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International Environmental Policies and Environmental Lobbying in the Presence of an Eco-industry

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Abstract

This paper analyses the political economy of environmental policies in the presence of an eco-industry pressure group. Previous studies have dealt with two types of lobbies: capitalists and environmentalists. We introduce a third pressure group representing the eco-industry sector.

Next, we assume an open economy. In two countries, two polluting sectors are subject to an environmental policy. Therefore, an eco-industry sector which supplies pollution abatement goods and services arises. Abatement goods and services are assumed to be internationally traded, creating the only industrial interaction between both countries. The pollution affects consumers in both countries.

The impact of lobbying activities on the politically optimal environmental policy is ambiguous and depends on the relative concentration of each pressure group.

Keywords: political economy, eco-industry, pollution abatement subsidies

JEL classification: F12, H23, Q58

1. Introduction

This work tries to answer the question by exploring the collective choice facet of environmental policymaking. We model the environmental regulatory choice as one in which interest groups vie with one another through a political process to determine the extent of environmental policies. As already assumed in the literature, the government pursues its own goals, seeking a mixture of political contribution and social welfare¹. Previous studies have dealt with two types of lobbies: capitalists and environmentalists. We introduce a third pressure group representing the eco-industry sector. Under this type of economy, the incumbent government maximizes its chances of being re-elected. Its objective functions include social welfare as well as political contributions. The introduction of the eco-industry lobby introduces a new political contribution and modifies the incentives of the traditional lobbies. Furthermore, we un-

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¹ See Aidt (1998), Conconi (2003), Aidt (2005).

derline the conditions under which environmentalists and eco-industries can become political allies. We also explain that, considering the overall profit of a vertical structure, an industrial lobby group can be favourable to a more stringent environmental policy.

Our work is based on two strands of the literature. First, it refers to the existing normative literature on eco-industries. This literature explains how the market powers of these firms modify the optimal environmental policy that should be chosen by a benevolent regulator². The eco-industry sector is modeled as competing a la Cournot, the last two papers adding imperfect competition among polluting firms as well. Imperfect competition among eco-industries tends to push-up the optimal second-best pollution abatement subsidy. As the price of environmental goods and services is fixed above marginal cost, it is in the interest of the regulator to increase the subsidy above the traditional pigouvian subsidy so as to give enough incentives for abatement activities. This impact should be balanced with the negative incentives that imperfect competition of polluting firms induces on the optimal pollution abatement subsidy.

We also refer to the political economy of environmental policies. This literature mainly applies instruments that have been used in the political economy of trade policies by Grossman & Helpman (1994). An incumbent government maximizes its chances of being reelected. In this context, her objective function encompasses both social welfare and political contributions. Political contributions are proposed by lobby groups in a two-stage game. Lobby groups move first and simultaneously offer the government 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 sector as given, the government moves second and implements the politically optimal pollution tax. This standard game has first been applied to environmental policies by Fredriksson (1997) and Aidt (1998). The first paper discusses politically optimal policies depending on lobby group membership and the relative importance of lobbying activities. It also introduces pollution abatement subsidies and shows that total pollution may be increasing, due to altered influence of the lobby groups in the political equilibrium. The second paper derives the characteristics of endogenous optimal environmental policy and shows that lobbying activities can be a source of internalization of economic externalities. More recently, in an open economy context, Conconi (2003) and Aidt (2005) have discussed cases where environmentalists are prone to a decrease in environmental taxation. Pollution leakages in the first analysis and a direct inter-

² See Canton (2008), David & Sinclair-Desgagne(2010).

est in foreign pollution in the second one explain these unintuitive results. One of the aims of this paper is to comfort those results with a different approach and thus new interpretations.

Next, we assume an open economy. In two countries, two polluting sectors are subject to an environmental policy. Therefore, an eco-industry sector which supplies pollution abatement goods and services arises. Abatement goods and services are assumed to be internationally traded, creating the only industrial interaction between both countries. The pollution affects consumers in both countries; we analyse both cases.

Our main findings can be summarized as follows. First, eco-industries lobby in favour of more stringent environmental policies, except if the impact of foreign competition more than compensates the turnover increase induced by a tighter environmental policy. Polluting firms always lobby against tighter environmental policies. However, an industrial pressure group, representing the industry as a whole and considering upstream and downstream profits, can sometimes be favourable to an increase in the environmental policy, as it leads to increased profits. We also show that an environmental pressure group can ask for a decrease in the environmental policy at home to decrease pollution abroad. This result does not rely on interactions between countries within the polluting sector. Interaction within the eco-industry sector is a sufficient condition for demonstrating that environmentalists can be favourable to a decrease in the local environmental policy. The impact of lobbying activities on the politically optimal environmental policy is ambiguous and depends on the relative concentration of each pressure group.

The rest of the paper proceeds as follows. Section 2 presents the economic model. Section 3 examines the political model and comparative statics in order to precise the incentives of each lobby group. Section 4 gives the politically optimal pollution abatement subsidy and discusses the impact of a change in the number of people in each lobby group. Section 5 considers the comparative statics. Section 6 sums up our work.

2. The economic model

Consider a representative polluting firm, producing an output $x_i (i = 1, 2)$ and a certain level of pollution $e_i(x_i, a_{di})$. Net pollution is positively correlated to production and negatively affected by abatement activities a_{di} , purchased to an international eco-industry. Polluting firms purchase environmental goods and services as they are subject to an environmental taxation. The governments of each country

subsidize polluting firms for pollution abatement activity. The environmental market is composed of two firms, one based in each country selling indifferently environmental goods and services to firms in both countries. We are only interested in the political decision in country one, so we assume for now that the other environmental policy is kept constant. Profits of the polluting firm can be written as follows:

$$\max_{x_i, a_{di}} \Pi_i = Px_i - c_i(x_i) - pa_{di} - t_i e_i(x_i, a_{di}) + s_i a_{di} \quad (1)$$

where P is the price taken by the representative firm, $c_i(x_i)$ the production cost function twice differentiable and increasing and convex, p the price of environmental inputs, a_{di} necessary to abate pollution. t_i is the level of environmental taxation, s_i the level of pollution abatement subsidy and $e_i(x_i, a_{di})$ the emission function. $t_i e_i$ is tax expenditure, and $s_i a_{di}$ subsidy revenue. We suppose that production function is $c_i(x_i) = cx_i$. The emission function is assumed continuous and twice differentiable. Partial derivatives have the following signs: $e_{ix_i}(x_i, a_{di}) > 0$ (more production entails more pollution), $e_{ia_{di}}(x_i, a_{di}) < 0$ (more abatement decreases total emissions), $e_{ix_i x_i}(x_i, a_{di}) < 0$ (emissions from the last unit produced increase with the production level), and $e_{ia_{di} a_{di}}(x_i, a_{di}) > 0$ (abatement is subject to diseconomies of scale). Abatement decisions are additively separable to production decisions, which yields $e_{ix_i a_{di}}(x_i, a_{di}) = 0$.

We suppose that the emission function is

$$e_i(x_i, a_{di}) = \varepsilon_i(x_i) - w_i(a_{di}), \quad (2)$$

where $\varepsilon_i(x_i) = x_i^2/2$, $w_i(a_{di}) = a_{di} - a_{di}^2/2$.

From the first order conditions of profit maximization, we get the inverse demand in environmental goods and services

$$x_i = (P - c)/t_i, \quad (3)$$

$$a_{di} = (-p + t_i + s_i)/t_i. \quad (4)$$

The overall demand is

$$A = a_{d1}(p, t_1, s_1) + a_{d2}(p, t_2, s_2) = -p(t_1 + t_2) + 2t_1 t_2 + s_1 t_2 + s_2 t_1 / t_1 t_2.$$

The overall inverse demand can be written as follows

$$p = t_1 t_2 (2 - A) + s_1 t_2 + s_2 t_1 / (t_1 + t_2). \quad (5)$$

The price of environmental inputs is decreasing in A . An increase in the local tax increases both the overall demand and the price of environmental goods and services.

The profit function of the local eco-industry is:

$$\max_{a_{si}} \Pi_i^{up} = p(A, t_1, t_2, s_1, s_2) a_{si} - c_{ui}(a_{si}) \quad (6)$$

where A is the world production, a_{si} local production, and $c_{ui}(a_{si}) = c_{ui} a_{si}$ the cost function, twice differentiable, increasing and convex. The first order condition of profit maximization is

$$a_{si} = \left[2t_1 t_2 + s_1 t_2 + s_2 t_1 + (t_1 + t_2)(c_{uj} - 2c_{ui}) \right] / 3t_1 t_2 \quad (i, j = 1, 2; i \neq j). \quad (7)$$

3. The political model

The political game is a two-stage game where lobby groups are the principals and the government the only agent. It has been extensively used in the literature following the contribution of Grossman & Helpman (1994). The objective of the incumbent government is to be reelected. Therefore, it is going to maximize a weighted function of national welfare and lobbies contributions. The existence of a solution to this two-stage game has been proved by Bernheim & Winston (1986) in a discrete case and extended by Grossman & Helpman (1994) and Fredriksson (1997) among others to continuous functions.

All citizens have the same preferences with respect to goods. The utility function of consumer is

$$u_i = u_i(x_i). \quad (8)$$

From (12), we get the following demand function:

$$u_i'(x_i) = P_i(x_i). \quad (9)$$

From (12) and (13), consumer's surplus is

$$CS_1 = \int_0^{x_1} P_1(u) du - P_1 x_1. \quad (10)$$

The welfare of this economy is

$$W_1 = CS_1 + t_1 e_1 - s_1 a_{d1} + \Pi_1 + \Pi_1^{up} - D_1^E \quad (11)$$

where CS_1 is consumers' surplus, $t_1 e_1$ tax revenues, $s_1 a_{d1}$ subsidy expenditure, and $D_1^E = \nu e_1 + \gamma e_2$ damage function in country 1. The marginal damage of pollution in country 1 is assumed strictly positive and constant and equal to ν . γ is the disutility incurred to environmentalists by each unit of pollution abroad. In a traditional normative approach, the government would choose her pollution abatement subsidies by maximizing that function. In our approach, however, her choice will deviate from the social welfare maximization policy if lobby groups offer positive contributions. Let $M^k(s_1)$ be the contribution of lobby group k if the policy chosen is s_1 . The payoff function of the government becomes:

$$v^g = \lambda W_1(s_1) + \sum_k M^k(s_1) \quad k = us, es, E \quad (12)$$

where λ is the political weight given to the economy's welfare. We allow for three lobby groups. We do not consider the way these lobby groups form and overpass the free-riding problem (see Olson (1965) for a discussion on the logic of collective action).

We assume that lobby groups are functionally specialised. They only care about one particular aspect of an issue, namely pollution for environmentalists (who are also consumers) and profits for capitalists (who are also consumers and suffer from pollution).

3.1 The payoff function of polluting firms

α_{us} of the share-holders of the polluting industry decide to form a lobby. In order to check which kind of environmental taxation they support, we study the way a change in the environmental policy affects the payoff functions of the polluters lobby. As lobbies are assumed functionally specified, the polluting industry lobby group is only concerned by the impact of the pollution abatement subsidization on profits

$$v^{us} = \alpha_{us} \Pi_1 \quad (13)$$

The net payoff function of industry lobby group is

$$V^{us} = v^{us} - M^{us}. \quad (14)$$

The lobby supports a change in the environmental policy that can ensure an increase in profits. These profits vary according to the subsidy rate. Using first order conditions of welfare maximization, the first order condition of the net payoff function of polluter's lobby group is

$$\frac{\partial V^{us}}{\partial s_1} = \frac{\partial v^{us}}{\partial s_1} - \frac{\partial M^{us}}{\partial s_1} = \alpha^{us} \frac{\partial \Pi_1}{\partial s_1} - \frac{\partial M^{us}}{\partial s_1} = 0 \quad (15)$$

3.2 The payoff function of eco-industry

α_{es} of the eco-industries' share-holders are assumed to form a new lobby group. Let us study what the incentives are for the eco-industry sector with regard to the impact of a subsidy on its profits.

The payoff function of eco-industry lobby group is

$$v^{es} = \alpha_{es} \Pi_1^{up} \quad (16)$$

The net payoff function of eco-industry lobby group is

$$V^{es} = v^{es} - M^{es} \quad (17)$$

Using first order conditions of welfare maximization, the first order condition of the net payoff function of eco-industry lobby group is

$$\frac{\partial V^{es}}{\partial s_1} = \frac{\partial v^{es}}{\partial s_1} - \frac{\partial M^{es}}{\partial s_1} = \alpha_{es} \frac{\partial \Pi_1^{up}}{\partial s_1} - \frac{\partial M^{es}}{\partial s_1} = 0 \quad (18)$$

3.3 The payoff function of environmentalists

Some of the environmentalists create a lobby group. They represent a fraction of the α_E of environmentalists in this economy. The menu auctions of the environmentalists depend on the impact of a change in the tax on pollution, including pollution abroad. Their gross payoff function is:

$$v^E = B - \alpha_E D_1^E = \bar{B} \alpha_E - \alpha_E (v e_1 + \gamma e_2) \quad (19)$$

where B is budget of environmental lobby group and $\bar{B} \geq D_1^E + M^E / \alpha_E$.

The net payoff function of environmental lobby group is

$$V^E = v^E - M^E \quad (20)$$

Using first order conditions of welfare maximization, the first order condition of the net payoff function of environmental lobby group is

$$\frac{\partial V^E}{\partial s_1} = \frac{\partial v^E}{\partial s_1} - \frac{\partial M^E}{\partial s_1} = -\alpha_E \frac{\partial D_1^E}{\partial s_1} - \frac{\partial M^E}{\partial s_1} = 0 \quad (21)$$

4. The politically optimal environmental policy

We can now present the impacts of these lobby activities on the policy chosen by

the regulator. As already recalled, the incumbent government maximizes her own political payoff function, namely:

$$v^g = \lambda W_1(s_1) + \sum_k M^k(s_1) \quad k = us, es, E \quad (22)$$

If the government was benevolent, she would maximize welfare following next condition:

$$\frac{\partial W_1}{\partial s_1} = 0 \quad (23)$$

$$s_1^{so} = \frac{4ts_2 + 5t(c_{u1} + c_{u2}) + 2t(c_{u2} - 2c_{u1}) + 4V \quad t - s_2 + c_{u1} + c_{u2} + \gamma \quad t - 4s_2 + c_{u1} + c_{u2}}{-33t + 16V + \gamma} \quad (24)$$

From (24), we get the following

$$\partial W_1 / \partial s_1 \stackrel{<}{>} 0 \text{ if and only if } s_1 \stackrel{>}{<} s_1^{so} .$$

The trade-off that faces a benevolent regulator in the presence of eco-industries have already been discussed extensively (David & Sinclair-Desgagne 2005, Canton et al. 2005, Nimubona & Sinclair-Desgagne 2005). We do not linger over the issue. Now, the social optimal policy is balanced according to the auctions menu proposed by lobby groups. So the government maximizes her own payoff function:

$$\frac{\partial v^g}{\partial s_1} = \lambda \frac{\partial W_1}{\partial s_1} + \frac{\partial M^{us}}{\partial s_1} + \frac{\partial M^{es}}{\partial s_1} + \frac{\partial M^E}{\partial s_1} = \lambda \frac{\partial W_1}{\partial s_1} + \alpha^{us} \frac{\partial \Pi_1}{\partial s_1} + \alpha^{es} \frac{\partial \Pi_1^{up}}{\partial s_1} - \alpha^E \frac{\partial D_1^E}{\partial s_1} = 0 \quad (25)$$

$$s_1^{PO} = \frac{I + (\lambda + \alpha_{us})J + (\lambda + \alpha_{es})K + (\lambda + \alpha_E)(LV + M\gamma)}{C + (\lambda + \alpha_{us})E + (\lambda + \alpha_{es})F + (\lambda + \alpha_E)(G\gamma + H\gamma)} \quad (26)$$

where $t = t_1 = t_2$,

$$C = 200\lambda t^2 - 36\lambda t, \quad E = 128t^2, \quad F = 8t^2, \quad G = -128t, \quad H = -8,$$

$$I = -8\lambda t^2 s_2 + 80\lambda t^3 + 8\lambda t^2(c_{u1} + c_{u2}), \quad J = -32t^2 s_2 - 8t \quad 8t^2 - 4t(c_{u1} + c_{u2}),$$

$$K = -8t^2 s_2 - 8t \quad 2t^2 + 2t(c_{u2} - 2c_{u1}), \quad L = 32ts_2 - 32t^2 - 32t(c_{u1} + c_{u2}),$$

$$M = 32s_2 - 8t - 8(c_{u1} + c_{u2}).$$

The net impact on the subsidy depends on the relative size of each lobby group and on the relative impact of a change in the environmental policy on their payoff function. In most cases, polluting firms, environmentalists and eco-industries will push in the same direction (toward higher pollution abatement subsidies). When three pressure groups lobby toward higher pollution abatement subsidization, the politically optimal subsidy will exceed the socially optimal one.

5. Comparative statics

We proceed to comparative statics. A rise of membership in the polluter's lobby group will have the following impact on the politically optimal pollution abatement subsidy

$$\frac{\partial s_1^{PO}}{\partial \alpha_{us}} = \frac{J}{C + (\lambda + \alpha_{us})E + (\lambda + \alpha_{es})F + (\lambda + \alpha_E)(G\nu + H\gamma)} - \frac{E}{C + (\lambda + \alpha_{us})E + (\lambda + \alpha_{es})F + (\lambda + \alpha_E)(G\nu + H\gamma)^2} \cdot \frac{I + (\lambda + \alpha_{us})J + (\lambda + \alpha_{es})K + (\lambda + \alpha_E)(L\nu + M\gamma)}{C + (\lambda + \alpha_{us})E + (\lambda + \alpha_{es})F + (\lambda + \alpha_E)(G\nu + H\gamma)^2}. \quad (27)$$

From (27), we get the following

$$\frac{\partial s_1^{PO}}{\partial \alpha_{us}} > < 0 \text{ if and only if } \frac{J}{E} > < \frac{I + (\lambda + \alpha_{us})J + (\lambda + \alpha_{es})K + (\lambda + \alpha_E)(L\nu + M\gamma)}{C + (\lambda + \alpha_{us})E + (\lambda + \alpha_{es})F + (\lambda + \alpha_E)(G\nu + H\gamma)^2}.$$

A rise of membership in the eco-industry lobby group will have the following impact on the politically optimal pollution abatement subsidization

$$\frac{\partial s_1^{PO}}{\partial \alpha_{es}} = \frac{K}{C + (\lambda + \alpha_{us})E + (\lambda + \alpha_{es})F + (\lambda + \alpha_E)(G\nu + H\gamma)} - \frac{F}{C + (\lambda + \alpha_{us})E + (\lambda + \alpha_{es})F + (\lambda + \alpha_E)(G\nu + H\gamma)^2} \cdot \frac{I + (\lambda + \alpha_{us})J + (\lambda + \alpha_{es})K + (\lambda + \alpha_E)(L\nu + M\gamma)}{C + (\lambda + \alpha_{us})E + (\lambda + \alpha_{es})F + (\lambda + \alpha_E)(G\nu + H\gamma)^2}. \quad (28)$$

From (28), we get the following

$$\frac{\partial s_1^{PO}}{\partial \alpha_{es}} > < 0 \text{ if and only if } \frac{K}{F} > < \frac{I + (\lambda + \alpha_{us})J + (\lambda + \alpha_{es})K + (\lambda + \alpha_E)(L\nu + M\gamma)}{C + (\lambda + \alpha_{us})E + (\lambda + \alpha_{es})F + (\lambda + \alpha_E)(G\nu + H\gamma)^2}.$$

A rise of membership in the environmentalists lobby group will have the following impact on the politically optimal environmental taxation

$$\frac{\partial s_1^{PO}}{\partial \alpha_E} = \frac{(L\nu + M\gamma)}{C + (\lambda + \alpha_{us})E + (\lambda + \alpha_{es})F + (\lambda + \alpha_E)(G\nu + H\gamma)} - \frac{(G\nu + H\gamma)}{C + (\lambda + \alpha_{us})E + (\lambda + \alpha_{es})F + (\lambda + \alpha_E)(G\nu + H\gamma)^2} \cdot \frac{I + (\lambda + \alpha_{us})J + (\lambda + \alpha_{es})K + (\lambda + \alpha_E)(L\nu + M\gamma)}{C + (\lambda + \alpha_{us})E + (\lambda + \alpha_{es})F + (\lambda + \alpha_E)(G\nu + H\gamma)^2}. \quad (29)$$

From (29), we get the following

$$\frac{\partial s_1^{PO}}{\partial \alpha_E} > < 0 \text{ if and only if } \frac{(L\nu + M\gamma)}{(G\nu + H\gamma)} > < \frac{I + (\lambda + \alpha_{us})J + (\lambda + \alpha_{es})K + (\lambda + \alpha_E)(L\nu + M\gamma)}{C + (\lambda + \alpha_{us})E + (\lambda + \alpha_{es})F + (\lambda + \alpha_E)(G\nu + H\gamma)^2}.$$

We present the results in the case of symmetric countries.

Proposition 1

A rise of polluter's lobby group membership increases the politically optimal subsidization if (i) s_2 is high and (ii) c_{u1} and c_{u2} are low.

Proposition 2

A rise of eco-industry lobby group membership increases the politically optimal subsidization if (i) s_2 is high and (ii) c_{u2} is higher than c_{u1} .

Proposition 3

A rise of environmental lobby group membership increases the politically optimal subsidization if (i) s_2 is high and (ii) c_{u2} is higher than c_{u1} .

As pollution abatement subsidization increases, more abatement efforts have to be implemented. Local demand is switched upward and the price of abatement activities increases. So, demand abroad is reduced, leading to an additional increase in the price of environmental inputs. It has a negative impact on domestic profits.

When the home country changes its pollution abatement subsidies, it increases local demand for environmental goods and services. Thus, it changes the price of environmental goods. It has a negative impact on foreign consumption. However, the overall demand increases. The impact on the production patterns of both firms depends on their relative cost functions. It happens when firms are asymmetric enough and concerns the low cost firm. If firms are relatively symmetric, both productions are going to increase with an increase in the subsidy. When they are asymmetric enough, the production of the low-cost firm can decrease, which leads to a decrease in profits. It is only in that case that the eco-industry would be favorable to a decrease in the pollution abatement subsidy. It should only be considered as a special case as conditions on cost functions are quite restrictive.

6. Conclusion

This paper analyses the political economy of environmental policies in the presence of an eco-industry pressure group. We assume an open economy. In two countries, two polluting sectors are subject to an environmental policy. Therefore, an eco-industry sector which supplies pollution abatement goods and services arises. Abatement goods and services are assumed to be internationally traded, creating the only industrial interaction between both countries. The pollution affects consumers in both countries; we analyse both cases.

Our main findings can be summarized as follows. First, eco-industries lobby in favour of more stringent environmental policies, except if the impact of foreign competition more than compensates the turnover increase induced by a tighter environmental policy. We also show that an environmental pressure group can ask for a decrease in the environmental policy at home to decrease pollution abroad. The impact of lobbying activities on the politically optimal environmental policy is ambiguous and depends on the relative concentration of each pressure group.

This work can be improved in many ways. First, the political game and the opportunity of coalitions among the different stakeholders should be considered. More work is also needed to understand the interactions between the eco-industry sector and the polluting one.

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