

# The Rise of Environmentalism, Pollution Taxes and Intra-industry Trade\*

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## Abstract

This paper develops a political-economy model to investigate to what extent a rise of environmentalism can successfully encourage higher pollution taxes and reduce pollution. The model focuses on special-interest group politics, intra-industry trade and a transnational environmental externality. The main finding is that a rise of environmentalism is not sufficient to protect the environment when pollution is relatively immobile and environmentalists are concerned with pollution in other countries than their own.

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## 1 Introduction

During the past three decades, public awareness about environmental problems has increased significantly in most industrialized countries. This is illustrated by a strong upwards trend in the percentage of citizens who, according to the Eurobarometer survey, believe that environmental issues are “very important”. In 1974 only 42 per cent shared that view; by 1996, the percentage had increased to over 80 per cent and it has stayed at that level since then.<sup>1</sup> A similar trend is documented by Dunlap and Scarce (1991) for the US. In addition, the number of organized environmentalists has increased and at least fourteen new international environmental lobby groups were founded during the same period (see Frijof Nansen Institute, 1994). The up-spring of green political parties and the adaptation of environmental policy in the policy platforms of most traditional political parties also point in the direction of *a rise of environmentalism*.

The purpose of this paper is to develop a political economy model of environmental policy (a pollution tax) to analyze links between a rise of environmentalism, international trade and transnational pollution. Environmentalism obviously has many facets. We focus on one particular aspect: the increase in the membership of green lobby groups. The main contribution of the paper is to identify – within the class of reciprocal externality problems – the circumstances under which a rise of environmentalism leads to stricter environmental policy and less pollution and to point out that environmental lobbying is not a guarantee for high environmental standards. In particular, it is shown that the impact of environmentalism on pollution depends on i) the extent to which pollution is internationally mobile and ii) the extent to which environmentalists care about pollution in other countries. In situations where pollution is immobile and environmentalists care a lot about pollution in other countries, a rise of environmentalism can be environmentally harmful and lead to more, rather than to less, total pollution.

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<sup>1</sup>See Eurostat (1974; 1996 and 2003).

We develop the argument within the context of an international trade model with imperfect competition in product markets as in Brander (1981). We want to capture the notion that environmental policy reflects a trade-off between producer and environmental interests and adopt the common agency model pioneered by Bernheim and Whinston (1986) and Grossman and Helpman (1994). The key assumption of the analysis relates, however, to the specification of the preferences of the environmentalists. We assume that environmentalists are concerned with pollution not only in the particular country in which they live, but also in other countries. The concern for pollution at home can be motivated by the environmental damage actually inflicted upon them by pollution. The concern for pollution in other countries is what sets environmentalists apart from other citizens. There is ample anecdotal evidence to motivate this assumption. One example is the Tuna-Dolphin problem in the Eastern Tropical Pacific Ocean, where primarily American environmentalists for decades have argued in favor of a ban on killing Dolphins (see Korber, 1998). A related example is the attitude of Greenpeace to the slaughter of endangered sea mammals elsewhere in the world. Yet another example is the concern expressed by many environmentalists about deforesting of tropical rain forest (see Wapner, 1995) or about forest death in Europe and North America (see Newbery, 1990).

The paper is related to a number of branches of the literature on the environment and trade. First, as pointed out by Copeland and Taylor (1994) and Antweiler et al. (2001), the income gains associated with trade liberalization can lead to a political demand for tougher environmental policy thereby counteracting the scale effect (more output and pollution being produced) and the composition effect (expansion of polluting sectors) associated with trade liberalization and possibly reduce pollution levels. Bommer (1996) makes a related point in his study of trade liberalization in the European Union. He shows that environmental and trade policy are substituting tools for redistribution and that trade liberalization therefore can lead to stricter environmental policy. Our model complements these studies by focusing on environmentalism as the driving force behind endogenous changes in environmental policy.

Second, since changes in trade patterns have environmental consequences, environmentalists have an interest in trade policy. Hillman and Ursprung (1992) show that the stake of environmentalists in trade policy depends on their concern for pollution in other countries. Our model complements this study by focusing on the feedback from changes in trade and emission pat-

terns to endogenous environmental policy for given trade policy.

Third, the paper is related to a recent literature on the political economy of environmental policy and trade. Conconi (2002; 2003) studies the impact of green lobbying on pollution taxes under different trade regimes in a model with perfect competition in all markets. She finds that green lobbying can lead to a lower pollution tax under free trade and unilateral environmental policy in situations where pollution is internationally *mobile*. In contrast, we focus on an economic environment with imperfect competition and find that an increase in the political influence of green lobby groups can lead to lower pollution taxes when pollution is *immobile* and environmentalists care sufficiently about pollution abroad. The difference in results derive from the specification of the objective function of the green lobby. Conconi (2003) assumes that environmentalists care about a linear combination of domestic and foreign pollution. This does not allow for a distinction between international mobility of pollution and the concern of the environmentalists for pollution abroad relative to pollution at home. Our specification allows for this and highlights that it is not the pollution leakage as such, but the fact that environmentalists care about pollution in other countries that can cause a simultaneous rise in environmentalism and a reduction in the pollution tax. Schleich and Orden (2000) study the link between pollution and trade protection in a large-country model with perfect competition. They show that inefficient policies (such as tariffs) can lead to lower pollution than more efficient policies (such as production or consumption taxes). Insofar as environmentalists favor instruments that target pollution (e.g., a production tax), this could lead to environmentally counter-productive effects similar to those discussed in this paper.

The rest of the paper is organized as follows. In section 2, we present the economic model. In section 3, we present the political model and derive the policy preferences of the lobby groups. In section 4, we characterize environmental policy in political equilibrium and derive the implications of a rise of environmentalism. In section 5, we discuss alternative externality problems. Finally, in section 6, we conclude.

## 2 The Economic Model

The model has two countries, indexed  $j = A, B$ . Each country has three types of citizens: consumers (C), environmentalists (E) and capitalists (P). The size of the population in each country is normalized to one. All citizens have the same preferences with respect to goods and environmental quality at home, but differ with respect to source of income and in their concern for pollution abroad. The baseline utility function is:

$$U_j = u_j(C_x^j) + C_y^j - \beta_j \frac{E_j^2}{2}, \quad (1)$$

where  $C_x^j$  is consumption of good  $x$  and  $C_y^j$  is consumption of a numeraire good  $y$ . We assume that  $u'_j > 0$ ,  $u''_j < 0$  and  $\beta_j > 0$ . The term  $\beta_j \frac{E_j^2}{2}$  represents environmental damage inflicted upon a representative citizen of country  $j$ . It is increasing in the amount of pollution deposited within the borders of the relevant country,  $E_j$ , at an increasing rate. Notice that all citizens suffer from degeneration of the physical environment in the country where they live. In addition, *environmentalists* are concerned about pollution in foreign countries.<sup>2</sup> This extended environmental concern implies that environmentalists care about the impact of domestic environmental policy on pollution in the neighboring country. For example, environmentalists in Britain may be concerned with acidification of lakes and soil, forest death and other consequences of  $SO_2$  emission, not only in Britain but also in, for example, Scandinavia. To capture this idea, we assume that the utility function of a representative environmentalist is:

$$U_j^E = U_j - \delta_j \frac{E_{-j}^2}{2}, \quad \delta_j > 0, \quad (2)$$

where  $\delta_j \frac{E_{-j}^2}{2}$  represents the disutility incurred by non-resident environmentalists as a consequences of the deposition of pollution in the neighboring country. We stress that environmentalists care about the pollution of the environment in the other country, rather than about the damage experienced by the residents of that country.

Consumers, environmentalists and capitalists have two common sources of income. First, they receive wage income,  $w_j$ , from inelastic supply of

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<sup>2</sup>This possibility has been noted by Hoekman and Leidy (1992) and Hillman and Ursprung (1992) who explore some of the implications.

(one unit of) labor. Second, they receive a lump sum transfer,  $R_j(\cdot)$ . The transfer is financed by the revenue from the pollution tax ( $t_j$ ) levied on the firm located within the relevant jurisdiction. In addition to this, capitalists have a third source of income. They earn income from the shares they hold in the domestic firm. From utility maximization subject to given income,  $I_j^i$ , we derive the (aggregated) demand function for good  $x$  as  $d_x^j(p_j)$ , where  $p_j$  is the relative domestic price of  $x$ .<sup>3</sup> Inverse demand is  $p_j = p_j(C_x^j)$  with  $p_j' < 0$ . Consumer's surplus from consumption of good  $x$  is  $CS_j(p_j) = u_j(d_x^j(p_j)) - p_j d_x^j(p_j)$ . Accordingly, the (derived) indirect utility function of a representative member of group  $i = P, C$  and  $E$  is

$$v_j^i = I_j^i + CS_j(p_j) - \beta_j \frac{E_j^2}{2} - \tau \delta_j \frac{E_{-j}^2}{2}, \quad (3)$$

where  $\tau$  is an indicator variable equal to one if  $i = E$  and zero otherwise. Consumer's surplus is decreasing in the domestic price of good  $x$ .

The two goods,  $x$  and  $y$ , are produced in both countries and are internationally traded. While there are no transportation costs or other barriers to trade, we assume that the cost of relocating firms is prohibitive. The  $y$ -good is produced in a perfectly competitive sector with a constant returns to scale technology and labor as the only input. Normalizing the international price of  $y$  to 1, this implies that the wage rate is 1 in both sectors as labor is assumed to be mobile domestically. The  $x$ -good is produced under conditions of imperfect competition and each country has one firm that produces the good.<sup>4</sup> Firm  $A$  produces  $x_A = x_{AA} + x_{AB}$ , where  $x_{AA}$  is supplied to the domestic market and  $x_{AB}$  is exported to the foreign market.<sup>5</sup> Likewise, firm  $B$  produces  $x_B = x_{BB} + x_{BA}$ . The production technology is  $l_j^x = c_j x_j$ , where  $c_j$  is the labor requirement per unit of output. Since the wage rate is 1, we can write the cost function as  $C_j(x_j) = w l_j^x = c_j x_j$ . The two firms consider

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<sup>3</sup>Let  $I_j$  denote the national income of country  $j$ . Then the demand for the numeraire good is  $I_j - d_x^j(p_j)$ . We assume this is positive for all relevant  $p_j$ . Notice that environmental damage is taken as given when the consumption choice is made and that individual demand is equal to aggregate demand because of the normalization of the size of the population to one.

<sup>4</sup>See Barrett (1994), Ulph (1997) and Rauscher (1997) for applications of trade models with imperfectly competitive markets to international environmental problems.

<sup>5</sup>The first index refers to the source and the second index refers to the destination.

the two markets as segmented. Hence, the equilibrium condition at market  $j$  is:  $C_x^j = x_{Aj} + x_{Bj}$ ,  $j = A, B$ .

Production of  $x$  (but not  $y$ ) pollutes the environment. We assume that emission,  $e_j$ , from firm  $j$  is proportional to the level of production. In particular,<sup>6</sup>

$$e_j = x_j, \quad j = A, B. \quad (4)$$

Pollution is transnational. Let  $\alpha_{lj}$  be the proportion of emission from firm  $l$  that is deposited within the borders of country  $j$ ,  $l = A, B$  and  $j = A, B$ . Pollution deposited in country  $j$  can then be defined as  $E_j = \alpha_{Aj}e_A + \alpha_{Bj}e_B$ ,  $j = A, B$ . We focus on a reciprocal externality problem (such as  $SO_2$  pollution and acid rain). Accordingly, pollution is partly deposited outside the source country, i.e.,  $\alpha_{lj} > 0$  for all  $l, j$  and  $\alpha_{jA} + \alpha_{jB} = 1$ ,  $j = A, B$ . Moreover, to simplify the analysis, but without loss of essential insights, we focus on the symmetric case where  $\alpha_{AA} = \alpha_{BB} \equiv \alpha > \frac{1}{2}$ . We consider some other special cases in section 5.

Total profit of firm  $j$  is:

$$\begin{aligned} \pi_j = & p_A(x_{AA} + x_{BA})x_{jA} + p_B(x_{BB} + x_{AB})x_{jB} - \\ & c_jx_j - t_j e_j, \end{aligned} \quad (5)$$

where  $t_j$  is the pollution tax imposed by government  $j$ . The two firms have Cournot conjectures. We assume that the Nash equilibrium in each market is unique and stable. The profit function of firm  $j$  is a function of the two pollution taxes:  $\pi_j^* = \pi_j(t_A, t_B)$ . The choice of quantities as the strategic variable is not without loss of generality. Only in situations where capacity constraints are binding is it true that price competition yields similar results to those derived below. In other situations, the results would differ.

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<sup>6</sup>This is obviously a great simplification. Firms have different pollution technologies and can invest in abatement, which reduces emission per unit of output. However, as long as pollution technologies are not too different and abatement and production decisions are made simultaneously, introducing different unit emission coefficients and allowing firms to invest in abatement effort do not affect the nature of our results.

### 3 The Political Model

We focus on the political economy of pollution taxation in country  $A$  and assume that  $t_B$  is exogenously given. We do so because we are mainly interested in the impact of environmentalism on environmental policy in a given country, rather than the implied strategic interactions between governments in different countries. These can, of course, be important but definite analytic results can only be derived by making strong assumptions about the demand structure of the model and a detailed discussion of this is beyond the scope of the current analysis.

Let the proportion of capitalists be  $\bar{\gamma}_A^P$ , the proportion of consumers be  $\bar{\gamma}_A^C$  and the proportion of environmentalists be  $\bar{\gamma}_A^E$ . The government in country  $A$  can tax pollution emitted by firm  $A$ . In the absence of lobbying, it cares about social welfare defined as:

$$W_A = w_A + \pi_A(\cdot) + R_A(\cdot) + CS_A(\cdot) - \beta_A \frac{E_A^2}{2} - \bar{\gamma}_A^E \delta_A \frac{E_B^2}{2}, \quad (6)$$

where we have used that  $\bar{\gamma}_A^E + \bar{\gamma}_A^P + \bar{\gamma}_A^C = 1$ , that each capitalist has profit income  $\frac{\pi_A(\cdot)}{\bar{\gamma}_A^P}$  and that  $R_A(\cdot)$  is total tax revenue. The government is willing to deviate from the social welfare maximizing policy if (domestic) lobby groups offer contributions.<sup>7</sup> Let  $M_A^k(t_A)$  be the contribution from lobby group  $k$  when the policy is  $t_A$ . The payoff function of the government is:

$$v_A^G = \theta_A W_A(t_A) + \sum_k M_A^k(t_A), \quad (7)$$

where  $\theta_A > 0$  is the relative weight given to social welfare.

Two lobby groups are active in country  $A$ . Some of the environmentalists organize a green lobby group and some of the capitalists organize a producer lobby group. Consumers are unable to overcome the free rider problem and do not organize a consumer lobby group.<sup>8</sup> The proportion of organized en-

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<sup>7</sup>We do not allow foreign lobby groups to offer contributions. In many countries, it is not legal for foreign lobby groups to do so and such funds have to be channelled through domestic lobby groups. It would be of interest to study the role of foreign lobbying in future research.

<sup>8</sup>See Olson (1965) for the classical discussion of the free rider problem associated with lobbying.

environmentalists is  $\gamma_A^E \leq \bar{\gamma}_A^E$  and the proportion of organized capitalists is  $\gamma_A^P \leq \bar{\gamma}_A^P$ .

In contrast to Grossman and Helpman (1994) and others, we assume that the two lobby groups are *functionally specialized*. A lobby group is functionally specialized if it advocates *one* particular aspect of an issue, disregarding other dimensions about which the members might care. The motivation for focusing on functionally specialized lobby groups is empirical. While it is possible to find examples of lobby groups with multiple goals, the survey of lobby groups in Marshall (1998) clearly demonstrates that many lobby groups are highly specialized.

The producer lobby group is concerned with the impact of  $t_A$  on the profits of the domestic firm. Its gross payoff function is:

$$v_A^P = \frac{\gamma_A^P}{\bar{\gamma}_A^P} \pi_A(t_A). \quad (8)$$

The producer lobby group always supports a decrease in the pollution tax.<sup>9</sup> This result reflects the well-known profit shifting effect whereby an increase in  $t_A$  reduces the competitiveness of firm  $A$  and shifts profit and production abroad (see Brander and Spencer, 1985).

The green lobby group is concerned with pollution at home *and* abroad. Its gross payoff function is:

$$v_A^E = -\frac{1}{2} \gamma_A^E [\beta_A E_A^2 + \delta_A E_B^2]. \quad (9)$$

The policy preference of the green lobby group is determined by

$$\frac{\partial v_A^E}{\partial t_A} = -\gamma_A^E (\beta_A E_A \frac{\partial E_A}{\partial t_A} + \delta_A E_B \frac{\partial E_B}{\partial t_A}) \quad (10)$$

and depends, among other things, on the impact of  $t_A$  on domestic and foreign pollution levels. To see how the pollution tax affects pollution in the two countries, consider an increase in  $t_A$ . This provides firm  $A$  with an incentive to reduce emission ( $\frac{\partial e_A}{\partial t_A} < 0$ ) and, as a result, production is scaled down. This, in turn, provides firm  $B$  with a strategic incentive to expand production. As a consequence, firm  $B$  emits more pollution ( $\frac{\partial e_B}{\partial t_A} > 0$ ). This tends to counteract the initial reduction of emission from firm  $A$ . The net effect of an increase in  $t_A$  is, however, unambiguous: total pollution,

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<sup>9</sup> A proof is available upon request.

$E = e_A + e_B$ , is reduced, i.e.,  $\frac{\partial E}{\partial t_A} < 0$ .<sup>10,11</sup> The distribution of the reduction of total pollution between the two countries depends on pollution mobility as well as on the size of  $\frac{\partial e_B}{\partial t_A}$  and  $\frac{\partial e_A}{\partial t_A}$ :

$$\frac{\partial E_A}{\partial t_A} = (1 - \alpha - \eta_A \alpha) \frac{\partial e_B}{\partial t_A}, \quad (11)$$

$$\frac{\partial E_B}{\partial t_A} = (\alpha - \eta_A(1 - \alpha)) \frac{\partial e_B}{\partial t_A}, \quad (12)$$

where  $\eta_A = -\frac{\partial e_A}{\partial t_A} / \frac{\partial e_B}{\partial t_A} > 1$  (because  $\frac{\partial E}{\partial t_A} < 0$ ). It is immediate that  $\frac{\partial E_A}{\partial t_A} > 0$  if and only if  $\alpha < \frac{1}{1+\eta_A}$  and that  $\frac{\partial E_B}{\partial t_A} > 0$  if and only if  $\alpha > \frac{\eta_A}{1+\eta_A}$  with  $\frac{\eta_A}{1+\eta_A} > \frac{1}{2} > \frac{1}{1+\eta_A}$ . We make a distinction between two scenarios. The first scenario arises when pollution is immobile ( $\alpha > \frac{\eta_A}{1+\eta_A}$ ): pollution is mostly deposited where it is emitted. In this case, the increase in emission from firm  $B$  is sufficient to increase the amount of pollution deposited in country  $B$ , while the reduction in emission from firm  $A$  is sufficient to decrease the amount of pollution deposited in country  $A$ . The point is that pollution can be imported and/or exported via reallocation of production between firms in the two countries. Similar effects have previously been discussed by, for example, Pethig (1976) and Rauscher (1997). The second scenario arises when pollution is *mobile* ( $\alpha \in [\frac{1}{2}, \frac{\eta_A}{1+\eta_A}]$ ). In this case, an increase in  $t_A$  reduces pollution deposited in both countries.

To characterize the policy preference of the green lobby group, it is useful to define

$$K(t_A) \equiv \frac{\alpha - \eta_A(1 - \alpha) E_B}{\eta_A \alpha - (1 - \alpha) E_A},$$

where  $K(\cdot) > 0$  whenever  $\alpha > \frac{\eta_A}{1+\eta_A}$ . Given this definition, we get

**Proposition 1** *Let  $\alpha > \frac{1}{2}$ . The green lobby group supports a reduction in  $t_A$  if and only if  $\alpha > \frac{\eta_A}{1+\eta_A}$  and*

$$\beta_A \leq K(t_A) \delta_A. \quad (13)$$

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<sup>10</sup>The details of the calculations are available upon request.

<sup>11</sup>The result is similar to the result from strategic trade policy that, under Cournot Conjectures, an export subsidy increases the output of the recipient firm more than it reduces the output of the foreign rival (see Brander and Spencer, 1985).

**Proof.** Condition (13) follows from manipulation of equation (10) using equations (11) and (12) ■

We see that the green lobby group may support a reduction in the domestic pollution tax, but only if two conditions are satisfied. The first condition is that pollution is immobile ( $\alpha > \frac{\eta_A}{1+\eta_A}$ ). When this is the case, a decrease in the domestic pollution tax increases pollution at home, but reduces pollution in the other country. The members of the green lobby group appreciates the second, but not the first effect, and the lobby group faces a trade-off between supporting a reduction in pollution at home and abroad. The second condition tells us how this trade-off is resolved. In particular, when the members of the green lobby are very concerned about pollution abroad –  $\beta_A \leq K(t_A)\delta_A$  – then the lobby group supports a *reduction* in the domestic pollution tax in order to induce a reduction in pollution abroad: the membership of the lobby group is willing to accept higher pollution at home in return for lower pollution abroad. We notice the importance of the environmentalists' extended environmental concern. If this concern is absent ( $\delta_A = 0$ ), the green lobby group supports an increase in  $t_A$  no matter how large or small the pollution leakage is.

## 4 Environmental Policy and Environmentalism

The pollution tax in country  $A$  is determined by political pressure from the two lobby groups. Following Bernheim and Whinston (1986), Grossman and Helpman (1994) and many others<sup>12</sup>, the two lobby groups (the principals) move first and simultaneously offer the government (the agent) contribution schedules that specify the payment to be made to the government as a function of the pollution tax. Taking the contribution schedules and the economic behavior of the private section as given, the government moves second and implements the politically optimal pollution tax. After the pollution tax has been levied, the private sector adjusts to the new policy circumstances and the lobby groups make the payment to the government as promised.

A *national political equilibrium* is defined as a subgame perfect equilib-

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<sup>12</sup>See, for example, Fredriksson (1997), Aidt (1998) and Schleich (1999).

rium of this multi-stage game.<sup>13</sup> Assuming that the contribution schedules are differentiable, it can be shown that the politically optimal tax satisfies the following condition:<sup>14</sup>

$$\theta_A \frac{\partial W_A}{\partial t_A} + \frac{\gamma_A^P}{\bar{\gamma}_A^P} \frac{\partial \pi_A}{\partial t_A} - \gamma_A^E (\beta_A E_A \frac{\partial E_A}{\partial t_A} + \delta_A E_B \frac{\partial E_B}{\partial t_A}) = 0, \quad (14)$$

where

$$\frac{\partial W_A}{\partial t_A}(\cdot) = \theta_A \left( \frac{\partial CS_A}{\partial t_A} + \frac{\partial R_A}{\partial t_A} + \frac{\partial \pi_A}{\partial t_A} - \beta_A E_A \frac{\partial E_A}{\partial t_A} - \bar{\gamma}_A^E \delta_A E_B \frac{\partial E_B}{\partial t_A} \right). \quad (15)$$

For ease of reference, we denote the left hand side of equation (14) by  $\Lambda_A(\cdot)$ . We assume that  $\frac{\partial \Lambda_A(\cdot)}{\partial t_A} < 0$ .<sup>15</sup> Condition (14) shows that the politically optimal pollution tax – denoted by  $t_A^{PO}$  – maximizes a weighed sum of the gross welfare of the government and the two lobby groups.

In the absence of lobbying, the government implements the pollution tax that maximizes social welfare (given by the solution to  $\frac{\partial W_A}{\partial t_A}(\cdot) = 0$  in equation (15) and denoted  $t_A^{SO}$ ). In the presence of lobbying, the politically optimal tax is, in general, different from the socially optimal one. This is because the two lobby groups are successful in buying concessions (see equation (14)). The producer lobby group always rewards the government for a reduction in the pollution tax below  $t_A^{SO}$ . The lobbying strategic of the green lobby group is more complex (Proposition 1) and two situations can arise. First, when the green lobby group rewards the government for an increase in the pollution tax above  $t_A^{SO}$  ( $\beta_A > K(t_A^{SO})\delta_A$ ), the interests of the two groups are pitched against each other and the deviation from the socially optimal tax depends on the relative political power of the two groups. If, for example, the green lobby group represents only a tiny fraction of environmentalists ( $\gamma_A^E \rightarrow 0$ ), then, *ceteris paribus*, the politically optimal tax is below the socially optimal one, and vice versa if the producer lobby group represents only a tiny fraction

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<sup>13</sup>We refer to the equilibrium as a national political equilibrium because we take the pollution tax of the other country as given.

<sup>14</sup>For details on how to solve the common agency game, see Grossman and Helpman (1994).

<sup>15</sup>This assumption implies that the relevant second order conditions are satisfied. A discussion of the conditions under which this is true is available upon request.

of capitalists ( $\gamma_A^P \rightarrow 0$ ). Second, when the green lobby group rewards the government for a reduction in the pollution tax below  $t_A^{SO}$  ( $\alpha > \frac{\eta_A}{1+\eta_A}$  and  $\beta_A \leq K(t_A^{SO})\delta_A$ ), the interests of the two lobby groups coincide and an environmentally unfriendly “coalition” of capitalists and environmentalists emerges. The result being a reduction in the politically optimal pollution tax below  $t_A^{SO}$  *independently* of the relative political power of the two groups. This happens when pollution is immobile and environmentalists care a lot about environmental damage in the other country.

Having characterized the national political equilibrium, we can ask how the domestic pollution tax is affected by a rise of environmentalism. We represent the rise of environmentalism by an increase in the proportion of organized environmentalists ( $d\gamma_A^E > 0$ ). To derive the impact of this on  $t_A^{PO}$ , we total differentiate equation (14) to obtain

$$\frac{dt_A^{PO}}{d\gamma_A^E} = -\frac{\frac{\partial \Lambda_A}{\partial \gamma_A}}{\frac{\partial \Lambda_A}{\partial t_A}}. \quad (16)$$

As  $\frac{\partial \Lambda_A}{\partial t_A} < 0$ , the sign of  $\frac{\partial \Lambda_A}{\partial \gamma_A^E}$  determines the impact on the pollution tax. We find that

$$\frac{\partial \Lambda_A}{\partial \gamma_A^E} = \frac{1}{\gamma_A^E} \frac{\partial v_A^E}{\partial t_A}(t_A^{PO}). \quad (17)$$

As the membership of the green lobby group expands, the group is willing, at the margin, to contribute more money to the government. The government appreciates this and adjusts the pollution tax to please the green lobby group. The adjustment depends on the lobbying strategy of the green lobby group as characterized by Proposition 1. The following result can then be stated.

**Proposition 2** *Suppose that  $\alpha > \frac{\eta_A}{1+\eta_A}$  and  $\beta_A \leq K(t_A^{PO})\delta_A$ . Then a rise of environmentalism induces government A to lower its pollution tax, and pollution in country A and in the world as a whole increases.*

A rise of environmentalism can have paradoxical effects. When pollution is physically immobile ( $\alpha > \frac{\eta_A}{1+\eta_A}$ ) and environmentalists are sufficiently concerned about pollution in other countries ( $\beta_A \leq K(t_A^{PO})\delta_A$ ), the green lobby group uses additional political influence to reward the government for a reduction in  $t_A$ . This reduces pollution in country B but increases pollution in

country  $A$ . The net effect being an increase in world-wide pollution. In this sense, a rise of environmentalism can be environmentally counter-productive, although, of course, the consequences are perfectly rational from the point of view of environmentalists. It is clear, however, that these paradoxical results only arise under special circumstances and are avoided in situations where pollution is mobile and/or when environmentalists care little about pollution in other countries.

## 5 Alternative Externality Problems

Above we focussed on reciprocal environmental problems. While the importance of  $SO_2$  pollution justifies this focus, problems associated with unidirectional and global externalities are also important and it is of interest to see if a rise of environmentalism can help internalize these externalities.

### 5.1 Unidirectional Externalities

Some important environmental problems, including pollution of river systems, are unidirectional; that is, emission from up-stream countries is deposited in down-stream countries without any (significant) reverse emission flows. Let country  $A$  be located up-stream from country  $B$ . Assume that all pollution is deposited down-stream, i.e.,  $\alpha_{AA} = \alpha_{BA} = 0$  and  $\alpha_{BB} = \alpha_{AB} = 1$ . An increase in the proportion of organized environmentalists in country  $A$  increases  $t_A$ . It follows that an increase in the pollution tax in country  $A$  always reduces pollution in country  $B$ . Accordingly, environmental lobbying up-stream has a beneficial impact on the environment down-stream.

### 5.2 Global Externalities

A global environmental problem arises when the environmental impact depends on the aggregate, world-wide level of pollution. Examples include the effect of emission of CFC gas on the ozone layer and the effect of emission of carbon dioxide and other greenhouse gasses on global warming. The recent

discussion about and implementation of  $CO_2$  taxes in many European countries (see OECD, 1998) makes it particularly interesting to analyze how a rise of environmentalism affects the national political equilibrium of our model in the presence of a global externality problem. When the externality is global, environmentalists face no conflict of interest: what is good for the environment at home is also (by definition) good for the environment abroad.<sup>16</sup> Therefore, when a rise of environmentalism occurs, the environmentalists, organized or not, use their additional political influence to demand an increase in  $t_A$  which reduces world-wide pollution.

## 6 Conclusion

This paper develops a political economy model of environmental policy to highlight some links between environmentalism, international trade and transnational pollution. The main contribution of the paper is to identify the conditions under which an upward shift in environmental awareness and support to green lobby groups similar to that observed in many industrialized countries over the past decades may *not* help internalize international environmental externalities via the political market for pollution taxes. We find that the impact of a rise of environmentalism depends on i) the extent to which pollution is internationally mobile and ii) the extent to which environmentalists care about pollution in other countries. As long as pollution is sufficiently mobile or as long as environmentalists are primarily concerned with pollution in their own country, a rise of environmentalism reduces pollution. However, our analysis shows that there is no guarantee that a reduction of pollution will be the outcome in situations where pollution is immobile and environmentalists care a lot about pollution in other countries.

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<sup>16</sup>Formally,  $\alpha_{AA} = \alpha_{BA} = \alpha_{AB} = \alpha_{BB} = 1$ .

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