that the status of women reflects the status of the environment, and vice versa, has thus been put forth as a potential explanation, or at least description, of the reality of persisting gender inequality and continual environmental degradation even in the face of a climate crisis. While this body of work, sometimes referred to as the subfield of 'gender and climate change' within the discipline of political science, offers preliminary connections between two interrelated political phenomena, there remain multitudes of unanswered questions, un-crystalized theory, and unmeasured relationships. It is these gaps which I seek to address in part in this research.

While the literature establishes that women's preferences may be represented in politics by women representatives, an additional existing literature suggests that women's environmental preferences are indeed distinct from men's preferences. American women know more about climate change than men (McCright, 2010) while Canadian women are both more worried about climate changes' impacts as well as more willing to participate in ecological cooperation than men (Arnocky & Stroink, 2010). Women in higher

income countries adopt more environmentally-friendly behaviours in their private lives than do men (Hunter et al., 2004), while women in Australia are both more in favour of environmental protection and are more concerned about global environmental issues than men (Tranter, 2011). American women are more likely to modify their personal energy consumption for specifically environmental reasons (Semenza et al., 2011) and are more willing to take action against climate change because they are less likely to engage in system justification, or the "psychological tendency to maintain certainty, security, and solidarity through motivated perceptions of the status quo" (Goldsmith et al., 2013, p. 159). American women from Maine were more likely than their male counterparts to support eco-friendly policy (Noblet et al., 2015). Finally, in higher income countries, men are more likely to worry about the potential costs of climate change mitigation, while women are more likely to perceive the benefits (Bush & Clayton, 2023).

Empirical research shows that, largely, women's descriptive representation leads to substantive representation of these distinct preferences. While much research has investigated impacts of representation for traditionally 'women's issues', a growing body of literature has demonstrated that the same links exist for women's environmental preferences. Greater participation of women in parliament is associated with a higher likelihood of environmental treaty ratification (Norgaard & York, 2005), more protected land area (Nugent & Shandra, 2009), lower CO_2 emissions (Ergas & York, 2012), and greater protection of forest area cover (Salahodjaev & Jarilkapova, 2020). Greater women's political empowerment is additionally associated with long-term reduction in CO_2 emissions (Lv & Deng, 2018), while gender equality is associated with a weaker association between GDP and CO_2 emissions even though development often drives up emissions (McGee et al., 2020). Finally, women representatives in the United States' House of Representatives were more in favour of environmental policies (Fredriksson & Wang, 2011) while women representatives in the European Parliament were also more supportive of environmental regulation than their male counterparts (Ramstetter & Habersack, 2019).

While this literature helps to shed light on the preliminary existence of a relation-

ship between women's increased role in the political sphere and resulting impacts on environmentalism, it leaves many questions unanswered. I seek to go further than this existing literature to investigate not only correlational relationships between increased social and political equality and positive environmental outcomes, but to explore in more detail *how, why,* and *in what contexts* these relationships exist.

1.4 Research Questions and Contributions to the Literature

In this original research, I explore the relationships between gender (in)equality and climate change policies and outcomes cross-nationally. I approach this question from a positivist perspective. As such, I assert that although gender inequality could be considered a nebulous concept, it exists as a social and political reality and thus it can be both observed and theorized, as well as serve as the basis for hypotheses testing. The normative question as to whether or not gender inequality is good or bad is irrelevant to the studies undertaken here. Rather, I am concerned with the observable and material effects of gender inequality on climate change outcomes, and attempt to uncover these observable and material effects by analysis of empirical data using the scientific method.

I engage with the growing subfield of 'gender and climate change', drawing on existing literature to identify unanswered questions, to attempt to answer them, and to map a path forward for a continued research agenda. More specifically, while existing literature points to the existence of a relationship between gender equality and environmentalism, I seek to uncover in greater depth why gender relations could have important implications for state-wide environmental outcomes, how women's influence in social and political contexts could lead to better environmental outcomes, and in what contexts women's increased political (and social, and economic) power could impact climate change outcomes.

Answering the questions of *why*, *how*, and *in what contexts* gender inequality and environmentalism are inter-related requires a multiplicity of approaches. First, I bring together the relevant existing research in the field of gender and climate change in

a literature review chapter. I split this literature review into three sections. The first section addresses the literature investigating if men and women's climate change experiences and opinions differ. The second address why men and women may differ in their climate change preferences. The third section explores how the differences between men and women impact policymaking and how women, as a politically and socially marginalized group, impact outcomes.

Following this literature review are three empirical chapters. In the first, I consider the role of substantive representation: because women usually display more environmental political preferences, women's substantive climate-related interests may be more effectively represented by their descriptive representatives and result in environmentally beneficial outcomes. I pay particular attention to uncovering in which contexts this representation can impact outcomes and how long such outcomes take to materialize. Following this, I consider the effects of governance contexts on women representatives to better understand the institutional constraints on women's ability to govern in line with their interests: while women representatives make up a minority of lawmakers and are marginalized all over the world, contexts of corruption may restrict women representative's ability to influence policy even more, resulting in compromised environmental outcomes. Finally, I set forth a continued research agenda investigating the potential effects of increased economic and political empowerment of women, outside of their roles as representatives, for the perpetuation of fossil fuel industries most harmful to the environment in states most reliant on these industries.

In the first empirical chapter, "The Effects of Women's Parliamentary Participation on Renewable Energy Policy Outcomes", I operationalize 'environmentalism' with a specific measure: renewable energy consumption. Because women's preferences tend to be more environmental than men's preferences, I measure if increased women's representation in democracies leads to increased renewable energy consumption, a relationship not yet analysed in the gender and climate change literature. Yet more importantly, I add to the literature by asking two additional questions regarding the nature of this relationship. Firstly, because the literature shows a gender gap in environmental preferences largely in wealthy democracies, I pay particular attention to these democ-

racies' wealth levels to investigate in which contexts women's representation leads to increased renewable energy consumption. Finally, I investigate how long changes in renewable energy consumption, as a result of women's increased representation, take to materialise.

I use time series cross-sectional data from 100 democracies across 20 years to conduct regressions with time and country fixed effects and show that women's representation in democratic parliaments is indeed positively and significantly associated with increased renewable energy consumption. Importantly, I find that state wealth plays a significant role in this relationship: only in high- and middle-income democracies does women's representation have significant impacts for renewable energy consumption. Also importantly, the timelines of these results are significant: renewable energy consumption increases more quickly as a result of women's representation in high income democracies, while results take longer to materialize in middle income democracies. These results thus indicate that the social and political context of state wealth has real impacts on the relationship between increased gender equality in governance and environmental outcomes and the timelines along which these outcomes materialize, and that women's representation is more impactful on this measure of environmentalism in wealthier democracies.

In the second empirical chapter, I undertake to measure the role of another potentially conditioning factor in the relationship between women's representation and environmentalism: corruption. In "The 'Women's Representation-Corruption Link' and Environmentalism: A Cross-National Study", I engage with the literature which explores the impact of corruption on women as representatives in democracies. While most existing literature in the subfield of gender and climate change measures women's impact on outcomes without respect to this important contextual factor, corruption can play a major role in the political processes of many democracies and impact women representatives in a uniquely gendered way with implications for their ability to influence policy and outcomes. Taking this for granted assumes that women in every democracy have the same latitude to impact policy; however, the literature on corruption and women's representation makes clear that this is not the case. Corruption

can restrict women by tokenizing and marginalizing them in parliamentary contexts (Branisa & Ziegler, 2011; Esarey & Schwindt-Bayer, 2019; Goetz, 2007; Stockemer, 2011; Sundström & Wängerud, 2016; Sung, 2003; Tripp, 2001; Valdini, 2019) and restricting their ability to act with sovereignty and alignment with their preferences and interests. Therefore, I predict that corruption is an important contextual factor which may impact both *how* and *in what contexts* women's representation matters for environmental outcomes.

Using data from 58 democracies across 15 years, I conduct regressions with time and country fixed effects to show that women's increased representation in democratic parliaments is moderated by corruption levels; in democracies where corruption is high, the impact of women's representation on four climate change outcome variables is insignificant or even negative, whereas in contexts of low corruption, women's representation is associated with significantly better environmental outcomes. These results help clarify the contexts in which women's representation matters for environmental outcomes and suggest that reducing corruption may be a key to a) improving the governance of climate change and b) to ultimately improving outcomes such that catastrophic levels of warming may be avoided.

Finally, in the third empirical chapter, "The Consequences of Gender Equality for Fossil Fuel Industries: Towards a Research Agenda " I move beyond investigating women's impact on climate change outcomes as representatives in democracies to better understanding the role of gender equality more generally on climate change outcomes. In so doing, I set forth a research agenda, offering a theoretical basis in the literature as well as preliminary descriptive statistical analysis which justifies further work to better understand the role of women's empowerment in fossil fuel industries.

I suggest that further work examining the impact of both economic and political gender equality– operationalised as women's labour force participation (WLFP) and women's political empowerment index (WPE)– on a particularly important climate change outcome measure, fossil fuel exportation, should be undertaken. While existing literature points to the detrimental impact of oil wealth on gender equality (Ross, 2008), the literature has not yet investigated a) the forces which may improve economic

and political gender equality in fossil fuel-reliant states and b) the consequences of increased economic and political gender equality for the fossil fuel industry. I offer a theoretical and empirical basis for the potential that global trends such as increased democracy, women's representation, economic diversification, and internet access may play an important role in augmenting gender equality in states most economically reliant on fossil fuel exportation. Thus, I suggest a research agenda investigating how improvements in gender equality may impact fuel exportation by reducing a) over-reliance on the male labor required by these industries and b) the over-representation of male interests resulting from heavily male-dominated economies and societies.

Conducting descriptive analyses with time series cross-sectional data from 159 states across 30 years evidences the potential for a relationship between increased gender equality and fuel exportation industries in the world's highest fuel-exporting states. I show that increased democracy & women's representation, increased economic diversification, and increased internet access may impact gender equality in these highly oil-dependent contexts. Thus, additional research examining whether increasing gender equality economically and politically enables fuel-dependent economies' shift away from economic reliance on fossil fuels is both justified and may be a key next step in the sub-field of gender and climate change research.

Such a research agenda may add important context to the existing literature surrounding the impact of gender equality on environmentalism by investigating not only whether women's representation is key to addressing one of the root causes of climate change, additionally whether women's full participation in public life through work and political participation may impact environmentalism.

This research provides clear insight to the research questions I seek to answer regarding *how, why*, and *in what contexts* gender equality can positively influence climate change outcomes. While existing literature has suggested the existence of such a relationship, my findings demonstrate that these relationships are more nuanced than previous research approaches have accounted for. The impact of women's representation and gender equality in governance and politics indeed has significant and overall positive impacts on environmentalism, but this relationship is hugely impacted by both

the wealth of the states in which women representatives operate as well as the level of corruption rampant within these contexts. Results suggest, contrary to the idea that gender equality is a magic bullet for solving large global problems, that women cannot solve these problems where they are marginalized or tokenized, or where they wield limited power. These results paint a clearer picture of the true relationship between gender equality and environmentalism and help close the gap in our understanding of how social and political power dynamics realistically and materially impact political outcomes. Additionally, they suggest that a broadened focus on the role of women outside of strictly governance contexts may yield even more insight into the role of gender equality in environmentalism.

In the following chapters, I include a complete literature review outlining research relevant to the work undertaken here as well as a framework for continued research. This is followed by three empirical chapters, and finishes with concluding remarks including agendas for further research.

Chapter 2

Gender and Environmental Preferences, Representation, and Outcomes: A Literature Review

2.1 Introduction

The idea that gender matters in political processes has been empirically established through feminist analysis in political science. In the realm of environmental politics, the unique role of women has been taken into consideration in some ways. However, the meaning of gender in climate change and environmental politics can sometimes essentialize women's characters or pigeon-hole them as political actors, often viewing them as passive victims of a changing climate and rarely acknowledging the role that they play as power-holders in the governance of climate policy and the larger movement against global warming (Bretherton, 2003).

In this literature review, I address three overarching areas of research and theory regarding the topic of women and the environment. The first section lays a foundation by exploring the role of gender in both environmental experiences and preferences. The second section addresses the existing theory as to why women and men's experiences and preferences of environmental issues differ. The last section explores what this gender differential means for policymaking outcomes and explicates how women, as out-

siders to traditional social and cultural power and minorities in governance structures, can still impact policy in line with their preferences.

I situate this literature review at the beginning of this doctoral dissertation to serve as a collection of many of the connections between gender and climate change established in the literature. I aim to determine what differences in experience and preferences persist between genders, why these differences may exist, and what these differences mean for policy and outcomes.

2.2 Are Men and Women Different? Exploring the gendered differences in opinions and experiences of climate change

To ultimately understand women's role in climate change policy creation and implementation, unpacking women's unique preferences, experiences, and political persuasions with respect to the issue of climate change and climate change policy—and how this differs from men's— is a necessary first step. While essentializing women as a stagnant and constant group is a dangerous and simplistic view that may yield incorrect assumptions about the role women play in all arenas, a multitude of literature explores the nuances of gendered experiences, preferences, and behaviors related to environmentalism.

Women's Environmental Experiences

Importantly, scholarship has documented uniquely gendered experiences of climate change as it occurs; in certain contexts, the impacts of climate change may be vastly different for women compared to men. Especially in the developing world, women are responsible for the majority of household tasks, such as collecting water, firewood, cooking, cleaning, caring for family members, subsistence farming, etc. (Figueiredo & Perkins, 2013; Fonjong, 2008; Makina & Moyo, 2016; Denton, 2002; Lookabaugh, 2017) Worsening droughts affect women as water gatherers disproportionately, forcing them to walk longer distances to find potable water (Figueiredo & Perkins, 2013). Gen-

dered divisions of labor in which women are responsible for resource provision often mean that women are more reliant on natural resources for daily subsistence (Agarwal, 2010). While resource scarcity impacts all family members, variation in perceptions of this scarcity is often gendered. Agarwal (2010) quotes a woman discussion group member in Gujarat, India: "What do men care whether or not there is firewood? They want cooked food, that is all. Men don't go to fetch firewood" (Agarwal, 2010, p. 32), highlighting the difference in men and women's perception of threats to resource availability. Disproportionate responsibility for household labor impacts women's experiences of environmental and climate changes differently from men in the developed world as well: in Sweden, Carlsson-Kanyama & Linden (2007) find that women spend more than twice as much time as men on household tasks and thus, when availability or pricing of household energy changes, women's labor burden increases substantially while men's does not.

It is often more difficult for women to recover from the he physical danger and financial burden of increased extreme weather events as women "typically possess fewer financial and social resources than men and are therefore more vulnerable" to long-term consequences of natural disasters (Figueiredo & Perkins, 2013, p. 189). Natural disasters and their aftermath kill more women than men, likely due to women's lower socio-economic status and lack of access to lifesaving resources (Neumayer & Plumper, 2007). In a qualitative study of food insecurity of the Inuit population in northern Canada, researchers found that women are often more food insecure and go hungry more often than their male counterparts (Beaumier & Ford, 2010). A mixture of factors, often rooted in poverty, lead to food insecurity, including high food prices and limited availability, high cost of hunting, and importantly, environmental conditions that lessen the availability of game traditional and common to the Inuit people. Half of women polled expressed anxiety due to lack of food in the past year, and 76 percent of women reported cutting down on meals or skipping them completely in line with customs in which women eat last in favor of children and the men who hunt (Beaumier & Ford, 2010).

Women's Environmental Preferences

The differences in environmental experiences of women and men suggests that a gendered preference divergence may exist with regard to environmental issues. While the vast majority of the literature on the gender gap in climate change preferences comes from developed countries, it suggests that women and men have different perceptions of climate change and subsequently different climate change policy preferences. Relative to men, American women are more knowledgeable about climate change (McCright, 2010), and Canadian women are more worried about the potential effects of climate change (Arnocky & Stroink, 2010). Hunter et al. (2004) show that women behave more environmentally than men, particularly in private, in higher income countries. Canadian women demonstrate a greater willingness to participate in ecological cooperation, a relationship which was mediated by gendered differences in empathy (Arnocky & Stroink, 2010). Australian women demonstrate more favourable attitudes towards environmental protection and concern for global environmental issues than men (Tranter, 2011), and women in the United States are more willing to act against climate change because they are less likely than men to partake in system justification, or the "psychological tendency to maintain certainty, security, and solidarity through motivated perceptions of the status quo" (Goldsmith et al., 2013, p. 159). In the United States, women are more likely to reduce their own energy consumption in response to the risk of climate change (Semenza et al., 2011). Noblet et al. (2015) find in a Maine-based study that women were more likely to support eco-friendly energy policy. Climate change attitudes in high-income countries, Bush and Clayton (2023) show, are a function of differential perceptions of environmental policy between women and men: men tend to prioritize their perceptions of the personal and societal costs of climate change mitigation efforts, while women are more likely to perceive its benefits. Yet, they find no gender gap in climate change preferences in developing countries (Bush & Clayton, 2023). Theobald et al. (2015) show that women outperform men on conceptual understandings of climate change. Female undergraduate biology students who learned about local effects of climate change "outperformed [on a conceptual assessment] females who analysed the global [effects] as well as males who analysed either

sample" (Theobald et al., 2015, p. 135). Female students were also more willing to take personal action to prevent climate change than were male students (Theobald et al., 2015, p. 135).

Thus, existing literature evidences gendered experiences of climate change as well as the gender differential in climate change and environmental preferences. In the next section, I explicate the existing theoretical frameworks which attempt to explain why women and men experience and perceive environmentalism, as a political issue, differently.

2.3 Why are men and women different? Exploring gender differences in environmental and climate change preferences.

Because women have historically made up a large percentage of environmental activists and members of Green parties, as well as supported environmentalism in traditional legislative bodies (Zelenzy & Bailey, 2006), some scholars assert that a "call for women to lead the modern environmental movement endorses a historically successful model of environmental progress" (Zelenzy & Bailey, 2006, p. 107). Yet, why would women gravitate to environmental issues? Much theoretical consideration of the relationship between women and environmentalism has been carried out by feminist and post-colonialists. In this section, I outline the theories which have sought to explain why women's climate preferences often differ from men's preferences and thus why women may be better suited to creating and supporting climate protective governance.

One of the most widely debated schools of thought which connects women's status and environmentalism is ecofeminism, which was borne from a branch of environmental philosophy known as radical ecology. Radical ecology broadly insists that humans are not overlords of the natural world, but an interlocked component of the bio-system, equal and not superior to any other species (McBeath & Rosenberg, 2006). Ecofeminism thus theorizes that women, to a greater extent than men, are inherently linked to the natural world, and that gender inequality and environmental exploitation "have

a social structural source in common—patriarchal domination" (Nugent & Shandra, 2009, p. 209). Often referred to as cultural ecofeminism, and sometimes criticized as gender essentialism, this viewpoint contends that adding a gendered lens to the analysis of humans' relationship with the earth reveals that "women's roles in production, as societies developed from hunting and gathering, to agrarian, to industrial, were distinct from men's and therefore produced different attitudes toward the environment" (McBeath & Rosenberg, 2006, p. 36). In some cases, scholars have posited that "women are inherently more prone to pro-environmental behavior than men due to essential differences that are programmed at birth" (Vollan & Henry, 2019, p. 258) and sometimes made the "narrower claim that women have a closer relationship to nature, although even ecofeminists themselves disagree about the degree to which such a connection is socially constructed" (Nugent & Shandra, 2009, p. 209).

A spiritual side of the ecofeminist argument has been both proposed and criticized: some assert that "the earth can be 'healed' through a reclaiming of purported ancient value systems, religions, rituals and practices that find liberatory power in the historic, symbolic, and material associations between women and nature" (Mallory, 2013, p. 19). This often takes biological tones, insinuating that women's connection to the earth is inherent and different from men's and that "women's reproductive bodies possess an ontological continuity with nature that surpasses that of men's" (Mallory, 2013, p. 19); this argument is one of the main reasons that ecofeminism has been "exiled... from 'serious' scholarly attention and analysis" (Mallory, 2013, p. 19) as "essentialist" of women's characters. As Bina Agarwal argues, ecofeminism at its most basic level "posits women as a unitary category and ignores socio-economic heterogeneity among women" (Agarwal, 2010, p. 42), failing to account for the enormous variety in women's lives and experiences.

Ecofeminism faces empirical criticism as well, as scholars have attempted to measure the validity of the notion that women's well-being reflects nature's well-being, and vice versa. Nugent and Shandra (2009) found no support for the idea that improvement in women's status in arenas other than political participation (namely, education, labor, and health) had any impact on their operationalization of environmental

health (protected land area), and therefore argue that their results do not support "the broader ecofeminist notion that overall women's status and environmental degradation are interconnected systems of oppression sharing a common source" (p. 222). Yet, as political scientists like Sally Engle Merry (2016) have pointed out, the reliance on quantification in social and political science may obscure the reality of phenomena that require deeper, more qualitative contextual, cultural, and political explanations. As could be the case with the theorization of ecofeminism, the hyper-focus on numerical measurement as 'proof' of ecofeminism's validity may be incomplete if "not closely connected to more qualitative forms of knowledge [and could lead] to oversimplification, homogenization, and the neglect of surrounding social structure" (Engle Merry, 2016, location 138 of 5820). In essence, ecofeminist scholars assert that women and nature may be inherently linked in ways that, while valid, are difficult for researchers to measure and should therefore not be disregarded simply due to lack of support by the few quantitative studies that have tested the theory.

Opposed to the ecofeminist perspective is 'feminist environmentalism', which asserts that there is actually very little reason to "expect gender differences in intrinsic worth [of natural resources or the natural world], but instrumentally differences can arise between women and men in the use value" (Agarwal, 2010, p. 32) of natural resources and the environment. Bina Agarwal's (2010) evaluation of forest conservation in India is a seminal articulation of this perspective, in which she asserts that "*both* women and men would have an interest in forest conservation and regeneration, but their interest would stem from *different* (and at times *conflicting*) concerns, rooted in their respective responsibilities, and the nature and intensity of their dependence on these resources" (Agarwal, 2010, p. 42, original emphasis). Rather than asserting that all women are predisposed to environmentalism, this perspective values the heterogeneity of women's lives, which are shaped by many factors outside of their gender (Agarwal, 2010). It asserts that the environmental preferences of women will be informed by their unique experiences and needs, such that, for example, the preferences of women living in rural regions of the developing world will likely differ from the perspectives of women living in developed urban settings. Yet, these experiences will likely be shaped in some way

by the gendered nature of their various realities and the gendered division of labor therein.

While men's and women's interests can certainly converge, Agarwal (2010) identifies three common interest divergences between women and men which apply to her focus on forestry conservation also extended to extractivism in general: "[1] the nature of the product that men and women are mainly concerned with; [2] the time horizon within which it needs to be obtained; and [3] the gestation period for the product to grow" (Agarwal, 2010, p. 43). In Agarwal's (2010) case, both women and men rely on forest extraction: women collect firewood and fodder on a daily basis while men fell much larger quantities of timber on a less regular basis. Thus, women's engagement with extraction is both much more frequent and much more necessary for daily subsistence than men's, yet results in a fraction of the ramifications for forest preservation. In essence, the feminist environmentalist perspective asserts that the difference between men's and women's conservationism is motivational, based on gendered needs, daily routines, family and economic roles, and division of labor.

A similar theoretical position is sometimes referred to as Women, Environment, and Development (WED) and posits that women do have a closer relationship with nature than men because "their work has always entailed a closer relationship with nature" (Masika & Joekes, 1997, p. 3). This position is based not on any biological predisposition to a connection with the natural world but focuses on the reality that women in many parts of the world are made close to nature by way of their roles as food and water suppliers, fuel providers, subsistence farmers, and other household roles that contribute directly to a household's ability to survive and also require women to be attuned to the resources (and the quality of those resources) available to them (Fonjong, 2008, p. 464).

In the same vein, socialization theory values the impact of external realities of women's and men's lives and resulting effects on their climate beliefs and preferences. Proponents posit that behaviors on an individual level are inherently influenced by gender expectations within cultural contexts (Hunter et al., 2004, p. 679). Because women are nearly universally conditioned, at least to some extent, as nurturers and caregivers,

they are socialized to have a "motherly mentality", or a worldview that values life, relationships, and empathy (Kroeber, 2022). By extension, they may adopt a protective position towards nature as they "come to understand themselves as embedded within community and within the larger world" (Hunter et al., 2004, p. 679). Men, on the other hand, are socialized as 'breadwinners', to value providing for their families, and to place little importance on any impact this may have on surrounding environments (Hunter et al., 2004). In fact, this may lead to a 'marketplace mentality' that may actually press men towards "objectification and desire to dominate the environment" (Hunter et al., 2004, p. 680). The socialization of women as caregivers who value compassion, interdependence, cooperation, and nurturing counter the socialization of men as competitive (Zelenzy & Bailey, 2006). In other words, "females, compared to males, have a stronger ethic of care and are socialized to be caretakers of others including generalized others, such as the earth and the environment" (Zelenzy & Bailey, 2006, p. 106).

From this point of view, women may have a positive influence on climate change policy due to their value structures including an 'ethic of care' (Ramstetter & Habersack, 2019, p. 3): it is claimed that "women are assumed to be more likely to take the role of the conceptualized other—be it human (altruistic) or non-human (biospheric) into account and adjust their behavior accordingly" (Ramstetter & Habersack, 2019, p. 3). A parallel hypothesis is that women are more concerned about the long and short-term health and safety concerns that policies may pose as an extension of their 'motherhood mentality' and conditioning as caregivers (Davidson & Freudenberg, 1996).

In sum, many theoretical positions explore why women may take a particular stance towards environmentalism that differs from a typical male perspective. In the following section, I explore how gender differences may influence policy and subsequently impact climate change and environmental outcomes.

2.4 How do the differences between men and women affect policymaking? Can women make a difference, even as a marginalized minority in global politics? How?

Existing literature has investigated how the inclusion of women in both local and national governance has affected environmental outcomes. Stemming from the empirical and theoretical differences in men's and women's conceptions of and opinions surrounding various environmental issues, this literature finds that outcomes and decisions are, by and large, different when women are involved in decision-making and policymaking processes.

When Women Aren't Involved in Political Decision-making

On the local scale, existing literature has investigated environmental decision-making, finding perhaps unsurprisingly that men usually maintain decision-making power when it comes to environmental and resource governance, and subsequently that decisions fall in line with men's interests as opposed to women's. Agarwal (2010) finds a distinct difference between what women and men deem important in terms of forest preservation in rural India. Forests in this region are viewed dually as a) public goods which help combat carbon dioxide emissions en masse, contributing to global warming prevention and b) resources crucial to the daily subsistence of the millions of communities local to them (Agarwal, 2010). In these cases, conservation on a large scale and community resource management on a local scale are intertwined and equally important. Agarwal (2010) finds that while women were preoccupied with an increasing firewood shortage in their forest, men who made up the vast majority of the policy-making institutions "brushed aside the issue of firewood shortages, saying women had enough fuel through cropwaste" (p. 4). Women, in their capacity as homemakers, food providers, and caregivers, raised alarms to these issues, while men in the community, who were not

attuned to these problems due to their roles outside of the home, retained nearly all political power that governed the usage of the forest and the subsequent availability of firewood and made decisions in line with their own perspectives and experiences (Agarwal, 2010).

Similarly, Fonjong's (2008) investigation of gender roles and resource management in Northwest Cameroon shows that raffia palm bushes, used by both women and men, are valued differently by gender: men are concerned with the large-scale income generated by raffia palm wine sales, while women use the wood from the branches as fuel for their households. This discrepancy can create conflict over the rate of exploitation and control of this resource. Because women cannot inherit land, participate in certain sacred societies which often make resource-allocation decisions, climb trees or harvest certain types of vegetative resources, own cattle, hunt, plant certain species of trees, enter forests without restriction, and, most importantly, own raffia bushes, among many other gender-based restrictions, it is women's needs which often go unmet in favor of men's preferences with regard to governance of this resource. Consequences of the "disregard of women in the exploitation and management of local resources is that [women's] livelihood activities have been limited to particular marginal areas where they overuse and misuse resources in order to survive" (Fonjong, 2008, p. 468). In this context, poverty, a social experience which is often gendered, is both the cause and the effect of environmental destruction (Fonjong, 2008).

Investigations into women's effect on policy on a national scale is a tangent, yet growing, field of political science. While empirical analysis shows in some cases that the presence of women in positions of political power has a marketed effect on subsequent policies and outcomes, the causal mechanisms of this relationship are widely debated. Drawing on literature regarding the way in which women, as a marginalized and minority group in nearly all governing bodies, affect policy, I outline potential mechanisms which may explain women's ability to uniquely affect climate change policy.

Descriptive and Substantive Representation

Existing representation literature distinguishes 3 types of representation: descrip-

tive, substantive, and symbolic. Descriptive representation "refers to the similarity (e.g., in terms of race, ethnicity, or in this case, gender) between representatives and the represented" (Barnes & Buchard, 2012, p. 769); substantive representation refers to "legislators acting on behalf of their constituents to represent policy concerns" (Barnes & Buchard, 2012, p. 769); and symbolic representation refers to "feelings of being fairly or effectively represented" (Schwindt-Bayer & Mishler, 2005, p. 407). Research investigating women's impact on policy is thus most interested in descriptive and substantive representation and the connection between them. Much literature demonstrates that descriptive representation of marginalized groups indeed leads to improved quality of life of that group (Hero & Tolbert, 1996), evidencing the potential that descriptive representation leads to substantive representation. Mansbridge (1999) argues that increasing women's influence in male-dominated decision-making spaces could boost substantive representation by diversifying deliberation in the democratic process as policymakers seek to understand "which policies are good for the polity as a whole, which policies are good for a representative's constituents, and when the interests of various groups within the polity and constituency conflict" (Mansbridge, 1999, p. 634). She also asserts that descriptive representation benefits marginalized groups by creating communication with the 'mistrusted' group (women), which in turn creates "a social meaning of 'ability to rule' for members of a group in historical contexts where that ability has been seriously questioned" (Mansbridge, 1999, p. 628).

The literature on substantive representation explicates why women as descriptive representatives may seek to substantively represent their women constituents through four main frameworks. First, the preferences of individual and elite women may converge due to shared gendered experiences. Women at both the individual and elite levels navigate gendered social roles, and thus they may come to hold congruent beliefs based on these experiences (Phillips, 1995). Second, women representatives may intentionally seek to represent interests of their women constituents, even if they personally hold differing preferences, as an attempt to equalize women's systematic exclusion from governance and to counteract historic power imbalances (Franceschet & Piscopo, 2008). Next, the socialization framework posits that a group's rhetoric has an impact

on individual-level preferences. The gendered aspects of women's lives, from being in charge of resource allocation to being socialized long-term to 'clean up messes' (Boas & Smith, 2019; Stoddart & Tindall, 2011), may have a socializing effect on both women at the individual level and women at the elite level with respect to their desire to protect and support the health of the environment. Finally, women representatives may have electoral incentives to intentionally represent women to gain re-election (Lloren et al., 2015). Voters of oppressed or under-represented groups may expect to be better represented by descriptive representatives than by traditional politicians, many of whom hail from privileged social and political groups (Mansbridge, 1999). Bailer et al. (2018) show that representatives of under-represented backgrounds may seek to substantively represent their constituents early in their careers to "[bestow] credibility when they have hardly any legislative track record and few opportunities to demonstrate their expertise" (p. 2).

Thus, increased participation of women in political decision-making suggests that policy outcomes may be different than those made by only men. Preub (2001) theorizes that, when traditional societal and governance power dynamics evolve and change, traditionally-excluded groups may attain political power in decision-making and governance, resulting in different political outcomes. He asserts that even if such groups were powerless in the 'old regime', "they were firmly woven in the social tissue of its society and needed no more than a political emancipation and legal-institutional recognition" (Preub, 2001, p. 183). Thus, women may need nothing more than increased social support, legal rights, and changing views of gender roles to make their way into positions of power, where they may have opportunities to implement their knowledge and policy preferences in the form of policy.

Yet, women's marginalized status in existing power structures calls their ability to make such change into question. Although women representatives may desire to represent their women constituents, because women almost always make up a minority of policy-makers in local, national, and global spheres, it is likely that their 'agency-freedom', or their ability to be "free to do and achieve in pursuit of whatever goals or values ... [they] regard as important" (Sen, 1985, p. 203) may be greatly restricted.

Some theorists argue that in order for women to be able to have a marketed effect on policy, they must make up a 'critical mass' of a decision-making body. Some theorists believe that this critical mass lays somewhere around 30 percent of the electorate (McKinsey & Company, 2007; Buckingham, 2010; Ergas & York, 2012), "otherwise their voices may be ignored, they may feel too intimidated to comment, or they may not be particularly representative of women in general, having been selected because their views were consistent with the men in the organization" (Ergas & York, 2012, p. 968). Where such a threshold is not met, women's lack of power as a marginalized group and as a minority in most legislative systems mean women can face a discrepancy between their policy preferences and their power to enact such preferences in policy (Agarwal, 2010, p. 20). Because of such constraints, the mechanisms by which women make policy attuned to their preferences may be multifaceted and strategic.

Yet women may influence environmental outcomes, before reaching national legislatures, through participation in their political parties. Research shows that increased participation of women in parties both increases the diversity of issues parties address in their election campaigns as well as pushes parties' manifestos to the left of the political spectrum (Greene & O'Brien, 2016), increases parties' focus on social justice and encourages gender quotas (Kittilson, 2011), and is the best predictor of parties' "commitment to gender equality in decision-making positions" (Keith & Verge, 2018, p. 400). With a focus specifically on the role of women in impacting parties' environmental stances, Kroeber (2022a, 2022b) finds that increased participation of women in parties' parliamentary groups and as party leaders leads parties to become "more supportive of environmentalist and ecologist positions and less supportive of productionist policies" (Kroeber, 2022b, p. 42). This serves as yet more evidence of women's ability to substantively represent women's interests: their participation pushes parties not only to the left of the political spectrum, but towards both women's interests and environmentalism.

It is for this reason that Senk (2020) argues that, when investigating women representatives' impact on policy, controlling for ideological party positions introduces posttreatment bias, which "occurs when researchers control for covariates that are po-

tentially affected by the treatment" (Senk, 2020, p. 795). They stipulate that:

"Since these institutional positions [like ideological party positions] are known to vary according to gender, this indicates that they are affected by gender, and controlling for these differences introduces posttreatment bias into the estimate of the direct effect of gender. If institutional positions vary according to gender, holding these positions at a constant level as controls removes this variation. It then becomes impossible to investigate how variation in institutional positions across gender affects legislative effectiveness. As a result this eliminates the indirect effect of gender on legislative effectiveness that passes through these institutional-positioning variables. Not accounting for these indirect effects biases the estimate of the direct effect of gender on legislative effectiveness in studies that control for these institutional differences" (Senk, 2020, p. 795).

While women's participation in parliaments and parties has significant effects for outcomes, increased descriptive representation of women may have additional impacts for political engagement and democratic processes. On one hand, there may be "little reason to believe that most individuals, particularly individuals from socioeconomically disadvantaged groups, have a firm grasp on the gender, ethnic, or racial composition of their legislatures. As a result, even collective descriptive representation in the legislature may not have much of an impact on political behavior or attitudes" (Madrid & Rhodes-Purdy, 2016, p. 893). Yet, some studies demonstrate that increased descriptive representation boosts political participation of under-represented groups. Barnes and Buchard (2012) find that "increased engagement of women in the political sphere is positively related [to] the political engagement of women at the mass level" (p. 769) across 20 Sub-Saharan African countries. Thus, not only could women representatives put forth interests in line with women's preferences, but increased political engagement by women, spurred by newfound descriptive representation, may electorally incentivize legislatures to align with women's policy preferences to a greater extent.

Other literature investigates the impact of increased descriptive representation on citizens' political efficacy, or the faith and confidence they have in government. Feeling represented contributes to increased constituent engagement with policy-making: con-

stituents with higher political efficacy may be more inclined to participate in decision-making where possible, vote, engage in activism, or communicate with their representatives. For example, Merolla et al. (2013) find that "having a descriptive representative play[ed] a vital role, among other factors, in contributing to feelings of political efficacy" (p. 264) of African American voters after the election of Barak Obama, America's first Black president. Because "increases in the descriptive representation of women at the elite level increase[s] the probability of women's interest in politics and civic engagement at the citizen level" (Barnes & Buchard, 2012, p. 769) elites may be more inclined to pander to women citizen's preferences.

In sum, increased women's representation may have two effects. First, it may give substantive representation to women's interests by deliberatively diversifying the political process, broadening the information, insights, and experiences that contribute to policy-making. Secondly, it may encourage more women constituents to participate in politics, which in turn may increase the political consequences faced by legislators who fail to reflect women's needs, experiences, and insights in policy.

Empirical Evidence: Impacts of Women's Representation on Policy

Firstly, much existing literature investigates the impact women representatives have for policy on 'women's issues'. Compared to male representatives, "female legislators [consistently] prioritize women's issues to a higher degree than do their male counterparts" (Wittmer & Bouché, 2013, p. 248). Such legislation includes that which "promotes equality, improves the status of women, supports social welfare programs, helps children and families, focuses on education, and/or concerns health" (Wittmer & Bouché, 2013, p. 248). Parties with more women's participation become more aligned with women's issues (Greene & O'Brien, 2016; Kittilson, 2011; Keith & Verge, 2018).

Wang's (2013) investigation into women's impact on policy outcomes in Uganda finds that while the sheer number of women in parliaments does increase the likelihood that women's policy preferences will be represented in the political agenda, bringing men on board with these policy preferences is a key component to actually creating and implementing policies (Wang, 2013; Wittmer & Bouché, 2013). An investigation of the

effect of women's leadership on 'women's issues', operationalized as human trafficking, demonstrates that the proportion of women in the US Senate has positive impacts on states' investment in human trafficking, even after controlling for party (Wittmer & Bouché, 2013). However, and perhaps more importantly, "as more of the sponsors of human trafficking legislation [were] women, the less likely a state [was] to pass legislation investing in the issue" (Wittmer & Bouché, 2013, p. 266). In other words, the more women who took on the full leadership roles associated with the passage of legislation, the less support they received; with male co-sponsors, however, bill passage was more successful (Wittmer & Bouché, 2013). Thus, a key mechanism by which women may be successful in influencing policy is by cultivating strategic alliances with male co-representatives in order to build wider support for policy which could result in passage and implementation of policy salient to women. Thus, the presence of women legislators is vastly important for bringing women's issues to the fore, but enacting policy in line with these issues may require strategic cooperation with male legislators.

Literature also shows that women have been effective at influencing policy-making through initiating cross-party alliances. These alliances are made more effective through the creation of women's caucuses within governing bodies (Wang, 2013). As "strong party discipline may impede the ability of women to collaborate across party lines to achieve women-friendly policy outcomes" (Wang, 2013, p. 114), the creation of caucuses, specifically for the purpose of uniting women of all parties in solidarity to address issues salient to women, has served the vital role of facilitating women legislators' ability to "collaborate irrespective of party allegiance" (Wang, 2013, p. 114). While male legislators may have less "common ground" to unite on outside of party lines, women can be more effective at cross-party communication because they align on issues based on their unique experiences as women and can act as representatives for their female constituencies. Having grounds on which to unite, outside of party, can benefit of women legislators' policymaking potential.

With regard to climate change and environmental outcomes, previous studies have determined connections between women's representation and empowerment measures and environmental outputs and outcomes. Nugent and Shandra (2009) find that "na-

tions with a higher proportion of women in governmental positions have a greater tendency to create protected land areas" (p. 222). The impact of women's voting rights on land area was insignificant, potentially indicating that women must hold positions of political power in order to make change. Norgaard and York (2005) test whether the proportion of women in national parliaments impacts environmental treaty ratification and find that "nations with higher proportions of women in Parliament are more prone to ratify environmental treaties than are other nations" (Norgaard & York, 2005, p. 506), and that this institutional gender variable was more strongly associated with state environmental treaty ratification than any other variable aside from per capita GDP and population, which simply support the tangent theory that larger industrialized nations are more willing, able, and likely to partake in global environmental policy initiatives. Ramstetter and Habersack (2019) find that, since legislatures are still overwhelmingly male, "environmental policies are disproportionately shaped by men's preferences" (Ramstetter & Habersack, 2019, p. 1). However, while both male and female legislators of the European Parliament expressed roughly the same level of environmental concern, female legislators were "significantly more likely to support environmental legislation than men" (Ramstetter & Habersack, 2019, p. 1). Ergas and York (2012) find that countries with higher participation of women in parliaments have lower CO_2 emissions; Salahodjaev and Jarilkapova (2020) find that women's representation is associated with less deforestation and the maintenance of more forest cover. Countries with greater political empowerment for women see long-term reductions in CO_2 emissions (Lv & Deng, 2018) and nations with greater gender equality see a weaker association between GDP and CO_2 emissions (McGee et al., 2020). While some scholars assert that "the correlation between policy outcomes and women's participation ... may not imply a causal effect from women's participation... [as] the fact that women are better represented in a particular country or locality may reflect the political preferences of the group that elects them" (Chattopadhyay & Duflo 2004, p. 1410), investigations presented here control as much as possible for these potentially confounding variables, and in most cases still find statistically significant correlations between women's representation and climate policy creation.

Literature also suggests that women may find success in promoting their interests through legislation as a result of their collaboration with civil society in which they interact with, work with, and follow in the footsteps of previous female organizers (Bretherton, 2003; Wang, 2013). Women in elite governance positions, "are faced with strategic choices over insider strategies, which involve working within mainstream, male-dominated bodies such as UN agencies, or in collaboration with sympathetic insiders; or outsider strategies, which reject such engagement in favor of various types of community building and direct action, and consciousness raising strategies... thus, the principle division, in terms of women organizing, lies in the choice between insider and outsider strategies" (Bretherton, 2003, p. 108). Women may be uniquely positioned to work in both insider circles, accomplishing environmental protection measures in established avenues of state and international governance, while simultaneously being more in tune with, concerned with, and connected with outsider circles of activists and civil society.

2.5 Conclusion

The existing literature in the subfield of gender and climate change offers support for the idea that gender does play a role in countries' governance of the environment, and thus, by extension, climate change outcomes. Building from this existing literature, I seek to explore three avenues of research in this dissertation which have not faced specific attention in the literature. Firstly, I investigate the impact of women's representation on renewable energy consumption across democracies, paying special attention to both where these impacts occur as well as when these impacts take effect. Secondly, I investigate the role of institutional context on women representatives' ability to impact climate change outcomes. Finally, I investigate how women's participation in the workforce and political empowerment shape and are shaped by reliance on fossil fuel extraction, which is both traditionally heavily male-dominated as well as a leading source of greenhouse gas emissions.

Chapter 3

The Effects of Women's Parliamentary Participation on Renewable Energy Policy Outcomes [1]

3.1 Abstract

Decreasing CO_2 emissions, a top priority of climate change mitigation, requires moving away from fossil fuels and towards renewable energy. Research shows that women tend to exhibit more knowledge about climate change, environmental concern, and pro-environmental behaviour than men. Theories linking descriptive and substantive representation suggest that women representatives better represent women citizens' policy preferences. Therefore, do higher levels of women's parliamentary participation increase renewable energy consumption? A time-series cross-sectional analysis of 100 democracies from 1997 to 2017 provides evidence for such a relationship in both high and middle-income democracies. Lagged modelling demonstrates that high income states see more immediate effects, while these effects take longer to materialize in middle-income states. These findings contribute to our growing understanding of

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women's role in policymaking outside of "women's issues" and offer a means of advancing climate-friendly energy policy.

3.2 Introduction

Climate change is perhaps the most threatening international crisis ever faced by the global community. While all human beings will experience its consequences, we will not all experience them equally—resource restriction, negative health outcomes resulting from exposure to pollutants and environmental destruction, and ability to recover from climate change-related disasters are often contingent on identity (Islam & Winkel, 2017). Because women may lack social and economic resources to adapt to climate change, bear the brunt of household tasks, and make up a large percentage of the world's poor (Figueiredo & Perkis, 2013; Neumayer & Plümper, 2007; Fonjong, 2008; Carlsson-Kanyama & Lindén, 2007) they experience the uniquely gendered costs of climate change.

Yet, the last half-century has seen a steady increase in the number of women in governance around the world, inspiring academics to question whether women make different political decisions than their male counterparts. While women make up just a quarter of parliamentary seats globally (World Bank Open Data, 2019f) and are systemically excluded from law-making and many other global power networks (MacKinnon, 1989), women have made notable impacts on policy and governance. Issues like abortion, domestic violence, and human trafficking have faced greater attention as women's participation in governance has grown (Wittmer & Bouché, 2013), leading eminent political scientist Jane Mansbridge (2005) to insist that "descriptive representation by gender improves substantive representation outcomes for women in every polity for which we have a measure" (p. 622). And yet, the effect of increasing women's participation in government affects not only issues deemed traditionally 'female' and may improve outcomes not just for women. The growing body of literature investigating women's role in climate change governance suggests that women, specifically in developed countries, favour environmentalism to a greater extent than their male counterparts at the citizen level (McCright, 2010; Arnocky & Stroink, 2011; Hunter et al.,

2004; Semenza et al., 2011; Tranter, 2011; Goldsmith et al., 2013) and that increases in women's participation in governance leads to positive environmental outcomes (Norgaard & York, 2005; Nugent & Shandra, 2009; Ergas & York, 2012; Salahodjaev & Jarilkapova, 2020; Fredriksson & Wang, 2011; Lv & Deng, 2018; Ramstetter & Habersack, 2019; McGee et al., 2020).

I seek to contribute to the existing literature by investigating the roles of both time and state wealth in the emergence of climate change related policy outcomes resulting from women's increased political participation. I account for time because policy outcomes, or the results of policymaking are "often indirect, diffuse, and take time to appear" (Hallsworth, 2011, p. 6) which has rarely been accounted for in the women's representation and environmentalism literature. Additionally, as the literature on climate change preferences suggests a gender gap between women's and men's environmental preferences specifically in developed states, I investigate the impact of state wealth on the link between women's representation and climate change outcomes.

I argue that women's presence in parliaments may impact the ultimate outcome of renewable energy consumption, a dependent variable missing from the women's representation and climate change literature, yet crucial to climate change mitigation in practice. I hypothesize that because women representatives may seek to substantively represent women's pro-environmental preferences, they may support various policies which favour renewable energy consumption, subsequently increasing renewable energy consumption itself. For these reasons, I assert that women MPs' substantive representation of their women constituents as well as their left-leaning and women-centric influence on party stances will lead to an aggregate effect of increased renewable energy consumption in developed countries. Because evidence for a gender gap in climate change preferences is strongest in developed states (McCright, 2010; Arnocky & Stroink, 2011; Hunter et al., 2004; Semenza et al., 2011; Tranter, 2011; Goldsmith et al., 2013), effects of this representation will be most pronounced in in these contexts. In addition, I put forth that these effects will take time to materialize.

To test women's influence on this climate change outcome with specific attention to both time and state development, I consider renewable energy consumption as a main

dependent variable in a series of time series cross-sectional regressions of 100 democracies (Dahlberg et al., 2019) from 1997 to 2017. I find positive relationships between women's representation and renewable energy consumption in both high-income and middle-income states, and while richer democracies exhibit more immediate relationships, those of less developed states take longer to materialise. These results provide a greater understanding of women parliamentarians' impact on policy outcomes, the contexts in which these outcomes emerge, and the drivers of these outcomes, moving past correlational relationships found in existing literature to demonstrate when and where women's political participation matters for climate change outcomes.

3.3 Gender and the Environment: Theoretical and Empirical Connections

Predicting that women's participation in parliaments impacts environmental outcomes, like renewable energy policy, rests on some key foundations. First, public opinion research has shown that men and women in developed countries perceive climate change differently, with women more likely to be worried about and take action against climate change as well as to support environmental energy choices (McCright, 2010; Arnocky & Stroink, 2011; Hunter et al., 2004; Semenza et al., 2011; Tranter, 2011; Goldsmith et al., 2013; Noblet et al., 2015).

This has implications for both representation and party platforms. The theoretical literature of descriptive and substantive representation discusses the mechanisms through which women, as an underrepresented group, may influence policy outcomes (Phillips, 1998; Mansbridge, 1999; Hero & Tolbert, 1996; Franceschet & Piscopo, 2008), while another literature shows how women's presence in party delegations affects party platforms (Greene & O'Brien, 2016; Kittilson, 2011; Keith & Verge, 2018). In addition, previous research shows that women's individual level preferences are reflected among political elites (Nugent & Shandra, 2009; Ergas & York, 2012; Norgaard & York, 2005; Salahodjaev & Jarilkapova, 2020; Fredriksson & Wang, 2011; Ramstetter & Habersack, 2019). Thus, I argue that increased participation of women in parliaments may increase

the likelihood that women's pro-environmental views are reflected in policy and translate into policy outcomes. I discuss the stages of this causal mechanism in more detail below.

Individual-Level Gender Gaps

In both the developed and developing world, gendered differences persist in men's and women's experiences of climate change, and thus, in their climate change opinions and policy preferences. With disproportionate responsibility to perform household tasks and manage resources, women are more directly impacted when resources necessary for the health and survival of the family are unavailable (Agarwal, 2010). Women are more often harmed and killed in natural disasters due to lack of financial resources and independence, insufficient social support, and restrictive cultural expectations (Figueiredo & Perkins, 2013; Fonjong, 2008; Makina & Moyo, 2016; Denton, 2002; Lookabaugh, 2017; Neumayer & Plumper, 2007). Since women spend more time indoors conducting household labour and using energy than men, they face more dire health consequences of indoor air pollution in the home (Soria et al., 2016; Carlsson-Kanyama & Lindén, 2007); a Sweden-based study showed that women spend twice as much time as men on energy-intensive household tasks as men, and that changing availability or pricing of energy increases this already unequal workload (Carlsson-Kanyama & Lindén, 2007).

Gendered experiences of climate change may thus inform women's climate change opinions and policy preferences. Yet, the vast majority of literature on the gender gap in climate change preferences comes from developed countries. Research has indicated that relative to men, American women are more knowledgeable about climate change (McCright, 2010), and Canadian women are more worried about the potential effects of climate change (Arnocky & Stroink, 2011). Hunter et al. (2004) show that women behave more environmentally than men, particularly in private, in higher income countries. Canadian women demonstrate a greater willingness to participate in ecological cooperation, a relationship which was mediated by gendered differences in empathy (Arnocky & Stroink, 2011). Australian women demonstrate more favourable attitudes towards environmental protection and concern for particularly global environmental is-

sues than men (Tranter, 2011), and women in the United States are more willing to act against climate change because they are less likely than men to partake in system justification, or the "psychological tendency to maintain certainty, security, and solidarity through motivated perceptions of the status quo" (Goldsmith et al., 2013, p. 159). In the United States, women are more likely to reduce their own energy consumption in response to the risk of climate change (Semenza et al., 2011). Noblet et al. (2015) find in a Maine-based study that women were more likely to support eco-friendly energy policy. Climate change attitudes in high-income countries, Bush and Clayton (2023) show, are a function of differential perceptions of environmental policy between women and men: men tend to prioritize their perceptions of the personal and societal costs of climate change mitigation efforts, while women are more likely to perceive its benefits.

Women in the Legislative Process: Mechanisms of Representation and Party Influence

While the evidence shows that women, mostly in developed countries, have demonstrably more environmentally friendly opinions at the individual level, here I outline the ways women may affect parliamentary outcomes: first, through substantively representing women's preferences, and second, through impacting the positions of political parties.

A wide literature demonstrates that descriptive representation of marginalized groups, in which representatives "in their own backgrounds mirror some of the more frequent experiences and outward manifestations of belonging to the group" (Mansbridge, 1999, p. 628), leads to improved quality of life of that group (Hero & Tolbert, 1996). In other words, descriptive representation, in which representatives have similar characteristics to their constituents, leads to substantive representation, in which legislators better represent constituents similar to them. Increasing women's influence in male-dominated decision-making spaces could diversify deliberation in the democratic process as policymakers seek to understand "which policies are good for the polity as a whole, which policies are good for a representative's constituents, and when the interests of various groups within the polity and constituency conflict" (Mansbridge, 1999, p. 634).

Substantive representation, as Anne Phillips (1995) argues, relies on a 'politics of presence', in which a "necessary condition for the representation of women's interests is the presence of women in decision-making bodies" (Campbell et al., 2010, p. 172). When there are few women in male-dominated institutions, it can be difficult or impossible for women parliamentarians to "aggregate the diverse priorities of women citizens" (Clayton et al., 2019, p. 92). In fact, a greater presence of women within governing bodies can offer women citizens an additional form of representation should the representative of their geographic constituency fail to represent them substantively (Boas & Smith, 2019).

While women are a heterogeneous group without a single set of political preferences or values, increasing the number of women within governing bodies can widen the range of issues deemed politically important while revealing the often-gendered nature of these issues (Greene & O'Brien, 2016). Childs and Krook (2006) speak to the importance of critical actors, women representatives "who initiate policy proposals on their own, even when women form a small minority, and embolden others to take steps to promote policies for women, regardless of the proportion of female representatives" (p. 528). The more women there are in parliament, the more likely the existence of many critical actors—more women to advance their women constituents' interests in government.

Within the representation literature, four main frameworks attempt to explain why legislators may represent constituents with whom they share descriptive similarities. Firstly, shared experiences of individual and elite women may lead to preference convergence of these groups. Women at both the individual and elite levels navigate gendered social roles, and thus they may come to hold congruent beliefs based on these experiences (Phillips, 1998). Second, women in government may have a desire to represent their women constituents specifically, regardless of whether or not they share experiences or preferences. Because women have been systematically excluded from governance, women representatives may put forth the preferences of their women constituents in order to counteract historic power imbalances (Franceschet & Piscopo, 2008). Next, the socialization framework posits that a group's rhetoric has an impact on individual-level preferences. The gendered aspects of women's lives, from being in

charge of resource allocation to being socialized long-term to 'clean up messes' (Boas & Smith, 2019; Stoddart & Tindall, 2011), may have a socialized effect on both women at the individual level and women at the elite level with respect to their desire to protect and support the health of the environment. Finally, women representatives may have electoral incentives to intentionally represent women to gain re-election (Lloren et al., 2015). Voters of oppressed or under-represented groups may expect to be better represented by descriptive representatives than by traditional politicians, many of whom hail from privileged social and political groups (Mansbridge, 1999, p. 628). Bailer et al. (2018) show that representatives of under-represented backgrounds may seek to substantively represent their constituents early in their careers to "[bestow] credibility when they have hardly any legislative track record and few opportunities to demonstrate their expertise" (p. 2).

It is through these mechanisms that women may be better positioned than men to represent women constituents' preferences which, in developed countries, tend to be pro-environmental. In addition, the literature on women's effect on party politics offers another avenue through which the increased presence of women representatives in parliaments may contribute to greener outcomes like renewable energy consumption.

In most cases, representatives' actions are dictated at least in part by their political party. Parties "bring together a multitude of interests within a single organization" (Greene & O'Brien, 2016, p. 435), and thus may limit individual party members' abilities to propose or vote for policies off the party line. Yet, increasing evidence suggests that the inclusion of women within parties' parliamentary delegations has notable effects on the policy positions of parties themselves. Greene and O'Brien (2016) show that greater representation of women in political parties not only increases the diversity of issues they address in election campaigns, but pushes parties' manifestos to the left. Kittilson (2011) finds that women's presence in parties significantly increases parties' emphases on social justice and increases the existence of gender quotas in parties. Keith and Verge (2018) find in addition that the best indicator of parties' "commitment to gender equality in decision-making positions is the percentage of women's representation in the national parliament" (p. 400). Taken together, women's increased presence

in political parties pushes these parties both to the left of the political spectrum as well towards women's interests.

Thus, increasing numbers of women in parliament may increase the potential for environmentalism, and thus sustainable energy policy, to be prioritized as women may substantively represent women's preferences more effectively than their male counterparts and may also push parties towards both leftward-leaning politics and towards women's interests. Women, as minorities in parliaments all around the world, can and do impact policy indirectly in this way—by helping to shape the policy stances of their parties in part by advocating for women's preferences. Thus, I predict that:

H1: Democracies with a greater share of women in their parliaments will have better renewable energy outcomes.

Existing literature demonstrates that nations with higher proportions of women in parliament are more likely to ratify environmental treaties (Norgaard & York, 2005), create more protected land areas (Nugent & Shandra, 2009), have lower CO_2 emissions (Ergas & York, 2012), experience less deforestation, and maintain more forest cover (Salahodjaev & Jarilkapova, 2020). Women legislators in the United States House of Representatives favour more stringent environmental policies (Fredriksson & Wang, 2011), and countries with higher women's political empowerment see long-term reductions in CO_2 emissions (Lv & Deng, 2018). Women members of the European Parliament were significantly more likely than their male counterparts to support environmental legislation (Ramstetter & Habersack, 2019), and while increases in GDP can often increase emissions, nations with more gender equality see a much weaker association between GDP and CO_2 emissions (McGee et al., 2020). While this literature demonstrates a relationship between women's presence in parliaments and various environmental outcomes, it fails to consider two important factors that I account for in the present analysis. Below I explore, first, the impacts of time on the emergence of policy outcomes, and second, the role of state wealth on the potential relationships between women's representation and environmental outcomes.

The Effect of Time on the Emergence of Policy Outcomes

Although climate change prevention and mitigation are time-sensitive, policy creation and implementation take time. Creating climate change mitigation and adaptation measures is a "complex and ongoing process" (Scheraga et al., 2003, p. 237), affected by individual stages of policymaking which both overlap with each other and are inextricably linked (Hallsworth, 2011, p. 6). Once policies take effect, they often have long-term consequences, as future greenhouse gas emission mitigation and climate change adaptation rests on decisions made today (Scheraga et al., 2003, p. 237). Policy outcomes, or the results of policymaking, do not manifest immediately and are "often indirect, diffuse, and take time to appear" (Hallsworth, 2011, p. 6). Some existing research suggests that environmental policymaking processes have sped up through the latter half of the 20th century (Jordan et al., 1999), and McCormick (1998) finds that, within the European Union, environmental proposals could take up to 7 years to develop, while Hayes-Renshaw and Wallace (1997) estimate an average time of 18 months. This suggests accounting for time is paramount in capturing women representatives' impact on environmental policy outcomes.

Importantly, further time considerations must be accounted for when testing women representatives' impact on policies and outcomes. Women representatives across the world operate in majority-male legislatures in which they may face marginalization by existing members of the legislature with an interest in preserving the status quo. This marginalization can restrict women's ability to influence the political agenda through various means, including placing women on less powerful committees, blocking them from leadership roles, and failing to support their legislation (Kerevel & Atkeson, 2013); Senk (2020) shows that the systematic exclusion of women from leadership positions and influential committees in governance disadvantages their bill approval rates. Not only may do many women enter legislatures in which policy priorities and values have already been defined (Clayton et al., 2019) by socio-political gendered norms, but women may be incentivized to "adapt to [these] norms that have already coalesced around men's priorities to appear as more serious or capable politicians" (Clayton et al., 2019, p. 77), reducing their own potential impact on policy. Although women's presence in parties

influence party positions (Green & O'Brien, 2016; Kittilson, 2001; Keith & Verge, 2018), because women have fewer avenues through which to enter politics, Clayton and Zetterberg (2021) show that women in strong party systems "have less latitude to depart from the party line" (p. 1) and are thus constrained, to a greater extent than their male counterparts, in their ability to influence issues outside of their party's platform. Thus, women's impact on policy will likely not materialize immediately; rather, the process may be time-intensive as they navigate these various institutional constraints.

In addition, developed states may maintain better-functioning institutions, while developing democracies often have lower governance benchmarks and "material, educational, structural, and organizational deficiencies that negatively affect development and governance" (Pelicice, 2019, p. 2). Lack of institutional strength can lead to bad political behaviour, including corruption, which is "widespread among political authorities and associated staff, leading to weak policies that provide little social benefits" (Pelicice, 2019, p. 3). Robert Barro (1994) argues that economic development is necessary for the function and survival of democracy and is often a prerequisite for its formation; states with low levels of economic development are much less likely to maintain institutions and structures necessary for the healthy function of democracy. Policy creation and implementation may thus take longer to influence outcomes in structurally weaker states. While gender-based discrimination and male domination of policymaking is certainly not limited to poorer democracies, weak institutional backing may mean women's influence on policy takes longer to manifest than in states with stronger institutions.

Because the process of legislating is both time-consuming and continual, and because women representatives must navigate gendered constraints in legislatures which may slow their ability to impact policy and outcomes, determining a relationship between women's involvement in governance and renewable energy policy requires accounting for the passage of time. Although I do not attempt to disentangle the time lags attributable to the general policy-making process and to the impact of women's representation in this study, I predict that:

H2: Increases in the share of women in parliaments will not have immediate effects but will impact future renewable energy outcomes.

The Effect of State Wealth on Climate Change Perceptions

The aforementioned impact of state wealth on the gap between women's and men's climate change preferences at the individual level may be of particular importance. The vast majority of research regarding the gender gap in environmental attitudes considers developed countries; importantly, as uncovered in the most recent analysis of women's and men's environmentalism, Bush and Clayton (2023) have found that the gender gap in climate change concern is moderated by state income, and that "when countries are wealthier, a gap emerges whereby women are more likely than men to express concern about our changing climate" (Bush & Clayton, 2023, p. 591).

If the gender gap in climate change attitudes increases with state wealth, it may be that the increased representation of women, and therefore their environmentally friendly preferences, has a greater impact on the environmental outcomes of high-income states. In states where women's and men's climate change preferences are similar, we have less reason to suspect that increased representation of women's preferences would lead to vast changes in environmental policy and outcomes. Thus, I predict that:

H3: The relationship between increased women's participation in parliaments and renewable energy outcomes will be stronger in high-income countries.

In summary, I argue that women's presence in parliaments may impact the ultimate outcome of renewable energy consumption. Yet, these effects will be most pronounced in high income states, as the evidence for a gender gap in climate change preferences is strongest in these contexts. Women representatives in these contexts may seek to substantively represent these preferences. For these reasons, I assert that women MPs will advocate for a range of policies in favour of sustainable energy consumption in the policymaking process and within their own parties, creating an aggregate increased renewable energy consumption in higher income countries. In addition, I put forth that these effects will take time to materialize.

3.4 Research Design: Methods and Variables

In the following analysis, I consider only democracies as categorized by Hadenius and Teorell (Dahlberg et al., 2019), as parliaments are most effective in democracies. Democracies are determined by finding the mean of the Freedom House and Polity scales with a threshold between democracies and autocracies drawn at 7.5, which "was chosen by estimating the mean cut-off point separating democracy from autocracy in five well-known categorical measures of democracy... together with Freedom House's and Polity's own categorical thresholds for democracy" (Dahlberg et al., 2019). Data comes from the 20-year period of 1997 to 2017, a selection based on data availability. Because the proportion of women in parliament theoretically does not vary between elections, I average variables for each election period. Election dates and periods were determined using the Global Elections Database (Brancati, 2020). Thus, panel data is organized by country-election term as the unit of analysis. The vast majority of election term durations range from two to five years. Not only does aggregating data into election periods capture the variance in women in parliament accurately, but it helps to account for the different institutional timeframes in place in each country.

Dependent Variable: Renewable Energy Consumption

Renewable energy consumption is a common measure used to gauge the amount of renewable energy consumed at the national level (Danish et al., 2017; Boluk & Mert, 2015; Al-mulali et al., 2016). Consumption quantifies not only the amount of renewable energy that was produced and subsequently consumed by each state, but also states' consumption of renewable energy imported from elsewhere. Measuring consumption captures a state's willingness to use cleaner energy even if it lacks the capacity, resources, will, or governance structure to produce it domestically. Thus, I choose consumption, rather than production, as a dependent variable to avoid biasing the results in favour of those states which have unequal advantage in producing renewable energy. This data comes from World Bank Data and is measured as a percent of overall energy consumption (World Bank Open Data, 2019b).

Renewable energy consumption may be influenced by many factors. Wang et al. (2020) find that while increases in middle income countries' consumption are most correlated with increased research and development initiatives, renewable energy consumption in high income countries is bolstered most by policy and environmental pressures. Due to the importance of policy in influencing renewable energy consumption, particularly in higher income states, below I outline two such policies identified in the literature as impactful for renewable energy consumption: feed-in tariffs (FITs) and carbon taxes.

Smith and Urpelainen (2014) demonstrate that implementing an FIT, "which mandates energy utilities to pay a higher price for renewable electricity to generators than for other sources of electricity" (p. 367-368) increases renewable energy generation. Because energy utilities must pay energy generators more for renewables, generators see more profit from renewable energy generation than from other types of energy generation and are thus incentivized to generate more energy from renewable sources than from non-renewable sources (Smith & Urpelainen, 2014; Mitchell et al., 2006; Mendonça, 2007; Kalkuhl et al., 2012). FITs, "a price-based policy tool in the sense that a government sets a price at which [renewable energy] can be sold" (Yamamoto, 2018, p. 4), allow "households and businesses to sell their [electricity generated from renewables] to an electric utility at a set price during a number of years" (Yamamoto, 2018, p. 3). For this reason, countries like Germany and Spain's FITs were very successful, inspiring other countries, like Japan, to adopt similar FITs (Yamamoto, 2018).

Similarly, carbon taxes, which are "levied on the emission of a quantity of carbon dioxide" (Hsu, 2011, p. 5-6), are an oft-used policy at the state and supranational level to make the generation of fossil fuel-based energy more expensive. Carbon taxation has often "been part of larger energy and excise tax reform efforts, rather than [only] focused on greenhouse gas emissions" (Murray & Rivers, 2015, p. 675); yet in specific instances in which a carbon tax has been implemented independently, such as in Canada's British Columbia, it has led to reduced emissions (Murray & Rivers, 2015).

While the implementation of these policies may mediate the relationship between women's participation in governance and renewable energy consumption, others may

impact renewable energy consumption as well. For instance, renewable energy consumption could be influenced by the preponderance of postmodern values within societies, a variable difficult or impossible to measure. The totality of influential policies is impossible to quantify and analyse in a systematic way; energy policy is layered and outcomes are not likely to be attributable to one policy. Moreover, I argue not that women's presence in parliaments should correlate with the passage of any one policy, but with the general movement of parliaments and parties towards environmental choices, which subsequently lead to more consumption of renewable energy. Focusing on renewable energy consumption circumvents the problem of identifying which policies are both the "most important" in encouraging renewable energy consumption and those which are most likely to be influenced by women representatives specifically, instead focusing on the final, aggregate effect.

Independent Variable and Controls

The main independent variable of interest, the percent of women in parliament, is compiled by the Quality of Government dataset (Dahlberg et al., 2018) and comes from the World Bank Group's World Development Indicators (2019f). Control variables include GDP per capita (World Bank Open Data, 2019c), Climate Change Vulnerability Index (Chen et al., 2015), natural resource rents as a percent of GDP (World Bank Open Data, 2019d), the level of democracy (Freedom House/Imputed Polity) (Dahlberg et al., 2018), and Human Development Index (Dahlberg et al., 2018).

I predict that GDP per capita will have a positive effect on renewable energy consumption when considered alongside the effect of the proportion of women in parliament. Additionally, there are likely to be more women in the parliaments of richer countries, and empirical literature suggests that some lower-income states are not yet on a path to renewable energy (Romano et al., 2016).

Including the Notre Dame Adaptation Initiative's Vulnerability Index, which indexes the "propensity or predisposition of human societies to be negatively impacted by climate hazards" by assessing the exposure, sensitivity, and adaptive capacity of "six life- supporting sectors: food, water, health, ecosystem services, human habitat,

and infrastructure" (Chen et al., 2015) is predicted to drive up renewable energy usage, as states that are the most likely to face harm from climate change may find it in their interests to mitigate climate change before it occurs.

Accounting for natural resource rents, which in this case include "oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents" (World Bank Open Data, 2019d) accounts for the potentially lower renewable energy consumption by states that benefit significantly from the extraction of resources. Relatedly, some states with high resource rents (particularly of oil) are also rich in unused renewable energy sources (Atalay, 2016), indicating that the incentives to use unrenewable resources may outweigh the burden of clean energy transition for some states, even when renewable resources are abundant.

Both Human Development Index and level of democracy measures are controlled for, in accordance with similar analyses, for their potential to impact both women's role in society, and thus governance, as well as electricity access in general (Nugent & Shandra, 2008; Salahodjaev & Jarilkapova, 2020; McGee et al., 2020; Lv & Deng, 2018; Ergas & York, 2012). They are obtained from the Quality of Government dataset (Dahlberg et al., 2018). The Human Development Index as measured by the United Nations Development Program provides an alternate development measure to GDP by emphasizing "that people and their capabilities should be the ultimate criteria for assessing the development of a country, not economic growth alone" (Dalhberg et al., 2018, p. 133). The level of democracy (Freedom House/Imputed Polity) measure is a scaled variable and ranges from 0, least democratic, to 10, most democratic. Because only democracies as characterized by Hadenius and Teorell are included in this analysis, this variable controls only for level of democracy within states that already qualify broadly as democracies. The score is formulated by transforming both Freedom House and Polity's scores to a 0-10 scale and averaging them. Combining the two measures is demonstrated by Hadenius and Teorell (2005) to be more valid and reliable than each measure individually (Dahlberg et al., 2018).

Importantly, country fixed effects capture renewable energy potential at the country level. This is especially vital, as some states may be better equipped to produce

renewable energy and subsequently consume it. Controlling for this will ensure the validity of comparisons between states with high and low renewable capacity. Time fixed effects additionally capture the temporal trends shared by all countries, such as overall decreases in the cost of renewable technology over time, as well as trends towards postmaterialist values which may increase both women's representation and renewable energy consumption.

While the ideological position of parties, and the strength of each party, could very well impact renewable energy consumption, the proportion of women in government also impacts the ideological position of these parties (Greene & O'Brien, 2016; Kittilson, 2011; Keith & Verge, 2018) and thus controlling for these party dynamics could introduce posttreatment bias, which "occurs when researchers control for covariates that are potentially affected by the treatment" (Senk, 2020, p. 5). If party positions vary according to their gender makeup, holding such party positions constant removes this variation, and thus removes the indirect effect of women's representation on renewable energy consumption. As my theoretical argument maintains that women's effect on renewable energy consumption is indirect—in other words, not by virtue of the fact that women are women, but through mechanisms of representation and party politics—controlling for party position may bias the estimates of the relationship I seek to measure in the first place. Nevertheless, in Appendix A I include the main models with an indexed control of the strength of all parties' left-right ideological position.

Model Specification

To test whether women's participation in parliaments influences renewable energy consumption, I estimate a two-way fixed effects panel regression. The fixed effects model is used to avoid inconsistency of a pooling model when the individual error component is correlated with the regressors, which was the case with the data used here. Thus, the model, which takes the form

$$y_{it} = \beta^T x_{it} + \gamma_i + \delta_t + \epsilon_{it}$$

where country is the individual component i, election term is the time component t, y_{it} is the dependent variable, x_{it} are time-varying independent variables, γ_i is the country-fixed effect, δ_t is the time fixed effect, ϵ_{it} is the error term, and β^T is a vector. With both time and country fixed effects, the model treats γ_i"as a further set of... parameters to be estimated" (Croissant & Millo, 2008, p. 3). This allows consistent estimates for β (Croissant & Millo, 2008, p. 3). Performing an augmented Dickey Fuller test on the data set reveals that the time series is stationary; full results of this test are printed in Appendix Figure A.1.

To account for the delayed effect that arises after women in parliament are elected and participate in the policy process, and to measure **H2**, most of the panel data models in this analysis regress a measure of renewable energy consumption, the dependent variable, on a lagged measure of women in parliament, the main independent variable. This modelling may uncover if variation in the proportion of women in parliament in previous election cycles correlates with future renewable energy consumption in a systematic way.

Descriptive Statistics

Figures 3.1 and 3.2 show the distribution of the two main variables of this analysis, renewable energy consumption and the proportion of women in parliament.

The distribution of total renewable energy consumption across countries is heavily right-skewed, with most renewable energy consumption falling below 25% as a percent of total energy consumption. Yet, breaking down this distribution by World Bank income group categorizations (World Bank Open Data, 2019e) reveals the notable differences in renewable energy consumption across income levels. A great majority of the states with the highest renewable energy consumption are low-income democracies; the average renewable energy consumption of states classified as low-income is over 75% of total energy consumption, while high-income states on average consume less than 20% renewable energy. This is likely due to poor energy access experienced by many low-income states; over 580 million people in Africa and 430 million people in Asia lack electricity access (Sambodo & Novandra, 2019) and thus may use small-scale and local

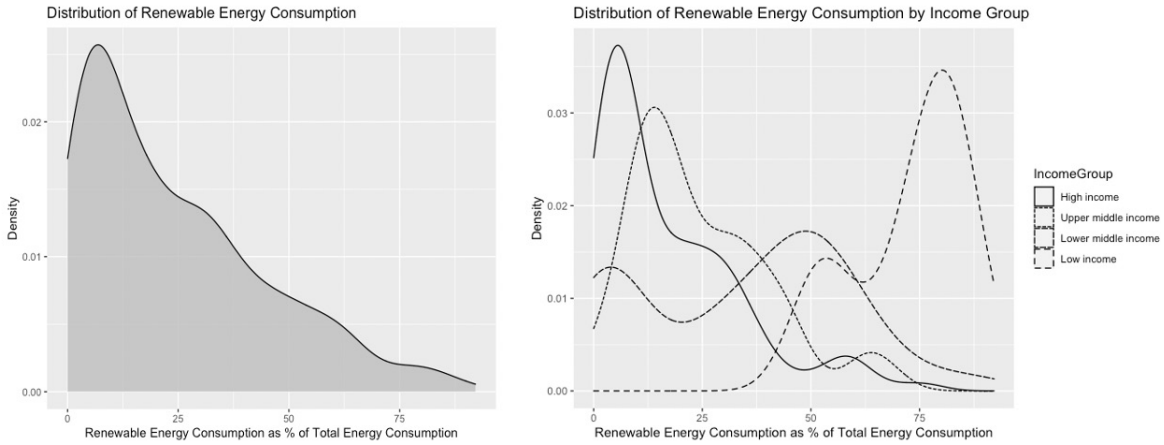

Figure 3.1: Distribution of Renewable Energy Consumption, and Distribution of Renewable Energy Consumption by Country Income Group

energy sources, like solar powered cookers and lanterns (Soria et al., 2016).

Low-income states within the sample like Zambia, Mali, and Sierra Leone all have renewable energy consumption rates above 80% of total energy consumption, while Benin demonstrates the lowest renewable energy consumption of all low-income states, at 60% renewable energy consumption. This is still over 40% points more renewable energy consumption than the average of high-income states, at 17.64%.

Thus, expectedly, high-income states consume far less renewable energy as a percent of their total energy consumption. Iceland consumes the most at just over 62% renewables, with Liechtenstein, Norway, Uruguay, and Sweden consuming between 40% and 58% renewable energy as a percent of total energy.

The overall distribution of women in parliament is also right-skewed, with most parliaments falling at less than 20% women's participation. Low-income states have significantly fewer women in their parliaments than do high, upper middle, and lower middle-incomes states. On average, high-income states have just over 20% women in their parliaments while low-income states demonstrate levels below 10% on average. Sweden's parliament ranks number one, with an almost 44% women makeup. Finland, Norway, Denmark, the Netherlands, and South Africa follow with rates between 35% and 38%. At the other extreme, Palau and Micronesia have no women in their

Figure 3.2: Distribution of Share of Women in Parliaments, and Distribution of Share of Women in Parliaments by Country Income Group

parliaments.

Denmark saw a 25% increase in renewable energy consumption, the greatest increase during the sample period, while its level of women's representation increased by nearly 5% in this timeframe. Iceland saw and increase in renewables of 22.15%, accompanied by an increase in women parliamentarians by 22.2%. Lithuania's 17.34% increase in renewables was accompanied by a 3.8% increase in women in parliament, while Uruguay's 20.35% increase in renewables was met with a 9.1% increase in women's representation.

Figure 3.3 shows the variation in renewable energy consumption in all countries across the sample period, demonstrating a slight increase in renewable energy consumption over time.

In contrast, Figure 3.4 shows that the percentage of women in parliament has increased steadily over time across all states in the sample.

3.5 Results

The regression results of the main variables and interaction are printed in Table 3.1. In Figure 3.5, I plot the marginal effects of the proportion of women in parliament when interacted with a logged value of GDP per capita, which ranges from Madagascar's 5.51

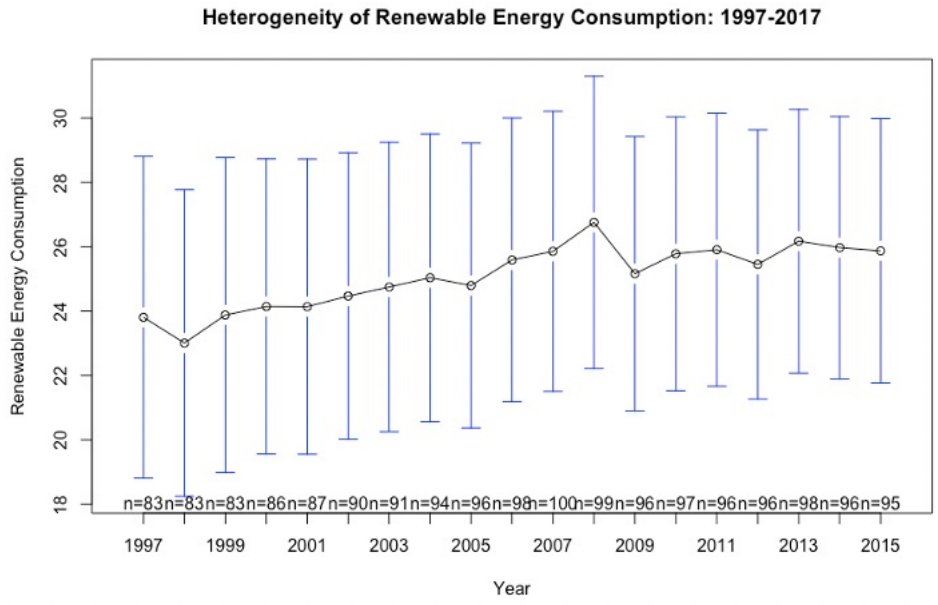

Figure 3.3: Heterogeneity of renewable energy consumption over time

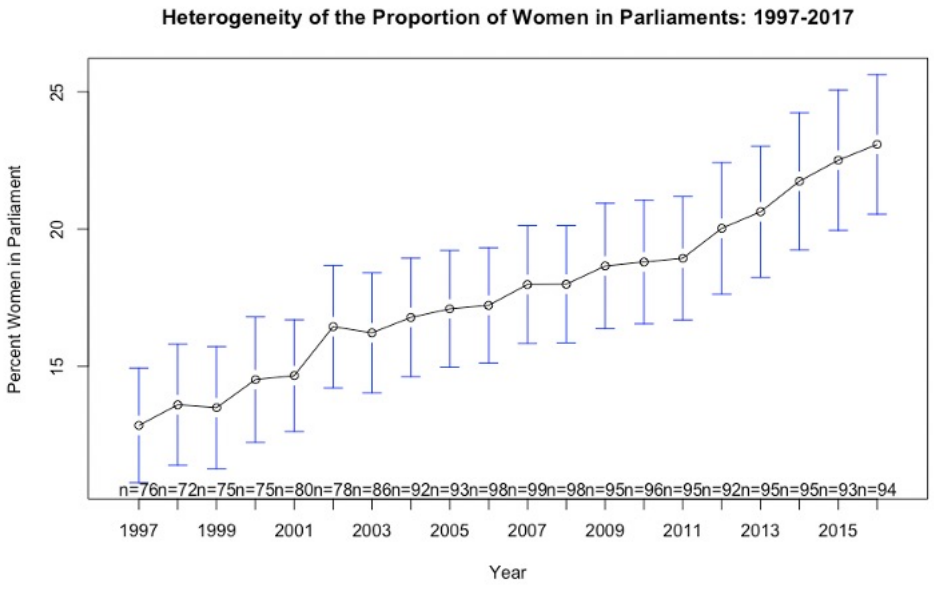

Figure 3.4: Heterogeneity of the proportion of women in parliament over time

Table 3.1: Time-series cross-sectional analysis of renewable energy consumption with country and year fixed effects and an interaction of women in parliament and GDP per capita.

	Dependent variable: Renewable Energy Consumption			
	no lag	1 lag	2 lags	3 lags
Women in Parliament	-0.069***	-0.061**	-0.049.	0.036
	(0.015)	(0.020)	(0.026)	(0.033)
Women in Parliament x GDP per capita	0.007***	0.007**	0.006*	-0.003
	(0.002)	(0.002)	(0.003)	(0.003)
log GDP per capita	-0.180*	-0.205*	-0.355***	-0.318**
	(0.070)	(0.082)	(0.103)	(0.116)
Vulnerability	3.727.	3.717	2.770	3.290
	(2.233)	(2.823)	(3.981)	(5.347)
Resource Rents	-0.008.	-0.005	0.015	0.031**
	(0.004)	(0.007)	(0.011)	(0.011)
Democracy Score	0.109*	0.044	-0.143.	-0.079
	(0.044)	(0.065)	(0.081)	(0.098)
HDI	0.737	0.308	1.115	2.658
	(1.143)	(1.436)	(2.069)	(2.732)
Observations	481	388	295	204
R^2	0.120	0.091	0.135	0.194
Adjusted R^2	-0.148	-0.275	-0.352	-0.475
F Statistic	7.166*** (df = 7; 368)	3.925*** (df = 7; 276)	4.201*** (df = 7; 188)	3.805*** (df = 7; 111)
Significance levels	*p<0.1; **p<0.05; ***p<0.01			

($247), at the poorest, to Liechtenstein's 12.05 ($171,056), at the wealthiest. Because of the non-normal distribution of renewable energy consumption, I use a logged value of this variable in all of the following models. This requires coefficients to be interpreted substantively as $\exp(\beta)$, since exponentiation is the inverse of a logarithmic function. Significant relationships exist where estimated coefficients and their confidence intervals do not contain zero.

The plotted marginal effects of the proportion of women in parliament on renewable energy consumption show the significance of the relationship as moderated by GDP per capita, the distribution of which can be found in each plot. Higher income countries demonstrate significant and positive relationships when women's participation in parliaments is lagged from zero to two election terms. In states with a logged GDP per capita of between 10 and 12 ($22,540 in Slovenia to $171,056 in Liechtenstein, with a mean of $45,395), such as Australia, Belgium, and the United States, the relationship between the proportion of women in parliament and renewable energy consumption is

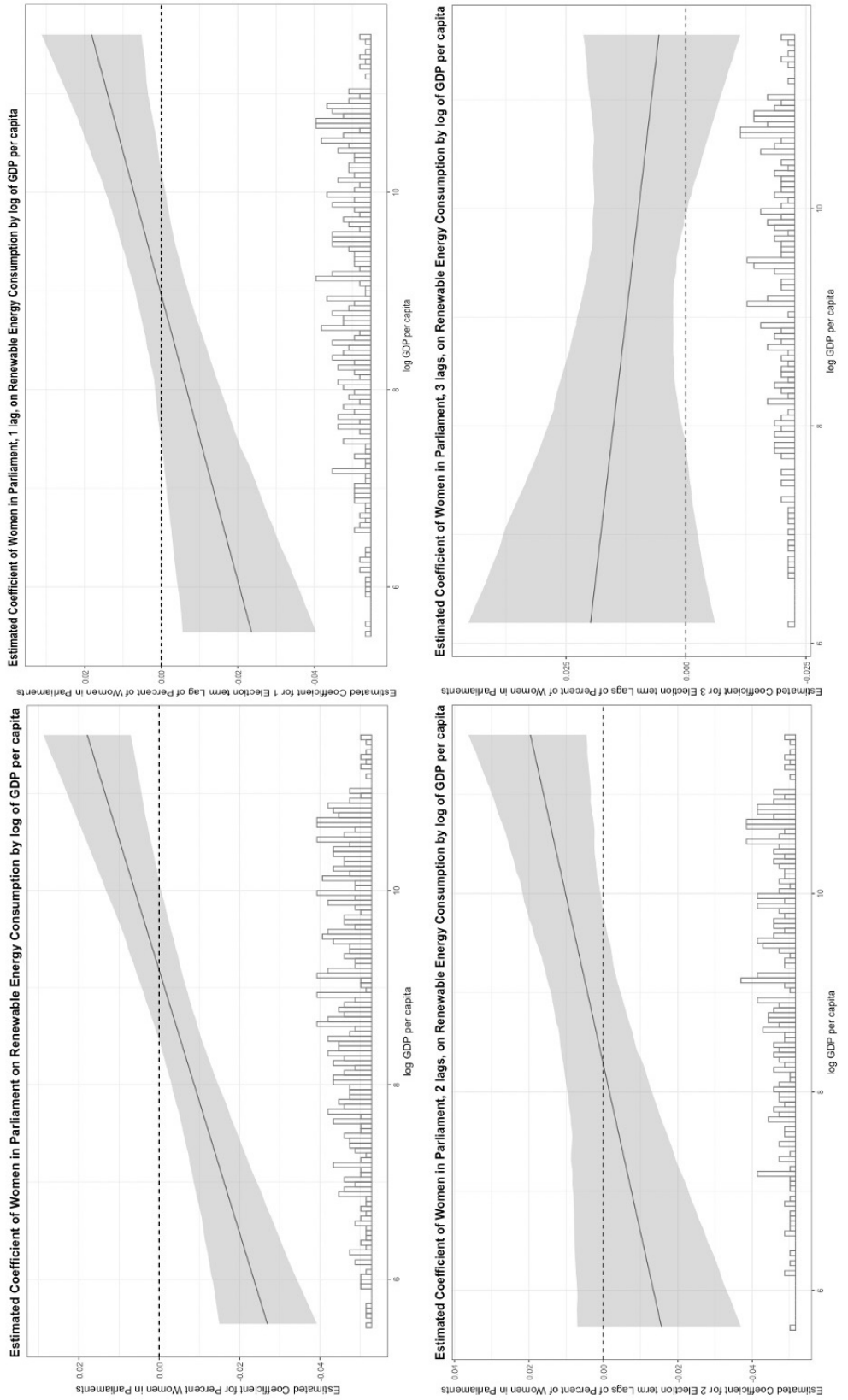

Figure 3.5: Plotted marginal effects of women in parliament on renewable energy consumption by GDP per capita at all lag structures.

indeed positive and significant. With a 5% increase in women in parliament, a 5.08% concurrent increase and a 5.12% increase in renewable energy consumption after 1 and 2 election terms is expected in Liechtenstein, the richest of democracies. Positive significance remains after 3 election term lags where logged GDP is equal to about 8 to 10 ($2,985 in Colombia and the Marshall Islands and $21,959 in Greece), indicating significance in more middle-income countries like Ecuador, Botswana, and Hungary. Conversely, the marginal effect of women's participation in parliament is significant and negative, when lagged from zero to one election terms, in lower-income countries with a logged GDP per capita of about 8 or less (less than about $3,000 GDP per capita), like Bulgaria, Ghana, and the Philippines.

While countries with lower incomes indicate negative or non-significant relationships, results of these time-series cross-sectional regressions also indicate that, in line with prior research and with **H3**, women's involvement in governance does contribute to a greener policy outcome with respect to renewable energy consumption in richer states. Although **H2** predicted that effects would not materialize immediately, I also find an immediate effect in higher income states. Yet, in line with **H2**, positive and significant effects remain after both one and two election terms in these states, while more middle-income states' relationships take longer to materialize and appear after three election terms. Thus, the results here lend support to the idea that women representatives in higher-income states may substantively represent women's environmental preferences.

Immediate positive effects may suggest spuriousness, yet it is important to note that time units are measured in election terms, periods which could last 5 years. Thus, immediate relationships indicate that the amount of women in parliament in a potentially five year period influences renewables within that period. As FITs, for example, increase renewable consumption very successfully (Medonca, 2007, p. 13), subsequent effects on renewable energy consumption could very well manifest within a timeframe of five years or less.

While little research investigates the timeline of environmental policy creation to final outcomes, some evidence suggests that these processes have sped up through

the latter half of the 20th century (Jordan et al., 1999). McCormick (1998) asserts that, within the European Union, developing environmental proposals could take up to 7 years, while Hayes-Renshaw and Wallace (1997) estimate an average time of 18 months. Because election terms last from 2 to 5 years, these estimates appear in line with the timeline of findings here; yet, in cases of longer election terms, the period from the election of women to the ultimate policy outcome could be between 10 and 15 years. So, future research should attempt to measure the difference in the timelines of policy outcomes resulting from policies spearheaded by women, as compared to those spearheaded by men, to measure more closely whether institutional gender-based constraints impact policy outcomes. It should also attempt to more specifically map the timeline of the policy output-outcome process.

Robustness Checks

In order to more fully determine the role of parties in the relationship at play, I include a control of the proportion of seats held by left parties with data from the Database of Political Institutions (Cruz et al., 2021). It may be the case that left parties drive the positive impacts on renewable energy consumption. Thus, I print the results of regression analysis containing this additional control variable: Table 3.2 controls for the percentage of seats held by government leftist parties, while Table 3.3 controls for the percentage of seats held by both government and opposition parties. Both tables additionally control for a lagged value of the dependent variable, renewable energy consumption, to serve as an additional control for autocorrelation (Keele et al., 2016) in line with methodologies applied in similar research (Alexiadou, 2015). The plotted marginal effects of the models in Tables 3.2 and 3.3 are displayed in Figures 3.6 and 3.7.

While including these additional control variables decreases significance of the main independent variable of interest, women in parliament, past the traditionally accepted level, the direction of the relationship remains the same, and relative significance remains notable. This indicates that left parties may indeed play an important role in the proliferation of renewable energy usage. Yet, in line with previous work by Kroeber

Table 3.2: Time-series cross-sectional analysis of renewable energy consumption with country and year fixed effects and an interaction of women in parliament and GDP per capita. Controls included for percentage of seats held by leftist governing parties, and logged dependent variable of renewable energy consumption

	Dependent variable: Renewable Energy Consumption			
	no lag	1 lag	2 lags	3 lags
Women in Parliament	-0.058***	-0.029*	-0.019	-0.021.
	(0.017)	(0.013)	(0.013)	(0.012)
Women in Parliament x GDP per capita	0.006**	0.003*	0.002.	0.002.
	(0.002)	(0.001)	(0.001)	(0.001)
Log GDP per capita	-0.067	-0.001	-0.015	-0.030
	(0.079)	(0.077)	(0.079)	(0.080)
Vulnerability	1.624	2.513	3.652	3.568
	(2.517)	(2.540)	(2.562)	(2.494)
Resource Rents	-0.008.	-0.006	-0.006	-0.006
	(0.005)	(0.005)	(0.005)	(0.005)
Democracy Score	0.038	0.038	0.038	0.050
	(0.054)	(0.052)	(0.054)	(0.052)
HDI	-0.256	-1.301	-1.004	-0.761
	(1.324)	(1.280)	(1.303)	(1.303)
Percent Government Party Left Seats	-0.167*	-0.193*	-0.183*	-0.156.
	(0.081)	(0.083)	(0.084)	(0.083)
Lag Renewable Energy Consumption	0.002	0.003*	0.003.	0.003*
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	365	362	351	352
R2	0.956	0.954	0.954	0.956
Adjusted R2	0.941	0.939	0.938	0.940
Residual Std. Error	0.223 (df = 271)	0.227 (df = 268)	0.229 (df = 258)	0.225 (df = 259)
F Statistic	63.105*** (df = 93; 271)	60.347*** (df = 93; 268)	58.450*** (df = 92; 258)	60.952*** (df = 92; 259)
Significance levels	*p<0.1; **p<0.05; ***p<0.01			

(2022a, 2022b), women's involvement in parties, as both leaders and members, pushes parties' stances towards environmentalism. Therefore, while parties indeed play a role in environmentalist outcomes, women's inclusion in these parties may additionally play a key role in the stances parties take, and therefore the impacts parties have. Additional research should attempt to more clearly untangle the pathways of women's impact on environmentalism by more clearly charting their paths as party members and leaders and subsequently as political actors who influence both political outputs and outcomes.

The Role of Institutional Strength

Results of time-series cross-sectional regressions indicate, in line with prior research, that women's involvement in governance does contribute to a greener policy outcome with respect to renewable energy consumption: while my original prediction that the

Table 3.3: Time-series cross-sectional analysis of renewable energy consumption with country and year fixed effects and an interaction of women in parliament and GDP per capita. Controls included for percentage of seats held by leftist governing parties, and logged dependent variable of renewable energy consumption

	Dependent variable: Renewable Energy Consumption			
	no lag	1 lag	2 lag	3 lags
Women in Parliament	-0.062***	-0.030*	-0.020	-0.021.
	(0.016)	(0.013)	(0.013)	(0.012)
Women in Parliament x GDP per capita	0.007***	0.003*	0.002.	0.002.
	(0.002)	(0.001)	(0.001)	(0.001)
Log GDP per capita	-0.104	-0.029	-0.044	-0.052
	(0.079)	(0.077)	(0.079)	(0.079)
Vulnerability	1.225	2.243	3.348	3.284
	(2.474)	(2.497)	(2.529)	(2.450)
Resource Rents	-0.008.	-0.006	-0.006	-0.006
	(0.005)	(0.005)	(0.005)	(0.005)
Democracy Score	0.037	0.042	0.042	0.055
	(0.053)	(0.052)	(0.053)	(0.051)
HDI	-0.277	-1.449	-1.142	-0.928
	(1.304)	(1.265)	(1.291)	(1.288)
Percent Left Seats	-0.368***	-0.373***	-0.343**	-0.332**
	(0.104)	(0.106)	(0.107)	(0.105)
Lag Renewable Energy Consumption	0.002	0.003*	0.003.	0.003*
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	365	362	351	352
R2	0.957	0.956	0.955	0.957
Adjusted R2	0.942	0.940	0.939	0.942
Residual Std. Error	0.220 (df = 271)	0.224 (df = 268)	0.226 (df = 258)	0.223 (df = 259)
F Statistic	65.107*** (df = 93; 271)	61.970*** (df = 93; 268)	59.720*** (df = 92; 258)	62.511*** (df = 92; 259)
Significance levels	*p<0.1; **p<0.05; ***p<0.01			

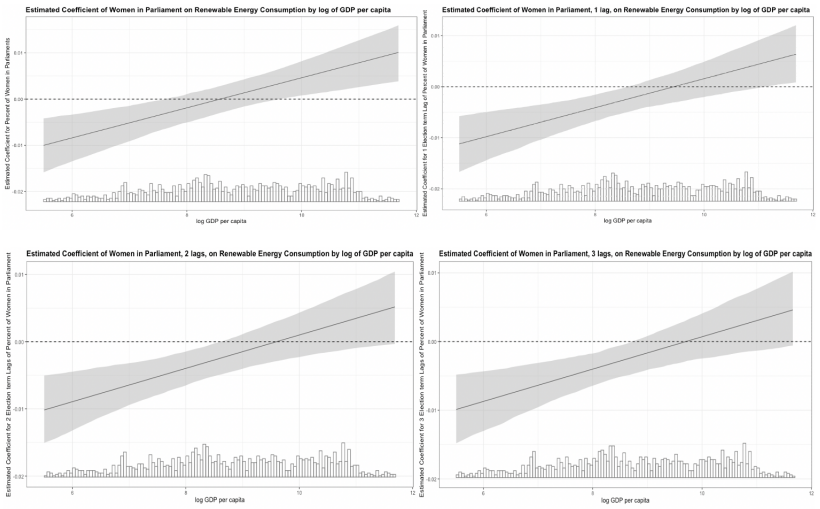

Figure 3.6: Plotted marginal effects of women in parliament on renewable energy consumption by GDP per capita at all lag structures, controlling for percent of left seats held by governing parties and lagged dependent variable.

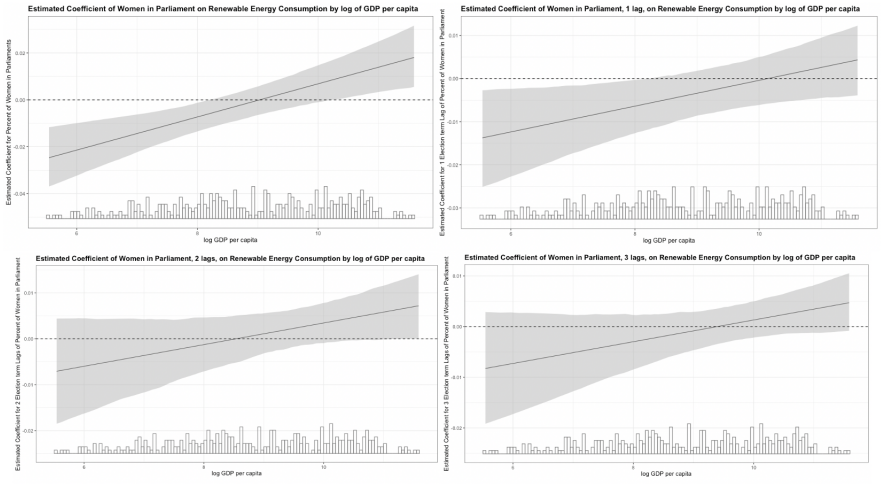

Figure 3.7: Plotted marginal effects of women in parliament on renewable energy consumption by GDP per capita at all lag structures, controlling for percent of left seats held by all parties (governing & opposition)and lagged dependent variable.

relationship would be strongest in high-income states plays out, the analysis here indicates that the increased involvement of women in democracies at mid-levels of economic development is also significant for renewable energy consumption. Yet, the relationship materialises more quickly in higher income states. Thus, the question of *whether* women make a difference in renewable energy consumption at various levels of economic development is accompanied by a question of *when* they make a difference at these various levels of economic development.

The timeline differential between high and mid-level incomes, as well as a lack of positive significance in lowest-income states, may be explained by high-income democracies' ability to maintain functioning and effective institutions, while developing democracies often have lower governance benchmarks and "material, educational, structural, and organizational deficiencies that negatively affect development and governance" (Pelicice, 2019, p. 2). As an initial test of whether the quality of democratic institutions explains the more immediate effect on women's representation in higher-income countries, I interact the proportion of women in parliament with a measure of the quality of democracy (Freedom House/Imputed Polity). Appendix Table A.2 and Appendix Figure A.1 broadly mirrors the patterns in Figure 3.5. Yet, further research on the influence of governmental institutions on women's ability to impact policy outcomes is required to reach more concrete conclusions.

Connecting the Dots: Investigating FITs and women's representation

Anecdotal evidence demonstrates women's involvement in climate change and environmental policy. US Representative Debbie Dingell's introduction of the Clean Energy and Sustainability Accelerator (2021) is one such example of a female representative specifically initiating a policy with implications for renewable energy consumption. While a large-scale qualitative analysis of other similar policies proposed by women representatives should be undertaken in the future, to further investigate the relationship between women's representation and renewable energy consumption, I include in the appendix an additional set of regressions with a focus on a policy that may increase renewable energy consumption: FITs.

While I assert that women's impact on renewable energy consumption is an aggregation of their impact in parliaments and parties, the results of these models, while insignificant to the 0.005 level, demonstrate a similar direction to the above models. This offers preliminary evidence for the systematic involvement of women in the passage of environmental legislation. The full models and plotted marginal effects can be found in Appendix A.

3.6 Conclusion

While much of the academic attention paid to the effects of increased women's representation in governments has focused on "women's issues" like abortion, paid maternal leave, and human trafficking (Ennser-Jedenastik, 2017; McBride, 2001; Wittmer & Bouché, 2013), the impact of women's increased participation in governance encompasses a much broader range of issues. While existing literature has suggested a relationship between women's parliamentary participation and environmental outcomes, this study sheds new light on the important contextualities of this relationship. I find that increases in women's parliamentary participation leads to increases in renewable energy consumption, that this relationship is moderated by state wealth, and that it takes time to appear. While richer countries show positive and significant effects of women's increased presence in parliaments on renewable energy consumption, middle-income countries' significant and positive relationships take longer to materialise. Overall, these results contribute to the growing literature on the impact of women's political participation on environmentalism and give new attention to the role of both state development and time in this relationship.

The implications for these findings are manifold and widely pertinent to today's environmental politics. The first implications are political, and impact all actors, from individual voters to governments themselves. They suggest that electing more women to office in higher income democracies could speed the process of decarbonization, notwithstanding the implicit and additional benefits to gender equality. Environmentally minded voters, activists, and interest groups should thus seriously consider the way their representatives' gender may impact environmentalism and take seriously the

role of gender equality in their governments.

Additional implications are direct: high-income states consume far more energy, and emit far more CO_2 per capita, than do lower-income countries (Ritchie, 2018). Thus, when considering global environmental outcomes, increasing high-income states' consumption of renewables is of real importance in achieving the goals set out by the Paris Climate Agreement (Ritchie, 2018). Because many countries aim for net zero emissions by 2050 (Bazilian & Gielen, 2020), finding fast and effective means to lower emissions is essential to meet goals as well as to substantively avoid excessive climate change. The results here suggest that increasing women's political power could accelerate higher-income states' ascension to these goals.

Yet, lower-income states maintain high future-emissions potential, particularly as they continue to develop. Thus, future research must uncover the unique and potentially powerful role that women representatives may play in environmental policymaking in lower-income states, and the institutional, cultural, and political barriers they face in contributing to impactful environmental policy.

Further research could take this analysis in another direction by investigating women's impact on particular policies, with special attention to whether women representatives are more prone to effecting certain policies over others. The role of women in various other government positions—such as cabinet members, heads of state, party leaders, and the like—could also be investigated to determine which roles offer women the most power in effecting environmental outcomes. Investigating the effects of other institutional factors, like corruption, on women's ability to influence outcomes would offer additional contextual insight to the relationship between women's representation and environmental outcomes.

Revisiting these relationships once more time has passed, and thus more data is available, could help explore the relationship to an even greater extent. With this additional data, analyses could attempt to uncover differentials in the emergence of policy outcomes, investigating whether it takes women longer to change policy outcomes compared to their male counterparts. Finally, further research could investigate why, and under what circumstances, women representatives fail to make a difference in

environmental policy, especially when states with lower levels of economic development, and thus potentially weaker political institutions, do take concrete steps to include more women in governance by instituting quotas and other equalizing initiatives. This could help uncover if the way women enter office matters for their effectiveness in influencing environmental policy.

Lastly, and beyond the scope of this research, additional work to uncover the role of government and party ideology on renewable energy policy will be of paramount importance, and such investigations should consider women's roles in shaping party platforms and agendas.

Chapter 4

The 'Women's Representation-Corruption Link' and Environmentalism: A Cross-National Study

4.1 Abstract

Numerous studies suggest a relationship between women's political representation and improved environmental outcomes. Yet, the contexts in which this holds and the mechanisms through which it comes to be remain under-studied. This study proposes that women's impact on political commitments to environmentalism and policy outcomes, such as CO_2 emissions and deforestation rates, are moderated by states' corruption levels. While women tend to be more environmental, left-leaning, and risk averse than men, environments of high corruption restrain, tokenize, and marginalize women representatives, thereby limiting the impact they may have on environmental governance. Time-series cross-sectional analyses of 58 democracies across 15 years show women's representation is correlated with better environmental outputs and outcomes, but only when corruption levels are low. These findings help broaden our understanding of the relationship between representation and environmental politics, bring attention to the

importance of governance contexts within the subfield of gender and climate change, and suggest that the interaction of both integrity and inclusivity in governments holds a key to fighting climate change.

4.2 Introduction

A growing literature in political science's subfield of gender and climate change has demonstrated a positive relationship between the participation of women in government and environmentalist outcomes, prompting some scholars to conclude that women's increased inclusion in governance around the world will yield environmental benefit (Ergas & York, 2012; Fredriksson & Wang, 2011; Lv & Deng, 2018; McGee et al., 2020; Norgaard & York, 2005; Salahodjaev & Jarilkapova, 2020; Salamon, 2023). Yet, much of the criticism of this apparent relationship has stressed that women's mere presence in government does not always mean they have the necessary authority to change policies or outcomes. As Melody Valdini, (2019, p. 72) states in The Inclusion Calculation: Why Men Appropriate Women's Representation, "women's presence does not equal women's power". Without meaningfully engaging with the reality that "system[s] designed to privilege and maintain men's power" (Valdini, 2019, p. 13) often inhibit women's power, understanding how and why women's representation in democracies leads to better environmental outcomes has remained out of reach. Is the relationship between women's influence in governance and environmentalism universal across democratic states? If not, where does it exist?

In attempting to answer these questions, I pay special attention to the governance norms which may help or hinder women's ability to influence environmental policy by focusing on the role of corruption as a moderator of the relationship between women's representation and various environmental outcomes. Corruption, "the abuse of a public role for private gain" (Hough, 2013, p. 4), is a relatively common phenomenon around the world which erodes governance in both democratic and undemocratic states. Not only can corruption incentivize representatives to make policy decisions in line with corrupt interests rather than with their constituents, but it can disincentivize civic engagement itself (Hooghe & Quintelier, 2014). Corrupt behavior often results in detri-

mental environmental outcomes (Cole, 2007; Gennaioli & Tavoni, 2016; Goel et al., 2013; Koyunco, 2008; Vasylieva et al., 2019). While existing literature investigates the impact of corruption on women's access to parliamentary participation (Branisa & Ziegler, 2011; Esarey & Schwindt-Bayer, 2019; Goetz, 2007; Stockemer, 2011; Sundström & Wängerud, 2016; Sung, 2003; Tripp, 2001), my argument is instead focused women parliamentarians' ability to impact outcomes—in this case, environmental outcomes—in contexts of varying levels of corruption.

I put forth a theoretical basis for the conditional effect of corruption on the relationship between women's representation and environmental outputs and outcomes. First, women representatives are much more likely to be tokenized and marginalized in highly corrupt contexts. Powerful elites may intentionally bolster the inclusion of women candidates or representatives not to offer them political power, but to hold them up as anti-corruption symbols to the public (Armstrong et al., 2022; Bjarnegård et al., 2018; Randall & Svasand, 2002; Sundström & Wängerud, 2016; Valdini, 2019). In less corrupt societies, where tokenization and marginalization are less likely, women have more agency to influence policy and outcomes in line with their preferences. I argue that women's preferences, which tend to be more environmental, left leaning, and risk averse (Abendschön & Stenmetz, 2014; Arnocky & Stroink, 2010; Greene & O'Brien, 2016; Holt & Laury, 2002; McCright, 2010), can more notably impact environmental governance in low-corruption contexts, and thus result in positive environmental outputs and outcomes. To test the proposed hypothesis, I estimate regression models using time-series cross-sectional data from 58 democracies from 1997 to 2017. I find that where corruption is low, women's representation is positively and significantly correlated with environmental outputs—political commitments to environmentalism—and outcomes—the resulting changes in emissions, deforestation, and other environmental measures (Bättig & Bernauer, 2009).

As evidenced by the growing attention to the study of gender and climate change, understanding the full picture of the relationship between women's representation and environmental outcomes is especially important given the nature of the ongoing climate emergency. The research conducted here offers unique insight into the institutional

factors which may impact the relationship between women's participation in governance and environmental outcomes.

4.3 Literature Review

In this section, I outline the relevant literature surrounding the linkages between women's representation, corruption, and environmentalism. First, I review the existing literature regarding women's environmental preferences and behaviors and the subsequent impacts of their increased representation on environmental outcomes. I then explore how corruption dampens women's ability to be effective representatives. Finally, I address the anti-environmental impact of corruption.

Women's Preferences, Representation, and Environmental Outcomes

Existing research shows that, as individuals and representatives, women tend to be more in favor of environmentalism than their male counterparts. Women are more knowledgeable about climate change, more worried about the consequences of climate change, more inclined to behave environmentally in light of climate change, more in favor of environmental protection measures, and more likely to perceive benefits of climate change mitigation while men are more likely to perceive costs (Arnocky & Stroink, 2010; Bush & Clayton, 2023; Goldsmith et al., 2013; Hunter et al., 2004; McCright, 2010; Noblet et al., 2015; Semenza et al., 2011; Tranter, 2011). Green parties see high rates of women's participation by marrying traditionally 'women's' issues with environmentalism (Keith & Verge, 2018; Kroeber, 2021).

Women also tend to be generally more left-leaning than men, even though "gender has never been a clear-cut cleavage determining electoral choice" (Abendschön & Stenmetz, 2014, p. 317) to the extent that, for example, class has been. Emmenegger and Manow (2014) put forward that women's leftward tendencies are attributable to decreasing religiosity of both women and parties, coupled with women's changing social roles; others assert that left parties have more successfully promoted issues important to women— like healthcare, childcare, welfare and social support, and economic equal-

ity—than those on the right (Keith & Verge, 2018). With women's meaningful support of these issues, "the evidence suggests that the women's vote translated into real impacts on policy and social welfare, even at a time [in which] women participated less in the electoral process relative to the present day" (Cascio & Shenhav, 2020, p. 25). Indeed, Greene and O'Brien (2016) find that women's presence in political parties is associated with more left-leaning party manifestos while Kroeber (2022a) finds that political parties headed by women increasingly support green positions.

Finally, research in psychology shows that women display more risk averse tendencies than men. Holt and Laury (2002) show that men took more risky choices than women in lottery experiments; similar results are found by Dohmen et al. (2005), Powell and Ansic (1997), Eckel and Grossman (2008), and others (see Croson & Gneezy, 2009). Hinz et al. (1997) find that women participate in less risky investments compared to men. Croson and Gneezy (2009) argue that this could be due to emotional differences, as women report more fear and nervousness when anticipating negative outcomes relative to men (Croson & Gneezy, 2009, p. 452). Additionally, they point to the tendency for women to be less overconfident than men in some situations (Estes & Hosseini, 1988) to explain why women may make less risky decisions. Regardless of the specific mechanisms for women's greater risk-aversion, climate change poses massive global risk to health, infrastructure, biodiversity, and survival. Since women are less prone to risk taking, they may be less likely to risk environmental health, and therefore favor environmental protection to a greater extent than their male counterparts.

The existing literature has established that women's preferences are reflected in policy as their representation increases. Nations with higher proportions of women in parliament are more likely to ratify environmental treaties (Norgaard & York, 2005), create more protected land areas (Nugent & Shandra, 2009), have lower CO_2 emissions (Ergas & York, 2012), experience less deforestation, and maintain more forest cover (Salahodjaev & Jarilkapova, 2020). Women legislators in the United States House of Representatives favour more stringent environmental policies (Fredriksson & Wang, 2011), and countries with higher women's political empowerment see long-term reductions in CO_2 emissions (Lv & Deng, 2018). Women members of the European

Parliament were significantly more likely than their male counterparts to support environmental legislation (Ramstetter & Habersack, 2019), and while increases in GDP can often increase emissions, nations with more gender equality see a much weaker association between GDP and CO_2 emissions (McGee et al., 2020). In high income democracies, women's representation correlates with increased renewable energy consumption over time (Salamon, 2023).

While these findings suggest that women are both more environmental and risk adverse than their male counterparts, and that their increased representation contributes to better environmental outputs and outcomes, this literature has not engaged sufficiently with the potential impacts of corruption on women's ability to influence policy when it comes to environmentalism. Thus, I next outline the role of corruption in women's ability to realistically impact policy.

Women's Representation and Corruption

The literature on women's representation and corruption is deep and wide-ranging. While much research has demonstrated that women's increased presence in governing bodies decreases corruption (Brollo & Troiano, 2016; Dollar et al., 2001; Esarey & Chirillo, 2013; Rose-Ackerman, 2008; Swamy et al., 2001), that corruption is detrimental to human rights and therefore to gender equality (Sung, 2003), and that in countries with high levels of corruption, fewer women are elected to government to begin with (Dollar et al., 2001; Stokemer, 2011; Esarey & Chirillo, 2013; Sundström & Wängerud, 2016), what is most relevant to the present research are the consequences of high-corruption contexts for women parliamentarians.

First, corrupt contexts can both discourage and disallow women's full participation in governments, hampering their potential to impact policy outputs and outcomes by helping to engrain existing power networks. Sundström and Wängerud (2016) argue that corruption causes 'shadowy arrangements' which benefit the already privileged, usually men, and "pose a direct obstacle to women when male-dominated networks influence political parties' candidate selection" (p. 354). Similarly, Randall and Svasand (2002) show that, in corrupt governments, political seats may be filled through patri-

archal clientelist networks which marginalize women candidates.

Next, corrupt governments often intentionally bolster women's representation for the express purpose of increasing public trust. Research shows that the presence of women candidates decreases voters' perceptions of election fraud (Barnes & Beaulieu, 2014); when women are both descriptively and substantively represented, public perceptions of corruption decrease (Watson & Moreland, 2014). Armstrong et al. (2022) find that while women's presence as finance ministers increases with corruption, "it is not simply the case that countries or leaders with an anti-corruption ethos are more likely to include women in politics, but rather that leaders who are likely to face electoral consequences for increasing corruption use women as anti-corruption symbols" (Armstrong et al., 2022, p. 1). Similarly, Valdini (2019) argues that when corruption scandals take place, "women's inclusion... becomes a valuable strategy in this environment due to their association with honesty and democracy; without actually changing any of the factors that led to the corruption scandal, elites see an opportunity to use women's inclusion as a means to repair the reputation of the party or government" (p. 63-64). She finds that in the aftermath of Spain's 1996 corruption scandals, the percentage of women candidates of all parties increased substantially, with the greatest increase in the corrupt party (Valdini, 2019). Additionally, in post-corruption scandal contexts, women's representation in legislatures increased by 9%, indicating greater voter support for women candidates (Valdini, 2019).

Corrupt governments may also instate gender quotas, or mechanisms which mandate a certain number of women to be included in government or party representation (Valdini, 2019). Similarly, quotas are often called upon in these corrupt contexts not to meaningfully include more women in governance, but to benefit the already-powerful. Gender quotas can draw 'good press' to parties or governments, appearing as permanent commitments to equality while actually being constructed such that they will be easily overturned by courts or made immediately ineffective; at the same time, they can disempower so-called "quota women" to the extent that the existing power of elites is actually bolstered (Valdini, 2019, p. 98). The "reproduction of patronage-based selection procedures means that quotas mainly provide illegitimate regimes with a solid

block of supporters in parliament" (Bjarnegård et al., 2018, p. 108). Valdini (2019) shows, with evidence from both Italy and Argentina, that "elites adopted a gender quota in each of these countries because they saw a potential political benefit from associating their governments with women in the post-[corruption] scandal context" (p. 123). Thus, women elected in corrupt contexts, whether by quotas or otherwise, may have vastly different experiences as legislators relative to women in non-corrupt contexts.

Importantly, tokenized women representatives in corrupt contexts are constrained in their ability to influence policy. Clayton and Zetterberg (2021) show with cross-national data from Africa that parties intentionally select women candidates with even higher party discipline than their male counterparts; once elected these women "are more constrained by expectations of party discipline than are men" (p. 1) because "as historical outsiders, [they] must do more to signal their commitment to the party" (p. 1) in order to maintain and sustain their political careers. In addition, women representatives elected in these contexts are constrained by "gendered expectations about proper behavior" (p. 1) which restrict them from taking political stances outside of their parties. Madsen (2019) explores the ways in which increased inclusion of women in the Ghanaian New Patriotic Party (NPP) was used to bolster the party's public perception; in reality, women were far from included, with one women MP recalling that "I had a member of Parliament tell me that I'm not in the kitchen so I should not be contributing to the debate in the committee" (Madsen, 2019, p. 81).

Notably, where corruption is not the norm, women representatives are less likely than their male counterparts to engage in corruption. Esarey and Schwindt-Bayer (2019) show that women are less likely than men to engage in corruption when "the risk of corruption being detected and punished by voters is high—in other words, when officials are held electorally accountable" (p. 659) because women are both more risk averse and held to a higher standard than men at the polls. Women may also have less opportunity to engage in corruption due to exclusion from power networks (Branisa & Ziegler, 2011; Goetz, 2007; Tripp, 2001). In fact, Alexander and Bagenholm (2019) find, in their analysis of Latin America and Europe, that women politicians "seem to be just

as keen or even keener on fighting corruption" (p. 187) than men politicians. Further, corruption decreases in countries in which women play larger political and economic roles (Branisa et al., 2013; Swamy et al. 2001). Thus, whether due to lack of opportunity or access, high-stakes consequences, or conscious opposition to corruption, the presence of more women in government will likely equate to less net corruption (Arriola & Johnson, 2014; Beck, 2003; Bjarnegård, 2013). Women representatives' policymaking choices may thus be less impacted by corrupt influences than men's policymaking in uncorrupt contexts. Yet where corruption is rampant, women representatives are just as corrupt as men (Esarey & Chirillo, 2013) and thus any benefit from increasing women's representation in these contexts relative to non-corrupt contexts may not play out. This literature suggests that, in order for women's representation to benefit environmental outputs and outcomes, levels of corruption must be low. Below, I explain how and why corruption is likely to be an anti-environment influence.

The Effects of Corruption on Environmentalism

Almost universally, corruption negatively impacts the environment. Because corruption often encourages politicians to accept bribes to limit the extent of environmental policies (Sundström, 2012), it is a leading source of environmental destruction (Desai, 1998). While democracies are generally more committed to climate change mitigation and have lower CO_2 emissions than non-democracies, "the benefits of democracy for climate change mitigation are limited in the presence of widespread corruption" (Povitkina, 2018, p. 411). At all levels of economic development, corruption increases pollution past manageable levels (Lopez & Mitra, 2000), weakens the authority of environmental policies and decreases pollution taxes (Damania et al., 2003), and "[reduces] the ability to respond to climatic stressors" (Rahman, 2018, p. 313). It diminishes the level of compliance with environmental regulations, encourages record falsification to hide harvesting of protected plant species (Wilson & Damania, 2005), and lessen fisherman's desire to comply with limits to their harvests when officials are easily bribed (Sündstrom, 2012).

Corrupt practices affect policy and implementation both immediately and long-

term, as research on the impact of a corrupt legacy on environmental outcomes shows that "both the current level of corruption-control and the stock of [past corruption] matter for climate change policies and cooperation" (Fredriksson & Neumayer, 2016, p. 457); thus, corrupt practices "mean that it will be more costly and take longer time to adapt to climate change" (Jacobson & Tropp, 2010, p. 85). The impact of corruption on environmental policies is "similar in magnitude to conventional explanations of environmental program strength, such as public environmentalism and state wealth [and] its impact is particularly pronounced in states with strong organized manufacturing interests" (Woods, 2008, p. 258).

Thus, where corruption is present, not only are women representatives constrained, but the influence of corruption is anti-environmental. In the next section, I explicate a theoretical framework linking women's representation, environmentalism, and corruption.

Why should women's participation in low corruption contexts result in better environmental outcomes?

Here, I develop a theoretical framework that suggests the existence of a conditional relationship between women's representation, corruption, and environmental outputs and outcomes. Because of the constraining effect of corruption on women's influence in the legislative process, and the generally anti-environmental impact of corruption, I predict that the potential benefit of women's representation for environmental outputs and outcomes suggested in the literature is conditional on corruption levels, and that greater representation of women in parliament will improve environmental outputs and outcomes only in contexts of low corruption. In these contexts, the increased inclusion of women's more left leaning, more environmental, and more risk averse preferences are more likely to manifest in environmentally friendly policy outputs and outcomes.

Because high corruption environments often breed situations in which women can indeed be elected to office, but are included merely to signal anti-corruption commitment (Armstrong et al., 2022; Bjarnegård et al., 2018; Valdini, 2019), it is more likely that women will be marginalized in governance in these corrupt contexts. In addition,

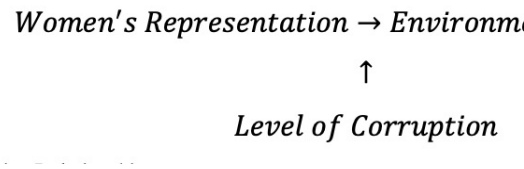

Figure 4.1: Conditional Relationship between women's representation, environmental outputs and outcomes, and corruption

women may work in congruence with powerful elites in contexts of corruption (Esarey & Chirillo, 2013). They may also be disproportionately constrained by their party platforms in order to maintain their political careers (Clayton & Zetterberg, 2021) as powerful elites are incentivized to select women who are outwardly supportive of the individuals or parties in power, who are inexperienced and therefore more easily controlled, or both (Valdini, 2019, p. 12). Thus, environmental benefit should not arise from the inclusion of women parliamentarians in high-corruption contexts.

Because women continue to make up a minority of representatives in virtually every parliament in the world (and all those included in my sample), women's pro-environmental preferences must survive passage through majority-male institutions to ultimately manifest in policy outputs and subsequent outcomes. Although male representatives have a lower likelihood of being in favor of environmental policy, increasing advocacy for environmental policy by women representatives could encourage more environmentalist support in government generally, which in turn could encourage new standards for environmental policy in parliaments. Additionally, men in non-corrupt contexts are less beholden to anti-environmental corrupt interests which may allow them more freedom to vote in congruence with women and pro-environmental agendas, especially when they face accountability through functioning democratic processes (Esarey & Schwindt-Bayer, 2017).

Thus, I predict it will be unlikely to see positive environmental outputs or outcomes as a result of women's participation in government when they are hindered institutionally. In contexts of lower corruption, women are less likely to be corrupt themselves, or to have gained office through elites' tokenization methods. By extension, they are less likely to be marginalized, sidelined, and silenced by powerful elites. Therefore, women

in less corrupt contexts retain more political power to put forth policy in line with their preferences. Thus, I predict that:

H1: Increased women's representation will lead to better environmental outputs and outcomes only in less corrupt governments.

Because women in corrupt contexts are as likely as men to be corrupt (Esarey & Chirillo, 2013) and often chosen specifically for their commitment to party or government status quo (Bjarnegård et al., 2018; Randall & Svasand, 2002; Valdini, 2019), it is probable that women's influence on environmental outcomes in highly corrupt contexts will be insignificant or even negative. Gender quotas are often instated merely to "provide illegitimate regimes with a solid block of supporters in parliament" (Bjarnegård et al., 2018, p. 108) and can intentionally disempower so-called "quota women" to the extent that the existing power of elites is actually bolstered (Bjarnegård et al., 2018; Randall & Svasand, 2002; Valdini, 2019). Thus, increases in the proportion of women representatives in corrupt contexts could signal even more active attempts to consolidate commitment to existing interests that result in environmental destruction. Thus:

H2: Increased women's representation in corrupt contexts may lead to worse environmental outputs and outcomes.

4.4 Methodology, Data, and Variables

To test the relationship between climate change outcomes, women's representation, and corruption, I conduct a time-series cross-sectional analysis of 58 democracies from 1997-2017. I use interaction terms to test the existence of conditional relationships. Due to the nature of the relationship I seek to uncover, I am interested in measuring the links between women's representation and environmental outputs and outcomes that have been identified in the literature as particularly vulnerable to the effects of corruption.

Bättig and Bernauer (2009) draw particular attention to investigating policy outputs, or political and legal commitments, and policy outcomes, the resulting changes in environmental measures like CO_2 emissions or forest area, side by side to help iden-

tify 'words-deeds gaps' in governments' approaches to policy issues and to acknowledge that policy outputs remain in control of policymakers to a greater extent than policy outcomes, which may be influenced by a host of other factors. Thus, I employ two categories of operationalizations of the dependent variable: policy outputs and policy outcomes.

Dependent variable: Policy Outputs

Climate Change Readiness Using the University of Notre Dame's Global Adaptation Index's measure of climate change readiness (Chen et al., 2015), I consider states' level of preparedness for climate change as policy output measure. The indicator is made up of three components. Economic readiness measures "the investment climate that facilitates mobilizing capitals from the private sector" (Chen et al., 2015, p. 4), governance readiness, which measures "the stability of the society and institutional arrangements that contribute to the investment risks, [as a] stable country with high governance capacity reassures investors that the invested capitals could grow under the help of responsible public service and without significant interruption" (Chen et al., 2015, p. 4) , and social readiness, which measures "social conditions that help society to make efficient and equitable use of investment and yield more benefit from the investment" (Chen et al., 2015, p. 4).

Corruption affects adaptation in a range of ways. As Mahmud and Prowse (2012) argue, the success of adaptation initiatives in states which foster high levels of corruption "depends partly on the level of fiduciary risk (in other words, that adaptation funds are used for intended purposes)" (p. 933). Where funds are lost to corrupt interests, adaptation measures fall short. According to the OECD, infrastructure investment for climate change adaptation will require over $6 billion a year through 2030, yet up to 33% could be lost to corruption (Timilsina, 2019). Similarly, Rahman (2018) finds that corrupt practices in Bangladesh "significantly reduce the ability to respond to climatic stressors" (p. 313) and undermine adaptive capacity. Jacobson and Tropp (2010) argue that while water crises will be "the primary medium through which climate change will have an impact on people's livelihoods, ecosystems, and economies" (p. 81), cor-

ruption will increase water sanitation costs by more than $48 billion. Considering the effect of corruption on this indexed variable of climate change readiness may demonstrate whether adaptation initiatives will be more successful when a greater number of women are involved in governance in low-corruption contexts.

Dependent variable: Policy Outcomes

Energy To measure energy outcomes, I consider CO_2 emissions per capita and renewable energy consumption as a percentage of overall energy consumption. Fredriksson et al. (2004) show that energy policy is impacted by corruption in that "greater corruptibility reduces the stringency of energy policy by shifting the government's relative weight away from welfare towards bribes, making it cheaper to purchase government influence" (Cole, 2007, p. 638; Demania et al., 2003). While the literature discusses in detail the existence of an environmental Kuznets curve (EKC) with regard to countries' per capita income and pollution levels (Lopez, 1994; Cole, 2007), Lopez and Mitra (2000) revisit this theory with specific attention to contexts in which corruption is high. The EKC assumes that policy is reflective of citizens' preferences. Yet, if government activity is beholden to corrupt interests, the EKC model may not hold (Cole, 2007). The authors thus put forth that "corruption will increase pollution levels above the socially optimal level" (Cole, 2007, p. 638; Lopez & Mitra, 2000).

CO_2 emissions can be influenced by corruption: Vasylieva et al. (2019) show that increased control of corruption correlates with significant decreases in greenhouse gas emissions. Goel et al. (2013) discuss the prevalence of under-reporting emissions in high-corruption countries, finding that higher corruption levels decrease reported CO_2 emissions by mis- or under-reporting, and that "corruption... [tends] to contribute negatively to (recorded) pollution levels" (p. 519). Cole (2007) finds that corruption has a direct and positive impact on per capita emissions.

The literature on renewable energy consumption is, in part, conflicting, while offering some evidence that corruption acts as a negative influence. While Bayer, Dolan, and Urpelainen (2013) find that corruption does not significantly influence innovation in the renewable energy sector, some literature has demonstrated other effects of corrup-

tion on renewable energy. Like most energy sectors, which generate rents and require government oversight to operate, activity in the renewable energy sector has prompted "international organizations such as the World Bank, which have been involved in the financing of energy infrastructure in the developing world, [to recognize] the need to reduce corruption, often by trying to strengthen governance" (Gennaioli & Tavoni, 2016, p. 262). Corrupt and criminal association offenses increased by 6% in windier Italian provinces compared to less windy provinces during the growth of the wind power sector (Gennaioli & Tavoni, 2016). Control of corruption positively correlates with greater renewable energy consumption (Uzar, 2020). Based on this limited literature I include a measure of renewable energy consumption as a dependent variable.

For the analysis conducted here, I derive both measures—CO_2 emissions in metric tons per capita and renewable energy consumption as a percent of overall energy consumption—from World Bank Data (World Bank Open Data, 2019a; World Bank Open Data, 2019b).

Natural Resources To consider natural resource outcomes, I use a measure of forest area as a percentage of total land area. Rates of deforestation have increased over time, particularly with the amplified human demand for agricultural, farming, and logging resources caused by exponential population growth (Koyuncu, 2008). In 2001, the UN Food and Agriculture Organization named corruption as a leading cause of deforestation (Koyunco, 2008), especially due to the forest sector's "high timber values, low visibility, low salaries of government officials, a far from standardized product, broad discretionary powers of local forestry officers to decide on a number of highly subjective matters, poor objective information, poorly-designed regulations, uneven distribution of power among players and the improbability of harsh punishment" (Koyuncu, 2008, p. 216). Corruption takes place through "the approval of illegal contracts with private enterprises by forestry offices, illegal sale of harvesting permits, under-declaring volumes cut in public forests, underpricing of wood in concessions, harvesting of protected trees by commercial corporations, smuggling of forest products across borders, allowing illegal logging, and processing forest raw materials without a license" (Koyuncu, 2008,

p. 216). While petty corruption in the public sector is a significant predictor of forest loss, grand corruption in the executive branch also significantly reduces forest area (Sommer, 2017). For this reason, Koyuncu and Yilmaz (2013) find that privatization of forest area decreases deforestation by reducing opportunities for corruption. Bulte et al. (2007) find that more corrupt governments pay more in subsidies to wealthy producers, at the cost of other public welfare spending, prompting more deforestation. Here, I use World Bank Open Data's (2020a) indicator of forest area as a percent of overall land area.

Independent Variable and Controls

The main independent variables of interest are corruption and women's participation in governance. Corruption is measured with the Worldwide Governance Indicators' Control of Corruption estimate from the Quality of Government Dataset (Dahlberg et al., 2020). This indicator measures "perceptions of corruption, conventionally defined as the exercise of public power for private gain" (Teorell et al., 2021, p. 541). While an absolute measure of corruption would be ideal, a measure of perceived corruption is often used as a substitute, as the secretive nature of corruption makes it extremely difficult to measure (Esarey & Schwindt-Bayer, 2019). I re-code the variable such that higher values indicate higher levels of corruption. To measure women's participation in governance, I use a measure of the proportion of seats held by women in national parliaments, which comes from the Worldwide Governance Indicators of the World Bank Group, which I access from the Quality of Government Dataset (Dahlberg et al., 2020).

I include common control variables found in corruption, environmental, and women's representation literature. A logged value of GDP per capita controls for the impact of state wealth and development on potential outcomes (Dahlberg et al., 2018); I include a squared value of GDP per capita in models considering CO_2 emissions. Human Development Index (HDI) provides another measure of development that goes beyond financial development measures. Measured by the United Nations Development Program, HDI accounts for the reality that "people and their capabilities should be the ultimate crite-

ria for assessing the development of a country, not economic growth alone" (Dalhberg et al., 2018, p. 133). The level of democracy (Freedom House/Imputed Polity) measure is a scaled variable and ranges from 0, least democratic, to 10, most democratic. Because only democracies as characterized by Hadenius and Teorell are included in this analysis, this variable controls only for level of democracy within states that already qualify broadly as democracies. The score is formulated by transforming both Freedom House and Polity's scores to a 0-10 scale and averaging them. Combining the two measures is demonstrated by Hadenius and Teorell (2005) to be more valid and reliable than each measure individually (Dahlberg et al., 2018, p. 77). Because representatives may be more likely to pass legislation in line with democratically-popular issues, like climate change mitigation, when they can be adequately punished at the polls, controlling for democracy may help control for the variance attributable to accountability. I also control for the effective number of parties, as this serves as an indication of the fragmentation of the party system (Dahlberg et al., 2018). Finally, I control for natural resource rents (World Bank Open Data, 2020b), as environmental outcomes may be worse in states that see significant financial benefit from the extraction of resources.

Methods and Modeling

I conduct interaction models using the above variables. In these models, each environmental outcome indicator is regressed on the interaction of women's political participation and corruption level. I measure these variables in country-year units of analysis, yet include models with country-election term units of analysis in Appendix B Table B.6 and Appendix Figure B.4.

In all time-series cross-sectional models, it is imperative to include both time fixed-effects as well as country fixed-effects, as the former help capture global trends over time (for example, the global trend towards higher CO_2 emissions), while the latter control for country-level variation that does not vary with time (for example, one state may have access to alternative forms of low-emission energy that another state lacks). The fixed effects model is used to avoid inconsistency of a pooling model when the individual error component is correlated with the regressors, which was the case with

the data used here. Yet, this will not capture time-varying within country changes that correlate with corruption. This regression equation takes the form:

$$y_{it} = \beta_1 x_{1it} + \beta_2 x_{2it} + \beta_3 x_{1it} x_{2it} + \gamma_i + \delta_t + \epsilon_{it}$$

where country is the individual component i, t is the year, y_{it} is the dependent variable, each x_{it} is a time-varying independent variable, $\beta_3 x_{1it} x_{2it}$ is the interaction, γ_i is the country fixed effect, δ_t is the time fixed effect, and ϵ_{it} is the error term. Performing an augmented Dickey Fuller test on the data set reveals that the time series is stationary; full results of this test are printed in Appendix Figure B.1.

4.5 Results

As described above, I predict that the proportion of women in parliaments will correlate with better environmental outputs and outcomes in contexts of low corruption. Thus, I expect that as the proportion of women increases, climate change readiness, a policy output, will increase. I also expect that as the level of corruption decreases, policy outcomes of CO_2 emissions will decrease while renewable energy consumption and forest area will increase. Regression outputs of interaction models containing all dependent variables of interest are printed in Tables 4.1 and 4.2.

Existing literature has suggested that women's entrance to politics may be hindered by corruption (Esarey & Chirillo, 2013). Thus, it is necessary to plot my sample's distribution of women's parliamentary participation across corruption levels to ensure that high levels of women's representation are not too strongly clustered only in low-corruption contexts, as this could bias regressions measuring the relationship between women's representation and environmental outputs and outcomes. Yet, Figure 4.2 demonstrates that this is not the case, as a high levels of women's representation are not clustered in only low-corruption contexts.

In addition, if a modifying variable is affected by the treatment, regression results may face post-treatment bias (Keele & Stevenson, 2021). One way of mitigating this is to measure the conditioning variable "temporally prior to the treatment" (Keele &

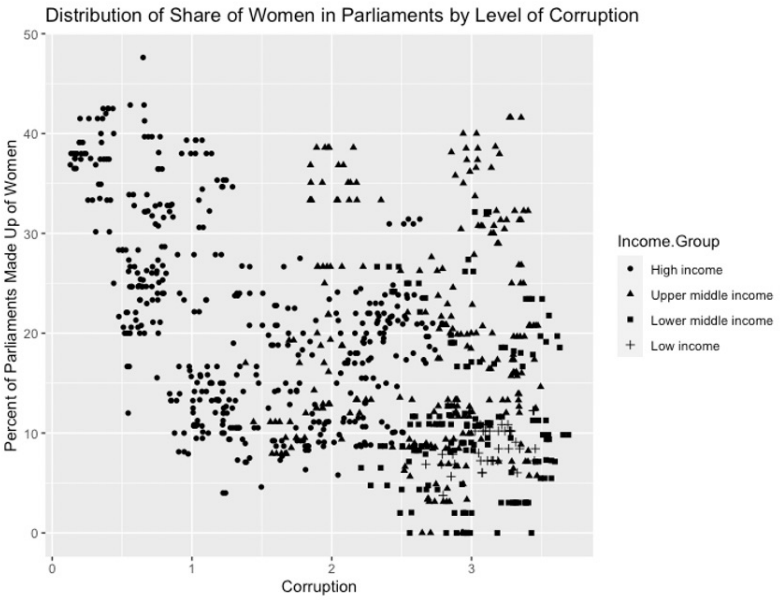

Figure 4.2: Scatterplot of the proportion of women in parliament by corruption level

Stevenson, 2021, p. 646) to ensure that the moderating variable is unaffected by the treatment. Thus, I re-conduct the main regressions using lagged measures of corruption at t-1, t-3, and t-5, as measuring moderation from the conditioning variable at lagged times may help address questions of reverse causality. With lags of 1 and 3 time units, results mirror regression results in Tables 4.1 and 4.2 while in some cases significance begins to disappear with a lag of 5 time units. These results can be found in Appendix B Tables B.7, B.10, and B.11 and Figures B.5, B.9, and B.10.

Before conducting moderation analysis, it is important to determine if the proportion of women in parliament impacts corruption levels, or alternatively if corruption levels impact the proportion of women in parliament. In Appendix B Tables B.8 and B.9 and Figure B.6, I conduct mediation analyses which show that measures of women in parliament and corruption are not significantly correlated in this sample, and that a mediative relationship does not exist. This suggests that results of interaction models are not biased, and that the effects of women in parliament on environmental outputs and outcomes are indeed dependent on the contexts of corruption, rather than influencing or being influenced by corruption levels. Appendix B Figures B.7 and B.8 show

that while the proportion of women in parliament has grown substantially over the sample period of just 20 years, corruption levels have stayed essentially stable over this period.

Tables 4.1 and 4.2 contain time series cross-sectional regression results of both environmental outputs and outcomes. Due to the nature of the interpretation of interaction models, I include the plotted marginal effects of these models in Figure 4.3. Significance levels should not be derived directly from the regression table—rather, where plotted estimated coefficients and their confidence intervals do not contain zero (which is demarcated with a dotted line) relationships are significant.

The results in Figure 4.3 demonstrate support for **H1**: in contexts of low corruption, increased women's representation significantly and positively impacts both environmental outputs and outcomes. Climate change readiness, a policy output, increases significantly as women's representation increases and corruption decreases. CO_2 emissions per capita decrease, while renewable energy consumption and forest area increase, with women's representation in less corrupt contexts. Consistent with **H2**, these environmental benefits do not hold in higher-corruption contexts: the marginal effects of women in parliament are negative and significant.

The proportion of women in parliament significantly benefits climate change readiness where corruption is equal to or lower than about 2.25, which includes countries like Barbados, Botswana, Canada, the Czech Republic, Finland, and Greece. With a corruption score of about 1.5, climate change readiness, which ranges from 0.25 to 0.82, would be 0.001 units greater for each 1% increase in the proportion of women in parliaments. Thus, a state with a parliament made up of 50% women —complete gender parity—would have climate change readiness score 0.05 higher than a country with no women in its parliament. As readiness scores in this sample range from 0.25 to 0.82, this equates to an 8.77% increase in climate change readiness. For a country like Germany, which scored 0.75 on the corruption scale in 2016, increasing women's representation from 30.7 to 50 percent could increase their already high 0.72 climate change readiness score by 0.014, or 2.46%.

Similar patterns emerge with policy outcomes measures. The proportion of women

Table 4.1: Regression Results of the interaction of women and parliament and corruption levels on policy output.

	Dependent variable: Climate Change Readiness
Women in Parliament	0.002***
	(0.0004)
Corruption	-0.044***
	(0.005)
Women in Parliament x Corruption	-0.001***
	(0.0002)
log GDP	0.019***
	(0.004)
HDI	0.282**
	(0.087)
Democracy level	0.005.
	(0.003)
Resource Rents	-0.001.
	(0.0004)
Number of Effective Parties	0.0001
	(0.001)
Observations	658
R^2	0.992
Adjusted R^2	0.991
Residual Std. Error	0.014 (df = 583)
F Statistic	953.516*** (df = 74; 583)
Significance levels	* p<0.1; ** p<0.05; *** p<0.01 .

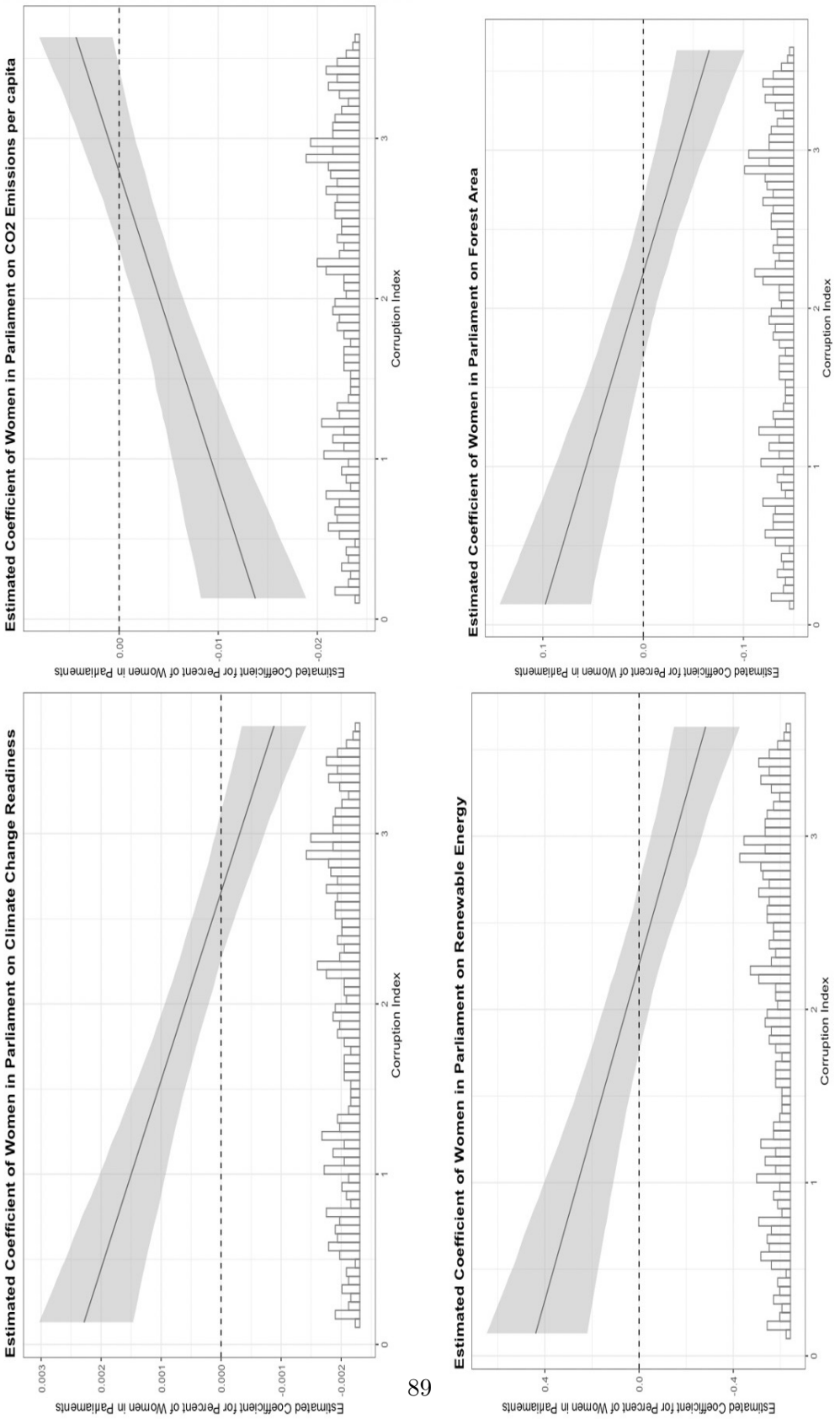

Figure 4.3: Plotted marginal effects of the proportion of women in parliament on all dependent variables: CO_2 emissions, renewable energy consumption, forest area, and climate change readiness.

Table 4.2: Regression Results of the interaction of women and parliament and corruption levels on policy outcomes.

	Dependent variables:		
	CO_2 emissions	*Renewable Energy Consumption*	*Forest Area*
Women in Parliament	-0.014***	0.463***	0.104***
	(0.003)	(0.111)	(0.025)
Corruption	-0.188***	7.539***	1.600***
	(0.034)	(1.217)	(0.290)
Women in Parliament x Corruption	0.005***	-0.205***	-0.046***
	(0.001)	(0.042)	(0.010)
log GDP		-2.806**	0.157
		(1.031)	(0.248)
log GDP^2	0.066***		
	(0.014)		
HDI	2.801***	-54.013*	10.366.
	(0.616)	(22.195)	(5.322)
Democracy level	-0.009	0.453	0.135
	(0.020)	(0.732)	(0.176)
Resource Rents	0.006.	-0.234*	-0.042
	(0.003)	(0.109)	(0.026)
Number of Effective Parties	-0.006	0.373**	-0.076*
	(0.004)	(0.141)	(0.034)
Constant	-1.313***	66.111***	15.141***
	(0.389)	(14.013)	(3.361)
Observations	658	652	657
R^2	0.984	0.972	0.998
Adjusted R^2	0.982	0.968	0.998
Residual Std. Error	0.100 (df = 582)	3.652 (df = 577)	0.878 (df = 582)
F Statistic	482.037*** (df = 75; 582)	267.722*** (df = 74; 577)	4,413.072*** (df = 74; 582)
Significance Levels	*p<0.1; >**p<0.05; >***p<0.01		

in parliaments leads to significant decreases in CO_2 emissions where corruption is equal to or less than about 2.5. This includes countries like Hungary, Japan, Luxembourg, Finland, Dominica, Chile, Canada, and Botswana. With a corruption score of 2.0, CO_2 emissions per capita would be 0.05 metric tons lower with each one percent increase in the percentage of women in parliament. So, a state with 50% women in its parliament would have CO_2 emissions 2.5 metric tons per capita less than a state with no women in its parliament. For a country like Chile, where CO_2 emissions per capita was 4.73 and corruption was 1.45 in 2016, increasing women's representation from 15.83 to 50 percent could drop their CO_2 emissions by 1.71 metric tons per capita, or over a third.

The proportion of women in parliament correlates with significant increases in renewable energy consumption where corruption is equal to or lower than about 1.75, which includes countries like Austria, Barbados, Costa Rica, Denmark, Germany, and Malta. With a corruption score of about 1.5, renewable energy consumption would be about 0.38% higher for each 1% increase in women in parliament. Thus, if women

made up half of a state's parliamentarians, that state would be expected to consume 19% more renewable energy than a state with no women in its parliament. A country like Israel, with a corruption score around 1.5, would see a 13.6% increase in renewable energy consumption if women's representation rose to 50%.

The effect of women in parliament on forest area is significant where corruption is equal to or less than about 1.6, which encompasses countries like Australia, Belgium, Iceland, Israel, and Japan. With a corruption score of 1.5, forest area is predicted to grow by about 0.4% for each 1% increase in women in parliament. If women made up 50% of a states' parliament, 20% more of that state should remain forest area compared to a state with no women in its parliament. If heavily forested country like Brazil, which scores 3.13 in corruption in 2017, decreased their corruption by 1.63 and increased their women's representation to 50%, forest area should increase by about 15.7%.

In Appendix B, I conduct additional testing of the proposed relationship by replacing the independent variable of women in parliament, a measure of women's descriptive representation, with the proportion of female secondary school enrolment, a measure of the substantive representation of women's interests and preferences. Higher enrolment of girls in secondary school indicates a state commitment to providing education for girls, a clear representation of women's interests. Such a measure thus captures whether governments actively seek to advance women's status and also whether women's voices are tokenized or marginalized in government. This serves as a robustness check to the findings considering women's numerical representation in parliaments, a strategy similar to that of Watson and Moreland (2014). This data comes from World Bank Open Data (2021) and the results of these models largely mirror the results of the main models presented in Table 4.1 and Figure 4.3.

Additional Robustness Tests

While I set forth theory and evidence that women's involvement in policymaking processes has beneficial effects for environmental outcomes in contexts of low corruption, political parties may also play a role in this relationship. While Kroeber (2022a, 2022b) shows that women's increased participation as both leaders and members of parties

pushes these parties towards more environmental political positions, I account for the percentage of seats in by leftist parties from the Database of Political Institutions (Cruz et al., 2021) in the robustness-check models in Tables 4.3 and 4.4. Table 4.3 controls for the percentage of seats held by government leftist parties, while Table 4.3 controls for the percentage of seats held by both government and opposition parties. In addition, I include an additional measure of each lagged dependent variable in these robustness checks. Although I control for time and country fixed effects in the previous models, controlling for lagged dependent variables additionally helps to control for autocorrelation (Keele et al., 2016) in line with methodologies applied in similar research (Alexiadou, 2015). Plotted marginal effects are displayed in Figures 4.4 and 4.5.

While inclusion of the percentage of left party seats and lagged dependent variables do impact significance levels relative to models which do not include these controls, the results largely hold and suggest significant relationships between women's representation and environmental outcomes in contexts of low corruption. Only one environmental measure, renewable energy consumption, loses significance to the traditional 0.05 level, yet the direction of the relationship remains the same, indicating that women's representation is associated with more renewable energy consumption where corruption is low relative to higher-corruption contexts.

4.6 Conclusion

Melody Valdini's (2019) observation that "women's presence does not equal women's power" (p. 72) embody the criticism of much quantitative research that has attempted to measure the effects of the gender makeup of parliaments on political outcomes: the simple existence of women parliamentarians does not always mean that these women have the ability to change policies or outcomes. Women may be included in political arenas for purposes expressly unrelated to increasing women's descriptive or substantive representation and used as mere symbols by powerful elites to gain the trust and support of their constituents. In addition, in contexts of high corruption, women parliamentarians are just as likely to perpetuate corruption as their male counterparts. In this analysis, I contribute to the growing subfield of gender and climate change by

Table 4.3: Regression Results of the interaction of women and parliament and corruption levels on policy outputs and outcomes, controlling for leftist government party seats and lagged dependent variables.

	Dependent variables:			
	Climate Change Readiness	Log CO2 Emissions Per Capita	Renewable Energy Consumption	Forest Area
Women in Parliament	0.001***	-0.007**	0.120	0.090***
	(0.0004)	(0.003)	(0.082)	(0.026)
Corruption	-0.021***	-0.120***	1.977**	1.261***
	(0.004)	(0.032)	(0.972)	(0.309)
Log GDP per capita	0.014***		-1.827**	-0.134
	(0.003)		(0.747)	(0.244)
Log GDP per capita2		0.059***		
		(0.013)		
HDI	0.120*	2.188***	-2.689	10.707**
	(0.070)	(0.546)	(16.510)	(5.223)
Democracy Score	0.006***	0.003	0.641	0.246
	(0.002)	(0.018)	(0.531)	(0.174)
Resource Rents	-0.0002	0.004	-0.045	-0.035
	(0.0003)	(0.003)	(0.080)	(0.026)
Effective Number of Parties	-0.001	-0.003	0.086	-0.075**
	(0.0004)	(0.003)	(0.101)	(0.032)
Percent Government Left Seats	-0.003	-0.030	-0.756	-0.439**
	(0.003)	(0.020)	(0.602)	(0.195)
Laggged Dependent Variable	0.337***	0.032***	0.631***	0.210***
	(0.025)	(0.004)	(0.027)	(0.018)
Women in Parliament x Corruption	-0.001***	0.003**	-0.033	-0.033***
	(0.0001)	(0.001)	(0.031)	(0.010)
Observations	558	558	523	557
R2	0.996	0.989	0.987	0.998
Adjusted R2	0.995	0.988	0.985	0.998
Residual Std. Error	0.011 (df = 492)	0.084 (df = 492)	2.410 (df = 458)	0.814 (df = 491)
F Statistic	1,699.587*** (df = 65; 492)	678.830*** (df = 65; 492)	550.875*** (df = 64; 458)	4,926.100*** (df = 65; 491)
Significance Levels	*p<0.1; **p<0.05; ***p<0.01			

Table 4.4: Regression Results of the interaction of women and parliament and corruption levels on policy outputs and outcomes, controlling for leftist party seats (government & opposition) and lagged dependent variables.

	Dependent variables:			
	Climate Change Readiness	Log CO2 Emissions Per Capita	Renewable Energy Consumption	Forest Area
Women in Parliament	0.001***	-0.007**	0.122	0.091***
	(0.0004)	(0.003)	(0.082)	(0.026)
Corruption	-0.020***	-0.116***	1.891*	1.223***
	(0.004)	(0.032)	(0.973)	(0.310)
Log GDP per capita	0.013***		-1.936***	-0.184
	(0.003)		(0.747)	(0.244)
Log GDP per capita2		0.058***		
		(0.013)		
HDI	0.121*	2.150***	-0.077	11.492**
	(0.071)	(0.550)	(16.605)	(5.245)
Democracy Score	0.006**	0.001	0.694	0.263
	(0.002)	(0.018)	(0.532)	(0.174)
Resource Rents	-0.0003	0.004	-0.044	-0.038
	(0.0003)	(0.003)	(0.079)	(0.025)
Effective Number of Parties	-0.001	-0.003	0.077	-0.077**
	(0.0004)	(0.003)	(0.101)	(0.032)
Percent Left Seats	-0.002	0.010	-1.391*	-0.566**
	(0.004)	(0.027)	(0.834)	(0.263)
Lagged Dependent Variable	0.339***	0.033***	0.633***	0.212***
	(0.025)	(0.004)	(0.027)	(0.018)
Women in Parliament x Corruption	-0.001***	0.002**	-0.033	-0.034***
	(0.0001)	(0.001)	(0.031)	(0.010)
Observations	558	558	523	557
R2	0.996	0.989	0.987	0.998
Adjusted R2	0.995	0.987	0.985	0.998
Residual Std. Error	0.011 (df = 492)	0.085 (df = 492)	2.406 (df = 458)	0.814 (df = 491)
F Statistic	1,694.899*** (df = 65; 492)	675.854*** (df = 65; 492)	552.343*** (df = 64; 458)	4,921.686*** (df = 65; 491)
Significance Levels	*p<0.1; >**p<0.05; >***p<0.01			

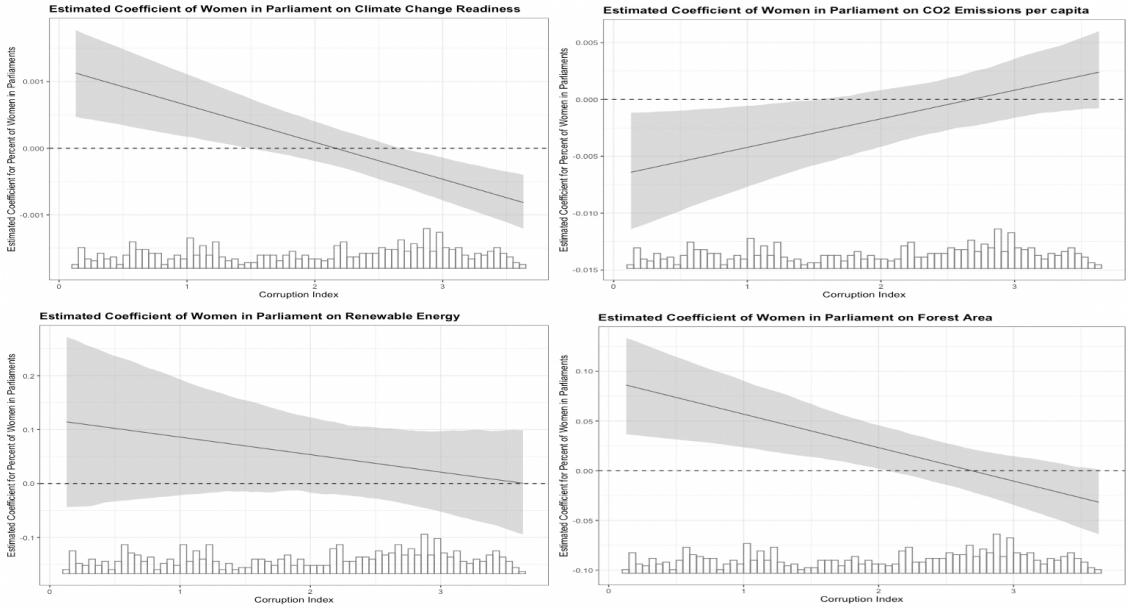

Figure 4.4: Plotted marginal effects of the proportion of women in parliament on all dependent variables, controlling for leftist government party seats and lagged dependent variables.

disentangling the relationship between women's parliamentary participation and environmental outcomes with specific attention to the level of corruption at play in these contexts, a dynamic previously unexplored.

I assert that in low-corruption contexts, women representatives are less likely to be tokenized by elites to serve as symbols of anti-corruption commitment. Thus, in low corruption environments, it is more likely that women parliamentarians have real agency and power and are less beholden to powerful elites. This fosters an environment in which women's preferences—which tend to be more environmental, left-leaning, and risk averse—can more notably impact policy and outcomes. Results support this theoretical foundation: where corruption is low, increases in women's parliamentary participation benefit environmentalism, results which do not hold in corrupt contexts.

Importantly, the marginal effects of increased women's political participation in low-corruption democracies are substantively large. In a world in which women representatives make up half of legislatures—full gender parity, a distant yet desirable goal—environmental benefits would be far from negligeable. With global pressure to

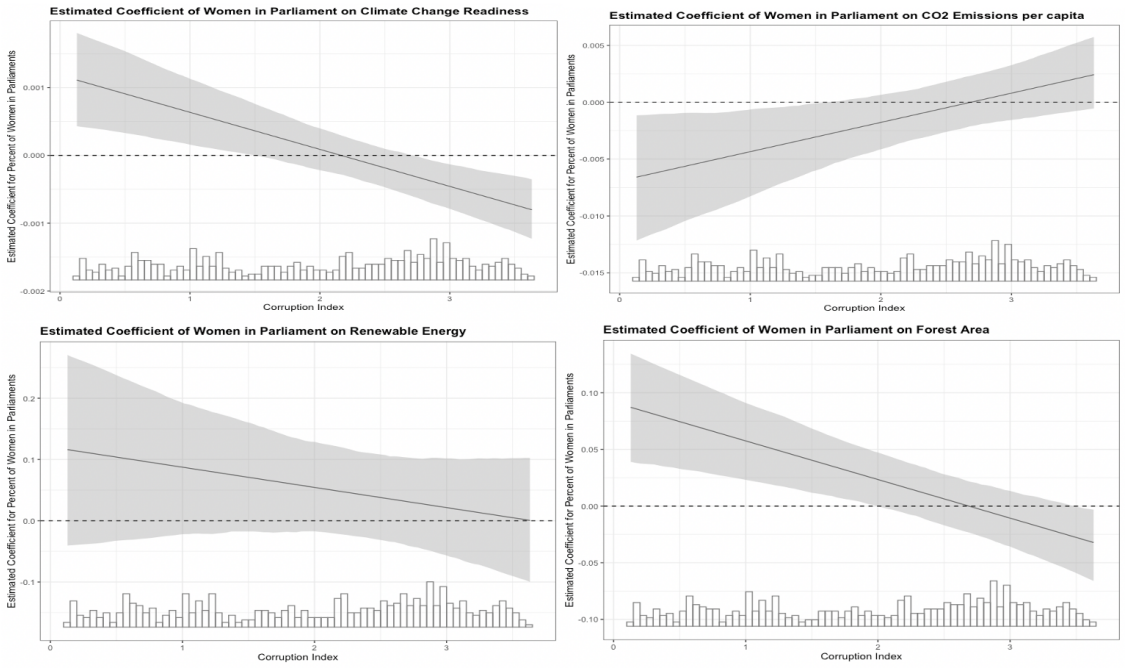

Figure 4.5: Plotted marginal effects of the proportion of women in parliament on all dependent variables, controlling for leftist party seats (government & opposition) and lagged dependent variables.

meet the Paris Climate Agreement's goal of stopping global warming beyond 1.5 degrees Celsius, many countries aim for net zero emissions by 2050 (Bazilian & Gielen, 2020). If growing renewable energy consumption by nearly 20%, decreasing per capita CO_2 emissions by over 2 metric tons, increasing forest cover by 20%, and being nearly 9% more ready for the effects of climate change is contingent on both lowering corruption levels and achieving full gender parity in parliaments, these goals should be pursued with haste by the global community.

While this analysis sheds light on the importance of institutional context for women's representation, it leaves many questions unanswered. Firstly, what other political arenas may be impacted by women's 'real' inclusion? If a lack of corruption allows women representatives more leeway in enacting their preferences, what other preferences, outside of environmental ones, do women put forth in policy when they have the power to do so? The theory and mechanisms here should thus be tested for their generalizability to other issue areas. Future research should also parse out just what goes on in policy-making processes that eventually lead to environmental benefit, and open the black box of how women parliamentarians act in their capacity as parliamentarians. Engagement with the potential for a mediative relationship between women's representation, corruption, and environmentalism should be more carefully explored, potentially taking a narrower focus than the 20 years and nearly 60 countries studied here. Using more qualitative research methods to engage directly with women parliamentarians may shed new light on this yet unexplored territory and could continue to add rich understanding to the subfield of gender and climate change.

Chapter 5

The Consequences of Gender Equality for Fossil Fuel Industries: Towards a Research Agenda

5.1 Abstract

Existing research indicates both that fossil fuel-reliant states have poor gender equality outcomes and also that women's involvement in governance leads to beneficial environmental outcomes. Yet, this literature has yet to investigate the consequences of increased economic and political gender equality on fossil fuel industries. I assert in this agenda-setting paper a theoretical justification for continued research on this topic by exploring that, because fossil fuel-dependent states may rely more heavily on labor conducted by men, they may more greatly favor the protection of male interests; thus, the over-representation of male interests in both the economy and politics may perpetuate fossil fuel industries. I use time series cross sectional data from 1990 to 2020 to offer an initial investigation of the correlational relationships between women's increased participation in the labor force (WLFP) and political empowerment (WPE) and states' rates of fossil fuel exportation. I identify additional factors that may play

a role in the relationship between women's empowerment and fossil fuel exports, particularly in contexts of intense patriarchy usually found in fossil fuel-reliant states. On this basis, I outline why additional research is needed to better explore the relationship between women's empowerment and economic reliance on fossil fuel industries.

5.2 Introduction

In order to "give the world a 50% chance of preventing devastating climate breakdown" (Taylor, 2022, p. 1), leading climate research indicates that all oil and gas production must end by 2034 in the world's richest countries and 2050 in its poorest (Taylor, 2022). This rapidly approaching target requires coordinated effort on the part of governments and private industry alike, yet also requires that the factors which promote the shift away from fossil fuel reliance be identified. While research relating to women's political equality and environmentalism demonstrates that meeting many environmental goals—like decreasing CO_2 emissions (Ergas & York, 2012; Lv & Deng, 2018; McGee et al., 2020), increasing renewable energy usage (Salamon, 2023), and stopping deforestation (Salahodjaev & Jarilkapova, 2020)— is linked to women's inclusion in political decision-making, little attention has been paid to the role of gender equality in the extraction, sale, and use of fossil fuels in the first place. While Ross (2008) finds that economic growth based on oil and mineral extraction "discourages women from entering the labour force and tends to exaggerate gender inequalities" (107), existing research thus far has paid little attention to the role of women's empowerment in the large-scale transition away from the extraction of fossil fuels. Here, I set forth a theoretical and empirical justification for a research agenda which more deeply interrogates the relationship between women's empowerment, both politically and economically, and the perpetuation of the fossil fuel industry.

Labour markets "are typically segregated by gender: men work in some occupations and women, in others, even when their qualifications are similar" (Ross, 2008, p. 108). This is especially true of the fossil fuel labour market. In even the United States, a developed economy with 47% female labour force and high women's educational attainment, only 15% of the oil and gas sector is comprised of women, with a mere 8%

of manufacturing, field engineering, and other technical operation roles filed by women (Petroleum Equipment & Services Association, 2018). Tsani et al. (2012) emphasise that "oil-rich countries tend to have non-diversified male-dominated private sectors [with]... fewer employment opportunities for women" (Tsani et al., 2012, p. 2).

While fuel-reliant states produce negative outcomes for women (Ross 2008), investigating the role that gender equality may play in perpetuating reliance on fossil fuel industries in the first place is necessary. Thus, I put forward a theoretical basis for investigating the impact of women's political and economic empowerment on states' reliance on fossil fuel exportation. First, because fuel industry labour opportunities are so heavily male-dominated (Mehnert, 2019), women's increased participation in the labour force (WLFP) may help foster growth in diverse sectors outside of the oil industry. Thus, increased women's participation in work outside of unpaid domestic labour may decrease countries' reliance on male-dominated industries, including the fossil fuel industry. Second, because Fish (2002) finds that household-level patriarchal social relations are the best predictor of autocratic and patriarchal governments, men's political preferences may be more favoured to the detriment of women's preferences where societies rely most heavily on male labour. It is likely that where household income is largely, or only, dependent on male labour, households will be more socially patriarchal, and thus project patriarchal relations into society at large. Existing literature on petro-masculinity explicates the connections between hyper-masculinity and climate change denial (Daggett, 2018), helping to explain the relationship between gender relations and fossil fuel usage. Thus, I suggest that growth in women's political empowerment (WPE) may have similarly important implications for fossil fuel extraction.

On this theoretical basis, I assert that questions such as: a) does the exclusion of women from the labour force and political sphere reinforce these states' dependence on resource industries, and b) does the increase of women's participation in the labour force and political empowerment destabilize states' reliance on fossil fuel exportation, should be subjected to investigation in the literature. As a preliminary step in this direction, I conduct descriptive statistical analysis of time series cross-sectional data from the 30-year period of 1990 to 2020, which documents a correlational relationship

between women's empowerment and fuel exports. I then take an additional step towards unpacking this relationship by offering further analysis of three global trends which I identify as being potentially instrumental in the relationship between women's empowerment and fossil fuel exports: democracy, economic diversification, and internet use. I show, in line with my theoretical framework, that democracy levels, economic diversification, and internet use correlate negatively with fuel exportation, whereas all three global trends correlate positively with WLFP and WPE. While preliminary and descriptive, these results serve as justification for a continued research agenda seeking to uncover the role of women's empowerment in decarbonisation.

5.3 Connecting WLFP, WPE, and the Fossil Fuel Industry

In the following section, I first address relevant literature explicating why and how increased women's economic and political equality could impact reliance on fossil fuel industries. I then address additional global trends which could improve gender equality, and lessen fuel exports, in states with high reliance on fossil fuel industries.

5.3.1 Women's Labour Force Participation: Trends and Economic Impacts

Global rates of WLFP have steadily increased over time. Figure 5.1 shows that the global WLFP average has grown by about 6% in the past 30 years, yet huge variations across countries persist. Much research has focused on the reason for this growth. Cavalcanti and Tavares (2008) find that falling prices of home appliances can account for over 10% of the increase in WLFP from 1975-1999. Because women still bear the majority of household caretaking and childcare responsibilities even when both parents are employed (Bianchi et al., 2000), women are able to engage in employment outside of the home when timesaving appliances help to cut down on the time necessary to undertake still-gendered household work. Blau (1998) finds that increased WLFP may also be attributed to "increasing wives' real wages exceeding the income effect of rising

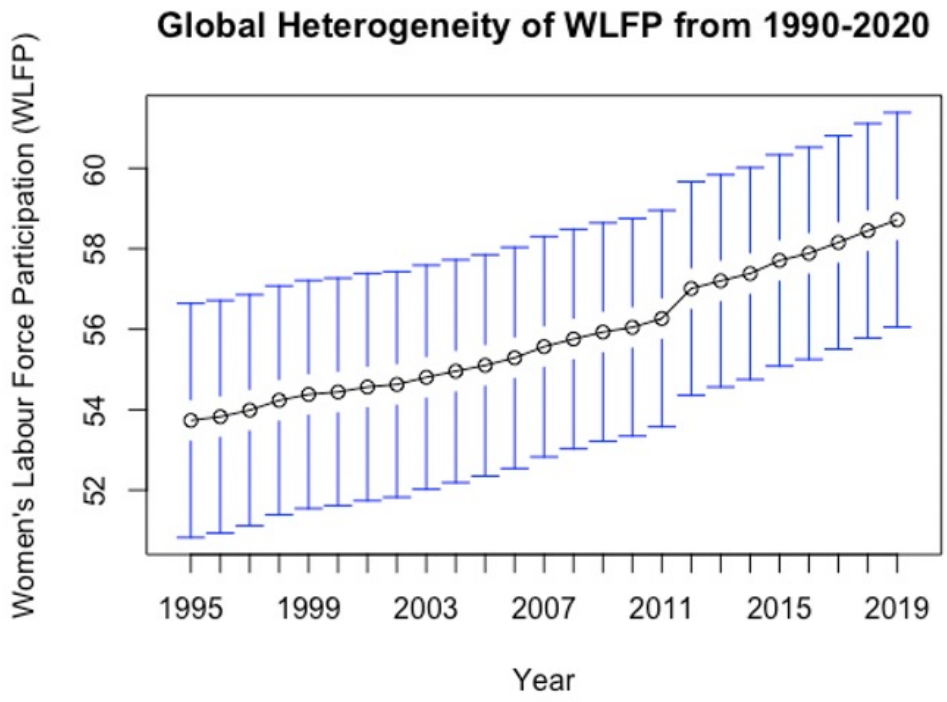

Figure 5.1: Change in mean WLFP (% of female population over 15 years old in the workforce, modelled ILO estimate), including all sample countries, from 1995-2020 with confidence intervals (World Bank Open Data, 2022a).

husbands' real wages; increasing educational attainment and divorce rates, and declining fertility and marriage rates" (Watson et al. 2018, p. 49). Complimentarily, Klasen and Pieters (2015) find that increases in household income and husbands' educational attainment had a negative impact on WLFP in India from 1987-2009.

The growth of women's participation in the formal workforce has enormous economic consequences with particularly relevant effects for highly male-dominated industries. Countries in which women are more educated have better social and health outcomes, as well as greater levels of economic growth (Hill & King, 1995). Aaron Benavot's 1989 study confirmed that "increases in female primary enrolment ratios have larger effects than male ratios on economic growth, especially in African and Latin American countries" (Hill & King, 1995, p. 26). More recently, Ghosh (2022) found that gender equality positively influences economic growth and trade diversification. Such consistent empirical links between increased women's equality and positive

economic outcomes (Bahramitash & Slaehi Esfahani, 2016) have contributed to the "consensus that empowering women is a way to enhance growth and couple it with equality, especially for women" (Bahramitash & Slaehi Esfahani, 2016, p. 155).

Because the fossil fuel industry is dominated largely by masculine labour (Petroleum Equipment & Services Association, 2018), Tsani et al. (2012) emphasise that "oil-rich countries tend to have non-diversified male-dominated private sectors [with]... fewer employment opportunities for women" (p.2), which can inhibit economic diversification. Yet, existing research regarding the economic impacts of increased women's labour force participation shows that increased WLFP not only leads to economic growth, but to economic diversification. Kazandjian et al. (2019) show that gender inequality inhibits economic diversification, and is "negatively associated with both output and export diversification in low-income and developing economies" (p. 6). Further, Abou-Shouk et al. (2021) find that women's empowerment in three oil-rich Arab countries positively and significantly increased tourism development. Lagarde and Ostry (2018) emphasize that because women and men bring different expertise, approaches, and skills to the workplace, "adding more women to the labour force should bring larger economic gains than an equal increase in male workers" (p. 1). The Aid for Trade initiative, run by the OECD and WTO, reports that "we need to consider that the economic empowerment of youth and women is not the outcome of the process of economic diversification, but frequently the starting point" (OECD/WTO, 2019, p. 3). While WLFP may ultimately be impacted by a variety of factors, existing research suggests that increases in women's labour force participation will help to bring about greater economic diversification: this could have major impacts on states' dependence on male dominated industries, such as the fossil fuel exportation industry.

Notwithstanding fossil fuels' widespread harm to the Earth's ecosystems, climate, and hospitability, the highly-lucrative nature of fossil fuel industries means that economic reliance on these industries is often strong for many states rich in fossil fuel reserves, even with incentives towards economic diversification and more environmentally friendly energy sources. Yet, even with some research clearly indicating the role that increased WLFP yields for economies, little research has been conducted on the

specific role that increased women's economic empowerment may play in the transition away from fossil fuels and towards renewable energy sources.

5.3.2 Potential Consequences of increased WPE for Fossil Fuel Industries

In addition, an increasing body of literature continues to demonstrate that women, while a diverse and heterogenous group, by and large have distinct preferences from their male counterparts. Thus, increased political empowerment for women could have substantive effects for political outcomes, particularly in democracies where citizens' preferences impact governance through electoral accountability. In the early and mid-20th century women tended to vote more conservatively than men, yet these preferences have moved increasingly to the left of men's in the past four to five decades and continue to do so (Emmenegger & Manow, 2014; Abendschön & Stenmetz, 2014). Scholars attribute this change largely to "changed employment patterns, women's higher educational achievements, higher divorce rates, and consequently more single mothers" (Emmenegger & Manow, 2014, p. 167). These changes in women's daily lives contribute to their preferences for social and family support programs, redistribution, and child welfare (Cascio & Shenhav, 2020), poverty reduction, health care, and women's rights (Clayton et al., 2019) relative to their male counterparts; all such issues have been more successfully promoted by left parties (Keith & Verge, 2018).

Yet most relevant to the theoretical framework being developed here is the literature on gender and climate change. First, women's and men's experiences of environmental destruction differ. Especially in the developing world, women are more likely to be harmed, killed, and financially damaged by natural disasters due to lack of independent finances, social and cultural norms, and lack of social support (Denton, 2002; Figueirdo & Perkins, 2013; Fonjong, 2008; Lookabaugh, 2017; Makina & Moyo, 2016; Neumayer & Plumper, 2007). Agarwal (2010) shows that, because women are often in charge of family resource provision, they are more impacted than men when these resources become scarce or unavailable due to climatic change and disasters. In the developed world, Carlsson-Kanyama and Lindén (2007) show that as energy pricing and availabil-

ity varies, the disproportionate amount of time that women spend on household tasks relative to men increases.

It is thus unsurprising that women tend to have more environmentally-friendly political preferences compared to men. In higher income countries, women display more environmentally friendly behaviours in the private sphere (Hunter et al., 2004) and are more likely to view climate change mitigation measures as beneficial compared to men, who are more likely to view mitigation as costly (Bush & Clayton, 2022). Studies conducted in America show that women are more knowledgeable about climate change than men (McCright, 2010), more likely reduce their personal energy consumption for environmental reasons (Semenza et al., 2011), and, because they are less likely to engage in system justification, or "the psychological tendency to maintain certainty, security, and solidarity through motivated perceptions of the status quo" (Goldsmith et al., 2013, p. 159), are more in favour of climate change mitigation (Goldsmith et al., 2013). Canadian women are more worried than men about the consequences of climate change and are more willing to participate in ecological cooperation (Arnocky & Stroink, 2010), while Australian women are more concerned than men about the global effects of climate change and are more in favour of environmental protection measures (Tranter, 2011). Across industrialized democracies, Kroeber (2022) shows that women are more likely than men to have pro-environmental attitudes.

Importantly, where these preferences are paid attention, outcomes change. Nations with more women in their parliaments consume more renewable energy over time (Salamon, 2023), have a weaker association between development and emissions (McGee et al., 2020), are more likely to ratify environmental treaties (Norgaard & York, 2005), and create protected land areas (Nugent & Shandra, 2009), and maintain more forest cover (Salahodjaev & Jarilkapova, 2020). In addition, women legislators in both the US House of Representatives and the European Parliament were more likely to support legislation (Fredriksson & Wang, 2011; Ramstetter & Habersack, 2019). Overall, this research points to the potential for women's increased political power to benefit environmental policy and outcomes.

Yet, little literature has investigated the role that improved political empowerment

for women could have on fossil fuel industries, particularly in states where these industries are largest. Below, I outline a theoretical foundation for investigation of these relationships.

5.4 Theory: Implications of Women's Empowerment for Fossil Fuel Usage in the context of Global Trends

Increased women's economic and political power may change countries' relationships to fossil fuel industries. Because fossil fuel industries are largely male dominated, and produce patriarchal social, economic, and political structures, additional research is needed to understand how improving WLFP may impact these industries. Importantly, the fuel extraction industry is not merely impacted by economic interests but is also highly political. Global environmental governance regimes exist alongside national governments to guide countries' decision-making when it comes to mitigating climate change. Thus, WPE may have additional consequences for states' reliance on fossil fuel sectors. Women's preferences are both distinct from men's and more aligned with environmentalism; at the same time, oil-reliant regimes tend to have lower levels of political empowerment for women (Awoa & Ondoa, 2022; Ross, 2008; Liou & Musgrave, 2016). Thus, research must seek to uncover the role of increased political empowerment for women in decarbonization, particularly with respect to countries which rely heavily on fossil fuel extraction.

Existing theory sometimes called petro-masculinity (Daggett, 2018) offers an additional basis for the connections between environmentalism and gender equality. Daggett (2018) explicates the conflation of masculinity with excessive energy use and argues that "challenges to fossil-fuelled systems, and more broadly to fossil-fuel soaked lifestyles, becomes interpreted as challenges to white patriarchal rule" (p. 29) and thus where one is perpetuated, so is the other. Because "the American way of life was centred around a version of white, patriarchal rule in which the achievement of hegemonic masculinity required intensive fossil fuel consumption and, for the working or middle-class, jobs within or reliant upon fossil fuel systems" (p. 32), I assert that other countries

which are highly economically reliant on fossil fuel extraction may also experience inherent links between fossil fuel reliance and hegemonic masculinity. This both perpetuates such environmentally-harmful industries while also maintaining gender inequality. Therefore, interrogating the role of bettered gender equality as an interrupter in this dynamic is key to understanding this component of decarbonisation.

While I assert that the role of women's empowerment has been understudied in terms of its impacts on fossil fuel industries, here I detail some additional global trends which likely impact this potential relationship: democracy, economic diversification, and internet use may play integral roles in shaping both women's empowerment as well as fossil fuel extraction.

5.4.1 Global Trends: Increased Democracy & Women's Representation

For centuries, democracy has been the gold standard form of government, demanded by citizens across the globe from the American Revolution in the 18th century to the Arab Spring in the 21st. At least normatively, democracy is considered the best form of government, allowing polities to rule themselves while also maintaining individual protections against the potential tyranny of majority rule. Importantly, democracy has key implications for gender power relations.

Existing literature shows that democracy levels are correlated with various measures of women's status (Richards & Gelleny, 2007), and that contexts in which provisions of constitutional social welfare principles and gender inclusive monarchies exist are best for women (McDonagh, 2002). States with higher levels of democracy have more women in government (Reynolds, 1999; Paxton, 1997). Fish (2002) shows that measures of women's equality are the best predictors of democracy level. Beer (2009) finds that countries with "greater stocks of democracy and longer experience of women's suffrage have a higher proportion of the population that is female, a greater ratio of female life expectancy to male life expectancy, lower fertility rates, and higher rates of female labour force participation" (2009, p. 212). Thus, growth in democracy may translate to higher levels of gender equality.

Another benefit of democracy for gender equality is women's ability to contribute to policymaking through representation. Particular policies and government stances—beyond mere level of democracy—which arise in systems wherein women have greater political power as lawmakers may both encourage and support more women to be more politically active and more involved in the formal economy. The literature finds consistencies in gendered prioritise of representatives: Clayton et al. (2019) find that women representatives in Sub-Saharan Africa are more likely to "prioritize poverty reduction, health care, and women's rights" (2019, p. 69) than men representatives. Schwindt-Bayer (2006) finds that women legislators in Latin America prioritized women's issues and children and family policy more than their male counterparts; Tremblay (1998) finds that women parliamentarians placed more importance on social issues. Wängnerud (2000) found similarly that women representatives in the Swedish Parliament prioritize issues of social welfare more than their male counterparts, and that "it is almost exclusively female politicians who pursue issues of equality between the sexes" (p. 68). Chaqués-Bonafont and Cristancho (2022) find that both the number of women in parliament and their access to leadership positions "have a significant impact on female MP's attention to rights-and welfare-related issues" (p. 3), indicating that the more women there are in government, and the more powerful these women are, the more political support there is for issues important to women. Not only are social welfare policies likely to result in increased childcare provision, wage equality, public transportation, and other support systems which may aid women in engaging in paid work in the public sphere, but infrastructure projects prioritized by male representatives likely increase employment largely for men, as construction, industry, and infrastructure jobs are highly masculine sectors (Enloe, 2013). Thus, increased representation of women in government may have positive effects for both women's labour force participation as well as their political empowerment.

In addition, the literature demonstrates important relationships between states' democracy levels and oil reliance. Fish (2002) goes so far as to say that "abundance of natural resources, and particularly of oil, has often been regarded as democracy's antagonist" (p. 10). Ross (2001) finds that a preponderance of fossil fuel resources

has "strong antidemocratic effects" (p. 341), and explores the avenues through which democracy fails in resource-rich countries. States funded by oil wealth "use low tax rates and patronage to relieve pressures for greater accountability" (p. 328), fund extensive internal security to dampen domestic political unrest, and avoid the economic— and thus social and cultural—developments that "tend to produce democratic government" (p. 328) by relying nearly exclusively on the income generated by lucrative fossil fuel sectors. While low levels of democracy dampen all citizens' political empowerment, these effects should be even more consequential for women's political empowerment, as women are systematically excluded from political processes even in democracies (MacKinnon, 1989).

Thus, growth of democracy may have the dual effect of negatively impacting fossil fuel reliance while simultaneously contributing to more equal gender relations. Disentangling this relationship, and where it plays out in reality, may thus be key to understanding decarbonisation.

5.4.2 Global Trends: Economic Diversification

In order to meet climate change goals, countries need to decrease fuel extraction and subsequent consumption, while moving toward greener energy sources. While many countries across the world still rely heavily on the economic benefits of fossil fuel extraction, both the volatility of this economic structure and its negative environmental impacts are well-known. Resource rich countries are the most vulnerable to falling commodity prices: in economies reliant on one sector or resource, "lack of diversification is associated with both lower economic growth and higher volatility" (Kazandjian et al., 2019, p. 4). Thus, many countries are undergoing a shift toward diversification: Gulf Cooperation Council countries, some of the most fuel-rich countries in the world, have "undergone a restructuring process, driven by the need to move from a commodity-dependent allocative state economic model to a more diversified and knowledge-based one, and to increase the competitiveness of its non-oil sectors globally" (Murray & Zhang-Zhang, 2018, p. 712). Not only is it environmentally important, but economically prudent, to diversify heavily resource-reliant economies.

It may thus be the case that countries which seek to diversify economically may directly or indirectly see increases in women's participation in the labour force. Existing research establishes a link between WLFP and economic diversification: Kazandjian et al. (2019) show that gender inequality inhibits economic diversification and is "negatively associated with both output and export diversification in low-income and developing economies" (p. 6). Further, Abou-Shouk et al. (2021) find that women's empowerment in three oil-rich Arab countries positively and significantly increased tourism development. Lagarde and Ostry (2018) emphasize that because women and men bring different expertise, approaches, and skills to the workplace, "adding more women to the labour force should bring larger economic gains than an equal increase in male workers" (p. 1).

Thus, the relationship between women's economic empowerment seems inextricably linked with diversification processes. It is therefore integral for research to pay adequate attention to the real impact of economic diversification on fossil fuel industries as well as women's increased participation in the labour force.

5.4.3 Global Trends: The Growth of Global Internet Access

In addition, an increasing literature suggests that internet usage has served as an important factor in the growth of women's economic and political rights. Economically, internet access expands women's abilities to work inside their own homes, where they maintain significantly more responsibilities than their male partners or family members. Dettling (2017) finds that access to high-speed internet access increases the labour force participation rates of particularly college-educated married women with children, as this creates options for women to blend working from home with their caretaking and household responsibilities; this increased ability to work from home is insignificant for men, who maintain less caretaking and household responsibilities. Watson et al. (2018) find that increased internet access is responsible for about 4/5ths of women's increased labour force participation in 72 countries between 2000-2016.

Internet access also has separate consequences for women's political and social rights. Whitten-Woodring (2016) finds that "the interaction of internet access and

media freedom has positive effects on women's rights regardless of regime type" (p. 383), and that the effects of internet access and media freedom are most consequential for women's political rights and physical security. Naeli (2018) explores the role of the internet for Iranian women's activist groups and shows internet-facilitated activity help groups make collective decisions, encourage collaboration with other activist groups, and augment members' knowledge of the issues. Thus, increased internet access can both increase women's access to work opportunities as well as play a positive role in augmenting women's rights.

Yet, organizations like the United Nations warn of the detrimental impact the internet can have for women's human rights, including cyber harassment and violence. Online "harassment, intimidation, and defamation are shockingly frequent, frequently terrifying, and often spill over into the real world", especially in target of women's human rights defenders (Al Hussein, 2018). Not only does the internet foster spread of misogynistic and anti-woman rhetoric with real impacts for both women's rights, but online gender-based violence and harassment has material impacts for women as actors in their own lives and in politics. Ging and Siapera (2018) investigate the "anti-woman spaces and discourses [that] have been transformed by the technological affordances of new digital platforms" (Ging & Siapera, 2018, p. 515), and find that 61% of women who have experienced online abuse or harassment lost self-confidence, 32% began to self-censor their online postings, 55% experienced stress, anxiety, or panic attacks, 63% lost sleep, 56% were unable to focus for long periods, and 25% feared for their safety (p. 520). Far from being contained to virtual spaces, "digital technologies do not merely facilitate or aggregate existing forms of misogyny, but also create new ones that are inextricably connected with the technological affordances of new media, the algorithmic politics of certain platforms, the workplace cultures that produce these technologies, and the individuals and communities that use them" (Ging & Siapera, 2018, p. 516). Thus, increased internet access may have negative implications for women's political empowerment.

Growth of internet use in the 21st century, as well as economies which rely on internet technology, could impact economic diversification needed to move away from

Figure 5.2: Potential pathway of relationships between global trends, women's empowerment, and fuel exports.

over-reliance on fossil fuel industries, with particular roles for women in these contexts. Because women's opportunities for work may be disproportionately facilitated by the internet, understanding the role this plays in the economics of fossil fuel reliance is a key avenue that should be considered in the literature.

Taking these important global trends into account, I suggest the potential for the relationship visualized in Figure 5.2.

5.5 Methods: Initial Investigation of Descriptive Correlations in WLFP, WPE, and Fossil Fuel Exportation

To conduct preliminary descriptive data analysis of the potential relationships between women's economic and political empowerment and fossil fuel exportation, I consider data from 1990-2020. The main dependent variable of interest is operationalized as fuel exports and comes from the World Development Indicators Dataset (World Bank Open Data, 2022b). This variable is comprised of exports of fuels in "SITC section 3: mineral fuels, lubricants and related materials" (World Bank Open Data, 2022b) as a percent of all merchandise exports. The two main independent variables of interest, WLFP (women's labour force participation) and WPE (women's political empowerment index) are derived from the World Development Indicators Dataset (World Bank Open Data, 2022a) and the Quality of Government dataset (Dahlberg et al., 2022) respectively. WLFP is measured as the percent of the female population over 15 years old that participates in the work force and is a modelled estimate by the International Labour Organization using labour force surveys, censuses, establishment censuses and surveys

(World Bank Open Data, 2022a). WPE is "the index formed by taking the average of women's civil liberties index, women's civil society participation index, and women's political participation index" (Dahlberg et al., 2022, p. 176).

I measure the level of democracy with a Freedom House/Imputed Polity variable from the Quality of Government Dataset. This measure scores states from 0, least democratic, to 10, most democratic by averaging Freedom House and Polity scores, as Hadenius and Teorell (2007) "show that this average performs better both in terms of validity and reliability than its constituent parts" (Dahlberg et al., 2022). I measure the proportion of women in parliament using data from the Inter-Parliamentary Union via World Bank Data (World Bank Data, 2022f). I measure economic diversification using the United Nations Conference on Trade and Development's measure, 'merchandise: product concentration index of exports and imports' which "shows to which degree exports and imports of individual economies or of groups of economies are concentrated on a few products rather than being distributed in a more homogeneous manner among several products" where 0 equals perfect diversification and 1 equals total concentration on a single product (United Nations Conference on Trade and Development, 2022). Finally, I measure internet access using the World Development Indicators' measure of 'individuals using the internet (% of population) via the Quality of Government Dataset (Dahlberg et al., 2022).

In estimations of two-way fixed effects regression models, I include a range of control variables identified as important in the related literature. First, I control for logged GDP per capita, and the data is derived from World Development Indicators Dataset (World Bank Open Data, 2022c). I control for the total population to account for state size (World Bank Open Data, 2022d). I control for the percent of the male population over 15 years old that is in the work force (World Bank Open Data, 2022e). This is a modelled estimate by the International Labour Organization using labour force from the same source as female labour market participation. I control for Human Development Index as an additional measure of state development (United Nations Development Programme: Human Development Data Centre, 2022).

In all regressions, I include country and year fixed effects. Country fixed effects

control for country-level variables that do not change over time—like access to fuel reserves—while time fixed effects control for global trends that happen everywhere over time, like variation in fuel prices. However, this does not control for time-varying within-country changes that correlate with fuel exports. Regressions take the form of:

$$y_{it} = \beta_1 x_{1it} + \beta_2 x_{2it} + + \gamma_i + \delta_t + \epsilon_{it}$$

where x_{it} is the key independent variable and x_{2it} is the vector of controls, i is the individual component (country), t is the time component (year), y_{it} is the dependent variable, γ_i is the country-fixed effect, δ_t is the time fixed effect, and ϵ_{it} is the error term. The time series of the dataset is tested using a Dickey-Fuller test, and the variables considered in this analysis are stationary; full results of this test are printed in Appendix Figure C.1.

5.6 Results

5.6.1 Exploring Fuel Exports Cross-Nationally

First, I use the time series cross-sectional data to explore the rates of fossil fuel exportation in the sample. The average percent of fossil fuel exportation of this sample is 15.4%. To explore the data clearly, I split the full sample into two groups, where one group contains high fuel-exporting states, which export more fuel than the sample average, and the other contains low fuel-exporting states, which export less than the sample average. Notable in Figure 5.3, which shows the distributions of fuel exports in high- vs. low-exporting states, is the substantively large difference in average fuel exportation between high- and low-exporting states: while fuel exports make up just an average of 3.2% of merchandise exports in low-exporting states, fuel exports make up well over 50% on average of merchandise exports in states which export more than the global average. Across the sample period, Figure 5.4 shows that there has been little change in mean fuel exportation across the sample period in either low- or high-exporting states, yet regressions with country fixed-effects allow for deeper investigation of change fuel exports at the state level (see Table 5.2). Thus, to realistically curb fuel

Table 5.1: Comparison of Fuel Exports, WLFP, and WPE between high- and low-exporting countries. Some countries fall below average or above average exportation levels during different years from 1990-2020

	Average Fuel Exports	**Average WLFP**	**Average WPE**	**N**
	% of merchandise exports	% of 15+ female population in the workforce	0: no empowerment to 1: full empowerment	countries
Full Sample	15.4%	55.7%	0.71	159
High-Fuel Exporters	54.3%	53.1%	0.69	58
Low-Fuel Exporters	3.2%	57.2%	0.78	130

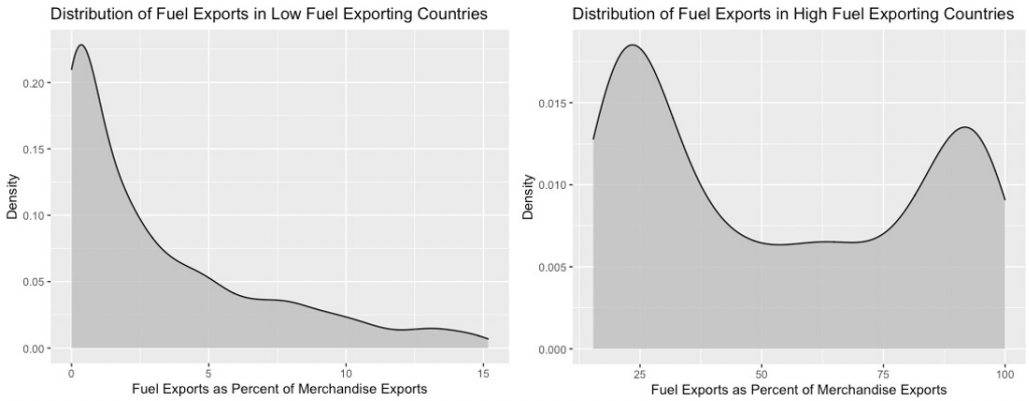

Figure 5.3: Distributions of fuel exports in low exporting and high exporting countries.

exportation, the 58 high-exporting states bear the brunt of the burden of lowering their fuel export rates.

The vast difference in fuel exportation rates emphasizes the importance of investigating potential relationships between gender equality and fuel exports in high- vs. low-exporting states separately. Countries with smaller fuel exportation industries will be less influenced (economically, socially, and politically) by the dynamics created by fossil fuel industries. Particularly because the fossil fuel industry work force is largely male, the role women may play in contexts of high fuel exportation may differ from that of low exportation. Thus, I investigate these relationships separately in this exploration of the data.

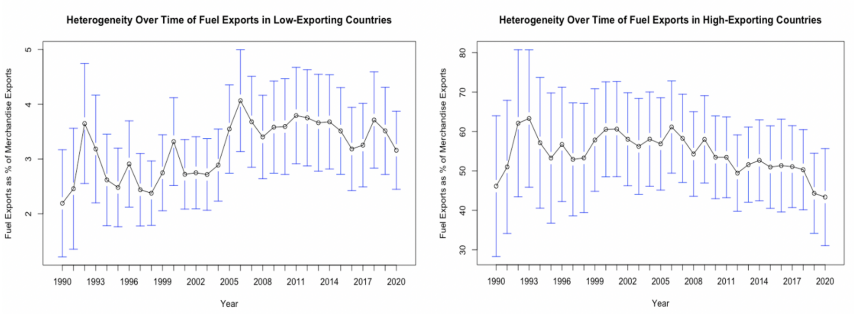

Figure 5.4: Change in fuel exports from 1990-2020 in low- fuel exporting and high-fuel exporting countries.

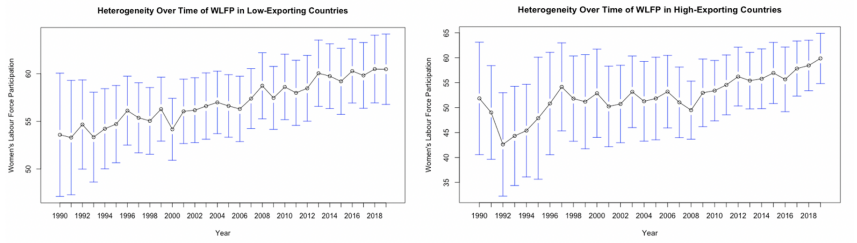

Figure 5.5: Change in WLFP from 1990-2020 in low- fuel exporting and high-fuel exporting countries.

5.6.2 Women's Labour Force Participation & Political Empowerment in High- and Low-Exporting States

Considering patterns of WLFP and WPE within low- and high-fuel exporting countries reveals interesting correlational patterns. As expected, I find that, on average, high-exporting states have lower rates of both WLFP and WPE (see Table 5.1). Conducting a t-test to determine the significance of the difference-in-means demonstrates a significant difference between high- and low-exporting states' WLFP ($p<0.000$) and WPE ($p<0.000$), reflecting the findings of existing research (Ross, 2008, etc.). Figures 5.5 and 5.6 shows that in both high- and low-exporting countries, mean rates of both WLFP and WPE have grown over time.

Next, I conduct regressions using WLPF and WPE as separate independent variables and fuel exports as the dependent variable to determine if there is a significant relationship between women's economic and political empowerment and rates of fossil fuel exportation in both high- and low-exporting countries: regression results are

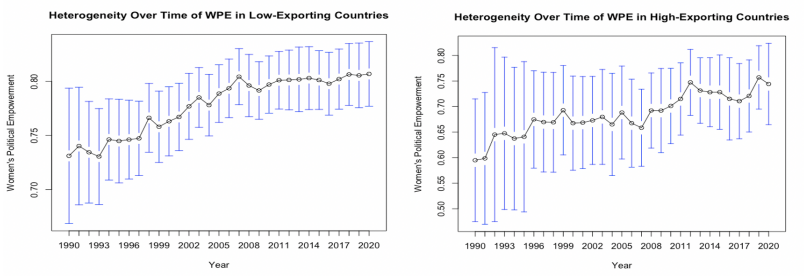

Figure 5.6: Change in WPE from 1990-2020 in low- fuel exporting and high-fuel exporting countries.

printed in Table 5.2. and plotted in Figures 5.7 and 5.8. As expected, I find that in high fuel-exporting countries, WLFP is associated negatively with fuel exports. Yet conversely, WLFP is associated positively with fuel exports in low-exporting countries. This again indicates that high- and low- exporting contexts should be studied separately. Whereas WFLP impacts fuel exports differently in high- vs. low- fuel exporting states, increased WPE correlates negatively with fuel exports in both high- and low-fuel exporting countries.

In addition, the positive and significant relationship between men's labour force participation (LFP) and fuel exports becomes apparent in this modelling: whereas men' LFP positively and significantly correlates with fuel exports in high fuel-exporting countries, men's LFP does not significantly correlate with fuel export in states which export less than the global average. This may also suggest a mutually-reinforcing relationship between reliance on specifically male labour and fuel exportation where these industries play a more significant role in state economies. These results taken together suggest that deeply interrogating the role of women's political and economic empowerment in the reliance on fossil fuel exportation, particularly where these industries are largest, may be key to understanding decarbonization in this special group of highly fossil fuel reliant countries.

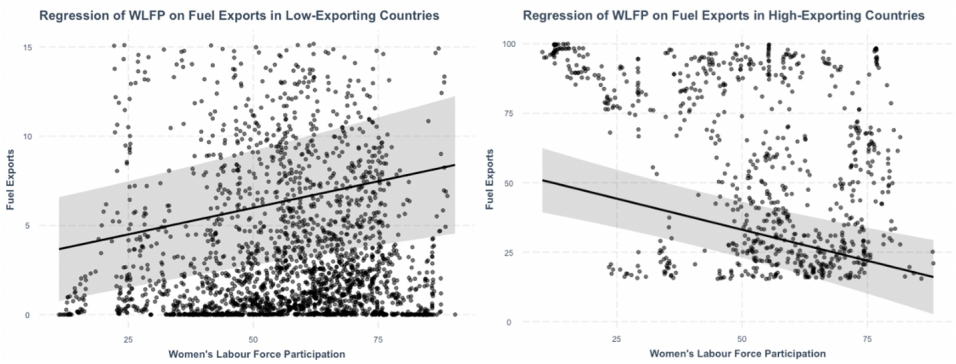

Figure 5.7: Plotted regressions of WLFP's impact on fuel exports in both high and low-fuel exporting countries.

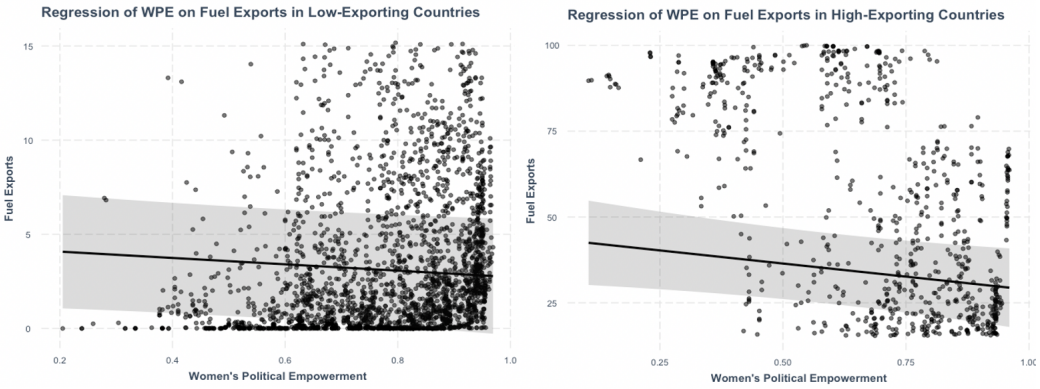

Figure 5.8: Plotted regressions of WPE's impact on fuel exports in both high and low-fuel exporting countries.

Table 5.2: Regression determining correlations of WLFP and WPE and Fuel Exports

	High Fuel Exporters		Low Fuel Exporters	
	Dependent variable: Fuel Exports			
WLFP	-0.592***		0.061***	
	(0.111)		(0.016)	
WPE		-15.426*		-1.682
		(7.043)		(1.135)
Log GDP per capita	4.004**	3.260*	-0.591**	-0.638**
	(1.280)	(1.387)	(0.226)	(0.225)
Democracy	-1.244***	-0.997**	-0.149**	-0.113*
	(0.327)	(0.379)	(0.051)	(0.057)
Population	-0.00000.	-0.00000	0.00000***	0.00000***
	(0.00000)	(0.00000)	(0.000)	(0.000)
HDI	11.024	30.596	1.101	0.720
	(17.352)	(18.805)	(2.820)	(2.847)
Men's LFP	0.336**	0.046	-0.004	0.023
	(0.130)	(0.128)	(0.024)	(0.023)
Observations	741	674	2,230	2,192
R2	0.957	0.954	0.748	0.746
Adjusted R2	0.951	0.947	0.730	0.728
Residual Std. Error	6.516 (df = 651)	6.642 (df = 587)	1.971 (df = 2081)	1.983 (df = 2046)
F Statistic	163.694*** (df = 89; 651)	141.772*** (df = 86; 587)	41.673*** (df = 148; 2081)	41.432*** (df = 145; 2046)
Significance levels	*p<0.1; **p<0.05; ***p<0.01			

5.7 Exploring Important Factors in the Potential Relationship Between Women's Empowerment and Fossil Fuel Exportation

While these findings show that women's political and economic empowerment largely correlate negatively with fuel exportation, here I offer a preliminary exploration of the global trends which I assert likely play a role in this relationship cross-nationally, particularly within strongly patriarchal contexts that often coexist with economic reliance on fossil fuels. In these models I seek to uncover if democracy, economic diversification, and internet use indeed correlate with a) women's empowerment and b) fossil fuel exports in order to lay a foundation for further research.

First, global pressure to democratize, as well as domestic demands for democracy, can push governments towards assuming at least some democratic practices in governance which may have real impacts on both WLFP as well as fuel exports. Equal representation is a pillar of genuine democracy. Because women parliamentarians may help to promote women's interests in government, women citizens may be more supported in their movement into the formal workforce and more prone to engage politically. Women's preferences also tend to be less aligned with fossil fuel industries. Second, as resource-reliant economies bear the burden of economic volatility associated with an undiversified economy, they may seek to grow other sectors and thus decrease their reliance on only one sector. Women are likely to participate in these extra-resource sectors. Finally, internet usage is associated with greater access to the workforce for women, and may thus interrupt the existing reliance on fuel exportation.

This preliminary descriptive regression analysis displays trends which support a need for further investigation into the role of the important global trends of democracy, economic diversification, and internet use on the potential relationship between women's empowerment and fossil fuel exportation. Table 5.3 shows that democracy is associated negatively and significantly with fossil fuel exports in high exporting countries, while economic concentration is associated positively with fuel exports in these countries. Internet use in addition has a negative association with fuel exports,

Table 5.3: Regression Analysis: Relationships between Democracy, Economic Diversification, and Internet Use Fuel Exports

	Dependent variable:Fuel Exports			
	(1)	(2)	(3)	(4)
Democracy	-1.301***			
	(0.334)			
Women in Parliament		-0.099		
		(0.072)		
Concentration Index			62.360***	
			(3.730)	
Internet Use				-0.049.
				(0.029)
Log GDP per capita	4.233**	2.116	-1.190	5.125***
	(1.306)	(1.597)	(1.170)	(1.392)
Population	-0.00000	0.000	0.000	-0.00000**
	(0.00000)	(0.00000)	(0.00000)	(0.00000)
HDI	27.475	38.588.	38.386*	25.781
	(17.427)	(23.065)	(15.906)	(18.526)
Men's LFP	-0.010	0.003	0.254*	0.081
	(0.114)	(0.141)	(0.100)	(0.124)
Observations	741	605	680	713
R2	0.955	0.955	0.970	0.954
Adjusted R2	0.949	0.949	0.966	0.948
Residual Std. Error	6.650 (df = 652)	6.640 (df = 524)	5.441 (df = 597)	6.738 (df = 625)
F Statistic	158.608*** (df = 88; 652)	140.074*** (df = 80; 524)	236.779*** (df = 82; 597)	149.834*** (df = 87; 625)
Significance levels				*p<0.1; **p<0.05; ***p<0.01

Table 5.4: Regression Analysis: Relationships between Democracy, Economic Diversification, and Internet Use WLFP WPE

	Dependent variables:							
	WLFP	WPE	WLFP	WPE	WLFP	WPE	WLFP	WPE
Democracy	0.096	0.024***						
	(0.115)	(0.002)						
Women in Parliament			0.056*	0.005***				
			(0.022)	(0.0003)				
Concentration Index					-6.318***	-0.059*		
					(1.440)	(0.030)		
Internet Use							0.042***	-0.001***
							(0.010)	(0.0002)
Log GDP per capita	-0.386	-0.021**	-0.131	-0.002	0.520	-0.015	-0.927.	-0.013
	(0.450)	(0.008)	(0.482)	(0.008)	(0.452)	(0.009)	(0.472)	(0.009)
Population	-0.00000***	0.000	-0.00000***	0.000***	-0.00000***	0.000**	-0.00000***	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
HDI	-27.803***	0.145	-26.565***	-0.377***	-42.665***	0.035	-22.263***	0.107
	(6.005)	(0.110)	(6.962)	(0.109)	(6.139)	(0.129)	(6.290)	(0.122)
Men's LFP	0.585***	0.001	0.679***	0.001	0.589***	0.0004	0.520***	0.003***
	(0.039)	(0.001)	(0.042)	(0.001)	(0.038)	(0.001)	(0.042)	(0.001)
Observations	741	674	605	586	680	624	713	648
R2	0.986	0.967	0.989	0.979	0.988	0.964	0.986	0.963
Adjusted R2	0.984	0.962	0.987	0.976	0.987	0.959	0.984	0.958
Residual Std. Error	2.291 (df = 652)	0.039 (df = 588)	2.004 (df = 524)	0.031 (df = 508)	2.100 (df = 597)	0.040 (df = 544)	2.287 (df = 625)	0.041 (df = 563)
F Statistic	516.860*** (df = 88; 652)	202.809*** (df = 85; 588)	597.235*** (df = 80; 524)	308.045*** (df = 77; 508)	611.427*** (df = 82; 597)	186.990*** (df = 79; 544)	504.736*** (df = 87; 625)	175.847*** (df = 84; 563)
Significance levels								*p<0.1; **p<0.05; ***p<0.01

although not significant to the traditional $p<0.05$ level. This largely supports my theoretical framework which predicts these effects for fuel exportation.

On the same token, these factors additionally correlate with both WLFP and WPE in high fuel-exporting states, as shown in Table 5.4. Democracy levels positively correlate with WPE while women's representation positively correlates with both WLFP and WPE in high fuel-exporting countries. High economic concentration is associated negatively with both WLFP and WPE. While internet use correlates positively with WLFP, perhaps affording work opportunities for women in high-fuel exporting contexts, it correlates negatively with WPE, perhaps playing into the potential negative impact of the internet in the prevalence of misogyny.

While these results are preliminary and offer merely descriptive information regarding the variance in potentially important variables, they largely support the basis of the theoretical frameworks I present here. Global trends like changes in democracy, economic diversification, and internet use all correlate to statistically significant degrees with both fuel exports themselves in high fuel exporting contexts as well as with two measures of women's empowerment in these contexts. Future research should build on these preliminary findings.

5.8 Research Agenda: Where to go from here

While the existing literature has repeatedly suggested a connection between women's political equality and various climate change outcomes (Ergas & York, 2012; Lv & Deng, 2018; McGee et al., 2020; Salamon, 2023; Salahodjaev & Jarilkapova, 2020), it has thus far left unquestioned the consequences of women's economic and political equality for the perpetuation of fossil fuel industries in oil-reliant states. Here, I offer theoretical grounds for continued research in this area and a preliminary descriptive investigation of the available data to form a basis for a continued research agenda. In so doing, I suggest that, as already demonstrated by existing literature, the question of women's equality is important not just for human and women's rights in a normative sense. Rather, this equality may have drastic and real-life implications for political outcomes. Without realistically accounting for many countries' heavy financial reliance

on the sale of fossil fuels, and the gendered dimensions of these economies, approaching a Green transition will be impossible and could lead to failure.

Given the theoretical basis outlined here as well as in the extant literature, in addition to the descriptive relationships made apparent in the preliminary data analysis I have undertaken, it is clear that a deeper understanding between women's empowerment, reigning patriarchal norms, and fossil fuel extraction is needed, particularly in the state contexts which rely most heavily on fossil fuel extraction economically. Relationships between gender inequality and reliance on fossil fuels may not be strictly correlational, and further work should thus seek to uncover the extent to which these relationships may be causal, self-reinforcing, or cyclical.

It is difficult or impossible to a) measure completely the proposed relationship and b) go beyond descriptive findings to make causal claims using global data across time. Rather, further research should set out to investigate this relationship regionally or nationally, which not only will enable estimation of more specific climate change outcomes, but offer increased ability to uncover causal pathways in the preliminary relationships theoretically proposed here. Whereas existing research in petro-masculinity (Daggett, 2018) focuses on the links between fossil fuel use and misogyny in the United States, a developed Western democracy, I propose that future work should seek to uncover the links between economic reliance on fossil fuels and their extraction (rather than use) and misogyny in countries which rely on these industries, which are often non-Western non-democratic.

Further research agendas could, for instance, use survey data to investigate whether patriarchal social or political preferences correlate with pro-fossil fuel preferences across countries, or more specifically in countries which rely on fossil fuel extraction disproportionately. Country-level analysis of these relationships could help to shed more light on the role of gender equality in decarbonization efforts at the root of the issue: extraction of fossil fuels for consumption. Beyond this, additional questions could be answered, including: How can highly patriarchal societies instate more gender equal relations in the short time frame needed to address the climate emergency? What types of policies are most effective in uplifting women politically and economically? How can states

determine which sectors will be most successful at replacing the fossil fuel industry, and how can these industries effectively integrate gender equality? I assert that these questions are not only invaluable for understanding decarbonization in the midst of an ongoing climate emergency, but also for helping to craft a more equal and just political and social order on a global scale.

Chapter 6

Conclusion: The Effects of Institutional Gender Makeup and Gender Equality on Climate Change Policy and Outcomes

Global warming has already caused noticeable and harmful levels of climate change with huge impacts for human and non-human life. Political action taken in the last three decades has made important strides, and yet has ultimately been insufficient on the global scale: warming will not be limited but rather will worsen, likely past manageable levels (Figueres et al., 2022). Successful and effective action, on both the mitigation and adaptation fronts, is necessary in order for the planet to remain hospitable, requiring increased commitment from political actors and institutions and dedication of the populace to push for environmentalism in the face of a strong pro-fossil fuel, anti-environmentalism lobby.

The gender and climate change literature insists that there is a clear connection between not only the degradation of women and the degradation of the environment, but between women's roles as political and social actors and bettered environmental outcomes. In some cases, pushes for women's rights are connected to environmental-

ism. In others, women and girls take on the challenge of advocating for the environment which cannot advocate for itself. Since the inception of environmentalism as a political issue, many of the most recognizable figures in the climate change political and activist communities have been women and girls: marine biologist Rachel Carson, author of Silent Spring (1962), called wide-scale attention to environmental damage long before the emergence of global environmental political movements; Jane Goodall came to prominence with her innovative research on chimpanzees and has since become a renowned advocate for conservation; Christiana Figueres served as the architect of the Paris Climate Change Agreement (2015) at COP21 (United Nations Climate Change, 2023); Alexandria Ocasio-Cortez was elected as the youngest member of the United States' Congress in 2018 and is one of the most recognizable voices in politics for environmental protection; Greta Thunberg has led global climate protests since her early teen years and has become a spokesperson for younger generations.

Not only have many women and girls served as activists and spokespeople for the environment in the public sphere, but they also play a particular role in influencing others' views in the private sphere. Lawson et al. (2019) find that parents with low levels of climate concern become significantly more worried about climate change when their children are given environmental education, and that daughters in particular are "especially effective in influencing parents" and their climate change views (Lawson et al., 2019). Following from more than two decades of "international institutions, governments, NGOs, and transnational corporations embrac[ing] the idea of girl power... the narrative goes that if you educate and empower a girl, she will go on to use that education for the better of humanity. Girls, we are told, will save the world" (Walters, 2022, p.1). As such, it is no wonder that growing attention has been paid to the consequences of increased inclusion of women in political, economic, and social decision-making spaces for the environment during the full-fledged and worsening climate crisis, even if women and girls "don't want to save the world all by themselves. Nor should they have to" (Walters, 2022, p. 1). Nevertheless, the reality that increased gender equality helps contribute to better environmental outcomes has become increasingly apparent following decades of research in political science's subfield of 'gender and cli-

mate change' (Norgaard & York, 2005; Nugent & Shandra, 2009; Erags & York, 2012; Salahojaev & Jarilkapova, 2020; Lv & Deng, 2018; McGee et al., 2020; Fredriksson & Wang, 2011; Ramstetter & Habersack, 2019).

With my original research, I have built upon the literature which shows a connection between increased gender equality and improved environmental outcomes, contributing key insights and expanding existing findings by exploring the dynamics of this relationship more deeply. Below, I outline these findings with specific focuses on the key topics which I add most to the literature: women's representation and environmental outcomes; the temporal dimensions of this relationship; the importance of governance contexts; and the role of women's economic and political equality for environmental outcomes. I then summarize my methodological approach. Following this, I address policy implications for these findings, the shortcomings of this research agenda, and avenues for continued research.

6.1 Empirical Findings: Key Themes and Additions to the Literature

While existing literature points to a relationship between gender equality and environmentalism, I focus on the themes below to more clearly uncover *how*, *why*, and *in what contexts* this relationship exists. Methodologically, I have taken a distinctly quantitative approach. This enables adequate measurement of comparative data to paint a picture of global reality with built-in mechanisms for determining the relative significance of resulting research outputs. It also enables synthesis of large amounts of data, including control variables, which help to narrow in on just which variables at play are most influential for explaining output variables. It is practical, requiring no data collection on my part as a researcher, and can help answer questions which set the stage for continued research agendas. While each chapter utilises quantitative data, these datasets vary from chapter to chapter based on data availability.

6.1.1 Women's Representation and Environmental Outcomes

Existing theory suggests various means by which women's descriptive representation can improve women's substantive representation. Women representatives may share gendered life experiences with women citizens, encouraging similar preferences (Phillips, 1995); women representatives may seek to actively represent women's interests to counteract historical political inequality (Franceschet & Piscopo, 2008); gendered socialization may encourage similar preferences by way of the social roles women are conditioned to play (Boas & Smith, 2019); and women representatives may be particularly electorally incentivised to represent women's interests in order to win their votes (Lloren et al., 2015). While much literature shows that women representatives effectively draw political attention to issues important to women (Wittmer & Bouché, 2013; Ennser-Jedenastik, 2017; Freidenberg et al., 2022; Tremblay, 1998; Reingold et a., 2020), my findings demonstrate that the link between descriptive and substantive representation of women exists not only for traditional 'women's issues', but also for other issues where preferences diverge along gender lines.

In the first empirical chapter, "The Effects of Women's Parliamentary Participation on Renewable Energy Policy Outcomes", I focus on the potential changes in renewable energy consumption which may take place as a result of increased women's representation in democratic parliaments. Because women's preferences tend to be more environmental than men's preferences, and because women representatives may be particularly effective at representing these gendered preferences, I predict that women's representation will increase political will to support renewable energy and thus increase renewable energy consumption. Yet in contrast to much existing literature in the gender and climate change subfield, I pay particular attention to the fact that the gender divide in environmental preferences is most pronounced in developed democracies; thus, I expect women representatives to play less of a role in increasing support for renewable energy in contexts where men are just as likely to be in favour of environmentalism. Using time series cross-sectional data from 100 democracies across 20 years, I find that increases in women's representation are associated with increased renewable energy consumption in high- and middle-income democracies over time, a relationship that does not hold in

lower-income democracies.

These results demonstrate that, indeed, women's descriptive representation leads to substantive representation where political preferences diverge along gendered lines. In higher income countries, where women display more environmentalist preferences than men, these preferences appear in policy outcomes as a result of increased women's representation. These findings suggest that women's representation has implications for issues beyond those deemed traditionally 'women's issues' and lends empirical support for the connection between descriptive and substantive representation.

6.1.2 Temporal Dimensions

While the impact of women's representation on various political outcomes has been investigated in the literature, the timeline along which changes in policy take place as a result of this increased representation has received less attention. While policies may be passed through legislatures rather quickly, the outcomes of these policies do not manifest immediately and are "often indirect, diffuse, and take time to appear" (Hallsworth, 2011, p. 6). Existing research suggests that environmental proposals could take from 18 months to 7 years to develop (Hayes-Renshaw & Wallace, 1997; McCormick, 1998); thus, environmental outcomes may not appear immediately following women's entry into parliaments. In addition, women often face barriers to policymaking due to systemic gender inequality (Kerevel & Atkeson, 2013; Senk, 2020) which may additionally contribute to more slow-moving changes in policy outcomes impacted by women's participation in policy-making. Finally, state wealth often impacts institutional strength such that policies may take longer to influence outcomes in less wealthy, structurally weaker states (Barro, 1994).

Accounting for the fact that policy outcomes will likely take time to appear as a result of women's increased representation, in the first empirical chapter, I use lagged modelling structures to measure how long changes in renewable energy consumption take to appear as a result of increased women's representation. I find not only that state wealth significantly impacts women representatives' influence on climate outcomes, but I uncover the role of state wealth in shaping the timeline of policy outcomes as a result

of increased women's representation. I find that results in middle-income democracies take longer to appear than in higher income democracies, indicating that state wealth is an important moderating factor in a) the existence of and b) the timelines of the relationship between women's representation and environmental outcomes.

6.1.3 Importance of Governance Contexts

In uncovering the contexts in which women's representation may impact environmental outcomes, I additionally focus on the potentially moderating role that governance contexts may play. The second empirical chapter, "The 'Women's Representation—Corruption Link' and Environmentalism: A Cross-National Study" builds upon the first chapter by addressing another contextual factor which may impact women representatives' influence on environmental outcomes in democracies: corruption. Because women are associated with trustworthiness, in corrupt contexts women are often included in governance to signal anti-corruption sentiment to voters rather than to promote women's power in any meaningful way. Such tokenisation and marginalization can severely limit women's latitude to impact policies in ways that may promote women's interests in democracies (Branisa & Ziegler, 2011; Esarey & Schwindt-Bayer, 2019; Goetz, 2007; Stockemer, 2011; Sundström & Wängerud, 2016; Sung, 2003; Tripp, 2001; Valdini, 2019). Following from this literature, I suggest that in order for women's representation to have beneficial impacts for climate change outcomes, governance contexts must be hospitable to and supportive of women. Thus, I predict that increases in women's representation will improve environmental outcomes only in contexts where corruption is not the norm.

With time series cross-sectional data from 58 democracies over 15 years, regression analysis with both time and country fixed effects and moderation analysis shows that the effect of women's representation on four environmental outcomes is indeed conditional on levels of corruption: women representatives contribute to improved environmental outcomes only in contexts of low corruption. These results help clarify the contexts in which women's representation matters for environmental outcomes and emphasize that democracies must be resistant to corruption in order to see any envi-

ronmental benefit as a result of increased women's representation. The IPCC (2023) has identified improved governance as a key to sufficiently addressing climate change; I put forward that these results further evidence the role of effective and impactful governance norms when it comes to governing climate change.

6.1.4 Women's Economic & Political Equality

While I have focused on the role of representation in shaping environmental outcomes, the final key theme I explore in this dissertation is the role that women's economic and political equality may play in shaping environmental outcomes. In the final chapter, "The Consequences of Gender Equality for Fossil Fuel Industries: Towards a Research Agenda", I set forth a theoretical and empirical basis for additional research focusing on important measures of economic and political gender equality: women's participation in the labour force (WLFP) and women's economic empowerment index (WPE).Whereas existing literature indicates that states reliant on fossil fuel wealth have particularly negative outcomes for gender equality (Ross, 2008), no literature has yet investigated the factors which may improve gender equality in these contexts and the subsequent role of such increased gender equality on states' dependence on fossil fuel and oil industries. Thus, I suggest that an additional research agenda should investigate if empowering women economically and politically can play a significant role in changing dependence on environmentally harmful and male-dominated industries through decreasing reliance on a) male labour within highly masculine fossil fuels industries b) men's political preferences in these contexts.

Using time series cross-sectional data from 159 states over 30 years, I explore descriptive and correlational relationships between gender equality and fossil fuel exports in highly fuel-reliant states (those which export more than the global average). I suggest through this analysis that global trends like increases in women's representation, democracy, economic diversification, and internet access may impact WLFP and WPE and thus play a role in the potential relationship between women's empowerment and fuel exportation.

Such a theoretical basis and preliminary empirical analysis serves as a foundation

for future research on this topic and suggests a new research agenda for the sub-field of gender and climate change. The proposed research agenda could help more clearly unpack how the gendered structures of societies themselves materially impact both a) the industries states rely on economically and b) what societies value politically and how these values are informed by both gender and gender relations. Future findings in this vein may help uncover more clearly both how and why gender equality impacts environmental outcomes.

6.2 Implications for Policies and Outcomes

Contributing to a better understanding of the role of gender equality in climate change mitigation and adaptation has important consequences for both policies and outcomes in the real world. Firstly, the IPCC (2023) emphasises the importance of equity and inclusion in the processes of climate change adaptation and mitigation, insisting that "outcomes are enhanced by increased support to regions and people with highest vulnerability to climatic hazards" (IPCC, 2023, p. 33). The report finds that actions which "prioritize equity, social justice, climate justice, rights-based approaches, and inclusivity, lead to more sustainable outcomes, reduce trade-offs, support transformative change and advance climate resilient development" (IPCC, 2023, p. 33). Thus, irrespective of the direct benefit to climate change outcomes that I find in this research, the inclusion of more women in governance and their increased political empowerment may indeed ensure greater levels of equity and inclusion in decision-making. Women are often disproportionately vulnerable to climate change and experience uniquely gendered costs of climate change (Agarwal, 2010); thus, their increased inclusion in decision making process may be directly tied to, and improve outcomes by way of, increased equity and inclusion.

Importantly, the IPCC report (2023) also identifies governance as the key to effectively adapting to and mitigating climate change moving forward. When deployed effectively, governance serves as the blueprint for future action by providing "overall direction on setting targets and priorities and mainstreaming climate action across policy domains and levels, based on national circumstances and in the context of in-

ternational cooperation" (IPCC, 2023, p. 34). The research presented here suggests, firstly, that environmental governance is improved by the increased inclusion of women in parliaments, and secondly, that such governance is greatly impacted by factors like corruption. Not only does corruption itself usually have a negative impact on environmentalism, but the environmental benefits of increased women's inclusion in parliaments only emerge where corruption is low. Thus, this research contributes to defining what "good governance" means and identifies ways in which it can be improved to the benefit of the environment. This research suggests that increased gender equality in governance is key to improving governance itself.

Finally, this research indicates that particular emphasis on increasing women's inclusion in governance, through methods like quotas, could have unintended yet significant environmental implications. Thus, this research implies that increased gender equality in government is valuable outside of normative desires to achieve equality for the sake of equality. While equality is certainly important for its own sake, research continues to reveal that increasing equality in decision making bodies and processes improves a myriad of political outcomes as a result. Because national and global systems of governance remain largely un-inclusive (women still make up only about a quarter of parliamentary seats globally), outcomes may have incredible scope to improve as not only inclusion of women, but inclusion of many other marginalized groups, in governance and politics grows and outcomes continue to reflect the needs and preferences of those who traditionally lack representation.

6.3 Limitations & Suggested Future Research

While I attempt to control for, or more deeply explore, the many factors which may influence the relationship between gender equality and climate change policies and outcomes, there are limitations to the approaches undertaken here and additional aspects to be explored in greater depth in future research.

Firstly, an important yet difficult to measure aspect of the relationship between gender equality and environmental outcomes is the role of political parties in influ-

encing a multitude of variables at play. Parties can influence everything from women's access to parliamentary positions (Kunovich & Paxton, 2005), the political platforms of parliamentarians (Osborn, 2012), women legislators' approach to addressing women's issues (Osborn, 2012), the ability of parliamentarians to take action off their party line (Clayton et al., 2019; Clayton & Zetterberg, 2021), and more. Thus, criticism of this research may posit that positive environmental outcomes may be a result of the action of parties rather than the action of women parliamentarians themselves. It could be that women are simply more likely to align with political parties which lean to the left; because left leaning parties are more likely to favour environmental protection, party platforms could be the true cause of bettered environmentalism.

Yet, while more research is necessary to uncover the complete role of parties in this relationship, existing research counters this criticism. First, a seemingly simple solution to determine the role of parties would be to control for the ideological positioning of parties at the national level in models seeking to uncover the statistical relationship between various measures of gender equality and environmental outcomes. The idea is that if, when controlling for this variable, women's representation still correlates significantly with environmentalism, it is indeed women who make a difference for environmentalism irrespective of parties' ideological positioning. However, I argue that this is inappropriate and will lead to biased results precisely because the literature shows that not only may parties impact women's parliamentary behaviour, but that women's participation in parties impacts these parties' ideological positions (Greene & O'Brien, 2016; Keith & Verge, 2018; Kittilson, 2011). Thus, Senk (2020) argues that controlling for party dynamics would introduce post-treatment bias to these models by "control[ing] for covariates that are potentially affected by the treatment" (Senk, 2020, p. 5). This would unfairly diminish the resulting significance of the main independent variables at play—measures of gender equality—on the dependent variables—environmental outcomes.

Therefore, it would be more useful to investigate the impact of women's participation in parties on the climate positions of these parties rather than to simply control for party position's impact on environmental outcomes and thereby 'control away' impor-

tant variation. Luckily, some relevant research has been undertaken. Kroeber (2022b) investigates how women's presence in party offices impacts environmental positions of parties in 19 democracies from 1995-2018 and finds indeed that "as a consequence of women's presence, parties become more supportive of environmentalist and ecologist positions and less supportive of protectionist policies" (Kroeber, 2022b, p. 42). Further research demonstrates that not only does women's presence as party members push parties towards environmentalism, but so too does having a woman party head (Kroeber, 2022a). Parties increasingly support greener positions with women party heads because "gendered preferences on sociocultural questions, which include issues such as... environmental protection and women's rights, tend to stem from gendered patterns of socialisation" (Kroeber, 2022a, p. 176) which can influence both women voters' and women elites' preferences.

While this research is preliminary and should certainly be continually explored, it demonstrates the validity of the conclusions drawn in the analyses conducted here. Future research could attempt to uncover women's specific involvement in parties by questioning how and why these women encourage environmentalism to a greater extent than their male counterparts, allowing for conclusions to be drawn from data richer than quantified ideological position. While this continued research agenda was outside the scope of the present research, it will shed even more light on the relationship investigated here and should be undertaken in the future.

Thus, further research on the topic of gender and climate change could benefit from a qualitative approach (Celis & Childs, 2008). Using methods like interviews and focus groups, women representatives and citizens could offer their perspectives directly to shed light on the potential reasons women tend to contribute to environmentalist outcomes. Such approaches could allow researchers to communicate directly with women in oil-dependent countries to uncover how they conceptualize the relationship between fossil fuels and gendered social structures, their own political or practical viewpoints towards environmentalism and climate change, and their conceptions of their ability to shift economic, social, and gendered power structures. Such investigations could also begin to uncover the manner in which women representatives go about influencing

policy, and whether or not this is coordinated or fragmented, strategic or linked to other political issues, and inherently or peripherally gendered. Further research could thus help determine other factors (beyond state wealth, time, and governance contexts) which play a role in the relationship between gender equality and environmental outcomes.

In addition, a research agenda investigating the role of patriarchal social contexts could help to better uncover the links between social gendered power dynamics and environmental degradation. While this research looks specifically at women's role as parliamentarians and as economic and political actors, this approach does not inherently measure the power of social structures of gendered power or the role of masculinity in exploitation of the environment. Engagement with more radical feminist theory (MacKinnon, 1989) and other theories like ecofeminism may help expose the root connections between gendered political and social power structures and the exploitation and degradation of the natural world.

Another important agenda prompted by this research is the potential generalizability to issues outside of environmentalism. While existing research has investigated in detail how increased participation of women in parliaments and gender equality generally impacts what are traditionally deemed "women's issues" (Wittmer & Bouché, 2013; Clayton et al., 2019; Tremblay, 1998; Schwindt-Bayer, 2006), this research shows that women's influence in decision making, and their increased economic and political equality, influences an issue which is not particular to women, in the sense that all genders are impacted by climate change. Additional research should investigate the gendered dimensions of political issues which are not traditionally considered to pertain particularly to women in order to uncover if women play a particular role in the governance of these issues. Some existing research offers support for such an idea: Reher (2018) finds that women and men's preferences differ on issues which are not traditionally gendered, like nuclear power and animal rights, while Kroeber (2022a) finds that when parties are headed by women, they emphasise anti-growth and the protection of freedom and human rights to a greater extent than those lead by men, issues which are not traditionally gendered.

Finally, an important avenue of research should investigate the role of gender in climate change governance and outcomes in the Global South. The increased inclusion of women in decision making should, and often does, result in more attention paid to the issues women care about. Because the gender difference in climate change preferences is most pronounced in higher income countries, it is unsurprising that in these contexts increased gender equality results in better environmental outcomes. Yet, women and men tend to care about environmental issues at similar rates in developing states, offering less support for the idea that women's increased representation should particularly impact the climate. Yet, this does not inherently mean that increased gender equality in developing contexts should have no impact on environmentalism: much work in developing countries shows the gendered nature of climate change and environmental issues (Agarwal, 2010). Additional research should offer new theoretical connections between gender equality and environmentalism and empirically test these connections to determine the extent of the relationship in developing contexts.

The empirical analyses I have undertaken in this dissertation offer support for the proposed relationship between women's representation, and general gender equality, and environmental outcomes. While further research is required to understand more fully these relationships, the results I provide here add to the existing literature by indicating that this relationship is not universal, but rather dependent on states' development levels, the passage of time, and governance contexts. This research helps to crystalize an understanding of the scope of gender equality's impact on political issues, including one of the most important political issues faced on the global scale.

Appendix A

The Effects of Women's Parliamentary Participation on Renewable Energy Policy Outcomes

I created the weighted value of government lean utilizing data from the Manifesto Project (Volkens, 2020). The vote percentage garnered by each country's parties in each year was multiplied by each party's value for left-right ideological position, resulting in a weighted value of each party's ideological position; party values are then combined

Variable	Dickey-Fuller	Lag Order	P-value	Stationary/non-stationary
Renewable energy consumption	-9.5133	7	< 0.01	stationary
Women in Parliament	-9.4996	7	<0.01	stationary
GDP per capita	-9.7858	7	<0.01	stationary
HDI	-8.7001	7	<0.01	stationary
Climate Change Vulnerability	-9.2408	7	<0.01	stationary
Resource Rents	-7.763	7	<0.01	stationary
Democracy	-9.1521	7	<0.01	stationary
Percent Left Seats	-8.7578	7	<0.01	stationary
Percent Government Left Seats	-8.7807	7	<0.01	stationary

Figure A.1: Dickey Fuller Stationarity Test Results

Appendix A.

Table A.1: Models of all democracies with control variable results.

	Dependent variable: Renewable Energy Consumption			
	No lag	*1 lag*	*2 lags*	*3 lags*
Women in Parliament	-0.004	0.001	0.006	0.011*
	(0.003)	(0.004)	(0.005)	(0.005)
log GDP per capita	-0.059	-0.100	-0.277**	-0.346**
	(0.065)	(0.076)	(0.097)	(0.110)
Vulnerability	5.979**	5.811*	5.230	2.231
	(2.222)	(2.784)	(3.846)	(5.141)
Resource Rents	-0.006	-0.004	0.014	0.029**
	(0.004)	(0.007)	(0.011)	(0.011)
Democracy Score	0.123**	0.053	-0.138.	-0.079
	(0.045)	(0.066)	(0.082)	(0.097)
HDI	-0.540	-0.678	0.542	2.724
	(1.130)	(1.423)	(2.071)	(2.725)
Observations	481	388	295	204
R^2	0.075	0.059	0.114	0.190
Adjusted R^2	-0.203	-0.315	-0.378	-0.469
F Statistic	5.014*** (df = 6; 369)	2.872** (df = 6; 277)	4.066*** (df = 6; 189)	4.366*** (df = 6; 112)

Significance levels *p <0.1; **p <0.05; ***p <0.01.

Table A.2: Interactions of the proportion of women in parliament with democracy score, followed by the marginal effects of women in parliament on renewable energy consumption.

	Dependent variable: Renewable Energy Consumption			
	No lag	*1 lag*	*2 lag*	*3 lags*
Women in Parliament	-0.083***	-0.097***	-0.055	0.077.
	(0.018)	(0.025)	(0.033)	(0.040)
Women in Parliament x Democracy score	0.009***	0.011***	0.007.	-0.007.
	(0.002)	(0.003)	(0.004)	(0.004)
Democracy Score	-0.053	-0.144.	-0.240*	0.011
	(0.058)	(0.081)	(0.098)	(0.110)
log GDP per capita	-0.035	-0.076	-0.253*	-0.396***
	(0.064)	(0.074)	(0.097)	(0.113)
Vulnerability	3.558	3.296	3.533	3.553
	(2.227)	(2.790)	(3.931)	(5.160)
Resource Rents	-0.007	-0.006	0.011	0.035**
	(0.004)	(0.007)	(0.011)	(0.011)
HDI	-0.546	-0.927	0.239	3.262
	(1.100)	*(1.389)*	*(2.064)*	*(2.722)*
Observations	*481*	*388*	*295*	*204*
R^2	*0.126*	*0.108*	*0.130*	*0.210*
Adjusted R^2	*-0.140*	*-0.251*	*-0.360*	*-0.446*
F Statistic	*7.557*** (df = 7; 368)*	*4.775*** (df = 7; 276)*	*4.016*** (df = 7; 188)*	*4.205*** (df = 7; 111)*

Significance levels *p <0.1; **p <0.05; ***p <0.01.

Appendix A.

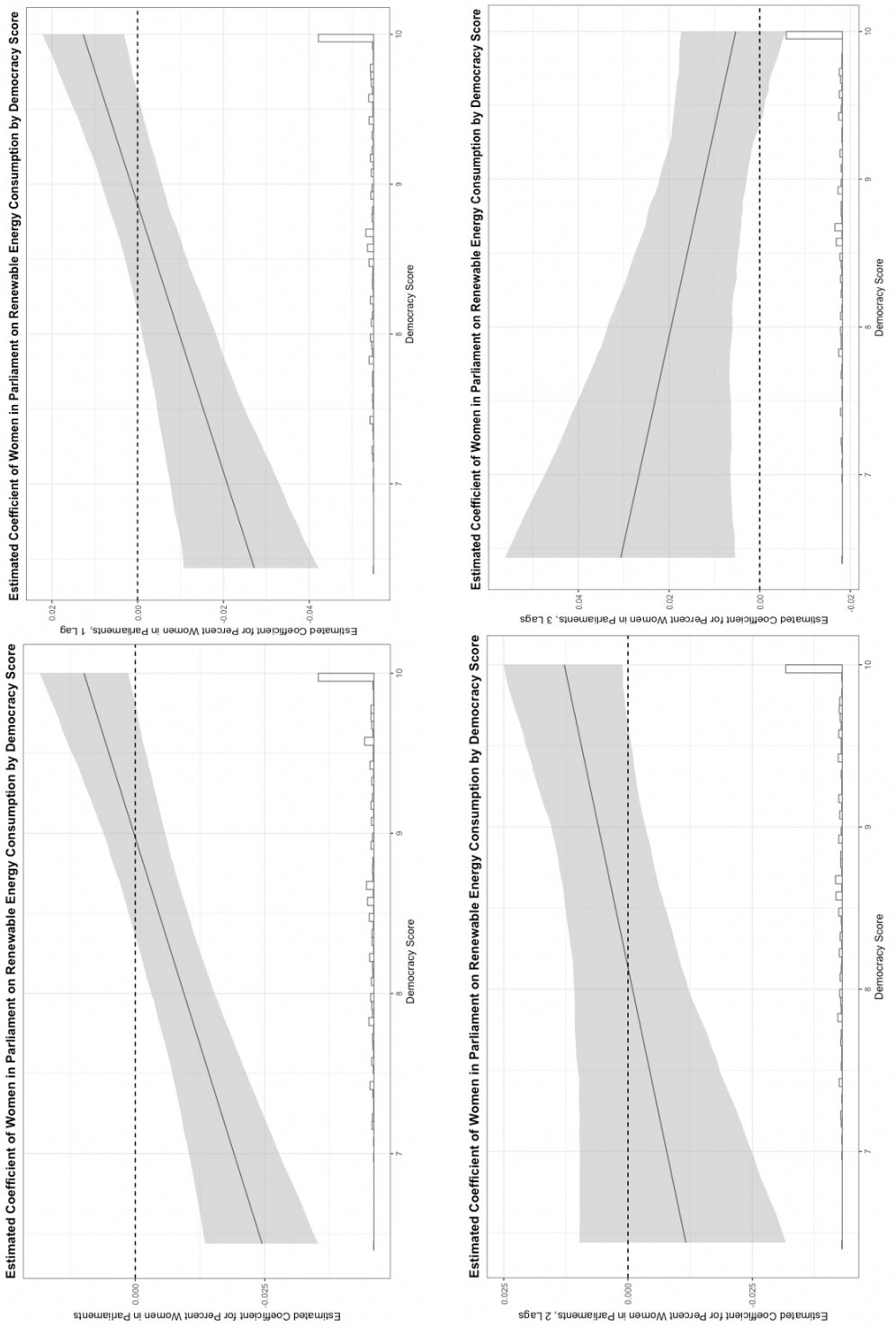

Figure A.2: Plotted marginal effects of women in parliament on renewable energy consumption by Democracy Score at all lag structures.

Appendix A.

Table A.3: Robustness test of the interactions of the proportion of women in parliament with HDI, followed by the marginal effects of women in parliament on renewable energy consumption.

	Dependent variable: Renewable Energy Consumption			
	No lag	*1 lag*	*2 lags*	*3 lags*
Women in Parliament	-0.074***	-0.085***	-0.079**	0.022
	(0.014)	(0.020)	(0.026)	(0.038)
Women in Parliament x HDI	0.097***	0.113***	0.109***	-0.014
	(0.018)	(0.026)	(0.033)	(0.046)
HDI	-0.991	-1.271	-0.260	2.956
	(1.094)	(1.385)	(2.031)	(2.845)
log GDP per capita	-0.037	-0.089	-0.268**	-0.352**
	(0.063)	(0.074)	(0.095)	(0.113)
Vulnerability	3.795.	3.526	1.518	2.770
	(2.182)	(2.747)	(3.906)	(5.473)
Resource Rents	-0.007.	-0.004	0.015	0.030**
	(0.004)	(0.007)	(0.011)	(0.011)
Democracy Score	0.092*	0.028	-0.144.	-0.079
	(0.044)	(0.064)	(0.080)	(0.098)
Observations	481	388	295	204
R^2	0.142	0.120	0.164	0.190
Adjusted R^2	-0.119	-0.234	-0.307	-0.481
F Statistic	8.686*** (df = 7; 368)	5.357*** (df = 7; 276)	5.282*** (df = 7; 188)	3.724** (df = 7; 111)
Significance levels	*p <0.1; **p <0.05; ***p <0.01.			

Appendix A.

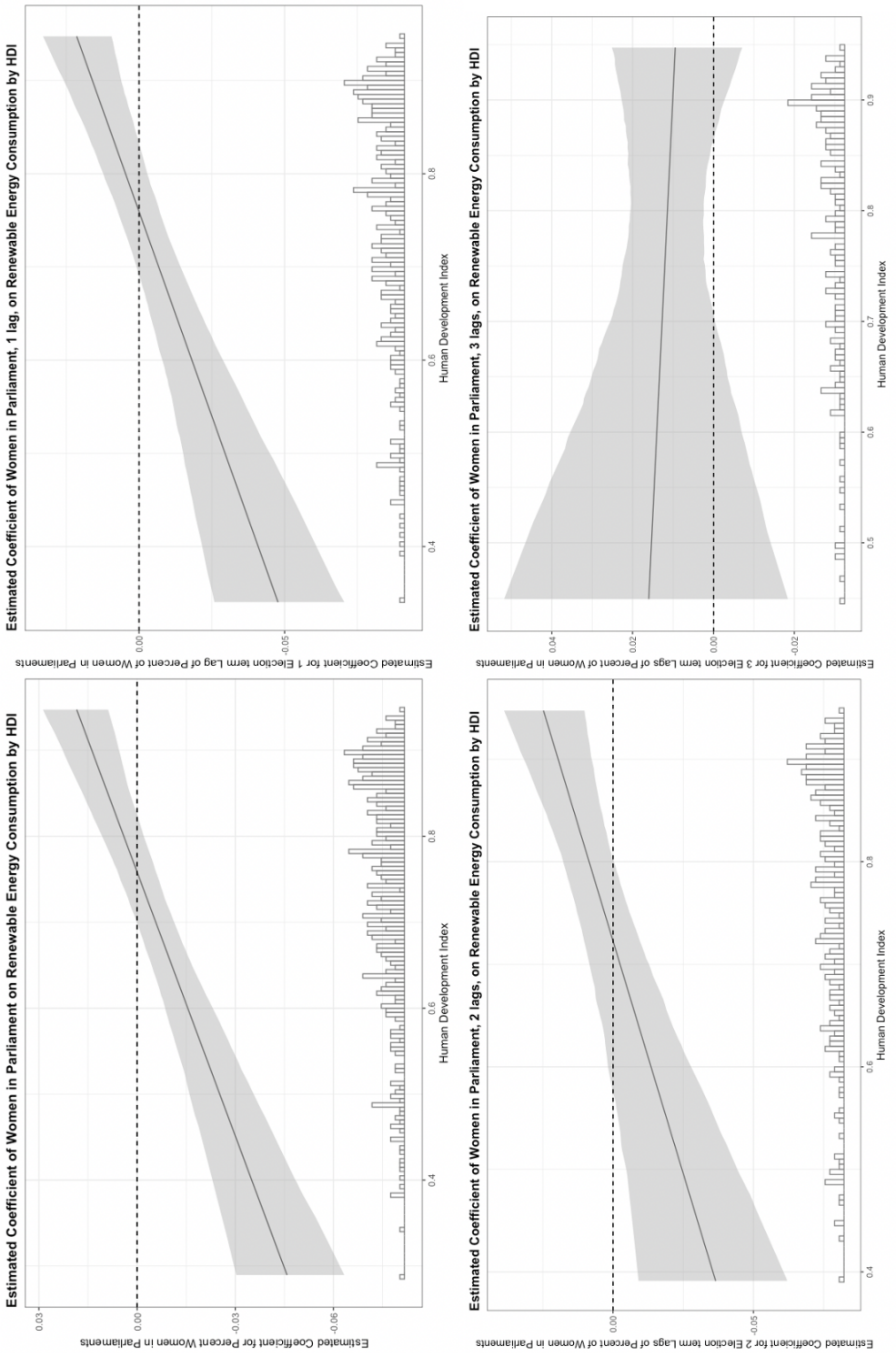

Figure A.3: Plotted marginal effects of the participation of women in parliaments by HDI.

Table A.4: Robustness tests including a measure of government's left-right ideological position with country and year fixed effects and control variables.

	Dependent variable: Renewable Energy Consumption			
	No lag	*1 lag*	*2 lags*	*3 lags*
Women in Parliament	-0.004	0.002	0.013	0.018
	(0.006)	(0.008)	(0.010)	(0.011)
log GDP per capita	-0.148	-0.147	-0.070	0.183
	(0.118)	(0.157)	(0.188)	(0.333)
Vulnerability	7.790	8.892	8.311	1.745
	(5.088)	(6.778)	(8.685)	(12.697)
Resource Rents	0.001	0.012	0.040	0.053
	(0.023)	(0.031)	(0.033)	(0.061)
Gov Left-Right Position	0.00001	-0.00001	0.00002	0.00003
	(0.00002)	(0.00003)	(0.00003)	(0.00004)
Democracy Score	0.220.	0.263	0.082	0.253
HDI	4.143.	4.635	9.295*	6.170
	(2.413)	(3.764)	(4.593)	(7.946)
Observations	180	126	94	61
R^2	0.085	0.075	0.201	0.371
Adjusted R^2	-0.331	-0.542	-0.689	-0.888
F Statistic	1.637 (df = 7; 123)	0.868 (df = 7; 75)	1.582 (df = 7; 44)	1.683 (df = 7; 20)
Significance levels	*p <0.1; **p <0.05; ***p <0.01.			

to form a government left-right ideological position value, such that:

Government Left-Right Position= Vote share Party A x left-right position (Party A) + Vote share Party B x left-right position (Party B) ...+Vote share Party N x left-right position (Party N)

The observations of government left-right ideological position per country and year were then averaged by election term period, consistent with the data format used to conduct the previous models. On this scale, higher positive values indicate more extreme right positions while lower negative values indicate more extreme left positions. For example, Australia's second election period demonstrates a substantial right-lean, with a weighted score of 3,377.4. Japan's fifth election term demonstrates, in the opposite direction, a substantial left-lean, with a score of -3,612.3.

Appendix A.

Table A.5: Robustness tests including a measure of government's left-right ideological position with an interaction of the proportion of women in parliament and GDP per capita, with country and year fixed effects and control variables.

	Dependent variable: Renewable Energy Consumption			
	No lag	*1 lag*	*2 lags*	*3 lags*
Women in Parliament	-0.073*	-0.034	0.129*	0.111
	(0.034)	(0.050)	(0.049)	(0.071)
Women in Parliament x GDP per capita	0.008*	0.004	-0.013*	-0.009
	(0.004)	(0.005)	(0.005)	(0.007)
log GDP per capita	-0.327*	-0.231	0.080	0.253
	(0.139)	(0.176)	(0.189)	(0.331)
Vulnerability	4.787	6.548	13.204	0.213
	(5.405)	(7.447)	(8.507)	(12.513)
Resource Rents	-0.001	0.007	0.056.	0.053
	(0.025)	(0.033)	(0.032)	(0.060)
Democracy Score	0.345**	0.325	-0.014	0.225
	(0.131)	(0.210)	(0.243)	(0.365)
HDI	6.071*	7.121.	7.253	-0.776
	(2.688)	(4.232)	(4.449)	(9.388)
Gov Left-Right Position	0.00003	-0.00001	-0.00002	0.00002
	(0.00003)	(0.00003)	(0.00003)	(0.00004)
Observations	159	116	89	60
R^2	0.150	0.097	0.294	0.424
Adjusted R^2	-0.221	-0.484	-0.444	-0.788
F Statistic	2.420* (df = 8; 110)	0.938 (df = 8; 70)	2.243* (df = 8; 43)	1.750 (df = 8; 19)
Significance levels	*p <0.1; **p <0.05; ***p <0.01.			

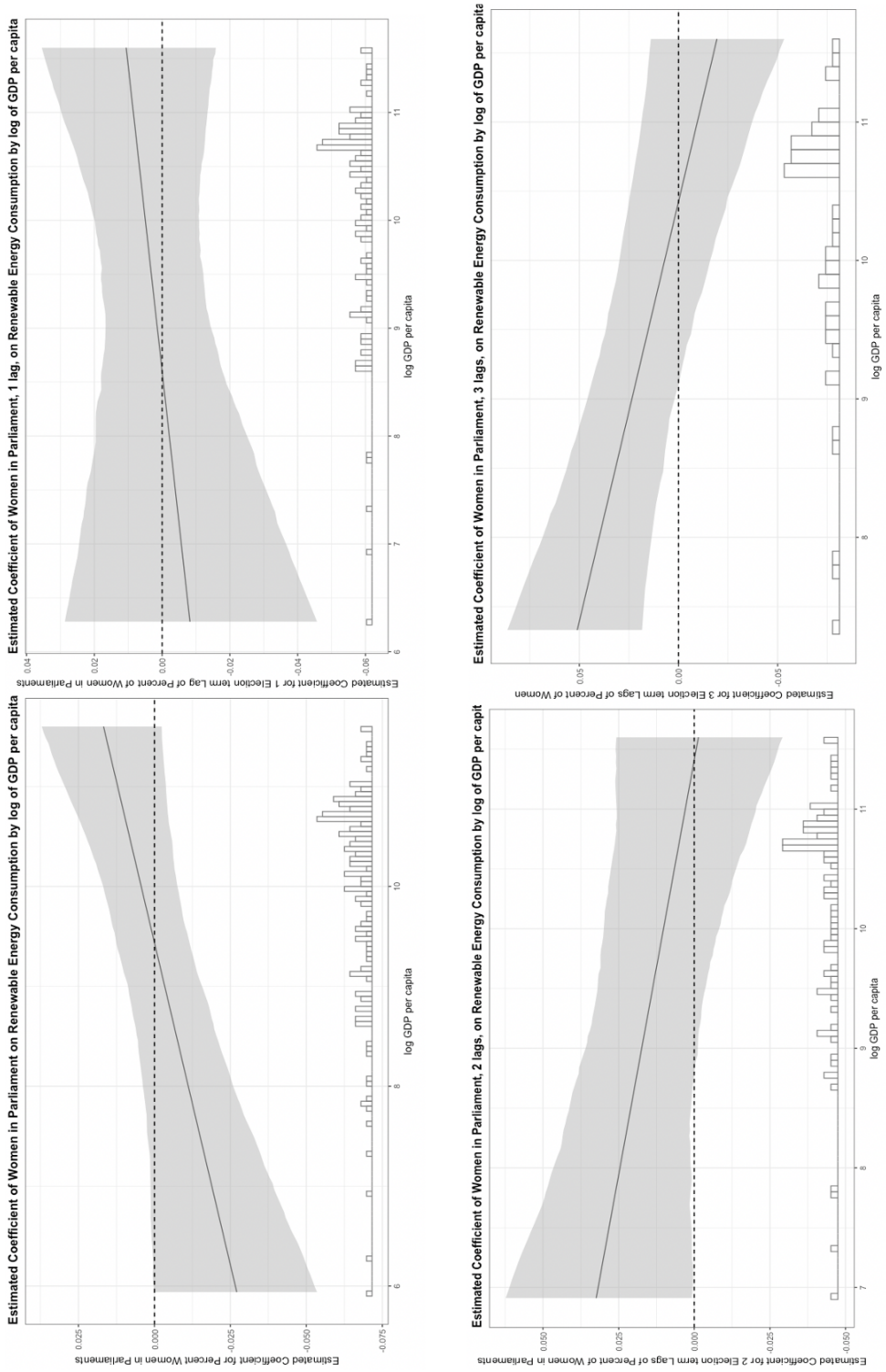

Figure A.4: Plotted marginal effects of women in parliament on renewable energy consumption by GDP per capita at all lag structures.

Table A.6: Robustness tests including a measure of government's left-right ideological position with an interaction of the proportion of women in parliament and democracy score, with country and year fixed effects and control variables.

	Dependent variable: Renewable Energy Consumption			
	No lags	*1 lags*	*2 lags*	*3 lags*
Women in Parliament	-0.076.	-0.005	0.133.	0.191*
	(0.045)	(0.078)	(0.073)	(0.082)
Women in Parliament x Democracy	0.008.	0.001	-0.013	-0.019*
	(0.005)	(0.008)	(0.008)	(0.009)
Freedom House Score	0.069	0.283	0.499.	0.641.
	(0.206)	(0.256)	(0.260)	(0.341)
log GDP per capita	-0.182	-0.182	-0.243	0.087
	(0.129)	(0.171)	(0.199)	(0.303)
Vulnerability	5.622	8.181	8.418	14.747
	(5.421)	(7.261)	(8.962)	(11.507)
Resource Rents	-0.002	0.012	0.067.	0.030
	(0.025)	(0.032)	(0.033)	(0.051)
HDI	4.606.	6.218	6.665	8.997
	(2.593)	(4.124)	(4.613)	(7.808)
Gov Left-Right Position	0.00002	-0.00001	-0.00001	-0.00002
	(0.00003)	(0.00003)	(0.00003)	(0.00004)
Observations	159	116	91	57
R^2	0.135	0.090	0.263	0.571
Adjusted R^2	-0.242	-0.495	-0.474	-0.413
F Statistic	2.151* (df = 8; 110)	0.867 (df = 8; 70)	2.007. (df = 8; 45)	2.828* (df = 8; 17)
Significance levels	*p <0.1; **p <0.05; ***p <0.01.			

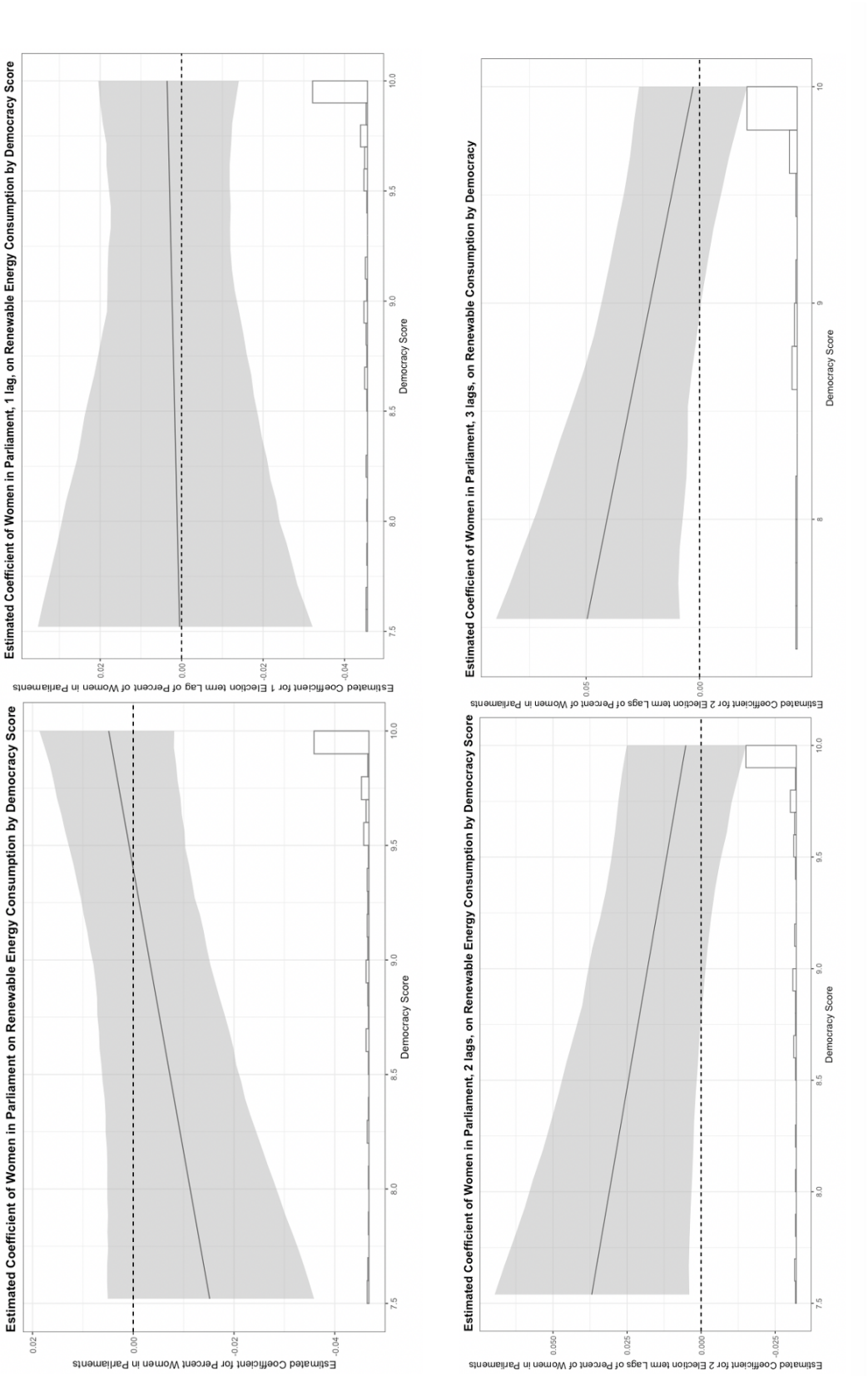

Figure A.5: Plotted marginal effects of women in parliament on renewable energy consumption by democracy score at all lag structures.

Table A.7: Robustness tests of Appendix Table 1, in which observations before election term 3 are discounted and models are rerun.

Models: Observations Removed before 3 Lags

	Dependent Variable: Renewable Energy Consumption			
	No lag	*1 lag*	*2 lags*	*3 lags*
Women in Parliament	-0.010*	-0.009.	0.009	0.011*
	(0.004)	(0.005)	(0.006)	(0.005)
log GDP per capita	-0.341**	-0.350**	-0.344**	-0.346**
	(0.110)	(0.111)	(0.113)	(0.110)
Vulnerability	-1.177	1.565	1.863	2.231
	(5.260)	(5.170)	(5.250)	(5.141)
Resource Rents	0.021.	0.024*	0.022*	0.029**
	(0.011)	(0.011)	(0.011)	(0.011)
Democracy Score	-0.060	-0.049	-0.029	-0.079
	(0.097)	(0.098)	(0.100)	(0.097)
HDI	2.211	3.023	1.890	2.724
	(2.737)	(2.752)	(2.796)	(2.725)
Observations	204	204	201	204
R^2	0.982	0.982	0.982	0.982
Adjusted R^2	0.968	0.968	0.967	0.968
Residual Std. Error	0.162 (df = 112)	0.163 (df = 112)	0.163 (df = 110)	0.161 (df = 112)
F Statistic	68.424*** (df = 91; 112)	67.531*** (df = 91; 112)	65.591*** (df = 90; 110)	68.641*** (df = 91; 112)
Significance levels	*p <0.1; **p <0.05; ***p <0.01.			

Table A.8: Robustness tests of Appendix Table 2, in which observations before election term 3 are discounted and models are rerun.

Models: Women in Parliament x GDP Interactions with Observations Removed before 3 Lags

	Dependent variable: Renewable Energy Consumption			
	No lag	*1 lag*	*2 lags*	*3 lags*
Women in Parliament	-0.069*	-0.018	0.003	0.036
	(0.031)	(0.038)	(0.036)	(0.033)
Women in Parliament x GDP per capita	0.007.	0.001	0.001	-0.003
	(0.003)	(0.004)	(0.004)	(0.003)
log GDP per capita	-0.456***	-0.367**	-0.353**	-0.318**
	(0.124)	(0.135)	(0.125)	(0.116)
Vulnerability	-3.599	1.275	1.641	3.290
	(5.341)	(5.350)	(5.417)	(5.347)
Resource Rents	0.017	0.023*	0.022*	0.031**
	(0.011)	(0.011)	(0.011)	(0.011)
Democracy Score	-0.076	-0.048	-0.029	-0.079
	(0.096)	(0.099)	(0.101)	(0.098)
HDI	2.247	3.024	1.959	2.658
	(2.703)	(2.764)	(2.835)	(2.732)
Observations	204	204	201	204
R^2	0.983	0.982	0.982	0.982
Adjusted R^2	0.969	0.967	0.966	0.968
Residual Std. Error	0.160 (df = 111)	0.163 (df = 111)	0.164 (df = 109)	0.162 (df = 111)
F Statistic	69.427*** (df = 92; 111)	66.231*** (df = 92; 111)	64.300*** (df = 91; 109)	67.624*** (df = 92; 111)
Significance levels	*p <0.1; **p <0.05; ***p <0.01.			

Appendix A.

Table A.9: Time-series cross-sectional analysis of FITs with country and year fixed effects and an interaction of women in parliament and GDP per capita.

Interaction of Women in Parliament and GDP on FITs

	Dependent variable: FITs			
	No lag	*1 lag*	*2 lags*	*3 lags*
Women in Parliament	1.003	1.486.	-2.121*	-0.525
	(1.178)	(0.828)	(0.890)	(0.822)
Women in Parliament x GDP per cap	-0.074	-0.130	0.195*	0.052
	(0.135)	(0.090)	(0.091)	(0.086)
logGDP	5.842	10.611*	4.185	3.883
	(5.089)	(5.128)	(4.918)	(5.217)
Vulnerability	-432.244**	-484.426**	-519.715**	-491.893**
	(161.075)	(165.853)	(166.943)	(166.881)
ResourceRents	-0.196	-0.257	-0.061	-0.311
	(0.501)	(0.509)	(0.517)	(0.514)
FreedomHouse	-0.082	-0.843	-1.457	-0.730
	(3.209)	(3.306)	(3.358)	(3.315)
HDI	-14.180	-83.824	-53.516	-16.431
	(87.381)	(85.071)	(86.634)	(85.827)
Observations	268	255	256	258
R^2	0.313	0.326	0.332	0.304
Adjusted R^2	0.082	0.090	0.099	0.063
Residual Std. Error	12.446 (df = 200)	12.704 (df = 188)	12.614 (df = 189)	12.813 (df = 191)
F Statistic	1.357. (df = 67; 200)	1.379* (df = 66; 188)	1.425* (df = 66; 189)	1.262 (df = 66; 191)
Significance levels	*p <0.1; **p <0.05; ***p <0.01.			

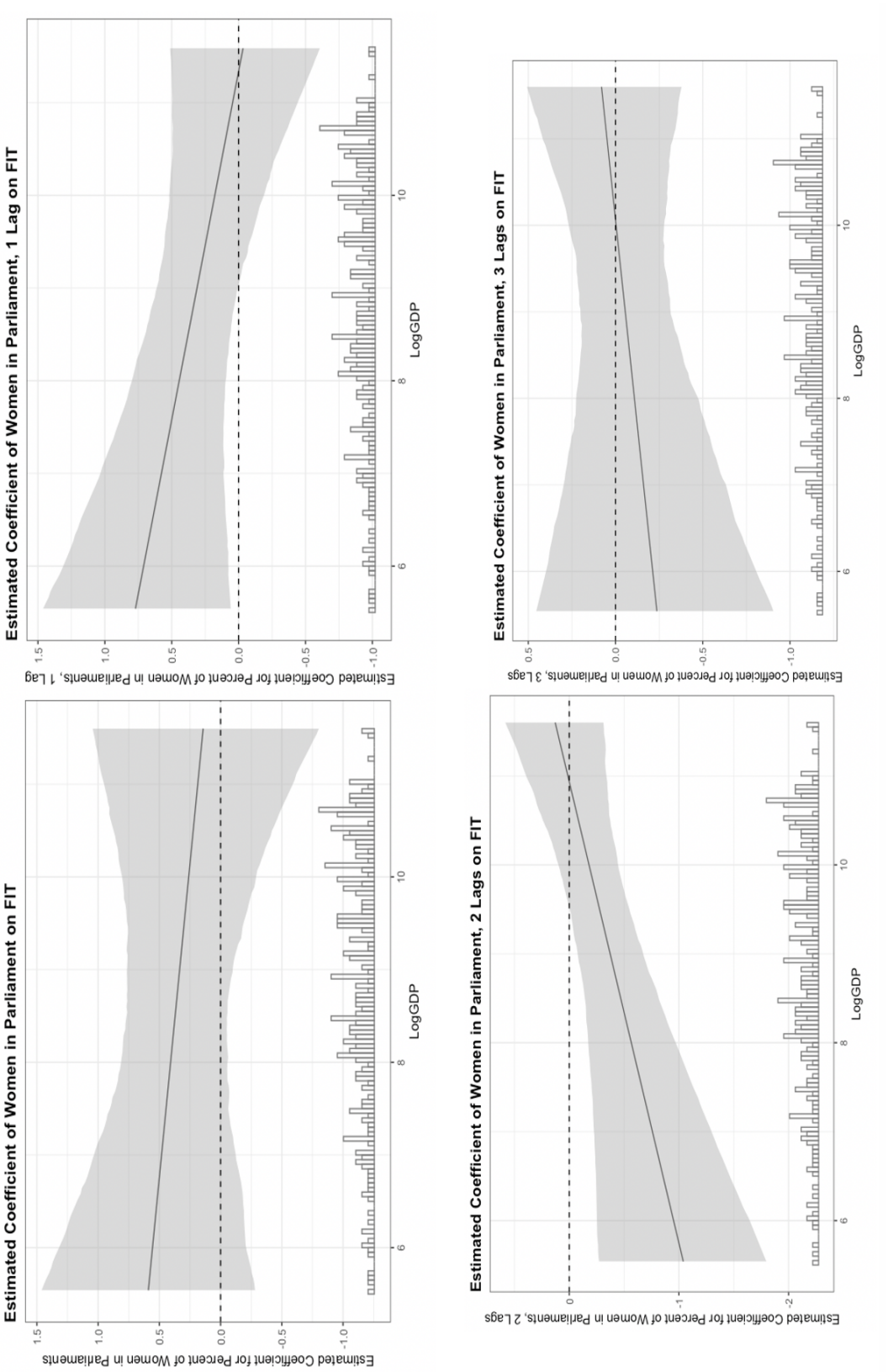

Figure A.6: Plotted marginal effects of women in parliament on FITs by GDP per capita at all lag structures.

Appendix A.

Table A.10: Time-series cross-sectional analysis of renewable energy consumption with country and year fixed effects and an interaction of women in cabinets and GDP per capita.

Interaction of Women in Cabinets and GDP per capita

	Dependent variable: Renewable Energy Consumption			
	No lag	*1 lag*	*2 lags*	*3 lags*
Women in Cabinets	-0.058	-0.142	-0.269	-0.453.
	(0.086)	(0.101)	(0.167)	(0.237)
Women in Cabinets x log GDP per capita	0.003	0.014	0.028.	0.039.
	(0.009)	(0.011)	(0.016)	(0.023)
log GDP per capita	-0.215*	-0.305*	-0.519**	-0.629***
	(0.098)	(0.123)	(0.153)	(0.181)
Women in Parliament	-0.099***	-0.086**	-0.079.	-0.040
	(0.026)	(0.032)	(0.042)	(0.048)
Vulnerability	4.263	1.247	3.415	1.776
	(3.373)	(4.618)	(5.721)	(9.054)
Resource Rents	-0.022.	-0.034*	-0.011	0.0003
	(0.011)	(0.013)	(0.018)	(0.021)
Freedom House Score	-0.046	-0.132	-0.340**	-0.207
	(0.065)	(0.093)	(0.109)	(0.129)
HDI	0.550	-1.030	0.404	2.208
	(1.766)	(2.084)	(3.097)	(3.899)
Women in parliament x log GDP	0.011***	0.009*	0.008	0.003
	(0.003)	(0.004)	(0.005)	(0.005)
Observations	247	202	157	111
R^2	0.202	0.235	0.318	0.369
Adjusted R^2	-0.079	-0.114	-0.132	-0.285
F Statistic	5.119*** (df = 9; 182)	4.718*** (df = 9; 138)	4.865*** (df = 9; 94)	3.512** (df = 9; 54)
Significance levels	*p <0.1; **p <0.05; ***p <0.01.			

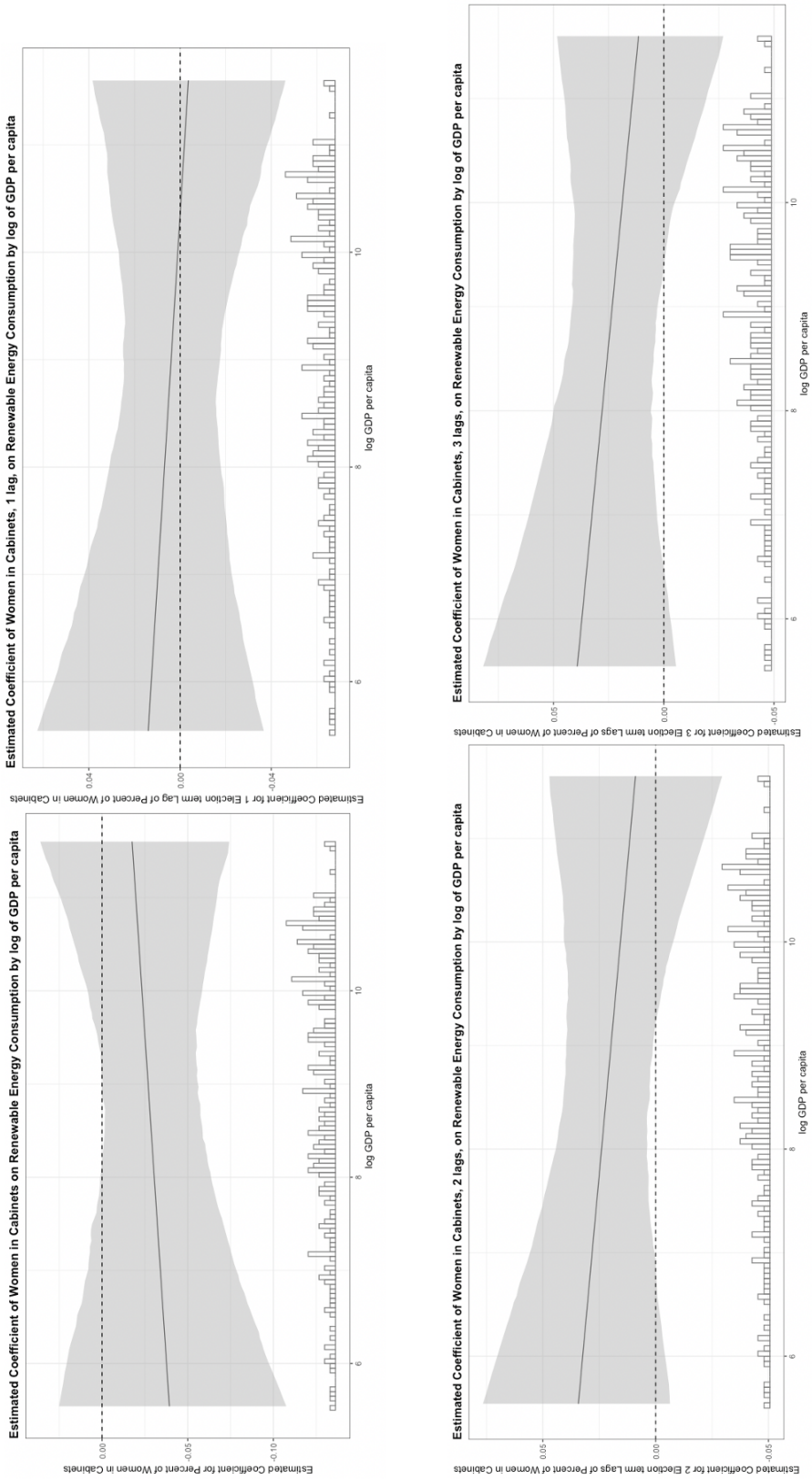

Figure A.7: Plotted marginal effects of women in cabinets on renewable energy consumption by GDP per capita at all lag structures.

Appendix B

The Women's Representation-Corruption Link and Environmentalism: A Cross-National Study

Variable	Dickey-Fuller	Lag Order	P-value	Stationary/non-stationary
Corruption	-5.8214	9	< 0.01	stationary
Women in Parliament	-5.6579	9	<0.01	stationary
GDP per capita	-6.8435	9	<0.01	stationary
HDI	-5.8301	9	<0.01	stationary
Resource Rents	-5.9235	9	<0.01	stationary
Democracy	-5.8089	9	<0.01	stationary
Effective # Parties	-4.9614	8	<0.01	stationary
Percent Left Seats	-8.2599	11	<0.01	stationary
Percent Government Left Seats	-9.179	11	<0.01	stationary

Figure B.1: Dickey Fuller Stationarity Test Results

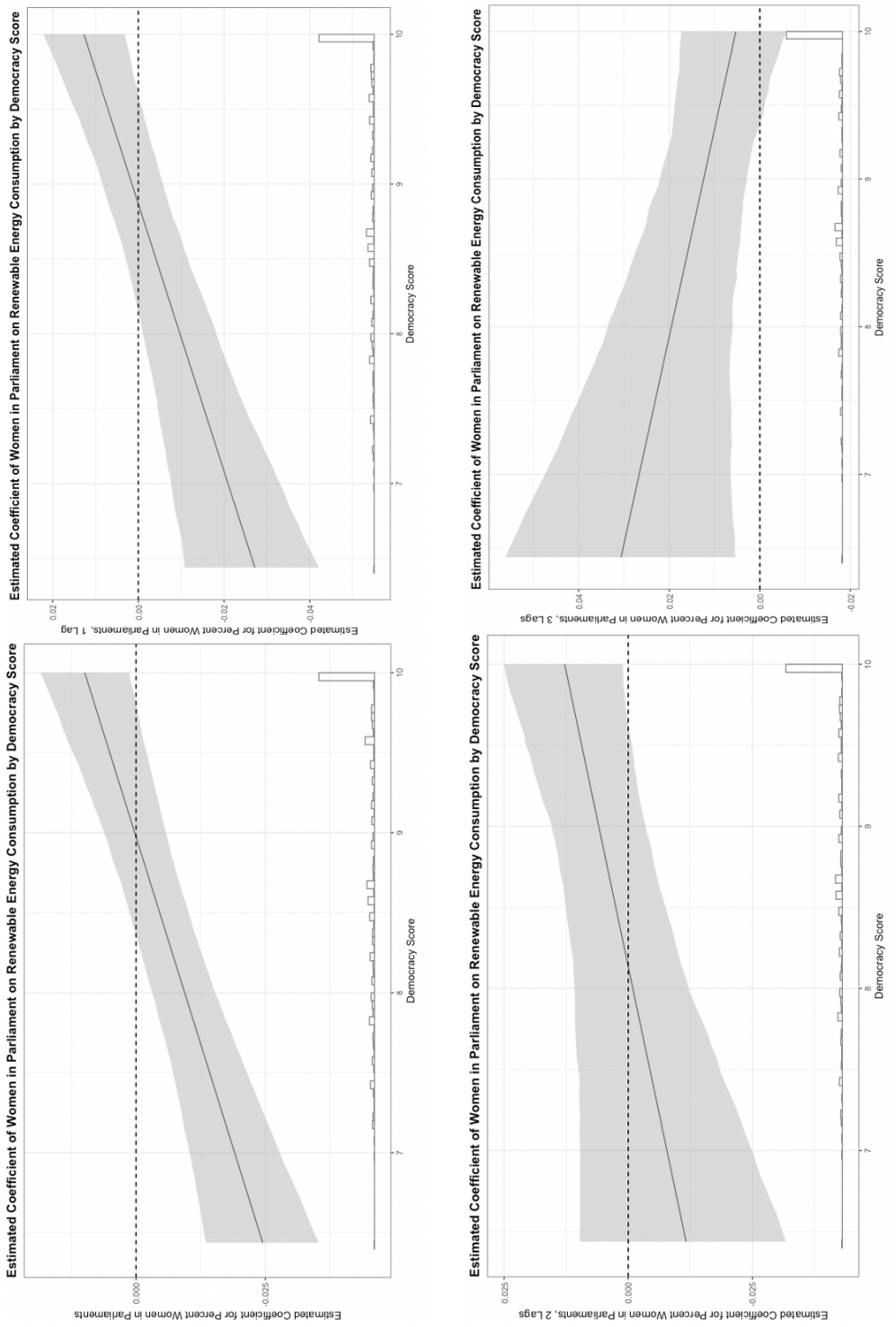

Figure B.2: Plotted marginal effects of women in parliament on renewable energy consumption by Democracy Score at all lag structures.

Appendix B.

Table B.1: Dataset Summary Statistics

	Min	Median	Mean	Max	NA's
Women in Parliament	0.000	15.833	17.878	47.619	25
Corruption	0.130	2.268	2.108	3.694	137
CO_2 Emissions per capita	0.053	3.765	5.244	25.669	0
Renewable Energy Consumption	0.000	22.19	27.56	87.73	108
Forest Area %	0.259	33.715	35.671	94.364	3
Climate Change Readiness	0.250	0.512	0.502	0.816	0
GDP per capita	156.4	7469.5	18,147.6	178,845.6	1
HDI	0.271	0.764	0.735	0.939	141
Democracy Score	5.314	9.333	9.017	10.000	10
Resource Rents	0.000	0.991	2.847	27.516	0
Number of Effective Parties	1.590	3.950	4.623	14.135	189

Table B.2: Calculated coefficients for the percent women in parliament at various values of corruption, using data from Table 4.1.

Marginal Effect Coefficients for Women in Parliament at Various Levels of Corruption

	CO_2 emissions per capita	*Renewable Energy*	*Forest Area*	*Climate Change Readiness*
Corruption= 1	-0.082	0.258	0.058	0.001
Corruption= 1.5	-0.061	0.155	0.035	0.0005
Corruption= 2	-0.039	0.053	0.012	0
Corruption= 2.5	-0.017	-0.05	-0.011	-0.0005
Corruption= 3	0.004	-0.152	-0.034	-0.001

Table B.3: Distribution of the 'corruption' variable

Distribution of Corruption	
Min:	0.130
1st quarter	1.229
Median:	2.268
Mean:	2.108
3rd Quarter:	2.941
Max:	3.694

Appendix B.

Table B.4: Women's Empowerment Index x Corruption Models

	Dependent variables:			
	Climate Change Readiness	*CO2 Emissions*	*Renewable Energy Consumption*	*Forest Area*
Women's Empowerment Index	0.250***	-0.204	9.801	15.102***
	(0.069)	(0.434)	(19.592)	(4.458)
Corruption	0.019	-0.219.	13.433*	7.289***
	(0.020)	(0.128)	(5.764)	(1.312)
Women's Empowerment Index x Corruption	-0.086***	0.151	-10.098	-7.658***
	(0.023)	(0.144)	(6.524)	(1.486)
log GDP	0.020***		-2.878**	-0.102
	(0.004)		(1.083)	(0.246)
log GDP^2		0.073***		
		(0.012)		
HDI	0.030	3.761***	-92.825***	1.659
	(0.080)	(0.504)	(22.757)	(5.163)
Democracy level	0.005.	0.013	0.378	-0.119
	(0.003)	(0.018)	(0.802)	(0.182)
Resource Rents	-0.001	0.003	-0.208.	-0.030
	(0.0004)	(0.003)	(0.114)	(0.026)
Number of Effective Parties	-0.00004	-0.004	0.333*	-0.079*
	(0.001)	(0.003)	(0.144)	(0.033)
Observations	603	603	603	602
R^2	0.993	0.990	0.970	0.998
Adjusted R^2	0.993	0.988	0.966	0.998
Residual Std. Error	0.013 (df = 533)	0.083 (df = 533)	3.754 (df = 533)	0.852 (df = 532)
F Statistic	1,167.879*** (df = 69; 533)	750.113*** (df = 69; 533)	251.400*** (df = 69; 533)	4,509.886*** (df = 69; 532)
Significance levels	*p <0.1; **p <0.05; ***p <0.01.			

Table B.5: Women's Substantive Representation x Corruption Models

The Effects of Women's Substantive Representation x Corruption on Environmental Outcomes

	Dependent variables:			
	Climate Change Readiness	*CO2 Emissions*	*Renewable Energy Consumption*	*Forest Area*
% Girls' Secondary School Enrollment	0.0005**	-0.003*	0.197***	0.070***
	(0.0002)	(0.001)	(0.047)	(0.010)
Corruption	-0.022**	-0.232***	16.762***	5.267***
	(0.008)	(0.062)	(2.111)	(0.457)
% Girls' Enrolment Secondary School x Corruption	-0.0004***	0.002**	-0.132***	-0.047***
	(0.0001)	(0.001)	(0.019)	(0.004)
log GDP	0.022***		-2.787*	0.153
	(0.004)		(1.119)	(0.242)
log GDP^2		0.081***		
		(0.016)		
HDI	0.389***	3.062***	-30.224	18.889***
	(0.095)	(0.718)	(24.433)	(5.294)
Democracy level	-0.001	-0.014	-1.007	0.005
	(0.003)	(0.023)	(0.795)	(0.172)
Resource Rents	-0.001*	0.008*	-0.365**	-0.059*
	(0.0004)	(0.003)	(0.113)	(0.025)
Number of Effective Parties	0.00004	-0.006	0.135	-0.158***
	(0.001)	(0.005)	(0.158)	(0.034)
Observations	571	571	567	570
R^2	0.992	0.981	0.970	0.999
Adjusted R^2	0.991	0.978	0.966	0.998
Residual Std. Error	0.014 (df = 498)	0.105 (df = 498)	3.578 (df = 494)	0.775 (df = 497)
F Statistic	859.639*** (df = 72; 498)	355.103*** (df = 72; 498)	225.573*** (df = 72; 494)	4,681.094*** (df = 72; 497)
Significance levels	* p<0.1; ** p<0.05; *** p<0.01 .			

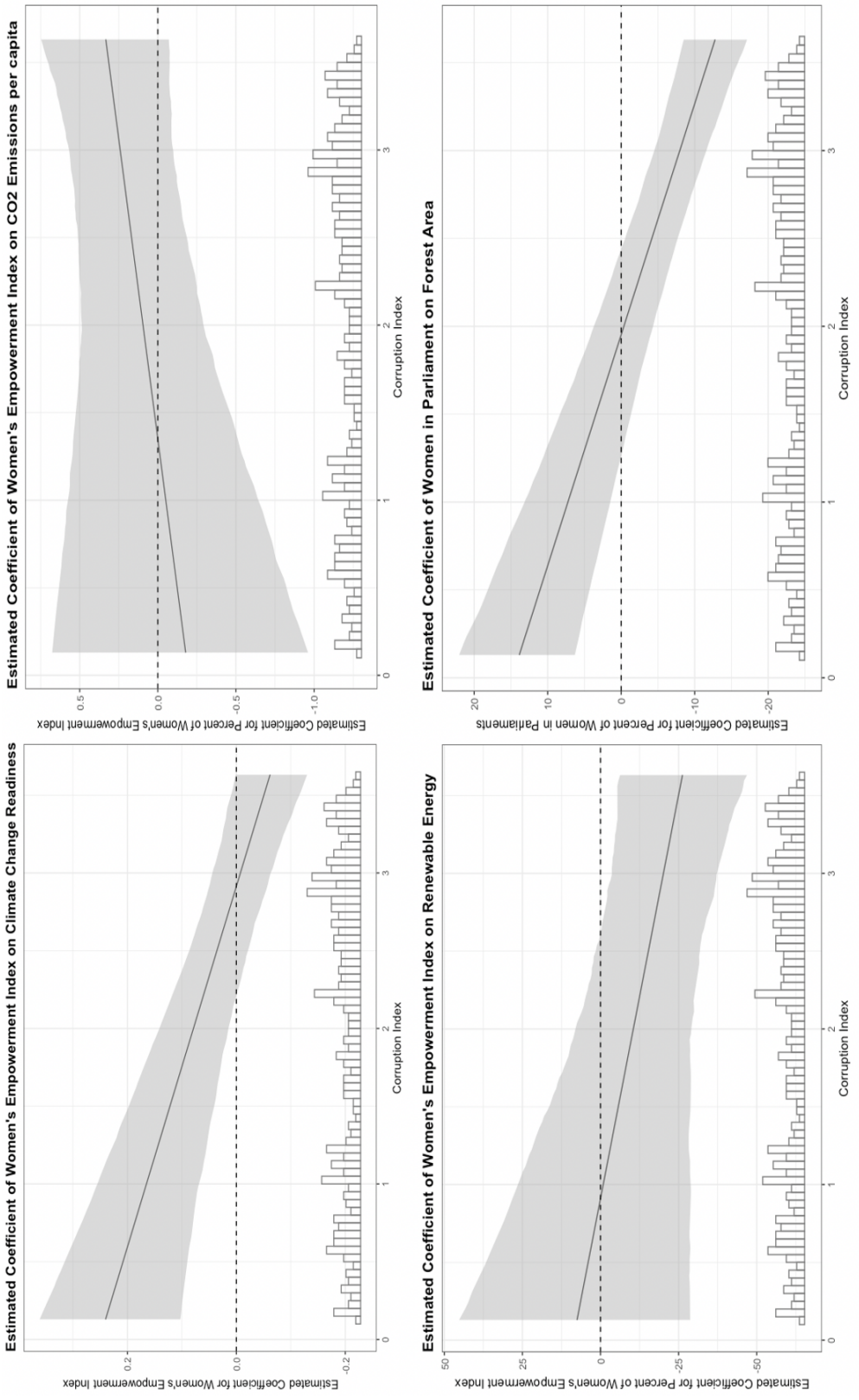

Figure B.3: Plotted marginal effects of women's empowerment index on climate change outcomes by corruption score.

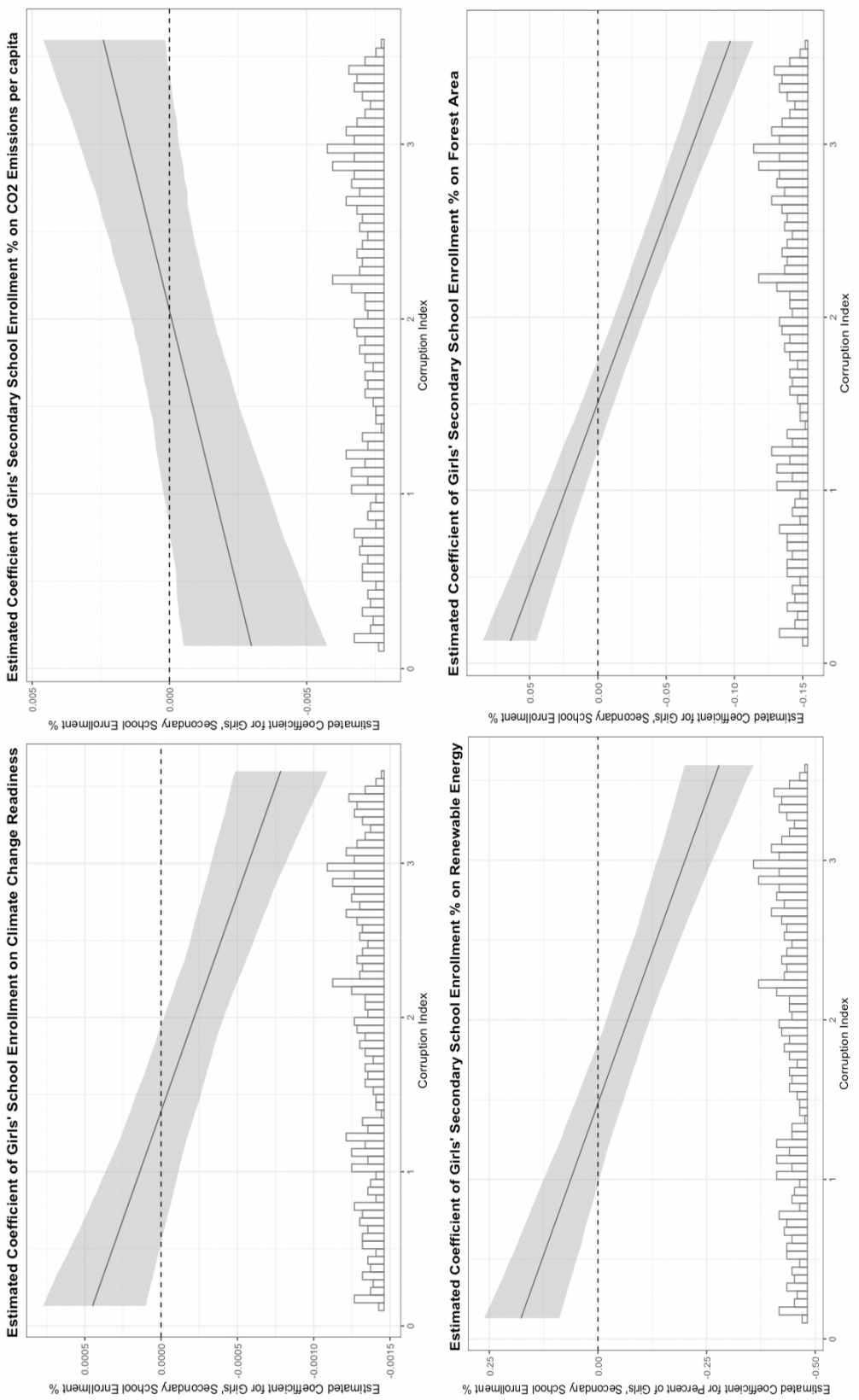

Figure B.4: Plotted marginal effects of women's substantive representation on climate change outcomes by corruption score

Appendix B.

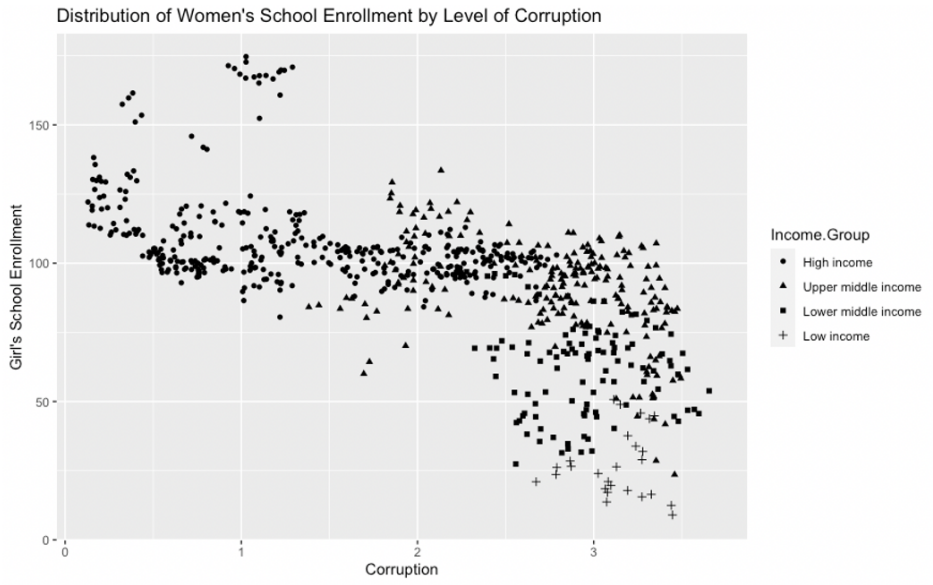

Figure B.5: Distribution of % Girls' Secondary School Enrolment by Corruption levels

Table B.6: Regression Results of the interaction of women and parliament and corruption levels on policy outcomes with country-election term units of analysis (rather than country-year).

The Effects of Women's Representation x Corruption on Environmental Outcomes

	Dependent variables:			
	Climate Change Readiness	*CO2 Emissions*	*Renewable Energy Consumption*	*Forest Area*
Women in Parliament	0.003***	-0.017***	0.535**	0.126*
	(0.001)	(0.004)	(0.200)	(0.052)
Corruption	-0.040***	-0.182***	8.423***	2.255**
	(0.009)	(0.054)	(2.498)	(0.682)
Women in Parliament x Corruption	-0.001***	0.006***	-0.252**	-0.049*
	(0.0003)	(0.002)	(0.076)	(0.020)
log GDP	0.020**		1.058	1.150*
	(0.007)		(1.946)	(0.532)
Log GDP^2		0.037.		
		(0.021)		
HDI	0.148	1.702*	-59.607	-3.280
	(0.141)	(0.841)	(39.143)	(10.697)
Democracy level	0.004	0.016	0.342	0.613
	(0.005)	(0.032)	(1.487)	(0.404)
Resource Rents	-0.001	0.005	-0.305	-0.023
	(0.001)	(0.005)	(0.254)	(0.069)
Number of Effective Parties	0.001	-0.008	0.699**	-0.057
	(0.001)	(0.005)	(0.254)	(0.069)
Observations	225	225	223	224
R^2	0.993	0.989	0.968	0.997
Adjusted R^2	0.990	0.985	0.956	0.996
Residual Std. Error	0.015 (df = 161)	0.092 (df = 161)	4.269 (df = 159)	1.167 (df = 160)
F Statistic	343.565*** (df = 63; 161)	236.932*** (df = 63; 161)	77.455*** (df = 63; 159)	995.935*** (df = 63; 160)
Significance levels	* p<0.1; ** p<0.05; *** p<0.01 .			

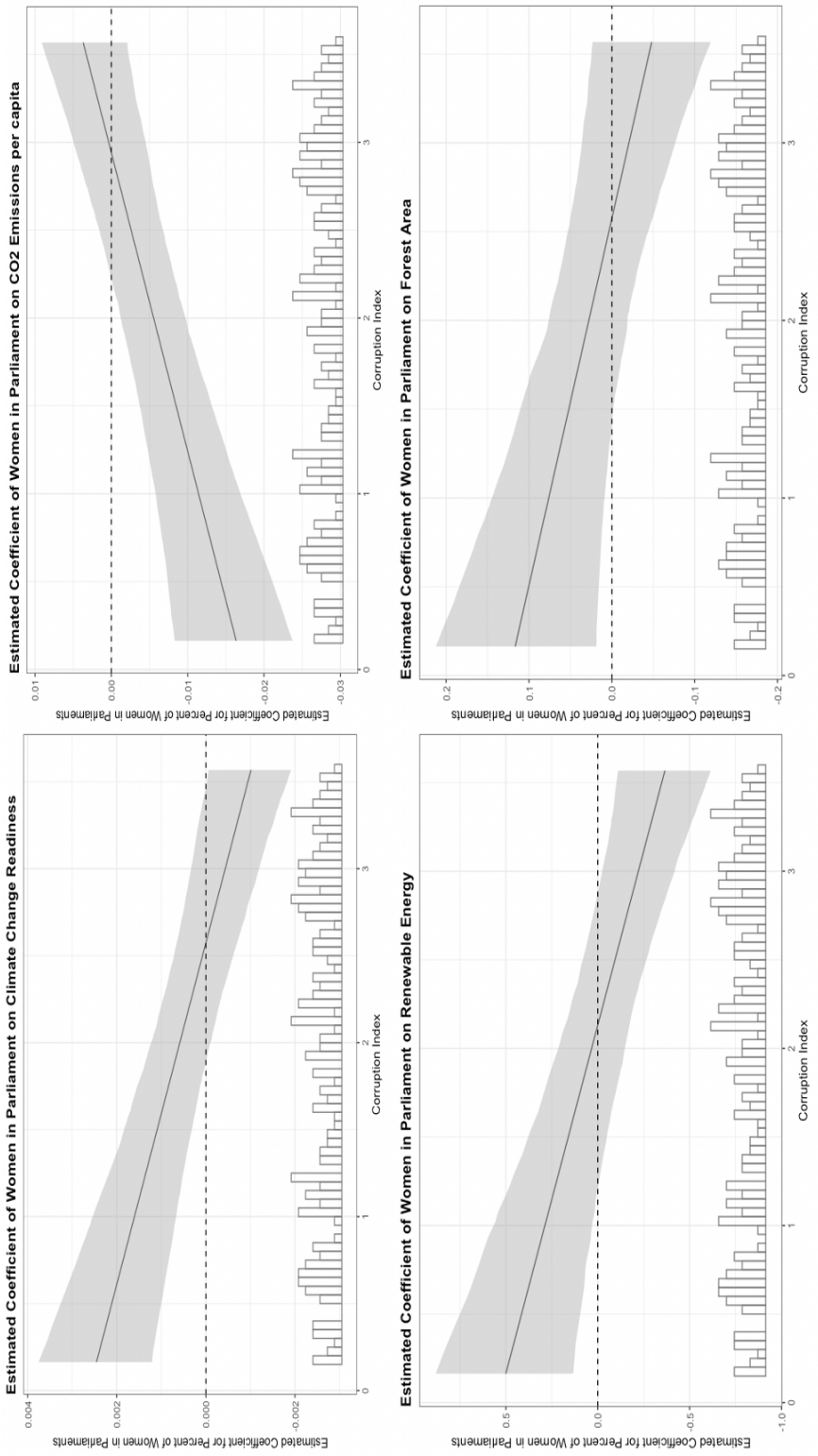

Figure B.6: Plotted Marginal Effects of the interaction of women and parliament and corruption levels on policy outcomes with country-election term units of analysis (rather than country-year).

Appendix B.

Table B.7: Regression Results of the interaction of women and parliament and corruption levels lagged by one year on policy outcomes.

The Effects of Women in Parliament x Corruption (t-1) on Environmental Outcomes

	Dependent variables:			
	Climate Change Readiness	*CO2 emissions per capita*	*Renewable Energy Consumption*	*Forest Area*
Women in Parliament	0.002***	-0.014***	0.494***	0.087***
	(0.0004)	(0.003)	(0.107)	(0.026)
Lag Corruption	-0.033***	-0.165***	6.929***	1.167***
	(0.005)	(0.032)	(1.212)	(0.302)
log GDP	0.019***		-2.005*	0.265
	(0.004)		(1.006)	(0.254)
log GDP^2		0.061***		
		(0.014)		
HDI	0.253**	2.405***	-50.753*	7.413
	(0.081)	(0.565)	(20.802)	(5.245)
Democracy level	0.005.	0.001	-0.102	0.038
	(0.003)	(0.020)	(0.747)	(0.188)
Resource Rents	-0.001*	0.007*	-0.238*	-0.034
	(0.0004)	(0.003)	(0.110)	(0.028)
Number of Effective Parties	-0.0003	-0.006	0.401**	-0.092**
	(0.001)	(0.004)	(0.140)	(0.035)
Observations	686	686	680	684
R^2	0.991	0.984	0.970	0.998
Adjusted R^2	0.990	0.982	0.967	0.998
Residual Std. Error	0.015 (df = 610)	0.102 (df = 610)	3.750 (df = 604)	0.946 (df = 608)
F Statistic	931.973*** (df = 75; 610)	489.425*** (df = 75; 610)	263.406*** (df = 75; 604)	3,914.364*** (df = 75; 608)
Significance levels	* p<0.1; ** p<0.05; *** p<0.01 .			

Appendix B.

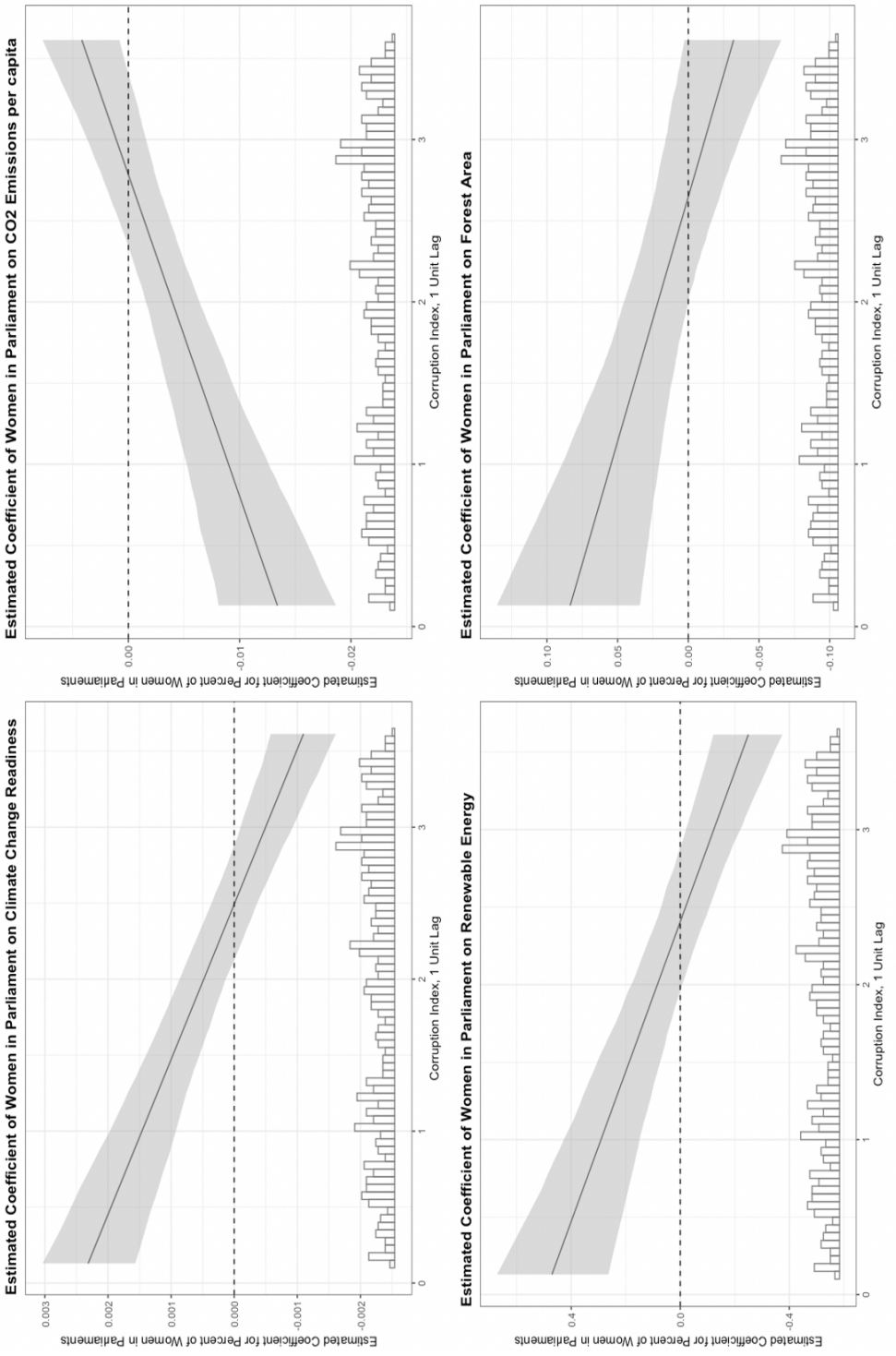

Figure B.7: Plotted marginal effects of women's representation on climate change outcomes by corruption score at t-1

Table B.8: Regression Results of the relationship between women and parliament and corruption.

Relationship between Corruption and Women in Parliament

	Dependent variable: Corruption
Women in Parliament	0.003
	(0.002)
Log GDP per capita	-0.180***
	(0.043)
HDI	0.714
	(0.876)
Democracy	-0.041
	(0.031)
Resource Rents	0.002
	(0.005)
Effective Number of Parties	0.008
	(0.006)
Observations	658
R^2	0.978
Adjusted R^2	0.976
Residual Std. Error	0.154 (df = 585)
F Statistic	365.032*** (df = 72; 585)
Significance levels	* p<0.1; ** p<0.05; *** p<0.01 .

Appendix B.

Table B.9: Mediation Analysis Regressions: women and parliament, corruption, and environmental outputs and outcomes.

Mediation Results

	Dependent variables:						
	Women in Parliament	*Readiness*	*Log CO_2 Emissions Per Capita*	*Women in Parliament*	*Renewable Energy Consumption*	*Women in Parliament*	*Forest Area*
Lag Corruption	1.210	-0.060***	-0.099***	1.698.	4.222***	1.684.	0.821***
	(0.895)	(0.004)	(0.028)	(0.898)	(1.024)	(0.898)	(0.247)
Women in Parliament		0.0003.	-0.002.		-0.025		-0.004
		(0.0002)	(0.001)		(0.047)		(0.011)
Log GDP per capita	0.405	0.021***	0.120***	0.507	-2.306*	0.528	0.263
	(0.936)	(0.004)	(0.029)	(0.920)	(1.045)	(0.920)	(0.252)
HDI	-5.797	0.114	3.751***	-2.843	-90.866***	-3.135	1.887
	(19.018)	(0.084)	(0.589)	(18.686)	(21.237)	(18.691)	(5.128)
Democracy	0.788	0.006*	-0.013	0.891	0.658	0.872	0.173
	(0.666)	(0.003)	(0.021)	(0.655)	(0.745)	(0.655)	(0.180)
Resource Rents	-0.290**	-0.001	0.005	-0.276**	-0.200.	-0.278**	-0.034
	(0.099)	(0.0004)	(0.003)	(0.097)	(0.111)	(0.097)	(0.027)
Effective Number of Parties	-0.262*	0.00002	-0.006	-0.273*	0.357*	-0.272*	-0.078*
	(0.128)	(0.001)	(0.004)	(0.126)	(0.143)	(0.126)	(0.035)
Observations	658	658	658	652	652	651	651
R^2	0.905	0.991	0.983	0.909	0.971	0.909	0.998
Adjusted R^2	0.893	0.990	0.981	0.897	0.967	0.897	0.998
Residual Std. Error	3.336 (df = 585)	0.015 (df = 584)	0.103 (df = 584)	3.275 (df = 579)	3.722 (df = 578)	3.275 (df = 578)	0.898 (df = 577)
F Statistic	77.072*** (df = 72; 585)	916.881*** (df = 73; 584)	464.366*** (df = 73; 584)	79.861*** (df = 72; 579)	261.007*** (df = 73; 578)	79.854*** (df = 72; 578)	4,268.141*** (df = 73; 577)
Significance levels	* p<0.1; ** p<0.05; *** p<0.01 .						

Climate Change Readiness

```
Causal Mediation Analysis

Quasi-Bayesian Confidence Intervals

               Estimate 95% CI Lower 95% CI Upper p-value
ACME           0.00e+00     0.00e+00            0   1.000
ADE            3.27e-04    -4.26e-05            0   0.084 .
Total Effect   3.27e-04    -4.26e-05            0   0.084 .
Prop. Mediated 0.00e+00     0.00e+00            0   1.000
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Sample Size Used: 658


Simulations: 1000
```

Renewable Energy Consumption

```
Causal Mediation Analysis

Quasi-Bayesian Confidence Intervals

               Estimate 95% CI Lower 95% CI Upper p-value
ACME              0.000        0.000         0.00    1.00
ADE              -0.025       -0.117         0.07    0.62
Total Effect     -0.025       -0.117         0.07    0.62
Prop. Mediated    0.000        0.000         0.00    1.00

Sample Size Used: 652


Simulations: 1000
```

CO_2 emissions per capita

```
Causal Mediation Analysis

Quasi-Bayesian Confidence Intervals

              Estimate 95% CI Lower 95% CI Upper p-value
ACME           0.00000      0.00000            0   1.000
ADE           -0.00244     -0.00506            0   0.066 .
Total Effect  -0.00244     -0.00506            0   0.066 .
Prop. Mediated 0.00000      0.00000            0   1.000
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Sample Size Used: 658


Simulations: 1000
```

Forest Area

```
Causal Mediation Analysis

Quasi-Bayesian Confidence Intervals

              Estimate 95% CI Lower 95% CI Upper p-value
ACME           0.00000      0.00000         0.00    1.00
ADE           -0.00429     -0.02529         0.02    0.73
Total Effect  -0.00429     -0.02529         0.02    0.73
Prop. Mediated 0.00000      0.00000         0.00    1.00

Sample Size Used: 651


Simulations: 1000
```

Figure B.8: Mediation Analysis Results: women and parliament, corruption, and environmental outputs and outcomes.

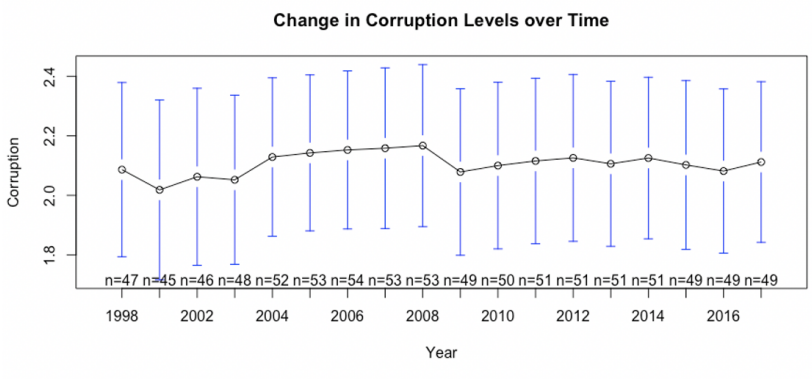

Figure B.9: Change in Corruption Over time

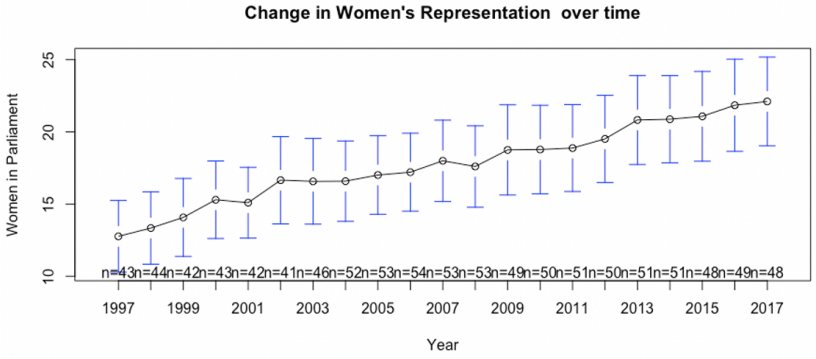

Figure B.10: Change in Women's Representation Over time

Appendix B.

Table B.10: Regression Results of the interaction of women and parliament and corruption levels lagged by 3 years on policy outcomes.

The Effects of Women in Parliament x Corruption (t-3) on Environmental Outcomes

	Dependent variables:			
	Readiness	*CO_2 Emissions*	*Renewable Energy Consumption*	*Forest Area*
Women in Parliament	0.001***	-0.007**	0.277**	0.055*
	(0.0004)	(0.002)	(0.092)	(0.022)
Corruption	-0.009*	-0.104***	3.507***	0.555*
	(0.004)	(0.026)	(0.947)	(0.236)
log GDP per capita	0.024***		-1.076	0.242
	(0.004)		(0.949)	(0.238)
Log GDP^2		0.056***		
		(0.013)		
HDI	0.139.	2.355***	-64.161**	9.456.
	(0.083)	(0.558)	(19.843)	(4.983)
Democracy level	0.007*	0.008	0.360	0.125
	(0.003)	(0.020)	(0.723)	(0.182)
Resource Rents	-0.001.	0.008**	-0.235*	-0.048.
	(0.0005)	(0.003)	(0.107)	(0.027)
Number of Effective Parties	-0.0002	-0.006	0.449**	-0.064.
	(0.001)	(0.004)	(0.137)	(0.034)
Women in Parliament x Corruption, lag 3	-0.001***	0.002*	-0.100**	-0.018*
	(0.0001)	(0.001)	(0.034)	(0.008)
Observations	682	682	675	680
R^2	0.991	0.984	0.972	0.998
Adjusted R^2	0.989	0.982	0.969	0.998
Residual Std. Error	0.015 (df = 607)	0.102 (df = 607)	3.625 (df = 600)	0.911 (df = 605)
F Statistic	859.289*** (df = 74; 607)	490.580*** (df = 74; 607)	282.658*** (df = 74; 600)	4,343.878*** (df = 74; 605)
Significance levels	* p<0.1; ** p<0.05; *** p<0.01 .			

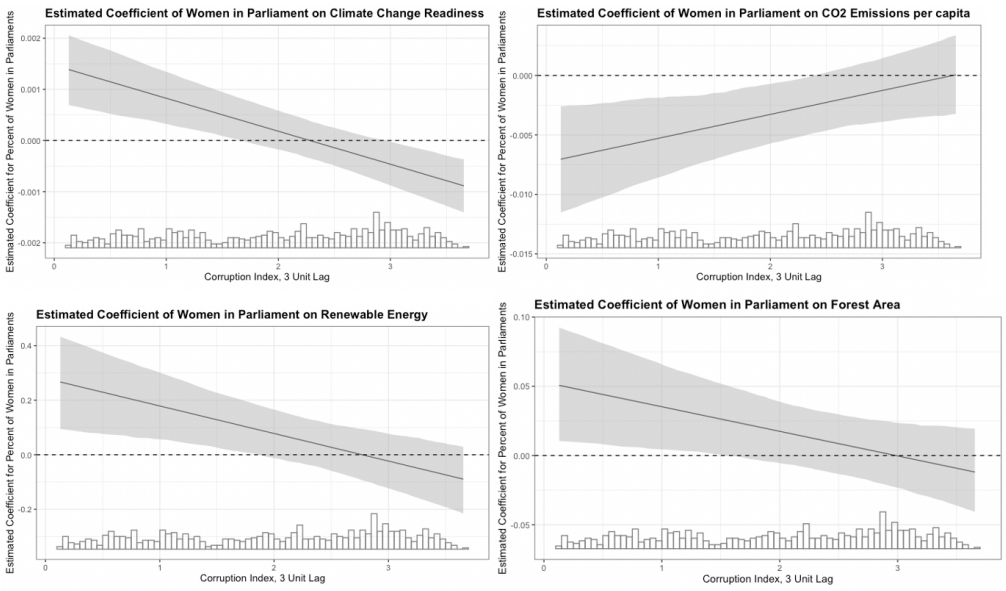

Figure B.11: Plotted marginal effects of women's representation on climate change outcomes by corruption score at t-3

Appendix B.

Table B.11: Regression Results of the interaction of women and parliament and corruption levels lagged by 5 years on policy outcomes.

The Effects of Women in Parliament x Corruption (t-5) on Environmental Outcomes

	Dependent variables:			
	Readiness	*CO_2 Emissions*	*Renewable Energy Consumption*	*Forest Area*
Women in Parliament	0.001***	0.001	0.045	0.024
	(0.0003)	(0.002)	(0.077)	(0.019)
Corruption	0.007*	0.013	0.381	0.175
	(0.003)	(0.019)	(0.689)	(0.173)
log GDP per capita	0.025***		-0.388	0.493*
	(0.004)		(0.949)	(0.241)
Log GDP per capita^2		0.045***		
		(0.013)		
HDI	0.169*	2.452***	-78.735***	7.460
	(0.084)	(0.547)	(19.421)	(4.926)
Democracy level	0.005.	-0.005	0.910	0.246
	(0.003)	(0.019)	(0.679)	(0.172)
Resource Rents	-0.001.	0.008**	-0.222*	-0.058*
	(0.0004)	(0.003)	(0.102)	(0.026)
Number of Effective Parties	-0.00003	-0.004	0.506***	-0.039
	(0.001)	(0.004)	(0.133)	(0.034)
Women in Parliament x Corruption, lag 5	-0.0003**	-0.001.	0.014	-0.003
	(0.0001)	(0.001)	(0.026)	(0.006)
Constant	0.005	-1.385***	79.538***	17.308***
	(0.049)	(0.319)	(11.316)	(2.871)
Observations	681	681	674	678
R^2	0.990	0.983	0.972	0.998
Adjusted R^2	0.989	0.981	0.968	0.998
Residual Std. Error	0.016 (df = 605)	0.103 (df = 605)	3.649 (df = 598)	0.926 (df = 602)
F Statistic	795.656*** (df = 75; 605)	479.656*** (df = 75; 605)	276.575*** (df = 75; 598)	4,199.026*** (df = 75; 602)
Significance levels	* p<0.1; ** p<0.05; *** p<0.01 .			

Appendix B.

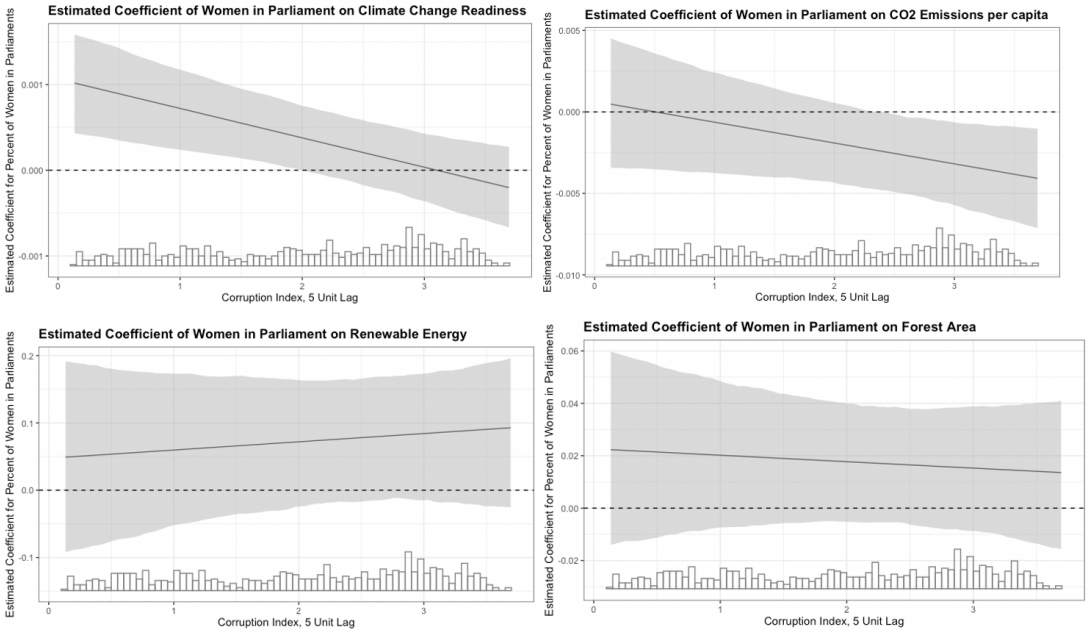

Figure B.12: Plotted marginal effects of women's representation on climate change outcomes by corruption score at t-5

Appendix C

The Consequence of Gender Equality for Fossil Fuel Industries: Towards a Research Agenda

Variable	Dickey-Fuller	Lag Order	P-value	Stationary/non-stationary
Fuel Exports	-10.108	15	< 0.01	stationary
WLFP	-10.325	16	<0.01	stationary
WPE	-10.644	16	<0.01	stationary
GDP per capita	-10.872	16	<0.01	stationary
Democracy	-11.476	16	<0.01	stationary
Population	-10.125	16	<0.01	stationary
HDI	-9.5206	15	<0.01	stationary
Men's LFP	-10.835	16	<0.01	stationary

Figure C.1: Dickey Fuller Stationarity Test Results

Appendix D

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