Can Green Lobbies Replace a World Environmental Organization?[¤]

Paola Conconi[y]

Abstract

We employ a common agency model to examine how green lobbies a®ect the determination of trade and environmental policy in two large countries that are linked through trade °ows and transboundary pollution. We show that, when governments are not restricted in their ability to use trade barriers, environmental lobbying always results in higher pollution taxes relative to a no-lobbying scenario. Consequently, uncoordinated environmental policies are closer to the e±cient Pigouvian solution than internationally coordinated policies. If, however, governments are bound by international trade rules, green lobbies may bias environmental policies downwards and environmental policy coordination is unambiguously e±ciency-enhancing.

KEYWORDS: Environmental Protection, International Trade, Political Contributions.

JEL Classi¯cation: D72, F13, Q20, Q28.

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[y]Correspondence to: University of Warwick, Department of Economics, Coventry, CV4 7AL, United Kingdom; Tel: +44 1203 523 474; Fax: +44 1203 523 032; E-mail: P.Conconi@warwick.ac.uk

1 Introduction

In this paper we examine how the presence of green lobbies can affect the determination of trade and environmental policies when countries are linked through trade flows and transboundary pollution. We show that the impact of green lobbies on the comparative efficiency of unilateral and cooperative environmental policy outcomes depends crucially on the trade policy regime.

It is widely recognized that the key to solving transboundary environmental problems is international cooperation. In the absence of cooperation, there is a presumption that green lobbies might act as a partial remedy, by exerting political pressure in favor of higher pollution taxes. In recent years, green lobbies have grown in size[1] and have become increasingly important actors in environmental politics. They exercise pressure on national governments as well as on supra-national institutions such as the World Bank, the World Trade Organization or the EU (Charter and Delfage, 1998). They are also active participants in all international trade and environmental negotiations.[2]

In this paper, we argue that, when applied to large countries, the presumption that green lobbies always bias environmental policies upwards can be misleading. This is because an increase in pollution taxes by one country improves the terms of trade in favor of the other country, leading to an increase in its production levels and emissions. We show that when trade policies are bound by international agreements or otherwise constrained, this leakage effect of environmental policy would actually result in rational environmental groups lobbying for lower domestic pollution taxes.

We employ a common agency model of lobbying of the kind introduced by Grossman and Helpman (1994). Green lobbies confront their governments with contribution

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[1] In the US, for example, the Environmental Defense Fund has 151 permanent staff and an annual budget of $23 m, Greenpeace (US) has 250 and $12 m, and the Natural Resource Defense Counsel 165 and $18 m.

[2] For example, at the Kyoto Conference on greenhouse emissions in December 1997, several green NGOs were represented (Greenpeace alone sent a 18-strong delegation). They "had considerable influence on the negotiations (and) served as sounding-board to assess how proposals would be received at home" (Financial Times, December 11, 1997). More recently, influential environmental groups such as Friends of the Earth launched a fierce campaign against the new round of GATT/WTO negotiations in Seattle (The Economist, December 11, 1999).

schedules, namely functions relating their binding promise of political support to the selected policies. Incumbent politicians are semi-benevolent, in that they choose trade and environmental policy to maximize a weighted sum of social welfare and total political contributions. The model is used to characterize unilateral and cooperative policy equilibria and compare their relative e±ciency. As a benchmark, we consider the policies chosen in a cooperative manner by benevolent politicians, who do not care about lobbies' contributions.

We ¯nd that, when governments can use trade barriers to counteract the leakage e®ect of environmental policy, green interest groups always lobby for higher pollution taxes. Consequently, uncoordinated environmental policies are closer to the e±cient Pigouvian solution than internationally coordinated environmental policies. However, when international trade rules restrain the possibility of trade intervention at the national level, if the spillovers and leakage e®ects are large enough, environmentalists lobby for lower pollution taxes and international coordination of environmental policies is unambiguously e±ciency enhancing.

Does the presence of green lobbies with a strong in°uence on policy makers weaken the need for a World Environmental Organization (WEO)? Our analysis suggests that the answer to this question depends crucially on the degree of existing trade policy coordination and on the magnitude of the leakage and spillover e®ects. Countries that are already cooperating over trade policy could gain by cooperating over environmental policy too. On the other hand, countries that have not committed to trade cooperation should set environmental policy in a unilateral manner.

Our analysis presents some similarities with work by Fredriksson (1997) and Aidt (1998), who apply the common agency approach to study the e®ect of lobbying in the determination of environmental policy.[3] However, since their studies focus on local environmental problems in a small open economy, they live aside the issues of pollution spillovers, policy leakages and international cooperation, which are central to

[3]Fredriksson (1997) incorporates into his model a pollution abatement subsidy, showing that pollution may be increasing in the pollution abatement subsidy rate. Aidt (1998) assumes that a production externality arises from the use of a factor input. His analysis generalizes Bhagwati's principle of targeting to distorted political markets: the most e±cient instrument to internalize the externality is a tax on the polluting input factor, which aims directly at the source.

our analysis.

The remainder of the paper is organized as follows. Section 2 describes the model. Section 3 examines the relative e±ciency of unilateral and cooperative environmental policies in the absence of preexisting international trade agreements. Section 4 considers the case of governments that are bound by international trade rules and that can only decide whether or not to cooperate over environmental policy. Finally, Section 5 provides some concluding remarks.

2 The Model

2.1 The Economy

We begin by describing a simple model of international trade and transboundary pollution in which two countries, denominated home (no*) and foreign (*), produce and trade many goods. We will focus on the political and economic structure of the home country; the structure of the foreign country can be derived symmetrically.

There are $N + 1$ competitive sectors, $i = 0; 1; : : : ; N$, where 0 denotes a non-traded numeraire good. All goods are produced with conventional constant returns to scale technology. The numeraire good is produced using labor alone and units are chosen so that its price equals unity in both countries. We assume that aggregate labor supply, I, is large enough to be able to produce a positive amount of good 0. This implies that in a competitive equilibrium the wage rate equals unity. Production of non-numeraire goods requires labor, and sector-speci¯c capital, which is available in ¯xed supply.

Domestic consumer and producer prices of non-numeraire goods are given by q_i and p_i, respectively. International prices are denoted by $¼_i$. With a wage rate equal to unity, the aggregate rent accruing to the speci¯c factor in sector i depends only on the producer price of the good, i.e. $¦_i(p_i)$. By Hotelling's Lemma, industry supply is given by $Y_i(p_i) = @¦_i=@p_i$. The production of good i generates pollution emissions $E_i = ®_i Y_i$, where $®_i$ is an exogenously given emission coe±cient.

The economy is populated by M identical individuals, $h = 0; 1; : : : ; M$, who have identical preferences. Preferences are quasilinear and additively separable. Thus, individual h's utility can be written as

$$u_h(c_0; : : : ; c_N; Z_h) ´ c_0 + \sum_{i=1}^{N} u_i(c_i) ¡ Z_h; \tag{1}$$

where c_0 is the consumption of the numeraire good, and the functions $u_i(:)$ are twice-di®erentiable, increasing, and strictly concave. The last term represents the environmental damage su®ered by consumer h, which is a function of domestic and foreign emissions: [4]

$$Z_h(p; p^{¤}) ´ \sum_{i=1}^{N} \mu_i ®_i Y_i + \sum_{i=1}^{N} (1 ¡ \mu_i) ®_i^{¤} Y_i^{¤}; \qquad \mu_i < 1; \tag{2}$$

where p and $p^{¤}$ are vectors of producer prices and μ_i and $(1 ¡ \mu_i)$ are the relative weights that individuals associate with domestic and foreign emissions in sector i, respectively. Notice that the restriction $\mu_i < 1$ implies the existence of transboundary pollution.

The government sets trade and environmental policy, which are restricted to two policy instruments: speci¯c trade taxes or subsidies ($¿_i$), and output taxes or subsidies (t_i).[5]

The (inverse) demand function for good i can be expressed as a function of price alone, i.e. $D_i(q_i)$. The indirect utility function corresponding to (1) can be obtained as follows:

$$V_h(q; p; p^{¤}) ´ I_h + \sum_{i=1}^{N} ¸_i^h ¦_i(p_i) + \frac{1}{M} \sum_{i=1}^{N} t_i Y_i(p_i) + \frac{1}{M} \sum_{i=1}^{N} ¿_i \left[Y_i^{¤}(p_i^{¤}) ¡ D_i^{¤}(q_i^{¤}) \right] + \sum_{i=1}^{N} \left[u\, D_i(q_i) \right] ´ ¡ \sum_{i=1}^{N} q_i D_i(q_i) ¡ Z_h(p; p^{¤}): \tag{3}$$

The ¯rst three terms represent income, which consumer h receives from three sources. First, she supplies her endowment of labor to the competitive market, receiving the wage income I_h. Second, she owns a share $¸_i^h$ of a speci¯c capital in sector i. Third, each consumer receives 1=M of environmental and trade revenues, as a lump sum transfer. The next two terms represent consumer surplus and the last is environmental damage.

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[4] In some cases, the concern about foreign emissions could derive from physical spillovers and be motivated by self-interest (e.g. ozone depletion, or carbon dioxide emissions); in other cases, it could derive from psychological spillovers and be motivated by aesthetic, altruistic or paternalistic reasons (e.g. foreign activities that endanger some species).

[5] Then $t < 0$ ($t > 0$) represents an output subsidy (tax), and $¿ < 0$ ($¿ < 0$) indicates an export subsidy (tax).

Trade and environmental policy drive a wedge between consumer and producer prices and between domestic and international prices, respectively. Consumer prices are thus equal to $q_i = \pi_i + \tau_i$, while producer prices are given by $p_i = \pi_i + \tau_i - t_i$. For each traded good i, world product markets clear when

$$D_i(\pi_i; \tau_i) - Y_i(\pi_i; \tau_i; t_i) + D_i^*(\pi_i; \tau_i^*) - Y_i^*(\pi_i; \tau_i^*; t_i^*) = 0: \tag{4}$$

From (4) we can derive an expression for world equilibrium prices as a function of the policies in the two countries, i.e. $\pi_i(t_i; \tau; t_i^*; \tau_i^*)$.

2.2 The Political Arena

In order to isolate the impact of green lobbying on the determination of trade and environmental policy, we shall assume that only a subset of citizens, the environmentalists, can influence the government.[6]

Environmentalists organize lobby groups in a subset $j = 1; ...; L$, of industry sectors.[7] Green lobbies are assumed to be functionally specialized, i.e. they are only concerned with environmental protection.[8] Each lobby j is formed by M_j members with identical preferences and its objective function is given by

$$W_j^E(q_j; p_j; q_j^*; p_j^*) = K - s_j M \left[Z_j(q_j; p_j; q_j^*; p_j^*) \right]; \tag{5}$$

where K is a constant and $s_j = M_j/M$ is the share of the total population organized in lobby j.

Green lobbies influence government action by setting contribution schedules $C(t; \tau)$ that link their political support to the vector of policy choices of the government. Contributions should be interpreted broadly as bribes, campaign funds, or support demonstrations, to reflect different strategies used by green lobbies (Charter and Delfgaauw,

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[6] The interaction between environmental and industry lobbies is analyzed by Aidt (1998) and Fredriksson (1997).

[7] We focus on single-issue organizations, committed to causes that are restricted by sector. However, our analysis could be applied to multi-issue green lobbies such as Greenpeace, whose mandate is to oppose environmental degradation wherever it might happen and in whatever form it might take.

[8] Aidt (1998) distinguishes between functionally specialized interest groups and interest groups with multiple goals.

1998). The contribution schedules will not be formal contracts, nor will they be explicitly announced. However, the government will know that an implicit link exists between the way it treats each organized lobby and the contributions it can expect to receive from that group. The implicit assumption is that lobbies keep their promises.[9]

The implicit objective of incumbent politicians is to be reelected; this implies that they care about the utility level achieved by the median voter, particularly if voters are well informed about the effects of government policy and base their vote partly on their standard of living. Incumbent politicians also value lobbies' contributions for financing future campaigns and deterring competitors. Thus the government sets trade and environmental policy so as to maximize a weighted sum of social welfare and total political contributions:

$$G = aW(t;\tau;t^0;\tau^0) + \sum_{j=1}^{I} C_j(t;\tau;t^0;\tau^0) \qquad a \geq 0; \tag{6}$$

where a is the government's weighting of every dollar of social welfare compared to a dollar of campaign contributions.[10] Social welfare is defined as aggregate income plus total consumer surplus minus total environmental damage:

$$W(q;p;q^0;p^0) = I + \sum_{i=1}^{N} \pi_i(p_i) + \sum_{i=1}^{N} t_i Y_i(p_i) + \sum_{i=1}^{N} \left[\tau_i Y_i^0(p_i^0) - D_i^0(q_i^0)\right] + M\left[\sum_{i=1}^{N} u(D_i(q_i)) - \sum_{i=1}^{N} q_i D_i(q_i)\right] - MZ(p;p^0). \tag{7}$$

In order to derive the equilibrium cooperative policies, we also need to define the objective function of a mediator or supra-national government. The policies that emerge from international negotiations must be such that G could not be raised without lowering G^0. This implies that the governments choose the environmental policy vectors

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[9] It is hard to achieve this commitment in a one-shot game, but in a dynamic context reputation considerations could enforce it.

[10] As noted by Grossman and Helpman (1994), the welfare function of the government could be written as $\tilde{G} = a_1 \sum C_{i2L} + a_2(W_i - \sum C_{i2L})$, where a_1 represents the weight that the politicians attach to campaign contributions and a_2 is the weight attached to net social welfare. Maximizing $\tilde{G}$ is equivalent to maximizing G in (6) with $a = a_2/(a_1 - a_2)$, provided $a_1 > a_2$.

to maximize the weighted sum

$$a^{\alpha}G + aG^{\alpha} = a^{\alpha}\left[a W(t;\gamma;t^{\alpha};\gamma^{\alpha}) + W^{\alpha}(t^{\alpha};\gamma^{\alpha};t;\gamma)\right] + a^{\alpha}\sum_{j=1} C_j(t;\gamma;t^{\alpha};\gamma^{\alpha}) + a\sum_{j=1} C_j(t^{\alpha};\gamma^{\alpha};t;\gamma): \tag{8}$$

In other words, the equilibrium policies are the same that would arise if a single decision maker had the preferences given on the right hand side of (8) and the organized lobbies of both countries bid to influence this agent's decisions.

Following Grossman and Helpman (1995), we model political competition as a two-stage game. In the first stage, green lobbies simultaneously confront politicians with their contribution schedules, which are assumed to be continuous and differentiable, at least around the equilibrium. In the second stage, the two governments set trade and environmental taxes and receive the contribution associated with the selected policies. They either act unilaterally or in a cooperative manner.

We focus on the efficient equilibrium of a common agency model, i.e. an equilibrium which is efficient for both the principals (green interest groups) and the agent (the incumbent government). The existence of such an equilibrium has been demonstrated by Bernheim and Whinston (1986). We leave out the derivation of the equilibrium of a common agency game, which can be found in Grossman and Helpman (1994, 1995), Dixit (1996) and Fredriksson (1997).

A common agency game has typically many equilibria. As suggested by Bernheim and Whinston (1986), we focus on "truthful" equilibria, where lobbies make contributions up to the point where the resulting change in economic policies is exactly offset by the marginal cost of the contributions.[11]

2.3 The Role of Green Lobbies

There is a presumption that environmentalists would always lobby in favor of higher domestic pollution taxes, thus counteracting the international environmental distor-

[11] Bernheim and Whinston (1986) show that only truthful contributions yield coalition-proof Nash equilibria.

tion. Here we argue that in the case of large countries environmentalists may actually lobby in favor of lower pollution taxes, increasing the inefficiency of unilateral environmental outcomes. We show that this might happen when the countries are bound by a free trade agreement, given sufficiently large policy leakages and emission spillovers.

Suppose that the home country increases its pollution tax on good j.[12] This leads to an increase in the international price of this good equal to

$$-\frac{\partial Y/\partial p}{\partial D/\partial q - \partial Y/\partial p + \partial D^{*}/\partial q^{*} - \partial Y^{*}/\partial p^{*}} \equiv \varepsilon; \qquad 0 < \varepsilon < 1. \tag{9}$$

If the two countries are already bound by a free trade agreement, the leakage effect of environmental policy cannot be counteracted by the use of import tariffs. In this case, an increase in the pollution tax by the home country has a direct effect on domestic emissions (which fall by $\partial Y/\partial p(\varepsilon - 1)$) and an indirect effect on foreign emissions (which increase by $\partial Y^{*}/\partial p^{*}\varepsilon$), due to the change in the terms of trade. From (5), it follows that a unilateral increase in pollution taxes in sector j has an ambiguous effect on the welfare of green lobby j:

$$\partial W^{E}/\partial t = sM\left[\mu\partial Y/\partial p(\varepsilon - 1) - (1-\mu)\partial Y^{*}/\partial p^{*}\varepsilon\right]. \tag{10}$$

The first term in the parenthesis reflects the welfare gain due to a fall in domestic emissions, while the second term represents the welfare loss suffered by the lobby because of the increase in foreign emissions. Notice that, since $0 < \varepsilon < 1$, the increase in foreign emissions is larger than the fall in domestic emissions. The overall effect depends on the relationship between the leakage coefficient (ε) and the coefficient of emission spillovers (μ): environmentalists gain (lose) from a higher (lower) pollution tax if $\mu > \varepsilon$ (if $\mu < \varepsilon$); in the case where $\mu = \varepsilon$, they are indifferent, since their welfare is unaffected by changes in environmental policy.

3 Trade and Environmental Outcomes

In this section, we consider a situation where governments can set both trade and environmental policy. In Section 4, we will examine the case where they have already

[12] For notational simplification, in the remainder of the paper we omit the sectoral subscript.

committed to trade cooperation, and can only decide whether or not to coordinate their environmental policies.

In making the comparison, we assume that the two countries are symmetric[13] and we set the weights a; a¤ in the objective function of the governments equal to unity.[14] As a benchmark, we consider the policies that would be chosen cooperatively by benevolent politicians. The social optimum thus implies free trade (i.e. ¿ = ¿¤ = 0) and the adoption of the e±cient Pigouvian taxes t_P, which re°ect the social marginal damage of emissions:

$$t_P = t_P^¤ = ®M: \tag{11}$$

A key feature of our model is that, given the symmetries assumption, the two countries will adopt identical import tari®s. Consequently, in equilibrium there will be no trade, independently of the policies adopted, and no allocative distortions other than those associated with uninternalized externalities. Therefore, in the analysis that follows, we shall characterize the comparative e±ciency of environmental policy outcomes simply in terms of their distance from the optimal Pigouvian taxes.[15]

3.1 Trade and Environmental Wars

Let us ¯rst consider the case where governments set their policies independently. Substituting the partial derivatives obtained from (7) and (5) into the ¯rst-order conditions for noncooperative political equilibria, we can derive the following expressions for unilateral policies:

$$t_{NC} = t_{NC}^¤ = ®M(1 + s)µ \tag{12}$$

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[13] This implies that in every sector of the economy Y = Y ¤, D = D¤, ± = ±¤, ® = ®¤ and µ = µ¤. It also implies that the the supra-national mediator gives the same weight to the two countries (a = a¤).

[14] This implies that governments value a dollar of campaign contributions twice as much as a dollar of social welfare.

[15] In the case of policies that lie on the same side of the optimum, the distance from the Pigouvian taxes can be unambiguously interpreted as a welfare measure. This is also the case for policies that lie on di®erent sides of the optimum, if the welfare function is symmetric with respect to the environmental tax.

and

$$\iquest_{NC} = \iquest^{\ddagger}_{NC} = \frac{\circledR M(1+s)(\mu \text{ ¡ } 1)@Y=@p}{@D=@q \text{ ¡ } @Y=@p}: \tag{13}$$

From (13) we can see that the two countries will set identical import tari®s. Thus in equilibrium trade policy has no e®ect on relative prices and welfare.

In terms of environmental policy, it is clear from (12) that green lobbying creates a bias towards higher pollution taxes. This should not be surprising, as taxing home production leads to a decrease in domestic emissions and, when combined with appropriate import tari®s, has no e®ect on foreign emissions. As the share s of citizens who are members of a green lobby increases, equilibrium pollution taxes in the organized sector increase. Also note that the larger are emission spillovers (i.e. the lower is μ), the lower are equilibrium pollution taxes.

Lemma 1 When the governments are not bound by a free trade agreement, uncoordinated environmental taxes in the organized sectors are socially optimal if and only if $s = 1=\mu \text{ ¡ } 1$. In this case, the domestic political distortion (green lobbying) exactly o®sets the international environmental distortion (emission spillovers).

PROOF: Given $s = 1=\mu \text{ ¡ } 1$, unilateral environmental taxes coincide with the Pigouvian taxes, i.e. $t_{NC} = t_P = \circledR M$. Q.E.D.

3.2 Trade and Environmental Talks

International trade and environmental negotiations lead to the adoption of the following cooperative policies:

$$t_C = t^{\ddagger}_C = \circledR M(1+s); \tag{14}$$

and

$$\iquest_C = \iquest^{\ddagger}_C = 0: \tag{15}$$

The following result immediately follows from the analysis of expression (14):

Lemma 2 Internationally coordinated pollution taxes in the organized sectors are always higher than the optimal Pigouvian taxes.

PROOF: When a share s of the population organizes a green lobby, $t_C > t_P = \alpha M$. Cooperative taxes are equal to the Pigouvian taxes if and only if $s = 0$, i.e. if no citizen is a member of a green lobby. Q.E.D.

Combining Lemma 1 and 2, it is evident that efficient Pigouvian taxes can only be achieved in an uncoordinated framework. However, the question we really want to address is one of second-best nature: would the environmental policies set by individual governments be more or less efficient than those set by a supra-national authority? Comparison between (12) and (14) allows us to state our first proposition:

Proposition 1 When governments are not bound by a free trade agreement, uncoordinated environmental policies in the organized sectors are more efficient than internationally coordinated policies.

PROOF: Subtracting (11) from (12), we obtain a measure of the efficiency of unilateral taxes:

$$t_{NC} - t_P = \alpha M \left[\mu(1+s) - 1\right]; \tag{16}$$

while the corresponding expression for cooperative policies is:

$$t_C - t_P = \alpha M s: \tag{17}$$

The difference between (16) and (17) gives us a measure of the relative efficiency of uncoordinated pollution taxes compared with internationally negotiated taxes:

$$\Delta = \alpha M (1+s)(\mu - 1): \tag{18}$$

Since $\Delta > 0$, noncooperative environmental policies are always closer to the Pigouvian taxes than cooperative ones. Q.E.D.

We may thus conclude that, when governments can use trade barriers to offset the trade-related effects of environmental policy, uncoordinated pollution taxes are always closer to the efficient Pigouvian solution than internationally coordinated taxes. It

should be noted that this result hinges on the assumption that green lobbies have sufficiently strong influence on the the decision making process.[16]

The intuition behind Proposition 1 is that, if politicians are more concerned about political contributions than social welfare, the bias towards higher pollution taxes caused by the political distortion (green lobbying) counteracts the downwards bias caused by the environmental distortion (pollution spillovers), making uncoordinated policies more efficient than in a no-lobbying scenario (and equal to the first-best solution when the two distortions exactly offset each other as described in Lemma 1). At the level of international negotiations, however, green lobbying distorts upwards policies that would otherwise be optimal.

4 Environmental-only Outcomes

Next, we examine the comparative efficiency of noncooperative and cooperative environmental policy outcomes, assuming the two governments have already committed to trade policy coordination. This scenario could, for example, apply to members of a regional trade agreement like the European Union or to countries that are effectively bound by GATT/WTO rules.

4.1 Environmental Wars

Equilibrium environmental policies emerging from decentralized decision-making are given by

$$t_{NC} = t^{*}_{NC} = \frac{\theta M (1 + s)(\delta - \mu)}{\delta - 1}. \tag{19}$$

Comparing equation (11) and (19), we obtain the following result:

Lemma 3 When governments are bound by a free trade agreement, uncoordinated policies in the organized sectors are socially optimal if $s = (\mu - 1)/(\delta - \mu)$; they are higher (lower) than the optimal Pigouvian taxes if $s > (<)(\mu - 1)/(\delta - \mu)$.

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[16] Recall that we set the weights $a; a^{*}$ in the objective function of the governments equal to unity, which implies that incumbent politicians value a dollar of campaign contributions twice as much as a dollar of social welfare.

PROOF: The distance between the Pigouvian taxes and the equilibrium noncooperative taxes is given by

$$t_{NC} - t_P = \frac{\Phi M^{h} \mu(1+s) - \pm s - 1^{i}}{1 - \pm}: \tag{20}$$

Setting expression (20) equal to zero and solving for s, we find that unilateral policies are equal to the first best if

$$s = \frac{\mu - 1}{\pm - \mu}: \tag{21}$$

It is easy to verify that (20) is positive for $s > (\mu - 1)/(\pm - \mu)$ and negative for $s < (\mu - 1)/(\pm - \mu)$. Q.E.D.

The most striking result from the analysis of (19) is described by the following proposition:

Proposition 2 When $(\pm > \mu)$, green lobbying creates a bias towards lower unilateral pollution taxes.

PROOF: When the leakage coefficient is larger than the spillover coefficient $(\pm > \mu)$, expression (19) is negative, implying that governments subsidize domestic production $(t_{NC} < 0)$. To understand this result, recall from equation (10) that a unilateral increase in emission taxes has an ambiguous effect on the welfare of environmental lobby:

$$\partial W^{E}/\partial t = sM^{h} \mu \partial Y/\partial p(\pm - 1) - (1 - \mu)\partial Y^{\alpha}/\partial p^{\alpha} \pm^{i}: \tag{22}$$

Given $\pm > \mu$, expression (22) is negative, implying a welfare loss for the green lobby. The latter will thus offer political contributions in favor of lower pollution taxes. Q.E.D.

Proposition 3 is in contrast with Fredriksson (1997) and Aidt (1998), who examine the determination of environmental policy in a small open economy and argue that green lobbies would always bias pollution taxes upwards. Our analysis shows that this argument can be misleading when applied to large countries, since the existence of terms of trade effects and pollution spillovers can lead environmental groups to offer political contributions in favor of lower pollution taxes.

4.2 Environmental Talks

The first-order conditions for cooperative environmental equilibrium policies yield the same equilibrium policies as in equation (14):

$$t_C = t_C^n = M\Phi(1 + s): \tag{23}$$

Therefore Lemma 2 also applies to the case in which governments have previously committed to trade policy coordination.

The comparison between (19) and (23) allows us to state the following proposition:

Proposition 3 When governments are influenced by green lobbies and bound by international trade agreements, environmental policy coordination is efficiency enhancing if and only if $\pm > \mu$.

PROOF: For unilateral and cooperative policy outcomes to be equally efficient, the following equality must hold:

$$t_P - t_{NC} = t_C - t_P = aMs: \tag{24}$$

Substituting (19) and (23) into (24), we find that unilateral and cooperative policies are equally distant from the efficient Pigouvian solution when:

$$\pm = \frac{s + \mu + s\mu - 1}{2s}: \tag{25}$$

It is straightforward to verify that cooperative environmental taxes are more efficient than uncoordinated taxes if and only if $\pm > (s + \mu + s\mu - 1)=2s$. Notice that function (25) is monotonically increasing in s, and lies between -1 and μ.[17] Therefore, when $\pm > \mu$ it must be true that $\pm > (s + \mu + s\mu - 1)=2s$, i.e. $t^c - t_P < t_P - t^{nc}$. Q.E.D.

Together, Propositions 2 and 3 imply that, in a situation where governments are not allowed to use trade barriers and there are large enough emission spillovers and terms of trade effects, environmental policy coordination is more efficient than decentralized decision making. This is because, due to the trade-related leakage effect of environmental taxes, green interest groups lobby their governments in favor of lower pollution taxes, thus exacerbating (instead of counteracting) the international environmental distortion.

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[17] Equation (25) implies that $\lim_{s \to 0} \pm = -1$, and $\lim_{s \to 1} \pm = \mu$.

5 Concluding Remarks

In this paper we have proposed an analytical framework to investigate how the presence of strong green lobbies in°uences the comparative e±ciency of unilateral and cooperative environmental policies. We have focused our analysis on two large symmetric countries that are linked through trade °ows and transboundary pollution.

The main results of our analysis can be summarized as follows:

- The impact of green lobbies on the comparative e±ciency of unilateral and cooperative environmental policies depends on the type of trade regime and on the magnitude of the leakage and spillover e®ects;
- In the absence of preexisting international trade agreements, green lobbying bias pollution taxes upwards. Consequently, uncoordinated pollution taxes are closer to the e±cient Pigouvian solution than internationally coordinated taxes;
- If, however, governments are bound by international trade rules, and the emission spillovers and leakage e®ects are large enough, green lobbying bias unilateral pollution taxes downwards. In this case, environmental policy coordination is unambiguously e±ciency enhancing.

Does the presence of green lobbies with a strong in°uence on policy makers weaken the need for environmental policy coordination? Our analysis suggests that the answer to this question depends crucially on the strength of international trade rules. On the one hand, countries that are already cooperating over trade policy could gain by coordinating their environmental policies too, at least in those sectors of the economy characterized by large emission spillovers and leakage e®ects. On the other hand, countries that have not committed to trade cooperation should choose their environmental policies in a unilateral manner.

The institutional implication of these results is that, when environmental groups are politically organized, the need to create a World Environmental Organization (WEO) depends on the strength of the World Trade Organization. The existence of GATT/WTO rules which restrict governments' ability to use trade barriers would suggest the need for a WEO. However, if GATT/WTO rules are not binding[18] green

[18]GATT obligations are eroded by the fact that countries are able to invoke many exceptions to

lobbying at the national level could replace international coordination of environmental policies under a WEO.

The analytical framework described in this paper is highly simpli¯ed and the results obtained must be interpreted with great caution. More work is needed to examine how economic policy, including environmental policy, is determined by political and economic interests.

First, the common agency approach leaves two crucial issues aside: it does not explain why only some groups of citizens overcome the free-rider problem of collective action described by Olson (1965) and become politically organized; and it does not model the underlying electoral process, failing to provide clear microfoundations for the government's objective function. Second, it would be relevant to consider the impact of lobbying by producer groups. Their pressure for lower pollution taxes could counteract the in°uence of environmental groups (when they lobby for higher pollution taxes) or reinforce it (when they lobby for lower pollution taxes). In both cases, unilateral environmental policies would become less e±cient compared to internationally coordinated policies. Finally, a model with symmetric countries does not capture the North-South divide which often characterizes international environmental relations. By relaxing the symmetry assumption, one could extend our analysis to consider the interaction between countries with di®erent economic and political structures.

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them. Examples are exceptions for health, welfare, and national security reasons (Articles XX and XXI), the General Waivers (Article XXV), or antidumping and countervailing duties (Articles VI).

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