GREEN AND PRODUCER LOBBIES:

ENEMIES OR ALLIES?

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Green and Producer Lobbies: Enemies or Allies?[¤]

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Abstract

In this paper we employ a common agency model to study the role of green and producer lobbies in the determination of trade and environmental policies. We focus on two large countries that are linked by trade ‡ows and transboundary pollution externalities. We show that the nature of the relationship between lobbies and the relative e¢ciency of unilateral and cooperative policy outcomes depend crucially on three factors: the type of policy regime, whether governments act unilaterally or cooperatively, and the extent of the 'pollution leakages'.

KEYWORDS: Transboundary Pollution, International Trade, Political Contributions.

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

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1 Introduction

The purpose of the analysis carried out in this paper is to understand how the presence of green and producer lobbies can a¤ect the political determination of trade and environmental policies.

Recent events in the United States have illustrated the extent to which citizen groups condition trade and environmental policies, both at the national and multilateral level. On the trade side, the creation of the North American Free Trade Agreement (NAFTA) initially encountered the resistance of business, labor and environmental groups (VanGrasstek, 1992). By pledging in an environmental side agreement[1], the White House was able to win the support of at least some environmental groups and obtain the fast track authority to negotiate the trade agreement without a line-by-line veto from Congress.[2] More recently, environmental groups have joined forces with protectionist industries and labor groups to launch a …erce campaign against further trade liberalization, which has caused the breakdown of the new round of GATT/WTO negotiations in Seattle.[3] Industry and green lobbies have been extremely in‡uential also on the environmental side. On some issues, such as multilateral emissions cuts, they have held di¤erent positions.[4] On others, such as the compliance of foreign legislation

[1] The North American Agreement on Environmental Cooperation (NAAEC), could be characterized as being primarily concerned with safeguarding the sovereign rights of each party to establish its environmental standards while working towards the compatibility of standards.

[2] Opposition on the part of business and environmental groups has also undermined the project of a Free-Trade Area of the Americas (FTAA), which the United States, Canada and 34 American and Caribbean countries (all of them except Cuba) have agreed to establish by 2005.

[3] See The Economist, December 11, 1999.

[4] While green lobbies have exercised "considerable in‡uence on the negotiations" at the Kyoto Conference in favor of multilateral reductions in greenhouse emissions (Financial Times, December 11, 1997), a broad coalition of corporations, unions and economic lobby groups has organized "one of the most intensive campaigns ever mounted on a single political issue, seeking to convince that American curbs on greenhouse gas are unfair and damaging to the economy" (Financial Times, September 10 1997).

with American environmental standards, their objectives have often coincided.[5]

This paper attempts to shed some light on the relationship between green and producer lobbies. In particular, we wish to address the following questions: when will their interests over trade and environmental polices be aligned and when will they diverge? What will be the unilateral and cooperative policies selected by politically minded governments? When will policy coordination be e¢ciency enhancing?

Understanding the nature of the relationship between lobby groups is important for two reasons. On the positive side, it can help us to explain observed trade and environmental policies. On the normative side, it can provide some guidance on how to construct e¢cient policy mechanisms in the presence of political distortions.

In Conconi (2000), we studied how green lobbying can in‡uence the determination of trade and environmental policies when countries are large and emissions are transboundary. Here we extend the analysis to a situation in which both producer and environmental interests are organized.

To examine the relationship between interest groups and policy-makers, we adopt the common agency model pioneered by Bernheim and Winston (1986) and applied to trade policy by Grossman and Helpman (1994, 1995a,b). A national or supranational government is the agent who sets trade and environmental policies. Green and producer lobbies act as principals and confront the government with contribution schedules, namely functions describing their political contributions contingent on the chosen economic policies. These can be interpreted, depending on the context, as legal campaign contributions, support demonstrations, or simply as bribes. The timing is that …rst lobbies simultaneously commit to contribution schedules, and then the government, having observed these schedules, sets trade and environmental policies. The implicit objective of incumbent politicians is to be re-elected. They trade o¤ the political support that comes from heeding interest groups' demands against the alienation of voters that may result from the implementation of socially costly policies.

A key feature of our model is that the countries considered are large, i.e. they are able to a¤ect world prices. When pollution is transboundary, this implies that

[5] For example, both lobbies have demanded compliance of foreign legislation with American environmental standards on incidental catching of dolphins set out in the Marine Mammal Protection Act.

unilateral policy changes can generate important leakage e¤ects: higher pollution taxes or lower import tari¤s at home will cause the terms of trade to shift in favor of the other country; this will lead to an increase in foreign emissions, which then spill over into the home country.[6]

We characterize the policy outcomes and the relationship between lobbies in three alternative policy regime: one where governments control both trade and environmental policies; one in which they are restrained to the use of environmental policy by an existing free trade agreement; and one in which trade policy is the only available instrument. We …nd that, if trade and environmental policies are selected unilaterally and in isolation, the relationship between green and producer interest is ambiguous and depends on the magnitude of the pollution leakages. If instead the leakage effects are eliminated by the combined use of both policy instruments or through policy cooperation, green and producer lobbies will unambiguously be enemies or allies.

The analysis presented in this paper is part of a vast literature which looks at the relationship between interest groups and policy-makers.[7] Most studies have focused on the role of producer groups in the determination of trade policy.[8] In this area, the political contributions approach of Grossman and Helpman (1994, 1995a,b) adopted in this paper has become something of a work-horse model (see Cadot et al (1997), Rama and Tabellini (1998) and Mitra (1999), among many others).[9] A similar approach, originally developed by Stigler (1971) and Peltzman (1976), and …rst applied to trade policy by Hillman (1982), describes trade policy as being set by an incumbent govern-

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[6] There exists some empirical evidence that unilateral emission cuts can lead to an increase in emissions in the countries which do not apply the restriction. See, for example, IPPC (1996), Bernstein et al (1998), Nordhaus and Boyer (1998) and Manne and Richels (1998).

[7] See Persson and Tabellini (2000), for an extensive review of this literature.

[8] The literature on the political economy of trade policy is nicely reviewed by Rodrik (1995).

[9] Gawande and Bandyopadhyay (2000) have recently tested the empirical predictions of Grossman and Helpman (1994)'s model about the pattern of protection and lobbying spending. Using cross-industry data on US nontari¤ barriers and US lobby spending, they …nd that US pattern of protection is indeed "in‡uenced by lobbying spending and lobbying competition, and that, hence, protection is sold".

ment seeking to maximize its political support. A third approach, developed by Magee at al. (1989), and Hillman and Ursprung (1988), focuses on the electoral competition among political parties. Here lobbies do not directly a¤ect policy choices, but instead in‡uence the probability of their favorite party being elected. Alternatively, Austen-Smith (1997) views the policy-making process as being characterized by uncertainty. In his framework, interest groups in‡uence the provision of informational expertise. Most studies on the political economy of trade policy have disregarded the environmental impact of trade and the role of green lobbies. Two notable exceptions in this respect are Hillman and Ursprung (1992, 1994), who introduce environmental lobby groups in a model of endogenous trade policy.

A more recent body of literature, which includes Fredriksson (1997) and Aidt (1998), has studied the political economy of environmental policy. These studies adopt the political contribution approach to study the impact of green and producer interest on environmental policy, but di¤er from our analysis in a number of ways. First, they only study environmental policy, while we are interested in the joint determination of trade and environmental policies. Second, they focus on local environmental problems in a small open economy, while we look at transboundary environmental problems between large countries. Third, in their setup, the interests of green and producer lobbies over environmental policy are always divergent, while we show that in some cases they might actually coincide. This consideration has also e¢ciency implications: while they …nd that the competition between green and producer lobbies is the "driving force behind the political internalization of externalities" (Aidt, 1998, p. 13), we show that a possible alliance between them can exacerbate the environmental distortion.

The issue of the link between the trade policy regime and stringency of environmental regulations has been recognized in number of papers. A study by Perroni and Wigle (1994) shows that, given the level of environmental regulations, trade policy has little impact on the quality of the environment. Husted and Logsdon (1997) …nd instead that the NAFTA agreement has lead Mexico to strengthen its environmental policies.[10] On the theoretical side, Fredriksson (1999) examines a scenario in which environmental and industry interest lobby groups in‡uence the determination of pol-

[10] For example, regulatory plant inspections have increased from 1425 in 1990 to 13,993 in 1995.

lution taxes in sectors protected by tari¤s. The level of protectionism is exogenously determined.[11] The main result of his analysis is that the level of political con‡ict on environmental policy falls with trade liberalization. Schleigh (1999) studies the joint determination of trade and environmental policies. The government is assumed to have a single or a variety of domestic and trade policy instruments to address production or consumption externalities and to obtain political contributions from producer lobby groups. He shows that, in the presence of both trade and environmental distortions, ine¢cient trade policies can lead to higher environmental quality than more e¢cient domestic policies. Di¤erently from our analysis, both Fredriksson (1999) and Schleigh (1999) focus on a small economy and on local environmental problems, thus leaving aside the leakage e¤ects of trade and environmental policies.

The remainder of the paper is organized as follows. In Section 2, we describe the economic and political features of the model. In Section 3, we derive unilateral and cooperative equilibrium policies in alternative regimes. Section 4 analyzes the relationship between green and producer interests. Section 5 discusses the relative e¢ciency of the policy outcomes. Finally, Section 6 presents some concluding remarks.

2 The Model

2.1 The Economy

We consider two large countries, denominated home (no*) and foreign (*). Our analysis is mainly focused on the economic and political structure of the home country (the foreign country will have symmetric characteristics).

The economy is described by a Ricardo-Viner model in which there are $N + 1$ goods $i = 0; 1; : : : ; N$. All goods are produced competitively under constant returns to scale. Production of the numeraire good 0 requires labor alone and does not generate pollution. Production of all other goods requires both the mobile factor, labor, and a sector speci…c capital, and generates emissions at the …xed level $\bar{}$ per unit of output.

[11] Fredrikkson (1999) compares an initial scenario with exogenously given tari¤s with a free trade scenario. As noted by the author, this analysis only applies to small open economies with a negligible impact on multilateral trade talks.

The numeraire good is traded freely across countries, with a world and a domestic price equal to one. In a competitive equilibrium, this implies that wage rate is also equal to unity.[12]

Let $¼_i$ be the international price of a non-numeraire good and q_i and p_i be its domestic consumer and producer prices, respectively. The reward to the owners of a speci…c factor can be denoted as $¦_i(p_i)$. By Hotelling's Lemma, the industry supply curve is then equal to $Y_i(p_i) = @¦_i=@p_i$, where $@(Y_i)=(@p_i) > 0$, and $(@Y_i)=(@p_i^2) · 0$.

The economy is populated by H individuals, $h = 0; 1; : : : ; H$, with identical preferences. Utility is quasilinear and additively separable:

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

where c_0 and c_i indicate consumption of the numeraire and non-numeraire goods. The functions $u(c_i)$ are di¤erentiable, increasing, and strictly concave. The last term captures the disutility caused by environmental damage:

$$Z(p; p^¤) ´ \sum_{i=1}^{N} \left[(1 ¡ µ_i)\bar{}_i Y_i(p_i) + µ_i \bar{}^¤_i Y^¤_i(p^¤_i) \right]; \tag{2}$$

where p and $p^¤$ are vectors of producer prices and $(1 ¡ µ_i)$ and $µ_i$ are the relative weights associated with domestic and foreign emissions in sector i, respectively. Equation (2) implies that, if the coe¢cient $µ_i$ is positive, citizens in the home country are negatively a¤ected by the emissions generated in both the domestic and foreign production of good i. The larger is $µ_i$, the larger is the impact of foreign pollution on the environmental damage su¤ered by the home citizens.

Inverse demand for a non-numeraire good can be expressed as a function of its price alone, i.e. $D_i(q_i)$. The indirect utility function corresponding to (1) can be written as:

$$\begin{aligned} V_h(q; p; p^¤) \quad ´ & L_h + \sum_{i=1}^{N} \left[¸_i ¦_i(p_i) + \frac{1}{H} t_i Y_i(p_i) + \frac{1}{H} ¿_i \left[D_i(q_i) ¡ Y_i(p_i) \right] \right] \\ & + \sum_{i=1}^{N} \left[u \left[D_i(q_i) \right] ¡ q_i D_i(q_i) \right] ¡ Z(p; p^¤): \end{aligned} \tag{3}$$

[12] The economy's labor supply is assumed to be su¢ciently large for the supply of the numeraire good to be positive.

The terms in the …rst row of (3) represent income, which consists of wage income (L_h), capital claims (with $¸_h$ indicating the share of capital owned by individual h)[13] and 1=H of environmental and trade revenues, transferred as a lump sum. The …rst two terms in the second row capture consumer surplus and the last term indicates environmental damage.

We consider two policy instruments: environmental taxes/subsidies t and import tari¤s/subsidies ¿. Thus the consumer prices of a non-numeraire good is given by $q_i = ¼_i + ¿_i$, and its producer price is $p_i = ¼_i + ¿_i - t_i$.

International product markets clear when

$$M_i(¼_i; ¿_i; t_i) + M_i^¤(¼_i; ¿_i^¤; t_i^¤) = 0; \qquad 8i = 1; : : : ; N; \tag{4}$$

where $M_i = D_i(q_i) - Y_i(p_i)$ and $M_i^¤ = D_i^¤(q_i)^¤ - Y_i^¤(p_i)^¤$ represent the net imports of the home and foreign countries.

2.2 The Leakage E¤ects of Trade and Environmental Policies

Equation (4) implies that the international price of a non-numeraire good is a function of trade and environmental policies in the two countries, i.e. $¼_i(t_i; ¿_i; t_i^¤; ¿_i^¤)$. Thus in our setup countries are large, i.e. they are able to a¤ect their terms of trade. For example, if the home country increases its pollution tax on good i[14], the international price increase by

$$± ´ = \frac{@¼}{@t} ´ - \frac{Y_p}{M0 + M¤0}; \qquad 0 < ± < 1; \tag{5}$$

where $M0 = D_q - Y_p$, with $Y_p = @Y=@p$ and $D_q = @D=@q$. Hence, the terms of trade shift in favor of the foreign country.

If instead the home country raises its import tari¤, the international price falls by

$$-Á ´ \frac{@¼}{@¿} ´ - \frac{M0}{M0 + M¤0}; \qquad 0 < Á < 1; \tag{6}$$

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[13] We assume that individuals own at most one type of speci…c factor.

[14] Given the quasilinearity of the utility function, there is no possibility of substitution among goods such that the amount of pollution resulting from a given level of production can be varied. This allows us to study the determination trade and environmental policies in a representative non-numeraire sector i of the economy. For ease of the exposition, in what follows we drop the sectoral subscript.

and the terms of trade shift in its favor.[15]

Hence, unilateral policy changes a¤ect production and emissions in both countries. Consequently, they generate important leakage e¤ects. Consider, for example, the environmental impact of an increase in the emission tax by the home country:

$$\frac{@Z}{@t} = (1 ¡ \mu)^{-}Y_p(\pm ¡ 1) + \mu^{-¤}Y_p^{¤}\pm: \tag{7}$$

Thus higher domestic pollution taxes lead to a reduction in domestic pollution, but also generate an increase in foreign pollution, so that the overall e¤ect is ambiguous. The larger the emission spillovers (μ) and the terms of trade e¤ects ($\pm$) are, the larger are the pollution leakages ($\mu^{-¤}Y_p^{¤}\pm$).

The e¤ects of a tari¤ increase by the home country is:

$$\frac{@Z}{@¿} = (1 ¡ \mu)®Y_p(1 ¡ Á) ¡ \mu^{-¤}Y_p^{¤}Á: \tag{8}$$

Thus higher domestic tari¤s lead to a reduction in foreign emissions, but also to an increase in domestic emissions. The larger the emission spillovers (μ) and the terms of trade e¤ects ($Á$) are, the larger are the pollution leakages ($¡\mu^{-¤}Y_p^{¤}Á$). Notice that, while a unilateral increase in pollution taxes is only bene…cial if the pollution leakages are small enough, a unilateral tari¤ increase has a positive environmental impact only if the leakage e¤ects are large enough.

As it will emerge more clearly in Section 4, the existence of pollution leakages has important consequences for the nature of the relationship between environmental and producer interest groups.

2.3 The Political Process

Our model does not explain the process of lobby formation. We simply assume that only the following groups of citizens can overcome the free-riding problem described by Olson (1965) and get politically organized: the owners of a subset S of all speci…c factors, who form producer lobbies in their respective sectors; and a proportion s_E of the population, the 'environmentalists', who form a national green lobby.

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[15]Notice that $|Á| > |\pm|$, which implies trade policy has a larger e¤ect on the terms of trade than environmental policy.

Political competition can be modelled as a two-stage game. In the …rst stage, green and producer lobbies simultaneously present incumbent policymakers with contribution schedules $C(t;¿)$, namely functions mapping every combination or trade and environmental policy into a level of political contribution. We assume that a citizen cannot be a member of more than one interest group. We also exclude the possibility that lobbies cooperate with one another and that they can o¤er political contributions to politicians in the other country. Therefore, when we refer to an 'alliance' between green and producer lobbies, we will be alluding to the fact that they exercise political pressure in the same direction, without formally coordinating their actions. The equilibrium set of contribution schedules is one in which each lobby maximizes the aggregate utility of its members, given the schedules of the other lobby group.

In the second stage, incumbent politicians select trade and environmental policies, given the equilibrium contribution schedules, and collect the corresponding contributions from every lobby. They are concerned with aggregate well-being, but also with the support they get from interest groups. In equilibrium, the decision-makers balance optimally the marginal bene…t of net aggregate contributions against the marginal welfare cost of distortionary trade and environmental policies.

We assume that interest groups are 'functionally specialized' (Aidt, 1998), in the sense that producer lobbies are only concerned about industry pro…ts and the green lobby is only concerned about environmental damage. The gross (of contributions) welfare of a producer lobby is thus given by

$$W_P^j(q_j; p_j; q_j^¤; p_j^¤) = ¦_j(q_j; p_j; q_j^¤; p_j^¤); \tag{9}$$

while that of the green lobby is

$$W_E(q; p; q^¤; p^¤) ´ B ¡ s_E H Z(q; p; q^¤; p^¤); \tag{10}$$

where B is a constant. The lobbies o¤er contributions to the government so as to maximize

$$W_P^j(q_j; p_j; q_j^¤; p_j^¤) = W_P^j(q_j; p_j; q_j^¤; p_j^¤) ¡ C_j(q_j; p_j; q_j^¤; p_j^¤); \tag{11}$$

and

$$W_E(q; p; q^¤; p^¤) ´ W_E(q; p; q^¤; p^¤) ¡ C_E(q; p; q^¤; p^¤): \tag{12}$$

When acting unilaterally, the home government selects trade and environmental policies

so as to maximize[16]

$$G(q;p;q^{\alpha};p^{\alpha}) \equiv aW(q;p;q^{\alpha};p^{\alpha}) + \sum_{j\in S} C_j(q_j;p_j;q_j^{\alpha};p_j^{\alpha}) + C_E(q;p;q^{\alpha};p^{\alpha}); \qquad a \geq 0; \tag{13}$$

where a represents the weight that the government attaches to social welfare relative to lobbies' contributions. Social welfare is de…ned as aggregate income plus total consumer surplus minus total environmental damage:

$$\begin{aligned} W(q;p;p^{\alpha}) \;=\; & L + \sum_{i=1}^{N} \pi_i(p_i) + \sum_{i=1}^{N} t_i Y_i(p_i) + \sum_{i=1}^{N} \phi_i M_i(q_i;p_i) \\ & + H\left[\sum_{i=1}^{N} \left(u\left[D_i(q_i)\right] - \sum_{i=1}^{N} q_i D_i(q_i)\right)\right] - HZ(p;p^{\alpha}): \end{aligned} \tag{14}$$

Alternatively, governments might act cooperatively. In this case, policies are selected by a supra-national government or an international mediator, who cares about the political contributions and the social welfare of both countries. Its objective function is given by[17]:

$$\begin{aligned} G^{w} = a^{\alpha}G + aG^{\alpha} \;=\; & a^{\alpha}\left[a W(q;p;q^{\alpha};p^{\alpha}) + W^{\alpha}(q^{\alpha};p^{\alpha};q;p)\right] + \\ & a^{\alpha}\left[\sum_{j\in S} C_j(q_j;p_j;q_j^{\alpha};p_j^{\alpha}) + C_E(q;p;q^{\alpha};p^{\alpha})\right] \\ & + a\left[\sum_{j\in S^{\alpha}} C_j^{\alpha}(q_j^{\alpha};p_j^{\alpha};q_j;p_j) + C_E^{\alpha}(q^{\alpha};p^{\alpha};q;p)\right]: \end{aligned} \tag{15}$$

Common agency games of the types described typically admit a multiplicity of Nash equilibria. Following Grossman and Helpman (1994), we focus on truthful equilibria, where lobbies make contributions up to the point where the resulting change in economic policies is exactly o¤set by the marginal cost of the contributions.[18]

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[16] See Grossman and Helpman (1996) for an endogenous derivation of the government's objective function.

[17] See Grossman and Helpman (1995) for a discussion of the objective function of the supra-national mediator.

[18] It can be shown that only truthful contributions support coalition-proof Nash equilibria, and vice-versa, all such equilibria are re‡ected by truthful contributions (see Bernheim and Whinston, 1986).

To understand lobbies' in‡uence on the decision-making process, it is thus necessary to examine how they are a¤ected by policy changes. Let us …rst consider the e¤ect of a unilateral increase in the emission tax. Producers' welfare falls by

$$\frac{@W_P}{@t} = Y(\pm - 1) < 0; \tag{16}$$

while the impact on the welfare of the green lobby is

$$\frac{@W_E}{@t} = -s_E H^{h}(1-\mu)\bar{Y}_p(\pm - 1) + \mu\bar{}^{\alpha}Y_p^{\alpha}\pm^{i}: \tag{17}$$

This implies that, if the pollution leakages are large enough, the environmental costs associated with the increase in foreign emissions could outweigh the bene…ts due to the fall in domestic emissions. In this case, the green lobby would paradoxically gain from a reduction in domestic taxes.

Next, consider the impact of a unilateral tari¤ increase. Producers gain by

$$\frac{@W_P}{@¿} = Y(1 - Á) > 0; \tag{18}$$

while the e¤ect on the green lobby's welfare is ambiguous:

$$\frac{@W_E}{@¿} = -s_E H^{h}(1-\mu)®Y_p(1 - Á) - \mu\bar{}^{\alpha}Y_p^{\alpha}Á^{i}: \tag{19}$$

Expression (19) implies that the green lobby would only bene…t from a tari¤ increase if the leakage e¤ects are large enough to guarantee that the environmental gains associated with the reduction in foreign emissions outweigh the costs due to the increase in domestic emissions.

To summarize, when governments act unilaterally, producers, as expected, o¤er campaign contributions in favor of lower pollution taxes and higher import tari¤s. The role played by the environmental groups depends on the magnitude of the leakage e¤ects, which, in turn, depends on the extent of the emission spillovers and the terms of trade e¤ects. If the leakage e¤ects of environmental policy are small (large) enough, the green lobby will favor higher (lower) emission taxes; if the leakage e¤ects of trade policy are large (small) enough, it will support higher (lower) import tari¤s.

As it will emerge from Section 4, when the leakage e¤ects are internalized by policy cooperation, or counteracted by the combined use of the two policy instruments, green lobbies will hold unambiguous policy stances.

3 The Policy Equilibria

In this section, we characterize the (politically) optimal unilateral and cooperative equilibrium policies in a particular sector j of the economy.[19] We focus on the simple case in which the two countries have identical economic and political structures[20] and consider three alternative policy regimes: one where governments have control over both trade and environmental policies; one in which they are restrained to the use of environmental policy by an existing free trade agreement; and one in which trade policy is the only instrument at their disposal.

3.1 Trade and Environmental Outcomes

Let us …rst consider the case where governments set trade and environmental taxes independently. Substituting the partial derivatives obtained from (9), (10) and (14) into the …rst-order conditions for non-cooperative political equilibria, we obtain:

$$¿_{NC} = ¿^{¤}_{NC} = \frac{¯H\mu Y_p(a + s_E)}{a(Y_p ¡ D_q)}; \tag{20}$$

and

$$t_{NC} = t^{¤}_{NC} = \frac{¯H(a + s_E)(1 ¡ \mu) ¡ Y}{aY_p}: \tag{21}$$

In the case of centralized decision-making, governments select the following policies:

$$¿_C = ¿^{¤}_C = 0; \tag{22}$$

and

$$t_C = t^{¤}_C = \frac{¯HY_p(a + s_E) ¡ Y}{aY_p}: \tag{23}$$

3.2 Environmental-only Outcomes

Next, consider the case in which the two governments have signed a free trade agreement, eliminating the tari¤s on each other's imports. In this scenario, environmental

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[19] The …rst-order conditions for the derivation of these policies can be found in the Appendix.

[20] In a more general case, as noted in the Appendix, the …rst-order conditions for the derivation of cooperative equilibrium policies are linearly dependent and thus yield multiple solutions.

policy is the only instrument available. Unilateral emissions are given by

$$t_{NC} = t^{¤}_{NC} = \frac{Y(1 ¡ ±) + ¯H(a + s_E)(± + µ ¡ 1)}{aY_p(± ¡ 1)}; \tag{24}$$

while international policy coordination yields

$$t_C = t^{¤}_C = \frac{¯HY_p(a + s_E) ¡ Y}{aY_p}: \tag{25}$$

3.3 Trade-only Outcomes

Finally, suppose trade policy is the only instrument available. Unilateral policy-making leads to the adoption of the following import tari¤s:

$$¿_{NC} = ¿^{¤}_{NC} = \frac{(Á ¡ 1)Y ¡ ¯HY_p(a + s_E)(µ + Á ¡ 1)}{aÁ(D_q ¡ Y_p)}; \tag{26}$$

while free trade is the outcome of centralized policy-making:

$$¿_C = ¿^{¤}_C = \frac{Y ¡ ¯HY_p(a + s_E)}{a(D_q ¡ Y_p)}: \tag{27}$$

4 The Relationships between Green and Producer Lobbies

As discussed above, producer groups will always lobby for protectionist trade policy and for lower pollution taxes. Therefore the ambiguity in the relationship between producer and green lobbies depends uniquely on the ambivalence of the green lobby's policy stances.

In this section, we examine the political pressure exercised by the green lobby in the alternative policy scenarios. This then allows us to evaluate whether green and producer lobbies have similar or divergent interests over trade and environmental policy.

As a measure of the green lobby's in‡uence, we consider the e¤ect of a change in its size on the policy outcomes (i.e. $@¿=@s_E$ and $@t=@s_E$).[21]

[21] Notice that de…ning political pressure in terms of the green lobby's contributions for each single policy vector (i.e. $@W_E=@¿$ and $@W_E=@t$) would be inappropriate, since it would not take into account the interdependence between trade and environmental policies.

Let us examine each of the policy scenarios considered in the previous section, starting from the case in which governments can use both policy instruments and act in a non-cooperative manner. We obtain the following result:

Lemma 1 When governments select trade and environmental policies unilaterally, the interests of green and producer lobbies will be aligned over trade policy, but opposite over environmental policy.

PROOF: Green lobbying leads to an increase in the pollution tax by

$$\frac{@t_{NC}}{@s_E} = \frac{\bar{H}(1 - \mu)}{a} > 0; \tag{28}$$

and to an increase in the import tari¤ by

$$\frac{@¿_{NC}}{@s_E} = \frac{\bar{H}\mu Y_p}{a(Y p - Dq)} > 0: \tag{29}$$

The intuition behind this result is that in this scenario environmental damage can be reduced by combining the use of pollution taxes (to reduce domestic emissions) and import tari¤s (to avoid the terms of trade shifts that would lead to increased foreign emissions). Q.E.D.

Moving to the case of centralized decision-making, we …nd:

Lemma 2 When governments select trade and environmental policies cooperatively, green and producer lobbies will have opposite interests over environmental policy.

PROOF: The presence of the green lobby implies an increase in cooperative pollution taxes:

$$\frac{@t_C}{@s_E} = \frac{\bar{H}}{a} > 0: \tag{30}$$

From (22), notice that, if trade and environmental policies are selected by a supra-national authority/mediator, green lobbying will have no e¤ect on the trade policy outcomes. Q.E.D.

Consider now the situation in which governments have committed to free trade. In the case of decentralized decision-making, we obtain the following result:

Lemma 3 When governments are bound by a free trade agreement and select their emission taxes non-cooperatively, the interests of green and producer lobbies will be aligned if and only if the leakage effects generated by an increase in emission taxes are large enough ($\theta + \mu > 1$).

PROOF: Under a free trade regime, green lobbying has an ambiguous effect on the non-cooperative environmental outcomes:

$$\frac{\partial t_{NC}}{\partial s_E} = \frac{\bar{H}(\theta + \mu - 1)}{a(\theta - 1)}. \tag{31}$$

It is straightforward to verify that expression (31) is positive for $\theta + \mu < 1$. As discussed in Section 2.2, this condition implies that the green lobby gains from a unilateral increase in the emission tax, even if this causes an increase in foreign pollution. Q.E.D.

If the decision-making process is centralized, the relationship between environmental and producer groups is described by the following lemma:

Lemma 4 When governments are bound by a free trade agreement and select their emission taxes cooperatively, green and producer lobbies will always have opposite interests.

PROOF: Green lobbying biases cooperative emission taxes upwards:

$$\frac{\partial t_C}{\partial s_E} = \frac{\bar{H}}{a}. \tag{32}$$

The competitive nature of the relationship between the two lobbies is due to the fact that a multilateral increase in emission taxes leads to a reduction in productive activities in both countries. This implies a reduction in total environmental damage but a fall in the welfare of capital owners in both countries. Q.E.D.

Let us now consider the scenario in which trade policy is the only instrument available. When import tariffs are selected in an independent manner, we obtain:

Lemma 5 When import tariffs are the only available instrument and governments act unilaterally, the interests of green and producer lobbies will be aligned if and only if the leakage effects associated with a tariff increase are large enough ($\acute{A} + \mu > 1$).

PROOF: An increase in the size of the green lobby has the following impact on non-cooperative import tari¤s:

$$\frac{@¿^{NC}}{@s_E} = \frac{¯H(Á + µ ¡ 1)}{aÁ(Y_p ¡ D_q)}: \tag{33}$$

Expression (33) is positive if and only if $Á + µ > 1$. The intuition behind this result is that, if the terms of trade e¤ects and the emission spillovers are large enough, the environmental gains associated with the decrease in foreign pollution outweigh the costs associated with the increase in domestic emissions. Q.E.D.

Finally, Lemma 6 applies to the case of trade policy coordination:

Lemma 6 When import tari¤s are the only policy instrument and they are chosen at the supra-national level, the interests of green and producer lobbies will always be convergent.

PROOF: When trade policies are chosen cooperatively, green lobbying leads to an increase in import tari¤s by

$$\frac{@¿^{C}}{@s_E} = \frac{¯HY_p}{a(Y_p ¡ D_q)} > 0: \tag{34}$$

This is due to the fact that higher tari¤s in all countries would normally imply a reduction in world production and emissions. However, in the case of two symmetric countries, the policies adopted are identical and have no impact on productive activities and on the level of global emissions. Q.E.D.

The results presented in Lemmas 1-6 are summarized by Table 1 and by the following Proposition:

Proposition 1 The nature of the relationship between green and producer lobbies depends crucially on three factors: the type of policy regime; whether government act in a unilateral or cooperative manner, and the magnitude of the pollution leakages.

The three factors a¤ecting the relationship between lobbies are clearly inter-related. As shown by Lemmas 3 and 5 above, the ambiguity of the green lobby's policy stances and of its relationship with producer groups arises from the existence of pollution

Table 1: The Relationships between Green and Producer Lobbies

Policy Regimes	Policy-making Process	
	Decentralized	Centralized
Trade and Environment	1) Trade Alliance, Environmental Competition	2) Environmental Competition —
Environment only	3) Alliance if ± + µ > 1	4) Competition
Trade only	5) Alliance if Á + µ > 1	6) Alliance

leakages. When trade and environmental policies are selected non-cooperatively and used in isolation[22], they lead governments to 'export' pollution (in the case of higher pollution taxes or lower import tari¤s) or to 'import' it (in the case of lower pollution taxes or higher tari¤s). If the pollution leakages are large enough, the interest of producer and environmental interests will be allied (scenarios 3 and 5 in Table 1). Notice that, even if the leakage e¤ects are smaller than the critical value (i.e. ± + µ < 1

[22]Notice from the previous section that the coe¢cients ± and Á only appear in equations (24) (26). This is because terms of trade e¤ects—and consequently pollution leakages— only exist in a policy regime in which governments have only one instrument at their disposal, which they use in a non-cooperative manner.

and Á + μ < 1) and the lobbies are thus competing, their interests will always be less polarized than in the case in which countries are small (i.e. ± = Á = 0) and/or pollution is local (i.e. μ = 0).

In a regime in which both policy instruments are available, governments can avoid pollution leakages by increasing both pollution taxes (to reduce domestic emissions) and import tari¤s (to avoid increasing foreign emissions). In this case, green and producer groups will unambiguously be allied over trade policy and competing over environmental policy (scenario 1 in Table 1).

Pollution leakages can also be eliminated through policy cooperation. This is why, if policies are selected at the supra-national level, the relationship between the two lobbies is always unambiguously one of competition or alliance.

In particular, we …nd that the interests of the green and producer lobbies will always diverge on international environmental agreements (cases 2 and 4 in Table 1). This could, for example, explain their di¤erent positions with regard to the multilateral reductions in greenhouse emissions proposed by the Kyoto Protocol.

Our analysis also predicts that, when unaccompanied by the use of pollution taxes, trade liberalization would clearly hurt both producers and environmental groups (scenario 6 in Table 1). Given the weakness of the existing policies to reduce emissions, one could argue that this scenario explains the alliance between industry and environmental groups to oppose the new round of GATT/WTO negotiations.

Notice that the trade alliance could be broken if both policies were negotiated upon (case 2 in Table 1). This result could explain why, as mentioned above, the introduction of an environmental side-agreement broke the alliance of green and industry groups against the NAFTA agreement. It also suggests that the introducing environmental issues in the agenda for the new GATT/WTO round might be necessary to avoid the …erce opposition by green and producer groups encountered in Seattle.

5 The E¢ciency Question

The model presented in this paper is characterized by the existence of three types of distortions: an environmental distortion, caused by the presence of emission spillovers; a trade distortion, due to the fact that countries are able to a¤ect their terms of trade; and a political distortion, arising from the lobbying activities of green and producer

groups. The question we want to address in this section is the following: is it still possible to achieve e¢cient policy outcomes in this second-best world?

The …rst-best solution—which is obtained when benevolent policymakers act cooperatively—requires that governments eliminate tari¤s on each other's imports and adopt optimal Pigouvian emission taxes, which re‡ects the social marginal damage of emissions:

$$¿ = ¿^{¤} = 0; \tag{35}$$

$$t_P = t_P^{¤} = ¯H: \tag{36}$$

Due to the symmetry assumption, the two countries always select identical tari¤s. As noted above, this implies that in equilibrium there is no trade distortion. In this setup, it is thus possible to focus the analysis on the relative e¢ciency of alternative environmental policy outcomes, which we simply measure scenarios in terms of their distance from (36). This analysis leads us to the following result:

Proposition 2 in the case of symmetric countries, e¢ciency can only be achieved if: (i) pollution taxes are available; (ii) green and producer lobbies have opposite interests over environmental policy; (iii) green lobbies have size $s_E^{\wedge}$.

PROOF: Table 2 reports the size of the green lobby for which the environmental policy outcomes presented in Section 3 are equal to the optimal Pigouvian taxes. Notice that e¢ciency can only be achieved though the use of emission taxes. In the policy regime in which import tari¤s are the only available instrument, environmental externalities cannot be internalized. The reason behind this result is that, due to the symmetry assumption, trade policy has no e¤ect on relative prices and productive activities.

Table 2 also reveals that the relative e¢ciency of the policy outcomes depends on the nature of the relationship between the two lobbies.: if governments act unilaterally and are bound by a free trade agreement, $\hat{s}$ is positive if $\mu + \pm < 1$. This implies that e¢ciency can only be achieved if the green and producer lobbies are in competition (see Table 1). Q.E.D.

Comparing the two policy-making processes, we obtain the following result:

Lemma 7 The size of the green lobby necessary to reach e¢ciency at the supra-national decision-making level is smaller than at the national level.

Table 2: E¢ciency and the Size of the Green Lobby

Policy Regimes	Policy-making Process	
	Decentralized	Centralized
Trade and Environment	$s^{\wedge}_E = \frac{Y + \bar{}Ha\mu Y_p}{\bar{}HY_p(1 - \mu)}$	$s^{\wedge}_E = \frac{Y}{\bar{}HY_p}$
Environment only	$s^{\wedge}_E = \frac{Y(1 - \pm) + \bar{}Ha\mu Y_p}{\bar{}HY_p(1 - \pm - \mu)}$	$s^{\wedge}_E = \frac{Y}{\bar{}HY_p}$
Trade only	—	—

PROOF: Consider …rst the regime where both trade and environmental policies are available. The di¤erence between the critical size of green lobbies in the case of a decentralized decision-making and in the case of policy cooperation is:

$$\frac{\mu Y + \bar{}Ha\mu Y_p}{\bar{}HY_p(1 - \mu)} > 0: \tag{37}$$

The corresponding expression for the regime in which environmental policy is the only available instrument is

$$\frac{\mu(Y + \bar{}HaY_p)}{\bar{}HY_p(\pm + \mu - 1)}: \tag{38}$$

As we discussed above, for unilateral policies to be e¢cient, it must be that $\pm + \mu < 1$, which implies that expression (38) is positive.

The intuition behind this result is simple. Cooperative pollution taxes are e¢cient

in the absence of lobbies; in the presence of green and producer lobbies, they can be e¢cient if green lobbies are large enough to exactly o¤set the political pressure exercised by producer lobbies. For unilateral environmental policies to be e¢cient, however, green lobbies must be larger, so that their bias towards higher taxes counteracts the downward bias of both producer groups and national governments. Q.E.D.

6 Concluding Remarks

In this paper we have employed a common agency model to examine the role of green and producer lobbies in the joint determination of trade and environmental policy. We have focused our analysis on the case of two large symmetric countries, which are linked through trade and transboundary pollution.

We have characterized the policy outcomes and the relationship between lobbies in three alternative policy regimes: one where governments control both trade and environmental policies; one in which they are restrained to the use of environmental policy by an existing free trade agreement; and one in which trade policy is the only available instrument.

We have shown that, in a scenario where only one of the policy instruments is available and governments act non-cooperatively, unilateral policy changes a¤ect the terms of trade and hence a¤ect not only domestic emissions, but also foreign emissions. In this case, the policy stances of the green lobbies and the nature of their relationship with producer lobbies depend on the magnitude of the pollution leakages: environmentalists and producers will be allied against a unilateral increase in domestic pollution taxes, if the associated pollution leakages are large enough; and they will be allied in favor of protectionist policies, if the associated pollution leakages are large enough.

In a regime in which both policy instruments are available, governments can eliminate pollution leakages by combining the use of pollution taxes (to reduce domestic emissions) and import tari¤s (to avoid increasing foreign emissions). In this case, green and producer groups will be unambiguously allied over trade policy and competing over environmental policy. Our analysis also predicts that the interests of green and producer lobbies will always diverge on international environmental agreements and converge on trade negotiations if unaccompanied by e¤orts to reduce pollution.

Appendix

We introduce the following indicator variables:

- I_E (I_E^*): indicator variable which is equal to one if the home (foreign) government is in‡uenced by a national green lobby, and zero otherwise.
- I_P (I_P^*): indicator variable which is equal to one if there is an organized producer lobby in the home (foreign) country, and zero otherwise.

In the case of non-cooperation, trade and environmental policies are selected to maximize (13). Under the assumption that lobbies o¤er truthful political contributions, the …rst-order conditions for the derivation of the domestic (politically) optimal non-cooperative policies in a representative sector of the economy are:

$$a\frac{@W}{@t} + I_E\frac{@W_E}{@t} + I_P\frac{@W_P}{@t} = 0; \tag{39}$$

$$a\frac{@W}{@¿} + I_E\frac{@W_E}{@¿} + I_P\frac{@W_P}{@¿} = 0; \tag{40}$$

while foreign unilateral policies must satisfy

$$a^*\frac{@W^*}{@t^*} + I_E^*\frac{@W_E^*}{@t^*} + I_P^*\frac{@W_P^*}{@t^*} = 0; \tag{41}$$

$$a\frac{@W}{@¿^*} + I_E^*\frac{@W_E^*}{@¿^*} + I_P^*\frac{@W_P^*}{@¿^*} = 0: \tag{42}$$

Substituting partial derivatives into (39) and (40), we obtain:

$$\begin{aligned} &a\Big[Y_h(± ¡ 1) + tY_p(± ¡ 1) + Y + ¿_{io}\big[D_q± ¡ Y_p(1 ¡ ±) ¡ D±\\ &¡ H_h\big[(1 ¡ µ)^{-}Y_p(± ¡ 1) + µ^{-*}Y_p^*±\\ &¡ I_E s_E H_h\big[(1 ¡ µ)^{-}Y_p(± ¡ 1) + µ^{-*}Y_p^*±\big]\\ &+ I_P Y(± ¡ 1) = 0; \end{aligned} \tag{43}$$

and

$$\begin{aligned} &a\Big[Y_h(1 ¡ Á) + ¿(1 ¡ Á)(D_q ¡ Y_p) + D ¡ Y + tY_p(1 ¡ Á) ¡ D(1 ¡ Á)\\ &¡ H_h\big[(1 ¡ µ)^{-}Y_p(1 ¡ Á) ¡ Áµ^{-*}Y_p^*\big]_{io}\\ &¡ I_E s_E H_h\big[(1 ¡ µ)^{-}Y_p(1 ¡ Á) ¡ µ^{-*}Y_p^*Á\big]\\ &+ I_P Y(1 ¡ Á) = 0: \end{aligned} \tag{44}$$

Foreign environmental and trade policies must satisfy two symmetric conditions.

In the case of cooperation, environmental and trade policies are chosen so as to maximize equation (15). Under the assumption of truthfulness of the political contributions, this implies the following …rst-order conditions:

$$a^{\alpha}\left[l_E\frac{@W_E}{@t}+l_P\frac{@W_P}{@t}\right]+a\left[l_E^{\alpha}\frac{@W_E^{\alpha}}{@t}+l_P^{\alpha}\frac{@W_P^{\alpha}}{@t}\right]+aa^{\alpha}\left[\frac{@W}{@t}+\frac{@W^{\alpha}}{@t}\right]=0; \tag{45}$$

$$a^{\alpha}\left[l_E\frac{@W_E}{@¿}+l_P\frac{@W_P}{@¿}\right]+a\left[l_E^{\alpha}\frac{@W_E^{\alpha}}{@¿}+l_P^{\alpha}\frac{@W_P^{\alpha}}{@¿}\right]+aa^{\alpha}\left[\frac{@W}{@¿}+\frac{@W^{\alpha}}{@¿}\right]=0; \tag{46}$$

$$a\left[l_E^{\alpha}\frac{@W_E^{\alpha}}{@t^{\alpha}}+l_P^{\alpha}\frac{@W_P^{\alpha}}{@t^{\alpha}}\right]+a^{\alpha}\left[l_E\frac{@W_E}{@t^{\alpha}}+l_P\frac{@W_P}{@t^{\alpha}}\right]+aa^{\alpha}\left[\frac{@W}{@t^{\alpha}}+\frac{@W^{\alpha}}{@t^{\alpha}}\right]=0; \tag{47}$$

$$a\left[l_E^{\alpha}\frac{@W_E^{\alpha}}{@¿^{\alpha}}+l_P^{\alpha}\frac{@W_P^{\alpha}}{@¿^{\alpha}}\right]+a^{\alpha}\left[l_E\frac{@W_E}{@¿^{\alpha}}+l_P\frac{@W_P}{@¿^{\alpha}}\right]+aa^{\alpha}\left[\frac{@W}{@¿^{\alpha}}+\frac{@W^{\alpha}}{@¿^{\alpha}}\right]=0: \tag{48}$$

Substituting partial derivatives into (45) and (46), we obtain:

$$\begin{aligned}
&a^{\alpha}\Big[-l_Es_EH\big[(1-\mu)^{-}Y_p(\pm-1)+\mu^{-\alpha}Y_p^{\alpha}\pm\big]+l_PY(\pm-1)\Big]\\
&+a\Big[-l_E^{\alpha}s_E^{\alpha}H^{\alpha}\big[(1-\mu^{\alpha})^{-\alpha}Y_p^{\alpha}\pm+\mu^{\alpha-}Y_p(\pm-1)\big]+l_P^{\alpha}Y^{\alpha}\pm\Big]\\
&+aa^{\alpha}\Big[Y(\pm-1)+tY_p(\pm-1)+Y+¿\big[D_q\pm-Y_p(1-\pm)\big]-D\pm\\
&-H\big[(1-\mu)^{-}Y_p(\pm-1)+\mu^{-\alpha}Y_p^{\alpha}\pm\big]\\
&+Y^{\alpha}\pm+t^{\alpha}Y_p^{\alpha}\pm+¿^{\alpha}\pm(D_q^{\alpha}-Y_p^{\alpha})-D^{\alpha}\pm\\
&-H^{\alpha}\big[(1-\mu^{\alpha})^{-\alpha}Y_p^{\alpha}\pm+\mu^{\alpha-}Y_p(\pm-1)\big]\Big]=0;
\end{aligned} \tag{49}$$

and

$$\begin{aligned}
&a^{\alpha}\Big[-l_Es_EH\big[(1-\mu)^{-}Y_p(1-Á)-\mu^{-\alpha}Y_p^{\alpha}Á\big]+l_PY(1-Á)\Big]\\
&+a\Big[-l_E^{\alpha}s_E^{\alpha}H^{\alpha}\big[-(1-\mu^{\alpha})^{-\alpha}Y_p^{\alpha}Á+\mu^{\alpha-}Y_p(1-Á)\big]-l_P^{\alpha}Y^{\alpha}Á\Big]\\
&+aa^{\alpha}\big[fY(1-Á)+¿(1-Á)(D_q-Y_p)+D-Y+tY_p(1-Á)-D(1-Á)\\
&-H\big[(1-\mu)^{-}Y_p(1-Á)-\mu^{-\alpha}Y_p^{\alpha}Á\big]\\
&-Y^{\alpha}Á-¿^{\alpha}Á(D_q^{\alpha}-Y_p^{\alpha})-t^{\alpha}Y_p^{\alpha}Á+D^{\alpha}Á\\
&-H^{\alpha}\big[-(1-\mu^{\alpha})^{-\alpha}Y_p^{\alpha}Á+\mu^{\alpha-}Y_p(1-Á)\big]\big]=0:
\end{aligned} \tag{50}$$

Two symmetric expressions hold for the foreign country.

Notice that the equations (39) and (40) (and the corresponding equations for the foreign country) are linearly dependent. To obtain unique solutions, in our analysis we focus on the case of two symmetric countries.

The …rst-best policies, represented by equations (35) and (36), are derived by solving the …rst-order conditions for the case of cooperation, after setting $l_E = l_E^¤ = l_P = l_P^¤ = 0$:

In Section 3.1, we derive the equilibrium policies when both trade and environmental policies are available. We use equations (43) and (44) (and the corresponding conditions for the foreign country) in the case of non-cooperation, and (49) (50) (and the corresponding equations for the foreign country) in the case of cooperation.

The case of a free trade regime is considered in Section 3.2. We set $¿ = ¿^¤ = 0$ and use (43) and (49) (and the corresponding equations for the foreign country) to solve for the politically optimal unilateral and cooperative environmental taxes.

Finally, in the case in which trade policy is the only instrument (Section 3.3), unilateral and cooperative equilibrium tari¤s are found by setting $t = t^¤ = 0$ and solving equations (44) and (50) (and the corresponding equations for the foreign country).

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