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Electoral Cycles and Environmental Cooperation, An event study on elections and environmental agreements.

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Abstract, Englisch

How does political competition impact the ability of countries to successfully coordinate their trans-national efforts to fight environmental externalities? As the international community increasingly relies on environmental agreements, it is crucial to explore this side effect of democratic systems and the implications it has on pressing challenges like climate change and environmental pollution. In this thesis project, I use multiple existing data sources to construct a dataset that merges information on the ratification of environmental agreements, political term lengths, election dates, and party-level data on environmental preferences for 36 OECD countries between 1975 and 2017. With this dataset, I perform an event study on the likelihood of ratification before, and after the election. Furthermore, I investigate if changes in pro-environmentalism between incumbents and successors foster electoral cycles. I find a significant impact of the electoral calendar on the likelihood of ratification for environmental agreements. Further, there is strong evidence that newly elected governments with stronger environmental preferences drive electoral cycles, but the impact is heterogeneous for different periods after the election. While newly elected green governments tend to ratify agreements shortly after the election, reelected incumbents postpone ratification further into the new term. This study contributes to the research field of environmental economics and the broader field of political economy by empirically testing for a mechanism through which electoral competition has negative spillovers on environmental cooperation and the provision of global public goods. In addition, the dataset can be used as a foundation for future research on questions surrounding the formation of environmental agreements.

Keywords – International Environmental Agreements, Electoral Cycles, Political Economy, Event Study, Survival Analysis

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Abstract, Portuguese

Como é que a competição política afeta a capacidade dos países de coordenar com sucesso os seus esforços transnacionais para combater as externalidades ambientais? À medida que a comunidade internacional depende cada vez mais de acordos ambientais, é crucial explorar esse efeito colateral dos sistemas democráticos e as implicações que isso tem em desafios urgentes como a alteração climática e poluição ambiental. Nesta tese, uso várias fontes de dados existentes para construir uma base de dados que junta informação sobre a ratificação de acordos ambientais, duração de mandatos políticos, datas de eleições e dados ao nível de partidos sobre preferências ambientais para 36 países da OCDE entre 1975 e 2017. Com esta base de dados, realizo um event study sobre a probabilidade de ratificação antes e depois da eleição. Além disso, investigo se mudanças no pró-ambientalismo entre atuais governantes e sucessores promovem ciclos eleitorais. Concluo que existe um impacto significativo do calendário eleitoral na probabilidade de ratificação de acordos ambientais. Além disso, há fortes evidências de que governos recém-eleitos com preferências ambientais mais fortes impulsionam os ciclos eleitorais, mas que o impacto é heterogêneo em diferentes períodos após a eleição. Embora governos pro-ambientais recém-eleitos tendam a ratificar acordos logo após a eleição, os atuais governantes reeleitos adiam a ratificação para o novo mandato. Este estudo contribui para o campo de pesquisa da economia ambiental e para o campo mais geral da economia política ao testar empiricamente um mecanismo através do qual a competição eleitoral tem efeitos negativos na cooperação ambiental e na provisão de bens públicos globais. Além disso, a base de dados pode ser usada como ponto de partida para pesquisas futuras sobre questões relacionadas à formação de acordos ambientais.

Keywords – International Environmental Agreements, Electoral Cycles, Political Economy, Event Study, Survival Analysis

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1 Introduction

1.1 Research Question

This thesis projects analyzes the impact of reelection incentives of local politicians on the ratification of environmental agreements. To do so, it builds on theoretical models to derive a set of hypotheses, aimed to answer the following research question:

- Do reelection concerns and competition between domestic politicians weaken international environmental agreements (i.e. negatively impacting the likelihood of ratification, even though uniform ratification could be achieved?

This research question relates to different fields within economics and political science. First, the question touches on the impact of political competition on environmental outcomes and the provision of public goods. Second, it relates to the field of environmental economics and a growing body of academic literature that discusses the emergence of international agreements to provide global public goods in the absence of third-party enforceability. Third, it relates to research on international cooperation and domestic politics and interactions between those two spheres. Finally, this thesis makes use of a very broad dataset on country participation in international environmental agreements and combines this information with country level data on election dates, election results, and parties' position on environmental issues, as well as economic controls.
The following sections will motivate the research question, and introduce the model of Battaglini and Harstad (2020) that lays the foundation for my hypotheses.

1.2 Climate Change, Economics, and the Environment

In his Nobel Price lecture on December 8th, 2018 Prof. William D. Nordhaus, one of the most influential scholars in the area of integrated assessment models for environmental impacts, addressed the economics of climate change. The title of his lecture? "Climate Change: The Ultimate Challenge for Economics". The lecture gave an overview of his work, the technical and scientific foundations of integrated assessment models, and the conceptual

challenge that climate change poses for the discipline of economics. Professor Nordhaus raised the question "Why have global policies on climate change been so ineffective compared to many national policies?" (Nordhaus, 2019 p.16). In their very essence, international agreements provide a public good and since agents can not be excluded from consumption, public goods are subject to free-riding. When a handful of countries agrees to reduce their greenhouse gas emissions, other countries cannot be excluded from sharing the benefits of their actions. Consequently, there is a strong incentive for countries to free-ride and leave costly abatement to other countries. In general, negative externalities, free-riding, and non-cooperative games have been a central feature of economic analysis for decades and the deployment of those concepts has delivered insights on the formation and challenges of international environmental agreements. Among those, research has found mechanisms that can improve the enforceability of international agreements. Free-riding can be reduced by linking the provision of a public good to other goods and markets. A prominent approach links participation in environmental agreements to access to research and development (R&D) and new technologies, effectively combining the provision of a public good with access to a club good (Harstad, Lancia & Russo, 2019). For a club good, players can be excluded from consumption, but consumption is still assumed to be non-rivalrous. Another possible solution is to punish free-riders by trade sanctions. Again, this builds on the interconnection of different areas of international cooperation and is commonly used in agreements concerning arms trade. However, for international environmental agreements trade sanctions are not a common feature.[1] As a result of the general lack of educability mechanisms, environmental agreements are considered to be ineffective and have caused a lot of frustration and disappointment among voters, environmentalists and NGOs. Landmark agreements such as the Kyoto Protocol or the Paris Accord are seen as ineffective in achieving their goal. Still, agreements like the Kyoto protocol or the Paris Accord are negotiated at an increasing rate without improving much on their design flaws. Though economists have invested a lot of effort in modeling IEAs, economic models have generally failed to explain this.

[1] An exception are IEAs concerning whale hunting, which have been subject to implicit and explicit threats of trade sanctions by the US (Mitchell, 2003).

1.3 The Political Economy of Weak Treaties

In their paper "The Political Economy of Weak Treaties", published in the Journal of Political Economy in 2020, Battaglini and Harstad developed a model that offers a new perspective and potential explanation for many of the puzzles around international environmental agreements. Their model consists of three stages $negotiation \rightarrow election \rightarrow ratification$. At the first stage, one or multiple countries cause an environmental externality e and an agreement is negotiated in order to internalize the externality. The agreement defines the abatement and a sanction s in case of non-compliance with the agreement. Even though sanctions for failed ratification are not a common feature of IEAs, the sanction can be interpreted as opportunity costs if ratification comes with access to a club good like R&D (Hoel and Schneider, 1997).[2] At the second stage, the incumbent faces an election in his home country and the associated threat of being replaced by a politician from a different party. Winning the election gives a payoff of R, the office rent. The two competing parties differ, among others, in their environmental-policy preferences. Stronger environmental preferences imply a lower cost of complying with the environmental agreement and result in a lower net cost of abatement. The election is decided by the median voter which himself has environmental preferences and respective costs of compliance. More precisely, the median voters' net cost of compliance is given by c_m, and the two parties/politicians are to the left and to the right of the median voter. The party with $c_i < c_m$ is referred to as green, the party with $c_j > c_m$ is referred to as brown and the relation is given by $c_b > c_m > c_g > 0$. The median voter elects the party that gives him the highest expected payoff, taking the agreement negotiated before as given. To analyze the impact of the political competition between the green and brown party on the design of the agreement the payoff relevant policies are split into two parts. First, there is the impact of the agreement on the expected payoff of the median voter. The agreement impacts the expected payoff by the sanction s negotiated by the incumbent in the first stage and the net cost of compliance of the median voter c_m if the successor decides to ratify the agreement. The second part is a popularity shock δ in favor of the challenger which captures all other policy differences between the two parties. This popularity shock is assumed to be random with a uniform distribution and realized

[2] Selected IEAs on whaling have featured threads of trade sanctions, more in 2.1

after the treaty is signed. The popularity shock not only models further policy differences between the incumbent and the challenger but also ensures an element of randomness that allows for the challenger to succeed even though the incumbent has the strategic advantage of the IEA on his side. At the third stage of the model, the agreement has to be ratified by the winner of the election. An agreement that requires two well-defined actions (signature and ratification) to enter into force constitutes the real-world process of international agreements used by the United Nations.[3] The winner of the election will ratify the agreement if $s \geq c_i$ and not ratify it otherwise. The two-stage process of the agreement allows for the incumbent to use his influence on the design of the agreement to maximize his reelection prospects. This is done by negotiating an agreement for which the incumbent and the median voter share a common interest to ratify the agreement, while the challenger finds it optimal to refuse ratification (or vice versa). Using this strategy, ceterus paribus, the median voter favors the incumbent over the challenger. How does the strategic design explains the puzzle of ineffective international environmental agreements? An agreement designed according to this strategy will most likely be what Battaglini and Harstad (2020) call "weak". Weak describes an agreement that, even though successfully negotiated, is unlikely to be complied with because the party involved in the design never intended it to be ratified. The success of the agreement is ultimately depending on the result of the election, although it would be welfare maximizing and feasible to ensure ratification in either case. Weak agreements are ineffective as well as inefficient and not only fail to achieve their purpose, but also waste resources through pointless international meetings and negotiations. This inefficiency arises from the incentive to divert the IEA from its purpose and use it as a comparative advantage in the election.

[3] See 2.1 for a detailed description of the process.

2 Literature Review

The following section will introduce the concept of international environmental agreements and review the relevant academic literature to provide an overview of the game theoretical models used to describe the formation and function of international environmental agreements. Moreover, it will introduce previous approaches to account for the political economy dimension of such agreements.

2.1 International Environmental Agreements (IEAs)

The definition of international environmental agreements used throughout this thesis will heavily rely on the work of Professor Ronald Mitchell from the University of Oregon and his International Environmental Database Project, short IEADB (2002-2020).[4] As stated by Nordhaus in his Nobel Prize lecture in 2018, IEAs are an approach to fight transboundary externalities of human actions on natural resources. More precisely, an environmental treaty is an "Intergovernmental document intended as legally binding with a primary stated purpose of preventing or managing human impact on natural resources“ (Mitchell, 2003 p.432). Since the subject of IEAs are transboundary externalities there are at least two countries part of every agreement. IEAs are split into Bilateral Environmental Agreements (BEA) with $n = 2$ and Multilateral Environmental Agreements with $n > 2$, n being the number of countries. MEAs are generally negotiated in the context of large international conferences hosted by the United Nations. Among international conferences, the Stockholm Conference (1972) is often named as the „kick-off“ for most international cooperation to protect the environment (Mitchell et al, 2020).[5] The agreements prior to the Stockholm Conference go back as far as the mid 19th century (Mitchell et al, 2020) and addressed mostly human impact on fish stock and bilateral issues of river pollution.[6] The increasing awareness of the human impact on natural resources in the 20th century

[4]Ronald B. Mitchell. 2020. IEA Membership Count Dataset from the International Environmental Agreements Database Project (Version 20200214). Eugene: IEADB Project. Dataset generated on 14 February 2020.

[5]Full name: United Nations Conference on Human Environment (UNCHE).

[6]For example the "Treaty To Regulate The Diversion Of Water From The River Meuse" (1863) or the "Convention for the preservation of the fur seal and sea otter in the North Pacific Ocean and Bering Sea" (1897).

has led to an increasing number of IEAs with more ambiguous goals. Since the 1970s the focus of IEAs has shifted from human impact on species towards the impact of pollution on natural resources, energy, and freshwater resources (Balsiger and VanDeveer, 2012). While international agreements on atmospheric pollution and climate change have received most media attention in recent years, they are only a small part of the total amount of agreements in place and emerged not earlier than the 1990s. Besides agreements, countries negotiate protocols, and amendments that build on, and extend existing agreements. Furthermore, IEAs often evolve in "lineages" (Mitchell, 2003). The term is defined as "any set of agreements, protocols, and amendments that modify, extend, replace or explicitly derive from one or more original agreements" (Mitchell, 2003 p.435). So lineages describe continuous effort that is targeted at a specific environmental issue. Agreements, protocols, and amendments are organized hierarchically and can be categorized by three levels. Agreements (level 1) embody major new policy objectives, protocols (level 2) new, but related objectives to an existing agreement, and lastly amendments (level 3) bring minor modifications to existing agreements or protocols (Mitchell, 2003). Participation in IEAs is reserved for states and international organizations, moreover regional economic integration units such as the European Union may participate in IEAs. Barrett (1998), described the process of environmental treaties as five distinguished steps: $pre-negotiations \rightarrow negotiations \rightarrow ratification \rightarrow implementation \rightarrow renegotiation.$ Pre-negotiations often take place on the sidelines of other international negotiations or during bilateral meetings (Barrett 1998), while negotiations take place at conferences dedicated to the agreement. This thesis will follow Mitchell (2003), and focus on the three core steps $negotiation \rightarrow signature \rightarrow ratification.$ After an agreement is negotiated at a Diplomatic Conference, it is open for signature. Signature has to be sharply distinguished from ratification and is largely a symbolic act that is meant to express consent about the agreement, often done at the end of the conference by all negotiating countries together. Ratification ultimately approves the agreement, making it legally binding for a country. This step is separated from the negotiation and signature action, and countries are free to ratify the agreement at any point in time after the negotiation is over.[7] Nevertheless, there are treaties that follow a different process. For example, the amendments of the MARPOL lineage rely on tacit acceptance rather than ratification.[8] For amendments that

[7]Generally there is no date that functions as a deadline for ratification.
[8]MARPOL: International Convention for the Prevention of Marine Pollution from Ships

use tacit acceptance as a mechanism, the amendment enters into force unless a member raises objections. Given that a member raised objections against the amendment, the amendment enters into force only when this member removes the objections after changes to the amendment have been made.

2.2 IEAs as Static Games

Economists developed an early interest in the topic of international environmental agreements (IEAs), which led to a broad body of academic literature. Most of the work focused on modeling IEAs as games and analyzed which mechanisms are at play. With environmental externalities affecting a large number of countries, and without clear rights for either a clean environment or pollution, the Coasian decentralized solution (Coase, 1960) cannot be achieved. Therefore, international treaties are an instrument that assigns responsibility and defines actions (i.e. abatement efforts) that are meant to internalize the externality (Wangler, Cabrera and Weikard, 2011). As the international community consists of sovereign countries, the community is organized horizontally, and international law does not allow for a higher entity that could enforce participation in international agreements. Consequently, economists modeled those treaties as one-shot games with the agreement being one possible equilibrium (Barrett, 2005). In detail, the agreement constitutes a Nash equilibrium (NE) for which all countries play abate (i.e. ratify the agreement), rather than deviate. In order for this to be the dominant strategy, each country has to be made better off by participating (i.e. playing abate), than in the case where country i decides not to participate. In either case, countries can not be excluded from sharing the benefits of $-i$ abatement. As a result, every country has an incentive to free-ride, rather than to abate, given that the cost of abatement outweighs the individual benefit. An agreement is successful if it improves the non-agreement counterfactual. This is the case if an agreement gives incentives to abate beyond the level that equalizes individual benefits and abatement costs. The Pareto-optimal benchmark is the full-cooperative scenario, in which all countries aim to maximize the joint payoffs.[9] In this case, the marginal costs for every country i have to be equal to the sum of the marginal benefits of abatement. This condition describes the welfare-maximizing provision

[9]The optimality condition is given by: $\sum_{i=1}^{n} MB_i = MC_i$.

rule for public goods (Samuelson, 1954). Barrett (1994) analyzed if and to what extent a self-enforcing IEA can improve the non-cooperative outcome, assuming interdependence on the benefit side. His findings were sobering, Barrett (1994) found that an agreement is unlikely to be successful if the number of countries affected by the externality is high. Thus, Downs, Rocke, and Barsoon (1996) concluded that if a one-shot self-enforcing IEA achieves full participation, this implies that the abatement level specified in the agreement is equal to the non-cooperative abatement level. In this case, the IEA does not improve the non-agreement counterfactual and, under the assumption of negotiation costs and inefficiencies, even decreased overall welfare.

2.3 IEAs as Repeated Games

While the approach of modeling environmental agreements as one-shot games is conceptually interesting, the NE in dominant strategies fails to constitutes the real world. In contrast, real world agreements are better modeled as repeated interactions between players, rather than a one-shot game. In the realm of repeated games, countries face the decision to participate or deviate from the agreement in every period. Nevertheless, for any game with $t = (1; T)$ and $T < infinity$ the NE in dominant strategies of the one-shot game is recovered.[10] To account for this dynamic, the equilibrium concept has to be changed from a simple NE to a Subgame Perfect Nash Equilibrium (SPNE). Models of repeated games can support more strategies as SPNE, as repeated interaction extends the strategy space for all countries. Defection in period t by one country can now be punished by collective deviation in period $t + 1$. If the strategy profile of all countries consists of playing abate as long as there was full participation in every period prior and defecting otherwise for the rest of the game, this strategy can be supported as an SPNE with full participation. These results build on the folk theorem, which states that every set of strategies can be supported as an SPNE, as long as players are sufficiently patient. While repeated interaction extends the strategy space for countries, collective punishment does not solve the problem of free-riding, rather than replace it with the problem of making punishment threats credible. For collective punishment to be credible,

[10] A solution to this is to introduce a stochastic dimension, such that there is the possibility that the game ends in every period with a positive probability.

the punishing countries would need to enjoy some idiosyncratic benefits from punishing, rather than share the collective cost.[11] Otherwise, the collective punishment strategy is strictly dominated and countries re-enter negotiations, which (by backwards induction) makes the agreement impossible to be sustained as a SPNE.

2.4 The Paradox of International Agreements

The theoretical approaches discussed up to this point all share a pessimistic perspective on the effectiveness of environmental agreements. Still, the international community has invested increasingly into environmental agreements, and their absolute number is on a steady rise since the end of the second world war (Mitchell, 2003). Kolstad and Toman (2005) called this "the paradox of international agreements", and summarize it as “A self-enforcing agreement is easiest to close either when the stakes are small, or at the other extreme, when no other option exists (a clear and present risk)” (Kolstad & Toman 2005, p. 45). In contrast, agreements are least likely to succeed if those conditions are not met, and the number of countries affected by the externality is high (Barrett, 1994). Which is the case for the broader area of environmental externalities. So how comes that the international community keeps pushing for more cooperation to tackle environmental externalities, even though research has largely doomed those agreements to fail?

2.5 The Political Economy of IEAs

The literature reviewed up to this point assumed that governments act as benevolent planners with regard to their citizens, rather than agents that seek reelection or want to increase their prestige, as suggested by political economy (Persson and Tabellini, 2000). In his paper “Diplomacy and domestic politics: the logic of two-level games” published in 1988, Putnam emphasizes how international cooperation can be described by a game with two levels of competition and players that act according to their own agenda. At the national level, domestic groups pursue their interests and politicians establish power by constructing coalitions among those groups. At the international level, national governments maximize their ability to express the preferences of those

[11] In effect, reallocating surplus from the punished to the punishing.

domestic groups and minimize negative foreign impacts. Putnam (1988) found that domestic conflict between parties is crucial for international cooperation to succeed. Following his argumentation, international cooperation is an instrument in such a manner, as that it allows for policies to be implemented that improve overall welfare, even if there is a sufficient domestic opposition against those policies. Successful agreements are described by overlapping "win-sets" (Putnam, 1988). These win-sets contain all agreements that would be ratified by the domestic government. Agreements that lie within both win-sets are pareto improvements and be individually rational much like in Barrett (2005). The relevance of reelection incentives for environmental cooperation was addressed by the academic literature by analyzing how environmental commitment and environmental outcomes differed between democratic and non-democratic countries. Desai (1998) argues that democratic governments are more depending on economic growth for their reelection. Therefore, democratic governments cannot afford to stress environmental protection if environmental protection decreases economic competitiveness (trade leakage). In contrast, Payne (1995) concluded that democratic governments are more likely to engage in environmental protection. His argument is that within a democracy, voters are better informed about environmental damages, and are better able to express their preferences. Murdoch et al (1997) presented empirical evidence for a positive correlation between a higher level of political freedom, and emission reductions. Highlighting the technical difficulty of analyzing the correlation between the political system and environmental outcomes due to their stock nature, Neumeyer (2002a) used a multivariate econometric model to analyze the relationship between political systems and environmental commitment, measured by the number or IEAs ratified by a country.[12] Neumeyer found that democracies are more likely to participate in IEAs, supporting the hypothesis of Payne (1995). Fredriksson et al (2005) analyzed how environmental lobbying impacted environmental policies in rich and developed countries. Their finding suggests a positive relationship between environmental lobbying, and environmental policy-making, conditional on sufficient electoral competition. In addition, political competition can impact environmental agreements through political cycles. Political cycles (also political business cycles) are changes in economic activity due to the intervention of political actors. Political actors have an incentive to stimulate economic activity before the election in

[12]Pollutants such as GHGs are building up stocks in the atmosphere and environmental outcomes are subject to massive time lags.

order to maximize their reelection prospects (Nordhaus, 1975). Empirical evidence on the existence of political business cycles has produced mixed results, in particular with regards to boosting pre-election economic activity (Drazen 2000; Shi and Scensson 2003). Instead, research has focused on political budget cycles, which is the usage of fiscal instruments and their timing (Cazals and Sauquet 2015). Accordingly, any cost that can be moved across time, such as the ratification of environmental agreements, should be delayed and occur after the election rather than before the election. Cazals and Sauquet (2015) analyze this mechanism by identifying the likelihood of ratification pre and post-election. They use a dataset of 41 environmental treaties from 1976 until 1999, together with information on election dates in 99 countries. Their dataset contains both developing and developed countries, and controls for political freedom, openness to trade as well as GDP per capita. Using a Cox proportional hazard model, the authors find weak evidence for the postponement of ratification for developed countries, and strong evidence for inverted political cycles in developing countries. The rationale is that for developing countries the net cost associated with the ratification of environmental agreements is substantially lower because environmental agreements tend to feature lower cost burdens for developing countries while the benefits are shared uniformly (Cazals and Sauquet 2015).

3 Hypotheses

This chapter derives a set of empirically testable hypotheses that are based on the aforementioned literature. In particular on the work of Battaglini and Harstad (2020) and Cazals and Sauquet (2015). Both papers analyze how reelection incentives and the ratification of environmental agreements interact. Battaglini and Harstad (2020) developed a theoretical model that offers a mathematical foundation and rationale for the strategic usage of environmental agreements by politicians, Cazals and Sauquet (2015) use an empirical model to analyze if ratification is strategically delayed to prevent the costs of the environmental agreement to occur pre election. For the scope of this thesis, I will rely on the propositions of Battaglini and Harstads baseline model (Propostion 1, see Battaglini & Harstad, 2020 p. 11).

3.1 Strategic Delay of Ratification

The common denominator of both papers is that ratification is assumed to take place with a higher likelihood after the election relative to before the election. The rationale behind this derives from the theory of political cycles. Based on this theory incumbents have a strong incentive to prevent pre-electoral costs because of the negative impact those could have on their reelection prospects. Further, the rational for post election ratification can be derived from the theoretical work of Battaglini and Harstad (2020). Put simply, incumbents use their influence in the treaty design and ability to postpone ratification in order to allow for the environmental agreement to become part of their electoral campaign

- *Hypothesis 1*: The likelihood of ratification is higher post election, relative to pre election

  In order to make use of the influence on the design of the agreement and to prevent pre-electoral costs, the incumbent should delay ratification if the office rent is sufficiently high and the perceived salience of the issue sufficiently low. Therefore, ratification is more likely to occur in the period after the election relative to the period before the election.

3.2 Changes in Government and Environmental Preferences

The central propositions of Battaglini and Harstad (2020) is that the differences in the environmental preferences between the incumbent and the challenger are enabling the strategic use of environmental agreements as an instrument in political competition. Weak agreements are not ratified when the incumbent fails and is not reelected. Therefore, I express my hypotheses in terms of election outcomes and resulting changes in the environmental preferences of the new government. In their empirical approach to evaluate the impact of political cycles on the ratification of environmental agreements, Cazals and Sauquet tested if any post-electoral increase in the likelihood of ratification is driven by newly elected governments. They concluded that this is not the case. I will use this as a starting point to evaluate if, given that the government changed in the election, ratification in post-electoral periods is driven by successors with stronger environmental preferences.

- *Hypothesis 2*: The impact of government changes on the likelihood of ratification depends on the difference in the environmental preferences between incumbent and successor

  The likelihood of post-electoral ratification is lower when the successor is brown rather than green. Newly elected leaders per se are not more likely to engage in environmental agreements relative to the incumbent.

Here the proposition from Battaglini and Harstad (2020) differ from the predictions of the political cycle theory. From the point of view of political cycles, the incumbent should ratify the agreement post election with a higher likelihood, disregarding the environmental preferences. This would imply that changes in government do not impact the likelihood of ratification post election because the mechanism that causes the delay is opportunistic rather than partisan. In contrast, for Battaglini and Harstad that the mechanism underlying post-electoral ratification is partisan, i.e. the difference in environmental preferences between the incumbent and the successor are driving the postponement of ratification. I test this by distinguishing between government changes

that resulted in a successor with stronger environmental preferences relative to the incumbent, and those that did not lead to a greener government. I want to highlight that this represents a strong simplification of the actual propositions of Battaglini and Harstad (2020). To allow for empirical testing and to reduce the complexity of the dataset needed for the analysis, I ignore any issue regarding asymmetries in bargaining power between the governments that negotiate the agreement. Furthermore, I base my hypothesis on how governments deal with the environmental agreements, rather than on the content of the agreement itself. Battaglini and Harstad make predictions about both, the content of the agreement and likely scenarios of how governments handle the agreement, limiting the ability of this thesis project to reach conclusions about their model.

4 Data

To empirically tests the hypotheses outlined before, the dataset requires information on country level election dates, agreement level signature dates, and country-by-agreement ratification dates. The data structure is therefore equal to a panel with an agreement dimension, a time dimension, and a country dimension. Conventionally a panel dataset consists of cross-sections (i.e. multiple unique individuals/observations in one particular point in time) and a time series for each of those individuals/observations that tracks changes in individual-specific variables over time. Respectively, for this thesis project, my unit of observation are semesters of the electoral term and organized by country-agreement-election. To my knowledge, there is no ready-to-download dataset that contains this type of information. Therefore, the next section will introduce the different datasets used to create the panel needed for the analysis. This is followed by a section discussing the data used and how the different data sources were merged.

4.1 Data Sources

4.1.1 Environmental Agreements Database Project

Previous research used the Environmental Treaties and Resources Indicators' (ENTRI) database (Cazals & Sauquet, 2015). In contrast, I make use of a relatively new data source that has been successfully used by Slechten & Verardi (2014). The IEADB project contains information on environmental agreements from the early 20th century up to today and represents the broadest data source for international agreements on environmental externalities available to me. Besides information on membership actions by countries, the database also contains information about the type of agreement and on lineages (see chapter 2) as well as further metadata.

4.1.2 Database of Political Institutions, 2017

The Database of Political Institutions 2017 by Cruz, Cesi, Philip Keefer, and Carlos Scartascini (2018), is a cross-country data set published by the Interamerican Development Bank and summarizes information on regimes, institutions, and electoral results for a total of about 180 countries between 1975 until 2017. The dataset is organized as country-by-years and each observation refers to the first of January of the given year. The DPI has been used in previous research on the impact of political economy on the ratification of environmental agreements (see Cazals & Sauquet, 2015).

4.1.3 Manifesto Project Database

The Manifesto Project (CMP, previously MRG / MAPOR), (Volkens et al, 2019), codes and summarizes electoral manifestos of over 1000 parties in 50 countries, using parties in each national election as the unit of observation. The time covered varies between countries, depending on the availability of party manifestos. The database is constructed by coding quasi sentences into different categories like environmental-protection, economic ideologies, and nationalistic tendencies (among others).[13] The share of quasi sentences coded in a specific category is reported as an indicator ranging between 0 (no quasi sentence in the manifesto was coded in the respective category) and 100 (every quasi sentence in the party manifesto could be coded in one category). The coding is done by native speaking coders in reference to a coders manual published by Volkens et al (2019). Among others, the CMP codes a proxy for the environmental position presented in the party manifesto as "per501".

4.2 Data used

This section will illustrate how the data was transformed and used to construct the final dataset for the econometric analyses. To make use of the additional depth of information that the IEADB provides, I use all country memberships for a total of 36 OECD countries (see appendix for a complete list of countries). The country membership data contains

[13] "The verbal expression of one political idea or issue" (Klingemann et al, 2006: 165).

information on the signature, ratification, and entry-into-force dates for country Y in agreement X. Further, I augmented this country membership information with agreement level information on the lineage and agreement type that the IEADB provides, to track agreements across countries I used the database internal agreement identification code (Mitch id, further referred to as IEA id). For the election cycles, I use the DPI2017 dataset as the underlying grid that the information from the CMP and economic controls are merged into. One shortcoming of the DPI2017 dataset is that it reports government level information at the beginning of the year (so the government in the election year[t] is the winner of the previous election), and only contains information on the month and the year of an election. I, therefore, use the exact election dates reported in the CMP. For later use, I extract information on the length of the political cycle in country Y by using the information on how many years a government has left in the current term.[14] Since the event of interest is the election of country Y, I reduce the data to election years. At this point, the dataset is organized as elections-by-countries. To evaluate the environmental position of the government, based on their election manifesto, I use the information on the party in power ("gov1me" & "gov2me") from the DPI2017 data and match those with the party codes of the CMP. The CMP party codes offer the advantage that they uniquely identify each party with a five-digit code across countries and elections. To match governments in the DPI2017 with party level information from the CMP data, I refer to the "Manifesto Project -List of Political Parties" document (Volkens et al, 2019) that provides additional information on the parties (active in which time period, official abbreviation, changes of party names and/or mergers with other parties) together with the unique five-digit identifier code. In some cases, this matching required additional information on the government of country Y in year t if the governing party ran the election jointly with other parties in an ex-ante determined coalition. Recalling that the DPI2017 data contains the regime information before the election, I use the information on the regime in [t] and in [t+1] to capture changes in governments. Further, I extract information on the actual term length by using the difference between the election dates within country Y.

To evaluate how the environmental preferences of the government change, I use the relative position with respect to "per501" of the governing party in a given election

[14]The variable "YRCURNT" from the DPI2017 is coded as $n-1$ years left in the year following the election, so the term length "n" is derived as $max(YRCURNT)+1$, see DPI2017 Codebook.

as "position_environment_gov". The "per501" variable is coded as "General policies in favour of protecting the environment, fighting climate change, and other “green” policies." (Volkens et al, 2019 p.17). It is clear that the "per501" as coded in the CMP is a noisy proxy for the environmental preferences of parties, as it includes a "great variance of policies that have the unified goal of environmental protection" (Volkens et al, 2019 p.17). In addition, the usage of party-issued statements could lead to biased results if those statements diverge substantially from the "true" preferences of the party for environmental public goods and the costs of compliance with environmental agreements. However, the CMP relies on the parties' main pre-party manifesto which is meant to illustrate the parties' preferences for the electorate. Therefore, the document should not diverge from the true preferences of the party (Carter et al, 2018).

By using the relative position of the governing party with respect to the environmental preference code (i.e. $position\_environment\_gov = 1$ indicates the highest value of per501 in the election, increasing values indicate lower relative per501 values), I am able to stay close to the theoretical model of Battaglini & Harstad (2020) without depending on additional information on the environmental position on the median voter. Further, using the relative position implies that the variable remains sensitive to the entrance of new parties to the left (greener) or the right (browner) of the governing party and reduces the impact of time trends on the country level (such as all parties moving more towards green positions in a given election). I refer to an election to result in a greener government ($green\_change = 1$) if $(position\_environment\_gov_t - position\_environment\_gov_{t+1}) < 0$. This includes changes towards a greener position of a reelected incumbent due to the entrance of a new party as well as green successors after a brown incumbent. To capture the impact of a change in government towards a greener party the interaction between the "gov_change" and "green_change" dummy variables is used later on in the analysis. Lastly, I split the term between two elections in semesters of a constant relative length of $\frac{1}{6} * term\_length$. Using a semester definition that is relative to the actual length of the political cycle offers a series of benefits. First, this design allows for a very simple way to ensure full coverage of the political cycle. Second, using a relative definition offers a solution to the problem of how to interpret agreement-membership actions at a given

point in time with different theoretical term lengths for countries.[15] A shortcoming that results from this design is the different length of a semester in cases where the political cycle was interrupted due to a lack of government support or other events that lead to an early election. As the absolute length of each interval becomes shorter in case of unanticipated premature elections, the likelihood of a mismatch between the actual phase of the term and the modeled phase of the term increases. I address this issue by distinguishing between elections for which the actual term differs substantially (more than 60 days) from the theoretical term. With the previous example, I also introduced an important question: If the research question demands a sharp distinction between pre- and post-election periods which part of the political cycle is post-current election, and which part is pre-upcoming election? My thesis resolves this issue by building the semesters symmetrically around each election. Accordingly, the interval that contains all events that are mapped into the election[t] has a total length of $\frac{1}{2} * term_t; \frac{1}{2} * term_{t+1}$. While the usage of $\frac{1}{6}$ is subjective, this fraction can be motivated from the data. Using a semester of $\frac{1}{6} * term$ together with a mean term length of 3.4 years results in a mean semester length of around 6.9 months. This is close to the 6 months semester-length used by Cazals and Sauquet (2015) and also allows for easier comparability between the two papers. The dataset is finalized with the inclusion of economic controls for openness to trade and gross domestic product per capita. Data for both are provided on a yearly basis as part of the "World Bank Open Data" data catalog (World Bank Group, 2020). Openness to trade is measured as the share of exports and imports to GDP in current USD, the information on GDP per capita is measured in units of 2015 USD. Those controls are included because they have proven to be significant determinants for the ratification decision of environmental agreements (see Frederiksson and Gaston, 2000; Slechten and Verardi, 2014; Cazals and Sauquet, 2015). With GDP and openness to trade available in the year-by-country format, they are mapped into the dataset using weights for each year. The dataset is then combined by the data on agreement participation with the country iso-code, creating pairwise combinations of all observations within the same group (i.e. the same iso-code). However, not all of those observations actually contain valuable information. The combination of an election in 1999 and an agreement

[15]For illustration, imagine a country Y_1 with a theoretical term length of 5 years and country Y_2 with a theoretical term length of 3 years. A membership action that took place 2,5 years after the election should be associated with the end of the current cycle and consequently, the upcoming election in country Y_2, but the same is not necessarily true for country Y_1.

Table 4.1: Agreement Type and Inclusion

	Agreement	Protocol	Amendment
MEA	150	84	365
BEA	235	10	57

signed in 2015 should not provide any meaningful insights into how elections impact the ratification of environmental agreements. Therefore, the analysis is restricted to election-agreement pairs with $SignatureDate_{IEA,country=Y} - SemesterStart_{country=Y} > 0$ and $RatificationDate_{IEA,country=Y} - SemesterStart_{country=Y} > 0$. These restrictions ensure that pairs of semesters and agreements that took place before the signature are excluded, as well as pairs of semesters and agreements that took place after the ratification.

4.3 Descriptive Statistics and overview

This section provides descriptive statistics to illustrate the dataset and should help the reader to understand the scope of the data available. Some of those descriptive statistics are also highly interesting by themselves and could inspire new research questions that go beyond the scope of this thesis project.

4.3.1 IEA data

Table 4.1 is a compact overview of the three types of environmental agreements and the two agreement-inclusions (multilateral & bilateral) that are part of this dataset. While the number of multilateral environmental agreements (MEA) is significantly lower than the number of bilateral environmental agreements (BEA), multilateral agreements tend to be extended more frequently by protocols and amendments. This stands in line with Mitchell (2003) and illustrates that multilateral agreements are subject to continuous improvements and changes. This could be due to the fact that the cost of negotiating the agreement is increasing disproportionately in the number of countries involved in the negotiation process. Therefore, starting from an existing agreement and maintaining its relevance by adding protocols and amendments, is be cheaper than initiating negotiation for a new agreement, as it seems to be done for bilateral agreements. Figure 4.1 shows the

frequency and Kernel distribution estimates of signature and ratification over the time covered in my dataset. Frequencies are plotted at the left y-axis and Kernel distribution estimates on the right y-axis.

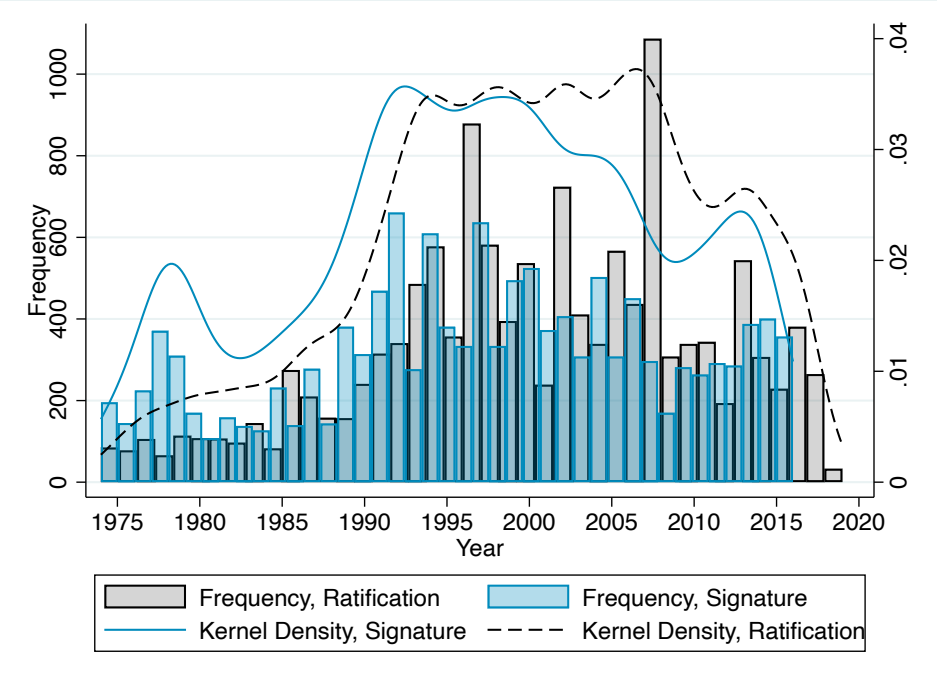


Figure 4.1: Signature and Ratification over time

Starting from the mid-1970s the number of signatures of international environmental agreements increases, indicating stronger international cooperation to fight environmental externalities. Ratification increases with a time lag, underscoring the problem of weak treaties. Signatures peaked in the mid to late 1990s. Recalling that the "Earth Summit" in Rio took place in 1992 and the Stockholm conference in 1972, a larger fraction of the increase in international cooperation can be associated with those two events. Taking a closer look at the time lag between signature and ratification, table 4.2 provides the mean delay in days between signature and ratification. The first thing to note is that the mean delay between signature and ratification is substantial for all types and levels of environmental agreements. In most cases, it is easily imaginable that a complete electoral term can fit between the date when the agreement was signed and when it was actually ratified. For both MEAs and BEAs, the duration (i.e. the delay of ratification) is the lowest for amendments. This aligns with Mitchell (2003) and Mitchell et al (2020) saying that amendments provide only minor changes to the original agreement and should

Table 4.2: Time lag between Signature and Ratification

		Duration, mean	Duration, std.Err.
MEA	Agreement	1969.41	47.83
	Protocol	2338.24	62.14
	Amendment	1005.28	18.37
BEA	Agreement	224.77	24.38
	Protocol	208.6	54.90
	Amendment	111.28	23.68

not face the same obstacles for ratification as agreements. Further, amendments can be subject to tacit acceptance which should decrease the duration (but also imply a standard error of zero for those amendments relying on tacit acceptance). Depending on the inclusion, either protocols or agreements feature the longest average delay. The most striking feature of table 4.2 is the difference in mean duration for all types of treaties between those with multilateral inclusion, and those of bilateral inclusion. Bilateral treaties take around a tenth of the time a multilateral equivalent to move from the signature to the ratification stage and finally enter into force (at similar standard errors). This can be related to the higher complexity of multilateral agreements that is as a side effect of a broader membership base. Further, multilateral agreements can be subject to strategic postponement until key players or countries that are critical for the success of the agreement ratified it. In contrast, bilateral agreements are much easier to control from the perspective of a single domestic government, the bargaining power is less dispersed and each player's concessions are lower (if interests are not completely opposed that is). Consequently, finding domestic conses about bilateral agreements should be easier and ratification delay substantially lower.

Table A1.1, which is provided in the appendix, provides an overview of the number of treaties signed by each country in the dataset. Besides information on the total number of treaties, the table contains information on the number of MEAs and BEAs for each country. The absolute number of agreements per country varies between 245 (Israel) and 495 (France), with a mean of 362 agreements per country. The number of bilateral agreements varies between 2 (Luxembourg & Ireland) and 103 (USA) while the number of multilateral agreements varies between 470 (France) and 242 (Israel). Following the literature, I assume that the number of neighboring countries is the main indicator for the number of bilateral agreements, as those agreements address bilateral trans-boundary

externalities. Further, table A1.1 suggests a positive relationship between the size of a country and the number of bilateral agreements, as well as environmental agreements in general. If the number of bilateral agreements also characterizes the perceived relevance of a country the data on bilateral agreements could be helpful in mapping out key players within multilateral agreements for further research.

4.3.2 Electoral data

This part is meant to illustrate the electoral component of the dataset. Table A1.2 (see appendix) provides a summary of the number of elections for each country in the dataset, the time covered and the theoretical term length together with the average real-term length for each country and its political system[16]. The absolute number of elections per country in the dataset varies between 16 (Australia) and 7 (Estonia, Hungary, South Korea, Lithuania & Poland). This difference is driven by differences in the time coverage and differences in the actual term length. Coverage varies due to data availability in the DPI2017 dataset (i.e. the first and last election available for a country) and major changes in the global political system (data on former soviet states starts in the early to mid-1990s).[17] What stands out is the obvious difference between the theoretical and the average actual term length. The real length of the term is generally shorter than what the DPI2017 dataset contains as the term length n. This is due to either consistent but small deviations or major outliers. Such outliers are elections that fell out of the theoretical cycle, reasons for early elections are among others the lost political support of the government, a distrust veto, or the death of an executive leader. Small deviations can be driven by the fact that the "should" term is given in years, while the actual term is measured in days and elections are set to take place in the, for example, the fourth year after the initial election but not exactly $4 * 365$ days after the initial election. Regarding the political system, most countries in the dataset are parliamentary democracies with presidential systems and assembly elected presidential systems as the exception.

[16]Either presidential, parliamentary or assembly elected presidential.

[17]This could also contribute to the peak in signatures in the mid to late 1990s as the number of countries in the dataset increases.

4.3.3 Environmental preferences data

The following figures are meant to illustrate the manifesto dataset with regards to the per501 variable and provide some rationale on why the variable might be useful as a proxy for the environmental preferences/positions of political parties. See section 4.1.3 and 4.2 for more information on what the per501 variable is coding.

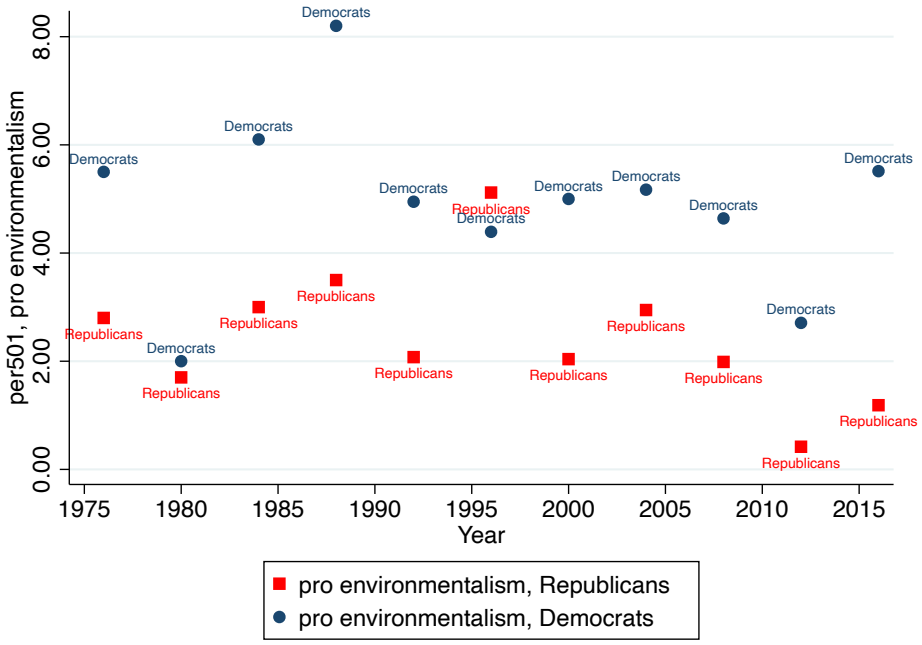


Figure 4.2: Environmental Position based on per501, US

Figure 4.2 is a scatter plot of per501 for republicans and democrats in the US between 1975 and 2016. The first observation is that the environmental position, based on the per501 variable, is higher for Democrats than it is for republicans, which confirms the general perception of US politics. With the exception of two elections (1980 & 1996) democrats seem to exhibit significantly stronger environmental preferences than republicans. The second feature of figure 4.2 that deserves attention is that the values of per501 fluctuate within parties more than between parties. With the exception of 1980 and 1996, the margin of the Democrats over the Republicans remains fairly stable, offering a rationale for the use of the relative environmental position in the election rather than the per501 variable directly. For future research, the environmental position of the median voter and the impact of changes in this position could be of particular interest, as they might explain the variance within a party and the stable margins across parties.

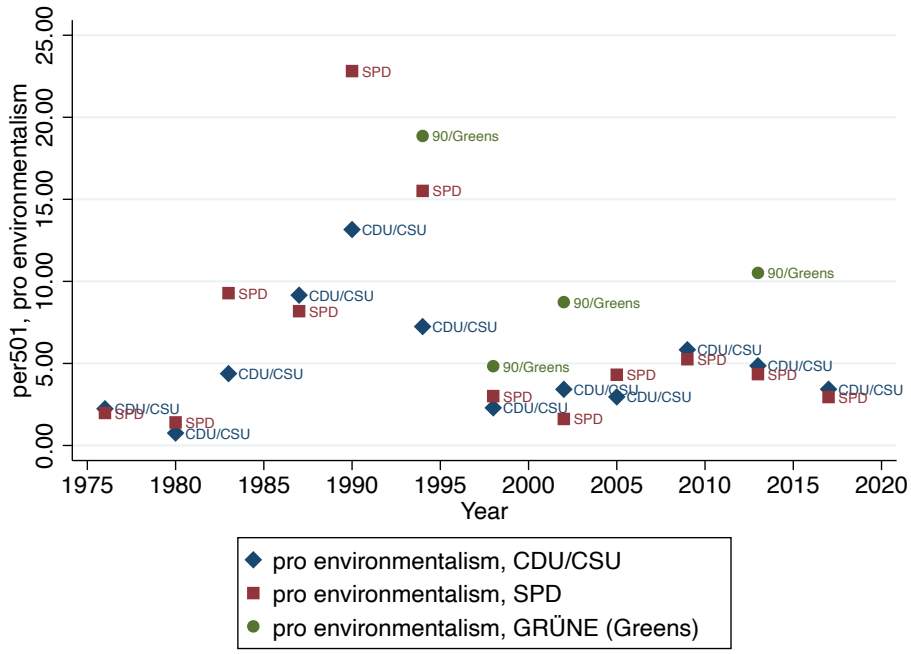
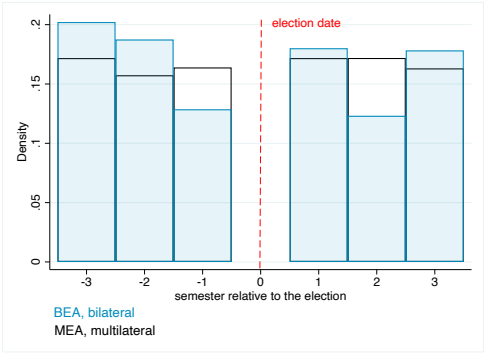
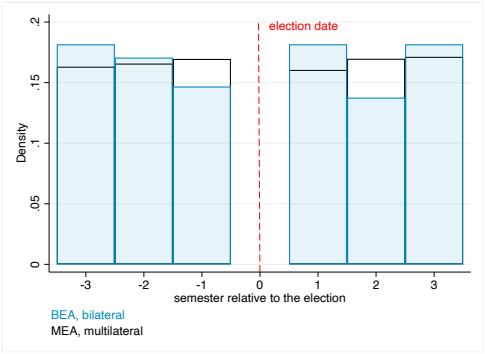


Figure 4.3: Environmental Position based on per501, Germany

Next, figure 4.3 provides a similar scatter plot as 4.2 for Germany rather than the US. In contrast to the US, Germany is farther away from a political duopoly but it makes use of a threshold (5%) to prevent dispersion in the parliament. Another aspect that is specific to Germany and makes this scatter plot interesting is a "shock" to the German party landscape after 1989 and the reunification of the former DDR with the BRD. In the aftermath of this shock most German parties matched up with their nearest ideological neighbor from the DDR, except for the relatively young party "the Greens" (it took them until 1993 to merge with a DDR counterpart), therefore they did not play a political role until then. Figure 4.3 shows the environmental position of the two biggest German parties (SPD & CDU/CSU) and how those parties responded to the entrance of a new party with stronger environmental preferences. From a qualitative perspective, the environmental position of the two major parties decreased, much like a hotelling model would predict how two established firms would respond to an unavoidable entrance of a third firm. Also, the pre-1990 tendency of increasing differences between the SPD and the CDU/CSU is reversed and the major parties start to differ less in their environmental position. As for the US case, it would be of interest to analyze if the tendency towards greener positions pre 1990 was driven by changes in the preferences of the respective median voter. Comparing



(a) Signature relative to the election



(b) Ratification relative to the election

the level of per501 the difference between Germany and the US is striking, in particular up to the 1990s. Besides the dynamic of the median voters' environmental preferences, the per501 variable seems also to be sensitive to economic recessions when parties, even the greens, clearly dropped expensive environmental positions, indicating room for future research analyzing environmental agreements and using economic crises as a source of variation in environmental preferences[18].

4.3.4 First view at electoral cycles

To conclude this selection of descriptive statistics, I provide the first group of graphs on countries' timing of signature and ratification relative to national election dates. Figure 4.4a displays two histograms for the density of signatures in the six semesters around the election for both bilateral and multilateral agreements. Focusing on multilateral agreements (the black outline bars), there seems to be little to no impact of the election date on the likelihood of signature in a given semester. This aligns with the information on how the signature of multilateral agreements takes place, i.e. at a large event, jointly by most countries that attend the negotiations, the signature should be therefore uncorrelated with election dates. Bilateral agreements follow a different dynamic with decreasing signatures approaching the election date (moving from -3 to 0) and increasing signatures after the election. Looking at this from the perspective of less dispersed bargaining power (relative to MEAs) regarding the date of the negotiations it seems plausible that for bilateral agreements the two countries can agree on a date that does not interfere with either of the two national elections. Figure 4.4b provides histograms on the density of

[18] In the late 1990s until early 2000s the German economy suffered substantial, giving Germany the title of the sick kid in Europe.

ratification in the respective semesters around the election (-3;+3) for both multilateral and bilateral agreements. Similar to figure 4.4a bilateral and multilateral agreements tend to follow slightly different dynamics. The tendency of decreasing density of legislative action moving towards the election that stood out for bilateral agreements in figure 4.4a is recovered in figure 4.4b. Again there is a clear, but weaker, tendency from -3 up to the election and a pattern similar to 4.4a after the election. The strong correlation between the density of signatures and the density of ratification of bilateral agreements in the respective semesters indicates that legislative action for these agreements is reduced towards the election and re-initiated after the election. This supports the hypothesis of electoral cycles, but no conclusion should be drawn before the actual analysis. Turning to multilateral agreements, there is very little variation in the density pre-election. Turning to the post-election semesters, there is a slight dip in the density in the election semester, followed by an increase in the density moving away from the election date. However, this tendency is very weak and should not be interpreted directly as evidence in favor of the hypotheses presented earlier.

5 Methodology

For my analysis, I use an event study technique. This approach uses information on ratification in different time splines around an event (in my case the election) to make a statement on the impact of the event on the dependent variable. Besides event studies, there are other techniques that can be used, those are shortly discussed below.

5.1 Possible Estimation Techniques

This section will introduce different approaches that have been used in the literature to analyze mechanisms that drive the ratification of international environmental agreements. There are generally two methodological approaches available on how to analyze how political competition might weaken environmental agreements. The first one is to analyze if countries with intense political competition, high office rents, or high political polarization are less likely to ratify an environmental agreement, given that they initially signed it. This approach uses ratification as a dichotomous variable. A country either ratifies the agreement (=1), or it fails to do so (=0). To estimate a model with a binary dependent variable probit and logit estimation techniques are appropriate. Both describe the data by defining a latent process that generates the binary component through some observation rule. This underlying process can be not observed, only the combination of independent variables that result in either of the two binary outcomes is observable in the data. Probit and logit models suit problems with binary dependent variables better than simple linear models because the latter would require range restrictions on the independent variables and, in their basic form, imply constant marginal effects.[19] The second approach is to analyze if countries with more intense political competition, higher office rent, or higher polarization are on average more likely to ratify environmental agreements *later*. The dependent variable, in this case, is still dichotomous, but the timing of the ratification relative to some event and the impact of independent variables on the timing is subject to the analysis. This approach describes the ratification process as a failure process, in which countries are observed from the opening (the signature of the agreement) until they fail

[19] See Cameron and Trivedi (2005), Chapter 14.

(ratification of the agreement). Estimation techniques suitable for such a failure process are proportional hazard models and event studies. Among the failure models, proportional hazard models (also called survival models) are most commonly used. Proportional hazard models assume an underlying, time-varying baseline hazard for the agreement to be ratified at any point in time. This baseline hazard depends on unobserved variables and the observable variables increase or decrease the baseline hazard proportionally. The disadvantage of proportional hazard models is that students and researchers are less familiar with the approach in comparison to logistic regression models that are taught more frequently. The major disadvantage of binary choice models is that they are only able to evaluate which countries ratified the agreement until the end of the study. Even though the issue of censoring, (I only know if a country ratified the agreement until $t = T$, but not if it will never ratify), and the time dependence can be incorporated into a logit model by the usage of time splines (Carter and Signorino, 2010), this reduces the flexibility of the model to capture the effect of time (Cazals and Sauquet, 2015). In contrast, proportional hazard models incorporate time dependence and censoring. Including time windows and evaluating how the ratification of environmental agreements depends on those windows transforms the duration analysis into an event study. Event studies are commonly used in financial economics and corporate finance to analyze how a dependent variable (like a stock price) responds to an event (like an earning announcement) by looking at changes in the dependent variable shortly after the event, relative to shortly before the event. The methodology of event studies was developed in the late 1960s, and papers publishing event study results peaked in the mid-1980s (Kothari and Warner, 2007). Therefore, the event study (as a methodology) is quite mature (Kothari and Warner, 2007).

5.2 Ratification as an Event Study

Event studies offer the advantage of an easy econometric model, at the cost of a more advanced data setup. For such a setup, the event is defined as the election which takes place at time t in country Y. The political term (beginning and ending with an election) is split into windows of a given length, and dummies for those windows are used as the independent variables of interest. Each observation refers to a semester before/after the event that contains the values of the controls in the semester, together with a dummy that

encodes the position of the semester relative to the event. As for all regression models using multiple dummies (i.e. binary variables) to encode different mutually exclusive variables, there is a choice to be made which dummy to omit in the regression. The omission is necessary to prevent perfect multicollinearity, and the resulting problem of a matrix X without full rank.[20] The coefficients for the remaining dummy variables have to be interpreted as relative to the omitted dummy. For event studies, it is common to omit the closest time window before the event. For my analysis, this implies to omit the semester before the election and interpret the coefficients as changes in the likelihood of ratification relative to the semester directly before the election (i.e. the pre1 semester). Keeping in mind the dichotomous nature of the dependent variable, the econometric model most suitable is a logistic regression including semesters around the event (i.e. the election).

5.2.1 Logistic Model

$$\begin{aligned}\ln\left(odds\left(Y_{ijt}=1|X_{ijt}\right)\right) = \alpha_i + \gamma_j + \theta_t + \beta_1\,\text{pre3}_{jt} + \beta_2\,\text{pre2}_{jt} + \beta_3\,\text{election}_{jt} \\ + \beta_4\,\text{post2}_{jt} + \beta_5\,\text{post3}_{jt} + \beta_6\,\text{GDPpCapita}_{jt} \\ + \beta_7\,\text{Trade}_{jt} + \beta_8\,\text{days\_since\_signature}_{ijt} + \epsilon_{ijt}\end{aligned} \tag{5.1}$$

The equation 5.1 depicts a basic logistic regression model where $Y_{ijt} = 1$ if agreement i was ratified by county j at time t. Due to the binary dependent variable, the log odds of $Y = 1$, conditional on the matrix of independent variables X_{ijt}, are used, rather than the dependent variable itself. Odds differ from probabilities, as odds describe the probability of the dependent variable being equal to one (given the matrix of independent variables X_i), relative to the probability of the dependent variable being equal to zero (given the matrix of independent variables X_i). As an example, with $P(Y = 1|X_i) = 0,6$ the odds are respectively $odds(Y = 1|X_i) = 1,5$, the idea here is that $Y = 1$ is one and a half times as likely as $Y = 0$, given the matrix X_i. Generally, log odds can be written as:

$$ln(odds(Y = 1|X_i)) = ln(\frac{P(Y = 1|X_i)}{1 - P(Y = 1|X_i)})$$

[20] Perfect multicollinearity describes a situation in which one independent variable can be expressed as a linear function of two or more independent variables, leading to a deterministic relationship among independent variables.

Moreover, the model includes dummies for each semester, except the semester before the election as well as year, country and treaty fixed effects $(\alpha_i, \gamma_j, \theta_t)$. To capture the time dependency of the ratification process, a variable that counts the days since the signature of the agreement X by country Y is included in the regression. Because agreements differ from each other in terms of costs resulting from ratification, residuals are likely to be correlated across agreements. To not underestimate standard errors, and prevent type I and type II errors, standard error estimates are clustered on the agreement level. Even with fixed effects, clustering standard errors is important if there is possible heterogeneity in the treatment effect.[21] Logistic regression relies on non-linear estimation techniques, therefore the interpretation of coefficients becomes more complex in comparison to a simple linear regression. Rather than being interpretable as the impact of a marginal/one-unit change on the dependent variable, the coefficients in a logistic regression model have to be interpreted as odds ratios. An odds ratio is the ratio of the odds of $Y = 1$ after a marginal/one-unit change in X_i, relative to the odds of $Y = 1$ before the change in X_i. As the odds of $Y = 1$ depend on the values of all independent variables in X_i, the quantitative impact of a one unit change in X_i changes with the other controls. However, the qualitative impact of a one unit change in X_i can be inferred directly from the sign of the coefficient.

The econometric model, as described in 5.1, is suitable to analyze how ratification depends on the political cycle, allowing to test if ratification is more likely to take place after the election, relative to before the election. To test if post-election ratification is driven by green successors, it is necessary to further distinguish between post-electoral periods where the governing party altered, and use this together with information on the successors environmental preferences. This is done using dummies that indicate changes in the ruling party and changes in the environmental position, as presented in the election manifesto of the succeeding party (see chapter 4). To capture the impact on the odds of ratification of

[21] see McKenzie, 2017

changes in the governing party, model 5.1 is extended to:

$$\begin{aligned}\ln\left(odds\left(Y_{ijt}=1|X_{ijt}\right)\right) = \alpha_i + \gamma_j + \theta_t + \beta_1\,\text{pre3}_{jt} + \beta_2\,\text{pre2}_{jt} + \beta_3\,\text{election}_{jt} \\ + \beta_4\,\text{post2}_{jt} + \beta_5\,\text{post3}_{jt} + \beta_6\,\text{post(i)}_{jt} * \text{gov\_change}_{jt} * \text{green\_change}_{jt} \\ + \beta_7\,\text{post(i)}_{jt} * \text{gov\_change}_{jt} + \beta_8\,\text{post(i)}_{jt} * \text{green\_change}_{jt} + \epsilon_{ijt} \\ + \text{Controls}\end{aligned} \tag{5.2}$$

In this more advanced model, β_6 is the coefficient of interest. β_7, β_8 are included to capture the pairwise interaction effects between changes in government, changes in environmental positions, and post election periods. The intuition behind the triple interaction effect is to compare how the impact of changes in the governing party in the post election period differs for movements towards greener parties, from movements towards browner parties (or such that did not result in a change in the environmental position of the government).

5.2.2 Ratification as a Failure Process and Survival Models

As discussed in the introduction of this chapter, IEAs can also be described by a failure process, in which countries are observed from the opening (signature of the agreement) until they fail (ratification of the agreement). Cazals & Sauquet (2015) and Fredriksson et al (2007) followed this approach and made use of a Cox proportional hazard model. The dataset constructed for this thesis project allows to also estimate proportional hazard models. Enables me to compare how a simpler event study performs relative to a more complex duration model. A Cox proportional hazard model is generally expressed in the following manner:

$$h\left(t|\mathbf{x_j}\right) = h_{0a}(t)\alpha_c \exp \underbrace{\left(\sum_{k=1}^{K} x_{kj}\beta_k\right)}_{independent-variables} \tag{5.3}$$

The dependent variable $h\left(t|\mathbf{x_j}\right)$ is the conditional hazard rate. As such, it captures the hazard of failure in t, conditional on x_j given that the observation did not fail before. All proportional hazard models, not just Cox proportional hazard models, allow for the conditional hazard rate to be factored into a time varying baseline hazard $h_{0a}(t)$ which is independent of x_j, and a function that is only depending on x. The baseline hazard is stratified on the agreement level, such that it can vary between agreements. The function

$\phi(\mathbf{x}, \boldsymbol{\beta}) = \exp(\mathbf{x}'\boldsymbol{\beta})$ scales the baseline hazard upwards or downwards, depending on the coefficients (see Cameron and Trivedi (2005), Chapter 17). Equation 5.3 is used from Cazals and Sauquet (2015), p.270. The model accounts for country- and treaty-heterogeneity by including α_c, as the country-specific random effect, and h_{0a} as the treaty specific baseline hazard that is shared across countries. Moreover, x_{kj} denotes the observed heterogeneity across countries (controls). Among the independent variables, Cazals and Sauquet include a dummies that identifies post-election periods for country j, given by $post\_S(i)_j$. The model can therefore be written as:

$$\begin{aligned} h(t|\mathbf{x_j}) =& h_{0a}(t)\alpha_c \exp(\beta_1 pre\_S2_j + \beta_2 pre\_S1_j + \beta_3 post\_S1_j + \beta_4 post\_S2_j \\ &+ \beta_5 GDPpc_j + \beta_6 \text{Trade}_j) \end{aligned} \tag{5.4}$$

In contrast to the event study illustrated before, the duration model does not rely on full coverage of the political cycle. Instead, the authors use a dummy to indicate the first and second six-month intervals after the election, as well as the first and second six-month interval before the election and included those as dummies in their regression model. Effectively, the duration model focuses on the year before and the year after the election and does not analyze how periods outside of this $+-$ one year interval impact the likelihood of ratification.

6 Analysis

The following chapter reports regression results for the models discussed in the methodology chapter. In detail, this chapter will provide the event study results to test if ratification is delayed strategically, such that the costs of participating in the environmental agreement occur post-election. Furthermore, this baseline event study is expanded to analyze how the likelihood of ratification (post-election) is changing if the incumbent was not successful in his reelection quest, and the successor depicts stronger relative environmental preferences than the incumbent. To decrease the complexity of the model, I restrict my observations to agreements that were ratified and use the event study to analyze when the ratification took place, relative to the election. This allows me to use a simple logistic regression instead of a tobit model, that would otherwise be needed to correctly incorporate the censoring.

6.1 Replication of Cazals & Sauquet, 2015

I begin my analysis by replicating a simplified version of the survival analysis by Cazals and Sauquet using my dataset. The model is estimated with GDP per capita and trade as independent, time varying controls, and pre2, election, and post2 semester dummies. Recall that the semester definition in my dataset is different from what Cazals and Sauquet (2015) used.[22] To keep the model close to Cazals & Sauquet (2015), I restrict observations to multilateral agreements only and stratify the baseline hazard at the agreement level, further country level fixed effects are used to capture heterogeneity across countries. Results reported in table 6.1 are qualitatively equivalent to Cazals & Sauquet for their analysis of developed countries (Cazals & Sauquet, 2015, p.274). The hazard ratio is significantly higher in the post2 semester and significantly lower in the election semester (i.e. +1). Controls are similar to Cazals & Sauquet, with trade having a positive and significant impact, while GDP has a negative impact in my study rather than the positive but non-significant impact that the authors found. Comparing the dataset, I use 52,619

[22] In my study a semester refers to an interval with a length of one sixth of the real political term with an average length of 6.9 months, whereas Cazals & Sauquet use semesters with a fixed length of six months.

Table 6.1: Survival Analysis, Dummy configuration according to Cazals and Sauquet (2015)

VARIABLES	(1) Cox Hazard Model Hazard ratio failure
Trade semester	0.00554***
	(0.00108)
GDP semester	-1.18e-05***
	(2.38e-06)
pre2 election	-0.0176
	(0.0336)
pre1 election	0.0325
	(0.0327)
election semester	-0.0614*
	(0.0368)
post2 election	0.0627*
	(0.0332)
Observations	52,619
Nb. events	6,933
Country FE	YES
Baseline Hazard stratified	Agreement Level

Robust standard errors in parentheses, clustered at agreement level
*** p<0.01, ** p<0.05, * p<0.1

observations with a total of 6,933 events (i.e. failures), while Cazals & Sauquet were using 15,331 observations with a total of 514 events.

6.2 Event Study

The following graph plots the coefficients of the event study, as described in the methodology chapter. The omitted semester is the semester before the election. The notation is accordingly pre3 for the semester -3, pre2 for the semester -2, election for the semester following the election, and post2, and post3 for the semesters +2 and +3. The dependent variables are the log odds of ratification. Bars indicate 95% confidence intervals for the point estimates.

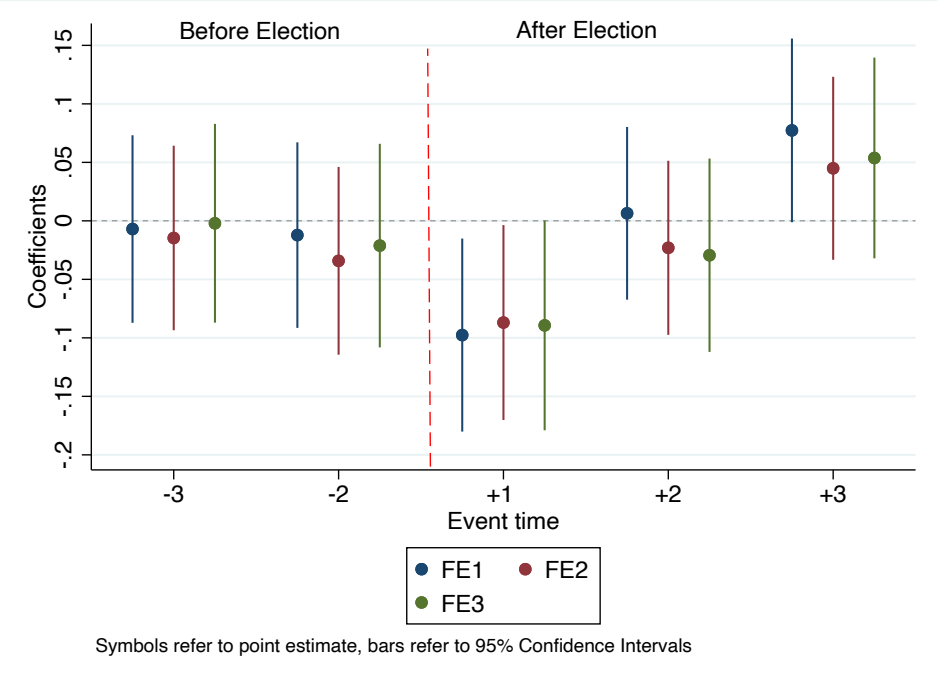


Figure 6.1: Coefficients Estimates, Event Study

I estimate the model with three stages of fixed effects. FE1 are the coefficients for each semester, estimated with country fixed effects. FE2 refers to the same model, but with country fixed effects, as well as year fixed effects. Finally, FE3 estimates the model with country, year, and agreement fixed effects. For all models, standard errors are clustered on the agreement level. For the agreement fixed effects, I use the unique identification code of the environmental agreement (IEA_id), country fixed effects use the iso-code. The point estimate for the pre-election coefficients are stable across pre3, and pre2, as well as

Table 6.2: Event Study

	(1)	(2)	(3)
	FE1	FE2	FE3
VARIABLES	log odds ratification	log odds ratification	log odds ratification
pre3 semester	-0.00697	-0.0146	-0.00205
	(0.0409)	(0.0402)	(0.0433)
pre2 semester	-0.0122	-0.0342	-0.0211
	(0.0405)	(0.0409)	(0.0444)
election semester	-0.0976**	-0.0869**	-0.0893*
	(0.0421)	(0.0425)	(0.0458)
post2 semester	0.00646	-0.0230	-0.0294
	(0.0377)	(0.0379)	(0.0422)
post3 semester	0.0773*	0.0449	0.0538
	(0.0401)	(0.0399)	(0.0438)
GDP	1.96e-05***	-1.36e-05***	-8.80e-06***
	(3.15e-06)	(2.44e-06)	(2.83e-06)
Trade	0.00737***	0.00943***	0.00987***
	(0.00151)	(0.00120)	(0.00129)
Observations	53,686	53,684	53,557
Country FE	YES	YES	YES
Year FE	NO	YES	YES
Agreement FE	NO	NO	YES
pseudo R^2	0.0452	0.0654	0.176

Robust standard errors in parentheses, clustered at agreement level
*** p<0.01, ** p<0.05, * p<0.1

across the different fixed effects specifications. Point estimates are negative but very close to zero indicating no significant difference in the likelihood of ratification relative to the omitted semester. Looking at the election semester, the likelihood of ratification drops significantly below zero, and point estimates are robust for all fixed effects configurations. This underscores the finding of Cazals and Sauquet (2015), indicates that both approaches, event studies, and survival models, are suitable methodologies. Further, the likelihood of ratification increases as the semesters move away from the election. Point estimates for the coefficients for the post2 semester increase substantially from the election semester, although not statistically significant at the 95% confidence level. For post3, in the simplest fixed effects configuration, the coefficient is significant. Focusing on economic significance instead of purely statistical significance, the coefficients increase post election. Based on the results, I conclude that there is evidence supporting the hypothesis of electoral cycles. The likelihood of ratification is increasing, ceterus paribus, post-election.

Table 6.2 provides the regression results underlying figure 6.1. Due to the logistic form of the regression model, the coefficients can be interpreted only in terms of their qualitative impact on the dependent variable (increasing or decreasing the log odds of ratification), but can not be interpreted directly as percentage changes, as they would be in a log-lin model. The three columns present the three fixed effects configurations, which are also provided in the lower part of the regression output. Regarding the interpretation of the different fixed effects configurations, country level fixed effects capture differences in the likelihood of ratification between countries, they are shared within countries across agreements and years. Year fixed effects capture yearly time trends across all countries and agreements. Lastly, agreement fixed effects are computed based on the IEA_id. They capture differences between agreements and are shared across countries. Recalling the model of Cazals and Sauquet (2015), agreement fixed effects are meant to replace the agreement specific baseline hazards in this simpler econometric model. As stated before, the likelihood of ratification drops significantly below zero in the semester after the election. One possible interpretation, used in Cazals and Sauquet (2015), is that the extent of government effort on international cooperation, and in particular on international cooperation focusing on environmental issues, is decreasing because governments need to reorganize themselves after the election. In general, it is valid to assume that there is a period of lower legislative activity immediately after the election. However, this effect should vary significantly between elections in which the incumbent was successfully reelected and elections that replaced the government. In particular for elections that ended with the replacement of the old government this argument is appealing. In contrast, reelections should not exhibit the same effect. This point will be further investigated with the extended model, to identify potential heterogeneity regarding post-election semesters in which the government changed. Another point that complicates the comparison between this event study and the results of Cazals and Sauquet (2015), is that the coefficients in the event study have to be interpreted as changes relative to the omitted semester dummy. As described in the methodology chapter, I follow the standard approach of event studies and omit the semester immediately before the event, therefore all coefficients are increasing or decreasing the likelihood of ratification relative to the likelihood of ratification in the pre1 semester. While this is not problematic for classic event studies, in my setup there is the possibility that the pre1 semester is not a good counterfactual.

Depending on the extent to which international reputation matters for the country and election-context, the likelihood of ratification can increase before the event if governments rely on media coverage regarding environmental agreements. To conclude the presentation of the results from the simple form event study, I like to compare the coefficients for GDP per capita and openness to trade with the results of the Cox hazard model of Cazals and Sauquet (2015). Across the different fixed effects configurations, both variables are significant. While openness to trade increases the likelihood of ratification in all fixed effects configurations, GDP per capita increases the likelihood in FE1, but decreases the likelihood in FE2 and FE3, while being extremely close to zero in either case. Cazals and Sauquet (2015) found no significant effect for GDP per capita in developed countries and a positive and weakly significant effect for developing countries. Point estimates for trade openness vary between positive and negative and generally lack statistical significance in their analysis. Because I modeled GDP per capita and the openness to trade as weighted averages of the respective years, the variance within those two variables particularly high. This could explain the high significance of the respective coefficients. Further, GDP per capita is negative when adding year fixed effects to the model. This implies that in the simple fixed effects configuration, time trends such as increasing GDP per capita resulted in the positive coefficient of GDP.

6.3 Event Study with interaction effects

The next section presents the regression results for the event study, extended by interaction effects between post-election semesters, a dummy for changes in government, and another dummy for changes in environmental preferences of the government from pre to post election. The results are based on model 5.2. In a general framework, interaction effects between dummy variables can be interpreted as differences between means in subgroups. While the logistic model makes interpretation more complex, this basic intuition still applies. Nevertheless, the interaction coefficient should not be analyzed in isolation. If, in my example, $gov\_change = 1$ and $green\_change = 1$ the marginal effect of semester $+1$ on the log odds of ratification is the sum of $\beta_6 + \beta_7 + \beta_8$, plus the coefficient of the semester itself. β_6, the coefficient of the double interaction term, captures the *difference* between the simple interaction for the two groups of the third dummy.

To begin, Figure 6.2 plots coefficients for the semesters, as well as the interaction between the post-election semester with either the dummy for changes in government or the dummy for changes in environmental preferences or both together. To simply the regression, the three post-election semesters are combined into one dummy.[23] While the coefficient for the post-election semester is negative, the interaction with both dummy variables is positive and highly significant.[24]

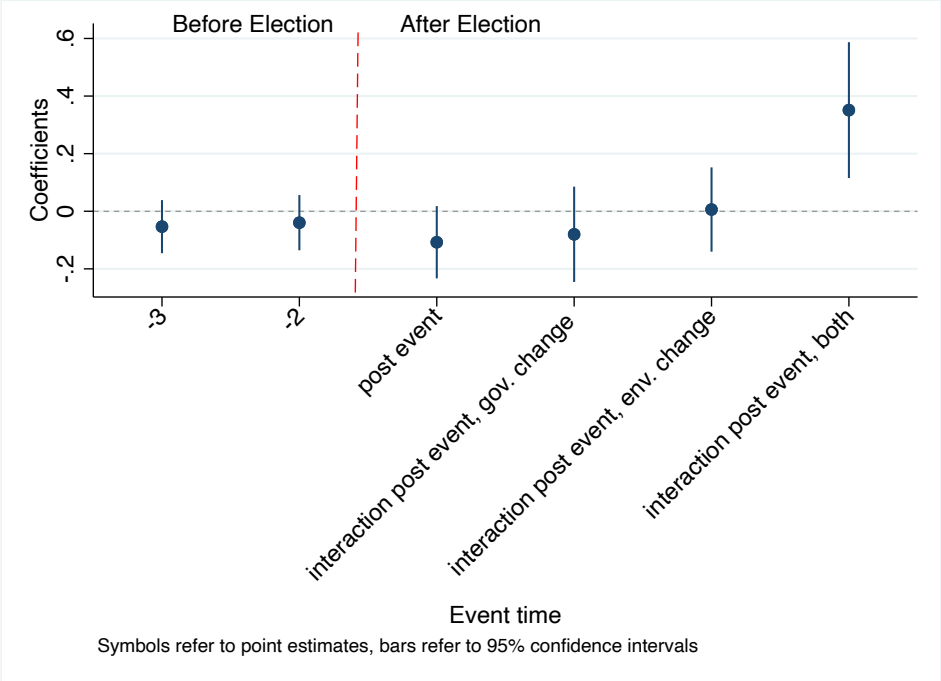


Figure 6.2: Coefficients Estimates, Event Study with interaction terms

Figure 6.2 indicates that ratification post-election is actually driven by newly elected green parties, supporting hypothesis 2. Nevertheless, the question remains if this effect is equally shared across post-election semesters. To analyze potential heterogeneity, I return to using the three post-election semesters in my regression. I estimate three models, each using one of the post-election semesters for the interaction terms. Table 6.3 presents the results. Each column refers to a different configuration of 5.2, the first column uses the election semester (+1) for the interaction, the second column the post2 semester (+2), and finally the third column the post3 semester (+3). As it would be expected, the point estimates for the interacted semester change. This is because the overall effect is now split up for the different categories of the dummy variable. The semester dummy (either

[23]The observations are still the individual semesters, but they share a dummy that that is equal to one for all three post-election semesters.

[24]See regression output in the appendix.

election, post2 or post3), captures the effect on the log odds of ratification (relative to the omitted semester) if both other dummies are equal to zero, so if neither the government changed nor the environmental position of the government increases. The interaction with the government change dummy (β_7 in model 5.2), is the additional effect of a change in government in the respective post-election semester, that did not lead to a change of the environmental preferences of the government. In the context of Battaglini and Harstad (2020), I interpret this interaction effect as the impact of a newly elected brown government on the likelihood of ratification. Continuing the interpretation in the context of Battaglini and Harstad (2020), the semester interaction with a change in both dummy variables (i.e. $gov\_change = 1$ and $green\_change = 1$; β_6 in the regression model 5.2), is the additional effect of a change from a brown to a green government on the likelihood of ratification in the semester that is used for the interaction. For all three models, I use the complete range of fixed effects (country, year, and agreement) and cluster standard errors at the agreement level.

Table 6.3 summarizes the results of model 5.2 for the coefficients of interest. Looking at the first column, the results are a negative but not significant impact of the semester dummy by itself and a negative and highly significant coefficient for the interaction with a government change. Further, the coefficient for the interaction between the semester and a shift towards greener positions is significant and negative, and the interaction with both (government and environmental position change) is positive and highly significant. Coefficients for the government and environmental position are both positive, but only significant for government changes. I interpret these results as evidence in favor of hypothesis 2. The likelihood of ratification in the election semester is significantly lower when a green government is replaced by a brown government than vice versa. Even as this should not come as a surprise, it still raises questions about the explanation offered by Cazals and Sauquet (2015) for the decrease in legislative activity directly after the election. With regards to the interaction of post2 and the dummy variables, there is a negative and highly significant coefficient for the semester and a positive but not significant coefficient for the interaction with a changed government. Further, a positive and highly significant coefficient for increasing environmental preferences without changes in government, and interestingly a weakly significant but negative coefficient for the double interaction term. The coefficient for the election semester returns to be negative and significant, as in 6.2,

Table 6.3: Event Study with semester interaction

Dummies interacted with:	(1) election s.	(2) post2 s.	(3) post3 s.
VARIABLES	log odds rat.	log odds rat.	log odds rat.
pre3 semester	-0.0528	-0.0499	-0.0491
	(0.04696)	(0.04701)	(0.0470)
pre2 semester	-0.0396	-0.0393	-0.0405
	(0.4885)	(0.04887)	(0.04889)
election semester	-0.00174	-0.131***	-0.1307***
	(0.08621)	(0.04991)	(0.04991)
post2 semester	-0.0828*	-0.219***	-0.0792*
	(0.04687)	(0.0734)	(0.04687)
post3 semester	-0.0373	-0.0332	-0.0748
	(0.04956)	(0.04971)	(0.07987)
change government	0.119**	0.0465	0.0261
	(0.04791)	(0.04824)	(0.04425)
change towards green	0.0626	-0.0411	0.0442
	(0.04775)	(0.04846)	(0.04726)
semester interaction, env. change	-0.276**	0.382***	-0.121
	(0.12581)	(0.07068)	(0.1095)
semester interaction, gov. change	-0.426***	0.0780	0.181*
	(0.12292)	(0.09720)	(0.06926)
semester interaction, change both	0.955***	-0.292*	0.00272
	(0.2159)	(0.1626)	(0.149)
Observations	45,326	45,326	45,326
Country FE	YES	YES	YES
Year FE	YES	YES	YES
Agreement FE	YES	YES	YES
pseudo R^2	0.181	0.181	0.180

Robust standard errors in parentheses, clustered at agreement level
*** p<0.01, ** p<0.05, * p<0.1

however the magnitude increases. I interpret the negative coefficient of post2 as a lower likelihood of ratification if there is no change in the government and the party maintains its relative environmental position. In contrast, the interaction term with changes towards a greener environmental position is positive and highly significant, this offers evidence that given a new brown party enters as a political competitor, the reelected incumbent is more likely to ratify the agreement post election. As the double interaction is negative and weakly significant, this implies that for a newly elected green government, the likelihood of ratification in post2 is actually decreasing. One possible explanation is that newly elected green governments tend to ratify environmental agreements shortly after the election (see column 1), rather than delaying it into the second semester after the election. The third column provides regression results for the interaction between post3 and the two dummy variables. As for post2, the coefficient for the semester is negative and significant, and only the positive coefficient for the interaction with the dummy for change in government reaches weak statistical significance. Looking at the results from column 1 to column 3 jointly, it appears as if new green governments ratify agreements shortly after the election, whereas incumbents are the ones that delay ratification until post2 or post3. Overall, the event study provides evidence for hypothesis 1 and hypothesis 2, but further research and robustness checks are needed to answer the research question with higher confidence.

7 Robustness Checks and Discussion

Without a doubt, the decision of national governments if, and when, to ratify an IEA is subject to many different kinds of incentives, both on the national and the international level. To increase the confidence in the results derived in the last chapter, this chapter provides a small set of robustness checks.

7.1 Agreement Inclusion

This section will repeat the exercise of model 5.1, but estimate the model for BEAs and MEAs separated. Recalling table 4.2, and figure 4.4b, bilateral agreements exhibit a stronger variation in their timing of ratification. To analyze if this effect is driving my results in model 6.2, I use country and year fixed effects and compare coefficients between the aggregated model, and the two separate models. The regression output and coefficient plots, similar to 6.1, are provided in the appendix. The coefficients for the MEA regression (column 1) are identical to 6.2, with country and year fixed effects. Turning to bilateral agreements, it stands out that the level of all coefficients differs substantially in comparison to the MEA regression. This result recovers the higher variation in the likelihood of ratification between the semesters, that was visible in the histograms (see figure 4.4b). Secondly, the two regressions differ substantially in the number of observations. Because MEAs are extended to a much greater extent by protocols and amendments, and because they feature on average 22.5 rather than 2 members, the number of observations differs by a factor of more than 100. In this sense, the higher variance within the likelihood of ratification between semesters for BEAs can be driven by the smaller number of observations, and the corresponding higher probability of extreme results. Because MEA results are robust, I conclude that the previous results are not jeopardized by this new evidence, but the difference between bilateral and multilateral agreements deserves a closer look in future research.

7.2 Marginal effects and interaction with continuous controls

So far the analysis was qualitative (i.e. I focused solely on the pre-sign and interpreted this as increases or decreases in the log odds of ratification), and ignored interactions between changes in controls and the marginal effects of the treatment variables. To gain a better understanding of how the marginal effects of the semester dummy interact with the continuous controls (GDP & Trade), I use the Interflex package for stata (Hainmueller, Mummolo, and Xu, 2016). The package allows me to plot marginal effects of treatment variables (in my case the semester dummies) over the range of moderators (my continuous controls).

7.2.1 GDP

Figure 7.1 presents subfigures for the marginal effects of the semester dummies over GDP. For each subfigure, three point estimates refer to the marginal effect for low, medium, and high values of GDP per capita. As GDP per capita increases the marginal effect for pre-election semesters increases, indicating that the likelihood pre-election ratification increases with higher values of GDP. Turning to post-election semesters the opposite is true, for 7.2b and 7.2f the marginal effect of the semester decreases as GDP is increasing. For low and medium levels of GDP, the marginal effect is positive (i.e. the likelihood of ratification in those semesters is higher), while the marginal effect for high levels of GDP is negative (i.e. the likelihood of ratification in those semesters is lower). This result indicates that heterogeneity in income between countries impacts the differences in the timing of ratification. Nordhaus (1975) suggested that political cycles can be moderated by higher income, which decreases the incentive to postpone costly legislation such as the ratification of environmental agreements, figure 7.1 supports such a mechanism. On the other hand, the change in GDP and the impact on the semester dummies could result from time trends. As GDP per capita broadly increases throughout my study, lower values of GDP are associated with older observations, both within and across countries. If this is the case, figure 7.1 suggests that the strategic delay of ratification post-election was

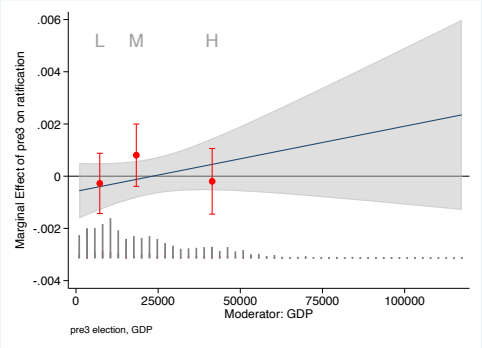
stronger in the past, and is decreasing as countries become richer.

7.2.2 Trade

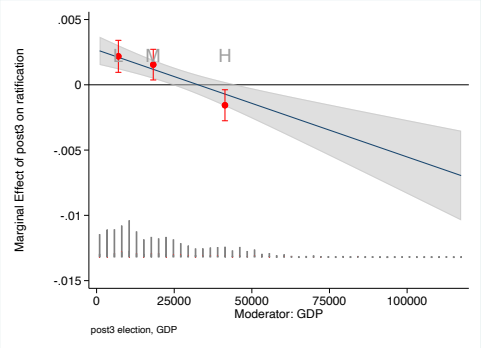
Figure 7.2 repeats the exercise of figure 7.1, using trade (sum of exports and imports as share of GDP) as the moderator. Trade might impact the marginal effects of the semester dummies through trade leakage. Trade leakage describes decreases in economic competitiveness, that result from environmental agreements. If trade leakage is present in my study, I hypothesize that increases in trade should lead to a higher likelihood of ratification post-election, and a lower likelihood of ratification pre-election, because trade leakage increases the costs of ratification. In contrast, if environmental agreements set standards for goods, they might facilitate trade among members, inverting trade leakage for countries that focus on intra-OECD trading relationships. Figure 7.2 does not provide a clear answer. The marginal effect for the pre3 semester increase for higher values of trade, moving from negative to positive as trade increases. Focusing on the point estimates for low and medium levels of trade only, the marginal effect of pre-election semesters is increasing while the marginal effect of post-election semesters is decreasing. This is evidence against the hypothesis of trade leakage, but further research is required to conclude that there is no trade leakage present.[25]

[25]Recall that the dataset contains OECD countries only, including a broader set of developing and emerging countries could lead to different results.

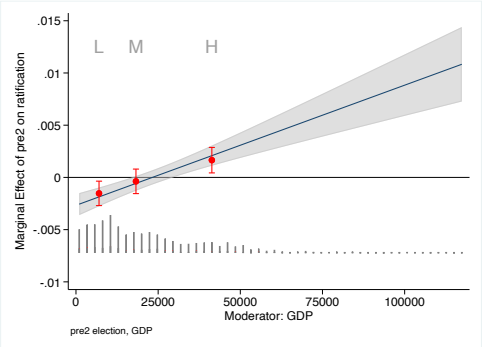
Figure 7.1: Marginal effects of semester dummies over GDP



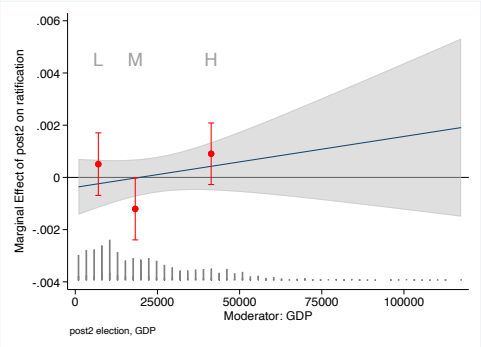
(a) pre3 election



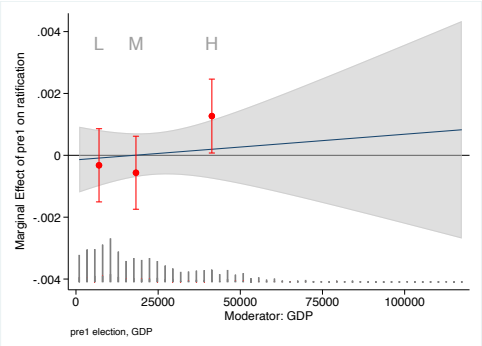
(b) post3 election



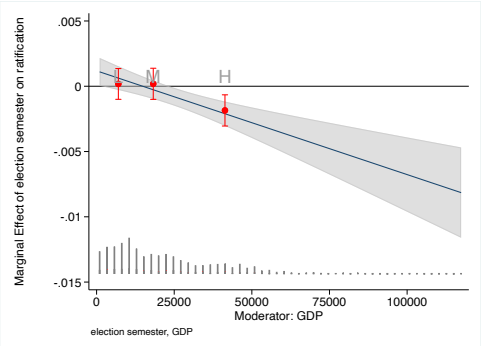
(c) pre2 election



(d) post2 election

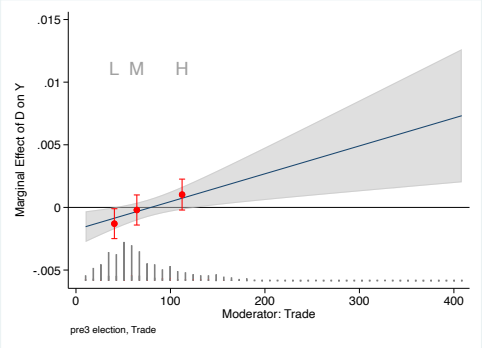


(e) pre1 election

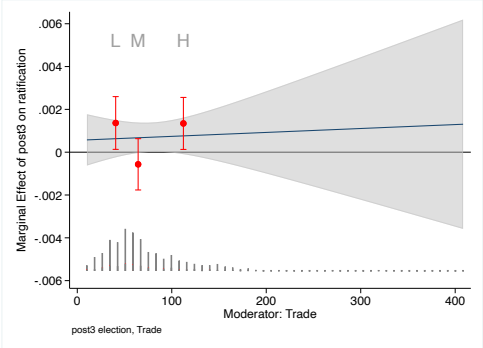


(f) election semester

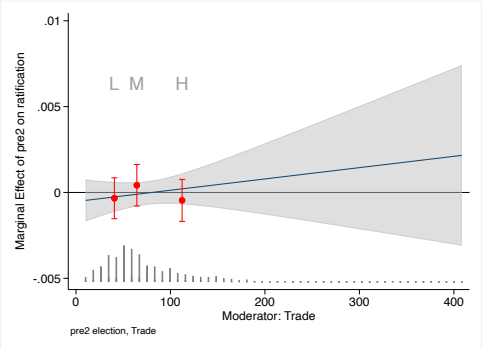
Figure 7.2: Marginal effects of semester dummies over Trade



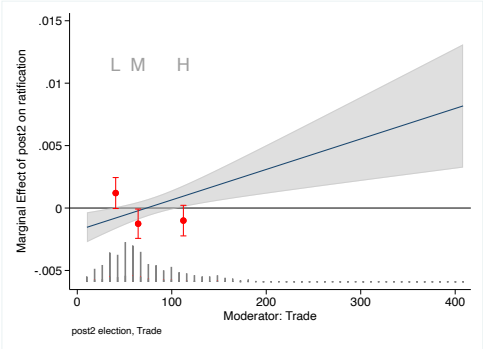
(a) pre3 election



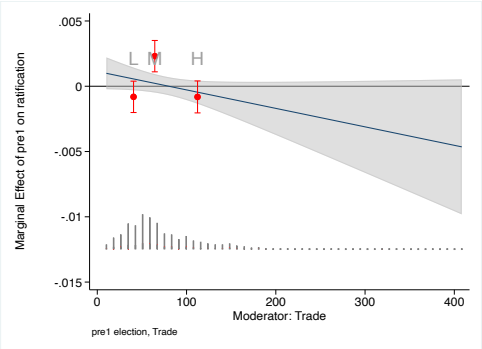
(b) post3 election



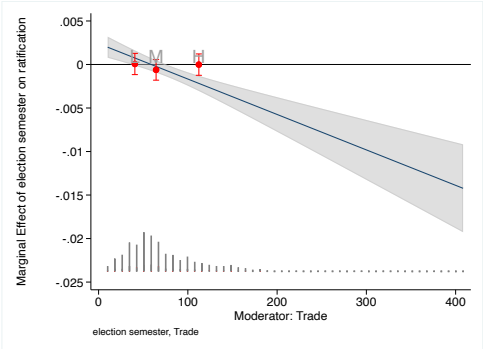
(c) pre2 election



(d) post2 election



(e) pre1 election



(f) election semester

8 Conclusion

This thesis makes use of multiple existing data sources to create a dataset that combines information on membership actions in environmental agreements with data on national elections, political terms, and party-level data on environmental preferences for 36 OECD countries. Next, it provides a simple econometric framework by translating a more complex survival analysis into a simpler event study that is used to test if governments delay the ratification of environmental agreements to post-election periods. Further, it tests if changes in the degree of pro-environmentalism before and after the election foster post-electoral ratification. Based on my findings, I conclude that there is an impact of the electoral calendar on the likelihood of ratification for environmental agreements. Furthermore, there is strong evidence that newly elected governments that exhibit stronger environmental preferences are responsible for the increase in the likelihood of ratification after the election. Moreover, this effect is heterogeneous for different periods after the election. While newly elected green governments tend to ratify agreements shortly after the election, whereas reelected incumbents delay ratification further into the new term. These results stand in line with Battaglini and Harstad (2020), but further research is necessary to conclude that political actors turn environmental agreements into chess pieces that are meant to enhance their reelection chances.

Generally, environmental agreements are subject to an extremely broad set of interacting incentives, all different for different players both within and between countries. However, reelection incentives can play a crucial role in this multilevel game as the theoretical literature has discussed and is continuing to discuss. At the current state of the research development it is not the lack of theoretical models that embodies the bottleneck but restrictions in terms of data available and hands-on work that evaluates the suitability of different empirical research designs. Overcoming this bottleneck is of crucial importance, not only because not knowing how to get to know something is scientifically unacceptable, but also because the degree of difficulty in resolving environmental issues is only assumed to increase. Environmental agreements are central in this regard as they might be the best tool available to resolve what is arguably the biggest public good problem imaginable.

References

Balsiger, J. and VanDeveer, S. D. (2012). Navigating regional environmental governance.

Barrett, S. (1994). Self-enforcing international environmental agreements. *Oxford Economic Papers*, 46:878.

Barrett, S. (1998). On the theory and diplomacy of environmental treaty-making. *Environmental and Resource Economics*, 11(3-4):317–333.

Barrett, S. (1999). A theory of full international cooperation. *Journal of Theoretical Politics*, 11(4):519–541.

Barrett, S. (2005). *Chapter 28 The theory of international environmental agreements*, volume 3. Elsevier B.V.

Battaglini, M. and Harstad, B. (2020). The political economy of weak treaties. *Journal of Political Economy*, 128(2):000–000.

Budge, I., Klingemann, H.-D., Volkens, A., Bara, J., Tanenbaum, E., et al. (2001). *Mapping policy preferences: estimates for parties, electors, and governments, 1945-1998*, volume 1. Oxford University Press on Demand.

Cameron, A. C. and Trivedi, P. K. (2005). *Microeconometrics: methods and applications*. Cambridge university press.

Canada, C. E. and yliopisto. Oikeustieteiden laitos, J. (2007). *Multilateral Environmental Agreement Negotiator's Handbook*, volume 5. University of Joensuu, Department of Law.

Carter, D. B. and Signorino, C. S. (2010). Back to the future: Modeling time dependence in binary data. *Political Analysis*, 18(3):271–292.

Carter, N., Ladrech, R., Little, C., and Tsagkroni, V. (2018). Political parties and climate policy: A new approach to measuring parties' climate policy preferences. *Party politics*, 24(6):731–742.

Cazals, A. and Sauquet, A. (2015). How do elections affect international cooperation? evidence from environmental treaty participation. *Public Choice*, 162(3-4):263–285.

Center for International Earth Science Information Network - CIESIN - Columbia University. (2013). Environmental treaties and resource indicators (entri) query service. NASA Socioeconomic Data and Applications Center (SEDAC). Available at: http://sedac.ciesin.columbia.edu/entri.

Cesi, C., Keefer, P., and Scartascini, C. (2018). Database of political institutions 2017 (dpi2017). Inter-American Development Bank. Numbers for Development. Available at: https://mydata.iadb.org/Reform-Modernization-of-the- State/Database-of-Political-Institutions-2017/938i-s2bw.

Coase, R. H. (1960). The problem of social cost. In *Classic papers in natural resource economics*, pages 87–137. Springer.

Coase, R. H. (2013). The problem of social cost. *The Journal of Law and Economics*, 56(4):837–877.

Desai, U. (1998). Environment, economic growth and government in developing countries. *Ecologial Policy and Politics in Developing Countries*, pages 1–46.

Downs, G. W., Rocke, D. M., and Barsoom, P. N. (1996). Is the good news about compliance good news about cooperation? *International Organization*, 50(3):379–406.

Drazen, A. (2000). The political business cycle after 25 years. *NBER/Macroeconomics Annual*, 15(1):75–117.

Fredriksson, P. G. and Gaston, N. (2000). Ratification of the 1992 climate change convention: What determines legislative delay? *Public Choice*, 104(3/4):345–368.

Fredriksson, P. G., Neumayer, E., Damania, R., and Gates, S. (2005). Environmentalism, democracy, and pollution control. *Journal of Environmental Economics and Management*, 49(2):343–365.

Fredriksson, P. G., Neumayer, E., and Ujhelyi, G. (2007). Kyoto protocol cooperation: Does government corruption facilitate environmental lobbying? *Public Choice*, 133(1-2):231–251.

Hainmueller, J., Mummolo, J., and Xu, Y. (2016). How much should we trust estimates from multiplicative interaction models? simple tools to improve empirical practice. *Available at SSRN: https://papers.ssrn.com/abstract$_i$d* = 2739221.

Harstad, B., Lancia, F., and Russo, A. (2019). Compliance Technology and Self-enforcing Agreements. *Journal of the European Economic Association*, 17(1):1–29.

Heal, G. (1993). *Trade, Innovation, Environment, chapter Formation of International Environmental Agreements*. Springer Netherlands, Dordrecht.

Heal, G. (2017). The economics of the climate. *Journal of Economic Literature*, 55(3):1046–1063.

Hoel, M. and Schneider, K. (1997). Incentives to participate in an international environmental agreement. *Environmental and Resource economics*, 9(2):153–170.

IPCC (2014). Mitigation of climate change.

Kolstad, C. D. and Toman, M. (2005). *Chapter 30 The Economics of Climate Policy*, volume 3. Elsevier B.V.

Kothari, S. and Warner, J. B. (2007). Chapter 1 - econometrics of event studies. pages 3–36. Elsevier B.V.

Krause, W., Lehmann, P., Lewandowski, J., Matthieß, T., Merz, N., Regel, S., and Werner, A. (2020). Manifesto corpus. version: 2020-5. WZB Berlin Social Science Center, Berlin.

McKenzie, D. (2017). When should you cluster standard errors? new wisdom from the econometrics oracle. *World Bank Blog, Available at: https://blogs.worldbank.org/impactevaluations/when-should-you-cluster-standard-errors-new-wisdom-econometrics-oracle*.

Mitchell, R. B. (2003). International environmental agreements: a survey of their features, formation, and effects. *Annual Review of Environment and Resources*, 28(1):429–461.

Mitchell, R. B., Andonova, L. B., Axelrod, M., Balsiger, J., Bernauer, T., Green, J. F., Hollway, J., Kim, R. E., and Morin, J.-F. (2020). What we know (and could know) about international environmental agreements. *Global Environmental Politics*, 20(1):103–121.

Mitchell, R. B. (2002-2020). International environmental agreements database project (version 2020.1). Available at: http://iea.uoregon.edu/.

Murdoch, J. C., Sandler, T., and Sargent, K. (1997). A tale of two collectives: sulphur versus nitrogen oxides emission reduction in europe. *Economica*, 64(254):281–301.

Neumayer, E. (2002a). Do democracies exhibit stronger international environmental commitment?: A cross-country analysis. *Journal of Peace Research*, 39(2):139–164.

Neumayer, E. (2002b). Does trade openness promote multilateral environmental cooperation? *World Economy*, 25(6):815–832.

Nordhaus, W. D. (1975). The political business cycle. *The Review of Economic Studies*, 42(2):169–190.

Nordhaus, W. D. (2019). Climate change: The ultimate challenge for economics +. *American Economic Review*, 109(6):1991–2014.

Payne, R. A. (1995). Freedom and the environment. *Journal of democracy*, 6(3):41–55.

Persson, T. and Tabellini, G. (2000). Political economics: explaining economic policy. zeuthen lecture book series. *The MIT Press*, 1(8):9.

Putnam, R. D. (1988). Diplomacy and domestic politics: the logic of two-level games. *International Organization*, 42(3):427–460.

Salant, S. W., Switzer, S., and Reynolds, R. J. (1983). Losses from horizontal merger: The effects of an exogenous change in industry structure on cournot-nash equilibrium. *The Quarterly Journal of Economics*, 98(2):185–199.

Samuelson, P. A. (1954). The pure theory of public expenditure. *The Review of Economics and Statistics*, 36(4):387–389.

Shi, M. and Svensson, J. (2006). Political budget cycles: Do they differ across countries and why? *Journal of Public Economics*, 90(8):1367–1389.

The World Bank Group (2020a). World development indicators, gdp per capita (constant 2015 usd), ny.gdp.pcap.kd. World Development Indicators. Available at: https://data.worldbank.org/indicator/NY.GDP.PCAP.KD?view=chart.

The World Bank Group (2020b). World development indicators, trade (% of gdp), ne.trd.gnfs.zs. World Development Indicators. Available at: https://data.worldbank.org/indicator/NE.EXP.GNFS.ZS?view=chart.

Volkens, A., Krause, W., Lehmann, P., Matthieß, T., Merz, N., Regel, S., and Weßels, B. (2019a). The manifesto project dataset - codebook. manifesto project (mrg / cmp / marpor). version 2019b. *Wissenschaftszentrum Berlin fur Sozialforschung (WZB).*

Volkens, A., Krause, W., Lehmann, P., Matthieß, T., Merz, N., Regel, S., and Weßels, B. (2019b). The manifesto project dataset - list of political parties. manifesto project (mrg / cmp / marpor). version 2019b. *Wissenschaftszentrum Berlin fur Sozialforschung (WZB).*

Wangler, L. and Altamirano-Cabrera, J.-C. (2011). The political economy of international environmental agreements: A survey. *IDEAS Working Paper Series from RePEc.*

Appendix

A1 Descriptive Statistics

A2 Analysis, Event Study with interaction terms

A3 Robustness Checks, IEA Inclusion

Table A1.1: Agreements by country

ifs	Agreements, MEA	Agreements, BEA	Agreements, total
AUS	317	49	366
AUT	311	4	315
BEL	389	5	394
CAN	314	74	388
CHE	376	12	388
CHL	292	5	297
CZE	331	14	345
DEU	360	43	403
DNK	403	8	411
ESP	393	7	400
EST	343	11	354
FIN	380	20	400
FRA	470	25	495
GBR	396	10	406
GRC	347	0	347
HUN	328	9	337
IRL	336	2	338
ISL	281	6	287
ISR	242	3	245
ITA	389	5	394
JPN	304	47	351
KOR	301	17	318
LTU	347	12	359
LUX	378	2	380
LVA	298	7	305
MEX	282	31	313
NLD	410	8	418
NOR	359	13	372
NZL	295	3	298
POL	360	18	378
PRT	360	4	364
SVK	337	3	340
SVN	374	6	380
SWE	362	16	378
TUR	247	6	253
USA	321	103	424

Table A1.2: Coverage and term length by country

ifs	# Elections	Term (should), years	Avrg term (real), years	System	Coverage
AUS	16	3	2.66	Parl.	1975-2016
AUT	13	4;5	3.51	Parl.	1975-2017
BEL	12	4	3.23	Parl.	1977-2014
CAN	12	5	3.09	Parl.	1979-2015
CHE	11	4	3.99	Parl.	1975-2015
CZE	8	4;5	3.67	Parl.	1992-2017
DEU	12	4	3.75	Parl.	1976-2017
DNK	15	4	2.83	Parl.	1975-2015
ESP	13	4	3.13	Parl.	1977-2016
EST	7	5	3.55	Ass. e. Pres.	1992-2015
FIN	11	4	3.91	Parl.	1975-2015
FRA	10	5	4.25	Parl.	1978-2017
GBR	10	5	4.22	Parl.	1979-2017
GRC	13	4;5	3.21	Parl.	1977-2015
HUN	7	4;5	4.02	Parl.	1990-2014
IRL	11	5	3.88	Parl.	1977-2016
ISL	13	4	3.13	Parl.	1978-2017
ISR	12	4	3.49	Parl.	1977-2015
ITA	11	5	3.60	Parl.	1976-2013
JPN	14	4	2.92	Parl.	1976-2014
KOR	7	5	4.01	Pres.	1992-2016
LTU	7	5	3.99	Pres.	1992-2016
LUX	8	5	4.92	Parl.	1979-2013
LVA	8	4	2.95	Parl.	1993-2014
MEX	14	6	2.99	Pres.	1976-2015
NLD	13	4	3.37	Parl.	1977-2017
NOR	11	4	4.00	Parl.	1977-2017
NZL	15	3	2.98	Parl.	1975-2017
POL	7	5	3.12	Pres.	1991-2011
PRT	15	4;5	2.76	Parl.	1975-2015
SVK	9	4	3.08	Parl.	1990-2016
SVN	8	5	3.36	Parl.	1990-2014
SWE	12	4	3.41	Parl.	1976-2014
TUR	10	5	4.48	Parl.	1977-2015
USA	11	4	4.00	Pres.	1976-2016

Table A2.1: Event study, interaction with post-election semester

VARIABLES	(1) log odds failure
pre3 semester	-0.0535
	(0.0470)
pre2 semester	-0.0397
	(0.0489)
post election	-0.108*
	(0.0640)
post election, interaction with gov. change	-0.0801
	(0.0844)
post election, interaction with env. change	0.00597
	(0.0747)
post election, interaction with gov. & env. change	0.351***
	(0.120)
gov. change	0.0948
	(0.0625)
env. preference change	0.0195
	(0.0572)
GDP semester	-6.15e-06**
	(2.97e-06)
Trade semester	0.0118***
	(0.00158)
Observations	45,326
r2_p	0.181

Robust standard errors in parentheses, clustered at agreement level
*** p<0.01, ** p<0.05, * p<0.1

Table A3.1: Heterogeneity & IEA Inclusion

VARIABLES	(1) MEA	(2) BEA
pre3 semester	-0.00802	-0.731
	(0.0463)	(0.599)
pre2 semester	-0.0366	0.504
	(0.0462)	(0.487)
election semester	-0.0889*	0.522
	(0.0470)	(0.457)
post2 semester	-0.0286	-0.411
	(0.0461)	(0.495)
post3 semester	0.0298	0.989**
	(0.0458)	(0.497)
GDP	-1.44e-05***	1.70e-05
	(2.43e-06)	(5.04e-05)
Trade	0.00951***	0.00735
	(0.00102)	(0.0195)
Constant	1.440	-0.519
	(1.257)	(3.678)
Observations	52,617	403
Country FE	YES	YES
Year FE	YES	YES
r2_p	0.0667	0.268

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1