

**DETERMINANTS OF INTERNATIONAL ENVIRONMENTAL
COOPERATION**

DOES NATIONAL ENGO STRENGTH FOSTER A COUNTRY'S INTERNATIONAL
ENVIRONMENTAL COMMITMENT?

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Abbreviations

CBD	Convention on Biological Diversity
CFC	Chlorofluorocarbon
CITES	Convention on International Trade of Endangered Species
CO ₂	Carbon Dioxide
EKC	Environmental Kuznets Curve
ENGO	Environmental Non-Governmental Organization
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organization
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GMO	Genetically Modified Organisms
HBCF	Hydrobromofluorocarbons
HCFC	Hydrochlorofluorocarbon
IEA	International Environmental Agreement
IUCN	International Union
NGO	Non-Governmental Organization
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Square
PIC	Prior Informed Consent
UNCCD	United Nations Convention to Combat Desertification
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environmental Program
UNFCCC	United Nations Framework Convention on Climate Change
UN	United Nations
WBI	World Bank Governance Indicators
WDI	World Development Indicators

This thesis examines the effect of domestic determinants on a country's international environmental commitment. It concentrates on the prevailing political system on the one hand and environmental pressure group strength on the other hand. I postulate that both, an increase in democracy as well as an upsurge of environmental lobby groups foster a country's international environmental commitment as measured by ratification delay of environmental agreements. A proportional hazard model is used in order to test the hypotheses empirically in a cross-country study on a variety of environmental topics. The results exhibit some support for the theoretically expected effects. Democracy as well as environmental pressure group strength tend to reduce ratification delay in four out of five agreements that are under study here. However, one treaty exhibits reverse effects, indicating that the relationship cannot be generalized on all international environmental problems alike.

1. Introduction

On February 18, 2005, the Kyoto Protocol entered into force more than seven years after being agreed on. The Protocol aims to stabilize global greenhouse gas emissions and to prevent further climate change. Seven years after being negotiated it became legally binding on its 128 parties (at that time) and demands industrialized countries to jointly reduce their greenhouse gas emissions to an amount 5% below 1990 levels until 2012 at latest. The Protocol's entry into force was rendered possible by Russia's decision to ratify the treaty in November 2004. "A period of uncertainty has closed", as the Executive Secretary of the Climate Change Secretariat Waller-Hunter has put it. After the United States under the Bush administration made clear that it will not pursue the pro Kyoto policy of former President Bill Clinton any further, but reject its ratification, it has long been doubtful whether international environmental cooperation would be sufficiently strong to permit the Protocol's entry into force at all. As most environmental agreements do, the Kyoto Protocol specified certain minimum participation requirements in order to become legally binding. Its effectiveness hence was contingent on the environmental commitment of the international community.

This thesis aims to analyze the determinants of international environmental cooperation. It argues that domestic aspects, namely democratic institutions as well as environmental pressure group strength contribute to a country's international environmental commitment. Political institutions set the frame for a government's accountability. In democracies political leaders are reliant on the support of a larger share of the population than in autocracies. Due to political and civil freedom the citizenry is enabled to voice environmental concerns and induce governmental response. In particular environmental interest groups aim to push policy-makers to more environmental commitment. These organizations possess knowledge and expertise which is valuable to policy-makers in the process of international cooperation. Hence they are granted access and face appropriate opportunities to lobby politicians. Since environmental topics appear to play an increasingly important role, policy-maker and environmental interest groups interact continuously, which in turn increases the credibility and potential influence of the lobby groups. Accordingly, the level of democracy as well as environmental interest group strength will have a positive impact on a country's environmental commitment.

The empirical analysis of this thesis hence assesses the effect of a country's level of democracy and environmental pressure group strength on its international environmental commit-

ment by measuring the country's ratification speed for several global agreements. The findings support the hypotheses to some extent. Both variables democracy and environmental pressure group strength seem to have a positive effect on commitment in four out of five agreements. In one case however, the results are contrary to what was expected.

In the following I will provide a brief introduction to the topic of environmental cooperation. The case of the Kyoto protocol can serve as an example illustrating the dilemma of international environmental cooperation: Climate stability as well as the ozone layer or biodiversity are natural resources that are shared internationally and fall under no authority. Neither their use nor access to it are restricted. Hence, no property right system exists in order to manage these resources. However, economic activity often triggers detrimental consequences to these resources. Climate change as well as ozone layer depletion or loss of biodiversity portray environmental problems that affect global society as a whole. Even though some countries may suffer more than others, the consequences are shared internationally. In order to protect the global natural resources society would have to limit its detrimental actions. However, a country that is willing to contribute to the protection of such a resource bears the full costs of its commitment, but has to share the corresponding profit also with those countries that refuse any action. Accordingly, sustainable management of these global public goods is hard to attain. Therefore, international environmental cooperation is needed in order to overcome this problem and to work out solutions. Agreements such as the Kyoto Protocol reveal the extent to which cooperation can be accomplished.

In order to identify strategies that foster environmental protection and sustainable development, political scientists as well as economists have increased their research effort remarkably during the last decade. How can international environmental cooperation be accomplished? What determines its success and progress? Are there systematic differences between countries with respect to their international environmental commitment? Apparently, some countries face higher obstacles than others, when they are asked to ratify treaties such as the Kyoto Protocol.

From the mid-1990s onwards an extensive debate about the relationship between growth and environmental progress emerged. A country's economic development is assumed to initially cause environmental degradation, though later on leading to an improved environmental quality. This relationship, portraying an inverted U-shape and known as 'environmental Kuznets curve', was subject to numerous studies. For the most part, these findings were empirical in nature, focusing on environmental outcomes such as levels of pollutants. Theoretical explana-

tions for the relationship were lacking behind. The results indicated that economic growth per se not necessarily leads to environmental degradation. But the underlying mechanisms to this relationship remained largely unveiled. Grossman and Krueger (1995), who were among the first to detect such a non-monotonic relationship pointed to the importance of the underlying causalities of the correlation. They argued, that “the strongest link between income and pollution in fact is via an induced policy-response” (Grossman and Krueger 1995: 372). As people become richer they extend their valuation of living conditions to non-material aspects and ask their governments for environmental commitment. This induced policy response, however, cannot be taken for granted. Later on in the debate Grossman and Krueger themselves pointed out, that economic growth alone will not assure environmental improvements. “If environmental improvements are mediated by changes in government policy, then growth and development cannot be a substitute for environmental policy. In the absence of vigilance and advocacy in each and every location, there is always the possibility that greater output will mean greater consumption of scarce resources” (Grossman and Krueger 1996: 120).

Argument developed in this thesis centers on the idea, that political systems as well as interest groups are central constituents of the notion of ‘vigilance and advocacy’. Previous research on this topic focuses predominantly on the statistical correlation between economic determinants and environmental quality. This thesis rather aims to put emphasis on underlying mechanisms that cause a country to exhibit environmental commitment. Although some research has already been devoted to the impact of democracy and pressure group strength with respect to environmental aspects, several constraints remain, which this study attempts to improve on. On the one hand, an attempt is made to identify the influence of environmental non governmental organizations (ENGOS) by analyzing their informative role. Existing research so far, has concentrated on formal modeling of environmental pressure groups influence by means of financial contributions. On the other hand, with respect to methodological aspects several modifications of previous studies have been carried out. Firstly, ratification rather than signature of environmental treaties will be examined. Whereas signing of an agreement merely expresses the willingness to continue the treaty-making process, ratification renders a country legally obliged to it. This allows more rigorous inferences to be drawn with respect to authentic commitment of a country. Secondly, panel data are utilized for regression analysis throughout. Previous work mostly ignored changes in environmental lobby group strength and levels of democracy during the period under consideration. As will be seen in the third chapter though, ENGO strength tends to vary significantly during the last 15 years, particularly in

Eastern Europe and Latin America. Hence, if these variations are not incorporated, one might fail to estimate the effect of the covariates correctly. Thirdly, the study takes into account international environmental commitment with respect to five essential and diverse environmental concerns. Most of the research carried out so far concentrated either on the Montreal Protocol or on the Kyoto Protocol. Results for one single subject can possibly not be generalized, though. Although the hypotheses of a positive impact of democracy and ENGO strength are largely supported here, the comparison of different agreements carried out in this study shows that the results do not hold true for all subjects of international environmental cooperation.

The subsequent chapters are structured as follows: At first, a survey on the literature evaluates previous studies on the topic (Chapter 2). Referring to the effects of democracy, most authors assess environmental outcomes. Only few articles examine its impact on environmental commitment. Results and differences between the two concepts are discussed (2.1). With respect to environmental pressure groups' impact, some studies assess lobbying quantitatively in the U.S. legislative process. The effect of ENGOs on policy-making regarding global environmental problems has been evaluated rather qualitatively by means of case studies. Both streams of literature, as well as formal theoretical models and empirical results will be considered thereafter (2.2). A review of articles that are particularly concerned with the ratification of international environmental agreements aims to report previous results and to identify methodological weaknesses of previous research (2.3). The subsequent chapter sets up the theoretical framework of this study (Chapter 3). An analysis of public goods and common property resources as well as remarks on international relations and environmental commitment clarifies the underlying concepts (3.1). Why and how different political systems as well as environmental pressure groups are expected to have a positive impact on international environmental commitment shall be illustrated in the two main sections (3.2 and 3.3). Concluding remarks (3.4) summarize the propositions and specify the two hypotheses to be tested in the following empirical analysis (chapter 4). After giving a brief overview over scope and findings of the analysis (4.1), the subsequent section portrays the different agreements and their associated environmental goals (4.2). An assessment of the explanatory variables particularly addresses the issue of different possible operationalizations and problems arising with the ENGO variable (4.3). Econometric attributes and the estimation technique of survival analysis is reviewed briefly (4.4) before turning to the regression results (4.5). Concluding remarks critically assess strengths and weaknesses and overall quality of the findings (4.6).

2. Literature Review

The central focus of this study lies on the domestic determinants of international environmental cooperation. It centers on the following argument: democracy as well as interest group strength are essential constituents, that will have an effect on a country's commitment to international environmental agreements. That is, more democratic countries and those with stronger environmental pressure groups are more prone to international environmental cooperation.

This chapter gives a survey on existing literature that takes into account the crucial individual parts of what will be examined later on in this study. Corresponding to the argument, the following three aspects will be subject to closer evaluation: Firstly, what role does a country's democratic development play with respect to environmental politics? Secondly, can interest group pressures be responsible for corresponding political decisions? Thirdly, when thinking about a country's commitment in terms of environmental treaty ratification, what elements have been found to be accountable for it? The former two aspects correspond to the main predictor variables of this study, whereas the latter one concentrates on the dependent variable. The following review of existing literature gives an overview over what has been covered in the field so far and what has been neglected. It takes account of central concepts, that have been developed and applied to explain environmental progress. All of the three aspects have been subject to debate and theoretical as well as empirical research, mostly though in different settings. To give an overview over the structure and content of this chapter, some crucial aspects of each category shall be pointed out briefly.

To begin with, most of the empirical literature examines how democracy influences environmental quality as measured by outcome indicators, such as levels of air pollution. These studies are largely motivated by the literature on the environmental Kuznets curve (EKC), which has already been mentioned in the introduction. Accordingly, a brief overview is given on the EKC, followed by a more detailed critique of particularly those studies, that link democracy and some indicators of environmental degradation.

Secondly, environmental pressure groups are just a special case of interest groups in general and a vast literature has been elaborated on that. In the following the terms of environmental pressure groups or interest groups will be treated as equivalent to environmental non-governmental organizations (ENGOS), since the latter one is the most common operationalization of the concept and most of the literature does not differentiate between the

zation of the concept and most of the literature does not differentiate between the three terms. To begin with, one has to differentiate between the stages at which ENGO exert influence on its government, which can be the global arena and the domestic level. Referring to the global arena, however, does not mean that lobbying necessarily takes place abroad. It rather concerns those situations, that are linked to the treaty-making process itself. Regional conferences or national consultations are considered, too. The literature on it often focuses on negotiation processes and relations among the actors in international politics. These case studies for example show in what ways environmental pressure groups are able to influence political decision-makers during conferences that prepare an international treaty. They are important to this study, since they point out factors by which ENGOs gain access to policy-makers. Empirical work that examines domestic lobbying is mostly based on case-studies dealing with policies that are unilateral in origin as well as in their impact, for example to what extent campaign contributions of green lobbies influence the Senate in coal mining legislation. These findings are of minor importance, as they are typically restricted to the political settings of the U.S. and particular topics that may not be comparable across countries. However, they indicate the degree to which environmental lobbying in fact is successful and shall be reviewed briefly.

However, not only empirical results, but also their underlying way of theoretical argumentation will be subject of discussion in order to identify the gap that shall be closed by the theoretical considerations employed here. Theoretical work that is based on formal models provides valuable insights on a variety of significant aspects: Largely based on the traditional public choice literature many models illustrate how self-interested policy-makers will choose a certain policy option. Moreover, competition between opposing lobbies are taken into account. Besides, the several means of lobbying such as dissemination of information or financial contributions are subject to theoretical explorations. However, with respect to environmental lobbying, only those models have been applied and further developed, that are based on financial contributions of interest groups rather than their informative role. Hence, they ignore an important function of interest groups by means of disseminating information and providing expertise. International environmental agreements require a lengthy process of preparation during which political decision makers and environmental interest groups communicate and the former often relies on the assistance of the latter. Accordingly, these groups have access to politicians and can establish themselves as influential lobbyists. In addition to mechanism of direct lobbying, some authors reflected on the possibility of ENGOs to indirectly exert influence, too. In order to give an overview over existing theoretical approaches, formal as well as non-formal contributions will be reviewed briefly.

Thirdly, as already noted, environmental quality being measured for example by emission outcomes may be contingent on other factors than those rooted in democracy. This is one of the reasons, why this study concentrates rather on environmental commitment as expressed by environmental treaty ratification instead. Those studies that already employed such an approach, however, contain some methodological weaknesses. For example they employ regression techniques that are based on a binary dependent variable, which means they base their conclusions on a country's decision to either participate in a treaty or not. Since most of the environmental treaties gain quasi-universal membership after some time, the results of these studies are based on the point in time at which data has been retrieved. At last, the data used here rely on ratification rather than signature of international agreements and employ panel data rather than covariates that are fixed over time. The former differentiation is of importance, since the signing of agreements does not pose any legal obligations on the party. Thus, ratification is a more suitable concept in order to measure environmental commitment. Utilization of panel data allows to cope with changes in the explanatory factors that occur over time.

With focus on the core questions of this thesis the above mentioned categories are covered to identify already existing approaches and state of the art research as well as missing elements and the gap that this thesis aims to fill. Accordingly, the remainder of this chapter is structured into three sections reviewing the relevant literature on the aforementioned categories: effects of democracy on environmental quality (2.1.), aspects of environmental special interest politics (2.2) and research that focused on the determinants of environmental commitment being measured by treaty ratification (2.3).

2.1 Democracy and environmental progress

Several studies examine the effect that democracy has on environmental quality. To a large extent these studies are motivated by an adjacent stream of literature, that centers around the relationship between economic growth and environmental degradation, which became known as 'environmental Kuznets curve' (EKC). The EKC derives its name from Simon Kuznets who studied the relationship between economic growth and income inequality. He postulated an inverted U-curve, indicating that inequality increases up to some level of economic development, but shrinks again later on (Kuznets 1955). With respect to the environment it main-

tains “that there exists an ‘inverted u-shaped’ relationship between a variety of indicators of environmental pollution or resource depletion and the level of per capita income” (Barbier 1997: 369). In other words, the relationship between environmental quality and economic growth is not fixed along different economic stages. Carbon Dioxide (CO₂) emissions for example may initially rise in a growing economy due to increasing output, but level off at some point of development and even fall thereafter. Possible reasons for the functional form are diverse and are discussed in more detail further below. The relationship has been subject to a variety of studies with sometimes inconsistent results. As Stern (2003) points out, it can not uniformly be applied to all pollutants or environmental impacts and some authors have even challenged the conception in general.¹ I will provide a brief introduction to this debate, since it serves as a starting point for the arguments that are pursued later on.

The reasoning of the EKC originated in two background papers in the early 1990s. Grossman and Krueger (1993) examined the consequences of economic growth accompanying the North American Free Trade Agreement on environmental degradation. Coming across air quality measures in a large cross country study for different years, they found a cubic N-normal shaped relationship between per capita income levels and some indicators of air pollution. That is, emissions tend to rise with GDP per capita initially. At some point of income, though, the curve turns its slope and begins to decline. There happened to be another turning point, which, however, was situated far outside from any realistic income levels. In a study prepared for the World Development Report 1992 Shafik and Bandyopadhyay (1992) included several environmental indicators and derived a quadratic U-shaped relationship for Carbon emissions, Sulfur Oxide emissions and annual rates of deforestation. It followed an intense research effort to further evaluate the robustness of these findings, leading to the Environmental Kuznets Curve hypothesis.²

The empirical results of the EKC research are usually based on a reduced form specification of the relationship. In other words, an environmental quality indicator, such as carbon dioxide (CO₂) emissions, is related to a measure of per capita income in a single-equation specification. Hence, the results do not allow to test any specific theoretical causalities, since income is considered as an all-purpose variable representing a variety of underlying causalities. The reason for the detected relationship may be grounded in different aspects, three of which are

¹ Stern (1998) and Stagl (1999) give an overview over existing literature on the EKC and different theoretical interpretations of the results. Stern (2003) focuses on econometric attributes and weaknesses that most of the literature suffers from.

² Panayotou (2000) summarizes the findings of some 34 articles on the subject.

usually considered to be most reasonable: Firstly, the composition of an economy may be altered, for example from an industry- to a more service-oriented structure. Consequently the 'scale effect' of a growing economy may be offset through less pollution intensive economic sectors (Panayotou 1997). Secondly, in the course of economic development abatement technologies may further improve and reduce environmental degradation (Selden and Song 1994). Thirdly, environmental quality may increase through more stringent policies that are pursued by the government. This approach is based on the idea of an induced policy response: with rising income levels, citizens are assumed to demand more environmental quality and hence the government will respond by means of stricter regulation (Grossman and Krueger 1991). However, due to the reduced form approach that relates income straightforward to environmental outcomes it can not be assessed to what extent the possible causalities in fact contribute to the shape of the EKC. "The ad hoc specifications and reduced form of these models turns them into a 'black box' that shrouds the underlying determinants of environmental quality and circumscribes their usefulness in policy formulation" (Panayotou 2000: 6). The findings rather display statistical significance than explaining the basic mechanisms that bring the relationship into being.

In order to open the black box and test the underlying causalities, several authors extended the basic EKC models and included additional explanatory variables. Panayotou (1997) focused on the impact of institutional aspects such as the protection of property rights or the enforcement of contracts on environmental quality. Suri and Chapman (1998) examined the effect of trade on environmental degradation. Most important to the argument of my study, several authors introduced measures of democracy in order to assess the effects of different political systems on environmental quality (Torras and Boyce 1998, Barrett and Graddy 2000). This approach focuses on the last of the three above mentioned underlying reasons for the environmental Kuznets curve. It aims to test whether the 'induced policy response', which Grossman and Krueger (1995) considered to be the "strongest link between income and pollution" is truly convincing. The authors claim, that "as nations or regions experience greater prosperity, their citizens demand that more attention be paid to the noneconomic aspects of their living conditions" (Grossman and Krueger 1995: 372). However, their argumentation is based on additional assumptions. In order to allow for rising demands, society has to be able to acquire information about the quality of its environment. In order to lead to better environmental protection, society also has to be able to articulate these demands. And finally, in order to translate into improving environmental quality, policy-makers have to respond to citizens'

demands by pursuing stricter regulation. In other words, if rising income levels in fact cause improving environmental quality by means of an induced policy response, the relationship is contingent on the existence of political rights and civil liberties, attributes that are commonly referred to as characteristics of democratic systems. While the vast array of literature on the EKC is of no further interest here, those studies that account for political institutions will be examined in more detail subsequently.

Torras and Boyce (1998) as well as Barrett and Graddy (2000) examine the effect of democracy on environmental quality, explicitly referring to the environmental Kuznets curve literature. Both of the articles draw on the panel data originally employed by Grossman and Krueger (1995). With respect to democracy, both studies are based on the index provided by Freedom House.

Torras and Boyce (1998) built an aggregate of the two variables 'civil liberties' and 'political rights' and ran ordinary least square regressions. Since the authors focused on power inequality in general, they included income inequality and literacy as additional proxies. In order to allow for possible differences in effects between low-income and high-income countries, they used a \$5000 per capita income as a dividing line and created dummy variables for high and low income countries. Democracy in general is found to be associated with environmental improvements, however stronger effects are present in low-income countries compared to the high-income group. The authors do not use time-varying democracy covariates, but rather base their results on the data reported for 1995. The dependent variables, comprise data between 1977 and 1988, however. Due to major changes in democratic developments for example in the transition economies of Eastern Europe in the 1990s though, using a democracy variable that is fixed over time falls short of displaying coherent correlations. Moreover, since environmental sound policies will have a measurable effect on environmental outcomes not before considerable time has passed, it would be rather reasonable to use a country's record on democracy some years before than some years after the emission levels have been composed.

Barrett and Graddy (2000) separated the effects of political and civil freedom and used grouped dummies for low, medium, and high freedom values. Using generalized least squares and fixed effects they derive similar results as Torras and Boyce (1998) do. Most of the environmental indicators show an improvement with rising levels of democracy, especially those measures that relate directly to human health. On the other hand, though, some measures of water pollution as displayed by the oxygen regime of rivers, are not significantly affected by

levels of democracy. Accordingly, Barrett and Graddy (2000) argue, that the promotion of political and civil freedom will in many cases foster an induced policy response as implied by the inverted U-shaped relationship. However, the results apparently can not be generalized on all areas of environmental quality.

In addition to the research mentioned so far, several other studies examined the effects of democracy on environmental outcomes, although referring less explicitly to the environmental Kuznets curve debate. Midlarsky (1998) assesses the relationship on six measures of environmental protection, based on the Freedom House democracy index as well. In line with Barrett and Graddy (2000) his results indicate, that democracy cannot be taken as undisputed assistant of environmental improvement. Multivariate OLS regression including standard control variables such as income, geographical aspects and demographic characteristics rather suppose a negative impact of democracy on environmental outcomes. Carbon dioxide emissions, soil erosion by water, and deforestation increase with levels of political freedom. Fresh water availability and soil erosion by chemicals show no significant dependence, and only protected land area is positively correlated with democracy. His findings, however, are not robust to alternative specifications with two additional measures of democracy.³ As Neumayer (2002b) points out, Midlarsky's results may suffer from misspecification. Including squared and cubic income per capita, as done in the standard EKC literature, renders the Polity variable insignificant. Scruggs (1998) examines the effect of income inequality on several indicators of environmental quality. He also includes the Freedom House democracy index and finds it not to be significant in three out of four measures. Only Sulfur Dioxide emissions are lower in more democratic countries. However, Scruggs derives his democracy variable by taking the average rating over 15 years rather than including time series data. Thus, his findings are subject to the same problems as Torras and Boyce' (1998) results.

Apparently, empirical evidence on a positive effect of democracy on environmental quality is mixed. Apart from criticism raised so far, that points out misspecification problems and democracy variables that are fixed over time, the studies suffer from an important theoretical drawback. Whereas the environmental Kuznets curve hypothesis tests the relationship between per capita income and levels of environmental indicators, we would expect democracy

³ Midlarsky also uses an index of liberal democracy developed by Bollen (1993) and the Polity III index compiled by Jagers and Gurr (1995). The three variables, though studying the same aspects differ considerably in significance.

to have an impact rather on reduction efforts or lower growth rates of emissions than on their absolute levels. As Neumayer (2002b: 144) notes with respect to carbon dioxide, not only economic growth but also the historical mix of primary energy types is essential in determining a country's level of CO₂ emissions. The same argument applies to structural determinants of other environmental indicators. Murdoch and Sandler's papers (1997a,b) are not subject to this problem, since they examine the reduction rates (or growth rates) of different air pollutants rather than their levels. In order to assess the reduction gains in the cooperative setting of the Montreal Protocol, Murdoch and Sandler (1997a) investigate the extent to which Chlorofluorocarbon (CFC) emissions have been reduced by member countries beforehand, that is between 1986 and 1989. While assessing the effect of national income as main predictor, they control for several taste parameters, one of which is political and civil freedom as measured by the Freedom House data. They show, that higher levels of democracy are significantly associated with larger CFC emission reductions. Analogous to their findings regarding CFC emissions Murdoch and Sandler (1997b) extend their research on cutbacks of sulfur emission prior to the 1985 Helsinki Protocol. They show that average reduction in emissions are significantly higher in countries that are free than in those that are unfree. 'Free' and 'unfree' are based again on the democracy proxy by Freedom House. According to their rating, countries are grouped into the two fractions. Due to the scope of the Helsinki Protocol, however, the sample is restricted to European countries only. Compared to political systems that exist throughout other continents the European countries are highly congruent in their democratic development. Hence, even though they controlled for different levels of democratic institutions and found this covariate to have a significant effect, this study does not allow for generalization.

As Neumayer (2002b: 144) pointed out, the "more general problem with much of the empirical literature is, that it focuses too much on environmental outcomes instead of looking at environmental commitment". Some exceptions exist, most of them studying the participation in international environmental agreements. Since these articles are the ones that come closest to the question raised here, I devote a special section to review their results and examine methodological questions in more detail, at the end of the chapter (2.3). Beforehand, existing literature on the second key concept, which is environmental pressure groups' impact shall be evaluated in more detail.

2.2 Special interest politics and environmental lobbying

While empirical as well as theoretical literature on special interest politics per se is vast, studies about environmental interest group pressures are limited.⁴ Within the field of environmental politics, the share with empirical focus on the one hand is mostly made of studies, that evaluate the domestic influence of ENGOs for example on decision-making in the U.S. Congress. Some research effort also focuses on the role of environmental interest groups in the preparation and negotiation of international environmental agreements. Theoretical literature that employ formal models on the other hand has been applied within the last few years in order to assess the influence of lobbying on environmental policies such as pollution taxes and to some extent also treaty ratification. Both streams shall be evaluated in the following.

2.2.1 Theoretical approaches to environmental lobbying

Theoretical literature on interest group politics that develops formal models, relies upon rigorous assumptions and detailed information about the actors' preferences and utility functions. Accordingly, it provides precise insights into mechanisms of lobbying. With respect to environmental aspects, research on the effects of lobbying is scarce. Those studies that do exist, put emphasis on policy outcomes. Fredriksson (1997) shows that the level of a pollution tax rate hinges not only on the government's weighing of social aggregate welfare relative to campaign contributions but also on lobbying group size. Particularly, when environmental and industry interests compete, the pollution tax rate which is set by the government increases in environmental lobby group membership, dependent on the government's valuation of the lobby group's marginal disutility from pollution. Aidt (1998) concentrates on the notion, that different lobby groups give voice to different aspects of environmental policy and as a result more aspects are considered in the political trade-off. His findings reveal that competition between lobby groups drives the internalization of economic externalities. That is, environmental interest groups succeed in lobbying a more favorable tax policy. Conconi (2003) extends the question of environmental lobbying effects on pollution taxation by the inclusion of a second country. In contrast to the first two studies, now the results turn to be mixed, as they are conditional on the prevailing trade regime. Only when policy-makers are able to impose

⁴ Potters and Sloof (1996) offer an overview over empirical studies on interest groups. Van Winden (2003) evaluates formal theoretical models and gives a thorough summary of applications

import tariffs or to set taxes cooperatively, environmental lobby groups are capable of creating a bias towards higher pollution taxes.

Fredriksson et al. (2005) and Fredriksson and Ujhelyi (2004) theoretically analyze the effect of environmental lobbying contingent on the level of political participation and competition and on the presence of institutional barriers. These articles find, that environmental lobby group strength indeed has an impact. However, the effect is governed by the interaction with respective covariates. Whereas the first argument refers to the stringency of environmental policies, the latter one, most important to the argument in my study, examines the probability with which countries will ratify international environmental agreements. Fredriksson and Ujhelyi (2004) develop a model predicting that rising numbers of government units, such as the number of legislative bodies, reduce the positive effect that environmental lobbying has on treaty participation. Both studies find empirical support for their propositions, which will be evaluated further below when turning to empirical findings. In order to account for these conclusions, I include two variables in the empirical model that control for the number of government units and the political competition respectively. With respect to the lobbying activity, these studies follow the concept of common agency games in order to estimate the effect that lobby groups have.⁵ The policy outcome maximizes the joint welfare of each lobby (business and environmental interests) and of the incumbent government. The government's objective function is made of the level of aggregate social welfare on the one hand and financial contributions on the other hand. Hence, formal theory building on the impact of environmental interest groups accounts for financial means, such as campaign contributions. However, it neglects the second instrument, by which interest groups typically pursue their goals: the transmission of information. This shortcoming should not stem from the absence of formal models, which comprise the informative role of interest groups.⁶ It may be rather a result of the reasonable objective to keep theory simple. Yet, as I will argue below, in the case of environmental interest groups it is of importance to concentrate especially on the dissemination of information.

Theoretical approaches that focus on the informative role of environmental interest groups in fact have been developed, though exclusively in a non-formal fashion. Mostly theory empha-

⁵ These models are based on the menu auction game developed by Bernheim and Whinston (1986) and applied by Grossman and Helpman (1994, 2001). The basic idea is that the government is auctioning off a policy and the lobbies are like bidders. Each of the bidders offers a menu which specifies a payment in exchange for a policy outcome.

⁶ Austin-Smith (1993) as well as Ainsworth and Sened (1993) develop formal approaches that point to the importance of lobbying for the dissemination of information to policy-makers.

sizes the role that ENGOs play in the preparation, the agenda-setting, and the negotiation of international agreements. Betsill and Corell (2001) develop a framework that aims to evaluate the influence of ENGOs in the sphere of negotiations of international environmental agreements. By identifying the intentional transmission of information by ENGOs on the one hand and the induced outcomes and processes on the other hand, they intend to single out the effects that ENGOs in fact have on state behavior and negotiations outcome. This framework, implicitly asks for and can be tested by qualitative research, though, as only data sources like documents, interviews, and observation will provide the researcher with the data he relies on. Princen and Finger (1994) focuses on negotiations for IEAs as well, when analyzing the capabilities of ENGOs regarding the provision and dissemination of information. His thoughts point to a niche in environmental diplomacy that interest groups have created and are able to fill: By drawing attention to the issues at stake through public relations, by enhancing the transparency of state actors, by articulating local public opinion, and by building expertise in areas that diplomats tend to ignore, ENGOs especially influence states during negotiations at the international level. Unfortunately, little research has been done with respect to the last step in environmental pressure groups activities, which is to ultimately persuade policy-makers to ratify the treaties they have formerly negotiated. Nevertheless, these studies clearly point to the importance that environmental interest groups have gained with respect to the ratification of international environmental agreements.

In a slightly different vein arguments have been put forward that ENGOs might severely influence environmental policy-making in indirect forms of political activism. Van der Heijden (2002) considers the possibility that interest groups even take over features originally belonging to political parties. Functions such as mass mobilization, articulation of interests, and voicing demands, for instance, are administered increasingly by ENGOs. The degree to which citizens are organized within such groups has been surpassed the level of party-members in many countries.⁷ Environmental groups may be particularly capable of dealing with global environmental problems, since they do not have to consider country-specific interests. Hence, they will seek to pressure policy-makers to undertake environmental action. However, the author also points to the limits of ENGO impact: "They have taken over, and are able to fulfill most of the functions originally belonging to political parties, but as they are not part of the

⁷ Van der Heijden (2002: 192) gives figures for the United States and several European countries. In the European Union as a whole, the membership in environmental NGOs amounts to 15 million people opposed to about ten million members of traditional parties.

state they cannot play the most essential party role, that is, the governmental role” (Van der Heijden 2002:199).

Wapner (2002) explores the cultural dimension of environmental interest groups and illustrates how they can change values and norms in society. In contrast to pressuring governments directly, ENGOs may exert influence on environmental policy-making in an indirect form as well, for example by strategic actions against or aligned with economic actors, hence, by creating public ‘ecological sensibility’. The author points to the weight of states, which remain to be the most important actors in world politics since they have the ultimate means to shape the behavior of their citizens through either persuasion or coercion. However, environmental interest groups are aware of this fact and devote much of their capacities to pressure policy-makers to support environmental protection. Additionally, these groups aim to change economic activity. Due to their capability to deploy media coverage and organize actions against particular economic targets, they are able to force industries to reconsider their strategies and engage in environmental commitment. Most importantly, though, environmental interest groups seek to shape public opinion itself. “In addition to states and firms, NGOs try to persuade ordinary citizens throughout the world to care about, and take action to protect, environmental well-being. Such actions involves not only educating people about given problems but also engaging widespread value systems and cultivating new understandings of personal identity. NGOs attempt, in other words, to disseminate an ‘ecological sensibility’ among all people in the hope that this will inspire many to act more responsibly toward the environment. This type of action forms the bulk of their cultural politics.” (Wapner 2002: 46).

The theories presented by Van der Heijden (2002) and Wapner (2002) can contribute to the question raised here in the following ways: For one reason, it is essential what kind of functions ENGOs perform and how well they fulfill this task. The articulation of interests and the mobilization and communication with constituencies are crucial factors for the argument that can be drawn from Van der Heijden’s (2002) considerations. For another reason, Wapner (2002) concentrates on cultural change induced by ENGOs in general. With respect to global campaigns that have been mounted by transnational environmental interest groups, the share of domestic pressure groups’ affiliation within this campaign is hardly computable. Nevertheless it will be worthwhile seeking to sort out those mechanisms that are valid for local ENGOs that influence a government’s decision-making process.

Having concentrated on theoretical research so far, I turn to studies that empirically tested some of these predictions in the next paragraph. Two major streams have to be distinguished. On the one hand quantitative studies focus on either emissions or policy and regulatory out-

comes that are restricted to the domestic level. On the other hand several qualitative studies focus on the impact that environmental pressure groups have on a government's stand on environmental topics that are of global concern.

2.2.2 Empirical results of environmental special interest politics

There are only very few cross country studies that empirically tested the effects of environmental lobbying. One of them will be covered in the final section. In addition, Binder and Neumayer (2005) examine the impact that ENGOs have on air pollution levels, by employing a time-series regression analysis. Their variable on ENGOs is taken from the 2001 edition of the World Environment Encyclopedia and Directory, which is the same source that has been employed for this study. Since their years of concern cover the time span from 1977 to 1988, however, problems arise with respect to the founding dates of the environmental groups. By carrying out supplementary research the authors sought to identify those groups that have been founded before 1977 but ceased to exist before the Directory was published. In order to check the robustness of their results, they additionally employed an instrumental variable (IV) approach, using variables that measure the strength of civil society strength in general as instrument variables. They find significant influence of pressure group strength on Sulfur Dioxide, smoke and heavy particulates. The results are robust to OLS regression with random effects and the IV estimation. Although the study includes industrialized as well as less developed countries, its sample covers only 17-35 countries, dependent on model specification. The analysis carried out here, expands the sample up to 175 countries and aims to derive more reliable results. Binder and Neumayer's (2005) study, however, is subject to the similar theoretical problem that has been identified in many of the above mentioned studies that link democracy and environmental outcomes. The authors argue, that environmental pressure groups play a strong role in determining environmental policy. By focusing on environmental outcomes, however, they in fact skip the stage of policy-making and implicitly assume, that it has been political regulation that causes emissions to decline. They hence, indicate, that environmental interest groups are able to raise a country's environmental commitment in the first place, which in turn translates into rising environmental quality.

This underlying relationship is subject to the study by Fredriksson et al. (2005), whose theoretical approach has already been mentioned. It appears to be the only study to date, that empirically examines the effects of environmental lobbying on policy outcomes across 72 developing and 22 OECD countries. The authors regress environmental pressure group strength as

well as political competition and political participation on environmental policy stringency measured by the lead content of gasoline. The results are consistent with their theoretical model, predicting that an increase in pressure group strength has a positive effect on environmental policy strictness. In other words, the higher the number of ENGOs in a country, the lower the lead content of gasoline. These findings suggest, that the causality between lobbying and environmental quality as suggested by Binder and Neumayer (2005) indeed holds true.

Apart from cross-country research, several quantitative studies have been conducted considering environmental interest groups and their impact on particular topics of legislation. Research focuses mostly on voting outcomes in US House or Senate. Coal-strip mining regulation has been subject to two independent studies. Kalt and Zupan (1984) focused on the question, to what extent altruistic and publicly interested goals of rational policy-makers play a role in determining legislative outcomes in U.S. Senate. They found membership in environmental interest groups to have influenced the voting decision, although only weakly. In addition, Durden et al. (1991) derive similar results. Voting on coal-strip mining bills and amendments, this time examined in the U.S. House of Representatives, seemed to be affected by the respective contributions of different interest groups. Environmental as well as business groups had the theoretically predicted impact. The results indicate contributions of environmental groups to have influenced the legislators to a greater extent than those of the mining industry lobby. Compared to other groups' influence (such as conservative or liberal supporters), however, ENGO influence remains below average. Fowler and Shaiko (1987) put the accent on grass root lobbying techniques and their effect on legislation in the U.S. Senate. The results in general support the positive impact of ENGO lobbying on environmental policies. Yet, out of five different bills that have been analyzed, only one proved to be statistically significant. Moreover, the authors do not control for opposing interest group's influence.

Differently though in a study on pesticide use in the U.S., carried out by Cropper et al. (1992) who take opposing interest groups into account. Substantial evidence for environmental as well as industry's lobbying impact on regulation has been found. Their probit regression results indicate that decisions on pesticide cancellations by the U.S. Environmental Protection Agency (EPA) have been significantly influenced by special interest groups. The authors at first examine how risks to human health or the environment on the one hand and benefits to manufacturer, farmer, or consumer on the other hand have an effect on EPA's decision whether or not to cancel a particular pesticide. Even though they find, that EPA is indeed ca-

pable of weighing risks and benefits in their decision-making process, interest group intervention appears to be another important factor. Cropper et al. used dummy variables if either environmental groups or grower organizations commented on the topic during the regulatory process. Participation by the former significantly increases the probability of cancellation, whereas participation by the latter reduces cancellation probability. Moreover the study points to the particular stages during which lobbying takes place. Whereas the grower lobby tends to take action after a cancellation has been proposed, the environmental lobby seeks to influence policy-makers beforehand. "By exerting influence before as well as during the public comment period, environmental groups may actually increase the chances of a proposed cancellation" (Cropper et al. 1992: 193).

To summarize, quantitative studies find some support for a positive effect of environmental lobbying on environmental aspects. Those studies that assess legislation in U.S. politics report results consistent with the hypothesis, but are rarely significant in their effect. Cross country comparisons are limited to only two studies, both of them however finding environmental interest group strength to be positively correlated with environmental outcomes or environmental regulations respectively.

Research on ENGOs impact on policy-making based on case studies instead has been carried out on a variety of aspects and included countries with different political systems. Scholars scrutinized the different settings in which interest groups have been successful or unsuccessful in pressuring policy-makers regarding environmental problems. Several studies deal with environmental interest groups impact on topics that may be of domestic origin but are global in scope. Mostly, though, these studies consider the effect of ENGOs on the negotiations itself rather than their lobbying of policy-makers to ultimately ratify the particular treaty. Nevertheless, they provide insight into resources of these groups and the methods by which they gain access to policy-makers. Some results shall be mentioned briefly.

Stairs and Taylor (1992) review the process of international law-making in the case of waste disposal at sea. ENGOs gained access to policy-makers throughout the treaty-making process, especially due to their technical knowledge. Similar evidence is found by Corell and Betsill (2002), who study the negotiations on the Convention to Combat Desertification (UNCCD) and on the Kyoto Protocol. With respect to the influence of ENGOs, they point out the importance of technical expertise as well. Insights into local and traditional development tasks in the case of UNCCD and special knowledge on sinks and emission trading in the case of Kyoto, assisted policy-makers throughout the process. Moreover, environmental pressure

groups appeared to become influential due to their impact on public opinion. “NGOs were seen as the people’s voice and shapers of public views about climate change and the appropriateness of governmental responses. Thus governments paid attention to how they were portrayed by NGOs” (2002: 95).

Focusing less on the different means by which environmental interest groups gain access to policy-makers, but rather on their effort to make the government take action, the following case studies present evidence from lobbying in different countries. Hurrell (1992) studied the impact of NGOs on the Brazilian government to fight Amazonian deforestation. The growth of grass root organizations, conservation movements, and ecological groups created awareness of the problem among public opinion and policy-makers alike. In general, however, the shift of government policy in order to more effectively address the problem was assisted to a large extent by external pressures, rendering the domestic determinants less important. Supported by external environmental groups to a minor extent have been lobbying efforts against a water engineering project in the wetlands of the Okavango delta in Botswana. Thomas (2003) examines how NGOs succeeded in halting the project, despite having been part of national development policy. An accountable multiparty system as well as the lack of major economic stakeholders appeared to strengthen the impact of environmental interests. Moreover he points to the ability of NGOs to complement government’s expertise, their credibility, and the international character of the topic as crucial factors. In their study on the influence of social capital on a Community Forestry Bill in Thailand, Birner and Wittmer (2003) find environmental lobbying to have significant impact on legislation. In a controversy about forestry policy, environmental interest groups made use of several means to pressure policy-maker to vote on their draft. The NGOs put forward their goal by establishing a network among the committed groups and bundling their forces, by lobbying member of parliaments directly and by building alliances with academics and disseminating scientific knowledge to the public.

These studies deal with environmental issues that arise on the local level, which however are of international interest because of the global effects of deforestation and biological diversity. Accordingly, some of the NGO impact has been a co-product of domestic pressure groups on the one hand and efforts from foreign NGOs on the other hand. Although the task of this thesis is to focus on the former effect alone, the arguments are valuable here nevertheless, since local groups remain crucial in running the lobbying actions.

As explained in the last two paragraphs empirical results back theoretical considerations, suggesting that environmental interest groups are capable of determining environmental policy-making to some extent. Magnitude and means of lobbying differ with respect to the field of research. When environmental problems are of global concern, the case studies indicate, that environmental groups are able to lobby policy-makers throughout the policy-formulation process. Since government officials rely on knowledge and expertise, environmental groups gain access and are capable of exerting direct influence. These findings are consistent with the theoretical considerations of Betsill and Corell (2002) as well as Finger and Princen (1994), who reflect on direct means of lobbying in the realm of international environmental agreements. The indirect impact by taking over functions that formerly have been held by political parties as suggested by Van der Heijden (2002) or by working towards a cultural change to 'ecological sensibility' as claimed by Wapner (2002), may play a role, too. Finally, I will now turn to those studies that also examined the participation in international environmental agreements.

2.3 Focus on environmental commitment

As stated earlier, linking democracy or environmental lobbying directly to environmental outcomes gives rise to the following theoretical problem. Often these outcomes are contingent on other factors but democracy and no clear statistical relationship can be established. Hence, some authors focused on environmental commitment instead, by analyzing ratification of international environmental treaties. Although international environmental agreements have been subject to several empirical cross-country studies, no attempt has been made so far to systematically incorporate the effects of democracy and lobbying on countries' decisions with respect to different topics. To date, the Kyoto Protocol seems to be the only agreement that has been scrutinized in a fashion similar to the one proposed here. Other treaties have been either neglected or analyzed with different theoretical or methodological approaches. Nevertheless these studies contribute to my thesis in several ways. In order to point out the features in which this study differs from earlier ones, some central variations will be illustrated in the following.

Neumayer (2002b) provides a thorough evaluation of the relationship between democracy and environmental commitment and is the only exception extending the scope beyond ratification of environmental treaties, by proposing four additional measures of environmental commitment: Membership in environmental intergovernmental organizations, the percentage of land under protection status, availability of environmentally relevant information and finally the rate of compliance with treaty requirements. His results support the hypothesis that a country's environmental commitment tends to increase with its democratic development. However, some restrictions to his study remain. The author does only control for income and population in his regression analysis. As has been mentioned earlier, theoretical and empirical findings suggest that additional control variables such as the number of government units involved in the policy-making process are likely to have an impact on the ratification choice of a country. Moreover, the study does not distinguish between signature and ratification. The former event however is merely a symbol of a country's intention to go on with the treaty-making process. It does not pose any legal obligations on the party, whereas ratification does.⁸ Finally, the probit model employed by Neumayer (2002b) analyzes the probability of a country's commitment coded as a dichotomous choice. It therefore serves as a review of a certain point in time, however, it neglects differences in ratification delay between those countries that already ratified.

This criticism is further examined by referring to two other studies that analyzed the effects of democracy on environmental treaty ratification with similar regression techniques. Congleton (1992) and Beron et al (2003) carried out logit or probit regressions and therefore focused on the event, rather than on the timing of ratification. This has some disadvantages: many environmental treaties gradually gain more and more members. It therefore depends on the point in time that has been chosen to analyze membership. This is especially misleading in cases where the agreement on the long run achieves almost universal coverage. Congleton (1992) for example based his study on data regarding the Montreal Protocol from 1988 and would probably come to different results when repeating the analysis with data from today.⁹ Beron et al. (2003), who examine the Montreal Protocol, too, put their limit deliberately on countries that became member before 1990 in order to account for early ratification. Moreover, when

⁸ Certainly one can argue, that ratification does not guarantee compliance either, since no international authority with suitable enforcement capacities exist. Nevertheless, the costs of non-compliance will be higher when legally bound to a treaty than without any such liability.

⁹ As Neumayer (2002b: 143) points out, Congleton's results might suffer from another problem: In the case of the Montreal Protocol, it were mostly developed countries that decided to take action in order to halt ozone depletion caused largely by their own. Accordingly, the sample of 28 countries, 19 of which were developed, was likely to be biased.

being capable of taking the timing of ratification decisions into account, one ignores valuable information by only considering the result of a binary choice.

Therefore, Fredriksson and Gaston (2000) as well as Neumayer (2002a) employed proportional hazard models in order to make use of the additional information available by the time that has elapsed until participation. The former analyzes membership in the Framework Convention on Climate Change whereas the latter studied participation in treaties on endangered species, biological diversity and ozone layer depletion.¹⁰ Both studies found, that democracy has a significant impact on ratification delay. That is, more democratic countries are likely to ratify faster than less democratic countries. Fredriksson and Gaston (2000) included a set of different control variables, of which only total CO₂ emission gained significance though. Neumayer entered trade specific control variables and found some evidence for trade openness to promote international environmental cooperation. Neither of the two studies, however, employed panel data or examined the influence of environmental pressure groups, an approach taken by Fredriksson and Ujhelyi (2004).

The authors examine the effects that democracy as well as pressure groups have on Kyoto ratification. They use a lobby group model that incorporates both environmental and business interests. However, the effect of the lobby groups has been tested jointly with political institutional arrangements. The effects of ENGOs became significant only when interaction terms were included in the model. In contrast to the dataset employed here, however, the ENGO variable is measured in one way only and is fixed over time. Paralleling the criticisms on a fixed democracy variable, the same problems arise in the article of Fredriksson and Ujhelyi (2004) with respect to environmental pressure group strength. Using data of the key predictor for one year only leads to wrongly estimated coefficients in survival models if the independent variable actually changes over time. This seems to apply in the case of ENGO strength, as the empirical results will reveal.¹¹ The environmental lobby appeared to have increased during the last 15 years especially in Eastern Europe. On the other hand, many countries in Latin America experienced a decline in ENGO numbers. With respect to the impact of democracy, Fredriksson and Ujhelyi's (2004) findings are consistent with the propositions of many EKC studies mentioned earlier. The effect of democracy was positive and reliably significant in all model specifications, matching the results of previous articles on environmental treaty ratification mentioned above.

¹⁰ The 1992 United Nations Framework Climate Change Convention (UNFCCC) preceded the Kyoto Protocol; the 1992 Convention on Biological Diversity (CBD) was amended by the Cartagena Protocol. The Kyoto as well as Cartagena Protocol are subject to analysis here.

¹¹ See Table 1 on page 57

The key findings of this literature review shall be recapitulated briefly. Firstly, those studies that examined a relationship between democracy and environmental politics have largely focused on outcomes as the dependent variable, such as emission levels. Their empirical findings are mixed, pointing to theoretical difficulties when assuming environmental policies to translate into outcomes instantly. Secondly, environmental pressure groups have been theoretically claimed as well as empirically found to be capable of exerting influence on environmental politics. However, cross country empirical evidence is very limited. Moreover, no attempt has been made to theoretically explain the mechanisms through which interest groups are able to pressure policy-makers to exhibit international environmental commitment by ratifying corresponding agreements. Thirdly, ratification of international environmental treaties has been analyzed to some extent, finding support for the positive impact of democracy on international environmental cooperation. The effect of environmental pressure group strength has been analyzed with respect to Kyoto only, having ignored however the changes of environmental lobby strength over time.

This study aims to build on the existing research by extending theoretical arguments to international environmental commitment, proposing a positive effect of democracy on the one hand and environmental pressure group strength on the other hand on a country's international environmental commitment. The empirical analysis seeks to improve on previous studies, by taking into account a country's ratification delay, changes of environmental pressure group strength over time, and extending the scope to a variety of different environmental topics subject to global concern.

3. Theory

International environmental agreements such as the Kyoto Protocol enter into force, despite compelling reasons that let assume us otherwise: it is by no means obvious, why one country should commit itself to protect a common good, while others lean back and make a profit. No global institution exists, that is empowered to force the international community to take action. Hence, one may argue, that any such agreement has to be self-enforcing due to its voluntary nature. As a result it will include only lax provisions. According to this logic, the treaty will neither contribute substantially to environmental improvement nor impede on any member country's interests. Why then, if there was nothing to fear from such an agreement, is it that some countries still choose to stay away from it? Put it another way, let's assume the opposite for a moment. That is, the costs for a country accruing from such an agreement may be substantially. Why then, in turn, is it that some countries still choose to enter into such agreements? Obviously some countries weigh the costs of certain international agreements differently than others.

This study focuses on the impact of domestic determinants on a country's attitude towards international environmental cooperation. It takes a country's decision whether or not to become a member in an international environmental agreement as a surrogate for this attitude. Hereby ratification delay serves as a tool to measure the extent of environmental commitment. The commitment is assumed to be the higher the more rapidly a country ratifies such an agreement.

I postulate that both, the level of democracy as well as pressure group strength are crucial contributors to a policy-maker's decision to approve or reject such an agreement. In democratic countries political leaders rely on the support of a larger share of the population compared to autocratic countries. Hence, in order to get re-elected, democratic leaders will put more weight on the provision of goods that serve large shares of society than autocratic leaders. Moreover, democratic systems provide the population with civil liberties and political accountability that secures a stronger emergence of public voice and a higher degree of governmental response to environmental interests. Additionally, autocratic political leaders tend to undervalue the consequences of environmental measures due to their shorter time horizon. Thus, democratic countries are more willing to provide public goods such as environmental protection than non-democratic countries.

Furthermore environmental interest groups are able to influence this choice. Members of these organizations jointly pursue environmental goals and aim to alter political decisions in a direction more favorable to them. Environmental lobbying takes place in two ways. On the one hand, environmental interest groups raise public awareness of environmental problems and foster the demand of the citizenry towards environmental sound policies. On the other hand, lobbyists directly access policy-makers to disseminate information on future benefits which would arise from environmental commitment. This logic rests on the notion, that the costs arising from environmental harmful activities are not fully taken into account by policy-makers. For this reason, environmental lobbyists aim to provide them with additional information, pointing to the need to take action. Since policy-makers know about the expertise of environmental interest groups they grant them access. Due to the increasing relevance of environmental problems, the interaction between lobbyists and policy-makers intensifies. Hence, the former has an incentive to reveal true information, rendering the latter more probable to rely on it. Consequently, both levels of democracy as well as environmental pressure group strength are assumed to be decisive determinants of international environmental commitment.

In order to develop the arguments, I first concentrate on the issue of international environmental cooperation and the properties of global public goods. Agreements such as the Kyoto Protocol deal with natural resources that are often referred to as the “global commons” and are subject to collective action problems. Hence a country’s international environmental commitment may be explained by aspects of international relations and power structures (3.1). Yet, as I will argue, these approaches only offer limited insights, indicating that domestic constraints remain crucial in a country’s decision-making process (3.1.1). Since most of the research to date has focused on environmental outcomes such as pollution levels rather than environmental commitment like treaty ratification, it follows a brief theoretical contention why this study focuses on the latter instead (3.1.2). Thereafter the main arguments are developed with respect to democracy (3.2) and environmental pressure group impact (3.3). Concluding remarks summarize the theoretical considerations and subsume the hypotheses to be tested in the following empirical analysis.

3.1 The problem of international environmental cooperation

Theory of international environmental cooperation begins with studying the problem of natural resources and its management. International environmental agreements (IEAs) typically refer to global natural resources. For instance, the “Copenhagen Amendment to the Montreal Protocol” aims to protect the Ozone layer, whereas the “Cartagena Protocol on Biosafety” focuses on the protection of biological diversity. Both of them, as does the largest part of international environmental agreements, deal with the “global commons”: resources that are shared internationally. When thinking about the ownership and management of resources, economists refer to property rights as a system of rules governing their use. Environmental resources that fall under either private or public ownership, can be managed by such a system. However, as the case of the ozone layer or biodiversity demonstrate, there are also environmental resources that do not fall under any ownership at all. Since neither use nor membership are restricted and they are shared internationally, the global commons are a special case of public goods.

Public goods are characterized by two distinguishing features: Firstly, these goods are not restricted in consumption, that is they are non-rival. Secondly, once provided, no one is excluded from the benefits of these goods, that is, they are non-excludable (Samuelson 1954, 1955). For example, the chemical industry may reduce its consumption of ozone depleting substances by using less damaging substitutes. If a particular firm decides to do so, it contributes to the conservation of the ozone layer and its employees profit from less UV radiation. Since the employees’ share of benefits does not diminish the amount of benefits remaining to anybody else, protection of the ozone layer is nonrival. Moreover, since the employees of other firms benefit from less UV radiation as well, the good is non-excludable. The latter attribute gives rise to the free-rider problem (Olson 1965). Since the public good can be consumed anyway, regardless of whether one had contributed to its provision or not, competitors of the firm have the incentive to free ride. Due to these characteristics, public goods are subject to market failures and will not be provided efficiently. A ‘social planner’, that is the government of a country has to choose the level of public goods provision and enforce corresponding regulation.

However, public good problems are not limited to national boundaries. As the case of ozone layer protection illustrates, the public good is non-rival and non-excludable in a global sense as well. If some countries decide to contribute to ozone layer protection, they are not able to exclude other countries from benefiting, too. Apparently, the social planner on a global level

does not exist.¹² Therefore IEAs deal with open access resources for which no property system exists as long as no external authority is capable of establishing and enforcing it. As Grafton et al. (2004 :249) emphasize, it is this lack of an external authority that distinguishes the global commons from other common property resources. Whenever resources cross national boundaries (as in the case of the ozone layer) or the externalities associated with their use (as in the case of both ozone layer and biodiversity) free-riding on the international arena may become a problem.

By describing the “Tragedy of the Commons” Hardin (1968) illustrated the logic of overexploitation that likewise applies to the ozone layer.¹³ Individual firms or countries have no incentive to voluntarily reduce their use of ozone depleting substances as it results in higher costs than benefits unless all engage in similar behavior. Still, some countries choose to participate in international environmental agreements. One may argue, that they do suffer more with respect to a special treaty than others do. There is certainly more economic harm imminent for the US and its industries when ratifying Kyoto than for the tourism centered island state of Cyprus. But how can we account for Canada’s decision to ratify Kyoto, as a large share of its industries directly has to compete with their US counterparts and therefore strictly opposes the costly provisions of Kyoto? What about Germany’s decision to sign the Rotterdam Convention with its restraining provision for chemical industries?¹⁴

3.1.1 Remarks on international relations and domestic aspects

In fact there are numerous theoretical paths giving explanations for countries’ decisions in the arena of international environmental cooperation. Structural perspectives on international relations focus on power attributes and the state as central actor in a given international system. A country’s foreign policy in this case is seen as a product of factors that are external to individual nations. Germany’s choice to ratify the Rotterdam Convention may consequently be explained by international pressures and the intention to enhance its standing in future negotiations, whereas the United States are possibly not as reliant on such motives. However, there are theoretical as well as empirical arguments indicating that such views

~~considered on their own have limited explaining power. The two most important aspects in~~
For a formal generalization and discussion of the theory of pure public goods to an international setting where countries contribute to the provision of global public goods, see Sandmo (2004).

¹³ The problem rests less in common property itself than rather in open access to it. Boyce (2002: 7) points out that communities for a long time have been - and still are - able to develop arrangements to ensure that common-property resources are used sustainably. Consequently, he argues, Hardin’s parable was named more accurately the ‘tragedy of open access’.

¹⁴ Indeed Cyprus ratified Kyoto already in 1999, whereas the US unmistakably decided not to become a member. Canada’s government insisted for years not to enter either, as long as the US stays away, but changed its mind in 2002. Germany and its chemical industry has to abide by the provisions of the Rotterdam Convention since 2001. The agreements such as Kyoto and Rotterdam are discussed in more detail in Chapter 4.2.

own have limited explaining power. The two most important aspects in this regard, namely free-riding incentives and power relations, will be sketched briefly in the following.

As discussed above, international environmental agreements deal with collective action problems, meaning that two or more nations must either provide a public good or eliminate a public bad. Due to the open access character of the environmental goods at stake, the benefits of one country depend also on the strategies of other countries, which can be participation, unilateral action, or free-riding.

However, benefits, arisen by the actions of others, are not by nature the underlying rationale that causes a country's decision. Not every country that rejects to participate in a treaty necessarily has to be a free-rider. Barrett (1998: 328) suggests to categorize non-signatories as free riders only when benefiting directly from the collective actions of signatories. Consequently one can add: countries can only be classified as free-riders when basing their decision on choices of other nations. Countries that take part in negotiations and later on ratify these treaties, I will argue, base their decision rather on domestic pressures and interests than intending to reap benefits out of others altruism. This goes along with the voluntary provision of public goods as Murdoch and Sandler (1997a,b) have put forward in their examination of pre-treaty emission reductions. A country chooses its strategy unilaterally. Free-riding may play less a role than widely assumed. Beron et al. (2003) aim to empirically test this contention and look for a country's motives to cooperate by studying participation patterns considering the Montreal Protocol. They rejected the free-riding hypothesis as a driving force of political decision-making, but rather detected a positive impact of civil and political freedom.¹⁵

Free-riding, though, is not the only aspect. One may also emphasize power structures as determinants of international cooperation. When thinking about security aspects or trade interdependencies, some countries are capable to put pressure on others and to influence their decision. IEAs frequently contain 'North-South' provisions with respect to financial or technological transfers. Developing countries hesitate to undertake environmental commitments fearing that economic growth will be hampered, whereupon industrialized countries use their economic power in order to pressure for environmental minimum standards. Security aspects may affect environmental issues as well. In 1986 Iceland refused to abide by an international whaling moratorium prompting the United States to impose an embargo on Icelandic fish. When Iceland threatened to expel the U.S. military base at Keflavik, the Reagan administration cancelled the ban (Porter and Brown 1990: 108). Although security aspects are likely to

¹⁵ As Grafton notes, experimental games also challenge the economic logic of free-riding. They often show results in which people voluntarily choose more cooperative outcomes than those predicted by economic theory (2004: 408).

persist in international environmental aspects, their scope seems to be limited. Beron et al. (2003) attempt to operationalize power attributes by trade relations. As with free-riding, they empirically illustrate that power indeed seems to have played an insignificant role in a country's choice whether or not to ratify the Montreal Protocol.¹⁶

Structural perspectives certainly provide valuable insight into a country's foreign policy formation. Nevertheless, as the brief contention on free-riding and power relations indicates, international constraints may be overestimated. In the following I will put emphasis on domestic settings arguing that democracy and environmental pressure groups play a role in shaping international environmental politics. I will therefore focus rather on group and decision-making perspectives than structural approaches. Rational choice and utility maximization are seen as driving forces of individual actors that generate outcomes that shape the international system itself rather than being shaped by it. Domestic political determination of environmental politics may comprise a wide range of aspects. Standard determinants that the EKC literature concentrated on, have been income, trade, and multilevel political structures.¹⁷ However, the EKC debate dealt with environmental outcomes and arguments put forward in this context are only valid partially with respect to environmental commitment. Aspects of decentralization, for example, are reasonable regarding environmental regulations, seeing the differences between policy-making and policy-implementation. The stringency of environmental policy becomes evident only when implemented effectively. With respect to international environmental commitment, however, the particular characteristics of federalism in the domestic arena are of little importance. Subsequent theory therefore looks upon individuals and their preferences, putting emphasis on citizens who are in charge to select and lobby the policy-makers. Hereby, the political system as well as interest group strength play a crucial role in forming a country's choice, whether or not to participate in an international agreement.

3.1.2 The case of environmental commitment

In order to assess the degree of international environmental commitment of a country, I focus on policy outputs, namely on ratification of international treaties.¹⁸ At first glance, one might

¹⁶ Beron et al. develop and examine a power matrix among participants of the Montreal Protocol. One nation's power over another is calculated by the magnitude of imports it receives from that country, accounting for the importing country's ability to tax or otherwise disrupt the trade flow (2003: 289pp).

¹⁷ For a survey of the literature on the political economy considering environmental regulation, see Oates and Portney (2003).

¹⁸ The precise operationalization of my dependent variable refers to ratification delay of countries. This aspect will be covered in the empirical analysis, though (Chapter 4.2).

ask however, if a government's decision to ratify an agreement indeed shows evidence of environmental commitment? Intuitively, one might rather be tempted to look at the environmental record of a country. Why not looking on figures such as pollution, trade numbers in hazardous chemicals or cultivation of genetically modified organisms? I will illustrate the advantages of the concept as it is used here in the following.

As can be seen in the vast literature about the Environmental Kuznet's curve, assessments of environmental politics mostly focus on outcomes, such as sulfur dioxide emissions or other pollutants. This may be due to the fact, that data are readily available and outcomes are easily quantifiable. Moreover it is actual pollution, environmental degradation or improvement, not words of commitment, what we are ultimately interested in. However, from a theoretical point of view, it has to be questioned whether environmental outcomes are an appropriate measure to test the effects of political systems or pressure group strength. Carbon dioxide emissions quantify a country's pollution level, without telling us anything about the determinants it is build on. Russia's massive decrease in pollutant emissions during the last decade is based rather on structural transition than environmental policies pursued by the government. A country's pollution levels are not necessarily – at least not exclusively - connected with its environmental achievements. Unless a thorough decomposition analysis is used, we cannot say, whether any increase or decrease is due to changes in economic structure, product mix, changes in technology or due to environmental regulation pursued by the government (Stern 2003). Therefore outcomes have to be interpreted carefully.

Moreover, even when environmental sound policies are pursued, they not necessarily result instantaneously in better outcomes. It would be far from reasonable to put rising Carbon Dioxide emissions spontaneously down to poor environmental politics. A relationship between democracy and environmental quality would be measurable only with outcomes that have to be lagged for years if not decades. As Neumayer (2002b: 144) suggests, this might be the reason, why studies examining such a relationship in general provide only weak statistical evidence. Hence, when studying determinants of environmental politics, it may be more reasonable to focus on environmental policy. International environmental agreements are a suitable measure. Membership in such treaties signal a government's willingness to cooperate and to introduce environmental measures themselves. The costs accruing to such measures can be substantively. Provisions such as those demanded by the Copenhagen Amendment regarding cutbacks in HCFC gases necessarily have to be met within one's own country. Implementation of stringent policies is essential in order to accomplish the goals.

Apparently though, this logic rests on the assumption that a country indeed abides by the regulations developed in the agreement. As Barrett (1990) argues, international treaties will indeed be framed in a way, that ensures compliance: As mentioned earlier, no international authority exists, that has the means to manage the global commons. Consequently, it has to be relied on voluntary arrangements that take on this task. In turn, due to their voluntary nature, these international environmental agreements will be self-enforcing. Likewise Chayes and Chayes (1991: 290) argue, that most of these agreements are in fact complied with by ratifying nations. “The common feature that substitutes for coercion in international compliance systems is the exploitation of the accountability of states by rendering their performance transparent to scrutiny by the international community.” Hence, I will take a country’s decision to ratify an environmental treaty as an indicator for its environmental commitment assuming that the country complies with the agreement.

3.2 How democracy influences environmental commitment

At the time when Garrett Hardin in 1968 envisaged the ‘tragedy of the commons’ liberal democracy was considered to possibly or even probably have detrimental effects on the environment. In particular, Hardin and other scholars such as William Ophuls (1977) and Robert Heilbroner (1974) stressed the limited potential of democratic governments to constrain environmental degradation induced by economic liberties and population growth. Rational self-regarding economic behavior has been seen as driving force of increasing exploitation of natural resources and disregard of environmental damages. Authoritarian regimes on the contrary, have the ability to suppress liberal tendencies and to avoid maximization of citizens consumption. Thus they are capable of restraining production as well as rising energy dependence and pollution. Those thoughts, obviously not meant to promote dictatorship, pointed to a negative effect of democracy and its endorsement of individual freedom and economic growth on environmental quality.

On the other hand there is an array of arguments indicating a positive effect of democracy on environmental policy, which became increasingly elaborated during the last decade. The following three arguments summarize, what will be illustrated in more detail in the subsequent sections. First of all, one has to account for the institutional characteristics of political systems and how they differ from each other. Due to the respective selection process, policy-makers in democracies rely on the support of a larger share of the population than autocrats and hence

tend to provide a higher level of public goods such as environmental protection than non-democratic leaders. Secondly, by means of other public goods such as civil liberties and political transparency a democratic country guarantees the accountability of its government, which has to respond to public opinion and environmental demands. Authoritarian countries more easily suppress inconvenient interests. And thirdly, the differences in their respective time horizons between democratic and authoritarian policy-makers make the former more aware of the benefits, the latter more sensible to the costs of environmental actions. Hence, the influence that democracy may have on a country's international environmental commitment is manifold. Each of these claims is covered in more detail in the following.

3.2.1 The provision of public goods

The subsequent argumentation is based on traditional rational choice assumptions. Individuals are assumed to possess utility functions which they are trying to maximize. For political leaders, that is opportunistic governments, on the one hand and citizens on the other hand assumptions about their utility functions will be made respectively. In order to define an ideal democracy as political system, I follow Bueno de Mesquita et al. (2003) by sticking to the concepts of 'selectorate' and 'winning coalition' as central ideas in developing the argument. The model is made of a world in which every country consists of residents, that are divided into two groups: those who are granted the possibility to select the political leader (*Selectorate*) and those who are not (*disenfranchised residents*). The selectorate in turn is divided in those, who's support is indispensable for the political leader to survive (*Winning coalition*) and those whose opinion can be ignored by the leader. Political systems are seen on a continuum that is build on the two critical dimensions 'selectorate' and the 'winning coalition' and entails therefore all possible political systems. In an ideal democracy, the selectorate will consist of all adult citizens and the winning coalition encompasses - dependent onto the voting system - usually about the half of the selectorate. In an autocracy to the contrary the winning coalition often encompasses a much smaller share of the selectorate, e.g. only military elites. Accordingly democratic leaders are reliant on the support of a large share of the population, whereas autocratic regimes only depend on a small selective share. In the following 'democracy' and 'autocracy' stand for the extremes on the continuum of political systems.¹⁹ Independent of the

¹⁹ There are certainly numerous other systems, such as dictatorship, monarchy, communism, etc. and even more differences within each categories. For ease of use they are accounted for by the continuum between democracy and autocracy.

political system, be it a democracy or autocracy, the incumbent political leader strives for survival (Downs 1957, Wintroppe 1998).

Citizens are assumed to maximize their utility function by consuming private goods on the one hand and public goods on the other hand. Along this quest he opts for certain policy choices that maximize his chances to hold onto his position. He will do so by providing a mixture of general public policies and allocation of private benefits. Public policies on the one hand share the characteristics of classic public goods, which are non-excludable and nonrival. They therefore serve society as a whole. Environmental protection is one of these public goods as discussed previously. Private goods on the other hand are excludable and rival and can be directed towards individuals and let the recipient benefit alone. Political leaders, as pointed out above, have to choose a policy mixture that adapts to their winning coalition and ensures its support. Since the winning coalition in authoritarian systems consists of a relatively small share of elites, policy-makers may be capable of directing sufficient private benefits to this fraction in order to remain in power. As the share of population that belongs to the winning coalition rises though, the policy-maker cannot afford any more to supply the required amount of rents. Hence, it is more reasonable for him to invest in public goods (Plümper and Martin 2003) Consequently with rising levels of democracy a country tends to provide more public goods. This argument is well developed and finds support in numerous empirical studies with applications on a wide array of public goods (e.g. Deacon 1999, Lake and Baum 2001, Bueno de Mesquita et al. 2003).

Congleton puts forward the argument with respect to environment politics, by concentrating on the costs accruing from environmental sound policies. He shows that a persons preferences for a certain degree of environmental regulation depends on his relative income share. Since elites typically have a greater than the median income share they confront a higher relative price for pollution abatement than median voters in democracies do. "In cases where this relative price effect dominates, authoritarian regimes will adopt less stringent domestic environmental standards than democratic regimes, be less willing to sign international conventions on environmental matters than democratic regimes" (Congleton 1992: 412). With respect to environmental commitment, consider the Rotterdam Convention as an example. When ratifying this agreement, the government has to implement a so called prior informed consent (PIC) procedure, that allows to assess the particular risks of certain hazardous substances when traded internationally. Hence, the government provides a public good (which is to protect population from risks associated with the trade of these substances) from which each member of the society benefits to the same extent. Since the government has to finance the PIC ser-

vice, the tax burden rises and those with high income shares contribute relatively more to the public good than the median voter does. Accordingly, it is more reasonable for a democratic government that relies on the support of the median voter to ratify the Rotterdam Convention than it is for an autocrat who is backed by elites.²⁰

3.2.2 Political freedom and civil rights in democracies

The second part of the argument picks up one basic reason that possibly makes the environmental Kuznets curve work. The EKC literature, though not consistently providing robust results, challenges the claim, that economic growth implies detrimental consequences for the environment. Although this debate focuses empirically on the correlation between income and environmental quality and rarely tries to establish underlying theoretical causalities, some authors explicitly account for the effects of political systems (Barrett and Graddy 2000, Torras and Boyce 1998). They do so, relying on the assumption that environmental quality holds luxury good properties in early stages of economic development, becoming a normal good though later on. A population that due to low income levels has to contend with basic needs will not put as much emphasis on environmental policies as a population that already reached substantial living standards. This argument is consistent with many findings of the EKC literature and has been repeatedly put forward as one of the underlying causes of the relationship.²¹ Hence, at first glance the correlation between income and environmental quality sometimes suggest, that the only thing to do is fostering growth: at certain income levels the environmental problem will take care of itself.²² There are several considerations that should prevent us from jumping to any such conclusions. Already Grossman and Krueger (1995: 371pp), who were among the first to detect a relationship between income levels and air pollution, warned to consider the process an automatic one. They argued, that the strongest link seems to exist through an induced policy-response. Governments will take account of citizen's demand and implement stricter regulation which in turn leads to improved environ-

²⁰ Congleton's model refers to environmental regulations rather than government services. Hence, the costs of environmental quality are not accrued by tax revenues, but by indirect effects on personal income, e.g. by the costs of consumer goods. The argument, however, remains the same.

²¹ However, skepticism remains. McConell (1997) for example analyzes the income elasticity of demand for environmental quality and argues that such preferences are neither necessary nor sufficient for the EKC. Additional explanations of the inverted u-shaped relationship are structural and technological effects. (See my literature review under 1.5). Still, the argument continues to be referred to as the "standard interpretation" of the EKC (Bernauer and Koubi 2004: 4).

²² As Deacon (1999: 2-3) point out, Intergovernmental organizations picked up the correlation to underline environmental aspects of their policy recommendations. GATT (1992) argued, that "countries near the top of the development ladder are likely to have and enforce stricter environmental standards". In its World Development Report the World Bank (1992) highlighted that poverty reduction not only is "a moral imperative, but it is also essential for environmental stewardship".

mental quality. Apparently, though, this reasoning is only valid if another assumption holds true: a country's government has to be accountable for its actions and responsive to its citizenry, otherwise increasing demand does not generate the environmental improvement as predicted. Governmental accountability and responsiveness are those attributes, that we commonly refer to as characteristics of democratic systems.

Payne (1995) presents a thorough theoretical essay illuminating the positive impact of democracy on the environment. Some arguments are relevant for the question of facilitating an induced policy response raised here. Firstly, democracies are more likely to protect human rights than authoritarian systems. Citizens are free in their actions of gathering and disseminating information and shaping as well as being shaped by public opinion. Environmental movements have been enabled to gain influence by means of free speech, free press, and other individual liberties.²³ Hence, this argument also relates to the other source of environmental commitment studied in this thesis: the impact of interest group pressures. Secondly, if environmental quality is considered to be valuable by the majority of the selectorate, a democratic government will respond by acknowledging this demand rather than suppressing criticisms and avoid transparency of its unsatisfactory policies. This claim ties in the logic of public good provision, which will be subject of further examination below. Thirdly, if governments indeed strive for a policy response, policy-makers and citizens in democracies may be more likely to make use of political learning. Referring to comparative political research, Payne argues that leaders in non-democratic states on the contrary lag behind with respect to innovation and flexibility. One can add to this argument by accounting for political competition that arises through elections and hence forces policy-makers to search for superior environmental strategies. Due to the already mentioned transparency and free flow of information democratic countries will adapt to novel ideas, for example in pollution taxation or emission abatement technologies. It hence is less reasonable for authoritarian regimes to take part in international environmental cooperation, when facing higher costs for domestic implementation. Another argument put forward by Payne particularly relates to the topic at stake here, since it postulates international tendencies to be present especially within democracies. Referring to the variety of international organizations and agreements that have been institutionalized by and rooted in the liberal democratic tradition, he suggests that democracies rely to larger degree on international cooperation. Global institutions facilitate cooperation and are taken as means

²³ Payne explicitly refers to Eastern Europe, where environmental lobbies have been among the first interest groups to emerge in the postcommunist era. His argument parallels my empirical findings (see Table 1 on page 57).

by which international problems may be solved more effectively. In turn, these countries are also more likely to listen to criticism from the international community.

Thus, a good case can be made arguing that compared to authoritarian regimes, democratic systems provide governments and citizenry to a higher degree with civil liberties, accountability and transparency, political learning and international bias, hence with features that favor international environmental commitment.

3.2.3 Why a policy-makers time horizon matters

The third part of the democracy-argument incorporates the assumption that autocratic leaders have shorter time-horizons than more democratic governments. At first this assumption may appear to be counterintuitive. When thinking about Cuba and Fidel Castro for example, one would suppose rather the opposite. Bueno de Mesquita et al. (2003) empirically confirm this perception. In fact, it is easier for autocrats (supported by the winning elites) to survive in office than for democrats (backed by the winning population). However, this conclusion is valid only in the long run. An authoritarian rulers' time-span depends on the condition to have survived at the outset of his incumbency. "While the average tenure in office of all autocrats is about twice as long as that of all democrats, those who survive the first few years typically survive a long time, often only succumbing to old age and ill health" (Bueno de Mesquita et al. 2003: 581). The question though is, whether an autocratic leader incorporates such empirical insights into his strategic actions and focuses on long term goals once having endured his first years of incumbency.

Quite the reverse, one can argue, an autocrat leader remains incumbent due to his focus on short-term provision of private goods to his winning elites. He faces an imminent threat to his incumbency, as he stays in power by force and bribery, not by institutional mechanisms as it is the case in democracies. Accordingly Wintroppe (1998 p.335) notes, that "ironically, the typical dictator is less secure in office than is a democratic leader. Or as Tullock (1987: p.17) puts it: "The dictator lives continuously under the Sword of Damocles and equally continuously worries about the thickness of the thread". He therefore tends to have a shorter time horizon when it comes to long-term policy planning. Costs and benefits accruing to certain environmental measures differ in respective time periods that elapse until their effect becomes evident or quantifiable. Environmental detrimental substances such as greenhouse gases or actions such as the depletion of the ozone layer often bring to bear their consequences not before years or even decades have past. This holds true for most of the topics that are subject to global cooperation and are under scrutiny here. International environmental agreements

deal with long term problems, be it the atmosphere, desertification or genetically modified organisms. The time stream of effects from environmental standards therefore is such that the costs are concentrated in the early periods while the benefits are concentrated in the later periods. Congleton (1992) consequently stresses the significance of the planning horizon. An authoritarian leader with a short planning horizon forecasts the costs of environmental regulations to exceed the benefits. A democratic leader on the other hand will value the cost-benefit-ratio the reverse. Hence, due to the long term effects of environmental policies, the third part of the argument maintains that autocratic policy-makers are less likely to put emphasis on environmental commitment, as they differ from democratic governments in their planning horizon.

So far, arguments have been developed that claim a positive impact of democracy on environmental commitment. Accountability of governments, the protection of civil liberties, and the longer planning time-horizon in democratic countries compared to autocratic countries have been argued to influence policy-makers to exhibit more environmental commitment. In the following the framework shall be extended in order to account for lobbying effects by special interest groups.

3.3 How environmental lobbying influences environmental commitment

In order to link up the second main predictor, I sketch the argumentation of the subsequent paragraphs briefly: Policy-makers are assumed to be subjects to lobby pressures from industry as well as from environmental interest groups. Industry lobbyists intend to convince policy-makers, that international environmental commitment is too costly due to economic harmful regulations that would have to be implemented. Therefore, it depends on the lobbying success of environmental lobbyists on the other hand to what degree a government can be convinced to bear the costs and is willing to take action. In order to further their goals, environmental interest groups adopt to mechanisms: on the one hand, they raise public awareness of environmental problems and foster the demand of the citizenry towards environmental sound policies. On the other hand, they attempt to lobby policy-makers directly. Since environmental pressure groups dispose of valuable knowledge and expertise, policy-makers grant them access. Additionally, the success of ENGOs increases through an intensifying interaction between policy-maker and interest groups due to rising importance of environmental topics.

At first glance, environmental lobbying parallels traditional special interest theories. Establishing an organization will entail costs to the founder. In order to reap benefits out of the investment, the organization will attempt to accomplish its goals. That is, the group seeks to alter policy-making in a more favorable direction. Interest groups will strive for either preventing political leaders from voting for ‘bad’ policies or by motivating them to pursue ‘good’ policies. Environmental non-governmental organizations (ENGOS) are such organizations, consisting of members that “share a sense of concern about the degradation of air, land, water, and diversity of species across the earth, and the interaction between human beings and the natural environment” (Wapner 2002: 40). Representing the concerns of their members, ENGOS have a stake in environmental improvements such as reducing greenhouse gases, sustaining biodiversity, protecting the ozone layer, and so on. For that reason, they promote corresponding international agreements such as the Kyoto Protocol or the Cartagena Protocol on Biosafety that contain provisions to effectively deal with these problems.

One can argue, that environmental interest groups, in order to promote these agreements, have to engage in international negotiations and assist governments in formulating effective arrangements. In fact they do and much of previous research centered on this task of ENGOS (see e.g. Stairs and Taylor 1992, Mathews 1997, Corell and Betsill 2002). However, these groups not only attempt to influence the negotiations, to push their goals, and to monitor the process at the international level. Even though the particular environmental problems are global in scope and their management relies on shared responsibility of the international community, ENGOS also have incentives to pressure their national governments to actually ratify these agreements. Following Aidt (1998) environmental interest groups are assumed to be ‘functionally specialized’ with respect to the topic under consideration. They do not have to take into account other interests and therefore ignore for example consumer costs accruing from pollution taxes. Hence, drawing their utility exclusively from environmental achievement, these interest groups are interested in any increase in environmental quality at all. If a country has ratified an agreement, it has to enforce domestic regulation in order to meet the treaty provisions. More stringent regulation on carbon dioxide emissions for example will help diminishing climate change consequences and let the particular country benefit, too. This profit is evidently lower in the case of global commons than in the case of local pollutants, as the benefits caused by one country are allocated among all countries.²⁴ Still, some share of

²⁴ Geographic aspects may partially shift the allocation of benefits to those countries, that are more likely to suffer from environmental disasters if no action is taken. The small flat island state Tuvalu in the Pacific Ocean will gain relatively more by climate change mitigation than Bolivia. Nevertheless the benefits arising from reduction in greenhouse gases will be shared by all nations.

profit remains to the individual country and hence contributes to the utility of its environmental interest groups.

Moreover, ENGOs are inclined to pressure their government for rapid ratification. This argument rests on two notions: Firstly, a country that becomes a member to an agreement will be more likely to begin carrying out corresponding actions. Murdoch and Sandler (1997a,b) point to pre-treaty cutbacks which indicate that countries are on their way to meet the provisions as soon as they ratify. Secondly, international treaties usually link its entry into force with minimum membership requirements.²⁵ Hence, before a treaty enters into force, ENGOs additionally benefit to the extent to which their country's participation raises the probability that these conditions will be met. Thereafter, the interest groups benefit from ratification in any case, since the country's commitment instantly becomes legally binding. Therefore, environmental interest groups lobby national policy-makers to enter into international environmental agreements following the premise: 'the earlier the better'.

In general, interest groups will further their goal by offering any mix of financial contributions on the one hand and dissemination of information on the other hand. As mentioned earlier, virtually all formal models of environmental lobbying concentrated on financial instruments, assuming that ENGOs coordinate financial offers to the government.²⁶ This approach, however, just accounts for one way of exerting influence. It does not apply equally to all circumstances of special interest politics. And, as I will argue in the following, it may overlook the fact, that ENGO strengths are more likely to rest on informative strategies. The subsequent sections illustrate the causal reasoning why ENGOs will use rather provision of expertise than financial contributions in their lobbying efforts (3.4.1), identify different methods by which ENGOs pursue their goals (3.4.2) and show why policy-makers will in fact take the information provided by ENGOs into account (3.4.3).

3.3.1 Focus on the informative role

To begin with, a closer look on the functioning of financial contributions provides insights into underlying mechanisms. Grossman and Helpman (2001:226pp.) point out three possibili-

²⁵ Usually, the agreements enter into force on the ninetieth day after the date of deposit of the fiftieth instrument of ratification. All of the agreements that are subject to the empirical examination in the fourth chapter contained such minimum participation requirements, too. The Copenhagen Amendment reduced the obligatory ratifications to twenty. The Kyoto Protocol in addition requires participation of as many Annex 1 countries as necessary to add up to fifty percent of their total carbon dioxide emissions.

²⁶ Riddel (2003) empirically supports this assumption with respect to campaign contributions on specific issues to U.S. Senate candidates. On the contrary, Wright (1990) in his thorough analysis of Committee voting in the U.S. House of Representatives suggests, that campaign contributions rather work indirectly through lobbying.

ties, by which financial contributions may work. The ‘most invidious’ considers money as a channel to buy influence. For example, an environmental interest group and an opposing industry alliance offer campaign contributions to a policy-maker who in turn chooses a policy, from which he expects the highest payoff. Accordingly, the contribution is assumed to directly translate into respective policies. If this was the case, ENGOs’ influence would simply be contingent on their financial capacities. Compared to business lobbies, however, ENGOs seem to be underprivileged with respect to the large scale problems at stake in international environmental agreements. “In their contests, these groups are often smaller, poorer and weaker than their business opponents” (Doyle and McEachern 1998: 85). Especially when thinking about the heavy impact of stricter regulations on aspects such as greenhouse gases or the phase-out of ozone depleting substances, environmental groups can hardly be assumed to keep up with the financial strength of affected industry sectors. Assuming this, ENGOs will try to gain expertise and provide policy-makers with information instead of financing election campaigns in democratic systems or attempting to bribe policy-makers in more autocratic systems.

The other two mechanisms mentioned by Grossman and Helpman suggest a rather indirect way, by which money resembles a medium that either buys access to a policy-maker or ensures credibility of the interest group’s concerns. The particular settings of IEAs, however, render both options less important to environmental interest groups. Firstly, especially during the preparation of international conventions policy-makers seem to have an interest in the participation of ENGOs. Case studies that examine the circumstances in which IEAs are discussed and negotiated point to non-state actors as valuable members of the process (e.g. Princen and Finger 1994, Corell and Betsill 2001). As a result of these resources, environmental interest groups are able to get in touch with their ‘lobby targets’. An organization, that is capable of assisting policy-makers in their task, will not have to buy access.²⁷ Secondly, doubts about an actor’s credibility arise, if this actor is either unknown or he has incentives to cheat. He may have a stake in an one-time concern for example and therefore does not rely on the policy-makers good faith another time. Global environmental problems, however, make increasingly their way into international diplomacy (Barrett 2003)²⁸. Actors, that are participating continuously, will be under scrutiny and their credibility is subject to steady evaluation.

²⁷ Grossman and Helpman comment on the access mechanism by pointing to this logical difficulty: interest groups will only be up to pay money for access, when they see some prospect for convincing the policy-maker. If this was the case, however, the policy-maker himself will be interested in acquiring the information, which in turn enables interest groups to gain access free of charge. (Grossman and Helpman 2001: 11)

²⁸ See Barrett (2003: 133-194) for a detailed list and figures. He shows, that the number of multilateral environmental agreements steadily increased since the Second World War.

Although not all ENGOs will take action in every single environmental topic, they are assumed to persist in lobbying policy-makers towards more environmental commitment. Hence, they are able to gain credibility by repeated interaction and are less reliant on financial contributions to emphasize their intention.

Both concepts, access and credibility, will be subject to more detailed examination in the following. At first, lobbying methods with respect to international environmental agreements are illustrated, pointing to different possibilities for ENGOs to achieve their goals. Thereafter I will concentrate on conditions that make policy-makers in fact willing to rely on information disseminated by interest groups – that is, conditions that render their information credible.

3.3.2 Stages and targets of environmental lobbying

Despite factoring out campaign contributions and concentrating on the ‘informative’ role of interest groups instead, a variety of different stages and targets of environmental lobbying remains. In order to visualize its different mechanisms and points of access to the policy-maker, some clustering will be useful. Putnam (1988) supposes to explain the treaty-making process as a two-level game. That is, a treaty not only has to be negotiated with skills in international diplomacy, but also be backed in the domestic arena. Political leaders face pressures both at the national level by the various domestic stakeholders and at the international level by the interests of their foreign counterparts. Putnam explicitly accounted for the influence of interest groups at the domestic level. Interestingly, though, the particular settings of international environmental conferences indicate, that ENGOs may be capable of extending their scope of influence onto the international level, too.

To begin with, I will concentrate on the domestic level. Smith and Conelly (1999: 78) point out several activities by which ENGOs may pursue their goals. Promoting consumer boycotts, staging media stunts, and engaging in violent action rank among those means, that are typically related to narrow interests and focus rather on individual industries than on policy-makers that have to decide upon an environmental agreement. However, these actions may influence policy-makers indirectly by rising public awareness. ENGOs educate people about environmental problems and inspire new value systems in order to motivate rising demand for more environmentally sound politics. Placing commercials, producing films, spreading out banners on skyscrapers impose significant costs on the activists and hence belong to forms with ‘signaling’ characteristics (Grossman and Helpman 2001). That is, since the policy-maker knows about the substantial costs that the interest group was willing to pay for the action, he will be prone to grade up its credibility. The same can be said of organizing public

demonstrations and marches or advertising campaigns. On the other hand, actions that impose little costs on the interest group, not necessarily have to be in vain. Success of 'cheap talk', which represents the low-cost activities of an interest group depends on the persuasiveness of argument itself and may gain credibility by expertise. Clark (1997: 198) notes, that environmental interest groups in the United States and United Kingdom regularly present evidence to Congressional Committees and Select Committees or other parliamentary bodies. Likewise interest groups experts draft bills for individual politicians or distribute briefings prior to debates on international issues. Hence, ENGOs have the means to directly influence policy-makers at the domestic stage. At this stage policy-makers usually have to decide on whether to vote for ratification or not.

Yet, reflecting on Putnam, it is reasonable to analyze the process of environmental agreements on the international level, too. Thus, using backward induction may help, because executives will try to negotiate treaties that they feel confident to be ratified (Barrett 1998). This is irrespective of the political system, as negotiators neither in democracies nor in autocracies are keen on submitting a proposal that will be refused. It is of no relevance for the argument here, to what extent environmental interest groups are capable of shaping the outcomes of international negotiations. Yet, their participation at these conferences can have an effect on a country's decision if the ENGO already has access to national actors that later on influence the ultimate decision. With respect to the climate change treaty for example, Mathews highlights, that "more members of NGOs served on government delegations than ever before, and they penetrated deeply into official decision-making" (Mathews 1997:55). The major role, that interest groups are able to play, becomes visible when looking at their bonds to government delegations. New Zealand for example assigned one of its delegation positions to a national Greenpeace staff member in the negotiations over waste-disposal at sea (Stairs and Taylor 1992: 133). In the case of climate change the small island state of Vanuatu appointed NGO members especially skilled in environmental law to their delegation (Mathews 1997: 55).

None of these examples proves that interest groups indeed are capable of pressuring a policy-maker to decide on ratifying an agreement. It may indicate though, that ENGOs have access to their targets at both, domestic and international level, that is, during the preparation of agreements as well as during the final decision-making process. Theory adds another line of arguments with respect to lobbying, which concentrates on the indirect effect on policy-makers through public opinion. ENGOs often are highly skilled in articulating their interests in ways that attract public attention and foster a policy-maker's sense of 'civic duty'. Exam-

ples are widespread and range from purely domestic scope to multilateral and international public attention: Mass mobilization with respect to the challenge of climate change (Corell and Betsill), Greenpeace' campaign on Shell's oil installation in Northern Europe (Parmentier 1999), or the global ENGO alliances against World Bank's funding of environmentally detrimental Polonoeste development projects in Brazil (Hurrell 1992). What in the case of the Brent Spar campaign may have been political opportunism, has alerted uninformed policy-makers in many other cases to respond to public indignation. Hence, environmental interest groups exert influence, both indirectly through sensitizing public opinion and directly by accessing policy-makers on national and international levels.

3.3.3 Conditions of successful lobbying

Having illustrated the means by which ENGOs aim to influence policy-makers, it still arises the question, why those should respond to the demands. A government will rely on information that has been disseminated by interest groups under certain conditions (Plümper 2002: 25): Firstly, the government does not possess complete information itself. Secondly, the policy-maker has to believe that the lobbyist is able to offer additional expertise. Thirdly, the policy-maker has to trust the lobbyist. Whereas the former two constraints are interrelated and fairly straightforward to be answered, most attention has to be paid to the latter condition.

The first prerequisite is subject to little dispute. A policy-maker is hardly capable of being completely educated about every aspect of a subject he has to decide on. Environmental matters in general and the global commons in particular are topics that are highly complex and characterized by a perpetual call for further research. Hence, I will focus on the second question, whether ENGOs are in fact capable of providing additional information to the policy-maker.

Interest groups in general, that is environmental interest on the one hand and business interests on the other hand, will be able to provide such proficiency, as they have a stake in respective sides of the coin and hence, will provide information supporting their argument. During debates about restrictions of pesticides in the U.S, environmentalists were likely to focus on the consequences that chemicals have on marine animals, whereas business lobbies such as grower organizations were likely to provide the government with calculations about the benefits accruing to them and consumers. (Cropper 1992:192). Interest groups' ability to provide useful information extends the scope of domestic environmental matters, though. The various stages, during which international agreements are negotiated, provide a platform for interest

groups to take key roles during the process. As mentioned above, national governments not only consult ENGOs in order to gather additional information but even account for their expertise by putting members on its official delegations. "Such knowledge is a particular valuable resource, as international environmental issues are highly complex, and decision-makers often turn to NGOs for help in understanding the nature of the problems and the implications of various policy alternatives under consideration" (Betsill and Corell 2003:74). Hence, it seems plausible to assume that the first two conditions are met with respect to IEAs: Policy-makers not only lack complete information themselves, but also believe that ENGOs are able to overcome this deficit.

The most critical condition remains the motivation of a policy-maker to trust the lobbyist. Additional information can be useful for increasing his chances to stay in office only, when its level of accuracy is known. Evidently, lobbyists have in mind to influence the policy-makers choices. Consequently they are likely to use biased information. This is not to say, that interest groups persistently tend to deceive policy-makers by telling wrong figures. As can be seen in Croppers remarks about special interests in pesticide-regulation, each fraction concentrates on respective parts of the story. Nonetheless, be it on purpose or not, deceiving cannot be eliminated as a possibility either. After Greenpeace campaigned against Shell's intention to dump the oil installation Brent Spar into the North Sea, it had to reveal that their published numbers on contaminated substances have been incorrect. Public debate about methodologies of Greenpeace arouse and the organization's credibility lost ground (Parmentier 1999: 442). Policy-makers, hence, will take into account not only an inherent bias of the interest group's reporting, but also its reliability based on past experience. ENGO impact will depend on the intensity of communication between policy-makers and lobbyists.

In the case of environmental politics in general and of IEAs particularly, ENGOs and government relations are characterized by ongoing interaction due to the vast number of environmental concerns. Their relationship can be interpreted as repeated games. ENGOs will be keen to provide supplementary and truthful information, if they prospect the possibility of future cooperation. Policy-makers in turn will rely increasingly on such contributions, contingent on the strengths of positive experiences. Those are most likely to occur, the more ENGOs are woven into the decision-making processes of environmental politics. This reasoning is mirrored by a changing and intensifying relationship between government and environmental interest groups during the last decade. Whereas campaigns targeting environmental policies were previously carried out in opposition to government, they are increasingly undertaken in a more co-operative way (Thomas 2003). The negotiations of the global climate

treaty and the Earth Summit in Rio in 1992 may have marked the turning-point in interest groups involvement in environmental processes (Mathews 1997: 55). During the process ENGOs established ties not only with industry, UN agencies, and other environmental interest groups, but also with governments of both developing as well as developed countries.²⁹

3.4 Concluding remarks

The theoretical considerations of this thesis aimed to analyze determinants of international environmental commitment. Since this topic is by nature international in scope, international relations theory may offer valuable insights into countries' particular strategies in order to deal with the management of global commons. On the other hand, it has been argued, that typical constraints such as collective action problems and power relations only exhibit limited ability to account for a country's decision. A framework has been employed here, considering national aspects to play a crucial role. Two major domestic determinants of international environmental commitment have been identified and analyzed: the role of democratic institutions and environmental interest groups.

As has been argued, democratic governments tend to provide public goods to a higher degree than autocratic regimes in order to secure electoral support. In addition a well functioning democracy provides citizens with civil liberties that enable them to voice environmental concerns. Finally, autocratic leaders tend to concentrate on short-term policies rendering environmental goals due to their long time characteristics rather irrelevant. I hence expect democracy to have a positive impact on environmental commitment.

The argument of environmental pressure group influence is intuitively more straightforward, nonetheless it is far less developed in academic research. The above stated arguments sought to illustrate, that environmental interest groups in fact are able to lobby a government with respect to treaty ratification by providing information and expertise. They gain access to policy-makers through their knowledge resources and establish an intensifying communication with them since the process of international environmental cooperation continuous. Due to the repeating interactions, governments are likely to believe in the information disseminated by the environmental interest groups and becomes more likely to take action. I hence expect the aggregate national environmental lobby strength to be positively correlated with a country's international environmental commitment.

²⁹ Princen and Finger provide a thorough analysis of the UNCED process and ENGOs' involvement. With respect to the cooperative relationships that ENGOs linked to national governments, they mention in particular the United States, Canada, India, Pakistan, and Malaysia (1994: 209).

4. Empirical results

On account of the theoretical considerations outlined above, the subsequent analysis aims to reveal empirically the effects that democracy and environmental pressure group strength have on a country's international environmental commitment. The review of literature in chapter two illustrated the merits and deficits of related studies that have been carried out so far. As noted, no attempt has been made to systematically examine a sample of different international environmental treaties on the two determinants at the same time. Moreover, those studies that examined international environmental commitment do not employ time varying data with respect to environmental lobby group strength. The subsequent analysis aims to bridge this gap, taking into consideration agreements that deal with global warming, biological diversity, hazardous substances, desertification and depletion of the ozone layer. Moreover it employs data on environmental pressure groups that refer to three different dates since 1992. By doing so, some progress in quantitative cross country research may have been furthered. However, due to the lack of data on financial as well as membership strength of ENGOs, the results still suffer from poor operationalization. This problem will be discussed in more detail later on.

Empirical findings show moderate support of the theory. Democracy as well as environmental interest group strength appear to add to a country's international environmental commitment, the former being slightly more significant than the latter. Not all agreements exhibit the same pattern though. While four out of five topics are consistent with the predictions, the Convention to combat Desertification appears to deviate in several respects and even demonstrates reverse impact of democracy and environmental pressure group strength.

The remainder of this chapter is structured as follows: I first give an overview over sample size and the period through which observations are included (4.1). The following sections give an overview over the dependent variables (4.2) and describe the independent variables and how the key predictors democracy and environmental pressure group strength are derived (4.3). At the outset of the actual analysis a brief introduction to estimation technique and its particular features is given (4.4). The core of this chapter consists of presentation, interpretation and discussion of the regression results as well as tests of specification and robustness check (4.5). Final remarks on the strength and weaknesses of the analysis conclude this chapter (4.6).

4.1 Scope of analysis

The theory outlined above refers to international environmental cooperation. It has been argued, that democratic institutions and environmental pressure group strength have an effect on a country's level of commitment to environmental protection. Ratification of international environmental agreements are comparable on a global scale and data are readily available. Since the predicted effects of the explanatory variables should be applicable to the universe of cases, the sample considers virtually all independent countries and the most important environmental agreements (or amendments) during the last 15 years. This approach provides us with a fairly large set of observations regarding the countries that have been included. The basic data set contains 190 independent countries. Any left outs are due to lack of data availability of the environmental interest group or democracy covariates.³⁰ Most of the results are based on fewer cases though, owing to data absence of other independent variables. The analysis contains data from 1992 onwards. Of course many important agreements have been reached also before that date, but no numbers on environmental pressure groups are available for that time. Ratification dates have been taken into account throughout 2004. Most variables though have been updated for 2002 or 2003 the latest.

4.2 Dependent variables

In order to analyze environmental cooperation, I consider a country's willingness to commit itself to international environmental actions, measured by ratification of international environmental agreements. In general, actual commitment can be assumed especially for those IEAs, that do not have quasi-universal membership, indicating that signatories in fact have to bear costs and therefore are dedicated to the intended goals. Another indicator of a country's international environmental commitment can be drawn from its behavior as 'abatement leader' opposed to 'abatement follower'. That is, countries differ in their respective speed of accession. This difference is interpreted as mirroring the relative intensity of preference and therefore amounts to an indicator for a country's commitment to the goals of the IEA in question (Fredriksson and Gaston 2000).

Due to the fact, that the agreement has to be global in scope, potential cases decrease significantly. In addition, ENGO data are available only from 1994 onward, when the first edition of the essential compendium was published. Taking into account, that the compendium was

³⁰ In 2002 these 190 countries though counted for more than 99.99% of the world's population.

composed during 1993 and the ENGOs must already have been established at that time, I decided to test the theory on the major environmental agreements that have been open for signature since 1992. These are five in number, covering different areas of global environmental concern and shall be described briefly in the following (see also Stokke and Thommessen 2003). The number of parties as of January 2005 is given in brackets.

- The *Convention to Combat Desertification* aims to mitigate the effects of drought in countries experiencing serious drought, particularly in Africa, through programs supported by international cooperation. These programs largely envision a "bottom up" approach involving local participation, community empowerment and decentralization of land management (open from 14 October 1994, 187 parties, entered into force 26 December 1996).
- The *Cartagena Protocol on Biosafety* deals with the consequences of modern biotechnology. It aims to ensure safe transfer, handling, and use of living modified organisms that may have adverse effects on the conservation and sustainable use of biological diversity (open from 15 May 2000, 109 parties, entered into force on 11 September 2003).³¹
- The *Copenhagen Amendment* to the Montreal Protocol speeded up the phase-out dates for many ozone depleting substances, that have been covered by the Montreal Protocol.³² In addition it included new substances on the list of controlled substances and confirmed financial arrangements for supporting a multilateral fund (open from 25 November 1992, 161 parties, entered into force on 14 June 1994).³³
- The *Kyoto Protocol* on Climate Change brings forward provisions set out by the United Nations Framework Convention on Climate Change (UNFCCC), which aims to stabilize greenhouse-gas concentration in the atmosphere. The Protocol contains individual emission limitations and reduction commitments for Annex I parties to the convention. (open from 16 March 1998, 130 parties, entered into force on 16 February 2005).
- The *Rotterdam Convention on the Prior Informed Consent Procedure* promotes shared responsibility and cooperative efforts among parties in the international trade of certain hazardous chemicals and pesticides. It requires governments to abide by a procedure, that allows for exports of a chemical only with the prior informed consent of the importing Party (open from 11 September 1998, 79 parties, entered into force 24 February 2004).

³¹ The Cartagena Protocol is an affiliated instrument to the Convention of Biological Diversity, which already entered into force in December 1993 and has 188 parties as of January 2005. Its objectives are the conservation and sustainable use of biological diversity.

³² The Copenhagen Amendment rather than the Montreal Protocol itself is subject to analysis, since the latter one holds quasi universal membership. In fact Equatorial Guinea, Iraq, and Andorra are the only three countries in my sample that have not ratified the Montreal Protocol yet.

³³ In particular it requires cutbacks in consumption of both hydrochlorofluorocarbons (HCFCs) and hydrobromofluorocarbons (HBCFs) and in production of HBCFs.

The respective dependent variable for each country is computed by the number of days that have passed from the first day at which the agreement has been open for signature until the day that the country accessed the agreement.³⁴ As already mentioned it is important to differentiate between signature and ratification. The former is just an instrument of authentication and signals willingness of the signatory state to continue the treaty-making process. The latter on the contrary expresses the consent of a state to be legally bound to a treaty. Therefore it is the event of actual ratification, not signature, that, due to its manifestation of sincere commitment is of importance to the analysis carried out here.³⁵ All dates are retrieved from the respective official websites of the agreements, listed in the references.

4.3 Independent variables

4.3.1 Levels of democracy

Institutional characteristics and criteria have been the starting point of analyzing the effects of democracy on environmental commitment. The concepts of ‘selectorate’ and ‘winning coalition’ contributed to develop a clear cut understanding of different political systems and their respective properties with respect to decision-making, economic performance, and the provision of public goods. Moreover, one of the fundamental features in our understanding of democracy is the protection of civil rights. Freedom of speech and press channel the articulation of interests and hence are important for ‘advocacy and vigilance’ and interest group influence alike. The empirical analysis therefore relies on the inclusion of political rights and civil liberties as an predictor. Hence I use the combined democracy index published by Freedom House that is based on Gastil’s methodology. This index is based on expert assessments of political indicators such as fairness of elections, existence of an opposition, but also civil rights aspects such as freedom of assembly or protection from political terror. It therefore seems more suitable with respect to the argument here than other measures of democracy such as the election centered Polyarchy dataset (Vanhanen) or Polity dataset (Jagers and Gurr) which has been

³⁴ In very few cases, a country came into existence after the first day that an agreement was open for signature. Following Fredriksson and Gaston (2000), the delay time then has been calculated from the date of that’s country admission into the UN. This group is comprised of Eritrea, the former Yugoslavian Republic of Macedonia, Monaco, and Serbia and Montenegro.

³⁵ For multilateral treaties a set of legal-technical terms refers to the various stages in the status of participation, based on i.e. the 1969 Vienna Convention on the Law of Treaties (see Stokke and Thommessen 2003: 79). Besides the noted difference between signature and ratification, one has to consider acceptance, approval, and accession by a country. These terms refer to different domestic constitutional arrangements, but describe the same legal effects as ratification. Hence, the concepts are used uniformly here.

used in many other studies on the provision of public goods. *Democracy* ranks countries according to their scores as free (2), partially free (1), and not free (0). In order to test the robustness of the findings a second variable is used additionally. *Democracy_2* stands for the Voice and Accountability variable of the World Bank's Governance database reported by Kaufmann et al. (2003). The index is composed of a wide range of indicators covering the political process, the people's ability to select the government, civil rights, independence of the media, etc. It is accessible for every second year from 1996 onwards.

4.3.2 Environmental lobby

The second central explanatory variable is national environmental pressure group strength. Operationalization of this covariate is much more contestable. With respect to the theoretical considerations illustrated above, environmental lobby group influence has to be explained rather by the dissemination of information than campaign contributions. Access to policy-makers and credibility of the group's objective has been identified as major factors herein. Both aspects, it has been argued, relate only modestly to financial contributions. Nevertheless, financial capacity will certainly play a role in environmental lobby strength. Firstly, interest groups on the whole spend more money in lobbying activities than they invest in direct contributions (Müller 2003: 496). Secondly, the budget of an interest group plays a role insofar as both acquisition and dissemination of information is costly. Besides, both financial capacity (Riddell 2003) as well as number in membership (Kau and Rubin 1982) have been found empirically to constitute interest group strength. Unfortunately neither measure is available on a cross country basis. Accordingly, I employ the same source of data as proposed by Binder and Neumayer (2005) and Fredriksson et al. (2005). I follow the latter authors in taking the number of national environmental non-governmental organizations as a proxy for the aggregate size of the environmental lobby in a country.

Additionally, I grouped countries into categories according to their total number of ENGOs. Transforming the variable into categories brings with it additional advantages for descriptive statistics and non-parametric estimates. Survival and hazard functions can be calculated by category and thereby offer first insights into correlation of pressure group strength and treaty ratification. I split up countries into three categories according to their ENGO distribution in 2001: the lower third represents weak environmental pressure group strength (*EnvLobby*=0), the intermediate third represents medium strength (*EnvLobby*=1), and the upper third represents strong pressures (*EnvLobby*=2). This approach artificially reduces variance and creates a rather arbitrary categorization of lobby group strength. However, I checked the robustness

of these findings by repeating the regressions with the original data, as well. When taking the log, regression results are virtually identical.³⁶ Hence, in order to make use of non-parametric graphical assessment of the relationship between environmental lobby strength and ratification delay I decided to use categories.

Moreover, this study aims to account for changes in lobby strength over time, that has been neglected in previously studies. Throughout the observation period, that runs from 1992 to 2004, I derived data for three different years 1994, 1998, and 2001, reported in the respective editions of the Environment encyclopedia and directory (Europa Publications). Doyle and McEachern (1998:82) point to the possibility that ENGOs may have faced problems in membership and support during the 1990s. Table 1 illustrates that some parts of the world indeed experienced significant changes in environmental lobby group strength during the last 15 years. Eastern Europe for example experienced a dramatic increase in ENGOs over the last 10 years, whereas North- and South America has been weakened in this respect.

Table 1. Changes in ENGO strength by regions over time

	ENGO 1994	ENGO 1998	ENGO 2000	IUCN (2004)
Western Europe	550	592	566	237
Asia Pacific	212	247	255	145
Eastern Europe	185	371	682	51
Latin America	396	431	321	164
Middle East & Africa	199	236	250	147
North America	422	404	360	86

Since the corresponding variable is transformed from absolute numbers into categories not all of these changes translate directly into the regression results. Although the variable still incorporates considerable deficiencies (such as its lack of information on budget or membership), it should provide a robust cross-country assessment of lobbying effects on environmental commitment and improve on previous attempts to do so. Another environmental lobby variable that has been employed by Fredriksson and Ujhelyi (2004) is used to further check the robustness of the results. *ENGO_2* corresponds to the current number of ENGOs that are accredited members of the World Conservation Union. It however cannot account for changes over time, since data are available for 2004 only. Analogue to the first lobby variable, countries have been grouped in lower, intermediate and upper third according to their amount of lobby groups. *EnvLobby_2* hence represents three categories of environmental lobby group strength, comparable to *EnvLobby*, but derived with different data.

³⁶ The Results of these regressions are given as Model (10) and (11) in Appendix D-2. Note, that the sample is limited to those countries with at least one ENGO operating in the country. Those subjects with no ENGO are singled out since the log of ENGO is taken.

4.3.3 Additional institutional variables

Since ratification delay is taken as the statistics of a country's commitment to an agreement, it should be noted, that other institutional characteristics may impinge on the speed of treaty accession. As Barrett (1998: 321) illustrates, ratification is likely to have different implications for countries with presidential democracies than for parliamentary democracies due to constitutional separation of powers. "The theory of international cooperation routinely takes countries to be monoliths. But plainly they are not". In addition to the *Democracy* predictor I therefore include two more variables that control for institutional differences, both published by the World Bank's Database of Political Institutions (Beck et al. 2001). The *System* variable differentiates between countries maintaining a direct presidential system (0), countries with strong presidents that are elected by assembly (1), and parliamentary systems (2). I hence expect the variable to correlate positively with ratification hazard, since in latter cases the prime executive is backed by the legislative body.³⁷

The *checks* variable accounts the number of veto players in a political system. The theory that has been illustrated above treats a group of policy makers as one singular leader instead of many individuals. It therefore excluded internal politics of that group. However, separation of powers and checks and balances are certainly existent and should be controlled for. *Checks* counts the number of decision-makers whose agreement is necessary before policies can be changed" and adjusts for "whether these veto players are independent of each other, as determined by the level of electoral competitiveness in a system, their respective party affiliations, and the electoral rules" (Beck et al. 2001 : 169-170). Especially in the case of treaty ratification, it may be rather due to legislative impediments than to interest group pressures or levels of democracy that some countries apply later for membership than others do. Accordingly, ratification delay is assumed to increase with the number of veto players.³⁸

Since *System* as well as *Checks* capture institutional differences, it is worth having a look on correlation between the two measures and *Democracy* in order to avoid multicollinearity. Table 2 reveals that neither the two institutional controls nor the other main predictor ENGO correlate highly with democracy. As expected the two measured of democracy are interrelated to a higher degree, nevertheless worth of using for a robustness check. The moderate correla-

³⁷ Deacon (1999) accounted for differences between presidential and parliamentary systems by employing the Cross-National Time Series Data Archive (Banks 1989). He found parliamentary systems in contrast to presidential systems to be more likely to provide public goods in four out of five cases. Disturbingly though, lead concentration, the only environmental good in his sample, was the exception. No answer could be provided to this finding.

³⁸ Fredriksson and Ujhelyi (2004) show, that the number of government units that are involved in the decision-making process have a decreasing effect on lobbying success. Hence the variable may also affect the lobbying variable.

tion between ENGO and its competing measure ENGO_2 once more supports the argument that the time varying nature of the former indeed differs to large extent from the fixed values of the latter.

Table 2. Correlation between main predictors, competing measures, and institutional control variables

	EnvLobby	EnvLobby_2	Democracy	Democracy_2	System	Checks
EnvLobby	1					
EnvLobby_2	0.8277	1				
Democracy	0.3195	0.3587	1			
Democracy_2	0.327	0.3809	0.8819	1		
System	0.0984	0.2004	0.5186	0.5706	1	
Checks	0.207	0.2924	0.5104	0.525	0.4344	1

4.3.4 Business lobbies

Although the main focus of this study is to analyse the influence of environmental interest groups, most of the arguments made here apply equally to other lobby groups as well. Even though means and mechanisms of business interests have not been subject to closer examination, it is assumed that lobbying groups are formed in cases where agreements collide with certain industry domains. As Grossman and Helpman (2001: 25) note “lobbying by two groups with different preferences is a fundamentally different situation than with only one lobbying group, because the policymaker can possibly use each group as a check on the claims of the other”. Hence, the effects should be tested whether they are robust to the inclusion of other interest groups, too. With the exception of the Desertification Convention, the other four IEAs under consideration hold industry specific provisions. Hence, the following variables are proxies for the possibly countervailing lobby activities by business groups.³⁹

The Cartagena Protocol aims to establish safer handling of genetically modified organisms (GMO) in cases of intentional introduction into the environment. Neumayer (2002a) uses a dummy for countries with plantations of genetically modified crops in excess of 100,000 hectares and finds it to significantly reduce ratification probability. In order to account for lobby strength, I calculated the lobby variable *GMO* corresponding to a country’s size of biotech crop area as percentage of total agricultural land area. The Copenhagen Amendment extends the range of ozone depleting substances that ultimately have to be phased out. Since it introduced control measures particularly for hydrochlorofluorocarbon (HCFC) consumption, this measure is taken as a proxy for countervailing interests (*HCFCcons*). The Kyoto Protocol stipulates the reduction of greenhouse gases, the most essential of which is carbondioxide

³⁹ For detailed information on provisions, affiliated instruments, rules and standards or monitoring procedures of all the agreements analyzed here, see Stokke and Thommessen (2003).

(CO₂). Several explanatory variables have been proposed, that may influence a country's ratification choice.⁴⁰ The number of vehicles in a country is used here (*vehicles*), representing the share of population and industry interests opposing the Kyoto protocol due to the costs likely to accrue from it. Since the protocol puts legal obligations only on countries that are listed under Annex 1 of the agreement, it seems reasonable to distinguish between the two fractions of members by using a dummy (*Annex1*). The Rotterdam Convention addresses environmental problems that may arise by trading certain chemicals and obliges exporting countries to abide by decisions of importing countries, as to whether they wish to receive future shipments of these substances. *Chemexp* displays the yearly sum of chemical exports of a country serving as a proxy for industry lobby strength. No particular opposing interests could be identified for the Convention to Combat Desertification. In order to nevertheless check robustness of democracy and ENGO effects on a country's probability to ratify the Convention, I controlled for the percentage of people living in dry lands. Consequently, *popdryperc* tests whether it is democracy and ENGOs that influence a country's decision or rather a country's receptiveness for damages by droughts.

In addition, all regressions are run with three general control variables accounting for the extent to which costs and benefits of the agreements accrue to a country. The effect of population size (*pop*) is subject to controversy. On the one hand, small countries are more easily compensated, since relatively small concessions by large countries can still pose a substantive profit for a small country. Hence, small countries would tend to ratify IEAs more readily, which means population would have a negative effect on ratification delay. (Fredriksson and Gaston 2000: 355). On the other hand, large countries may be prone to ratify faster due to their higher exposure to environmental damage in absolute terms (Murdoch and Sandler 1997a). Moreover it may be easier for small countries to free ride. Per capita income, as outlined above, is expected to positively effect a country's commitment, since environmental quality is assumed to be a normal good. In order to account for the induced-policy logic of the Environmental Kuznet's Curve (EKC) literature, I also include GDP squared in the regressions. According to the EKC findings an inverted u-shaped relation between pollution measures and income levels point to the possibility that a country in early stages of development

⁴⁰ Fredriksson and Gaston (2000) found CO₂ levels to be significantly influencing ratification delay regarding the United Nations Framework Convention on Climate Change. However, Fredriksson and Ujhelyi (2004) could not support this finding. I found neither CO₂ levels nor CO₂ yearly changes or CO₂ variation compared to 1990 levels significant (which is the baseline year of Kyoto regulations). Neumayer (2002a) included a dummy of fuel exports in his probit analysis and observed a significant negative effect. Fredriksson and Ujhelyi (2004) and myself arrived at different results. Hence, I stick to their more straightforward and intuitive *vehicle* variable.

favors economic growth rather than environmental protection. Accordingly, one might expect an u-shaped curve with respect to ratification delay of environmental agreements. Whereas a country at low income levels faces relatively low abatement costs accruing from environmental regulation and hence loses little by ratifying an agreement, it tends to object environmental commitment at medium income levels due to its potential economic harm. After the turning point at some income level the population's demand for environmental protection exceeds this objection and ratification delay diminishes again. Hence, we would expect a positive effect of the linear GDP component and a negative effect of GDP squared.

Table 3 lists all dependent and independent variables, the number of observations, mean, standard deviation, minimum and maximum, as well as sources and availability of the data. The number of observations corresponds to sample size times the number of years, during which the analysis has been carried out.⁴¹ Note, that the statistics of the independent variables are given for the total time of analysis from 1992 to 2004. Hence, they ultimately differ from model to model, since each of the agreements covers only a fraction of the complete time-span.

Table 3. Variables and data sources

Variable	Obs	Mean	Std. Dev.	Min	Max	Description	Record	Sources
Pop	2470	0.31	1.18	9.5E-05	13.09	Population (100 Million)	2002 (a)	WDI
GDPpc	2275	5.31	8.80	0.08	44.45	GDP per capita (1000US\$)	2002 (a)	WDI
GDPsq	2275	135.33	381.25	0.00243	3487.3	GDP per capita squared	2003 (a)	WDI
Checks	2080	2.76	1.79	1	10	Number of veto players	2000 (a)	DPI
System	2197	0.78	0.92	0	2	Political system presid-parliam	2000 (a)	DPI
Democracy	2470	0.85	0.81	0	2	Democracy Index Freedom House	2003 (a)	FH
Democracy_2	2457	0.01	0.95	-1.81	1.67	Government's accountability index	2002 (b)	WBI
ENGO	2470	11.80	30.35	0	349	Number of ENGOs	2001 (x)	EUR
EnvLobby	2470	0.73	0.81	0	2	Environmental lobby strength (Categories)	2001 (x)	EUR
ENGO_2	2470	4.37	7.94	0	63	Number of IUCN members	2004 (f)	IUCN
EnvLobby_2	2470	0.73	0.81	0	2	Environmental lobby strength (Categories)	2004 (f)	IUCN
Copenhagen Amendment (161 failures)								
dayscopen	1491	1592.72	1211.06	37	4420	Ratification delay, days after Nov 25, 1992	2004	Copen
censcopen	190	0.85	0.36	0	1	Ratification status as of Jan 1, 2005	2004	Copen
HCFCcons	1151	0.80	5.82	0	108.14	Consumption of HCFC in ODP metric tons	2003 (a)	UNEP
Kyoto Protocol (130 failures)								
dayskyoto	1013	1161.33	663.92	185	2483	Ratification delay, days after March 16, 1998	2004	Kyoto
censkyoto	190	0.68	0.47	0	1	Ratification status as of Jan 1, 2005	2004	Kyoto
Vehicles	884	1.39	1.75	0.00	7.65	Vehicles in 1996 (per 100 persons)	1996 (f)	WDI
Rotterdam Convention (79 failures)								
daysrott	1208	1120.01	705.05	112	2304	Ratification delay, days after Sept 11, 1998	2004	Rott
censrott	190	0.42	0.49	0	1	Ratification status as of Jan 1, 2005	2004	Rott
Chemexp	772	4.20	12.25	1.00E-07	92.40	Chemical exports (Mrd US\$)	2003 (a)	UNCTAD

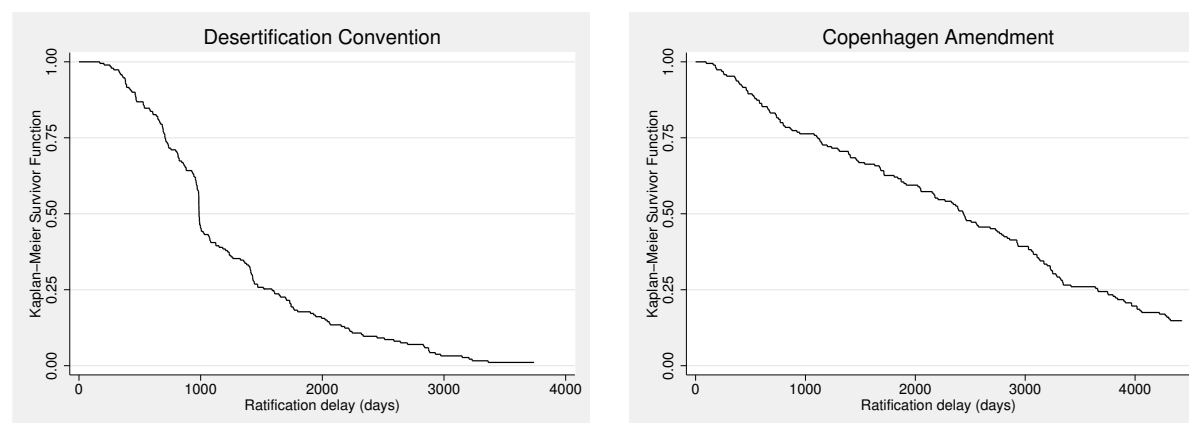
⁴¹ For example data on *Pop* are available for all 190 countries and each of the 13 years, corresponding to 2470 observations in total. Accordingly, the number of observations of the dependent variables (*dayscartag*, *dayscopen*, *dayskyoto*, *daysrott*, and *daysdesert*) results from the number of years of analysis and the distribution of ratification dates.

Desertification Convention (187 failures)								
daysdesert	880	866.56	730.54	79	3732	Ratification delay, days after Oct 14, 1994	2004	Desert
censdesert	190	0.98	0.12	0	1	Ratification status as of Jan 1, 2005	2004	Desert
Popdryperc	722	25.70	33.12	0	100	Percentage of people living in drylands	1994 (f)	UNEP
Cartagena Protocol (109 failures)								
dayscartag	825	852.95	477.29	143	1692	Ratification delay, days after May 15, 2000	2004	Cartag
censcartag	190	0.57	0.50	0	1	Ratification status as of Jan 1, 2005	2004	Cartag
GMO	825	0.18	1.06	0	11.60	Biotech crop area (% of total agric. area)	2004 (a)	ISAAA/ FAO

Notes: Sources and availability of data are listed in the Appendix, "Record" shows the year of the most recent record and record frequency: a: annual, b: biannual, f: fixed, x: 1994,1998,2001

By studying the ratification statistics, one can infer that the agreements differ significantly in their respective rate of accession. The Desertification Convention (from now on “*Desertification*”) for example has a considerable lower mean of delay days, than the Copenhagen Amendment (“*Copenhagen*”). Moreover, although Copenhagen was open for signature almost two years earlier than Desertification, it acquired also less members in absolute terms.⁴² Figure 1 plots the non-parametric estimates of the Kaplan-Meier survival distribution function for the two agreements. The estimator gives the probability of survival (that is remaining a non-member) past time t (Kaplan and Meier 1958, see also Cleves et al. 2001).⁴³

Figure 1. Comparison of Survivorship Functions of the Convention to Combat Desertification and Copenhagen



Apparently Desertification was subject to rapid accession. Only three countries remained non-members until 2005 (Estonia, Iraq, and Serbia Montenegro). On the contrary, ratifications of

⁴² Note that a ‘failure’ symbolizes the decision of a country to exit its current state of being a non-member, meaning that it ratifies the agreement.

⁴³ More precisely, the estimator at any point t in time is derived by multiplying a sequence of conditional survival probability estimators. Each conditional probability estimator is calculated by the sum of countries ‘at risk’ of ratifying (n_i) minus the observed number of ratifications (d_i) divided by all at risk: $\hat{S}(t) = \prod_{t_{(i)} \leq t} \frac{n_i - d_i}{n_i}$.

Copenhagen were more evenly distributed, indicating that the costs accruing from this agreement were more substantial.⁴⁴

4.4 Estimation technique - The proportional hazard regression model

Cross-country quantitative analysis of environmental commitment by means of IEA membership allows for two different regression techniques. When thinking about the country's status as of a binary choice (member vs. not-member), one would typically employ logit or probit estimation. However, since ratification is an ongoing process, the results depend on the point in time at which the analysis is been carried out. Bearing in mind the delay time that elapses until a country chooses to ratify the agreement provides us with additional data, that cannot be accounted for by logit or probit models. Survival analysis on the contrary draws particularly on time-to-event data and allows us to take into consideration ratification delay. With respect to international environmental agreements we know for example that Singapore has not ratified the Kyoto Protocol yet. However, we do not know if it will do so in the future and in case it does, we do not know when. However, we can include information on how long it already has avoided to do so. Hence, assuming that ratification delay symbolizes the degree to which a country is environmentally committed, survival models enable us to use information that would otherwise have been lost.

The basic idea of these models is to specify a hazard function λ that gives the probability of failure in an interval after time t , conditional on the subject having survived to time t , written as a conditional function of country characteristics. (Kiefer 1988). Suppose, for the moment, a model containing one covariate only. Cox (1972) suggested to describe the hazard rate by

$$h(t, x, \beta) = h_0(t)\phi(x, \beta) \quad (1)$$

which is the product of two separate functions. The first part $h_0(t)$ depicts the baseline hazard, characterizing how the hazard function changes as a function of survival time. The second part captures the effects that the covariates have on that distribution. Since the purpose of this study is to sort out the effects that democracy and environmental pressure groups have on ratification delay, we are interested in this second component. On the contrary, the baseline distribution, that is how ratification delay time is distributed without taking account of the

⁴⁴ The survival functions of the other agreements can not describe ratification delay equally illuminating, since their rate of failures is much smaller. Nevertheless their 'preliminary' probability distribution reveals a far more hesitant ratification behavior than in the case of Desertification. The Graphs are given in Appendix A.

influence of covariates, is of no further interest here. Letting $\phi(x, \beta) = \exp(x\beta)$, the commonly used specification for the proportional hazards regression model with respect to the j th subject is

$$h(t, x, \beta) = h_0(t) \exp(x\beta) \quad (2)$$

Since we are interested in the effects, that the covariates have on survival time, a transformation of the hazard function is needed that is linear in its coefficients. Hence, this linearizing transformation (analogue to the link function for generalized linear models) in this case is the natural log transformation, yielding the log-hazard function

$$g(t, x, \beta) = \ln[h_0(t)] + x\beta \quad (3)$$

Assuming a change in the covariate from $x = a$ to $x = b$, the difference in the log-hazard function is calculated by

$$\begin{aligned} [g(t, x = a, \beta) - g(t, x = b, \beta)] &= \{\ln[h_0(t)] + a\beta\} - \{\ln[h_0(t)] + b\beta\} \\ &= a\beta - b\beta \\ &= (a - b)\beta \end{aligned} \quad (4)$$

Hence, the baseline hazard subtracts itself out. Consequently, the difference in the log hazards does not depend on time. For example, when thinking of the effect of the Democracy variable on the ratification hazard, a graph of the log hazard over time would produce three curves, one for $x = 0, \ln[h_0(t)]$, one for $x = 1, \ln[h_0(t)] + \beta$, and one for $x = 2, \ln[h_0(t)] + 2\beta$. Independent of the shape of the baseline hazard function, the vertical distance between the adjacent curves at any point in time is β . Thus, for assessment of model adequacy one has to check, whether the three curves are equidistant over time. In other words, if a covariate enters the hazard function non-proportionally, the coefficient on that covariate is $\beta(t)$ rather than β . With respect to model building, one therefore has to account for this critical proportional hazards assumption (see Hosmer and Lemeshow 1999: 196-240). As will be seen later on, this assumption makes some difficulties in the cases of the Copenhagen Amendment and the Kyoto Protocol, which had to be re-specified.

By applying the Cox estimation method, β can be estimated without having to make assumptions about the baseline hazard. For this purpose a risk set is constructed at each failure time (the number of countries that is *at risk* of ratification at each time one country ratifies) and the conditional probability of failure is maximized. The Cox partial likelihood function is given then by maximizing the probability that country j ratifies

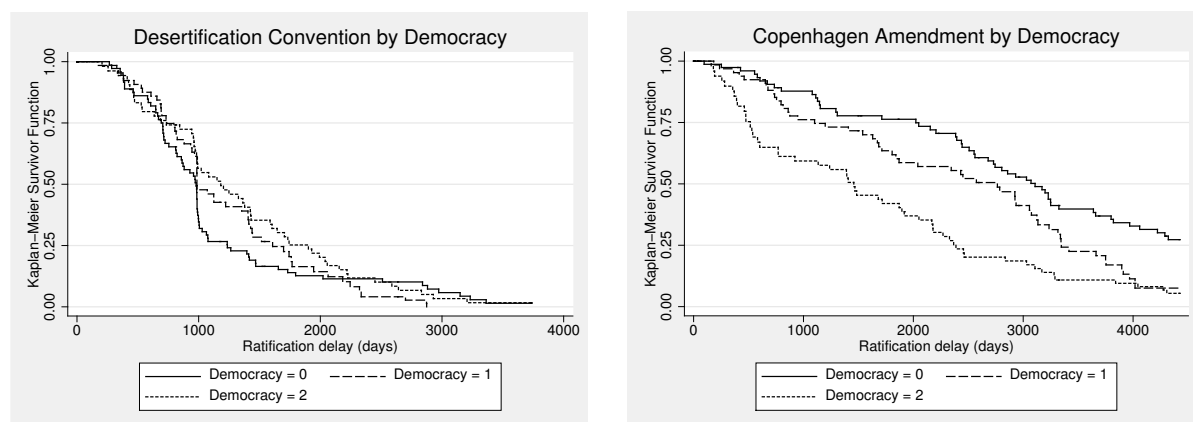
$$L(\beta_x) = \prod_{j=1}^k \frac{h(t | x_j)}{\sum_{i \in R_j} h(t | x_i)} = \prod_{j=1}^k \left(\frac{\exp(x_j \beta_x)}{\sum_{i \in R_j} \exp(x_i \beta_x)} \right) \quad (5)$$

with k distinct failure times, multiple x variables, and R_j denoting the set of countries at risk at time t_j .⁴⁵ Since ratification is an ongoing process and the explanatory variables may change in the meantime as could be seen with respect to ENGO strength (Table 1), it will significantly improve the results to control for these changes. The proportional hazard model allows for the inclusion of time-varying covariates and the respective regression function and generalization of the partial likelihood function differ from equations (2) and (3) only in their time-dependent notation (see Hosmer and Lemeshow 1999: 248-253 for further discussion).

4.5 Regression results

Before discussing the regression results, a closer look to the nonparametric estimates allows for first insights. As we have seen in Figure 1, the survivor function is a useful tool in order to compare ratification behavior for different agreements. Even more so, it is possible to display these functions with respect to different groups of subjects. Since we are interested in the effects of democracy on ratification delay, Figure 2 plots the survivor functions for Copenhagen and Desertification comparing countries that are free (Democracy=2), partly free (Democracy=1), and not free (Democracy=0).

Figure 2. Comparison of Survivorship Functions by Democracy subgroups

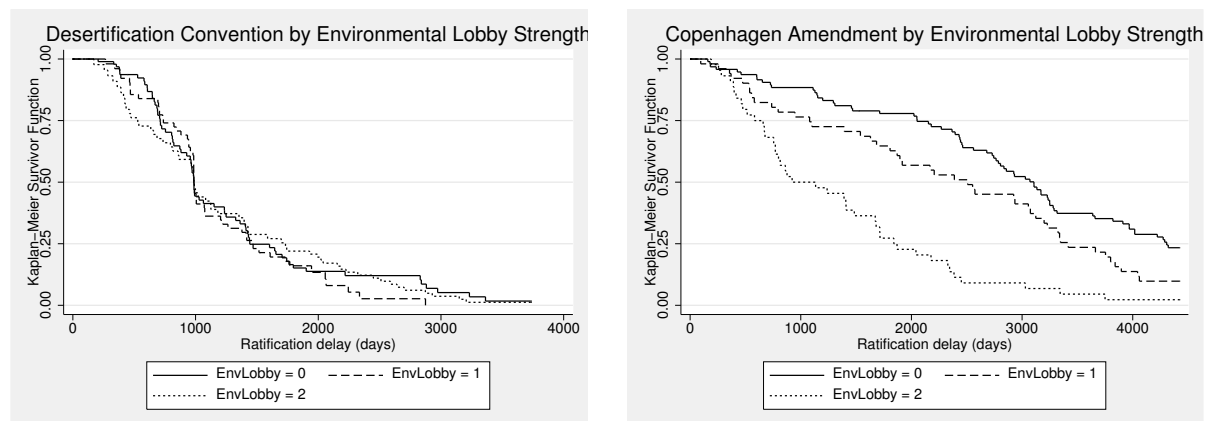


⁴⁵ For further discussion of duration models see Cox and Oakes (1984) and Lancaster (1990)

Apparently, the Copenhagen Amendment confirms clear cut differences in ratification behavior of countries grouped according to their levels of democracy. While ‘free’ countries have the lowest survival probabilities throughout, countries that are ‘not free’ experience continuously the highest survival probabilities. The fraction of ‘partly free’ countries takes medium values. Hence, on average, more democratic countries tend to ratify earlier than less democratic countries. Quite differently, the case of the Desertification Convention does not allow for any robust conclusions. As one can see, the individual survivor functions cross each other several times throughout the analyzed period. The three other agreements displays pattern similar to Copenhagen, although less conclusive (see Appendix B). Log-rank tests for equality of survivor functions additionally support the graphical judgment. The tests of Cartagena, Copenhagen, Kyoto, and Rotterdam are highly significant and back the impression that those countries with higher democracy levels tend do ratify sooner than those with lower levels. Desertification marks the only exception, with a chi squared value of 1.64 and two degrees of freedom, corresponding to a p-value of 0.44. (Test statistics are given in the Appendix).

Likewise, it is illuminating to have a preliminary graphical assessment of the effects of the second crucial explanatory variable. Accordingly, ratification behavior can be assessed by classifying countries along the lines of their domestic environmental lobby strength. Figure 3 parallels the pattern of the above graphed survival probabilities. In the case of Copenhagen the divergence of the subgroups appears to be more substantial between 1000 and 3000 days, though converging little more in the end than in the case of democracy subgroups. Once again, no systematic differences based on ENGO strength can be detected with respect to Desertification. Consequently also the log-rank tests report results similar to those from above, even though p-values are slightly higher. All graphs and tests are given in Appendix C.

Figure 3. Comparison of survivorship functions by ENGO subgroups



The graphical assessments are illuminating regarding correlation of the crucial covariates and ratification delay. Since we are interested in systematic effects that are robust to the inclusion of several control variables, regression analysis of probabilistic models in the form outlined in the previous section, provide additional insights.

Regressions have been run basically in two steps. Firstly, I focused on the influence of democracy as the main explanatory variable. The effect of environmental interest group strength has been subject to a second set of regressions afterwards. As has been mentioned, the Cox proportional hazard model is conditional on the assumption that the influence of the independent variables is independent of time. Thus, in order to assess whether the models are specified adequately, a test of the proportional hazard assumption proposed by Grambsch and Thernau (1994) has been applied. Table 4 reports the specification tests for Copenhagen and Kyoto, since these two agreements indicate a violation of the assumption.⁴⁶ Test statistics follow a chi-squared distribution and is reported for each individual covariate as well as for the full model as a whole.

Table 4. Test of the proportional hazard assumption

	Kyoto						Copenhagen			
	(Preliminary)			(Stratified)			chi2	df	Prob>chi2	
	chi2	df	Prob>chi2	chi2	df	Prob>chi2				
Democracy	0.09	1	0.7671	0.04	1	0.8434	Democracy	2.05	1	0.1521
Area	0.07	1	0.7842	0.22	1	0.6381	area	0.28	1	0.5965
GDPpc	0.03	1	0.8601	0.01	1	0.9337	GDPpc	5.84	1	0.0157
GDPsq	0.01	1	0.9424	0.03	1	0.8536	GDPsq	3.65	1	0.0562
Pop	1.35	1	0.2454	0.98	1	0.3227	pop	0.19	1	0.6602
System	0.23	1	0.6286	0.11	1	0.7416	System	1.69	1	0.1939
Checks	0.07	1	0.7916	0.03	1	0.8609	checks	0.01	1	0.9361
Vehicles	0.19	1	0.6671	0.08	1	0.7832	HCFCons	1.76	1	0.1844
annex1	7.2	1	0.0073							
global test	20.18	9	0.0168	4.04	8	0.8538	global test	11.43	8	0.1784

In the case of the Kyoto Protocol, the proportional hazard assumption is rejected by the global test and annex1 obviously poses a problem. This finding is consistent with Fredriksson and Ujhelyi (2004). Following them, the regressions for Kyoto are run on models, that are stratified by annex1. By stratifying, the model allows for different baseline functions between the individual subgroups, here annex1 countries and non-annex1 countries. As can be seen in the second column, under stratification the global tests do not reject proportionality any more. In the case of the Copenhagen Amendment the effects of GDP and GDP squared on the ratifica-

⁴⁶ The basic idea of the test is to retrieve residuals and check whether these are related to time. There are different procedures to test whether a relationship exists. Grambsch and Thernau showed that these tests can be subsumed under their alternative method, that tests for a nonzero slope in a generalized regression of residuals on functions of time. The test is based on a scaled form of the residuals developed by Schoenfeld (1982) (see Cleves 2001: 157-177).

tion hazard apparently are not independent of time. The model appears to be more appropriate specified by allowing some coefficients to vary with time. We deal with this problem in the second set of regressions, because *EnvLobby* effects, as will be seen, are even more contingent on time. For the moment, since income levels only operate as controls, they are not of prime interest for the analysis here, and most importantly the global test for the full model does not reject the assumption, I decided to leave GDP and GDP squared unchanged.

Table 5 contains the estimation results, firstly considering only the effects of democracy while ignoring any possible confounding of environmental interest group strength. For ease of comparability only two model specifications are shown for each agreement. Model 1 includes the standard controls, whereas Model 2 extends the set of covariates to institutional characteristics and the agreement specific control variable. Note, that reported results are coefficients. Thus, in order to derive the easy-to-interpret hazard ratios, one has to take the exponent of the coefficients.⁴⁷

On the whole, standard control variables not appear to have strong effects on the ratification behavior of a country. The signs of the coefficients do not indicate any systematic effects. Contrary to Congleton's findings though, the resource base as proxied by *Area* tends to be negatively related to a country's hazard of ratification. Congleton however studied signature rather than ratification, used logit estimation and examined the Montreal Protocol only. In addition he did not control for institutional variables, which remove the significance of *Area* in the two cases where it was given (Cartagena (1) and Kyoto (1)).

With respect to the influence of income levels, no consistent pattern can be detected neither. In the case of the Copenhagen Amendment the linear component of GDP is positively related to the hazard, whereas the squared component has a negative sign. However, the GDP coefficients for Cartagena indicate the reverse relationship (if any at all). The results for Kyoto are consistent with those of Fredriksson and Ujhelyi (2004), who also found GDP to be positively correlated with the ratification hazard, though never significantly. On the whole, income levels do not seem to have a consistently strong effect on international environmental commit-

⁴⁷ As was illustrated in equation (4), the difference in a one unit change in the coefficient is calculated for the log-hazard function: $g(t, x, \beta) = \ln[h_0(t)] + x\beta$. Hence, in order to derive a more easily interpreted expression, one has take the exponential function, yielding the *hazard ratio*:

$$HR(t, a, b, \beta) = \exp[g(t, x = a, \beta) - g(t, x = b, \beta)] = \frac{h(t, a, \beta)}{h(t, b, \beta)} = e^{(a-b)\beta}$$

ment. The effect of the population size of a country, only significant at Rotterdam, supports the assertion that smaller countries are able to gain more by concessions than large countries.

Table 5. Proportional Hazard Regression Results

	Cartagena		Rotterdam		Kyoto		Desertification		Copenhagen	
	Model (1)	Model (2)	Model (1)	Model (2)	Model (1)	Model (2)	Model (1)	Model (2)	Model (1)	Model (2)
Democracy	0.474 [0.144]***	0.383 [0.187]**	0.070 [0.174]	0.323 [0.282]	0.581 [0.131]***	0.775 [0.181]***	-0.267 [0.104]**	-0.551 [0.156]***	0.332 [0.110]***	0.283 [0.152]**
Area	-0.191 [0.098]*	-0.086 [0.108]	0.019 [0.068]	0.113 [0.085]	-0.116 [0.064]*	-0.133 [0.083]	-0.054 [0.037]	-0.087 [0.052]*	-0.004 [0.042]	0.011 [0.055]
Pop	0.149 [0.096]	-0.014 [0.114]	-0.278 [0.271]	-1.133 [0.544]**	0.117 [0.076]	0.011 [0.117]	0.006 [0.026]	0.054 [0.029]*	0.026 [0.060]	-0.145 [0.094]
GDPpc	-0.030 [0.025]	-0.028 [0.027]	0.034 [0.028]	-0.045 [0.042]	0.013 [0.026]	0.034 [0.037]	0.001 [0.001]	0.000 [0.001]	0.095 [0.026]***	0.069 [0.033]**
GDPsq	0.001 [0.001]**	0.001 [0.001]*	0.000 [0.001]	0.001 [0.001]	0.000 [0.001]	0.000 [0.001]	0.090 [0.080]	0.075 [0.085]	-0.001 [0.001]*	-0.001 [0.001]
System		-0.035 [0.142]		0.205 [0.203]		0.018 [0.133]		-0.022 [0.112]		0.053 [0.121]
Checks		0.185 [0.078]**		0.009 [0.128]		0.121 [0.082]		0.022 [0.065]		0.053 [0.059]
GMO		-0.154 [0.156]								
Chemexp				0.003 [0.001]*						
Vehicles						-0.093 [0.149]				
Popdryperc								0.008 [0.003]***		
HCFCons										0.025 [0.011]**
Observations	756	630	1105	664	920	724	785	605	1335	892
Subjects	175	146	175	137	175	143	175	142	175	142
LR	26.91	30.50	17.64	20.45	28.08	36.58	12.59	28.48	53.76	30.06

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Of the two institutional control variables, only the number of veto players has a positive effect on ratification hazard throughout. Yet, as with the results of Fredriksson and Ujhelyi (2004), the variable barely gains significance.⁴⁸ Although consistent with their findings, the trend of the correlation is rather counterintuitive. The larger the number of veto players that are independent of each and have to decide on a topic, the more time will pass until they reach consensus, one would suggest. Hence, the ratification hazard would have to decrease with an increasing number of *checks*. Though not of further interest here, this finding asks for closer scrutiny in the future. With respect to the second control, the relationship between the prime executive leader and legislative body do not reveal any systematic influence. The signs are changing from case to case and standard errors are too high than allowing for any robust con-

⁴⁸ Fredriksson and Ujhelyi have been interested in the interaction of ENGOs and the number of government units. Only with the inclusion of these interaction terms, the effect of veto players turned out to be significant.

clusions. This stands somewhat in contrast to Deacon (1999), who found parliamentary systems more prone to provide public goods than presidential ones. However, his findings are hardly comparable to the ones here. Firstly, he considered mainly non-environmental goods. Secondly, his dependent variables were purely domestic in nature and not subject to international negotiations. Thirdly, he did not control for any additional explanatory variables other than income. Thus, differences between presidential and parliamentary systems apparently can not account for any differences in ratification delay of international environmental agreements.

Turning to our first main predictor variable, regression results seem to support the outlined hypothesis to some extent. Democracy turns out to be positively related to ratification hazard in four out of five agreements, three of them yielding significant results. In line with the graphical assessments of the survival probability according to democracy subgroups (Appendix B), in the cases of Cartagena, Kyoto, and Copenhagen countries that are *free* not only tended to participate more than *not free* countries in absolute terms, but also ratified the agreements more rapidly. This effect is highly significant when controlling only for standard controls and loses only some power when additional institutional and issue specific covariates are included. With respect to the extent to which influence is exerted, environmental commitment is most reliant on the existence of democratic institutions regarding global warming, followed by biological diversity and ozone depletion. In absolute terms, regression results indicate, that a one unit change in democracy level results in $e^{0.775} = 2.11$ times increase of the hazard ratio. Thus, on average a country ranked as non-free that implements substantial democratic reforms (and accordingly would be rated as partly free) tends to more than double its hazard ratio. Size and significance of this effect differ from issue to issue but seem to be consistent in four out of the five agreements examined here.

Disturbingly though, in the case of desertification the predicted relationship holds not true. On the contrary, the data indicate a reverse correlation. This finding may be explained in several ways. Firstly, a graphical assessment of the survivorship function in Figure 2 illustrates, that the significant negative effect of democracy just arises during the time span between 1000 and 2000 days after commencement. Before and after, countries face about the same survival probability regardless of their level of democracy. Secondly, as already mentioned the Desertification Convention appears to posit the lowest barriers for participation. It was by far the most rapidly ratified agreements of those presented here. Ratification delay for Desertification has a median of 810 days, while the median for the other Protocols varies between 961 (Cart-

agena) and 1498 days (Copenhagen). This impression is further supported by, thirdly, the fact that no specific lobby could be identified, that was hypothesized to oppose participation in the agreement. The percentage of population that lives in drylands, however, influences ratification delay as theoretically expected.

On the whole we may conclude, that Democracy indeed can have a positive effect on environmental commitment. This relationship however does not hold true consistently. It seems to depend on the environmental issue at stake, pointing to a lower or even reverse effect of democracy when the ratification process occurs rapidly.

Having evaluated the effect of democracy, I now turn to the second set of regressions by assessing whether environmental pressure group strength exerts influence on ratification as well. The analogies in the survivorship functions as seen in Figures 2 and 3 point to very similar effects of *EnvLobby* and *Democracy* and the possibility that one is in fact caused by the other. The apparent systematic differences between countries with strong environmental interest group pressures and those with weak pressures, may in fact result from their correlation to respective levels of democracy. Even though correlation between the two variables is only moderate (see Table 2), it remains to be tested, whether the effect of *Democracy* is robust to the inclusion of *EnvLobby* and vice versa.

Table 6 reports regression results for Model (3) and Model (4), considering ENGO only in the former case while accounting for both key predictors in the latter. Note that *EnvLobby* in the case of Copenhagen is replaced by constant 1994 levels. This is due to the fact, that the proportional hazard assumption was otherwise violated. As already mentioned, in order to allow adequate interpretation of the Cox model, the effect of the covariates has to be independent of time. As the specification tests in Appendix C-2 report and graphical assessment indicate, the original form of the environmental lobby variable does not meet this condition in the case of Copenhagen.⁴⁹

Environmental pressure group strength indeed exerts similar effects as democracy does. Four out of five agreements yield positive signs, Desertification being the only exception again. On the whole however, effects indeed are contingent on whether democracy is included in the model or not. At Cartagena, Kyoto, and Desertification democracy removes at least some significance from ENGO. This mechanism works also the other way around. A comparison with Table 5 indicates that ENGO itself removes significance from democracy, too.

⁴⁹ When ignoring the misspecification problem and running the regression with the original ENGO dataset nonetheless, one derives very similar results, changing neither signs nor significance levels.

Due to the categorization of environmental lobby group strength, the coefficients can not be interpreted in the same way as the *Democracy* variable. It only allows for ordinal interpretation: On the whole, those countries that belong to the medium category, as measured by environmental lobby strength, face a higher “risk of ratifying” than those countries that belong to the lowest third but a lower risk than those that nations that make up the upper third. We can however not derive the marginal change that on average arises from one ENGO unit more. Due to the rough data properties, such an attempt to interpret the data would make little sense in any case.

Table 6. Proportional Hazard Regression Results including ENGO

	Cartagena		Rotterdam		Kyoto		Desertification		Copenhagen	
	Model (3)	Model(4)	Model (3)	Model(4)	Model (3)	Model(4)	Model (3)	Model(4)	Model (3)	Model(4)
Democracy		0.248 [0.197]		0.309 [0.294]		0.740 [0.187]***		-0.489 [0.164]***		0.080 [0.167]
EnvLobby	0.457 [0.171]***	0.385 [0.180]**	0.124 [0.248]	0.045 [0.261]	0.346 [0.180]*	0.186 [0.187]	-0.313 [0.138]**	-0.183 [0.146]	0.561 [0.142]***	0.535 [0.152]***
Area	-0.131 [0.115]	-0.120 [0.113]	0.114 [0.086]	0.112 [0.085]	-0.153 [0.083]*	-0.137 [0.084]	-0.074 [0.052]	-0.084 [0.052]	-0.032 [0.058]	-0.031 [0.058]
Pop	-0.053 [0.113]	-0.024 [0.114]	-1.176 [0.547]**	-1.133 [0.544]**	-0.098 [0.116]	0.007 [0.117]	0.107 [0.083]	0.090 [0.086]	-0.197 [0.099]**	-0.187 [0.100]*
GDPpc	-0.033 [0.027]	-0.044 [0.028]	-0.037 [0.041]	-0.046 [0.042]	0.011 [0.035]	0.031 [0.037]	0.025 [0.028]	0.057 [0.029]*	0.083 [0.032]***	0.077 [0.034]**
GDPsq	0.001 [0.001]**	0.001 [0.001]**	0.001 [0.001]	0.001 [0.001]	0.000 [0.001]	0.000 [0.001]	0.000 [0.001]	0.000 [0.001]	-0.002 [0.001]**	-0.002 [0.001]*
System	0.034 [0.140]	0.000 [0.142]	0.246 [0.203]	0.212 [0.206]	0.144 [0.131]	0.034 [0.133]	-0.072 [0.110]	-0.021 [0.112]	0.144 [0.117]	0.128 [0.122]
Checks	0.188 [0.074]**	0.163 [0.077]**	0.053 [0.116]	0.006 [0.129]	0.190 [0.081]**	0.108 [0.082]	-0.040 [0.064]	0.032 [0.066]	0.044 [0.059]	0.037 [0.061]
GMO	-0.130 [0.152]	-0.146 [0.155]								
ChemExp			0.003 [0.001]*	0.003 [0.001]*						
Vehicles					0.056 [0.135]	-0.108 [0.153]				
Popdryperc							0.008 [0.003]***	0.008 [0.003]***		
HCFCcons									0.029 [0.011]**	0.028 [0.011]**
Observations	630	630	664	664	724	724	605	605	892	892
Subjects	146	146	137	137	143	143	142	142	142	142
LR	33.61	35.2	19.37	20.49	22.33	37.56	21.03	30.06	41.98	42.21

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

With respect to the agreement specific control variables, Cartagena and Kyoto show the expected signs. Strength of chemical export industry and HCFC consumption in the case of Rotterdam and Copenhagen respectively work rather counter intuition, since they increase the ratification hazard. This finding parallels partly the results of Neumayer (2002a), who found

CFC exports positively correlated with ratification of the Montreal Protocol. Chemical exports though did not reveal significant effects on signing of the Rotterdam Convention. Desertification results, which show no impact of ENGOs when democracy is included may be due to the fact, that there have been virtually no business interests contradicting the convention. Accordingly, ENGOs did not have to focus on this issue either and the decision of a country to participate in the agreement was rather based on other factors, such as the proportion of population affected by drought covered by *drylandperc*. Note, that the other measure of environmental interest group strength (*EnvLobby_2*) as reported in Appendix D-1 does not show a negative coefficient.

All other results, however, are fairly robust to checks with competing measures of environmental pressure group strength and democracy (see Appendix D). Only at Cartagena, the World Bank's measure of democracy exhibits less significance than the Freedom House index. The second ENGO operationalization, which is membership in the World Conservation Union, shows sometimes even more significance in its effects on the ratification hazard. Recall, however, that this measure refers to 2004 membership numbers only and thus does not account for any changes in environmental pressure group strength that may have been occurred for example in Eastern Europe during the decade.

4.6 Lessons from the empirical analysis

On the whole, graphical assessments of the survivorship functions as well as regression results from the proportional hazards model support to some extent the theoretical considerations outlined in the previous chapter. A country's international environmental commitment rises with the degree to which democracy is developed as well as with the intensity of domestic environmental pressure group strength. Analysis has been carried out on a large cross-country sample on a variety of environmental problems. The findings are mostly robust to a different operationalization and the inclusion of additional institutional control variables. Since international environmental commitment is measured in ratification delay, this quality is especially important for making sure that the results do not stem from other characteristics of political systems that may be independent of the level of democracy or differ within same subgroups.

However, several limitations remain. Firstly, as the Convention on Desertification illustrates, results are not consistently supporting the theory. They rather suggest, that susceptibility to

environmental lobby pressures and determination by democratic development differ between environmental agreements. As indicated by the distribution of ratification dates, democracy and ENGO strength appear to reverse its effects in the case of Desertification. This may indicate, that the positive effect of democracy and environmental interest group strength on environmental commitment fades or even reverse when countries are prone to rapid accession. Secondly, whereas several well established measures exist for democracy, the kind of operationalization of environmental pressure group strength that was used here suffers from its unawareness of financial budgets and membership figures.

5. Conclusion

This study analyzed the effects of domestic determinants on international environmental cooperation. It aimed to identify the effect that democratic development on the one hand and domestic environmental pressure group strength on the other hand have on a country's willingness to ratify environmental agreements. I hypothesized a positive impact of both factors. Countries with well developed democratic institutions and those with a strong environmental lobby are more prone to environmental cooperation than rather autocratic regimes and those with smaller aggregate interest group size. The hypotheses have been tested in a cross country study on five different international environmental agreements.

The empirical results support these hypotheses to some extent. In four cases, namely those of climate change, ozone layer protection, biodiversity, and trade of hazardous substances, the findings are consistent with the prediction. Three of them report statistical significance. However, the analysis of the Convention to Combat Desertification reveals coefficients that are contrary to the expectations. Accordingly, the theoretical predictions appear not to be valid in all cases of international environmental cooperation. One possible explanation for the unexpected relationship may be grounded in lower costs accruing from the Convention compared to other agreements. Since the Convention on the whole has been ratified far more rapidly than the other agreements, neither democratic institutions nor environmental interest groups may have been necessary to pressure the governments to early ratification. Instead, the degree to which a country is affected from droughts appeared to be an important factor.

I aimed to contribute to the existing research in the following ways. On the one hand, research so far has postulated a positive effect of democracy on environmental progress largely by focusing on environmental outcomes. Yet, empirical results have been mixed, reinforcing theoretical arguments that establish a link between democratic institutions and environmental commitment rather than on outcomes. Those studies, that examine the latter concept by analyzing participation in international environmental agreements already found some support for the hypothesis. In order to assess whether it is possible to generalize these findings, I extended the sample on a variety of environmental topics. Moreover, survival analysis has been employed in order to account for the timing of a country's ratification decisions. The inclusion of additional institutional control variables ensures, that the calculated effects do not arise from other factors, such as parliamentary or presidential systems.

On the other hand, theoretical arguments already pointed out ways by which pressure groups exert influence on environmental politics. However no attempt has been made to identify the mechanisms by which lobby groups are capable of pressuring policy-maker to take part in international agreements. I focused on the informative role of environmental interest groups. These organizations are skilled in influencing policy-makers indirectly by raising public awareness on the one hand as well as directly by lobbying in the realm of the treaty-making process on the other hand. With respect to the latter, environmental interest groups dispose of valuable expertise and therefore gain considerable access to policy-makers. Since environmental topics become increasingly important, communication between the actors intensifies. A mutual relationship between the two gets established, rendering policy-makers likely to trust and respond to the lobby efforts of environmental interest groups.

Existing empirical research focused on lobbying effects on specific environmental topics in the U.S. legislative process on the one hand. Case studies have evaluated ENGO influence on global environmental problems on the other hand. Cross country studies have been scarce, though. I examined whether the theoretically proposed impact of ENGOs on environmental commitment finds empirical support. As mentioned above, the findings are largely consistent with the hypotheses. However, as the Convention to Combat Desertification reveals, the results can most likely not be generalized for all environmental agreements. Unfortunately, lack of data on membership or financial strength of ENGOs exhibits a major restriction to this study.

As pointed out in the last chapter, the results indeed point to the meaning of ‘advocacy and vigilance’ as Grossman and Krueger argued. Both factors, democracy and environmental pressure group strength seem to foster international environmental cooperation. This study, however, treated the determinants largely independently from each other. Further research may be valuable with respect to a possible interaction between the two. ENGOs, their activities, and the recognized mechanisms by which they exert influence may be dependent to some extent on the predominant political system. Olson illustrated (1982) that special interests are seen to be particularly successful, when facing a long tradition of democracy. Stable societies that can rely on a well established judiciary tend to accumulate more interest groups over time. Furthermore, democratic governments are less likely than autocratic regimes to abuse human rights and more likely to be accountable and responsive to citizens’ demands. Payne (1995: 43) points out that environmental concerns have been among the first that caused interest groups to emerge after countries transition into democracies. Following the above stated

assumptions, ENGOs will primarily use the instrument of disseminating information to citizens as well as to policy-makers. They accumulate expertise regarding the environment and establish networks in order to spread their knowledge and raise awareness. Ideal democratic systems are characterized by the protection of individuals' rights such as freedom of speech and press. Therefore ENGOs possibly face more favorable circumstances in order to influence a government's policy, when levels of political and civil freedom are high in a country. Further research could therefore center on a possible mutually reinforcing effect of democracy and environmental lobbying on environmental cooperation.

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Data Sources

Cartag: Data taken from the official website at www.biodiv.org/biosafety/signinglist.asp

Copen: Data taken from the official website at http://www.unep.org/ozone/Treaties_and_Ratification/2C_ratificationTable.asp

Desert: Data taken from the official website at <http://www.unccd.int/convention/ratif/doiif.php>

DPI: Data from Beck et al. (2001), available at <http://econ.worldbank.org>

EUR: Data taken from Europa Publications (1994/1998/2001)

FAO: Data from FAO, available at http://www.fao.org/waicent/portal/statistics_en.asp

FH: Data from Freedom House, available at www.freedomhouse.org/ratings/index

ISAAA: Data from James, C. (2004), available at isaaa.org/kc

IUCN: Data from the World Conservation Union, available at www.iucn.org/members

Kyoto: Data taken from the official website at http://unfccc.int/essential_background/convention/status_of_ratification/items/2631.php

Rott: Data taken from the official website at <http://www.pic.int/en/ViewPage.asp?id=345>

UNCTAD: Data from UNCTAD, available at <http://stats.unctad.org/>

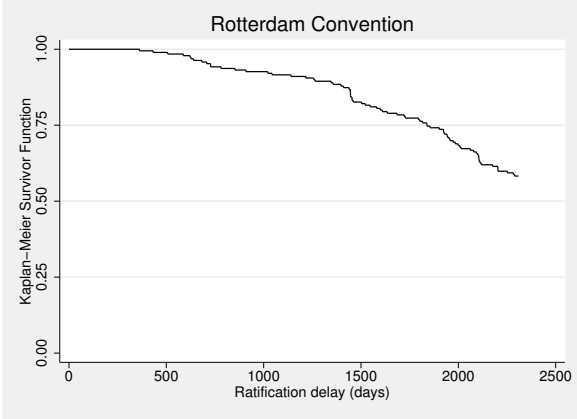
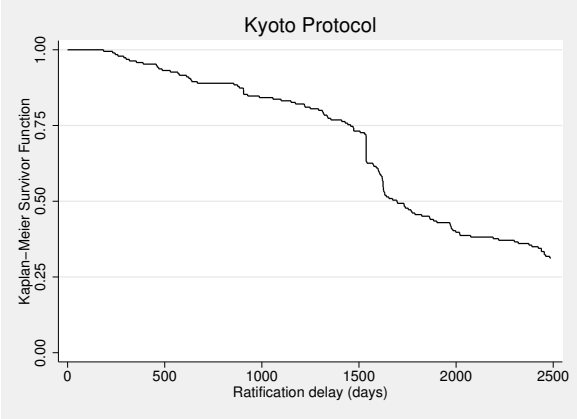
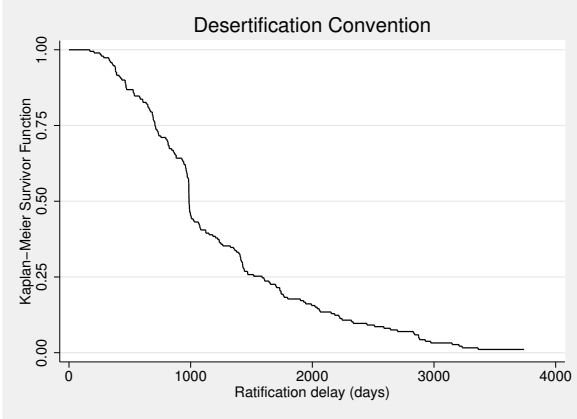
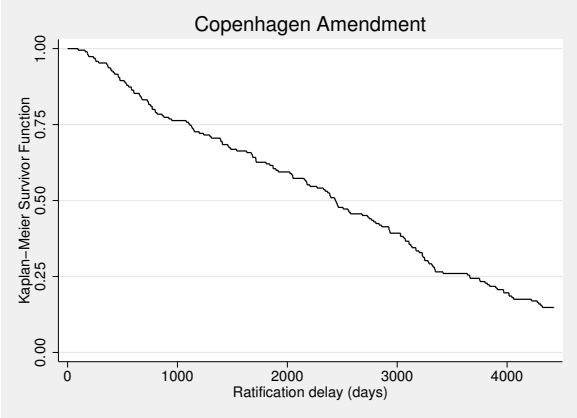
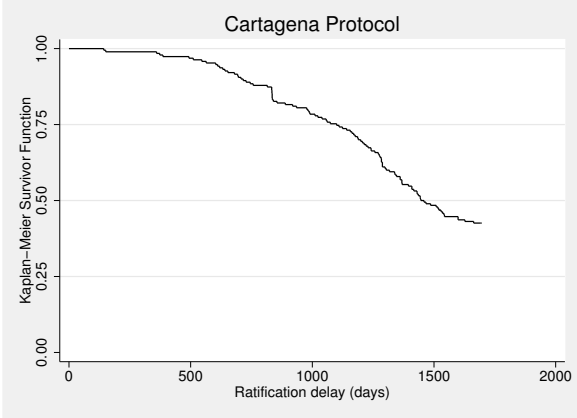
UNEP: Data from UNEP, available at <http://geodata.grid.unep.ch/>

WBI: Data from Kaufmann et al. (2003), available at www.worldbank.org/wbi/governance

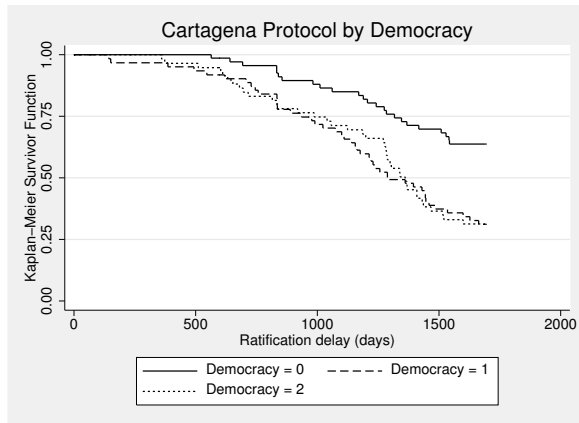
WDI: Data from the World Bank Development Indicators 2004

Appendix

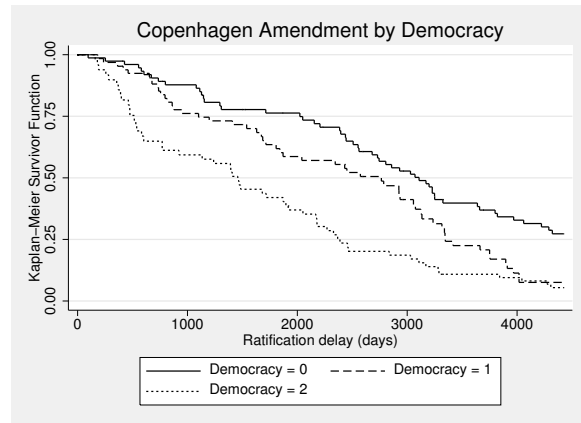
A. Survivor Functions on all countries



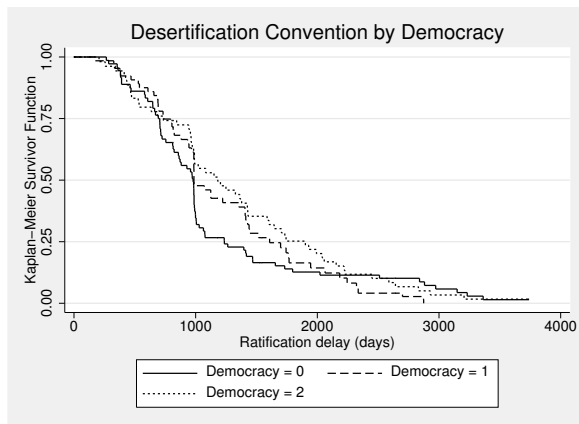
B-1. Survivor Functions – Comparison of Democracy Subgroups



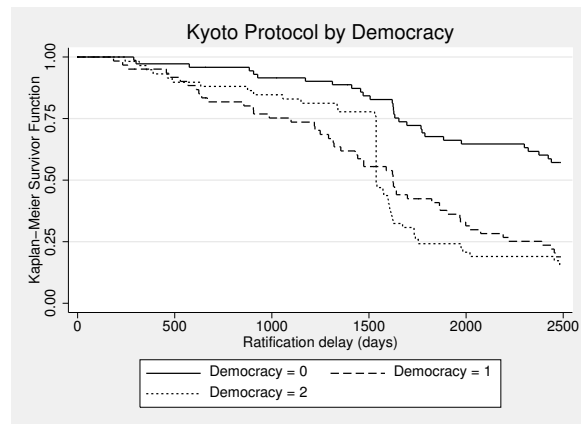
Logrank Test	chi2(2)	17.36
	Pr>chi2	0.0002



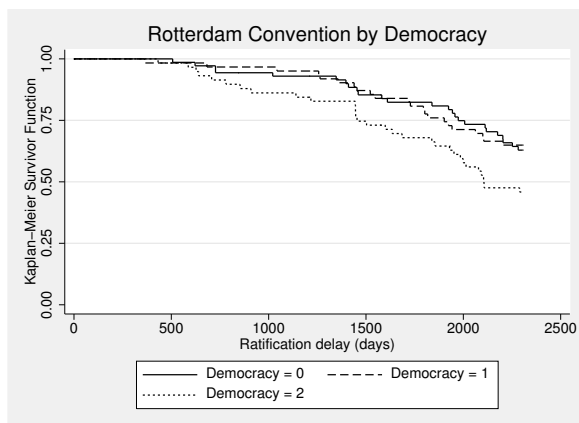
Logrank Test	chi2(2)	25.42
	Pr>chi2	0



Logrank Test	chi2(2)	1.64
	Pr>chi2	0.4404

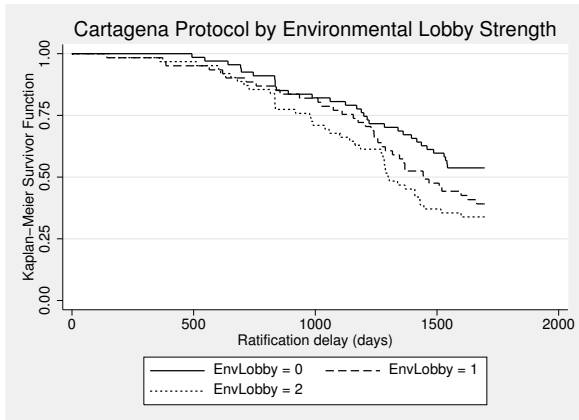


Logrank Test	chi2(2)	32.32
	Pr>chi2	0

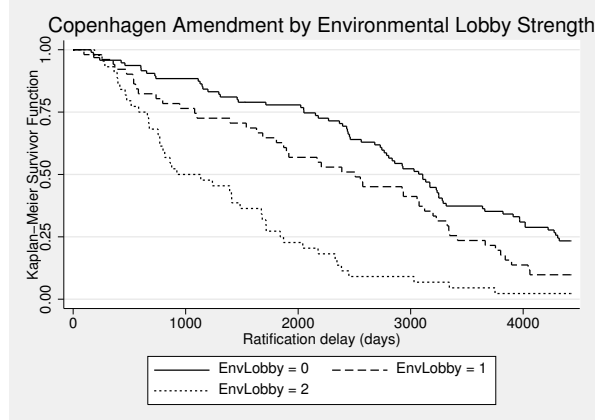


Logrank Test	chi2(2)	6.26
	Pr>chi2	0.0438

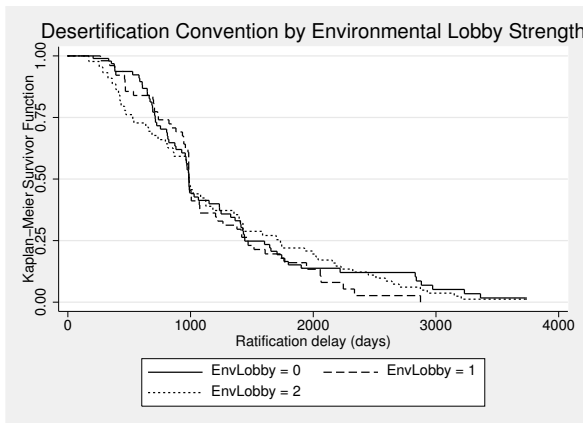
B-2. Survivor Functions – Comparison of ENGO subgroups



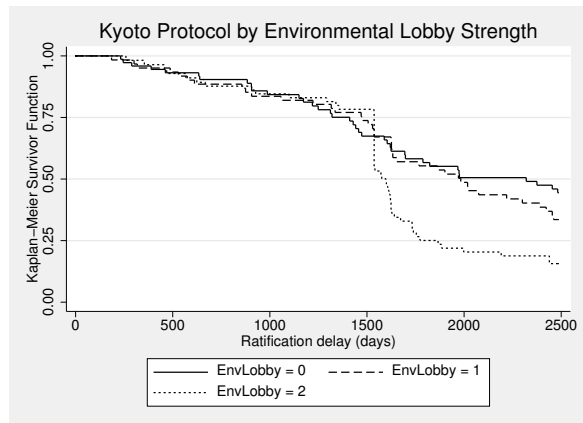
Logrank Test	chi2(2)	6.13
	Pr>chi2	0.0466



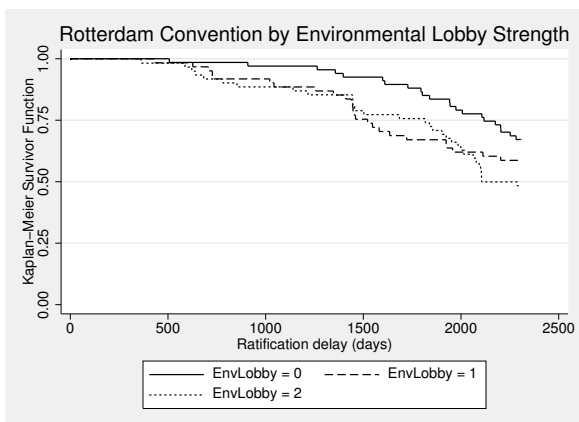
Logrank Test	chi2(2)	26.94
	Pr>chi2	0



Logrank Test	chi2(2)	0.64
	Pr>chi2	0.7279



Logrank Test	chi2(2)	12.04
	Pr>chi2	0.0024



Logrank Test	chi2(2)	5.34
	Pr>chi2	0.0693

C. Assessment of the proportional hazard assumption

C-1. Models (1) and (2) – Regressions without ENGO

Cartagena				Copenhagen			
	chi2	df	Prob>chi2		chi2	df	Prob>chi2
Democracy	1.34	1	0.2478	Democracy	2.05	1	0.1521
Area	0.1	1	0.746	area	0.28	1	0.5965
GDPpc	0.84	1	0.358	GDPpc	5.84	1	0.0157
GDPsq	1.26	1	0.2626	GDPsq	3.65	1	0.0562
Pop	1.86	1	0.1725	pop	0.19	1	0.6602
System	0.43	1	0.5122	System	1.69	1	0.1939
checks	0.28	1	0.5941	checks	0.01	1	0.9361
GMO	0.52	1	0.4717	HCFCons	1.76	1	0.1844
Global test	5.28	8	0.7269	global test	11.43	8	0.1784

Desertification				Rotterdam			
	chi2	df	Prob>chi2		chi2	df	Prob>chi2
Democracy	0.01	1	0.9306	Democracy	0.06	1	0.8092
Area	0	1	0.9835	area	0.36	1	0.5477
GDPpc	0.09	1	0.763	GDPpc	0.66	1	0.4169
GDPsq	0.26	1	0.6113	GDPsq	0.09	1	0.767
Pop	0.33	1	0.5633	pop	0.51	1	0.473
System	0.42	1	0.5145	System	0.16	1	0.6928
checks	0.51	1	0.4762	checks	0.41	1	0.5243
drylandperc	1.94	1	0.1638	chemexp	1.08	1	0.298
Global test	4.55	8	0.8047	global test	7.88	8	0.4456

	Kyoto			(Stratified)		
	chi2	df	Prob>chi2	chi2	df	Prob>chi2
Democracy	0.09	1	0.7671	0.04	1	0.8434
Area	0.07	1	0.7842	0.22	1	0.6381
GDPpc	0.03	1	0.8601	0.01	1	0.9337
GDPsq	0.01	1	0.9424	0.03	1	0.8536
Pop	1.35	1	0.2454	0.98	1	0.3227
System	0.23	1	0.6286	0.11	1	0.7416
Checks	0.07	1	0.7916	0.03	1	0.8609
vehicles	0.19	1	0.6671	0.08	1	0.7832
Annex1	7.2	1	0.0073			
global test	20.18	9	0.0168	4.04	8	0.8538

C-2. Models (3) and (4) – Regressions with environmental lobby

Cartagena				Desertification			
	chi2	df	Prob>chi2		chi2	df	Prob>chi2
Democracy	0.92	1	0.3382	Democracy	0.01	1	0.9433
EnvLobby	0.1	1	0.7479	EnvLobby	0.27	1	0.6014
area	0.04	1	0.8321	area	0	1	0.9455
GDPpc	0.83	1	0.363	GDPpc	0.01	1	0.9117
GDPsq	1.24	1	0.2647	GDPsq	0.17	1	0.6823
pop	1.6	1	0.2065	pop	0.32	1	0.5731
System	0.4	1	0.5268	System	0.42	1	0.5191
checks	0.19	1	0.6659	checks	0.16	1	0.6894
GMO	0.4	1	0.5248	popdryperc	2.87	1	0.0901
global test	5.08	9	0.8269	global test	5	9	0.834

Copenhagen ENGO				Copenhagen ENGO 94 constant levels			
	chi2	df	Prob>chi2		chi2	df	Prob>chi2
Democracy	4.33	1	0.0374	Democracy	2.18	1	0.1398
EnvLobby	7.58	1	0.0059	EnvLobby	0.55	1	0.4585
area	0	1	0.9679	area	0.24	1	0.6216
GDPpc	6.42	1	0.0113	GDPpc	6.32	1	0.0119
GDPsq	4.79	1	0.0286	GDPsq	4.16	1	0.0415
pop	0.53	1	0.466	pop	0.38	1	0.5366
System	3.02	1	0.0824	System	1.88	1	0.1706
checks	0.24	1	0.6259	checks	0.03	1	0.8525
HCFCcons	1.44	1	0.2303	HCFCcons	2.09	1	0.1487
global test	20	9	0.0179	global test	12.87	9	0.1684

Kyoto (stratified)				Rotterdam			
	chi2	df	Prob>chi2		chi2	df	Prob>chi2
Democracy	0.02	1	0.8839	Democracy	0.01	1	0.9186
EnvLobby	0.04	1	0.8374	EnvLobby	1.4	1	0.2374
area	0.26	1	0.6089	area	0.26	1	0.6068
GDPpc	0	1	0.9667	GDPpc	0.35	1	0.553
GDPsq	0.03	1	0.8661	GDPsq	0.01	1	0.9419
pop	1	1	0.3166	pop	0.53	1	0.4646
System	0.05	1	0.829	System	0.03	1	0.8689
checks	0.04	1	0.8337	checks	0.26	1	0.6112
vehicles	0.11	1	0.7386	chemexp	1.25	1	0.2626
global test	4.16	9	0.9005	global test	9.38	9	0.4032

D-1. Test of robustness

	Cartagena							
	Model (2)	Model (5)	Model (3)	Model (6)	Model (4)	Model (7)	Model (8)	Model (9)
Democracy	0.383 [0.187]**				0.248 [0.197]	0.360 [0.187]*		
Democracy_2		0.241 [0.188]					0.114 [0.195]	0.214 [0.189]
EnvLobby			0.457 [0.171]***		0.385 [0.180]**		0.428 [0.177]**	
EnvLobby_2				0.290 [0.166]*		0.268 [0.168]		0.275 [0.167]
pop	-0.086 [0.108]	-0.085 [0.108]	-0.131 [0.115]	-0.106 [0.108]	-0.120 [0.113]	-0.100 [0.107]	-0.125 [0.114]	-0.099 [0.107]
area	-0.014 [0.114]	-0.033 [0.115]	-0.053 [0.113]	-0.079 [0.114]	-0.024 [0.114]	-0.027 [0.115]	-0.039 [0.115]	-0.049 [0.116]
GDPpc	-0.028 [0.027]	-0.030 [0.030]	-0.033 [0.027]	-0.022 [0.026]	-0.044 [0.028]	-0.041 [0.029]	-0.043 [0.031]	-0.042 [0.032]
GDPsq	0.001 [0.001]*	0.001 [0.001]*	0.001 [0.001]**	0.001 [0.001]*	0.001 [0.001]**	0.001 [0.001]**	0.001 [0.001]**	0.001 [0.001]**
GMO	-0.154 [0.156]	-0.143 [0.155]	-0.130 [0.152]	-0.142 [0.153]	-0.146 [0.155]	-0.166 [0.158]	-0.137 [0.154]	-0.156 [0.156]
System	-0.035 [0.142]	-0.020 [0.143]	0.034 [0.140]	0.043 [0.141]	0.000 [0.142]	0.005 [0.143]	0.018 [0.143]	0.017 [0.143]
Checks	0.185 [0.078]**	0.194 [0.081]**	0.188 [0.074]**	0.217 [0.074]***	0.163 [0.077]**	0.167 [0.079]**	0.172 [0.080]**	0.181 [0.081]**
Observations	630	630	630	630	630	630	630	630
Subjects	146	146	146	146	146	146	146	146
LR	30.5	27.91	33.61	29.34	35.2	33.05	33.96	30.62

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

	Copenhagen							
	Model (2)	Model (5)	Model (3)	Model (6)	Model (4)	Model (7)	Model (8)	Model (9)
Democracy	0.283 [0.152]*				0.080 [0.167]	0.280 [0.152]*		
Democracy_2		0.397 [0.159]**					0.196 [0.175]	0.368 [0.162]**
EnvLobby			0.561 [0.142]***		0.535 [0.152]***		0.498 [0.153]***	
EnvLobby_2				0.398 [0.142]***		0.396 [0.142]***		0.371 [0.142]***
Area	0.011 [0.055]	0.015 [0.055]	-0.032 [0.058]	-0.015 [0.058]	-0.031 [0.058]	-0.017 [0.058]	-0.027 [0.058]	-0.011 [0.058]
Pop	-0.145 [0.094]	-0.133 [0.093]	-0.197 [0.099]**	-0.211 [0.096]**	-0.187 [0.100]*	-0.176 [0.097]*	-0.173 [0.099]*	-0.166 [0.096]*
GDPpc	0.069 [0.033]**	0.048 [0.035]	0.083 [0.032]***	0.085 [0.032]***	0.077 [0.034]**	0.067 [0.033]**	0.062 [0.037]*	0.047 [0.036]
GDPsq	-0.001 [0.001]	-0.001 [0.001]	-0.002 [0.001]**	-0.002 [0.001]**	-0.002 [0.001]*	-0.001 [0.001]	-0.001 [0.001]	-0.001 [0.001]
HCFCcons	0.025 [0.011]**	0.024 [0.011]**	0.029 [0.011]**	0.031 [0.011]***	0.028 [0.011]**	0.028 [0.011]**	0.027 [0.011]**	0.027 [0.011]**
System	0.053 [0.121]	0.016 [0.122]	0.144 [0.117]	0.143 [0.119]	0.128 [0.122]	0.093 [0.121]	0.097 [0.124]	0.061 [0.123]
Checks	0.053 [0.059]	0.037 [0.060]	0.044 [0.059]	0.074 [0.056]	0.037 [0.061]	0.038 [0.060]	0.024 [0.062]	0.026 [0.061]
Observations	892	892	892	892	892	892	892	892
Subjects	142	142	142	142	142	142	142	142
LR	30.06	32.8	41.98	34.55	42.21	37.9	43.23	39.69

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

	Convention on Desertification							
	Model (2)	Model (5)	Model (3)	Model (6)	Model (4)	Model (7)	Model (8)	Model (9)
Democracy	-0.551 [0.156]***				-0.489 [0.164]***	-0.608 [0.156]***		
Democracy_2		-0.172 [0.156]					-0.067 [0.163]	-0.285 [0.162]*
EnvLobby			-0.313 [0.138]**		-0.183 [0.146]		-0.295 [0.145]**	
EnvLobby_2				0.308 [0.136]**		0.390 [0.139]***		0.375 [0.142]***
Area	-0.087 [0.052]*	-0.081 [0.051]	-0.074 [0.052]	-0.088 [0.052]*	-0.084 [0.052]	-0.102 [0.053]*	-0.075 [0.052]	-0.096 [0.052]*
Pop	0.075 [0.085]	0.077 [0.083]	0.107 [0.083]	0.051 [0.085]	0.090 [0.086]	0.038 [0.089]	0.103 [0.084]	0.037 [0.087]
GDPpc	0.054 [0.029]*	0.032 [0.033]	0.025 [0.028]	-0.003 [0.029]	0.057 [0.029]*	0.041 [0.030]	0.032 [0.033]	0.030 [0.034]
GDPsq	0.000 [0.001]	0.000 [0.001]	0.000 [0.001]	0.001 [0.001]	0.000 [0.001]	0.000 [0.001]	0.000 [0.001]	0.000 [0.001]
Popdryperc	0.008 [0.003]***	0.008 [0.003]***	0.008 [0.003]***	0.007 [0.003]***	0.008 [0.003]***	0.007 [0.003]**	0.009 [0.003]***	0.007 [0.003]***
System	-0.022 [0.112]	-0.049 [0.115]	-0.072 [0.110]	-0.037 [0.112]	-0.021 [0.112]	0.021 [0.112]	-0.059 [0.115]	0.026 [0.118]
Checks	0.022 [0.065]	-0.047 [0.067]	-0.040 [0.064]	-0.110 [0.065]*	0.032 [0.066]	-0.013 [0.067]	-0.031 [0.067]	-0.070 [0.067]
Observations	605	605	605	605	605	605	605	605
Subjects	142	142	142	142	142	142	142	142
LR	28.48	17.06	21.03	20.98	30.06	36.37	21.19	24.09

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

	Kyoto Protocol							
	Model (2)	Model (5)	Model (3)	Model (6)	Model (4)	Model (7)	Model (8)	Model (9)
Democracy	0.775 [0.181]***				0.740 [0.187]***	0.777 [0.184]***		
Democracy_2		0.773 [0.195]***					0.731 [0.200]***	0.747 [0.197]***
EnvLobby			0.346 [0.180]*		0.186 [0.187]		0.203 [0.184]	
EnvLobby_2				0.265 [0.158]*		0.255 [0.163]		0.197 [0.164]
Area	-0.133 [0.083]	-0.121 [0.081]	-0.153 [0.083]*	-0.154 [0.082]*	-0.137 [0.084]	-0.146 [0.084]*	-0.128 [0.083]	-0.131 [0.082]
Pop	0.011 [0.117]	0.017 [0.119]	-0.098 [0.116]	-0.107 [0.117]	0.007 [0.117]	0.010 [0.117]	0.011 [0.118]	0.008 [0.119]
GDPpc	0.034 [0.037]	-0.017 [0.035]	0.011 [0.035]	0.001 [0.035]	0.031 [0.037]	0.020 [0.038]	-0.016 [0.036]	-0.027 [0.036]
GDPsq	0.000 [0.001]	0.000 [0.001]	0.000 [0.001]	0.000 [0.001]	0.000 [0.001]	0.000 [0.001]	0.000 [0.001]	0.001 [0.001]
Vehicles	-0.093 [0.149]	-0.077 [0.144]	0.056 [0.135]	0.088 [0.127]	-0.108 [0.153]	-0.088 [0.149]	-0.093 [0.149]	-0.069 [0.143]
System	0.018 [0.133]	0.021 [0.132]	0.144 [0.131]	0.131 [0.132]	0.034 [0.133]	0.041 [0.133]	0.038 [0.133]	0.038 [0.133]
Checks	0.121 [0.082]	0.089 [0.087]	0.190 [0.081]**	0.206 [0.081]**	0.108 [0.082]	0.100 [0.083]	0.078 [0.087]	0.081 [0.087]
Observations	724	724	724	724	724	724	724	724
Subjects	143	143	143	143	143	143	143	143
LR	36.58	34.6	22.33	21.5	37.56	39.04	35.83	36.06

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

	Rotterdam Convention							
	Model (2)	Model (5)	Model (3)	Model (6)	Model (4)	Model (7)	Model (8)	Model (9)
Democracy	0.323 [0.282]				0.309 [0.294]	0.348 [0.285]		
Democracy_2		0.177 [0.279]					0.156 [0.285]	0.193 [0.277]
EnvLobby			0.124 [0.248]		0.045 [0.261]		0.098 [0.252]	
EnvLobby_2				-0.223 [0.238]		-0.252 [0.244]		-0.236 [0.241]
Area	0.113 [0.085]	0.113 [0.086]	0.114 [0.086]	0.126 [0.087]	0.112 [0.085]	0.121 [0.087]	0.11 [0.086]	0.12 [0.088]
Pop	-1.133 [0.544]**	-1.128 [0.554]**	-1.176 [0.547]**	-1.159 [0.547]**	-1.133 [0.544]**	-1.107 [0.543]**	-1.129 [0.553]**	-1.102 [0.554]**
GDPpc	-0.045 [0.042]	-0.046 [0.045]	-0.037 [0.041]	-0.023 [0.040]	-0.046 [0.042]	-0.035 [0.041]	-0.048 [0.045]	-0.037 [0.044]
GDPsq	0.001 [0.001]	0.001 [0.001]	0.001 [0.001]	0.001 [0.001]	0.001 [0.001]	0.001 [0.001]	0.001 [0.001]	0.001 [0.001]
ChemExp	0.003 [0.001]*	0.003 [0.001]*	0.003 [0.001]*	0.003 [0.001]**	0.003 [0.001]*	0.003 [0.001]*	0.003 [0.001]*	0.003 [0.001]**
System	0.205 [0.203]	0.212 [0.204]	0.246 [0.203]	0.207 [0.202]	0.212 [0.206]	0.17 [0.205]	0.226 [0.207]	0.18 [0.206]
Checks	0.009 [0.128]	0.04 [0.123]	0.053 [0.116]	0.09 [0.115]	0.006 [0.129]	0.033 [0.130]	0.032 [0.125]	0.062 [0.125]
Observations	664	664	664	664	664	664	664	664
Subjects	137	137	137	137	137	137	137	137
LR	20.45	19.51	19.37	19.98	20.49	21.51	19.66	20.47

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

D-2. Regression Results with continuous ENGO variable:

	Cartagena		Rotterdam		Kyoto		Desertification		Copenhagen	
	Model(10)	Model(11)	Model(10)	Model(11)	Model(10)	Model(11)	Model(10)	Model(11)	Model(10)	Model(11)
InENGO	0.343 [0.132]***		0.096 [0.184]		0.091 [0.136]		-0.113 [0.110]		0.335 [0.114]***	
InENGO_2		0.397 [0.129]***		0.259 [0.195]		0.091 [0.132]		0.239 [0.117]**		0.251 [0.125]**
Democracy	0.268 [0.216]	0.512 [0.232]**	0.313 [0.312]	0.396 [0.339]	1.000 [0.227]***	1.071 [0.238]***	-0.487 [0.181]***	-0.611 [0.175]***	-0.047 [0.178]	0.351 [0.177]**
Area	-0.110 [0.106]	-0.112 [0.103]	0.100 [0.090]	0.096 [0.090]	-0.123 [0.084]	-0.113 [0.083]	-0.078 [0.055]	-0.124 [0.061]**	-0.063 [0.066]	-0.024 [0.063]
GDPpc	-0.060 [0.030]**	-0.069 [0.034]**	-0.053 [0.043]	-0.054 [0.049]	0.035 [0.039]	0.015 [0.042]	0.062 [0.030]**	0.041 [0.031]	0.112 [0.037]***	0.050 [0.038]
GDPsq	0.002 [0.001]***	0.002 [0.001]***	0.001 [0.001]*	0.001 [0.001]*	0.000 [0.001]	0.000 [0.001]	0.000 [0.001]	0.000 [0.001]	-0.002 [0.001]**	-0.001 [0.001]
Pop	-0.028 [0.113]	-0.110 [0.139]	-1.116 [0.550]**	-1.401 [0.615]**	0.063 [0.117]	0.083 [0.116]	0.096 [0.083]	0.040 [0.093]	-0.170 [0.108]	-0.177 [0.104]*
System	-0.009 [0.145]	-0.040 [0.161]	0.246 [0.208]	0.122 [0.244]	-0.067 [0.144]	0.026 [0.153]	-0.041 [0.116]	0.036 [0.128]	0.019 [0.127]	0.146 [0.138]
Checks	0.158 [0.079]**	0.210 [0.095]**	0.011 [0.133]	-0.009 [0.149]	0.063 [0.083]	0.021 [0.085]	0.047 [0.067]	-0.045 [0.073]	0.067 [0.065]	0.016 [0.066]
GMO	-0.384 [0.265]	-0.201 [0.157]								
Chemexp			0.002 [0.002]	0.002 [0.002]						
Vehicles					-0.227 [0.152]	-0.205 [0.148]				
Popdryperc							0.009 [0.003]***	0.007 [0.003]**		
HCFCcons									0.018 [0.012]	0.024 [0.012]**
Observations	585	484	638	547	683	552	559	469	735	645
Subjects	136	113	133	108	137	111	133	114	122	110
LR	42.81	41.34	21.61	21.72	48.26	38.95	28.27	28.84	36.61	30.29

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%