

The Influence of Political Pressure Groups on the Stability of International Environmental Agreements

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Abstract

This paper examines the effects of political pressure groups (lobbies) on the decisions of countries and the size and stability of international environmental agreements. We consider two types of lobbies, industry and environmentalists. Lobbying is endogenous. We find that the influence of lobby-groups has an effect on the abatement decisions of countries. This influence affects members of an international environmental agreement as well as outsiders. However, in the case of agreement members, the effects of lobbying are not restricted to the lobby's host-country but spill over to other member countries and have ambiguous effects on the agreement stability.

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1. Introduction

Game theoretical studies on the formation and stability of international environmental agreements (IEAs) have pointed out that strong free-rider incentives exist and that these prevent agreements from being effective (e.g. Hoel 1992, Carraro and Siniscalco 1993, Barrett 1994, 1997, Jeppesen and Andersen 1998). A common characteristic of these studies is that the participants in international negotiations are treated as monolithic and benevolent governments that truly represent the common interests of their nation.¹ Furthermore, it is assumed that governments only care about the aggregated welfare level of their respective country. Thus, in this view, welfare maximization is the main force that drives environmental policy decisions. However, recent events in the international policy arena have illustrated the fact that national political actors (e.g. lobby groups and voters) are able to affect environmental policy-making, both at the national and the international level.²

Even though the game theoretical analysis of IEAs has yielded many important insights, it ignores the fact that governments often have interests not in line with those of their constituency. Moreover, it does not consider that the electoral process and the lobby groups may influence what these governments would do at the international negotiation tables. In particular, lobby groups (e.g. business associations and environmental NGOs) may be able to affect the behavior of politicians by providing information, by financing election campaigns, or by bringing environmental concerns to the forefront of the minds of the voters (Grossman and Helpman 2001). These political factors play an important role when the national representatives meet at the international level to decide, for instance, whether or not they will participate in an IEA.

Most of the studies on the influence of interest groups on policy-making focus on the role of producer groups in the determination of trade policies. In this area, the political contributions approach of Grossman and Helpman (1994, 1995 and 1996) is a standard model. Grossman and Helpman study the effect of lobby contributions on trade policies. They consider self-interested policy-makers who seek to maximize the sum of lobby contributions and the welfare of the median voter in order to increase their chances to be reelected. The political

¹ Wangler et al. (2013) and Hagen et al. (2016) argue for extending the game theoretical analysis of IEAs to consider actors that are not nation state governments.

² In 2002, the Competitive Enterprise Institute (CEI), a conservative lobby group in the USA, intended to discredit the USA's Environmental Protection Agency report on global warming. Moreover, in 2003, the CEI sued other government climate research bodies that produced evidence for global warming (The Observer, 2003). In 2005, Scientific Alliance, a British lobby group linked to Exxon Mobile, published a report challenging current views about potential effects of climate change (The Guardian, 2005).

contributions approach has further been applied to study environmental policy-making (e.g. Fredriksson 1997, Aidt 1998, Conconi 2003, Fredriksson *et al.* 2005). Fredriksson (1997) shows that there is a relation between the strength of lobby activities and the deviation from an optimal pollution tax. Aidt (1998) explains that lobby groups, through the competitive political process, are important to internalize production externalities. Conconi (2003) shows that the impact of lobby groups on environmental policy depends on the trade policy regime and the size of the transboundary environmental spillovers. Finally, Fredriksson *et al.* (2005) empirically show, for OECD countries, that there is an effect of lobby actions on policy-making and that it is more likely to occur in countries with sufficiently high levels of political competition. In recent empirical work Fredriksson *et al.* (2007) show that the ratification of the Kyoto Protocol has been facilitated by environmental lobbying in particular in countries with a lower integrity of government. Altamirano-Cabrera *et al.* (2007) have studied the impact of lobby groups on the stability of climate agreements in a empirically calibrated simulation model. They find that although lobby contributions may help to stabilize IEAs the additional greenhouse gas abatement is insignificant.

A theoretical analysis that combines the influence of interest groups (e.g. using the political contributions approach) and stability of IEAs is largely missing. Only Haffoudhi (2005) and Dietz *et al.* (2012) have studied the impact of lobby groups on the size and stability of IEAs for homogeneous countries. Haffoudhi (2005) finds that a global agreement would be sustained by means of industry lobby contributions. In contrast, Dietz *et al.* (2012) find that lobbying may increase the incentives for parallel multilateral action.

The aim of this paper is to study the influence of lobby groups on IEA participation and abatement policies. In our model analysis, lobby groups organize a collective action to influence government decisions. We model this by means of contributions that reflect the willingness to pay of a lobby to change the government's policies in its favor.

As in Grossman and Helpman (1994), we assume that lobbies try to influence government's policy decisions and we abstract from the election process. We represent lobbies' influence as prospective contributions that enter into the government's political revenue function and are made conditional on a change of government's policy decisions. Different from Haffoudhi (2005) and Dietz *et al.* (2012), we consider heterogeneous world regions. We test for stability using the concept of internal and external stability (d'Aspremont *et al.*, 1983).

Our results show that the influence of lobby-groups has an effect on the abatement decisions of the respective countries. This influence appears for members of an IEA as well as for

outsiders. However, in the case of IEA-members, the effects of lobbying are not restricted to the lobby's host-country but spill over to other member countries and have ambiguous effects on the IEA-stability.

The formation of IEAs is modeled as a game in which governments decide about their participation before they choose their abatement strategies – considering both net benefits from abatement and the prospective lobby contributions. We assume that there are two lobbies from which governments can obtain contributions: industry and environmentalist. We consider that the level of contributions depends on each lobby's payoff functions and the abatement strategy chosen by the government. The payoff of an environmentalist lobby depends on the additional abatement efforts undertaken. We assume that the industry lobby is always harmed if the government increases abatement. First, we lay out our model and explain the three stages of the game. We then solve the game by backward induction and focus on the abatement decisions of the countries and the stability of the IEA before we conclude the paper with a summary and discussion.

2. Description of the model

We study the impact of lobbying on the formation and stability of IEAs in a sequential game. The players in our game are lobbies and governments in n countries. The set of countries is denoted N . An IEA is a subset of all countries $S \subseteq N$. There are three stages: (i) IEA formation, (ii) the lobbying stage, and (iii) a transboundary pollution game. We describe these stages in turn.

(i) *Formation of an IEA*. All countries $i \in N$ decide simultaneously whether or not to join an IEA. We denote country i 's choice to join and become a signatory by $\sigma_i = 1$. If country i does not join, $\sigma_i = 0$, it remains a singleton player. The signatories $S \subseteq N$ act jointly, *i.e.* as a single player in the subsequent transboundary pollution game. If no country or only a single country joins the IEA, then there is no effective agreement. We refer to this situation as “All Singletons” and denote it by $S = \emptyset$. If $S = N$, we have the Grand Coalition. We assume that signatories make a binding agreement. Hence, we restrict our attention to participation and do not discuss enforcement.³

(ii) *The lobbying stage*. Lobbying takes place in all countries $i \in N$ and affects national climate policies. In our model the policy space is the level of abatement, reflecting the

³ McEvoy and Stranlund (2009) introduce a model that addresses both issues.

strictness of the environmental policy adopted. Hence, a particular policy is described by a variable $q_i \in [0, \bar{e}_i]$, where \bar{e}_i is the level of business-as-usual emissions. Following a common assumption in the literature (c.f. Grossman and Helpman 1996, Aidt 1998 and Conconi 2003), we assume two exogenously given lobby groups, the industry, referred to as “firms” f , and the environmentalists, referred to as the “greens” g . The Firms’ preferred policy is $q_i = 0$, i.e. the preferred level of abatement is zero, while the greens’ preferred policy is $q_i = \bar{e}_i$. Hence both lobbies pull in opposite directions. The government maximizes a political revenue function that reflects social welfare and the influence of lobby groups. We model lobby pressure as prospective contributions that reflect the willingness to pay of a lobby to influence the government’s policy decisions in their favor. Contributions, thus, represent the monetary value assigned to all lobbying activities that influence the government’s decisions.⁴ The political revenue function thus has two components. First, it is a function of a country’s net benefits from the climate policy adopted. This may include the net benefits of participating in an IEA. Second, political revenue depends on the contributions from lobby groups.

The political revenue function of government i , π_i , reflects the benefits and costs of greenhouse gas abatement and the prospective contributions, L , from lobby groups supporting the government’s policy. The political revenue function is

$$\pi_i(q_i) = B_i(q) - C_i(q_i) + \lambda_i L(q_i), \quad (1)$$

where B_i are the total discounted benefits from global abatement $q = \sum_{i \in N} q_i$, and C_i are the total discounted abatement costs from own abatement q_i . We assume that B_i is concave, i.e. $\partial B_i / \partial q_i > 0$ and $\partial^2 B_i / \partial q_i^2 \leq 0$, C_i is strictly convex, i.e. $\partial C_i / \partial q_i > 0$ and $\partial^2 C_i / \partial q_i^2 > 0$. The parameter $\lambda_i \geq 0$ captures the relative weight of contributions compared to net benefits from abatement. Finally, $L \geq 0$, represents the total contributions from local lobbies. Total lobby contributions are the sum of firms’ and greens’ contributions, $L \equiv L_i^f + L_i^g$ and we assume for the firms $\partial L_i^f / \partial q_i < 0$, $\partial^2 L_i^f / \partial q_i^2 < 0$ and for the greens $\partial L_i^g / \partial q_i > 0$, $\partial^2 L_i^g / \partial q_i^2 \leq 0$.

⁴ Some authors argue that contributions may be interpreted as bribes in order to influence government policies (see Schulze and Ursprung, 2001).

(iii) *The transboundary pollution game.* Our model of transboundary pollution is standard in the literature and has been used in recent contributions (*e.g.* Asheim and Holtmark 2009). We assume a uniformly mixing pollutant (such as greenhouse gases). In this setting, abatement is a pure public good. At this stage the IEA has been formed and, as indicated before, we assume that it behaves like a single player. Hence the players of the transboundary pollution game are the IEA and the remaining singletons.

Each non-signatory government chooses abatement to maximize its political revenue given by eq. (1). To arrive at closed form solutions we assume that benefits are linear and costs are quadratic in abatement. Thus we have

$$\pi_i(q_i) = b_i q_i - \frac{1}{2} c_i q_i^2 + \lambda_i L(q_i). \quad (2)$$

Signatory governments cooperatively decide about their abatement to maximize the joint payoffs, including lobby contributions. The abatement decisions are taken in a simultaneous-move game. With our specifications this game has a unique Nash equilibrium.

Lobby contributions are specified as follows. Firms face additional abatement costs. They bear a fraction ϕ of these costs while a fraction $1 - \phi$ is passed on to consumers. Hence we stipulate that firms' willingness to pay for reducing abatement is given by

$$L_i^f(q_i) = \phi \frac{1}{2} c_i (\hat{q}_i^2 - q_i^2) \quad (3)$$

where \hat{q}_i denotes the preferred policy in country i in the absence of lobbying, *i.e.* the policy preferred by the electorate. As firms do not know the true \hat{q}_i we assume that they calculate with the worst case scenario which is the fully cooperative quantity of abatement.⁵ The greens appreciate any avoided damage from emissions, *i.e.* the benefits of abatement. Their willingness to pay for additional abatement is as follows

$$L_i^g(q) = \gamma_i (q_i - \hat{q}_i) \quad (4)$$

where γ is a scaling parameter that captures the greens preference for money vis-à-vis the avoided damage. Similar to the firms the greens do not know the true \hat{q} and we assume that they take into account their worst case scenario which is zero abatement.⁴ We consider only

⁵ Other assumptions for the firms \hat{q}_i are possible as well and do not change the results as \hat{q}_i does not influence the government's abatement decision as long as both lobby groups choose to pay lobby contributions. Since we observe both environmentalists and firms lobbying activities events in the international policy arena this seems to be a reasonable assumption.

positive lobby contributions (c.f. Habla and Winkler 2013) so that lobbies are not compensated for potential losses from the government's decisions.

3. Emission Abatement

The three stages of the game are solved by backward induction, analyzing the third stage first. In this stage, all non-signatories maximize their political revenue functions simultaneously with the signatories' joint decision. Maximization of (2) yields the non-signatories' abatement decision dependent on the lobby-contributions proposed in the second stage:

$$q_i^{out} = \frac{b_i + \lambda_i L'(q_i)}{c_i}. \quad (5)$$

The signatories of the IEA reveal their political revenue as a function of q^s and all signatories cooperatively maximize their joint revenue $\Pi(q^s)$ with q^s being a vector of the abatement quantities q_i^s of all signatories

$$\Pi(q^s) = \sum_{i \in S} \pi_i(q_i) = \sum_{i \in S} \left[b_i q_i - \frac{1}{2} c_i^2 + \lambda_i L(q_i) \right]. \quad (6)$$

The solution of this maximization problem yields the abatement decision for each type i signatory dependent on the lobby contributions

$$q_i^s = \frac{\sum b_i + \sum_i \lambda_i L'(q_i)}{c_i}. \quad (7)$$

In the second stage of the game the lobby-groups present their prospective contributions that reflect the willingness to pay of a lobby to influence the government's policy decisions in their favor. We only consider truthful contribution schedules here as Bernheim and Whinston (1986) have shown that lobby-groups do not lose by playing truthful contribution schedules. A truthful contribution schedule is given if a lobby-group offers the change in its welfare that is induced by a corresponding change of the governments' policy completely as lobby contributions. Thus the second stage of the game boils down to (3) and (4) which characterize the maximum willingness to pay of the lobbies.

Inserting (3) and (4) in (5) we yield the quantities of emissions abatement that are undertaken by outsiders

$$q_i^{out} = \frac{b_i + \lambda_i \gamma_i}{c_i(1 + \lambda_i \phi_i)}. \quad (8)$$

We see that non-signatories have dominant abatement strategies that do neither depend on the number of IEA-signatories or their amount of abatement nor on the amount of abatement from the other non-signatories.

The quantities of emission abatement of a signatory country of type i may be found by inserting (3) and (4) in (7) and reads

$$q_i^s = \frac{\sum_i (b_i + \lambda_i \gamma_i)}{c_i (1 + \lambda_i \phi_i)}. \quad (9)$$

We directly see that signatories abate a higher amount of emissions than the non-signatories of the IEA.

Proposition 1

The inclusion of lobby groups has an effect on the optimal abatement quantities of signatories and non-signatories. The inclusion of green lobbies in country i results in higher abatement while the inclusion of firms results in lower abatement. For signatories lobby effects spill over to all other signatories, i.e. other signatories abate more (less) as a response to green (firm) lobby contributions in country i .

Proof.

The proof of *Proposition 1* is given in the Appendix.

Already at this stage we see how lobby groups influence global emissions abatement in the “All Singletons” situation with $S = \emptyset$ and the case of the grand coalition with $S = N$. While the presence of greens leads to a greater amount of globally abated emissions, firm’s lobbying reduces global efforts to mitigate climate change.

4. IEA Formation

To solve the participation stage of the game we apply the concepts of internal and external stability. Initially borrowed from cartel-theory (d’Aspremont et al. 1983) these are widely used in IEA-Theory (e.g. Barret 1994 and Carraro and Siniscalco 1993) and define a stable coalition as one in which no member is better off by leaving the coalition and no non-member gains by joining the coalition. Formally it has been shown in a standard setting with symmetric players that if a stability function $\Lambda(k)$ is defined as $\Lambda(k) = P_s^*(k) - P_{out}^*(k - 1)$ such stable coalitions are characterized generally by the largest integer k that satisfies $\Lambda(k) \geq 0$ (c.f. Dietz et al. 2012 and Carraro and Siniscalco 1993) if $\frac{\partial \Lambda(k)}{\partial k} < 0$. The number of

signatories is denoted by k while $P_s^*(k)$ denotes the optimal payoff of a signatory country and $P_{out}^*(k)$ the optimal payoff of a singleton. In our case the stability function is given by.

$$\Lambda_i(k, \lambda_i) = b_i q(k^*) - \frac{1}{2} c_i (q_i^s(k^*))^2 + \lambda_i [L_i^f(q_i^s(k^*)) + L_i^g(q(k^*))] - b_i q(k^{*-1}) + \frac{1}{2} c_i (q_i^{out}(k^{*-1}))^2 - \lambda_i [L_i^f(q_i^{out}(k^{*-1})) + L_i^g(q(k^{*-1}))] \quad (10)$$

The number of signatories of each type is given by $k := (k_1, \dots, k_{|N|})$, the superscript $*$ characterizes the situation with the respective country of type i being a member and the superscript $*-1$ the situation if the respective country i would have left the agreement.

Proposition 2.

In absence of lobbying an internally and externally stable non trivial coalition exists.

Proof.

The proof of *Proposition 2* is given in the Appendix.

This result is in line with the standard literature on IEAs (c.f. e.g. Dietz et al. 2012 and Carraro and Siniscalco 1993) so that we now turn to the effects of lobby groups on the stability of IEAs.

Proposition 3.

The influence of firms in country i decreases the size and stability of the IEA as it lowers the incentives to join the agreement.

Proof.

The proof of *Proposition 3* is given in the Appendix.

The negative effect of firms' contributions on international cooperation for global abatement is twofold. Firstly it directly influences a country to abstain from the IEA-membership as this would lead to higher emissions abatement and therefore reduced lobby-contributions from firms. Secondly, in case of an IEA-membership it also negatively affects other countries' incentives to join the agreement because the higher 'marginal costs of abatement' in the host country lead to a decreased reaction to the growth of the coalition. The country increases its abatement efforts less if another country joins the coalition so that the other country's incentives to join are reduced.

Proposition 4.

The inclusion of greens increases the own country's incentives to join an agreement while it makes it less attractive for other countries to be a member of the IEA.

Proof.

The proof of *Proposition 4* is given in the Appendix.

Opposed to the influence of firms, lobby contributions from environmentalists increase the incentives of the host country to join an IEA. The increased costs of the higher abatement that follows from the IEA membership are compensated by lobby contributions. The effect of green lobby contributions on other countries is less straightforward: as green contributions raise the abatement ambition of a IEA member every potential further member country has to fulfil higher abatement targets as well (following from the joint rationale of all IEA signatories). This leads to higher abatement costs for a potentially joining country which reduces the incentives to join.

In total the effects of lobbying activities on the size and stability of IEAs are ambiguous. This is in contrast to the clear results that we obtain for the "All-Singletons" case and the situation with the grand coalition. However, we clearly show that lobby contributions not only affect the abatement decisions of the host countries but have an effect on the size and stability of IEAs as well.

5. Conclusion

In this paper, we study the effect of political pressure groups (lobbies) on the size and stability of international environmental agreement. We study IEAs as a coalition formation process. The formation of ICAs is modeled as a three-stage game in which governments choose their participation at the first stage before lobbies announce their contributions. In the last stage of the game countries decide about their abatement strategies considering both net benefits from abatement and lobby contributions. We assume that there are two lobbies from which governments obtain contributions: industry and environmentalist. We consider that the level of contributions depends on each lobby's payoff functions and the abatement strategy chosen by the government. The payoff of an environmentalist lobby depends on the additional abatement efforts undertaken by the government. We assume that the industry lobby is always harmed if the government increases abatement.

Our results show that lobby contributions have an effect on the abatement decisions of IEA signatories and outsiders in the absence of an agreement as well as in the cases of partial

cooperation and of the grand coalition. Firms' contributions reduce emissions abatement of the affected country while environmentalists' contributions give incentives for more ambitious abatement targets. The effects on the stability and size of IEAs are ambiguous. Firms' contributions have a negative effect on the size and stability of IEAs while greens may incentivize countries to join an agreement. However, the increase of ambition in the abatement goals of members that are influenced by environmentalist lobby groups may deter less ambitious countries from joining the agreement. We thus show that the influence of lobby groups not only changes the abatement decisions of countries but may as well affect the stability of IEAs and deserves more attention in the theoretical literature on IEA formation.

6. Appendix

Proof of Proposition 1

As the abatement decisions are given by (8) for singletons and (9) for IEA-signatories, comparative statics show that

$$\forall i: \quad \frac{\partial q_i^{out}}{\partial \phi_i} < 0 \quad (\text{A1})$$

$$\forall j \neq i: \quad \frac{\partial q_i^{out}}{\partial \phi_j} = 0 \quad (\text{A2})$$

$$\forall i: \quad \frac{\partial q_i^{out}}{\partial \gamma_i} > 0 \quad (\text{A3})$$

$$\forall j \neq i: \quad \frac{\partial q_i^{out}}{\partial \gamma_j} = 0 \quad (\text{A4})$$

and

$$\forall i: \quad \frac{\partial q_i^s}{\partial \phi_i} < 0 \quad (\text{A5})$$

$$\forall j \neq i: \quad \frac{\partial q_i^s}{\partial \phi_j} = 0 \quad (\text{A6})$$

$$\forall i: \quad \frac{\partial q_i^s}{\partial \gamma_i} > 0 \quad (\text{A7})$$

$$\forall j \neq i: \quad \frac{\partial q_i^s}{\partial \gamma_j} > 0. \quad (\text{A8})$$

■

Proof of Proposition 2

From equation (10) we see that in absence of lobbying the stability function can be written as

$$\Lambda_i(k_i) = b_i(\Delta q) - \frac{1}{2}c_j((q_i(k_i^*))^2 + \frac{1}{2}c_j(q_i(k_i^{*-1}))^2) \quad (\text{A9})$$

with $\Delta q = q(k^*) - q(k^{*-1})$.

Differentiation of (A9) with respect to k_i yields

$$\frac{\partial \Lambda_i}{\partial k_i} = q_i^{out} \left[2b_i - \frac{1}{2}c_i(q_i^{out} + q_i(k^*) + \Delta q_i q_i^{out}) \right]. \quad (\text{A10})$$

For every non trivial coalition ($k_i > 2$) (A10) is negative so that an internally and externally stable coalition is by the largest integer k_i that satisfies $\Lambda_i(k^*) \geq 0$.

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Proof of Proposition 3

Writing the stability function (10) including the lobby-contributions of firms (3) and greens (4) we get

$$\Lambda_i(k, \lambda_i, \gamma_i, \phi_i) = b_i q(k^*) - \frac{1}{2} c_i (q_i(k^*))^2 + \lambda_i \left[\phi_i \frac{1}{2} c_i (\hat{q}_i^2 - q_i^{*2}) + \gamma_i (q^* - \hat{q}) \right] - b_i q(k^{*-1}) + \frac{1}{2} c_i (q_i^{out})^2 - \lambda_i \left[\phi_i \frac{1}{2} c_i (\hat{q}_i^2 - (q_i^{out})^2) + \gamma_i (q^{*-1} - \hat{q}) \right]. \quad (\text{A11})$$

Differentiation of (A11) with respect to ϕ_i and $\phi_j \forall j \neq i$ shows that

$$\frac{\partial \Lambda_i}{\partial \phi_i} < 0 \quad (\text{A12})$$

$$\forall j \neq i \quad \frac{\partial \Lambda_i}{\partial \phi_j} < 0. \quad (\text{A13})$$

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Proof of Proposition 4

Differentiation of (A11) with respect to γ_i and $\gamma_j \forall j \neq i$ shows that

:

$$\frac{\partial \Lambda_i}{\partial \gamma_j} > 0 \quad (\text{A14})$$

$$\forall j \neq i \quad \frac{\partial \Lambda_i}{\partial \gamma_i} < 0. \quad (\text{A15})$$

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