An Analysis of the European Union Climate Policy: Governance, Domestic Politics and Policy Outcomes

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To Diogo, Lucas and Olivia

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Abstract

This dissertation follows a three-article format, and each article corresponds to one chapter. Chapter 1 investigates the autonomy of the European Union through an analysis of the impact of powerful member-states and convergence on the enforcement of climate legislation. In the empirical analysis, I investigate whether and how powerful member states and member states whose interests converge with the EU affect enforcement. The dependent variable describes a key enforcement measure, the total number of infringement investigations issued by the Climate Action Directorate General. The independent variables measure power and convergence. Results show that the EU enforces its climate policy against powerful member states and member states with convergent interests, suggesting that the EU is autonomous in the climate area. Chapter 2 examines the effects of the government's ideology on the stringency environmental legislation across EU member-states. The main objective is to investigate whether leftist governments increase environmental policy stringency. I employ data on the price of environmental regulations and governments' ideological composition. I perform pooled OLS regression models with Driscoll and Kraay standard errors and results suggest that the presence of left parties on member-states' legislatures is associated with increases in environmental policy stringency. Chapter 3 investigates the extent to which environmental policies adopted by 20 of the world's largest economies have promoted environmental quality in the period between 1990 and 2015. The chapter examines the effect of environmental regulations on GHG emissions. I estimate OLS PCSE regressions.

Results suggest that the relative stringency of a country's environmental policy is associated with improvements in environmental quality. In the first two chapters, different aspects of environmental policies are the dependent variables, or, in other words, I study the effect of different variables on environmental policies. Nevertheless, in the third, environmental policies become the independent variable and their impact on GHG emissions, one of the key goals of contemporary environmental policies, is investigated.

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Introduction

In this three-article dissertation, each chapter addresses a relevant question to the Political Science Discipline. The theme connecting the chapters is the ecological crisis that currently challenges world politics, the global economy, and the Earth. Chapters 1 and 2 focus on the European Union. Groundbreaking features of its stringent environmental policy, such as the first emission trading market, confer the EU a place of relevance in the international arena. Therefore, the examination of how the EU and its member states have dealt with environmental politics and policies may offer clues about more effective and efficient ways to promote international legislation about the environment and other issue areas, in Europe and across the world. Chapter 3, on the other hand, seeks to establish whether implemented environmental policies have already yielded results. Results shed light on discussions about these policies' environmental costs and benefits.

In chapter 1, I question whether the European Union (EU) is autonomous to enforce its climate policy on member states. Although the issue of autonomy has been extensively discussed in the literature, no consensus has been reached, especially in relation to the EU's governance in the climate area. In my analysis of the autonomy of EU climate governance I depart from the informal governance theory which proposes that IO's autonomy is contingent upon the consent of powerful member-states (Stone 2008, 2011). Based on Stone's definition, autonomy is characterized as the ability of the EU to enforce rules (Stone 2008, 2011).

Stone's the informal governance theory suggests that the autonomy of an international organization (IO) is contingent upon the consent of powerful member states (Stone 2008, 2011), and thus, I examine whether the Commission's actions in the climate area depend on the consent of powerful EU member states. Moreover, as König and Luetgert (2009) and Fjelstul and Carrubba (2018) propose that the relationship between the EU and a member-state impacts compliance, I also investigate whether shared interests lead to a heightened enforcement and, consequently, autonomy. In the empirical analysis, I investigate whether powerful member states and convergence impact the launch of infringement procedure investigations by the Commission. The dependent variable infringement proceeding investigations. The key independent variables capture economic and political power capabilities of EU member-states, including GDP per capita (World Bank 2018), number of parliamentary seats (own calculation), participation in the G6 (own calculation), contributions to the EU (European Commission n.d.), EU spending on member state (European Commission n.d.) as well as convergence (Fjelstul and Carrubba 2018).

Findings indicate that the European Commission has strategically decided when to launch infringement investigations in ways that promote its autonomy. Therefore, the enforcement of climate legislation seems to be associated with power relationships and convergent interests, as expected, but in complex ways. Nevertheless, the Commission seems to be imposing its autonomy upon member states.

In chapter 2, I question the impact of party ideology on the stringency of environmental policy. The point of departure for my examination is Gourevitch (1978) and

Putnam's (1988) argument that states react to international pressure in their own ways, depending on domestic factors. Moreover, Cameron (1978), Garrett (1998), Iversen and Cusak (2000) and Rodrik (1998) have analyzed the impact of trade liberalization on government expenditures and demonstrated that expenditures tend to increase when left parties are in power. Based on these arguments, I am particularly interested on the impact of left ideologies on the stringency of member-states' environmental policies.

I examine the relationship between government ideology and policy stringency across EU member-states. A handful of analyses of the impact of party ideology on environmental policymaking have been conducted with a large sample (Jahn 1998; Knill, Debus, and Heichel 2010; Neumayer 2004; Scruggs 1999). Most of these studies utilize environmental performance as the dependent variable (Jahn 1998; Neumayer 2004; Scruggs 1999). Only Knill and others focus on policy output, as I do, but while their dependent variable describes the number of policies adopted by a country, I use OECD's environmental policy index that measures the degree to which environmental policies put an explicit or implicit price on environmental externalities (OECD 2017). The use of the OECD index contributes to more reliable calculations of the relationship between party ideology and environmental policy outcomes. The main independent variables capture the ideology of member-states' governments. Given the characteristics of the data, I estimate pooled OLS models with Driscoll and Kraay standard errors to examine the relationship between ideology and stringency. Findings indicate that the presence of left parties in the government is associated with environmental policy stringency.

As the environment is a policy area characterized by a high degree of international pressure, and as international and domestic factors influence policymaking, Chapter 2 contributes to the understanding of the impact of one domestic factor, government ideology, in environmental policymaking across EU member-states.

In Chapter 3, I investigate the impact of environmental policies on the environmental performance in 20 of the largest world economies since the 1990s. In the analysis, I examine the extent to which environmental policies established by the largest economies in the world have contributed to environmental quality.

The dependent variable is total GHG emissions (OECD 2020a) and the main independent variable is the OECD's environmental policy index (OECD 2017). The hypotheses question the extent to which specific types of environmental regulations as well as the stringency level of environmental policies, more broadly, are associated with environmental quality. In the statistical analysis, I perform Ordinary Least Squares with Panel-Corrected Standard and Heteroskedastic Errors regressions. Findings suggests that subsidies to research and development and the overall stringency of environmental policies have incrementally promoted environmental quality in the past three decades.

Christopher Weible says that "[one of] the goals of policy process research is the generation of knowledge as embodied in theories, [and] the use of this knowledge must eventually help attain societal values and realize greater human dignity" (2017, 3). I partake of Weible's idea and audaciously hope that the incremental knowledge advanced with this dissertation eventually contributes to the responses we offer to the threat posed by the environmental crisis challenging the world.

1. An Analysis of Autonomy: The Investigation of the European Commission and its Enforcement of EU Climate Policy

1.1. Introduction

The European Union (EU) has established stringent environmental and climate policies since the 1980s. The current goal of the EU climate action is to collectively reduce about 50% of greenhouse gas (GHG) emissions by 2030, and to achieve carbon-neutrality by 2050 (European Commission n.d.). The European Union Emission Trading Scheme (EU ETS), approved in 2003 and implemented in 2005, is the force driving the climate action, and while member states must transpose and implement Directive 2003/87/EC, which established the EU ETS, and others, the European Commission is responsible for monitoring and enforcing their transposition and implementation.

In one of the first assessments of the operation of the EU ETS, Dechezleprêtre compares emission allowances surrendered by participating firms to official emission measures.[1] The report indicates that in Phase 1 (2005-2007), 91 percent of installations surrendered allowances that corresponded to their measured GHG emissions, or, in

[1] Dechezleprêtre's report verifies whether members reached the stipulated emission reduction target of 8% below 1990 levels over the 2008-2012 period. Despite high compliance rates, findings are not a measure of effectiveness of the EU ETS. During this period, European economies faced severe consequences of the 2007-2008 global financial. Therefore, although compliance rates were generally high, it is hard to tell whether they were a consequence of environmental policies or of reduced economic activity.

other words 91 percent of installations were compliant. In Phase 2 (2008-2012), 97 percent of installations have been found compliant (Dechezleprêtre 2012).

Dechezleprêtre's report shows high compliance rates and thus suggest that the EU may be considered autonomous. Autonomy is defined as the ability of the EU to enforce rules (Stone 2008, 2011). According to the Treaty on the Functioning of the European Union (TFEU), the European Commission is responsible for enforcing rules and promoting compliance. Several studies have examined the factors which impact compliance (Börzel 2000, 2001, 2003; Falkner 2010; Falkner, Hartlapp, and Treib 2007, 2007; Falkner and Treib 2008; Mbaye 2001; Tallberg 2002; Thomson, Torenvlied, and Arregui 2007; Zhelyazkova, Kaya, and Schrama 2018). Nevertheless, only Fjelstul and Carrubba (2018) have examined how the Commission's responds to non-compliance and conclude that though effective in enforcing directives, the Commission deliberately drops infringement procedure investigations considered unlikely to win.

While several studies investigate initial levels of compliance, only Fjelstul and Carrubba (2018), that I know of, examine the Commission's reaction to suspected non-compliance. In this chapter, I conduct an analysis similar to Fjelstul and Carrubba's, I examine whether the Commission's responses to non-compliance further enhance compliance and autonomy. Drawing from the informal governance theory, which suggests that the autonomy of an international organization (IO) is contingent upon the consent of powerful member states (Stone 2008, 2011), I examine whether the Commission's actions in the climate area depend on the consent of powerful EU member states. Alternatively, Based on König and Luetgert (2009) and Fjelstul and Carrubba (2018), I

investigate whether convergence between the Commission and the member states promote enforcement, compliance and autonomy.

In the empirical analysis, I analyze the impact of powerful member states and convergence on the launch of infringement procedure investigations by the Commission. The dependent variable depicts the total number of infringement investigations issued by the Climate Action Directorate General. The independent variables measure power and convergence. Results surprisingly show that power is correlated with an increase in the number of infringement investigations issued against a member state. Although convergence is only significant in one of the models, the coefficients of the world of compliance variables, proxies for compliance levels, suggest that a moderate level of compliance is correlated with more infringement investigations while non-compliance is correlated with less. Therefore, the Commission seems to be able to strategically assert its autonomy as it launches more infringement investigations against members that are more likely to address them.

1.2. EU Climate Policy: Interests and Design

The climate policy of the European Union is a body of legal acts designed to fight climate change through the reduction of greenhouse gas (GHG) emissions, technology development and conservation measures (Climate Action n.d.). The specific goals of the EU climate policy have become more stringent since the early 2000s to keep up to date with the challenge posed by global warming. The initial goal was to reduce GHG emissions to about 8% below 1990 levels during the period of 2008 and 2012, as stipulated

by the Kyoto Protocol(Kyoto Protocol 1997). In 2007, the EU established a reduction target of 20% from 1990 levels by 2020. Discussions about the reduction target have continued and intensified as the consequences of global warming became clearer and (European Parliament 2003). In 2020, the Commission proposed to increase the reduction target, including emissions and removals, by 55% from 1990 levels by 2030. The long term goal of the EU is to become climate-neutral by 2050 (Climate Action n.d.). The continuous work of reviewing targets and goals, the proposal and approval of ever more stringent climate legislation, the monitoring and enforcement of climate legislation demonstrates the EU's commitment to climate action.

In this context, the EU climate policy consists of several pieces of legislation. The EU Emissions Trading System (EU ETS) created by Directive 2003/87/EC of the European Parliament and of the Council in 2003 is the flagship program of the policy. As most policies established by the EU, the climate policy has been enacted through binding and non-binding legal acts. Resolutions and opinions, which make suggestions and recommendations to member states, and are non-binding. On the other hand, regulations, directives, and decisions are legally binding and *must* be followed. Directives must be transposed and implemented in a form and means stipulated by the governments of member states.

While member states determine how transposition and implementation may occur, the TFEU determines that the Commission is responsible for monitoring and enforcing the transposition and implementation of directives. The Commission verifies, for example, whether member states have transposed Directive 2003/87/EC, which created

the EU ETS, and subsequent modifying acts into their domestic law, and whether the directives' legal provisions have been followed.

If the Commission suspects that a member state has not transposed a directive, properly incorporated, or satisfactorily applied it, an infringement procedure investigation may be launched. as the European Commission states, "complete, consistent, transparent and accurate monitoring and reporting of greenhouse gas emissions (…) are fundamental for the effective operation of the greenhouse gas emission allowance trading scheme" (European Commission Regulation No 601/2012).

Infringement procedure investigations are the Commission's response to suspected non-compliance.[2] These investigations follow a predetermined step-by-step process that can have several stages. Article 258 of the TFEU declares that "[i]f the State concerned does not comply with the opinion within the period laid down by the Commission, the latter may bring the matter before the Court of Justice of the European Union" (TFEU 2012). However, most infringement investigations are closed before a case may be brought before the Court. Several authors have examined member states' reasons for non-compliance, as I detail below.

1.3. EU Climate Policy: Monitoring and Enforcing

When the Commission suspects that a member state has not complied with EU legislation, it may launch an infringement procedure investigation. With the launch of

[2] Suspected non-compliance refers to instances when the Commission supposes an infringement has occurred, even without proof (see Börzel 2001).

the investigation, the Commission may guide the member state in question toward to compliance while maintaining the respect of member states (Barnett and Finnemore 2004). Therefore, infringement procedure investigations are a tool used by the Commission to assert its autonomy, or, in other words, the extent to which it is able to enforce rules (Stone 2011).

If autonomy is associated with the Commission's ability to enforce rules, compliance with EU legislation is an important predictor of its autonomy. Dechezleprêtre's findings (2012) indicate that compliance with the EU ETS in phases I and II was high Despite some level of non-compliance. Other studies have examined the determinants of non-compliance among EU member states. Of these studies, many have focused on the role of domestic factors. Falkner and others (2007) argue that domestic characteristics influence member states' participation in certain typologies and affect the rate of implementation of EU social policy. As a result, the authors have proposed three typologies or 'worlds of compliance' to explain the extent to which the first 15 members to join the EU have implemented EU social policy.

The first world of compliance is composed of member states with great respect for their domestic politics (Denmark, Finland, and Sweden). In these member states, transposition is aligned with the interests of the government and major interest groups. It occurs on time and correctly as long as European legislation is not at odds with domestic policies. The second world of compliance is associated with the neglect of EU pressure, inertia, and late transposition (France, Greece, Italy, Ireland, Luxemburg, and Portugal). In the world of transposition neglect, non-compliance is the rule. The third

world of compliance is characterized by law observance (Austria, Belgium, Germany, the Netherlands, Spain, and the Great Britain). In this world, member states transpose directives on time and correctly, even when there are conflicts with domestic policies.

Extending Falkner and others' argument to the study of Central and Eastern European (CEE) states which later joined the EU (e.g., Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia), Falkner and Treib (2008) add a fourth typology to the previous three. The fourth world of compliance is characterized by difficulties with the application and enforcement of EU directives as a result of economic struggles and a lack of administrative capacity.

Bergman (2000) similarly notices that lacking administrative capacity may be a driving factor to non-compliance. Nevertheless, Börzel (2000a, 2001) investigates the role of domestic factors to compliance in the environmental area and rejects the argument about administrative capacity. Alternatively, she suggests that the economic costs of adaptation are the crucial factor to compliance, that is, in member states where the costs of transposition and implementation are lower because of similarities between EU directives and domestic legislation, for example, environmental compliance tends to be higher. Moreover, Tsebelis and Chang (2004) indicate that the presence of many veto players in advanced democracies increases the difficulty of altering budget structures.

McLean and Stone (2012) have found that member states with Parliamentary political systems implemented the Kyoto Protocol sooner than member states with presidential systems, even though ratification was delayed when a single opposition party controlled a majority in the lower house of Parliament.

Other compliance studies discuss the role of international factors to compliance. König and Luetgert (2009) demonstrate that opposition to the EU is associated with notification failure.[3] The authors also notice, similarly to Börzel (2000a, 2001) and Tsebelis and Chang (2004) that the costs of compliance, a domestic factor, influence the timely transposition of directives.

Nevertheless, when focusing on international factors, König and Luetgert argue that the voting procedure at the EU is key to member state compliance. Member states have more incentives to comply with the directives that they agree with than with directives that they do not fully agree with, but cannot veto, and that are passed by qualified majority voting (QMV). The authors notice that when directives are adopted by consensus voting, compliance rates tend to be higher than when they are passed with QMV. Mbaye (2001) and Thomson, Torenvlied and Arregui (2007) similarly find that consensus voting leads to higher compliance rates.

König and Luetgert (2009), Mbaye (2001) and Thomson et al. (2007) examine directives in multiple policy areas. Voting procedures for legislative proposals on different policy areas are established by the TFEU (2012). A unanimous vote is used in a few policy areas, such as foreign and security policy, police and judicial co-operation in criminal matters (Tsebelis 2013, 18). According to the TFEU, voting in all other policy areas

[3] Directive (EU) 2015/1535 states that member-states must inform the Commission of draft regulations prior to their adoption. From the date of the notification, a three-month period during which the member-state cannot adopt the regulation in question starts. The period allows the Commission to examine the text and to respond in a suitable manner (Directive (EU) 2015/1535 of the European Parliament and of the Council of 9 September 2015 laying down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services (Text with EEA relevance) 2015).

should follow the ordinary legislative procedure which establishes that when the Council votes on a legislative proposal, a qualified majority is sufficient for the adoption of legislation. König and Mäder (2013) also notice that the disagreement between the Commission and a member state concerning the outcome of a vote tends to be more relevant to transposition than acknowledged in the literature. Disagreement delays conformable transposition and stimulates non-conformable transposition, and thus an effective sanctioning mechanism is necessary for safeguard compliance.

Article 192 of the TFEU determines that decisions regarding environmental and climate issues should follow the ordinary legislative procedure and thus, qualified majority voting. As a result, climate directives have been adopted with a QVM which suggests that compliance with environmental directives may to be lower than compliance with directives adopted through unanimous voting. Thus, as climate directives are adopted with a QVM, the analysis of the impact of voting procedures on compliance would seem irrelevant, unless it captures the extent to which a member state agrees with the Commission, as I discuss below.

1.4. Enforcement of the Climate Policy

While several studies have examined the impact of domestic and international factors on compliance, only a few have focused on the role of the Commission in enforcing the transposition and implementation of directives through the launch of

infringement procedure investigations. As the Commission is responsible for monitoring and enforcing EU policies, its most relevant tool is the infringement procedure investigation.

Theoretically, the decision to issue an infringement investigation should be driven by non-compliance: as the Commission suspects that a member state has not transposed or satisfactorily implemented a climate directive, it launches an infringement investigation to address the issue by conducting the member state toward compliance. However, given the complexity of monitoring whether member states have transposed and implemented directives, it is unlikely that Commission fully assesses member states' compliance in all issue-areas. Certain members and issues may be more closely monitored than others (see Börzel 2001) and if decisions to launch infringement investigations are based on an imperfect assessment of compliance, infringement investigations may be biased.

Therefore, the Commission's decisions to launch these investigations likely have a bias, intentional or unintentional. Fjelstul and Carrubba (2018) find that the Commission is effective in enforcing directives, in all issue areas. The analysis uses the normalized QMV weight to investigate the influence of member states in the Commission's decisions to move investigations to a second stage with a reasoned opinion. According to the authors, this variable, labeled influence, captures the general impact of a member state in the EU legal system, and as influence increases, the probability of a reasoned opinion also does. Nevertheless, the authors also find that in the subsequent stage, a

referral to the Court, the Commission deliberately drops those cases it considers difficult to win.

That is, according to Fjelstul and Carrubba, the Commission may act in ways that promotes compliance, even if it is necessary to let some non-compliance cases slide. Building on Fjelstul and Carrubba's findings, I examine the extent to which the Commission's relationship with member states impacts the launch of infringement procedure investigations in the climate area.

Using Stone's informal governance theory (Stone 2011) as a point of departure, I examine the extent to which member states' power capabilities affect the launch of infringement procedure investigations.[4]

The informal governance theory proposes that IOs such as the EU[5] are governed by two sets of rules, formal and informal ones. Stone's informal governance theory proposes an analysis of the extent to which members follow formal rules or establish informal ones to assess the IO's autonomy. Whenever formal rules are followed, member states allow the IO to be autonomous. However, under some circumstances, the

[4] It is relevant to note, however, that the concept of informal governance is studied by several authors, in distinct settings. Christiansen, Follesdal, and Piattoni (2004), for example, define informal governance as "the interaction of a plethora of public and private, collective and individual actors (…) [whose] participation in the decision-making process is not yet or cannot be codified and publicly enforced" (p. 7). Therefore, though related to informal governance, these perspectives have different definitions. While Stone's theory is based on rule observance, Christiansen, Follesdal, and Piattoni analyze informal governance as a process, associated with pluralist and neo-corporatist theories.

[5] The EU is not an ordinary IO. Even though it was created by member-states through the establishment of formal rules which delegate responsibility to the EU in specific areas, it was given supranational powers, exemplified by the Commission's ability to launch infringement proceeding investigations against its members. Nevertheless, given the EU similarities with IOs in general, it may be described and explained by Stone's informal governance theory.

interests of powerful members compete with the interests of the IO, and when this happens, powerful members may interfere with IO's governance and weaken its autonomy.

France, for example, was hesitant to delegate responsibilities to the organizations that came before the EU throughout the 1950s to the 1980s. The French boycott to European summits forced a change in the Community's rules to allow any member state to have a veto power in Community proposals. A vetoed proposal would continue to be discussed outside the formal forum; a setting that benefited France given its power capabilities. That is, France exercised informal governance to alter formal rules and continue to informally influence EU politics (see Stone 2011). At present, France is included in Falkner and others' second world of compliance associated with the neglect of EU pressure, where non-compliance is the rule (Falkner, Hartlapp, and Treib 2007). Although France's opposition behavior persists, I do not know how the Commission responds to it: does it pressure France to comply or strategically does not launch infringement procedures against the member state?

Stone's informal governance perspective draws on Waltz's concept of power (2010) and is grounded on the capabilities of the most powerful member states. Waltz suggests that the total amount of power in an international system is given by the sum of states' capabilities, such as military resources. Capabilities are unevenly distributed among the states which participate in the system, and thus, powerful states, with more capabilities, may pursue their interests. Thus, Stone's argument that powerful states may pursue their interests through the establishment of informal rules is derived from Waltz's neorealist perspective.

For example, the IMF is commonly regarded as an autonomous organization with enough powers to establish conditionalities. However, in spite of the Fund's autonomy, Stone (2008, 2011) suggests that it occasionally endures the informal influence of the US, the world's financial hegemon. The US tends to interfere with the IMF bureaucracy upon request of its strategic partners to soften the type and scope of conditionalities tied to loan packages. In other words, the US occasionally exercises informal governance to protect its strategic partners' interests. In the absence of pressure from the US, formal rules prevail, and the Fund may autonomously stipulate conditionalities.

However, the informal governance theory also proposes that IOs may be autonomous when powerful members do *not* exercise informal governance. Copelovitch (2010a, 2010b) examines the relationship between the IMF and its Board, composed of the G-5, and proposes that the strictness of conditionalities and loan amounts vary depending on the G-5's interest in a borrowing country. That is, if the borrowing country is strategic to the big five, conditionalities tend to be less strict and the loan larger. On the other hand, if there is little to no interest among the big five, conditionalities tend to be stricter and loans smaller. However, if there is no consensus among them, two possibilities arise: either members with weak interests support those with strong ones (and anticipate the return of the favor in the future), or the disagreement causes a stalemate that empowers the IMF to do as it sees it fit.

Copelovitch's analysis bears a significant resemblance to Stone's informal governance theory. The difference, however, is that Copelovitch uses a hybrid approach and assesses autonomy through a measure of the influence of the G-5 on

conditionalities. When the G-5 influences them, the IMF is not autonomous, but when the G-5 does not reach a consensus or is not interested in affecting them, the IMF is autonomous.

Considering the European multipolar history, a concert of powers, resembling Copelovitch's argument about the G5 may be a more likely representation of the EU distribution of power. Of the 28 EU member states in the analyzed period, a group of six member states (G6) composed of France, Germany, Italy, Poland, Spain, and the United Kingdom has been considered the powers in the EU. These six have the largest populations in the EU and together they hold more than half of the votes in the Parliament, and a bargaining chip in QMV in the Council of the EU. Within the six powers, France, Germany, and the United Kingdom have disproportionally higher GDPs, larger populations, and more seats in the Parliament. They have also been the chief contributors to the EU budget, even though German contributions have been considerably larger than French and British ones.

König and Luetgert (2009) found that member states tend to comply more with the directives they agree with. When this happens, convergence, but not power, becomes more relevant to compliance. Thus, based on König and Luetgert (2009), I also investigate whether the Commission issues more infringement investigations when a member states is more likely to address them.

As I analyze the determinants of infringement proceeding investigations, I assume that these investigations are unwanted. Whenever the Commission starts a case, the targeted member state(s) is(are) expected to pay the costs associated with it.

Infringement investigations are launched under the Commission's suspicion of non-compliance, which may occur for different reasons. Falkner (2005) and Fjelstul and Carrubba (2018) suggest that non-compliance be classified as intentional and unintentional. Unintentional non-compliance is often associated with frail administrative capacity (Bergman 2000), interpretation issues or issue linkage (Falkner et al. 2004). When the Commission issues an infringement investigation and non-compliance is unintended, targeted member states are expected to quickly address the situation, solve the issue, and avoid any further costs associated with the case (see Fjelstul and Carrubba 2018).

On the other hand, intentional non-compliance is a deliberate choice. It may be associated with economic costs of adaptation (Falkner 2005; Falkner and Treib 2008) or opposition to the EU (Falkner 2005; König and Luetgert 2009; König and Mäder 2013). If a member state does not comply for economic reasons, the domestic government and the Commission may negotiate a pathway for compliance. However, if the government is not ideologically aligned to the EU leadership or if it opposes to the role of the EU, compromises may be difficult to reach, and the infringement procedure investigation is expected to drag through different stages. A long-lasting investigation that moves from one stage through the next indicates power struggles between the Commission and the member state, especially when the member state in question is powerful.

Thus, intentional non-compliance is a form of informal governance. When intentional non-compliance happens, the burden of cost goes back to the Commission. As a member state refuses to address the issue brought up by an infringement procedure investigation, a situation like the game of the chicken takes place. In this game, two

drivers accelerate toward each other on a collision course. The drivers face the possibility of a heads-on collision, and to avoid it, at least one of them must swerve or both may experience the consequences, including fatal ones. However, if one driver swerves and the other does not, the one who swerved becomes the 'chicken'. The two the players are the Commission and the targeted member state. In the worst-case scenario, the case is referred to the Court of Justice of the European Union. The referral of a case to the Court demonstrates the Commission's failure to promote enforcement, requires the parties to pay high costs of litigation and, if the Court rules in favor of the Commission, the member state becomes legally compelled to comply. If the ruling favors the member state, the Commission risks losing the respect of member states. According to Barnett and Finnemore, respect is an incentive for compliance (2004, 6) and an IO that does not have the respect of its members cannot enforce compliance.

In order to maintain its respect and continue to promote compliance – to the extent that it can, the Commission may strategically decide when to issue infringement investigations as a result of a cost *v.* benefit analysis. Hence, if the Commission suspects that a member state may not comply with an infringement investigation, it may not issue the investigation in an attempt to preserve its autonomy, something Fjelstul and Carrubba (2018) have found to be the case in an specific stage of infringement procedure investigations, the referral to the Court, in all issue areas.

On the other hand, the Commission may address its suspicions of non-compliance and issue investigations when member states are likely to address them, either

because non-compliance in unintentional or the member shares the Commission's interests and is more likely to further them through compliance with EU legislation.

Thus, the key question is: does the Commission treat member states differently based on its calculations of which actions could further its autonomy? Does it let its suspicions of non-compliance slide when the suspects are powerful members? Does it issue more investigations against members who are more likely to comply? To answer these questions, I analyze the influence of power and convergence on the extent to which the Commission issues infringement procedure investigations.

I examine whether the Commission is pressured by powerful member states not to launch infringement investigations against them. If powerful members consistently resort to informal rules to circumvent formal ones, the Commission could avoid issuing investigations against them. In these cases, not issuing an investigation is less costly than issuing it and not having the member state comply. A refusal to address an infringement procedure investigation may risk the Commission's reputation and autonomy. Therefore, if the informal governance theory is valid to explain the autonomy of the EU in the climate area, I expect the following:

H1: Powerful member states are targeted with fewer infringement proceeding investigations than other member states.

However, König and Luetgert (2009) suggest that member states which share interests with the Commission tend to comply more. As I analyze factors impacting the launch of infringement investigations, I examine whether the Commission issues more

infringement investigations against those member states that are more likely to comply. In this case, compliance promotes the Commission's reputation, generate respect, and promote autonomy. Thus, hypothesis 2 investigates the extent to which convergence are associated infringement proceeding investigations, and I expect that:

H2: Member states that demonstrate high levels of convergence with the EU are targeted with more infringement proceeding investigations than those that do not.

1.5. Research Design

To investigate the impact of power and convergence on the launch of infringement proceeding investigations in the climate area, I examine all the 154 infringement investigations issued by the Climate Action Directorate-General between January 1, 2006 and December 31, 2017. A dataset based on infringement cases is constructed. Data show that all 28 member states[6] have been targeted with at least 1 infringement investigation in the analyzed period. Croatia and Denmark were targeted with the least number of investigations, 1each. On the other hand, Poland was targeted with the highest number, 11 (See Table 1.8.1 for the number of infringement procedure investigations by member state).

The dependent variable is the number of launched infringement procedure investigations, coded from 1 to 154. Raw data on infringement investigations were obtained on the Commission's website (European Commission n.d.).

[6] In the analyzed period, the United Kingdom was still a member of the EU.

The independent variables depict the economic and political power capabilities of member states[7] and the convergence between a member state and the EU. Collinearity tests indicate that the power capabilities of member states are highly correlated (see Appendix, Table 1.8.3: Collinearity Tests). As the power capability variables are highly correlated, I create a power index using principal component analysis. The index reduces the number of variables in the analysis by describing a series of uncorrelated linear combinations that contain most of the variance. The variables included in the index are GDP per capita, number of parliamentary seats, participation in the G6, contribution to the EU, EU spending in member state and population. I calculate the interitem correlations for all pairs of variables in the index and Cronbach's α statistic for the scale formed from them. The scale reliability coefficient is acceptable (0.91). As the variables are not in the same scale, they have been standardized to have a mean of zero and a standard deviation of one.

Building on Stone's informal governance theory, I expect the Commission to spare powerful members from infringement investigations, or, in other words, the more power capabilities a member state has, the less infringement investigations will be launched against it.

On the other hand, I expect that convergence promotes higher levels of transposition and implementation, as shown by König and Luetgert (2009). As conversion is

[7] As German military capabilities have been limited since the end of World War II, variables that describe the distribution of military capabilities in the region were not included since their inclusion could bias results.

positively associated with compliance, I expect that the higher the level of convergence between a member state and the Commission, the more compliant the member state tends to be. As a result, I suspect that more infringement investigations are launched against convergent members. The intuition is that as a member state and the Commission have convergent environmental and climate interests, the member state is more likely to address an issue brought up by the infringement investigation, and as member states comply with the infringement investigation, the Commission asserts its autonomy. If the Commission strategically acts to assert its autonomy, it may launch more infringement investigations against those members who are more likely to comply.

Convergence is defined as the extent to which a member state's vote in qualified majority proposals coincides with the result of the vote. The measure was initially obtained from Fjelstul and Carrubba (2018) but interpreted differently in the context of this chapter. I argue that instead of expressing the overall influence of a member state in the EU legal system, the measure describes the convergence in the interests of the EU and a member state.

As I examine the influence of convergence on the Commission's decisions, I employ variables that illustrate the voting distance between each of the three big European powers (Germany, France, and Great Britain) and the other member states at the United Nations General Assembly (UNGA). To create these variables, I used the mean estimate of the distance between the votes of the powers and the other members at UNGA, coded by Voeten, Strezhnev, and Bailey (2009). Voting data in the Council of the EU is captured by the Convergence variable. Voting data on other European Union institutions

would be preferred to UNGA, but I did not have access to such data. Copelovitch (2010a) similarly uses UNGA votes in his analysis of IMF autonomy. In short, the voting distance between each of the three big powers and the other member states depict the convergence between the interests of the big three and the other member states and offers another measure of convergence.

Theoretically, infringement proceeding investigations would be issued in cases of non-compliance, or, in other words; the number of infringement investigations are expected to be inversely proportional to compliance levels. It is relevant to note, however, that compliance is not the target of the EU climate policy. The policy's goal is the reduction of GHG emissions to commonly agreed levels as to limit global warming. Nevertheless, compliance is key; it is a means to the reduction of GHG emissions and therefore more compliant member states are expected to be targeted with fewer infringement investigations, they are thought to be on target. Nevertheless, to investigate whether more compliant members are targeted with fewer investigations, I include measures of compliance in the statistical regression.

One measure was constructed by Dechezleprêtre (2012) through the comparison of surrendered emission allowances by firms participating in the EU ETS to official emission measures and the results indicate whether member states reached the stipulated emission reduction target of 8% below 1990 levels over the 2008-2012 period. As this measure of compliance is limited to the operation of the EU ETS in a period of the sample, I employ for a preliminary examination of the relationship of compliance levels and infringement investigations.

Falkner and others' argue that the 'worlds of compliance' (2007) are proxies for compliance levels. Participation in each of the three worlds is associated with a degree of compliance; members in the world of law observance are expected to be the most compliant members, followed by members of the world of domestic politics. Members of the world of neglect are expected to be the least compliant ones. Therefore, I construct three binary variables that depict participation in each of the three worlds of compliance. The law observance variable takes the value of 1 for member states that strictly obey the law, and 0 otherwise. The domestic politics binary variable that takes the value of 1 for member states that rely heavily on domestic politics to make decisions regarding the transposition and implementation of directives, and 0 otherwise. The neglect variable takes the value of 1 for member states which often disregard EU pressure, act in opposition to the EU and tend not to transpose and implement directives on time, and 0 otherwise. Considering my expectations about convergence and compliance, I suspect that member states from the worlds of law observance and domestic politics are targeted with more infringement investigations than members in the world of neglect.

Falkner and others (2007) argue that CEE members-states have difficulty with compliance as a result of economic struggles and a lack of administrative capacity, and thus, I employ a measure of administrative capacity to control for the impact of administrative capacity on the Commission's decisions. The administrative capacity variable describes perceptions of the quality of public and civil services, the degree of independence from political pressures, the quality of policy formulation and implementation, and the credibility of the member state's commitment to such policies (World Bank, 2019).

It is relevant to examine the impact of administrative capacity to the launch of infringement investigations because the debate about its relevance to compliance is not yet set. For instance, Bergman (2000) contends that a lack of administrative capacity is associated with unintentional non-compliance; but Börzel (2001) rejects the argument in an environmental policy setting and suggests instead that compliance is associated with the costs of transposition and implementation a directive. Although the analysis I conduct in this chapter does not examine the determinants of (non-)compliance, this measure may indicate whether and how member states' administrative capacity is associated with the Commission's launch of infringement investigations.

As the enforcement of climate directives through infringement investigations is expected to promote the reduction of GHG emissions, I employ a measure of total GHG emissions (OECD 2020a) to compare whether and how GHG emissions are associated with infringement investigations. I would expect total GHG emissions to be negatively associated with infringement investigations, but as I suspect that the Commission's actions are driver by other factors, this may not be the case.

Characteristics of political systems such as the type of government also impact implementation. For example, McLean and Stone (2012) found that members with parliamentary regimes implemented policies described in the Kyoto protocol more rapidly than member states with presidential regimes, even though ratification was delayed when a single opposition party controlled a majority in the lower house of Parliament. In presidential regimes, the president may veto bills, which may delay the implementation process, but in parliamentary ones, although partisan veto is still possible, a veto is

more difficult to happen and thus the implementation of environmental legislation may occur more rapidly. Thus, to check for the impact of the type of government on infringement investigations, I include a binary variable that that takes the value of 1 for member states in which the legislative branch elects the chief executive, and 0 otherwise. This variable is the same as the one used by McLean and Stone (2012).

The 2008 financial crisis caused a decline in economic productivity and since such decline could have negatively impacted GHG emissions, I include a growth variable, measured as the annual percentage growth rate of GDP at market prices in local currency based on constant 2010 U.S. dollars (World Bank 2018), to control for GHG emission reductions triggered by the economic decline.

1.6. Methods and Results

The dependent variable, infringement procedure investigations, is a count variable that display signs of overdispersion. However, even though the data show greater variance than might be expected in a Poisson distribution, I estimate a Poisson regression and conduct tests to establish a suitable statistical model for the analysis. Test results indicate that the Poisson model is inappropriate (Appendix, Table 1.8.5: Statistical Tests). Therefore, I estimate negative binomial regressions. Likelihood ratio tests show that the negative binomial's alpha is different from zero and further indicates that it is preferred over the Poisson regression.

Table 1.1.1, below, presents results of the negative binomial regressions. Some of the independent variables were on different scales and have been standardized to

have a mean of zero and a standard deviation of one.[8] Model 1, the base model, is a negative binomial regression with the Huber/White/sandwich estimator, robust to heteroskedasticity of the errors. The coefficient of the power index is significant and positively associated with infringement procedure investigations. That is, the more power a member state has, more infringement investigations are launched against it. This finding invalidates hypothesis 1. Contrary to expectations, powerful member states are targeted with more infringement proceeding investigations than other member states.

The coefficient of convergence is not statistically significant. Nevertheless, the coefficient of neglect is significant and negatively associated with infringement investigations. That is, the least compliant member states are targeted with fewer infringement investigations than the others. This finding offers some support for hypothesis 2 which suggests that convergent member states are targeted with more infringement proceeding investigations than non-convergent ones, such as the participants in the world of neglect.

Model 2, another Negative binomial regression with the Huber/White/sandwich estimator, includes Dechezleprêtre's measure of compliance. Even though the measure is limited to a period of the sample, the coefficient of compliance is significant and positively associated with infringement investigations. As compliance increases, so do infringement investigations. The coefficients of the power index are not significant. However, the coefficient of convergence is; the more convergent a member state is, more

[8] Standardized variables (stdd.) are noted on Table 1.6.1.

infringement investigations are launched against it. This finding validates hypothesis 2, convergence is associated with more investigations. Similar to Model 1, the coefficient of neglect is significant and negatively associated with investigations; that is, the least compliant member states are targeted with fewer investigations. The coefficient of law observance is also significant and negatively associated with investigations which suggests that the most compliant member states are also targeted with fewer investigations. Thus, the least and most compliant states seem to be targeted with less infringement investigations. However, as the coefficient of domestic politics is not significant, it is difficult to interpret the relationship between convergence and the three worlds of compliance. As expected, GHG emissions are associated with more infringement investigations. Last, the Bayesian information criterion (BIC) often used to compare models with the same estimation commands suggests that Model 2 is has a poorer fit than Model 1.

Model 3 is a multilevel negative binomial regression that fits a random effect negative binomial model to count data. The random effect is useful for modeling member states' correlation as they may be correlated due to common cluster-level random effect. Results of Model 3 are very similar to those of Model 1.

Results of Models 1 and 3 contradict hypothesis 1; they surprisingly show that powerful member states are targeted with more infringement proceeding investigations than other member states. If this is the case, powerful members have not been using informal rules to pressure the Commission not to issue investigations against them. Quite the opposite, the Commission has been autonomous enough to act strategically and

even target powerful members with more infringement investigations. In fact, such finding is associated with hypothesis 2 which examines whether the Commission issues more infringement investigations against those member states that are more likely to comply. By promoting compliance, the Commission builds its reputation, generates respect, and increases its autonomy. More than the indication provided by the coefficients of the power index in Models 1 and 3, the coefficients of neglect in Models 1, 2 and 3 offer support for hypothesis 2. Neglect is significant and negatively associated with infringement investigations, suggesting that the least compliant member states are targeted with lass infringement investigations. Moreover, in Model 2, the coefficient of convergence is significant and positively associated with investigations, which indicates that member states that demonstrate high levels of convergence are targeted with more infringement investigations. However, in Model 2, the coefficient of law observance is significant but negatively associated with investigations, suggesting that the most compliant member states are targeted with fewer investigations, contrary to expectations.

Table 1.6.1: Negative Binomial Regressions

	Model 1	Model 2	Model 3
	b/se	b/se	b/se
Dependent Variable: Infringement Proceding Investigations			
Power index	0.208*	0.155	0.208*
	(0.09)	(0.09)	(0.09)
Convergence	0.106	0.240**	0.106
	(0.06)	(0.09)	(0.07)
WOC: Domestic Politics	-0.001	-0.027	-0.001
	(0.210	(0.24)	(0.25)
WOC: Neglect	-0.669*	-0.969***	-0.669**
	(0.28)	(0.28)	(0.2)
WOC: Law Observance	-0.193	-0.428**	-0.193
	(0.1)	(0.13)	(0.15)
Adm. Capacity	-0.085	-0.044	-0.085
	(0.06)	(0.07)	(0.06)
Total GHG (stdd.)	0.093	0.214**	0.093
	(0.08)	(0.08)	(0.08)
Type of Government	-0.054	-0.197	-0.054
	(0.15)	(0.15)	-0.17
Growth	-0.008	-0.015	-0.008
	(0.01)	(0.02)	(0.02)
Commission Presidency	0.12	0.081	0.12
	(0.12)	(0.16)	(0.14)
Vote distance: GER	0.089	0.235	0.089
	(0.89)	(1.00)	(0.96)
Vote distance: FRA	0.524	0.57	0.524
	(0.53)	(0.49)	(0.58)
Vote distance: GBR	0.316	0.377	0.316
	(0.33)	(0.32)	(0.42)
Compliance (stdd.)		0.171**	
		(0.06)	
Constant	3.219***	3.233**	3.219**
	(0.94)	(1.03)	(1.15)
BIC	1664.436	1398.543	1664.436

*p<0.05, **p<0.01, ***p<0.001

1.6.1. Selection Effects

If the Commission launches more investigations against the member states that are more likely to comply, as proposed in hypothesis 2 and supported by some of the coefficients in Models 1, 2 and 3, then the Commission's decisions seem to be driven by unobserved factors and if decisions to launch infringement proceedings are affected by factors that I cannot observe, there is an endogeneity problem. To deal with the endogeneity issue, I employ endogenous treatment estimators. Treatment-effects estimators extract experimental-style causal effects from observational data and address the endogeneity issue. Thus, as I attempt to measure the effect of the worlds of compliance on the launch of infringement investigations but am concerned that unobserved factors affect both the outcome and treatment and thus confound my estimates, I employ Poisson regression models that include endogenous treatment estimators.

Considering that there is overdispersion, the estimates of Poisson regressions may be consistent, but inefficient, with small standard errors and large z-values (Long 1997). Moreover, because models with endogenous treatment estimators are computationally intensive, I cannot not include all the variables employed in the previous models and determine the most relevant ones based on interpretations of the results of Models 1, 2 and 3.

I estimate three Poisson regressions with endogenous treatment effects for the three world of compliance binary variables. The worlds of compliance are proxies for levels of compliance. Member states in the world of law observance tend to be the most

compliant, members in the world of domestic politics are part of the second most compliant group and members of the world of neglect are not usually compliant. The law observance, domestic politics, and neglect variables are used as binary-treatment variables.

In these Poisson regressions with endogenous treatment effects, the dependent variable continues to be the number of launched infringement procedure investigations, coded from 1 to 154. In the control equation, I employ the following independent variables: the power index, convergence, total GHG, lagged, and administrative capacity. In the treatment equation, I employ the same variables with the world of compliance binary variables as an endogenous treatment to estimate the number of infringement investigations launched against each world of compliance.

In the three models, significant Wald tests indicate good fits and the absence of correlations between the treatment errors and the outcome errors. The power index is significant and positive in the control-models 4, 5 and 6. Convergence is significant and positive in control-models 5 and 6. Administrative capacity is significant in the three control-models, positive in 4 and 5, but negative in Model 6. As the methods implemented in these treatment-effect commands are not naturally in the potential-outcomes framework, I use margins to obtain treatment effects such as the average treatment effect (ATE) and the average treatment effect on the treated (ATET) (See Table 1.1.3: Treatment Effects).

In Model 4, the estimated correlation between the treatment-assignment errors and the outcome errors is positive, or, in other words; unobservable factors that

increase the number of infringement investigations in the treatment group, which is the world of law observance, tend to occur with unobservable factors that increase the number of infringement investigations in the control group, EU member states. The potential outcome mean for the treatment regime is 0.86 time the potential outcome mean for the control regime, that is, the average number of infringement investigations in the treatment regime is smaller than the average number of investigations in the control regime. The estimated average difference (ATE) of the world of law observance and EU member states is -20.35, that is, the average member state will be the targeted with 20.35 fewer infringement investigations when it participates in the world of law observance. The estimated average treatment effect on the treated (ATET) suggests that the average member state in the world of law observance is targeted with 28.90 less investigations than it would if not in the world of law observance. In short, participants in the world of law observance, the most compliant member states, are targeted with less infringement investigations than other member states.

Results of Model 5 show that the estimated correlation between the treatment-assignment errors is positive, that is, unobservable factors that increase the number of infringement investigations in the treatment group, domestic politics, tend to occur with unobservable factors that increase the number of infringement investigations in the control group, EU member states. The average number of infringement investigations in the treatment group is over 1.24 times the average number of investigations in the control group. The estimated average difference (ATE) of the world of domestic politics and EU member states is -33.73, or in other words, the average member state will be the

targeted with 33.73 more infringement investigations when it participates in the world of domestic politics. The estimated average treatment effect on the treated (ATET) indicates that the average member state in the world of domestic politics is targeted with 31.68 more investigations than it would if not in the world of domestic politics. The similar numbers suggest a small correlation between the treatment errors and that outcome errors and that the exogenous covariates have a very similar distribution among control and treatment groups. However, more infringement investigations are launched against members in the world of domestic politics than against other members states, a finding that offers support for hypothesis 2.

In Model 6, the estimated correlation between the treatment-assignment errors and the outcome errors is negative and suggests that unobservable factors that increase the number of infringement investigations in the treatment tend to occur with unobservable factors that decrease the chance of participating in the world of neglect. The average number of infringement investigations in the treatment group is less than 0.90 times the average number of investigations in the control group. The estimated average difference (ATE) of the world of neglect and EU member states is -13.52, that is, the average member state will be the targeted with 13.52 fewer infringement investigations when it participates in the world of neglect, and the average member state in the world of neglect is targeted with 7.20 less investigations than it would if not in the world of neglect, a finding that suggests that a different treatment for members in the world of neglect and also offers support for hypothesis 2.

Table 1.6.2: Poisson Regression with Treatment Effects, Control Models

	Model 4	Model 5	Model 6
	b/se	b/se	b/se
Dependent Variable: Infringement Proceding Investigations			
Power index	0.095**	0.100***	0.125***
	(0.03)	(0.02)	(0.02)
Convergence	-0.026	0.031*	0.172***
	(0.03)	(0.01)	(0.01)
Total GHG (stdd.)	0.02	0.048***	0.013
	(0.03)	(0.01)	(0.02)
Adm. Capacity	-0.105***	-0.086***	0.150***
	(0.01)	(0.01)	(0.02)
WOC: Law Observance = 1	-0.147***		
	(0.04)		
WOC: Domestic Politics = 1		0.214***	
		(0.03)	
WOC: Neglect = 1			-0.100*
			(0.04)
Constant	4.512***	4.445***	4.604***
	(0.02)	(0.01)	(0.01)
BIC	1805.271	1726.717	1796.565

*p<0.05, **p<0.01, ***p<0.001

Table 1.6.3: Treatment Effects

Treatment	Ratio	ATE	ATET
Law Observance	0.86	-20.36	-28.90
Domestic Politics	1.24	33.73	31.67
Neglect	0.90	- 13.52	-7.20

Ratio corresponds to the ratio of the treatment regime potential-outcome mean to the control regime potential-outcome mean. ATE corresponds to average treatment effect and ATET to average treatment effect on the treated.

1.7. Conclusion

The examination of the autonomy of the European Union through the analysis of infringement procedure investigations suggests that the Commission has strategically launched investigations in ways that promote its autonomy. The main questions addressed in this chapter examine whether the Commission allows suspicions of non-compliance against powerful members slide and does not issue infringement investigations against them, and whether the Commission targets members that are more likely to comply with more investigations to promote compliance and thus autonomy. Results indicate that the Commission does not favor powerful member states but does act strategically in issuing infringement investigations.

In all estimated statistical regressions, the coefficients of the power index are significant and positively correlated with infringement investigations. That is, powerful members were not targeted with less investigations, but more. Therefore, powerful EU members did not exercise informal governance in the climate during the analyzed period, a finding that coincides with Stone's argument that EU most powerful members have avoided involvement with the EU governance (2011). According to him, even though they may have the power to exercise leadership, their behavior has oscillated between delegation in areas of common agreement and avoidance of cooperation in areas of intense conflicts of interest. Germany, for example, known as the 'gentle giant' has opposed to get more involved in the region, especially in the aftermath of the 2008 global financial crisis which had profound effects in the economies of Greece and

Portugal (Bulmer and Paterson 1996; Janning 2005; Simms 2012). Findings indicates that this may indeed be the case with climate policy, an area of common agreement.

Moreover, the analysis of the relationship between the worlds of compliance and the number of infringement investigations suggests that certain member states may be spared from investigations while others are strategically targeted. Participants in the world of law observance are targeted with fewer infringement investigations, and this makes sense since these are the most compliant members. However, participants in the world of domestic politics are targeted with more investigations and participants in the world of neglect, which tend not to comply, are targeted with less. Certain level of tolerance with the participants of the world of neglect combined with more sternness with participants of the world of domestic politics suggest that the Commission acts strategically in ways that promote its autonomy.

The evidence put forward by this chapter is tentative. The period covered in the analysis (2006 to 2017) is short. The creation and implementation of the EU climate policy is relatively recent and thus its impacts and outcomes are still being delineated. For this reason, ongoing policy analyses remain necessary to delineate a clearer picture of the autonomy of the EU in the climate area. The power distribution in the EU may have shifted and the Commission may have become more powerful *vis-à-vis* powerful members avoidance to get involved with the EU governance and more analyses are relevant to either confirm or reject this argument.

Nevertheless, results indicate that the Commission acts strategically to promote its autonomy. Fjelstul and Carrubba reach a similar conclusion and describe the

Commission's actions as effective, though imperfect (2018, 429). I, however, question whether policy enforcement, much like anything else, can be perfect. Thus, the most substantively relevant finding of this chapter is that the EU seems to have found ways to assert its autonomy and even though the enforcement of climate legislation is imperfect, it may put the EU a few steps closer to reaching its GHG emission targets.

1.8. Appendix 1

Table 1.8.2: Infringement Procedure Investigations

Member State	*IPI*
Croatia	1
Denmark	1
Netherlands	2
Lithuania	3
Austria	4
Czech Republic	4
Estonia	4
Finland	4
Ireland	4
Slovenia	4
Spain	4
Sweden	4
Cyprus	5
Latvia	5
Luxemburg	5
France	6
Germany	6
Portugal	6
United Kingdom	6
Hungary	7
Malta	7
Bulgaria	8
Greece	8
Slovakia	8
Belgium	9
Italy	9
Romania	9
Poland	11

Table 1.8.3: Collinearity Tests

	GDP	GDP pc	Growth	Parl. Seat	G6	EU Contr.	EU Spen.	Area	Pop.
GDP	1								
GDP pc	0.1976	1							
Growth	-0.0405	0.0792	1						
Parl. Seat	0.9526	0.0578	-0.0482	1					
G6	0.8397	0.0601	0.0094	0.9189	1				
EU Contr.	0.9761	0.2372	-0.0292	0.9289	0.8125	1			
EU Spen.	0.7217	-0.0339	-0.133	0.862	0.8293	0.7124	1		
Area	0.6844	0.0028	-0.0011	0.7587	0.7493	0.7193	0.7152	1	
Pop.	0.9635	0.0957	-0.0357	0.9951	0.9285	0.9459	0.8359	0.7615	1

Table 1.8.4: Descriptive Statistics and Sources

Variable	Obs	Mean	Std. Dev.	Min	Max	Description	Source
Infringement	154	77.50	44.60	1.00	154.00	Infringement Proceeding Investigation	Own calculations based on European Commission (n.d.)
G6	154	0.27	0.45	0.00	1.00	Participation in the G6	Own calculation
Convergence	154	-0.11	0.89	-1.17	1.32	Coincidence between member vote in QMV and the result of the vote	Fjelstul and Carrubba (2018)
Total GHG, lagged	153	0.00	1.00	-0.85	2.89	Total GHG emissions, with a 1 year lag	OECD (2020a)
Domestic Politics	154	0.06	0.24	0.00	1.00	Members rely on domestic politics to make ransposition and implement directives	Based on Falkner et al. (2007)
Neglect	154	0.20	0.40	0.00	1.00	Members that disregard EU pressure, act in opposition and tend not to transpose and implement directives on time	Based on Falkner et al. (2007)
Law Observance	154	0.25	0.43	0.00	1.00	Members that strictly obey EU law	Based on Falkner et al. (2007)
Adm. Capacity	154	-0.28	0.99	-2.52	1.73	Perceptions of quality of public and civil services, degree of independence from political pressures, quality of policy formulation and implementation, and the credibility of the member commitment to policies	World Bank (2019)
Type of Government	154	1.17	0.38	1.00	2.00	Legislative branch electing the chief executive (1; 0 otherwise)	McLean and Stone (2012)
Growth	154	1.34	3.18	-14.24	7.44	Growth as a percentage of GDP	World Bank 2018
Commission Presidency	154	0.23	0.42	0.00	1.00	Change in Commission Presidency, from Portugal to Luxemburg	Own calculation
Compliance	129	90.20	18.07	25.00	99.54	Extent to which members reached the stipulated emission target of 8% below 1990 levels	Dechezleprêtre (2012)
Parliamentary Seats	154	30.45	25.67	6.00	96.00	Number of seats in the EU Parliament	Own calculations
GDP	154	675004	847654	11417	3148274	GDP	World Bank 2020
Vote distance: GER	154	0.78	0.06	0.71	1.00	Voting distance between Germany and the other members at UNGA	Based on Voeten et al (2009)
Vote distance: FRA	154	1.41	0.10	1.00	1.58	Voting distance between France and the other members at UNGA	Based on Voeten et al (2009)
Vote distance: GBR	154	1.62	0.13	1.00	1.71	Voting distance between Great-Britain and the other members at UNGA	Based on Voeten et al (2009)

Table 1.8.5: Statistical Tests, Model 1

Poisson Regression Goodness-of-Fit Test
Deviance goodness-of-fit = 4015.559
Prob > chi2(139) = '0.0000
Pearson goodness-of-fit = 3546.736
Prob > chi2(139) = '0.0000

2. The Impact of Government Ideology on Environmental Policy Stringency Across EU Member States

2.1. **Introduction**

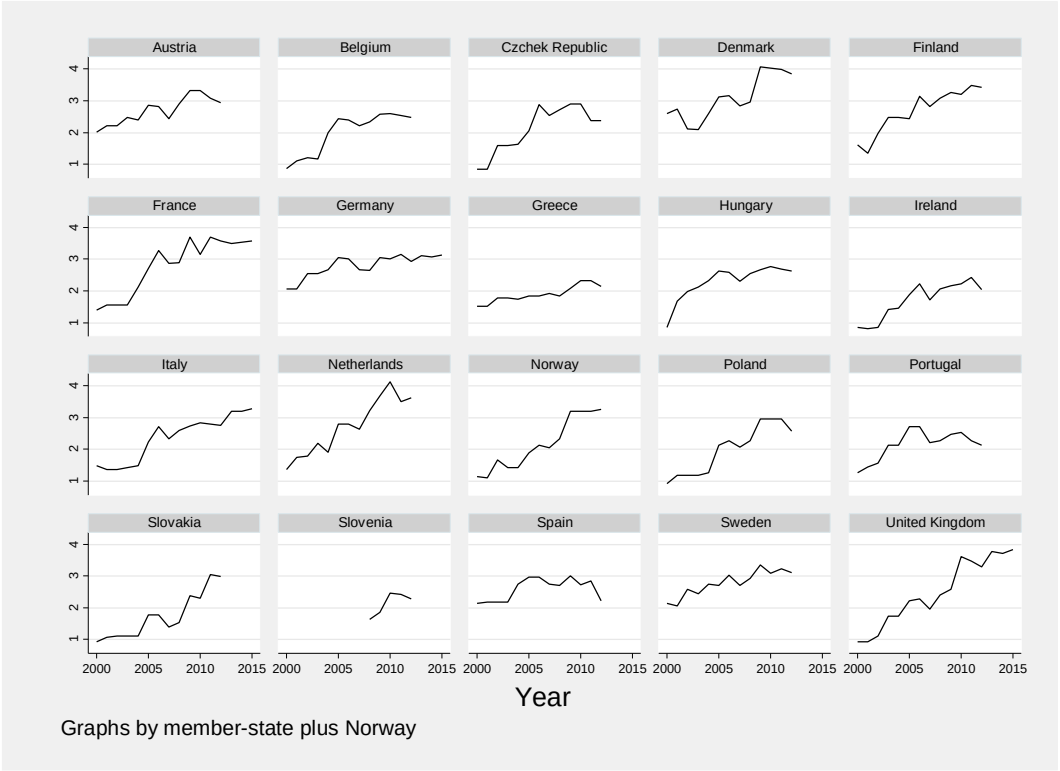
The relationship between the international system and states that participate in the system is one of mutual influence. At the same time as the system pressures states to conform to the international *status quo*, states respond to the pressure and these responses readjust the *status quo* (Gourevitch 1978; Putnam 1988). The EU, which is the international system in question, has established, monitored and enforced a stringent environmental policy since the 1980s (McLean and Stone 2012).

Member states' responses to the community environmental policy have promoted its readjustment. Despite the common baseline, the stringency of environmental policies varies significantly across member states. Graph 2.1, below, illustrates such variation. The differing levels of stringency suggest that although the EU sets the standard, there are other that factors influencing domestic policymaking. Therefore, in this chapter, I examine the impact of one political factor, the ideology of the party in government, on the stringency of environmental policies across EU member states.

I define ideology based on the economic dimension and categorize it as left, center and right. The label 'left' describes green, labor, and other parties to the left of social democrats, and 'right' labels parties to the right of economic liberals, including socially

conservative and radical right-wing parties. The analysis encompasses 18 member states in the period between 2000 and 2012.

Graph 2.1.1: Environmental Policy Stringency Index (OECD)



Only a few cross-national studies have examined the effect of government ideology on environmental policy. Among these studies, Jahn (1998), Neumayer (2004) and Scruggs (1999) investigate the impact of left ideologies on environmental performance. Nevertheless, there are issues with their dependent variables. Jahn, Neumayer and Scruggs employ measures of environmental performance that may be moderated by economic productivity. Knill and others (2010) attempt to fix this issue and use a

measure of policy stringency, the number of environmental regulations adopted by a country. However, the measure does not capture actual environmental stringency in cases when a new regulation relaxes the stringency of a previous one.

I use the Environmental Policy Stringency (EPS) Index (OECD 2017) as the dependent variable. The index measures the price which environmental regulations put on environmental externalities, either explicitly or implicitly and offers a more sophisticated measure than the number of regulations adopted by a country. For example, the EPS index may account for stringency setbacks, something that a measure of the number of adopted regulations may not. Suppose that a new regulation relaxes the stringency of previous ones. In this case, the higher number of regulations does not correspond to increased environmental policy stringency, but a measure that accounts for the number of environmental regulations adopted by a country may not capture this nuance. Therefore, as the EPS index measures the price put on externalities, it captures changes in any direction of environmental policy stringency; it is a more accurate measure of stringency than the number of regulations and thus yields more reliable results.

The key independent variables offer different measures of the ideology of the party or coalition in the government. Considering that the analyzed panel dataset is short, with a small T and large N, I estimate pooled OLS regressions with Driscoll and Kraay standard errors. This chapter addresses the impact of the ideology of the government party on environmental policy stringency in a highly internationalized environment. Results indicate that when the government is composed of left parties, there is an increase in environmental policy stringency and, in contrast, when the government is

composed of right-wing parties, there is a decrease in stringency. That is, even in the presence of increasing international pressure that favors increased environmental stringency, the ideology of party in government paces member states' movement toward increased stringency.

Results also suggest that ideas about environmental conservation, currently prominent among the public, may have been incorporated by the left more generally. Especially as these left platforms are science-based and pro-international *status quo*, as opposed to the new right-wing parties which, despite having attracted the losers of globalization, trade liberalization and environmental regulations which are traditionally associated with labor parties, has added an anti-system attitude to the political mix. Even though results do not offer conclusive evidence regarding the impact of ideologies on environmental policymaking, this chapter contributes to a better understanding of how ideology influences environmental policy stringency and explains why member states have environmental policies with different stringency levels, despite the EU pressure.

2.2. **International Pressure and Domestic Responses**

Certain aspects of the EU environmental policy are legally binding. Legal acts such as directives and decisions, for example, are mandatory. That is, according to the TFEU, they must be transposed into member states legal systems and satisfactorily applied. Directive 2000/60/EC, which established a framework for action in relation to

water policy, and Directive EU 2003/87 EC that created the EUETS, are legally binding and must be transposed and implemented by member states.

However, members' choices regarding environmental laws are shaped by international *and* domestic factors. Their relationship with the EU as well as political, social, and economic factors, among others, combine in complex ways to influence policymaking. Börzel (2000, 2003), Guinaudeau (2014), and Knill, Debus, and Heichel (2010) have examined how the relationship between the EU and a member state affects the implementation of the environmental legislation. Their findings generally suggest that when the relationship is marked by low levels of conflict, implementation tends to occur smoothly. However, (Falkner 2005; Fjelstul and Carrubba 2018; König and Luetgert 2009; Tallberg 2002) argue that if the relationship is contentious, implementation tends to be more difficult.

When the focus is shifted to domestic factors, Falkner and others (2007) and Falkner and Treib (2008) have suggested that certain typologies, or "worlds of compliance" affect the rate of implementation of EU social policies. The number of veto players (Tsebelis 1995, 2011; Tsebelis and Chang 2004), administrative capacity and the state of the economy (Börzel 2000; Börzel 2002, 2003), among others domestic factors, also impact the implementation of directives and thus environmental policy stringency across member states.

In summary, the EU pressures member states to transpose and implement environmental legislation; member states transpose and implement it at different paces and with varying levels of compliance. Nevertheless, as environmental legislation is

transposed and implemented, winners and losers of environmental policies are invariably defined.[9] For example, the benefits of the EU environmental policy are widespread. If the policy is successful, individuals in different regions of the world will benefit from the reduction in GHG emissions and a consequent better environmental quality. In fact, as the consequences of global warming have been experienced at different rates in distinct regions of the world, the populations suffering the most severe consequences of global warming would benefit the most from reductions in GHG emissions in the EU.

However, although the benefits of environmental policies are widespread, the costs tend to be localized. In the case of EU environmental regulations, costs tend to be unevenly paid by the EU population. Depending on member states' decisions regarding the transposition and implementation of environmental directives, certain groups pay more of the costs. According to the Pollution Haven Hypothesis (PHH), when governments establish stringent environmental regulations, companies tend to outsource production plants to other locations, with lax environmental regulations. When this movement happens, it generates unemployment in places with stringent regulations.

For instance, the implementation of the EU ETS in 2005 made energy-intensive industrial installations in participating member states adapt. In general terms, the EU ETS raises production standards and intensifies the competition among energy-intensive industrial installations. An installation that struggled to remain competitive risked closing their doors. Technologically outdated installations that struggles to remain

[9] See McGillivray (2004) for detailed explanation of how winners and losers of public policies are defined.

competitive are at a heightened risk of closing their doors. When installations close their doors, workers become unemployed. Therefore, workers in carbon-intensive industries, whose jobs depend on the stability of industrial installations, may incur in great losses with the implementation of the EU ETS and other environmental regulations and thus tend to disapprove of it (Walker 1992, Samuels 2017). The argument put forward by the PHH, that environmental regulations hurt the economy, bases the opinions of workers and explains why environmental regulations are often referred to as 'job-killing regulations' (Johnson and Finkel 2016).

Moreover, the public opinion about environmental regulations may be associated perceived impacts of these regulations. Kauder, Potrafke and Ursprung (2018) conducted a public opinion survey in Germany to investigate German public opinion of environmental regulations and findings demonstrate that supporters of left and right wing parties show similar low levels of support for environmental regulations. Ziegler (2017) finds that German supporters of the right demonstrate less support for climate regulations, but the author also notices that when environmental values are present, they weaken the differences in beliefs and attitudes between right and left supporters. McCright and others (2016) examine the extent to which the left-right ideological divide is present on views regarding the climate change across 28 member states, Turkey, and Macedonia in 2008.[10] Findings show that supporters of the left consistently reported stronger belief in climate change and support for action to mitigate it than did supporters of the right in 14 Western European member states. In 11 former Communist

[10] At the time of the survey, Croatia was an EU candidate country.

member states, there was no such ideological divide. Germany was disaggregated in the study and results for both West and East Germany were consistent with Western European and former Communist countries.

Regardless of the public opinion support for environmental regulations, environmental policy stringency has trended upward in the analyzed period. International pressure is part of the phenomenon, but insufficient to explain the differences in stringency levels across member states. Does public opinion influences government responses to the international pressure along the left-right ideological spectrum? In the next section, I explore the electoral connection between the public opinion, support or opposition to environmental policies and environmental policymaking.

2.3. **The Politics of Environmental Policy Stringency**

McGillivray defines politics as the redistribution of the costs and benefits of public policies among different groups in a society (McGillivray 2004). This redistribution of costs and benefits specifies winners and losers, which are not chosen at random. Considering Mayhew's widely accepted assumption that the number one goal of politicians is to remain in office (Mayhew 2004), I suppose that politicians cater to the interests of their constituents and thus, the winners of public policies are selected according to the extent to which their electoral support is relevant for politicians to remain in office.

In the environmental issue-area, some authors argue that the interests of constituents are divided along ideological lines. Zahariadis (2007) contends that ideology is

an appropriate measure to examine environmental policymaking as it exposes preferences and provides signals for floor voting. While Zahariadis argument seems to fit most analyses of environmental politics in the United States (McCright, Xiao, and Dunlap 2014; Sexton and Sexton 2014; Shipan and Lowry 2001), employing ideology to the examination of environmental policymaking in the EU is more complex.

Nevertheless, McCright and others (2016) have analyzed the attitudes of individuals in 14 EU member states toward climate change and noticed that individuals on the left reported stronger beliefs and support for action to mitigate it than did individuals on the right. Similarly, Neumayer's findings (2004) suggested that left parties and individuals are more pro-environment than their right-wing counterparts. Therefore, even though McCright and others and Neumayer indicate that the left–right ideological divide is, to some extent, present on the public opinion regarding environmental issues and policies, the EU presents a scenario that is different from that of the United States.

European democracies have multi-party systems (Rae 1968) and in such systems, a single party does not usually gain control over the government. Parties usually coalesce to govern. In a coalition, the norm is joint decision-making and bargaining between the coalition partners. Parties coalesce with other parties with close ideological positions but also to get the benefits of participating in the government, and in these cases, they may coalesce with parties with different ideologies. In the end, policies represent a compromise between the ideal policy points of the coalition parties (Laver and Shepsle 1990; Strom et al. 2008).

Most European societies have developed strong corporatist systems, composed of organized groups, like labor unions, which have developed ways of participating in the government and influencing policymaking (Falkner 2003; Grote and Schimitter 2004).[11] These groups exchange electoral support for policy prizes. In other words, labor unions that endorse a leftist party expect that, when in office, the party contributes to the promotion of policies that benefit workers, such as the expansion of the welfare (Cameron 1978; Garrett 1998; Rodrik 1998).

The increase in government expenditure is explained by the pressure that workers negatively impacted by trade liberalization put on government and labor or left parties are more likely to give in to workers pressure. Therefore, under the pressure of the labor or the left, governments tend to expand in order to counterbalance the volatility of an open economy and protect impacted workers (Cameron 1978; Garrett 1998; Lall 2017; Rodrik 1998).

However, there is one subset of the left that strongly supports environmental policies: the greens. The greens are niche parties, typically situated at the far left of the ideological spectrum, with platforms that generally focus on ecological sustainability and socio-economic issues (Gericke 2018; Neumayer 2004). Kauder and others (2018) conducted a survey and found that Germans who support the green party have shown considerably greater support for environmental protection. On average, the greens are

[11] In the late 1980s and 1990s, globalization and trade liberalization forced a reorganization of the economic structure of EU member states. International competition and high unemployment rates led to the weakening of labor unions. However, the expansion of the welfare state and European integration offered political incentives that contributed to the revival of corporatist systems (Bieling and Schulten 2001; Grote and Schimitter 2004).

young, educated, socially progressive individuals that live in urban centers and who are willing to pay for the economic costs of stringent environmental policies. Members of green groups tend to exhibit more extreme values and beliefs in comparison to the median values and beliefs of the left (Gericke 2018). Beyond environmental conservation, green parties' platforms include issues such as economic reform, welfare redistribution, women's, and minority rights, for example, and thus green parties are on the far left of the ideology spectrum.

Nevertheless, the ideology of the left includes green, labor, and social democratic parties. While constituents of green parties tend to demonstrate more extreme values and beliefs in comparison to the median values and beliefs of the left (Gericke 2018), workers tend to associate environmental policies with economic losses (Johnson and Finkel 2016; Neumayer 2004).

Center parties, exemplified by Christian democratic or Catholic parties, are considered moderate. Armingeon and others (2018) describe centrist parties as advocates of the *status quo*. That is, centrist parties go with the political flow and they neither promote stringent environmental policies or oppose to the implementation of environmental directives from the EU (Carter 2013; Dalton and Rohrschneider 2015).

The right is composed of liberal and conservative parties. Parties on the right side of the ideological spectrum represent the interests of liberal groups, who tend to be pro-business (Neumayer 2004). Pro-business groups contend that stringent environmental policies are unnecessary given the market's ability to self-regulate. Supporters of liberal economic ideologies defend the market's ability to internalize environmental

externalities and promote environmental protection without government intervention (Simmons and Elkins 2004; Vogel 1997a, 1997b). However, the liberal economic ideology does not seem prevalent among supporters of the right in EU member states.

Europe has witnessed the emergence of radical right-wing parties since the 1990s. Lockwood (2018) suggests that economic and political marginalization among the losers of globalization and trade liberalization is one of the factors which has triggered the emergence of radical right-wing parties. Therefore, if constituents traditionally associated with labor parties, which have suffered losses with globalization and trade liberalization, have been allured by right-wing parties, then the ideology associated with the economic dimension is insufficient to explain how government ideology impacts environmental policy stringency across member states.

The emergency of radical right-wing parties seems more associated with sociological and political attitudes, including international political attitudes, than with economic dimensions. Ignazi (1992) suggests that a right-wing anti-system attitude has favored the emergency of the new right-wing parties. Hix and Noury (2007) similarly suggest anti-immigrant sentiments, rather than economic preferences, have shaped radical right-wing parties ideologies. In relation to environmental policies and climate change, right supporters tend to be climate sceptics and hostile to environmental regulations. Lockwood (2018) examines the nature and causes of this association and suggests that both structuralist factors, drawing on accounts of the roots of populism in economic and political marginalization among the losers of globalization and trade liberalization, and

the ideological content of right wing parties, especially its anti-system attitude seem to have driven the emergency of the new right wing.

Niche parties such as the greens or the radical right usually have a limited participation in governments, and thus, their effect in policymaking tends to be small. Unless they are kingmakers and have a disproportionate influence in the government. Between 1998-2005 in Germany, Parliamentary seats of the greens were needed for the left coalition to achieve a majority. As the kingmaker, the green party had a substantial amount of influence on policymaking (Jensen and Spoon 2007).

Therefore, considering the peculiarities of member states' electoral systems, the public's support of environmental issues and policies, nuances in ideologies and the electoral connection, how does the party's location on the left-right ideological spectrum impact environmental policy stringency across member states?

2.3.1. Hypothesis

The EU has established and enforced increasingly stringent environmental policies since the 1980s. Public opinion surveys suggest that supporters of left and right parties show similar levels of support to environmental regulations (Kauder, Potrafke, and Ursprung 2018; Ziegler 2017). Yet, despite the limited support of left and right partisans, Graph 2.1 (above) shows that environmental policy stringency has trended upward among member states. Considering the EU pressure, characteristics of member states' electoral systems, the public opinion, the electoral connection, or the assumption that

politicians cater to the interests of their constituents in order to remain in office, I examine the impact of the ideology of the government on environmental policy stringency across member states.

Given the strength of corporatism across Europe, I suppose that workers are a relevant constituency of the left. Workers tend to associate environmental regulations with economic losses, something Kauder and others (2018) found this to be the case in Germany, and thus I would expect labor parties to oppose to stringent environmental regulations. Nevertheless, the left is also composed of green parties, who advocate for environmental protection, including stringent environmental policies, and other parties to the left of social democrats. Although green parties are niche parties and often have a limited participation in the government, the public opinion in the EU tends to strongly support the environment (Anderson, Böhmelt, and Ward 2017; Drews, Antal, and van den Bergh 2018). Consequently, given the public support for the environment and the fact that in multi-party systems public policies are a compromise between ideal policy points of the coalition partners, I expect that parties to the left of social democrats incorporate environmental issues to their platforms; especially when green parties are in the governing coalition and use the opportunity to negotiate, compromise, and advance their electoral programs.

McCright and others (2016) and Neumayer (2004) suggest that the left–right ideological divide is still present on the public opinion when it comes the environmental issues and policies. Parties on the right side of the ideological spectrum have traditionally represented the interests of liberal groups, demonstrated pro-business attitudes, and

contended that stringent environmental policies are unnecessary given the market's ability to self-regulate.

Since the 1990s, radical right-wing parties that have emerged in the EU political scenario and represented the interests of losers of globalization and trade liberalization, much like labor parties. Yet, these radical right-wing parties also channel scientific skepticism, anti-system attitudes as well as anti-immigrant sentiments. Therefore, even though the radical right economic ideology does not match that of traditional right-wing parties, skepticism and anti-systemic attitudes explain the opposition to environmental regulations and thus, I expect that these attitudes will shift right parties' ideological position further to the right of the ideological spectrum and distinguish the environmental policies of left and right parties. I suspect that:

H1: Considering the left-right ideological spectrum, as the parties or coalitions that compose the government move from the right to the left, there is an increase in environmental policy stringency.

2.4. **Research Design**

To investigate the impact of the government ideology on the stringency of environmental policy, I analyze annual data for 18 member states[12] between the years of

[12] The analyzed members are Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Netherlands, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, and Great Britain.

2000 and 2012. The dependent variable is the Environmental Policy Stringency (EPS) index (OECD 2020b), measured as the degree to which environmental policies put an explicit or implicit price on environmental externalities. The EPS Index calculates the price established by the following regulations: taxes, feed-in tariffs (FITs), deposit and refund schemes (DRS),[13] emission trading schemes, emission standards and subsidies to R&D. It ranges from 0 (not stringent) to 6 (highest degree of stringency).

The EPS Index provides a more complex and detailed measure of stringency when compared to measures of environmental performance. For example, the environmental performance measure, used by Jahn (1998), Neumayer (2004) and Scruggs (1999) may be moderated by economic productivity, and the number of adopted regulations, used by Knill and others (2010) does not capture actual environmental stringency in cases when a new regulation relaxes the stringency of a previous one.

The main independent variables capture nuances of the ideology of member states' governments. Ideology is defined according to the party orientation with respect to economic policy and categorized as left, center and right. 'Left' ideology describes green, labor, and other parties to the left of social democrats; 'center' designates moderate parties such as Christian democratic or Catholic ones, and 'right' labels those parties to the right of economic liberals, including socially conservative *and* the radical right-wing parties that emerged since the 1990s.

[13] Feed-in tariffs (FITs) are paid by electricity consumers to support the build-up of renewable energy capacity. Deposit and refund schemes (DRS) offer incentives for non-pollution. DRS reward conservation and thus promote environmental quality.

Based on the Historical Archive of Parliamentary Election Results, made available by the Inter-Parliamentary Union (Inter-Parliamentary Union 2018) (see Appendix 2.7.1 for links to member states pages), I coded the ideology of the largest party in parliament, based the distribution of votes.[14] In those cases when a coalition won the majority of seats, which happened in Finland, Hungary, Poland, France, Italy and Slovenia, I have coded the ideology of the coalition after reviewing the coalition's website and/or news articles. Parties or coalitions are coded 1 if on the right side of the political spectrum, 2 if on the center, and 3 if on the left side. Though simple, this measure of government ideology is a suitable starting point for the investigation of the impact of ideology on environmental policy stringency, especially when accompanied of other measures of ideology and government support.

I have also constructed a measure of the vote share of the largest party or coalition in parliament. Vote shares were calculated based on information made available by the Inter-Parliamentary Union (Inter-Parliamentary Union 2018). The ideology of the largest party and vote share indicate the prevailing ideology in the legislature and its relative power in the parliament, in each member state. Nevertheless, these measures do not consider the ideological differences across countries and over time or the impact of coalition partners.

A measure of general left-right positions of parties would take care of differences over time. Therefore, I include a measure of right-left positions of parties, the

[14] I considered parties in the Lower House in bicameral parliaments and in the unicameral parliament otherwise.

"rile" index, developed by Budge and Laver (2016) and coded by Volkens et al. (2019b). The rile index defines 12 categories of parties' platforms as left, other 12 as right and supposes that left parties mention more leftist issues while right parties discuss more right-wing ones. Researchers examine sentences in party manifestos and code the extent to which a party manifesto mentions left or right issues to determine what the party position in the right-left scale is. The index is negative if the party manifesto mentions more leftist issues and positive if a party mentions more right-wing issues.

However, the rile index presents shortcomings. The index does not consider ideological differences across countries. Franzmann and Kaiser (2006) and Jahn (Jahn 2011) have argued that what is considered as left in a country may not be thought so in another country. Moreover, Mölder (2016) noticed that the construct validity of rile index is lower in Central and Eastern European countries than in Western Europe, possibly because the original calculation and validation was developed by Budge and Laver (2016) for Western European countries. Kim and Fording (2012) have pointed out that the index has a low construct validity as neutral sentences could bias the estimates toward the political center, and proposed a different calculation where party positions are not biased by neutral sentences. Lowe and others content that marginal effect of an added sentence decreases as the total of sentences in the party platform increases and propose a measure that captures this decreasing marginal effect of sentences (Lowe et al. 2011). Nevertheless, even though calculations may differ, aggregation functions of these three different measures have yielded similar results (Manifesto Project Team 2018) and thus the rile index is suitable in the analysis of the impact of the impact of the

government ideology on the stringency of environmental policy, especially as it is one of the employed measures of ideology.

The other used measures to depict the ideology of the government are the share of cabinet posts, right or left, that describes the proportion of cabinet posts of right or left parties as a percentage of total cabinet posts (Armingeon et al. 2018) and the seat share, right or left, described as the seat share of right or left parties in the government based on the proportional seat share in Parliament, weighted by the number of days in office in a given year (Armingeon et al. 2018). In cases when the government is composed of a coalition, Armingeon et al. consider the ideology of the parties in the coalition to code these variables.

Institutional characteristics of member states' political systems, such as multi-party systems, affect policymaking. In multi-party systems, joint decision-making and bargaining between the coalition partners is the norm and public policies correspond to a compromise between the ideal policy points of the coalition parties (Laver and Shepsle 1990; Strom et al. 2008). As the ideology measures described above do not depict the combination of parties in the government, I include a government composition variable (Armingeon et al. 2018). The variable takes a value of 1 through 7, as follows. For a member state with a single-party majority government, where one party takes all governments seats and has a parliamentary majority (>50.0%), the government composition variable takes the value of 1. For a member state with a minimal winning coalition, where all participating parties are necessary to form a majority government (>50.0%), the government composition variable takes the value of 2. For a surplus coalition, where

coalition governments exceed the minimal-winning criterion (>50.0%), the government composition variable takes the value of 3. In cases of a single-party minority government, where the party in government does not possess a majority in parliament (≤50.0%), the government composition variable takes the value of 4. As the government is composed of a multi-party minority government and the parties in government do not possess a majority in Parliament (≤50.0%), the variable takes the value of 5. For a caretaker government, where the government attempts to maintain the *status quo*, the government composition variable takes the value of 6; and in cases of a technocratic government, led by technocratic prime minister, consisting of a majority of technocratic ministers and in possession of a mandate to change the *status quo*, the government composition variable takes the value of 7.

Moreover, McLean and Stone (2012) found that member states with parliamentary regimes implemented the policies described in the Kyoto protocol more rapidly than member states with presidential regimes, even though ratification was delayed when a single opposition party controlled a majority in the lower house of Parliament. In presidential regimes, the president may veto bills, which may delay the implementation process, but in parliamentary ones, although partisan veto is still possible, a veto is more difficult to happen and thus the implementation of environmental legislation may occur more rapidly. Thus, to check for the impact of the type of government on the stringency of environmental policies, I include a binary variable that that takes the value of 1 for member states in which the legislative branch elects the chief executive, and 0 otherwise. This variable is the same as the one used by McLean and Stone (2012).

Other domestic factors are also relevant to policymaking. Falkner and others (2007b) suggest that the typologies exemplified by the worlds of compliance are key to the transposition of EU directives. The first world of compliance is heavily impacted by domestic politics. In this first world of compliance, transposition tends to be aligned with the interests of the government and of major interest groups. The second world is associated with a neglect of EU pressure, inertia, and late transposition. In the world of neglect, non-compliance is the rule. The third world of compliance is characterized by law observance and member states tend to transpose directives on time and correctly, even in those cases of domestic conflict. Extending Falkner and others' argument to the study of Central and Eastern European member states, which later joined the EU, Falkner and Treib (2008) add a fourth typology to the initial three. The fourth typology is characterized by difficulties with the application and enforcement of EU directives, as a result of domestic factors associated with struggling economies.

Extending the "worlds of compliance" typology from social to environmental policymaking, I include a world of compliance variable to the analysis of the impact of ideology on environmental policy stringency. The variable ranges from 1 to 4 and describes the following situations: member states that rely heavily on domestic-politics (1), member states that neglect EU pressure (2), member states that obey the law and do what they are expected to do (3), and CEE member states that have limited administrative capacity and more fragile economies (4).

The impact of globalization and trade liberalization on domestic economies has made leftist governments increase welfare expenditures and protect workers from the

negative consequences of liberal policies (Cameron 1978; Rodrik 1998) and thus a measure of government expenditures, coded as per capita percentage of the GDP in the analysis (OECD 2020a), captures the relevance of labor unions in a member state. Nevertheless, as I argue that certain types of environmental regulations (such as environmental taxes, emission trading schemes emission standards, for example) tend to impose economic costs similar to those imposed by trade liberalization, left governments may also use welfare expenditures to counteract the negative effects of environmental policies on their constituents. Because the relationship between the stringency of environmental regulations and government expenditures implies a conditional effect, I interact the expenditure variable with the EPS Index, lagged (OECD 2020b).

Still considering the economic costs of environmental policies, I suspect that member states with economies based on agricultural activities and natural resource rents do not tend to increase the stringency of their environmental policies as much member states with economies that do not rely on these sectors. Therefore, measures of natural resource rents as a percentage of GDP (World Bank 2020) are included in the analysis.

Similarly, member states with economies based on exports may fear that stringent environmental policies increase production costs and hurt their economies. As a result, these member states may not increase the stringency of their environmental policies as much as member states which do not depend on these economic sectors. Thus, I include a measure of total exports (World Bank 2020).

Considering that the 2008 financial crisis caused a decline in economic productivity, I include a growth variable, measured as the annual percentage growth rate of GDP at market prices in local currency based on constant 2010 U.S. dollars (World Bank 2018), to control for the impact of economic decline on environmental policymaking.

2.4.1. Statistical Analysis

The analyzed panel dataset is strongly balanced, but short, with a small T (12 years, from 2000 to 2012) and large N (18 member states). Given the incidental parameters problem, fixed effects models are not adequate to this analysis of the impact of government ideology on environmental policy stringency (Heckman 1981; Stimson 1985). Moreover, omitted variables or the random nature of one or more parameters may have induced correlations between member states, and thus I run Breusch-Pagan LM and Pasaran cross-sectional dependence tests. Results indicate contemporaneous correlation (Frees 1995).

In the case of a short panel dataset with contemporaneous correlation, pooled models with adjustments are suitable to the statistical analysis. As Driscoll and Kraay standard errors have been considered consistent for small balanced panels (Certo and Semadeni 2006; Stimson 1985), I estimate pooled OLS regressions with Driscoll and Kraay standard errors with a default lag (Hoechle n.d.).

Considering that the stringency of environmental policies at a time t may be correlated with the stringency of policies enacted at time t-1, I use lagged EPS (with 1-year

lag) as the dependent variable in the models. The results of the pooled OLS regressions with Driscoll and Kraay standard errors are presented in Table 2.1, below. Some of the independent variables were on different scales and have been standardized to have a mean of zero and a standard deviation of one (Table 2.1 denotes the standardized variables).

2.5. **Results**

I analyze four statistical regressions, described in in Table 2.5.1. The dependent variable in all regressions is EPS with a 1-year lag, and the key independent variables depict different measures of government ideology. The control variables are also the same in the regressions and this allows for a careful examination of the impact of the different ideology measures in environmental policy stringency. In Model 1, the key independent variables are the ideology and seat share of the main party in the government. The coefficient of the ideology of the main party is significant and in the expected direction; as the ideology of the government goes from right to left, there is an increase in environmental policy stringency, as expected. This finding suggests that left parties may indeed be associated with more stringent environmental policies, however, the used measure of ideology is simple, it does not capture the ideology of the executive or cabinet, differences between the ideologies of the left, center and right within a country or differences across countries or over time.

The coefficient of the government composition variable is not significant, and thus, considering all the variables in this regression, the combination of parties in the

government establishing either a single-party majority government, a minimal winning coalition, single-party minority government, or multi-party minority government, among other combinations, does not seem relevant to the stringency of environmental policies. Nevertheless, the type of government variable indicates that parliamentary regimes are associated with more increases in EPS in comparison with presidential regimes, a finding similar to McLean and Stone's (2012). Therefore, presidents may have used their veto powers more than parties in parliamentary regimes and this may have decelerated the stringency of environmental regulations. The significance of the type of government variable indicates that the ideology of the executive government is relevant to the analysis of the stringency of environmental policies across EU member states.

The interaction between government expenditures and EPS with a 1-year lag is significant and positively associated with EPS. That is, increases in the interaction between government expenditures and EPS are associated with increases in EPS. The is, governments expand as EPS increase. Such expansion could be associated either with greater welfare expenditures to compensate workers for job losses, or environment related expenditures with research and development, for example.

The coefficient of the "worlds of compliance" variable is significant and thus suggests that the typologies are relevant to the stringency of environmental policies, as expected. Surprisingly, growth and exports are positively associated with EPS. Despite the argument that environmental regulations are associated with economic downturn and job losses, this has not been the case in EU member states from 2000 to 2012. These

results suggest that, differently from worker's expectations, economic activities and environmental protection may not be inconsistent, after all.

In Model 2, I include a measure of the executive party ideology variable to the measures of main party ideology and seat share, already present in Model 1. Nevertheless, the coefficient of executive party ideology is not significant and an analysis of the Variance Inflation Factor (VIF) (Appendix 2: Table 2.7.3) indicates some moderate level of collinearity between the variables in model 2. The coefficients of all the other variables, however, are very similar to those of Model 1.

In Model 3, I employ the right-left government position variable. The coefficient of right-left government position is significant and in the expected direction: as left-wing issues become more salient in the platforms of governing parties, there is an increase in environmental policy stringency. The right-left government position variable offers another indication that left parties are associated with more stringent environmental policies. The coefficients of the control variables are, again, very similar to those of Model 1.

In Model 4, I employ variables that describe the proportion of cabinet posts of left parties as a percentage of total cabinet posts (Armingeon et al. 2018) and the seat share of left parties in the government based on the proportional seat share in parliament (Armingeon et al. 2018). However, the coefficients of the cabinet posts and the seat share are not significant. The coefficients of the control variables are similar to those of Model 1, with one notable difference, type of government is no longer significant.

Based on model 1, I estimated another regression that includes a measure of the vote share of the main governing party or coalition, for robustness check. Yet, though the vote share variable depicts the public support for the government, its coefficient is not significant (see Appendix 2, Table 2.7.5). Moreover, considering the upward trend of stringency across member states, I estimated models 1 through 4 including year as a covariate. The significance of results did not change, but analyses of Variance Inflation Factor (VIF) demonstrate a high level of collinearity.

The inclusion of a lagged dependent variable in statistical models has been criticized; critics argue that it may not capture the dynamic effects present in political processes (see Knill, Debus, and Heichel 2010). One possible solution for the issue is the inclusion of the lagged variable as an independent variable. Therefore, I conduct regressions, based on the previous models, respectively, that include EPS as the dependent variable and EPS with a 1-year lag as a further independent variable (See Appendix 2, Table 2.7.5). The key independent variables are not significant in models 1.1, 2.1, or 3.1, anymore. Nevertheless, in model 4.1, the proportion of cabinet posts of both right and left parties are significant and associated with an increase in environmental policy stringency. The seat shares of both right and left parties are significant and associated with decreases in stringency. The issue is, however, that analyses of Variance Inflation Factor (VIF) (Appendix 2: Table 2.7.3) demonstrate a high level of collinearity between the variables in of these models. VIF analyses indicate that the variables in models 1 through 4 are not highly collinear (Appendix: Table 2.7.3).

Results of models 1, 2 and 3 indicate support for the investigated hypothesis: as the government party or coalition moves from the right to the left, there is an increase in environmental policy stringency. However, the used measures of ideology of the government party are simple and do not capture the ideological differences across countries. Yet, results of all 4 models indicate that increases in government expenditures are correlated with increases in environmental policy stringency, a finding that corroborates the idea that leftist governments are associated with more stringency. Increases in government expenditure are explained by the pressure that workers put on governments (Cameron 1978; Garrett 1998; Lall 2017; Rodrik 1998). Therefore, under the pressure of the left, left-wing governments tend to expand to counterbalance the volatility of an open economy, protect impacted workers and as indicated by these results, promote the environmental policies. Surprisingly, growth and exports are also associated with more stringency, which suggests that participation in international trade is associated with more stringent environmental policies.

Table 2.5.1: Pooled OLS with Driscoll and Kraay Standard Error Models

	M1 b/se	M2 b/se	M3 b/se	M4 b/se
Dependent Variable: EPS, lagged 1 year				
Ideology main party	0.063***	0.071***		
	(0.01)	(0.02)		
Seats main party (std.)	0.013	0.016		
	(0.02)	(0.02)		
Type of Government	0.087*	0.092**	0.077**	0.072
	(0.03)	(0.03)	(0.02)	(0.04)
Gov. Composition	0.005	0.006	0	0.001
	(0.01)	(0.01)	(0.01)	(0.01)
Worlds of Compliance	-0.069***	-0.067***	-0.066***	-0.074***
	(0.01)	(0.01)	(0.01)	(0.02)
Gov. Expenditure x EPS lagged (std.)	0.713***	0.711***	0.712***	0.712***
	(0.04)	(0.04)	(0.04)	(0.04)
Agriculture (std.)	0.035	0.036	0.04	0.033
	(0.02)	(0.02)	(0.02)	(0.02)
Natural Resources Rent (std.)	-0.009	-0.013	0.01	0.011
	(0.02)	(0.02)	(0.02)	(0.02)
Exports (std.)	0.103***	0.103***	0.086***	0.096***
	(0.02)	(0.02)	(0.02)	(0.02)
Growth	0.030**	0.029*	0.028*	0.029*
	(0.01)	(0.01)	(0.01)	(0.01)
Executive Party		-0.013		
		(0.02)		
Right-Left Gov. Position (std.)			-0.027*	
			(0.01)	
Cabinet Posts: Left (std.)				0.013
				(0.06)
Seat Share: Left (std.)				-0.001
				(0.06)
Constant	2.200***	2.199***	2.364***	2.382***
	(0.05)	(0.06)	(0.04)	(0.07)
R-squared	0.938	0.934	0.935	0.934
Degrees of Freedom	17	17	17	17

I simulate different combinations of ideologies in the government, that is, parliament and cabinet, to examine which of combination is expected to yield a more stringent environmental policy. The mean of the environmental policy stringency variable with a 1-year lag in the sample is 2.37. To simulate the combinations, I conduct pooled OLS regressions similar to Model 1, where the main independent variable is the ideology of the major party in parliament, with conditional variables (see Table 2.5.2: Expected Values).

The first model includes a measure of cabinet posts of the right, if larger than 50% as the conditional variable. In this case, the expected mean of stringency is 2.33. The second model uses a measure of cabinet posts of the left, if larger than 50% as the conditional variable. The expected mean of stringency is 2.17. The third and fourth models use measures of the ideology of the executive party, if the ideology is right or left, respectively. The expected means of stringency are 2.59 and 2.19, in that order. Surprisingly, the expected mean values of the stringency are larger when the ideology of the major party in the parliament goes from right to left *and* the cabinet is composed of parties or coalitions with a right-wing ideology. However, the expected means of stringency are smaller than the mean of stringency in the sample, 2.37.

To further investigate the relationship between the ideology of the parliament and the cabinet, I simulate other two regressions. The difference is that the key independent variable is now the ideology of the executive party. The fifth and sixth regressions and include measures of ideology of the major party in the parliament, if right or left, respectively. The coefficient of the ideology of the executive party in the sixth

model is not significant. Nevertheless, in the fifth model, the expected value of stringency is larger when the ideology of the executive party goes from right to left and the cabinet is composed of parties or coalitions with a left-wing ideology. The expected means of stringency is 2.28. Though these estimations indicate that the ideology of the parliament and the cabinet impact environmental policy stringency, it is not clear how this happens and thus this is an issue for future research.

Table 2.5.2: Expected Values

Expected Values of EPS with 1-year lag

Main IV	Condition	Mean	Std. Err.	95% Conf.	Interval
Ideology major party	Cabinet posts > 50% Right	2.33	0.02	2.29	2.37
Ideology major party	Cabinet posts > 50% Left	2.17	0.02	2.14	2.20
Ideology major party	Exec. Party = Right	2.56	0.02	2.53	2.59
Ideology major party	Exec. Party = Left	2.19	0.02	2.16	2.22
Exec. Party Ideology	Major Party = Right	2.28	0.01	2.25	2.30
Exec. Party Ideology	Major Party = Left	2.37	0.01	2.34	2.40

2.6. **Conclusion**

In this chapter, I examine the impact of the ideology the government party or coalition on the stringency of environmental policies across EU member states in the period from 2000 to 2012. I question whether ideology is a suitable measure to examine environmental policymaking across member states given that supporters of left and right parties disapprove of environmental regulations at similar levels (Kauder, Potrafke, and Ursprung 2018; Ziegler 2017).

Considering the intense international pressure for increased environmental policy stringency and the public support of the environment, I suppose that the ideas about environmental conservation spill over from the public to left parties, other than green parties. Moreover, as EU member states have multi-party systems, joint decision-making and bargaining between the parties in government is expected. In the end, public policies correspond to a compromise between the ideal policy points of the government parties (Laver and Shepsle 1990; Strom et al. 2008). Therefore, building on Mayhew's widely accepted assumption that politicians cater to their constituents' interests to remain in power, I use different measures of party ideology to investigate whether the ideology of the government party affects the stringency of environmental policies across member states.

Results of the pooled OLS regressions with Driscoll and Kraay standard errors offer support to the hypothesis. The presence of left parties in the government is associated with more stringent environmental policies, and the presence of right parties is associated with less stringent policies. This result is similar to results reported Neumayer

(2004) that indicate that left parties are more supportive of environmental protection. Nevertheless, they question the argument proposed by Knill and others (2010) suggesting that a focus on the left-right ideological dimension is insufficient for a proper understanding of the political output in any policy area over time and across countries.

Quite the opposite, results presented in this chapter seem to indicate that as polarization has increased within member states, the left-right ideological dimension may be appropriate to the analysis of the stringency of environmental policies. Especially since left platforms are science-based and pro-international *status quo*, as opposed to the new right-wing ones which, despite having attracted the losers of globalization, have added an anti-system attitude to the political mix. Therefore, even though the examination conducted in this chapter uses simple measures of ideology and covers a relatively small timeframe, results indicate that the left-right ideological spectrum is a relevant tool for the understanding of environmental policy stringency across EU member states.

2.7. **Appendix 2**

Table 2.7.1: Descriptive Statistics and Summary

Variable	Obs	Mean	Std. Dev.	Min	Max	Description	Source
Member 1	234	16.11	9.54	1	31	Member-state code number	Own calculations
Year	234	2006	3.75	2000	2012	Year of observation	
EPS lagged 1 year	233	2.33	0.73	1	4	EPS Index, 1 year lag	OECD 2020b
EPS	234	2.34	0.73	1	4	EPS Index, 1 year lag	OECD 2020b
Ideology main party	234	2.28	0.78	1	3	Right (1), center (2), left (3)	Own calculations based on IPU 2018
Votes main party	234	36.22	9.76	14	53	Vote share of governing parties (or coalition)	IPU 2018
Seats main party	234	150.03	126.83	23	640	Number of Seats of governing parties	IPU 2018
Government Composition	233	2.70	1.33	1	7	Single-party majority (1), minimal winning coalition (2), surplus coalition (3), single-party minority (4), multi-party minority (5), caretaker (6), technocratic (7)	Armingeon et al. (2018)
Type of Government	234	0.88	0.32	0	1	Legislative branch electing the chief executive (1; 0 otherwise)	McLean and Stone 2012
Worlds of Compliance	234	2.29	1.16	1	4	Reliance on domestic politics (1), neglect of EU (2), int'l law obedience (3), CEE (4)	Own calculations based on Falkner et al (2007), Falkner and Treib (2008)
Gov. Expenditure x EPS lagged	233	110.99	40.39	27	231	Gov. expenditure as per capita % of GDP interacted with EPS, lagged	OECD 2020a and b
Natural Resourse Rents	234	0.47	0.48	0	2	Total natural resources rents	World Bank 2020
Exports	234	201.34	114.45	87	681	Total exports	World Bank 2020
Growth	234	1.88	3.02	-9	11	GDP growth, annual %	World Bank 2020
Exec. Party Ideology	226	1.96	0.99	0	3	Right (1), center (2), left (3)	World Bank 2020
Gov. Support	234	53.37	9.17	0	73	Seat share of all parties in government	World Bank 2017
Cabinet posts: right	234	41.22	38.35	0	100	Posts of righ parties, % of total cabinet posts	Armingeon et al. (2018) according to Schmidt (1992)
Cabinet post: left	234	40.96	39.82	0	100	Posts of social democratic and other left parties, % of total cabinet posts	Armingeon et al. (2018) according to Schmidt (1992)
Seat share: right	234	22.26	20.68	0	68	Parliamentary seat share of right parties in government	Armingeon et al. (2018)
Seat share: left	234	21.77	20.58	0	64	Parliamentary seat share of social democratic and other left parties in government	Armingeon et al. (2018)

Table 2.7.2: Historical Archive of Election Results

Member State	Paliament Structure	Chamber name	Inter-Parliamentary Union Link
Austria	Bicameral	Nationalrat	http://archive.ipu.org/parline-e/reports/2017_arc.htm
Belgium	Bicameral	Chambre des Représentants	http://archive.ipu.org/parline-e/reports/2029_arc.htm
Czechia	Bicameral	Poslanecka Snemovna	http://archive.ipu.org/parline-e/reports/2083_arc.htm
Denmark	Unicameral	Folketinget	http://archive.ipu.org/parline-e/reports/2087_arc.htm
Finland	Unicameral	Eduskunta - Riksdagen	http://archive.ipu.org/parline-e/reports/2111_arc.htm
France	Bicameral	Assemblée Nationale	http://archive.ipu.org/parline-e/reports/2113_arc.htm
Germany	Bicameral	Deutscher Bundestag	http://archive.ipu.org/parline-e/reports/2121_arc.htm
Greece	Unicameral	Vouli Ton Ellinon	http://archive.ipu.org/parline-e/reports/2125_arc.htm
Hungary	Unicameral	Orszaggyules	http://archive.ipu.org/parline-e/reports/2141_arc.htm
Ireland	Bicameral	Dáil Éireann	http://archive.ipu.org/parline-e/reports/2153_arc.htm
Italy	Bicameral	Camera dei Deputati	http://archive.ipu.org/parline-e/reports/2157_arc.htm
Netherlands	Bicameral	Tweede Kamer der Staten-Generaal	http://archive.ipu.org/parline-e/reports/2231_arc.htm
Poland	Bicameral	Sejm	http://archive.ipu.org/parline-e/reports/2255_arc.htm
Portugal	Unicameral	Assembleia da Republica	http://archive.ipu.org/parline-e/reports/2257_arc.htm
Slovakia	Unicameral	Národná rada	http://archive.ipu.org/parline-e/reports/2285_arc.htm
Spain	Bicameral	Congreso de los Diputados	http://archive.ipu.org/parline-e/reports/2293_arc.htm
Sweden	Unicameral	Riksdagen	http://archive.ipu.org/parline-e/reports/2303_arc.htm
United Kingdom	Bicameral	House of Commons	http://archive.ipu.org/parline-e/reports/2335_arc.htm

Table 2.7.3: Variance Inflation Factor Analyses

Model 1

Variable	VIF	1/VIF
Ideology	7.04	0.141983
Gov. Type	6.93	0.144322
WOC	6.66	0.150143
Gov. Comp.	5.95	0.167952
Growth	1.57	0.637541
Exports	1.42	0.702081
GG Exp X EPS lag	1.4	0.7162
Agriculture	1.37	0.732592
Parl. Seats	1.33	0.754641
Nat. Resources	1.25	0.797275
Mean VIF	3.49	

Model 2

Variable	VIF	1/VIF
Ideology	10.15	0.098538
Exec. Party	7.31	0.13684
WOC	7.3	0.137061
Gov. Type	6.78	0.147463
Gov. Comp.	6.16	0.162387
Growth	1.55	0.643668
Exports	1.5	0.665448
Parl. Seats	1.38	0.722783
Agriculture	1.38	0.726627
GG Exp X EPS lag	1.37	0.728756
Nat. Resources	1.35	0.741388
Mean VIF	4.2	

Model 3

Variable	VIF	1/VIF
WOC	6.38	0.156659
Gov. Comp.	5.42	0.18443
Gov. Type	5.16	0.193671
Growth	1.57	0.635413
Exports	1.42	0.703469
GG Exp X EPS lag	1.36	0.736917
Nat. Resources	1.26	0.795318
Agriculture	1.24	0.804999
RiLe Position	1.14	0.873931
Mean VIF	2.77	

Model 4

Variable	VIF	1/VIF
Cabinet Right	13.68	0.073084
Cabinet Left	13.11	0.076265
Seats Right	12.65	0.079035
Seats Left	12.15	0.082291
WOC	6.9	0.144932
Gov. Type	5.54	0.180605
Gov. Comp.	5.49	0.18218
Exports	1.61	0.620158
growth	1.58	0.631809
Nat. Resources	1.41	0.708735
GG Exp X EPS lag	1.39	0.717551
Agriculture	1.26	0.79062
Mean VIF	6.4	

Model with Vote Share

Variable	VIF	1/VIF
Gov. Type	7.73	0.129371
WOC	7.48	0.133758
Ideology	7.16	0.139746
Gov. Comp.	6.03	0.165967
Votes	2.08	0.480103
Parl. Seats	1.82	0.55072
Growth	1.57	0.635627
Agriculture	1.49	0.673066
Nat. Resources	1.46	0.686425
Exports	1.42	0.701999
GG Exp X EPS lag	1.4	0.713567
Mean VIF	3.6	

Model 1.1

Variable	VIF	1/VIF
EPS lagged	32.83	0.030459
Ideology	11.35	0.088129
Gov. Type	10.32	0.096944
WOC	7.29	0.137111
Gov. Comp.	6.65	0.150447
GG Exp X EPS lag	4.84	0.206496
Growth	1.69	0.592782
Nat. Resources	1.67	0.597536
Exports	1.47	0.680618
Agriculture	1.45	0.687379
Parl. Seats	1.4	0.713472
Mean VIF	7.36	

Model 2.1

Variable	VIF	1/VIF
EPS lagged	33.06	0.030249
Ideology	14.57	0.068614
Gov. Type	10.13	0.098715
WOC	7.88	0.126946
Exec. Party	7.31	0.136775
Gov. Comp.	6.96	0.143654
GG Exp X EPS lag	4.67	0.21422
Nat. Resources	1.79	0.557914
Growth	1.65	0.606265
Exports	1.55	0.645478
Parl. Seats	1.47	0.678173
Agriculture	1.47	0.681301
Mean VIF	7.71	

Model 3.1

Variable	VIF	1/VIF
EPS lagged	18.33	0.054551
Gov. Type	9.65	0.103646
WOC	7.89	0.126708
Gov. Comp.	6.01	0.166406
GG Exp X EPS lag	3.6	0.277457
Growth	1.62	0.616438
Nat. Resources	1.52	0.659501
Exports	1.43	0.699795
Agriculture	1.4	0.714098
RiLe Position	1.18	0.848191
Mean VIF	5.26	

Model 4.1

Variable	VIF	1/VIF
EPS lagged	22.78	0.043897
Cabinet Right	15.23	0.065674
Cabinet Left	15.01	0.06661
Seats Right	14.18	0.070497
Seats Left	13.99	0.071493
Gov. Type	11.94	0.083728
WOC	8.12	0.123187
Gov. Comp.	6.44	0.155189
GG Exp X EPS lag	4.45	0.224533
Growth	1.66	0.60203
Exports	1.64	0.609374
Nat. Resources	1.62	0.616224
Agriculture	1.46	0.686877
Mean VIF	9.12	

Table 2.7.4: Pooled OLS with Driscoll and Kraay Standard Error Models

	Vote Share b/se	M 1.1 b/se	M 2.1 b/se	M 3.1 b/se	M 4.1 b/se
Dependent Variable	*EPS, 1-y lag*		*EPS*		
Ideology largest party	0.060***	0.022	0.067		
	(0.01)	(0.04)	(0.06)		
Seats largest party (stdd.)	0.003	0.018	0.027		
	(0.02)	(0.02)	(0.02)		
Vote share largest party (stdd.)	0.021				
	(0.01)				
Type of Government	0.100**	0.009	0.05	-0.003	-0.212**
	(0.03)	(0.05)	(0.05)	(0.05)	(0.06)
Government Composition	0.007	0.014	0.013	0.008	-0.022
	(0.01)	(0.02)	(0.02)	(0.02)	-0.03
Worlds of Compliance	-0.074***	-0.163*	-0.137*	-0.152*	-0.162*
	(0.01)	-0.07	(0.05)	(0.06)	(0.06)
Gov. Expenditure x EPS lagged (stdd.)	0.712***	0.617*	0.635*	0.622*	0.578*
	-0.04	(0.27)	(0.27)	(0.28)	(0.22)
Agriculture (stdd.)	0.03	-0.075**	-0.064**	-0.059**	-0.082**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Natural Resource Rents (stdd.)	-0.002	0.114*	0.086*	0.123*	0.124*
	(0.02)	(0.04)	(0.04)	(0.05)	(0.05)
Exports (stdd.)	0.104***	0.223	0.21	0.203	0.249
	(0.02)	(0.12)	(0.01)	(0.11)	(0.12)
Growth	0.030**	-0.023	-0.027	-0.024	-0.028
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
EPS 1-year lagged		-0.248	-0.281	-0.251	-0.252
		(0.47)	(0.46)	(0.48)	(0.41)
Executive Party			-0.075		
			-0.05		
Right-Left Gov. Position				-0.048	
				(0.05)	
Cabinet Posts: Right (stdd.)					0.278*
					(0.12)
Cabinet Posts: Left (stdd.)					0.245**
					(0.06)
Seat Share: Right (stdd.)					-0.387*
					(0.15)
Seat Share: Left (stdd.)					-0.365*
					(0.13)
Constant	2.203***	3.237*	3.280**	3.299*	3.596**
	(0.06)	(1.12)	(1.1)	(1.17)	(1.1)
R-squared	0.939	0.664	0.663	0.667	0.699
Degrees of Freedom	17	17	17	17	17

*p<0.05, **p<0.01, ***p<0.001

3. Environmental Regulations and Environmental Quality

3.1. Introduction

In this chapter, I examine the extent to which environmental policies established by the largest economies in the world have contributed to sustainable development. While chapters 1 and 2 of this dissertation discuss environmental policies as dependent variables, here they become the independent variables as I examine the impact of environmental regulations on environmental quality. Given that one of the most acute threats to the quality of the environment is global warming, caused by GHG emissions, I use GHG emissions as a proxy for environmental quality.[15]

The dependent variable is GHG emissions, measured as tonnes per capita (OECD 2020b). The main independent variables are described in the OECD's Environmental Policy Stringency (EPS) Index. The EPS Index measures the degree to which different environmental regulations put an explicit or implicit price on environmental externalities and thus allows reliable calculations of the impact of environmental policies on environmental quality.

My objective with this chapter is to examine whether the development of environmental policy instruments across time has contributed to environmental quality. The

[15] Although environmental policies are the object of study in this chapter, they are not the only proposed means to sustainable development. For an alternative example, see Vogel (1997a, 1997b) where the author describes a process in which voluntarily environmental standards promoted environmental quality in California.

hypotheses question the extent to which specific types of environmental regulations and the stringency level of environmental policies are associated with environmental quality. In the statistical analysis, I perform Ordinary Least Squares with Panel-Corrected Standard and Heteroskedastic Errors regressions. Findings suggests that 'good' regulations seem to promote more GHG emission reduction and that more stringent environmental policies, regardless of their composition, are associated with the most GHG emission reduction.

3.2. The Case for Environmental Regulations

Globalization and trade liberalization have intensified since the 1990s. Technological advances promoted the shortening of distances and the incorporation of new markets to the world economy. As a result, billions of people were taken out of poverty and experienced an increased quality of life (Soto 2000; World Trade Organization 2018). To keep up with the intensified global demand for industrialized goods, the volume of production has exponentially increased (Simmons, Dobbin, and Garrett 2008; Simmons and Elkins 2004).

At the same time as the market economy has promoted international trade, growth and economic development, it has also triggered the environmental crisis (IPCC 2018; IPCC Report 2019). Economic development increases industrial production and depletes the environment through unwanted consequences such as pollution and GHG emissions. The same mechanism which creates growth and development has also

degraded the environment beyond its recovery capacity and prompted the environmental crisis (IPCC 2018; IPCC Report 2019).

The epistemic community has thoroughly discussed the environmental crisis. Its causes have been examined and solutions proposed. A scientific consensus regarding the causes of the environmental crisis has been reached. It has been established that the crisis has been caused by anthropogenic actions (IPCC 2018; IPCC Report 2019). However, although the causes have been established, global society has not yet figured out how to effectively mitigate and adapt to its consequences. In this chapter, I examine the extent to which of environmental policies have protected the environment.

Studies based on the Environmental Kuznets Curve (ECK) have attempted to associate environmental quality with a stage of economic development. ECK studies suggest that the relationship between economic growth and environmental protection may be described by an inverted u-shaped curve that outlines the impact of economic growth on environmental quality. Thus, the curve shows that growth is associated with a decreasing environmental quality until the vertex, but from the vertex on, growth becomes positively associated with environmental quality.[16]

Holtz-Eakin and Selden (1992) found support for an EKC-like relationship between CO_2 (the most common GHG) and income. Dietz and Rosa (1997) found that as income raises, CO_2 emissions tend to decrease. The authors question, however, whether it fits the shape of an inverted parabola. Arrow and others note that the inverted curve

[16] EKC analyses usually rely on measures of GDP per capita and income as proxies for growth while pollutant emissions (such smoke, suspended particulates, SO2, GHG, etc.) are common proxies for environmental quality (Grossman and Krueger 1991).

accurately describes the relationship between growth and environmental quality when pollutants with have short-term effects are examined, but argue that it does not describe the relationship well when substances that have long-term effects, such as GHG, are considered (Arrow et al. 1995).

However, Raymond (2004) argues that the EKC is inadequate to describe the relationship between growth and environmental quality. The author suggests that as production plants relocate from developed to developing countries, environmental quality in developed countries tends to improve. However, industrial production processes would continue to degrade the environment to the same degree, only in a developing country, and thus, as environmental problems cannot be contained by borders, a spatial shift of degradation does not improve overall environmental quality.

In sum, the EKC's suitability to describe the relationship between growth and environmental quality is questioned (Unruh and Moomaw 1998; Chua 1999). EKC analyses fail to explain why or how the shift from environmental degradation to environmental protection would occur.

Several scholars, international bureaucrats and policymakers defend that environmental degradation may be overcome through adaptations of industrial production. Proponents of this argument understand that trade liberalization and industrial production have created the crisis but propose that innovation and technological developments may alter the production mechanism and protect the environment while promoting social and economic growth.

Therefore, investments in innovation and research and development allow the mitigation of and adaptation to the unwanted consequences of industrial production and satisfy the needs of current generations without sacrificing those of future ones, as promoted by the concept of sustainable development. This argument is echoed by international organizations such as the UN and its agencies (IPCC 2018; IPCC Report 2019; UN 2015; UN Development Programme 2020, 2020; UN Environment Programme 2018), the EU (Bergman 2000; Bieling and Schulten 2001; McLean and Stone 2012) and the governments of South Korea (OECD 2014) and Japan (Vogel 1997a, 1997a), among others.

The idea that environmental quality may result from innovation and technology development is fairly disseminated in the international system. The international *status quo* has pressured different actors to move toward environmental protection. Governments, the focus of this chapter, are pressured to adopt environmental policies (see Chapter 2, and Knill, Debus, and Heichel 2010). Considering that the international system has pressured governments to implement environmental policies, I investigate the extent to which these policies have impacted GHG emissions and protected the environment.

Environmental policies are the sum of all the different types of environmental regulations established by a government to promote environmental quality. The Porter hypothesis, formulated by Porter (1991) and Porter and van der Linde (1995), suggests that certain types of environmental regulations move countries toward sustainable development. These regulations incentivize market competition and promote innovation and technology development which, in turn, may drive production efficiency, offset the

costs of compliance and lead to environment protection (Porter and van der Linde 1995, 98).

Note, however, that the Porter hypothesis is grounded on a conditional assumption; it proposes that regulations may trigger environmental protection *if* they are 'good' and 'good' regulations stimulate market competition and innovation. Emission Trading Schemes (ETSs) and Emission Standards and are examples of 'good' regulations. Emission Trading Schemes, which have been on the spotlight since the early 2000s, are expected to produce sound environmental and economic outcomes through the establishment of a market for externalities. The price of externalities would regulate the production of goods and services. As their prices increase, as a result of a government-led allowance withdrawal, the market becomes more competitive. As a consequence, only the most efficient producers remain and guarantee the most production at the lowest environmental cost. The European Union ETS is the largest market currently in operation in the world, trading approximately two-thirds of all traded carbon dioxide (European Commission n.d.).

Emission Standards may limit emissions of specific pollutants to certain levels or specify a technology to be used in production. In these cases, business would compete among themselves to develop the technology at the lowest cost and maximum efficiency and thus would also keep pollutant emission under control. The establishment of emission standards in India has recently improved air quality with a small impact on productivity (Harrison et al. 2015).

On the other hand, not all types of environmental regulations promote sustainable development. According to the Porter hypothesis, 'bad' regulations, based on the polluter pays principle, offer an incorrect perception of how to deal with the unwanted consequences of the production process. These types of 'bad' regulations establish a price to such consequences, but do not promote innovation through market competition. In these cases, the price of environmental externalities is calculated and incorporated into the price of goods. The unwanted consequences of industrial production could continue to be generated as long as consumer are willing to pay their price. Taxes, tariffs, and fees are examples of 'bad' regulations.

Several authors have tested the validity of the Porter hypothesis, but findings are not conclusive. For example, Jaffe and Palmer (1997) test three different specifications of the Porter hypothesis and find that stringent regulations may increase innovation if expenditures with research and development are considered. However, results do not hold when a measure of quantity of new patents is employed. Berman and Bui (1998) find that oil refineries located in Southern California, a stringent regulating locality, demonstrate faster growth than those located in less stringent regulating places, regardless of the type of regulation employed.

Governments adopt different combinations of 'good' and 'bad' environmental regulations, at varying stringency levels to improve environmental quality without compromising economic growth. Measuring 'good' and 'bad' regulations to investigate their impact on environmental quality is not an easy task. Nevertheless, the OECD (OECD

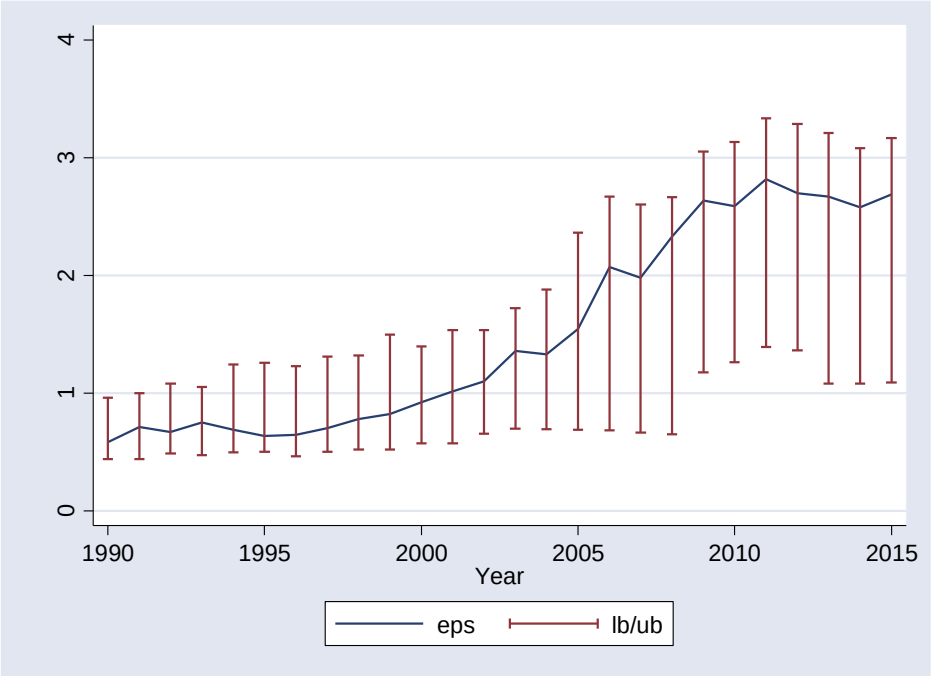
2020a) has compiled an Environmental Policy Stringency Index that distinguishes between several types of regulations.

Differently from Porter and van der Linde (1995), the EPS Index groups environmental regulations in two categories: market and non-market-based regulation. The Environmental Policy Stringency (EPS) Index (OECD 2017) attributes weights to different types of environmental regulations. The sum of the weights results in a stringency measure. The EPS Index demonstrates that the mean stringency level of environmental policies has increased in 20 of the world's largest economies in the period from 1990 to 2018.

The EPS index classifies environmental policy instruments in two categories: market and non-market-based regulations. Market-based regulations have two sub-categories; the first establishes a price to environmental degradation. With this, the cost of environmental externalities is calculated and incorporated into the price of goods and services. The costs associated with environmental degradation are transferred from society at large to consumers through taxes, fees, and tariffs. These types of regulation provide firms with incentives to adjust their production to a new equilibrium. Some common examples of environmental taxes are gas taxes and waste management fees. The revenue from these taxes and fees should be used in the promotion of environmental quality. The same applies to certain tariffs. For example, Feed-In Tariffs (FITs) are paid by electricity consumers to support the build-up of renewable energy capacity. Nevertheless, critics argue that environmental regulations do not affect the production

of negative externalities, that is, as long as the market is willing to pay the price of environmental degradation, externalities continue to be produced.

Graph 3.2.1: EPS Index



The second sub-category of market-based regulations offers incentives for non-pollution. For example, Deposit and Refund Schemes (DRS), which are different from environmental taxes, attempt to reduce environmental degradation through incentives for non-pollution. DRS reward conservation and thus promote environmental quality. Emission trading schemes (ETS) are another example of a regulation that offers incentives for non-pollution.

The second category in the EPS index refers to non-market-based regulations. These types of regulations do not put a price on degradation. Instead, they promote

environmental quality through investments in research and development. They include emission standards and subsidies to research and development. Porter and van der Linde consider that subsidies are 'bad,' however incentives to research and development are 'good,' and thus, as it contains elements of 'good' and 'bad' regulations its classification according to the Porter hypothesis is tricky. Table 3.2 details the differences between the classification of environmental regulations proposed by Porter and van der Linde (1995) and by the EPS Index.

Table 3.2.2: Different Classifications of Environmental Regulations

		Porter Hypothesis		*OECD Index*	
		Good	*Bad*	*Market Based*	*Non-Marked Based*
Taxes	CO2 NOx SOx Diesel		x	x	
Trading Schemes	CO2 Renewable Energy & Energy Efficiency Certificates	x		x	
FITs*	Solar Wind		x	x	
DRS**			x	x	
Standards	Emission Limit Values: NOx SOx PMx Sulphur content (Diesel)	x			x
R&D Subsidizes	Government R&D Expenditure on Renewable Energy	?	?		x

*Feed-in-tariffs (FITs) support scaling up renewable electricity capacity. FITs offer long-term contracts that guarantee a price to be paid to source of electricity per kWh fed into the electricity grid. **Deposit & Refund Scheme (DRS) is the surcharge on the price of potentially polluting products. If pollution is avoided, a refund of the surcharge is granted. Source: OECD 2017

Hypotheses

As illustrated in Graph 3.1, mean environmental policy stringency has trended upward from 1990 to 2018. Environmental regulations are adopted to mitigate environmental degradation and promote environmental quality. Nevertheless, among all the different types of environmental regulations, what are the most effective?

Porter and van der Linde propose that 'good' regulations promote market competition through innovation and technology development. Different authors have tested the argument promoted by the Porter hypothesis, but results are unconclusive. One of the key issues with testing the Porter hypothesis is the difficulty of separating different types of regulations to test their isolated impact on environmental quality. Nevertheless, the EPS Index (OECD 2020a) measures different types of regulations, including standards and emission trading systems, considered the 'good' ones and taxes and FITs, or the 'bad' ones. Therefore, I test the impact of 'good' and 'bad' environmental regulations on GHG emissions and, following the tenets of the Porter hypothesis, expect that:

H1: 'Good' regulations are associated with greater decreases in GHG emissions than 'bad' regulations.

On the other hand, the EPS Index classifies environmental regulations differently than Porter and van der Linde. The EPS Index describes market and non-market-based regulations and the overall stringency of environmental policy. Departing from the Index's classification, I examine the impact of market and non-market-based regulations

on environmental quality. Based on liberal economic perspectives which defend the market's ability to autoregulate, I expect that:

H2: Market-based regulations are associated with greater decreases in GHG emissions than non-market-based regulations.

Finally, considering the upward trend in mean environmental policy stringency across the sample countries and Berman and Bui's findings about oil refineries in stringent regulating locations demonstrating more economic and environmental efficiency than refineries in less stringent regulating places, I test the influence of environmental policy stringency, regardless of the combination of regulations that compose the policy, on environmental quality and expect that:

H3: More stringent environmental policies are associated with a greater decrease in GHG emissions.

3.3. Research Design

To investigate hypotheses 1 and 2, I examine the impact of different types of environmental regulations on environmental quality. As I investigate hypothesis 1, I examine the impact of specific regulations such as emission standards, ETS and taxes on GHG emissions, and as I focus on hypothesis 2, I use sub-indices composed of market and

non-market-regulations, as classified by the OECD. To investigate hypothesis 3, I assess the relationship between the environmental policy stringency index and GHG emissions.

I analyze annual data for twenty of the world's largest economies in the period between 1990 and 2015. The following countries are included in the sample: Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Korea, Mexico, Netherlands, Russia, South Africa, Spain, Switzerland, Turkey, United Kingdom and United States. The sum of these countries' GDP represents about 80% of the world's GDP in the analyzed period (World Bank 2018). Likewise, their GHG emission levels correspond to about 80% of global emissions (OECD 2020b).

The dependent variable is GHG emissions, measured as tonnes per capita (OECD 2020b). GHG refer to seven gases that have direct effects on climate change: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), chlorofluorocarbons (CFCs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF6) and nitrogen trifluoride (NF3).

The key independent variables depict different types of environmental regulations, including those refereed to 'good' and 'bad' by Porter and van der Linde, market, and non-market regulations as well as the overall environmental policy stringency. I use the measures of the Environmental Policy Stringency (EPS) Index (OECD 2017). The EPS Index calculates the price established by the following regulations: taxes, feed-in tariffs (FITs), deposit and refund schemes (DRS), emission trading schemes, emission standards and subsidies to R&D. It ranges from 0 (not stringent) to 6 (highest degree of stringency).

I control for several factors that impact GHG emissions. For instance, industrial activities are expected to increase GHG emissions. Thus, an industry variable, which describes the value added by the mining, manufacturing, construction, electricity, water, and gas industries,[17] is included in the analysis. A manufacturing variable that designates the percentage value added by manufacturing in a country's GDP is also incorporated to the dataset. Moreover, as GDP ultimately impacts the level of GHG emissions, I use the log of GDP (OECD 2021). As the value added by industry, manufacturing, and GDP increase, GHG emissions are expected to increase and environmental quality, decrease. Collinearity tests indicate that the variables are not collinear (See Appendix, Table 3.6.1).

As agricultural and forestry activities are estimated to account for about 10% of all GHG emissions in the EU (EEA 2019), I include an agriculture variable that depicts the percentage participation of the agricultural, forest and fishing sectors in the country's economy. Countries with intense agricultural and forestry activities are expected to have a constant level of GHG emissions. Nevertheless, as innovation may improve agricultural activities through adaptation measures such as better irrigation techniques, adapted and diversified crops or precision farming, among others (EEA 2019), agricultural and forestry activities can reduce GHG emissions through investments in research and development and improve environmental quality.

In a globalized world with intense international trade, international financial flows may impact domestic economies. Thus, I include a measure of net inflows of FDI

[17] Value added is defined as the net output of a sector subtracting intermediate inputs (World Bank 2020).

as a percentage of GDP in the dataset. Countries with high net inflows of FDI tend to be the recipients of outsourced production plants. The inclusion of the FDI variable allows the investigation of the impact of outsourcing on GHG emissions.

Since the sample includes developed and developing countries, such as the US, Germany, and Japan, as well as China and Indonesia, the pollution haven hypothesis can be tested. The hypothesis proposes that as production plants relocate from developed to developing countries, environmental quality in developed countries tends to improve while in developing it tends to deteriorate. Perkins and Neumayer (2012) examined whether the displacement of car manufacturing plants from developed to developing countries has occurred in the car manufacturing sector and suggest that, despite a lag, technology was also transferred, and thus, the displacement of production plants from developed to developing countries has not significantly deteriorated environmental quality in the latter. Considering the pollution haven hypothesis and that the FDI variable gathers data of several industrial sectors, not only car manufacturing, and thus I expect the pollution have hypothesis to hold. I suspect that increases in the net inflow of FDI are associated with increased GHG emissions.

To test the hypotheses, I compile a panel dataset for the period of 1990 to 2015. Panel data often show non-spherical errors, resulting from contemporaneous correlation across the units and unit level heteroskedasticity. I estimate ordinary least squares with panel-corrected standard errors (OLS PCSE) that are robust to non-spherical errors (Beck and Katz 1995, 2011). Nevertheless, this is a relatively short timeframe, and this is a cause for concern. Ordinary least square estimates are asymptotically unbiased, but

the short sample challenges this assumption and thus I estimate OLS PCSE regressions with country fixed effects. I also estimate generalized least square regressions for robustness checks (see Appendix, Table 3.6.2).

As total GHG emission in a time *t* may be contingent on the stringency of environmental policies that had been enacted at previous times, I use some lagged independent variables. Unit-root tests of the independent variables indicate that they have unit roots with 5-year lags, as expected, and thus I specify models where the independent variables are lagged, with 5-year lags. Considering that extremely high or low GHG emissions may be influential to the relationship being examined, I dropped observations below the 1 and above the 99 percentiles. Some of the independent variables were on different scales and have been standardized to have a mean of zero and a standard deviation of one (Table 3.2 indicates the standardized variables).

3.4. Findings

Model 1 includes measures of 'good' and 'bad' environmental regulations. According to the Porter hypothesis, 'good' regulations promote market competition through incentives for innovation. Emission standards and emission trading systems (ETS) are the common examples of 'good' regulations. 'Bad' regulations establish a price for environmental externalities, but do not promote competition. Taxes, FITs and subsidies are examples of 'bad' regulations. However, according to the EPS Index classification, subsidies are specifically destined to research and development, something that

Porter and van der Linde consider 'good.' Therefore, the measure of subsidies for research and development is included in Model 1, but not necessarily considered 'good' or 'bad.' As the impact of Emission Standards on GHG takes time to be perceptible, I use a 5-year lag. However, as the impacts of Emission Trading Systems, taxes, and FITs on GHG emissions are rapidly noticed, I do not lag the variables depicting these types of regulations.

ETS and emission standards, lagged 5-years are statistically significant and negatively correlated with GHG emissions per capita; increases in the stringency of ETS and emission standards across countries are associated with decreases in GHG emissions. As predicted by the Porter hypothesis, the coefficient of environmental taxes, a "bed regulation," is statistically significant and positively associated with GHG emissions with a 5-year lag, suggesting that environmental degradation could continue to occur even though consumers are paying the price for emissions. Such result seems to corroborate the argument that environmental taxes do not seem to promote environmental protection. However, FITs, a form of environmental tax that supports renewable energy capacity, are negatively associated with GHG emissions. Research and Development Subsidies are not statistically significant either.

The coefficients of manufacture, industry and GDP are positively associated with GHG emissions and suggest that as economic activities intensify, so do GHG emissions, as expected. Nevertheless, the coefficient of Agriculture is negatively associated with GHG emissions and it indicates that agricultural activities may promote environmental quality. As FDI coefficients are not significant in Model 1, I cannot compare them to

Perkins and Neumayer's (2012) findings about the displacement of car manufacturing plants from developed to developing countries.

Nevertheless, the results of Model 1 indicate support for the Porter hypothesis and suggest that 'good' regulations seem to decrease GHG emissions and that environmental taxes, a type of 'bad' regulation seem to increase them.

Models 2 and 3 test the impact of market and non-market regulations, with a 5-year lag, on GHG emissions. I estimate two models because the variables depicting market and non-market regulations are collinear (see Appendix, Table 3.6.2). The coefficients of market and non-market regulations are significant and negatively associated with GHG emissions; or in other words, as the stringency of market and non-market regulations increase, GHG emissions decrease. The coefficient of market-regulations is smaller than that of non-market regulations suggesting that the latter are associated with slightly greater GHG emission reductions, indicating support for hypothesis 2.

Results of the other coefficients are similar to the results of Model 1, with one exception: the coefficient of FDI is statistically significant and negatively associated with GHG gas emissions. In other words, as FDI increases, GHG emissions tend to decrease, a finding that is in accordance with Perkins and Neumayer's (2012) findings about the displacement of car manufacturing plants from developed to developing countries, suggesting that contrary to the proposition of the Pollution Haven hypothesis, FDI may be associated with environmental quality.

Model 5 tests the relationship between the stringency of environmental policies, with a 5-year lag, and GHG emissions. Unsurprisingly, more stringent policies are

associated with reduced GHG emissions, as proposed by hypothesis 3. The coefficient of the EPI index is associated with the greatest reduction in GHG emissions, compared to all other environmental regulation variables. The other coefficients are very similar to those of Models 2 and 3.

Table 3.4.1: OLS with Panel-Corrected Standard Errors (PCSE)

	Model 1 b/se	Model 2 b/se	Model 3 b/se	Model 4 b/se
Dependent variable: GHG emissions, per capita				
ETS	-0.053***			
	(0.01)			
Emission Standards, 5-y lag	-0.023***			
	(0.01)			
Taxes	0.077***			
	(0.02)			
FITs (stdd.)	-0.027**			
	(0.01)			
R&D subsidie, 5-y lag	0.004			
	(0.01)			
Market Based, 5-y lag		-0.050***		
		(0.01)		
Non-Market Based, 5-y lag			-0.037***	
			(0.01)	
EPS index, 5-y lag				-0.052***
				(0.01)
Manufacture (stdd.)	0.208***	0.290***	0.269***	0.274***
	(0.03)	(0.03)	(0.03)	(0.03)
Industry (stdd.)	0.069**	0.074**	0.079**	0.078**
	(0.03)	(0.03)	(0.03)	(0.03)
Log of GDP	0.158***	0.076*	0.06	0.074*
	(0.03)	(0.04)	(0.03)	(0.04)
Agriculture (stdd.)	-0.327***	-0.408***	-0.383***	-0.380***
	(0.05)	(0.06)	(0.06)	(0.06)
FDI (stdd.)	-0.01	-0.017**	-0.015**	-0.016**
	(0.01)	(0.01)	(0.01)	(0.01)
Constant	0.022	1.290**	1.519***	1.338**
	(0.41)	(0.48)	(0.43)	(0.47)
R2	0.988	0.984	0.984	0.984
Number of obs.	360	364	371	364

* p<0.05, ** p<0.01, *** p<0.001. Country fixed-effects not included in the table.

3.5. Conclusion

The IPCC claims that limiting global warming to 1.5°C would require greenhouse gas (GHG) emissions to decrease by about 45 percent from 2010 levels by 2030 and to reach 'net zero' around 2050 (IPCC 2018). This chapter investigates the extent to which environmental policies are associated with a reduction of GHG emissions. The investigation included 20 of the world's largest economies in the period of 1990 to 2015. These economies represent about 80% of the world's GDP and are roughly responsible for 80% of total GHG emissions (OECD 2020b; World Bank 2018). I examined how different types of environmental regulations are associated with GHG emissions and how stringency levels, regardless of the type of regulations, may impact GHG emissions.

Harrison et al. contend that the best environmental policies adopt a vast array of regulatory instruments, adapted to the domestic characteristics of each country. However, results indicate that some types of regulations seem to promote more environmental quality than others. For instance, while environmental standards and ETS seem to reduce GHG emissions, environmental taxes are associated with increases in emissions, suggesting that environmental degradation continue to occur even though consumers are paying the price for emissions. Nevertheless, the coefficient of the EPS Index is associated with the greatest reduction in GHG emissions, compared to all other environmental regulation variables. That is, even though some types of regulations are more efficient than others in reducing GHG emissions, more stringent policies, regardless of their composition, are associated with the greatest reduction, and these results prompt

a question for future research: is it possible to increase efficiency of environmental regulations through more careful choices of the type of regulations? Would the exclusion of taxes, for example, lead to more efficiency? Although many public policy scholars have been investigating the more efficient types of environmental regulations, a consensus has not yet been reached.

Another interesting result indicates that increases in the percentage participation of the agricultural, forest and fishing sectors in the country's economy are associated with decreases in GHG emissions. I suspect this finding is associated with improvements in agricultural practices as a result of innovation (EEA 2019), but the impact of agriculture on GHG emissions has to be further investigated.

Considering that the bulk of environmental policies have been implemented since the 1990s, available data may not yet have captured fully developed outcomes of these policies. For example, the European Union Emission Trading Scheme (EU ETS) was launched in 2005 and thus the data depict 10 years of the EU ETS. The data also show that ETSs have been adopted by 13 of the 20 countries in the sample. Nevertheless, given the short period since ETSs' implementation and the relatively small number of countries that have implemented it, the impact of ETSs on environmental quality may not have yet been fully developed, and thus analyses covering longer periods of operation remain necessary.

3.6. Appendix 3

Table 3.6.1: Collinearity Tests

	Manufacture	Industry	GDP	Agriculture
Manufacture	1			
Industry	0.2031	1		
GDP	0.1129	0.2039	1	
Agriculture	0.3202	0.6002	0.0103	1

	ETS	Em. Std.	Taxes	FITs	R&D sub.
ETS	1				
Em. Std.	0.6283	1			
Taxes	0.1492	0.4395	1		
FITs	0.3356	0.6295	0.3206	1	
R&D sub.	0.2677	0.5133	0.4181	0.3178	1

	EPS	MKT	Non-MKT	R&D sub.
EPS	1			
MKT	0.9046	1		
Non-MKT	0.9516	0.7299	1	
R&D sub.	0.6908	0.4241	0.804	1

Table 3.6.2: Generalized Least Square Regressions

	Model 4 b/se	Model 5 b/se	Model 6 b/se	Model 7 b/se
Dependent variable: GHG emissions, per capita				
ETS	-0.053***			
	(0.01)			
Emission Standards, 5-y lag	-0.023***			
	(0.01)			
Taxes	0.077***			
	(0.02)			
FITs (stdd.)	-0.027**			
	(0.01)			
R&D subsidie, 5-y lag	0.004			
	(0.01)			
Market Based, 5-y lag		-0.050***		
		(0.01)		
Non-Market Based, 5-y lag			-0.037***	
			(0.01)	
EPS index, 5-y lag				-0.052***
				(0.01)
Manufacture (stdd.)	0.208***	0.290***	0.269***	0.274***
	(0.02)	(0.02)	(0.02)	(0.02)
Industry (stdd.)	0.069**	0.074**	0.079**	0.078**
	(0.02)	(0.03)	(0.03)	(0.03)
Log of GDP	0.158***	0.076*	0.06	0.074*
	(0.03)	(0.04)	(0.04)	(0.04)
Agriculture (stdd.)	-0.327***	-0.408***	-0.383***	-0.380***
	(0.05)	(0.05)	(0.05)	(0.05)
FDI (stdd.)	-0.01	-0.017*	-0.015*	-0.016*
	(0.01)	(0.01)	(0.01)	(0.01)
Constant	0.022	1.290**	1.519***	1.338**
	(0.44)	(0.49)	(0.44)	(0.47)
BIC	-405.553	-348.568	-362.009	-354.525

* p<0.05, ** p<0.01, *** p<0.001. Country fixed-effects not included in the table.

4. Concluding Remarks

The first two chapters of this dissertation examine environmental politics in the context of the European Union. The third chapter presents an examination of the performance of environmental policies across 20 of the world's biggest economies. While Chapters 1 and 2 discuss institutional roles in the environmental policymaking process, Chapter 3 addresses the outcomes of these policies. As a consequence, each of these chapters provides an incremental contribution to the Political Science body of knowledge.

Results in Chapter 1 show that the European Commission strategically launches infringement proceeding investigations in an attempt to expand its autonomy. Such finding is in agreement with Fjelstul and Carrubba's findings (2018) and suggest that the European Union has become more powerful over time, with the ability to enforce environmental directives, despite economic and political powers of member states.

The examination of the impact of ideology on environmental policy stringency, in Chapter 2, suggests that the presence of left parties in the government contributes to stringency. Supporting evidence is offered by the significant interaction between government expenditures and environmental policy stringency, which is associated with more stringency. Results make us question whether as the right radicalizes and incorporate science skeptic and anti-systemic attitudes, environmental policy becomes more polarized, similar to what has happened in the United States. The findings of Chapter 3

indicate that environmental policy stringency is associated with a reduction of GHG emissions.

This dissertation is one more step in an attempt to understand how international pressure and domestic factors affect policymaking and policy outcomes in the environmental area. Though the evidence put forward is tentative, obtained results help us focus on the factors that merit further investigation. In the end, the body of knowledge of the Political Science discipline is incrementally more robust as a result of this work.

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