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## Cross-Country Policy Harmonization with Rent-Seeking

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# Cross-Country Policy Harmonization with Rent-Seeking\*

Patrik T. Hultberg and Edward B. Barbier

## Abstract

In a reciprocal market model with imperfectly competitive firms, domestic policies will differ across countries that are economically and politically diverse. We explore the implications of this standard result with regard to harmonization of environmental policies between corrupt and non-corrupt countries. Imposing a more stringent policy on a non-corrupt government will be welfare reducing to the 'receiving' country, but may be welfare enhancing for the 'imposing' country. However, where environmental standards are under the control of a corrupt government, it is possible that harmonization is welfare enhancing to both countries.

**KEYWORDS:** corruption, environmental policy, rent-seeking, reciprocal market model, harmonization

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As the volume of international trade increases, more concern is expressed regarding cross-country policy harmonization. In the trade literature this is generally defined as making the regulatory requirements or government policies of different jurisdictions identical or at least more similar (Leebron, 1996). Although there are numerous rationalizations for harmonization calls, the two most prominent are charges of “unfair trade” and fears of a “race to the bottom” (see Bhagwati, 1996). Allegations of unfair trade advantages, traditionally limited to subsidies and dumping, are now being extended to include international differences in environmental and labor standards. The “race to the bottom” fear takes this argument a step further by predicting that countries will “harmonize” downward to the lowest standards as they compete for trade and investment (Esty, 1999). The primary motivation for rich countries to join in such an environmental “race to the bottom” would be to counteract any “pollution haven” effect. As outlined by Copeland and Taylor (2003, p. 15), “according to the pollution haven hypothesis ... high-income countries have relatively stringent pollution policy and this shifts dirty good production to poor countries via international trade.”

In contrast, environmentalists contend that the pollution haven effect and any race to the bottom could be avoided through deliberate policies for the “greening of trade” and the “upward harmonization” of environmental regulation across countries at the stringent policy levels set by richer countries (Arden-Clarke, 1991). Today the linking of trade negotiations to environmental policy harmonization objectives is increasingly influencing actual trade negotiations between countries. One such example is the North American Free Trade Agreement (NAFTA) with its side agreement, the North American Agreement on Environmental Cooperation (NAAEC). Although the NAAEC stops short of advocating complete harmonization of environmental policy between Canada, Mexico and the United States, the agreement does promote upward convergence of environmental regulations in Mexico to US and Canadian levels.<sup>1</sup>

Such efforts to combine environmental policy harmonization with international trade agreements suggest two interesting issues that have not been fully explored by the economics literature. First, what is the likely outcome of one trading partner imposing higher policy standards on the other as a condition for greater trade cooperation? And, second, what are the circumstances under which this sub-optimal global strategy can nevertheless lead to potential welfare gains for both countries?

The purpose of our paper is to address these issues by exploring the effects of harmonization of domestic policies on two imperfectly competitive trading nations following economic integration. We do this through a two-country, two-firm reciprocal market model incorporating strategic environmental policy that is solved through a three-stage game. First, we employ the model to demonstrate explicitly why domestic policies should differ across countries. Thus, if one country is characterized by low

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<sup>1</sup> The NAAEC was clearly established in response to special interest groups (environmentalists, labor groups and industrialists) and reflect the fears of “unfair trade” and “eco-dumping” arising from the NAFTA agreement. For example, the Canadian NAAEC office states that the NAAEC establishes “a level playing field with a view to avoiding trade distortions and promoting environmental cooperation” (NAAEC).

absorption capabilities or social preferences that favor a clean environment, it will be better off with stringent environmental standards (high emission taxes), whereas its trading partner should choose less stringent policies, and perhaps even subsidies, if the country has a higher absorption capacity or greater tolerance for environmental damage. This result implies that when an open economy raises its pollution taxes to “harmonize” with the regulations imposed by its trading partner, the economy will be worse off, while its foreign rival could be better off.<sup>2</sup> This is particularly the case if the two trading nations differ in their level of development. If a less-developed nation is able and willing to accept relatively high levels of pollution but is forced to impose stringent environmental policies approximating their more wealthy trading partners, perhaps due to a relatively weak bargaining position, then the poorer country is locked into an inefficient outcome while the richer country may actually gain at the expense of the poorer nation. Despite this, it may be beneficial for such a poor nation to sign a bilateral trade agreement that requires environmental policy harmonization, if access to export markets in the wealthy country compensate for the inefficiency of harmonization. However, in this case the gains from trade to the less-developed nation are less than under its optimal policy choice.

When we include rent-seeking behavior in our two-country model, we observe that environmental regulations are likely to be less strict in more corrupt societies as predicted in the literature (Damania *et al.*, 2000, López and Mitra, 2000). We also show that if one country’s adopted environmental policy is inefficient due to rent-seeking activities, then it is possible that a higher environmental standard imposed by its trading partner could raise efficiency (in a second-best sense). Under such circumstances, externally imposed pollution policy harmonization may actually enhance efficiency.

Finally, it is important to note from the outset that our approach to the environmental policy harmonization problem differs from the existing economics literature in two important respects.

First, the focus of most studies is on whether or not environmental policy harmonization is an optimal strategy (Kanbur *et al.* 1995; Ulph 1997 and 2000), including under the presence of special interest lobbying (Damania and Fredriksson 2003; Ulph 1998; Johal and Ulph (2002)). In contrast, our objective is not to derive “optimal” harmonization rules between trading partners, but rather to illustrate a different yet realistic scenario, in which one trading partner that has adopted unilaterally a more stringent policy seeks to impose this policy on the other trading partner as a condition for entering into a trading agreement with the latter country.<sup>3</sup> We believe that such a scenario is likely to occur more frequently with the advent of additional trading

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<sup>2</sup> These welfare effects are important despite the fact that a first-best solution would involve a supranational organization that mitigates the inherent prisoner’s dilemma problem.

<sup>3</sup> A realistic proposition since the domestic firm’s profit is increasing in the stringency of the rival country’s environmental policy choice (see e.g. Ulph, 2000). In addition, Johal and Ulph (2002) show that if environmentalists are allowed to lobby either the domestic or the foreign government to achieve higher environmental standards, they will in fact lobby the other country more intensively. The reason is, again, that domestic profits are directly related to foreign policy stringency. Our paper will explicitly model the profit-shifting effect, but not the foreign lobbying.

and economic integration agreements globally that require stricter environmental and other policy harmonization as a condition for extending the agreements to additional regional participants. This trend has been part of international economic policy since the US administration made a formal commitment to discuss environmental issues together with trade negotiations under NAFTA, which established that trade and environmental goals must be pursued in tandem (Esty 1999). Since the relationship between trade and harmonization of domestic policies is both most manifest and compelling in the area of environmental policy, we frame our discussion of policy harmonization in terms of the choice of domestic regulation of environmental quality.

Second, although our findings concur with the existing literature that allowing for special interest group politics does not, in general, justify calls for complete harmonization (Ulph, 1998, Johal and Ulph, 2002), our novel insight is that harmonization (though not first-best) may be beneficial when one trading partner is susceptible to domestic lobbying pressure. For example, Johal and Ulph (2002) report that for a variety of potential asymmetries in both information and lobbying, international cooperation is always preferable over non-cooperation, but such international cooperation does not generally involve complete policy harmonization.<sup>4</sup> However, our study differs from that of Johal and Ulph in some important respects. In addition to the fact that Johal and Ulph focus on the optimal policy of a supranational agency and we do not, their paper incorporates implicitly a prisoner's dilemma framework and interprets the "democratic deficit" problem to mean that the lack of lobbying is detrimental to the democratic process. In contrast, we avoid explicitly solving for the well-known prisoner's dilemma problem that faces countries in a model of "environmental dumping". Also, we view lobbying and rent-seeking activity to be hurtful to the democratic process, as it distorts the government's net benefits function. For example, whereas we argue that industrialists benefit from rent-seeking activity, Johal and Ulph find that industrialists are worse off from having more political influence.<sup>5</sup> Damania and Fredriksson (2003) argue, as we do, that industries have an incentive to lobby for laxer environmental policy. Damania and Fredriksson endogenize this domestic lobbying activity and show that under some circumstances trade liberalization may actually raise pollution taxes in the home country.<sup>6</sup> Our result is in

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<sup>4</sup> Although Johal and Ulph (2002) is related to our study, the main focus is the lobbying asymmetries that may exist when environmental policy is set at either the national or the supranational level.

<sup>5</sup> The intuition is that when two countries face incentives to lower their environmental policy stringency, the effect is that the environment suffers and output levels are greater than the monopoly outcome. In the third market model, this reduces welfare, since both environmental damage increases and firm profits decrease. Since firm lobbying exaggerates this problem, such lobbying is harmful even for the firm. In our model countries and firms cannot avoid this prisoner's dilemma problem without international cooperation (which we do not allow). Also, in our reciprocal market model, an increase in consumer surplus would mitigate these adverse effects.

<sup>6</sup> Damania and Fredriksson (2003) have a domestic duopoly where each firm wants to free ride on the other firm's lobbying, which therefore requires some (tacit) collusion to make lobbying sustainable. They then show that trade liberalization, by increasing competition, reduces the degree of collusion and therefore may raise pollution taxes. Their policy conclusion is that when foreign and domestic goods are close substitutes trade liberalization is likely to increase the stringency of environmental policy. Although

essence the flip side of their outcome: imposing harmonization on a corrupt country with lax environmental policies, especially when accompanied by tariff reduction, may in fact be beneficial.

The next section introduces the two-country, two-firm model and discusses the determination of unilateral strategic environmental policy in the two countries. Section 2 examines the effects of environmental policy harmonization, when the two trading nations are not influenced by corruption. Section 3 extends this analysis to the case where rent-seeking behavior by a firm located in one country is allowed. The final section discusses the policy implications of our analysis and the emerging conclusions.

## 1. The Reciprocal Market Model

We consider a two-country ( $j=A,B$ ), two-firm ( $i=1,2$ ) model comprising of a three-stage game in which a firm chooses the level of contribution (bribe) in the initial stage in order to affect its government's choice of domestic (environmental) policy in the second stage. Given this choice of policy, the two rival firms compete by setting their optimal quantities in the third stage. Firm 1 is located in market A and firm 2 is located in market B, but both firms sell a homogeneous good in both markets. We choose this reciprocal market model in order to include the effects on consumers in our welfare discussions. For the same reason similar models are used by Batabyal (1996, 1998) and Motta and Thisse (1994).<sup>7</sup>

This three-stage reciprocal market model is solved through backward induction. In the third stage of the game, each firm chooses the quantities sold in countries A and B in order to maximize its respective profit function. The two firms' behavior is modeled as a Cournot duopoly where the two firms choose aggregate output levels  $q^1$  and  $q^2$ , respectively. We assume that the firm's total cost function,  $C^i(q^i, t)$ , takes the form  $(c^i + t^{kj}) \cdot q^i$ , where  $c^i$  and  $q^i$  are the per-unit production cost and total output for firm  $i$ , respectively, and  $t^{kj}$  is any tariff rate in country  $j$  associated with international shipping from  $k$  to  $j$  (which satisfies  $t^{kj} = 0$  if  $k = j$ ). We assume that the transportation costs associated with shipping a good are either negligible or constant, and are therefore subsumed in the costs of producing  $q^i$ . In addition, the pollution abatement cost facing firm  $i$ ,  $A(q^i, e^j)$ , is assumed to take the form  $e^j \cdot (q^{iA} + q^{iB})$ , where  $e^j$  is the emissions tax/subsidy in country  $j$  and where  $q^{iA}$  and  $q^{iB}$  denote firm  $i$ 's sales in countries A and B, respectively. Given these assumptions, firm 1 and firm 2, respectively, face the following profit functions:

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Damania and Fredriksson's focus on the political process in the domestic country is quite different from our approach, it is worth noting that they also employ a three-stage game where lobbying occurs in the first stage, government sets environmental tax in the second and firms set quantities in the third stage (Cournot competition).

<sup>7</sup> Most current models of strategic environmental policy choice employs a third market model, but as noted in the text, the disadvantage of a third market model is that it cannot include any effects on domestic consumer surplus.

$$(1) \quad \pi^1 = p^A q^{1A} - c^1 q^{1A} - e^A q^{1A} + p^B q^{1B} - (c^1 + t^{AB}) q^{1B} - e^A q^{1B}$$

$$(2) \quad \pi^2 = p^A q^{2A} - (c^2 + t^{BA}) q^{2A} - e^B q^{2A} + p^B q^{2B} - c^2 q^{2B} - e^B q^{2B},$$

where  $p^j$  is the inverse demand function in country  $j$ , which we assume is given by

$$(3) \quad p^j = a - b \cdot Q^j = a - b \cdot (q^{1j} + q^{2j}).$$

This choice of a linear model allows us to explore our questions in a tractable model that follows the relevant literature's accepted framework. Note, in particular, that we consider a fixed amount of pollution per unit of output, which implies that the emissions tax is equivalent to an output tax. For firm 1, the optimization results in the following first-order conditions:  $d\pi^1/dq^{1A} = 0$  and  $d\pi^1/dq^{1B} = 0$ , and similarly for firm 2. The resulting reaction functions are solved simultaneously for each market to obtain the following optimal quantities for both firms in the two markets:<sup>8</sup>

$$(4) \quad q^{1A*} = \left(\frac{1}{3b}\right)(a - 2c^1 - 2e^A + c^2 + t^{BA} + e^B) \quad q^{2A*} = \left(\frac{1}{3b}\right)(a - 2c^2 - 2e^B - 2t^{BA} + c^1 + e^A)$$

$$q^{1B*} = \left(\frac{1}{3b}\right)(a - 2c^1 - 2e^A - 2t^{AB} + c^2 + e^B) \quad q^{2B*} = \left(\frac{1}{3b}\right)(a - 2c^2 - 2e^B + c^1 + t^{AB} + e^A).$$

These are the optimal quantities given the choice of environmental policy by each country, and assuming constant tariff rates  $t^{kj}$ . Of course, any changes in environmental or tariff policy in either country will affect the optimal quantities chosen by each firm. For example, firm 1's output in its domestic market,  $q^{1A*}$ , increases as  $t^{BA}$  and  $e^B$  increase, since both these terms makes firm 2 in country B less competitive. Similarly, an increase in  $e^A$  would make firm 1 less competitive, thus reducing its optimal quantity supplied to both the domestic and foreign markets. The partial derivatives of the above optimal quantities with respect to  $e^A$  and  $e^B$  are:

$$(5) \quad \frac{\partial q^{1j*}}{\partial e^A} = -\frac{2}{3b} < 0 \quad \frac{\partial q^{2j*}}{\partial e^A} = \frac{1}{3b} > 0$$

$$\frac{\partial q^{1j*}}{\partial e^B} = \frac{1}{3b} > 0 \quad \frac{\partial q^{2j*}}{\partial e^B} = -\frac{2}{3b} < 0 \quad j = A, B.$$

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<sup>8</sup> Thus the two outputs are strategic substitutes, so that firm  $i$ 's total and marginal revenues decrease as the other firm increases its output, which means that the reaction function is downward sloping, as in Bulow *et al.* (1985).

The government then chooses an optimal policy in the second stage of the game. The government's policy choice depends on how it weighs market outcomes relative to environmental costs. The level of rent-seeking activity by the domestic firm influences the relative importance that the government assigns to the environment. In its policy choice, the government is assumed to possess full knowledge of the industrial market structure and the two firms' behavior in response to its choice of policy. Also, the choice is assumed to be credible, but myopic in the sense that when setting its own environmental policy the government does not recognize that it might influence the other country's environmental policy. Finally, the governments cannot observe the amount of corruption or how it affects the choice of domestic policy in the rival country. These assumptions allow us to solve for the two firms' optimal outputs in both markets for any given policy in those markets, and then to determine each government's optimal domestic policy. For clarity, consider country B whose government collects revenue according to the function

$$(6) \quad GR^B(q^{2A}, q^{2B}, q^{1B}) = e^B \cdot (q^{2A} + q^{2B}) + t^{AB} \cdot q^{1B},$$

where  $e^B$  is the emissions tax imposed by country B. Further, we assume that country B sustains environmental damage given by the function

$$(7) \quad D^B(q^{2A}, q^{2B}; \gamma^B) = \gamma^B \cdot (q^{2A} + q^{2B})^2,$$

where  $\gamma^B$  is a constant. The parameter  $\gamma^j$  is important as it encompasses country  $j$ 's emission absorption capacity and/or social preferences for a clean environment.

In addition, the government may collect a bribe ( $F$ ) offered from its rent-seeking domestic firm that influences the "weight" that the government assigns to the environmental damage function. As discussed in Section 3 below, since countries are likely to differ in their degree of corruptibility the amount of contribution offered by firms in the two countries will differ. We assume that  $\alpha(F) = 1/2 + \beta \cdot F$ , where  $\beta$  denotes the degree of corruptibility of the government. Consequently, for a non-corrupt nation  $\beta=0$  and for a corrupt nation  $\beta>0$ . Assuming that the firm in country B chooses to offer a bribe to its government ( $\beta$  is sufficiently greater than zero), the government of country B solves the following optimization problem:

$$(8) \quad \underset{e^B}{\text{Max}} NB^B = \alpha(F) [\pi^2 + CS^B(q^{1A} + q^{2A}) + e^B \cdot (q^{2A} + q^{2B}) + t^{AB} \cdot q^{1B} + F] - (1 - \alpha(F)) \cdot \gamma^B \cdot (q^{2A} + q^{2B})^2$$

where  $\pi^2$  is firm 2's optimal profits,  $CS^B(\cdot)$  is the aggregate consumer surplus in country B which depends on the total amount consumed (as domestic and foreign goods are perfect substitutes). The third and fourth terms represent government revenues, generated from emissions taxes and tariffs, respectively. The third term may be positive or negative depending on whether  $e^B$  is a positive or negative emissions tax. The last

term is the environmental damage function, which as noted above depends crucially on the parameter  $\gamma^B$ . The government's decision also includes the bribe ( $F$ ) that the rent-seeking firm may offer in order to induce the domestic government to assign less weight ( $1-\alpha$ ) to the environmental damage function in its net benefits function.<sup>9</sup>

After taking the first-order condition with respect to  $e^B$ , we use the partial derivatives in (5), firm 2's first-order conditions, our chosen inverse demand function and the assumption that the effect on consumers from a change in quantity consumed is the same whether the good consumed is produced domestically or abroad. This then yields country B's optimal emissions tax:

$$(9) \quad e^{B*} = -\left(\frac{b}{4}\right) \cdot (q^{2A} + q^{2B}) - \left(\frac{1}{4}\right) \cdot CS_q^B + \left(\frac{1}{4}\right) \cdot t^{AB} + \left(\frac{(1-\alpha(F))}{\alpha(F)}\right) \cdot [2\gamma^B \cdot (q^{2A} + q^{2B})].$$

Equation (9) indicates that the optimal environmental policy for country B is determined by the total quantities sold by the domestic firm in both markets (the profit-shifting effect), the change of consumer surplus of citizens in country B ( $CS_q^B = \partial CS^B / \partial q$ ), the tariff on imports, and the perceived environmental damage sustained domestically. An important component of the latter term is the weight given by the government to the environment, which is influenced by the firm's rent-seeking behavior. Equation (9) thus shows that whether the optimal environmental policy will be a tax or a subsidy depends critically on the magnitude of  $\gamma^A$  and  $\alpha$ . These parameters are likely to differ between the two countries.

Continuing our backward induction solution, in the first stage the rent-seeking firm chooses an optimal bribe,  $F > 0$ , given the optimal output levels in stage three and given its knowledge of how a bribe affects the government's choice of "weights" and therefore the environmental policy. The incentive of the firm arises because it knows that by paying the lump-sum bribe to the government, it can raise its profit, provided that the government is willing to behave in a certain way. Naturally, the firm's profit with the bribe must be greater than without the bribe. In our model, this implies that  $\alpha$  must be sufficiently large for any given amount of bribe ( $\beta$  sufficiently greater than zero), and that the domestic firm can affect this weight by increasing the bribe. Consequently, the firm attempts to convince its government to adopt a policy that is even less stringent than implied by the profit-shifting incentive inherent in the imperfectly competitive market structure, leading to a shift of welfare toward producers and government (in the form of the bribe) at the expense of the consumers. If the government do adopt a less stringent policy than in the absence of rent-seeking activity, then the country will be worse off overall. As the bribe,  $F$ , is a lump sum, it influences

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<sup>9</sup> We assume that all firm assets are owned by households so that the firm wants the government to care about both producer and consumer surplus in addition its revenue from taxes and bribes. An alternative approach would be to have the government make the distinction instead between producer surplus and its revenue and consumer surplus and environmental damage; that is, move consumer surplus to within the  $(1-\alpha)$  term.

only the firm's optimal quantities indirectly through the environmental policy. In effect, we are assuming that the bribe changes the government's "weights," but not the environmental policy directly, i.e.  $F_{e^B} = \partial F / \partial e^B = 0$ . Knowledge of the environmental policy relationship (9) then allows us to determine the optimal bribe for the firm. That is, firm 2 maximizes its profit according to:

$$(10) \quad \text{Max}_F \pi^2 = p^A \cdot q^{2A} - (c^2 + t^{BA}) \cdot q^{2A} - e^B(F) \cdot q^{2A} + p^B \cdot q^{2B} - c^2 \cdot q^{2B} - e^B(F) \cdot q^{2B} - F.$$

The first order condition  $\partial \pi^2 / \partial F = 0$  yields:

$$(11) \quad F^* = \frac{1}{\beta} \left[ -1/2 + \sqrt{\beta 2 \gamma^B \cdot (q^{2A*} + q^{2B*})} \right].$$

At low levels of output no bribe will be offered, since the profit shifting effect would not outweigh the cost to the firm, but at higher output levels the firm will bribe the government if given the opportunity, *ceteris paribus*. The amount of the bribe also depends on how corrupt the government is and the level of environmental concern in the country. For example, if country B does not care about the environment or has a geography or climate that allows it not to care, i.e.  $\gamma^B \approx 0$ , then the weight becomes irrelevant and hence no bribe would be forthcoming. As  $\gamma^B$  increases, the firm would have to raise the amount of bribe in order to influence environmental policy.

## 2. Policy Harmonization in the Absence of Rent Seeking Behavior

Initially we consider the case of non-corrupt nations ( $\beta=0$ ), in which case the government gives equal weight to environmental damage and market outcomes so that  $\alpha=0.5$  and the term in front of marginal environmental damage in equation (9) drops out. Furthermore, here and throughout the paper, we assume without loss of generality that  $\gamma^A > \gamma^B$ . That is, country A is viewed as being more sensitive to environmental problems than country B, either because of the geography or climate of country A or because of the strong preferences of its population for a clean environment. Thus, country A views environmental damages as large and chooses a relatively more stringent emissions tax. It follows, again from equation (9), that countries with differing preferences or absorptive capacity for tolerating environmental damage should choose different optimal environmental policies. This in turn implies:

**Proposition 1:** *In the case without rent-seeking ( $\beta=0$ ), if country A, the more environmentally concerned nation, imposes its environmental policy,  $e^A$ , on country B, then country B's net benefits will be reduced while country A's net benefits will be enhanced for a sufficiently small  $\gamma^A$ .*

The first part of the proposition is self-evident in that, if  $e^{B*}$  is the optimal environmental policy for country B, no other environmental policy choice can raise its net benefits. Country B will therefore be unambiguously worse off. As for the second part of the proposition, in the Appendix to this paper we derive the following condition for the effect of a change in  $e^B$  on the net benefits of country A:

$$(12) \quad \frac{dNB^A}{de^B} = \left( \frac{1}{9b} \right) \cdot \left[ \left( 1 - \frac{4\gamma^A}{b} \right) \cdot (2a - 2e^A - t^{BA}) + 6 \cdot (e^A - t^{BA}) \right].$$

From the above equation (12), it is clear that country A will benefit if  $\gamma^A$  is sufficiently small ( $\gamma^A < (b/4)$ ). That is, Country A will be better off as long as the profit-shifting effect is not outweighed by an increase in domestic environmental damage (see Appendix). In contrast, only if country A cares greatly about the state of its environment or is very susceptible to environmental damage, may its overall net benefits decrease as a result of any shift in production resulting from the imposition of country A's environmental policy on country B.<sup>10</sup>

We do not explicitly model the reasons for why country B, which is unambiguously worse off by environmental policy harmonization, may choose to accept this cross-country coordination, but the most obvious tradeoff is greater market access into country A's market.<sup>11</sup> Proposition 1 may help explain the recent combining of both negotiations over environmental policy harmonization and lowering trade barriers between regional partners already engaged in trade that have established reciprocal markets. In effect, if the trading partner with more stringent environmental policy (country A) wish to impose its higher emissions tax on a country (B), it may be able to achieve this by lowering its import tariffs, which can then compensate country B for adopting a more stringent environmental policy. In essence, we are establishing the case for negotiating a preferential trade agreement, such as a comprehensive regional trade agreement or an economic union, where the two countries negotiate over more than respective tariff rates. When countries engage in preferential trade agreements they tend to negotiate simultaneously about tariffs and other policies such as environmental policies. Here we simplify this negotiation by assuming that environmental policy is set first by a country with great bargaining strength, and then tariffs are negotiated in order to make sure that the trade agreement is signed. Alternatively, as discussed below, an existing trade agreement may be extended to include additional countries that are forced to accept the agreement's environmental policy if they choose to join.

<sup>10</sup> This proof assumes that after country B accepts country A's more stringent policy, country A does not change its environmental policy. That is, we do not find the "optimal" harmonization policy for country A. If country A is allowed to change its optimal environmental policy, then it would unambiguously be better off since the main effect would then be that the foreign competitor has been made less competitive.

<sup>11</sup> A sufficient reduction in country A's import tariffs ( $t^{BA}$ ) reverses the negative output effect associated with adopting a too stringent emissions tax in country B. That is, country A could perhaps *induce* country B to accept the stringent policy by lowering its tariff barriers.

As a real world example of what we have in mind, we refer throughout the paper to the expansion of NAFTA between the United States, Canada and Mexico to a hemisphere-wide trade agreement. In this case, the NAFTA agreements will be extended to other Latin American countries, which will have the option either to comply with all the side agreements (in particular, the NAAEC) upon joining NAFTA or to decide not to join.<sup>12</sup> On the other hand, as we have just shown, the existing members of NAFTA cannot expect other Latin America countries to accept the NAAEC unless these countries are also offered full membership in NAFTA and the subsequent lowering of tariffs on their exports to the US, Canada and Mexico. This NAFTA example raises an additional important issue in considering the expansion of a regional trade agreement with harmonization conditions: participants in such a regional agreement that are at different stages of economic development are likely to not only differ in absorption capacity, social preferences, but also in the degree to which they control corruption in their economies. For an example of the latter, many Latin American countries appear to be more corrupt than the existing NAFTA members, especially Canada and the United States (see Table 1 in Section 3).

### 3. Policy Harmonization and Rent-Seeking Behavior

The previous section has established that, under certain conditions, two trading partners may forego setting environmental policy unilaterally and may instead agree to harmonize their domestic environmental policies at a stricter level as part of a wider trade-environment deal. However, there remains the possibility that a firm in one, or both, of the countries decides to lobby in order to influence the environmental policy choice of its government. We consider this effect to be important for several reasons.

First, corruption appears to be a fact of life in many countries, particularly in the poorer regions of the world. That is, just as countries appear to differ greatly in their willingness or ability to accept more pollution, they also differ in the degree to which they control corruption in their economies. For example, a recent project on governance conducted by the World Bank has assembled a measure of the control of corruption and other governance indicators for 178 developing and advanced economies (Kaufmann *et al.* (1999a,b)).<sup>13</sup> In Table 1, we compile the control of corruption indices for the three NAFTA countries and compare them to other Latin American countries. As the table shows, the latter countries tend to be more corrupt than the existing NAFTA members.

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<sup>12</sup> We assume that the Free Trade Area of the Americas (FTAA) will contain environmental provisions similar to the NAAEC. Thus "fast-track" proposals that do not include such environmental provisions, although proposed, will in our view not be adopted.

<sup>13</sup> In compiling this index, Kaufmann *et al.* (1999b, p.8) use the conventional definition of corruption: "the exercise of public power for private gain." However, the authors note that "the particular aspect of corruption measured by the various sources differs somewhat, ranging from the frequency of 'additional payments to get things done' to the effects of corruption on the business environment. The presence of corruption is often a manifestation of a lack of respect of both the corrupter (typically a private citizen) and the corrupted (typically a public official) for the rules which govern their interactions ...".

**Table 1. Control of Corruption Indices for NAFTA and Latin American Countries**

<b>Country</b>	<b>Corruption Control<sup>a</sup></b>	<b>Country</b>	<b>Corruption Control</b>
United States	1.135	Guatemala	-0.819
Canada	2.055	Guayana	-0.019
Mexico	-0.277	Honduras	-0.938
		Jamaica	-0.116
Argentina	-0.275	Nicaragua	-0.836
Bolivia	-0.438	Panama	-0.458
Brazil	0.058	Paraguay	-0.958
Chile	1.029	Peru	-0.200
Colombia	-0.490	Puerto Rico	1.118
Costa Rica	0.577	Suriname	-0.019
Dominican Republic	-0.773	Trinidad & Tobago	0.511
Ecuador	-0.819	Uruguay	0.430
El Salvador	-0.354	Venezuela	-0.725
<b>Region</b>			
NAFTA	0.971		
SOUTH AMERICA	-0.202		
CENTRAL AMERICA	-0.471		
CARRIBEAN	0.185		

<sup>a</sup> Measured in units ranging from about -2.5 to 2.5, with higher values corresponding to better control of corruption. Source: Kaufmann *et al.* (1999a and b).

Second, recent empirical evidence suggests that rent-seeking behavior and corruption may be a powerful influence on governmental policies, including environmental policies. As shown by Damania *et al.* (2000) and López and Mitra (2000), rent-seeking behavior may lead to non-optimal choices of environmental policies, as environmental regulation tends to be less strict in more corrupt societies.<sup>14</sup> Barrett and Graddy (2000) also show empirically the negative influence of corruption on environmental policies. As noted by Vogel (2000), environmental policies in developing countries may be particularly susceptible to the influence of rent-seeking lobbying by domestic firms and government corruption. Vogel points out that many developing countries appear to be “stuck at the bottom,” which may be due in large part to the incentives for domestic firms to influence environmental policy outcomes. For many locally owned firms in poorer economies, the relative costs of environmental regulation are substantial, even if such measures might be socially optimal. Thus one reason why poorer nations do not select their “optimal” regulatory standards may be rent-seeking behavior by those firms that would in fact be made worse off by such standards. The World Economic Forum (ESI 2001) shows that a measure of countries

<sup>14</sup> More generally, corruption, or rent seeking behavior, has also been shown to lower the rate of overall economic growth of countries (e.g., see Scully (1988), Schleifer and Vishny (1993), and Mauro (1995)). These papers show that efficient government institutions tend to foster economic growth by raising private investment (Mauro, 1995).

overall progress toward environmental sustainability (measured by an Environmental Sustainability Index) is negatively correlated with a variable that measures corruption. This suggests that, when comparing the stringency of environmental regulations, one needs to consider that a government prone to corruption is unlikely to have strict environmental policies, or have strict policies with lax enforcement. The second objective of this paper is therefore to explore the extent to which the degree of rent-seeking behavior and government corruption affect the welfare of a country adopting stricter harmonization policies as a condition of joining an international trading agreement.

The presence of rent-seeking activity does affect a country's unilateral choice of environmental policy as shown in equation (9). Consequently, we introduce into our model the possibility that one of the countries (country B) is corrupt, in the sense that its firm can engage in rent-seeking behavior with the aim of getting the government to put less weight on the environmental damage generated by production and more weight on the market outcomes; that is, the firm convinces the government to increase  $\alpha$ , where  $\alpha$  represents the weight given to the market outcome and  $(1 - \alpha)$  the weight assigned to the environmental damage.<sup>15</sup> We assume only one corrupt nation, without loss of generality, since the results hinges on the two countries choosing different environmental policies, not on the relative degree of corruption. The optimal choice of environmental policy for country B is shown in equation 9, which shows that as  $\alpha$  approaches unity, less weight is given to the marginal environmental damage. In this case, *the optimal government policy is to reduce any environmental tax or increase any subsidy*. Note that when  $\alpha=1$  the results are similar to the Brander and Spencer (1985) model in a reciprocal market and with an explicit tariff rate, where the optimal policy is to use a production subsidy.<sup>16</sup>

Further insights into the influence of increased lobbying and corruption on both government benefits and the overall social welfare (i.e., net benefits) of country B is aided through a partial numerical simulation. The simulation was performed using values of the model parameters that yield an emissions tax of 3.1 percent for both countries (tariff rates are 8 percent and  $\gamma^B$  equals 0.155). These arbitrarily chosen numbers show the general result that social welfare and government benefits are in conflict (see Figure 1). Other parameter values yield very similar results.

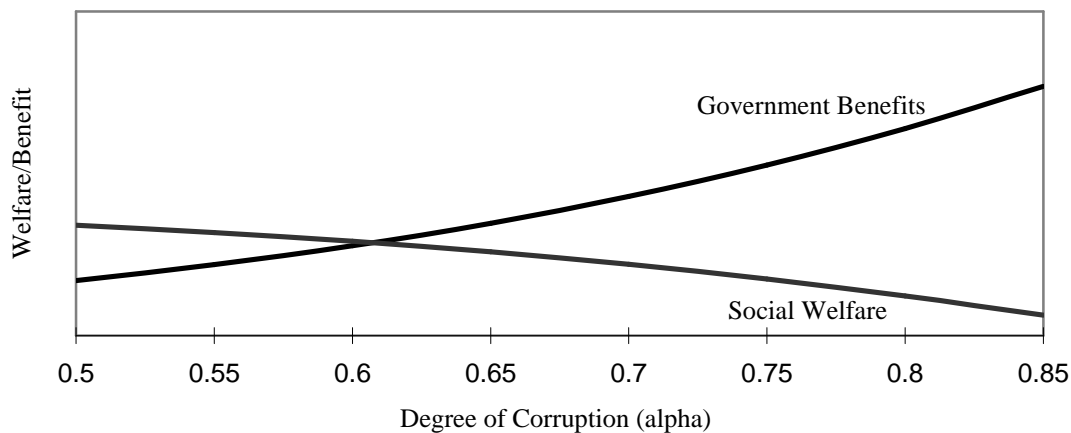
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<sup>15</sup> See Damania *et al.* (2000) and López and Mitra (2000) for further discussion of this approach to modeling the government's objective function to account for the influence of rent-seeking behavior. Following López and Mitra (2000), we could assume in our equation (9) that there is an additional term attached to the "weight" on the environmental damage function in favor of the market outcome, where this additional term  $\rho$  is the probability of the government being re-elected, which may be linear and increasing in environmental damages,  $D^B$ . This would make our model compatible with voting models that take into account that the motive of democratically elected government is to win elections. In equation (9), to sharpen the analysis, we drop  $\rho$  but note that our model could easily be extended to include the re-election motive.

<sup>16</sup> The result is a production subsidy since in the reciprocal market model the firm receives the subsidy whether selling at home or abroad.

Figure 1 shows that as the degree of corruption increases, represented by a greater  $\alpha$  (and a higher level of bribe,  $F$ , since  $\partial\alpha/\partial F = \beta > 0$  for a corrupt nation), the benefits to the corrupt government increase at the expense of society at large. It is clear that the government has an incentive to be corrupt since its benefits with corruption is always greater than for all outcomes without corruption. Although not indicated explicitly in the simulation, clearly social welfare is declining as bribes and corruption increases because the government is adopting less stringent policies to control environmental damages. In essence, we have replicated in our model what is now a well-known result in the empirical literature: environmental policies tend to be less strict in more corrupt societies.

**Figure 1. Social Welfare and Government Benefits under Rent-Seeking Behavior**



Since the net benefits to society at large decrease as a firm engages in rent-seeking behavior through bribing the government, it follows that proposition 1 no longer holds strictly for country B. That is, if country A, the more environmentally concerned nation, now imposes its more stringent environmental policy on country B, then country B's welfare may actually improve. This suggests the following:

**Proposition 2:** *In the presence of rent-seeking activity ( $\beta > 0$ ), it is possible that the more corrupt country (B) is better off after harmonization of environmental policy is imposed by country A.*

Consider two countries that are identical in the sense that without corruption they would choose the same (optimal) environmental policy. This assumption is made for

tractability and does not affect the results.<sup>17</sup> Letting  $\partial\alpha/\partial F = 0$  so that no corruption is present, we have that the two countries will optimally choose exactly the same emissions tax:  $e^A = e^B > 0$ . Next suppose that country *B* becomes corrupt in the sense that firm 2 pays a bribe that induces its government to care less for the environment, so that  $\alpha > 0.5$ . In this case, country *B*'s government chooses a sub-optimal environmental policy  $e^{B^*}$  that is less than  $e^B (=e^A)$ . If country *A* then imposes its environmental policy on country *B*, so that country *B*'s environmental policy is no longer a choice variable to its government, then the domestic firm in country *B* no longer has an incentive to bribe the government. Without a bribe, the government chooses to set  $\alpha = 0.5$ , which means that the imposed environmental policy is again the optimal one. That is, removing the incentive for corruption by imposing environmental harmonization returns country *B* to its initial policy, i.e.  $e^A = e^B > 0$ . Country *B* is thus better off after harmonization. This result can also be seen in Figure 1 since social welfare under corruption is always lower than at  $\alpha = 0.5$ .<sup>18</sup>

Furthermore, when the two countries differ in terms of both their concern for environmental damage and in the degree of corruption, we can demonstrate the following:

**Corollary:** *In the presence of rent-seeking activity in the country that optimally chooses a lower emissions tax (B), it is possible that the country is better off after harmonization of environmental policy if the initial amount of corruption is sufficiently great.*

Now assume that the two countries are different, but the only differences are that  $\gamma^B < \gamma^A$ , i.e. country *A* is the more environmentally concerned country, and the government of country *B* is corrupt in the sense that  $\alpha > 0.5$  for that country. Assume further that  $\gamma^j$  is sufficiently large in both countries so that their respective governments impose a positive emissions tax, i.e.  $e^A, e^B > 0$ . The relatively low  $\gamma^B$  and high  $\alpha$  for country *B* imply that its government will choose a lower environmental tax than country *A* (equation 9). It follows that, if country *B* foregoes its optimal environmental policy and adopts the more stringent policy of country *A*, then the unambiguous reduction in net benefits for a non-corrupt government (proposition 1) will be mitigated by the elimination of an incentive for bribery. There is thus a trade-off present here: on the one hand, social welfare is reduced in country *B* by adopting a too stringent environmental policy; on the other, social welfare increases because equal weight is now in effect being given to the market outcome and environmental damages. If the benefit from setting  $e^B = e^A$  (as if  $\alpha = 0.5$ ) is greater than the efficiency loss from setting an environmental policy that is too stringent, then the harmonization policy will actually

<sup>17</sup> The proof hinges on the fact that the derivative of the net benefit function with respect to the emissions tax is positive when the chosen environmental policy is less than optimal so that as the pollution tax is raised, a nation's net benefit increases with it.

<sup>18</sup> This discussion of course assumes that the corrupt government would in fact allow a foreign country to impose a more stringent environmental policy on its country. The reasons for this, which may be either political or economic, are not modeled in the present paper.

enhance net benefits. This will be true as long as country  $B$  is sufficiently corrupt, i.e.  $\alpha \gg 0.5$ , and the only other difference between the two countries is the level of environmental concern, i.e.  $\gamma^B < \gamma^A$ .

However, if country  $B$  adopts country  $A$ 's environmental policy, country  $B$  is still not operating at its first-best environmental policy choice, i.e. the level of environmental taxation it would choose if no corruption were present. Nevertheless, in the presence of rent-seeking activity it might be better for country  $B$ 's social welfare level if its government were to adopt the strict policy imposed by  $A$  if this externally imposed environmental policy removed the incentive for the government and firm to engage in rent-seeking activity, even in the absence of any import tariff reductions. However, a corrupt government would *ceteris paribus* be less likely to accept an externally imposed policy since the accompanying removal of the incentives for rent-seeking behavior would both enhance social welfare and reduce government benefits.

#### 4. Conclusion

Since countries differ in pollution absorption capability and tolerance for environmental damage, they will optimally choose different environmental policies. Attempts at environmental policy harmonization between these countries are therefore non-optimal. Despite this well-known fact among economists, trade agreements are increasingly associated with policy harmonization efforts. We therefore explore the likely outcome on a trading partner when a high standard member imposes its policy choice on another member, e.g. as a condition for greater trade cooperation. We are able to show, within our framework with no corruption, that if a country with stringent policies manages to impose its policy on another nation, then the latter economy that values the environment less will be hurt, while the former nation may gain. This provides an explanation for why harmonization efforts are so prevalent. However, the gains from trade in this case will be lower than if both nations adopt their respective optimal environmental policies and trade according to comparative advantage or if a supranational agency was able to impose a cooperative solution on the two trading nations. Nevertheless, the analysis in the first part of the paper helps explain why two or more regional partners often combine both negotiations over environmental policy harmonization and lowering trade barriers.

In the case of an imperfect political process, there is ample empirical evidence that rent-seeking behavior can distort the environmental policy choices of nations. We model this additional dimension in terms of the government of one country being bribed to assign less weight on the marginal environmental damage, which leads to a lower pollution tax. Under this scenario, cross-country harmonization of environmental policy could be strictly welfare enhancing for both countries, if corruption is rampant in one country and the externally imposed policy removes the incentive for rent-seeking activity in that country.

Although this is a counter-intuitive outcome, and not one usually put forward by proponents of environmental policy harmonization, there is an important caveat

attached to such a policy. Under current trade rules of the World Trade Organization (WTO) and General Agreement on Tariffs and Trade (GATT), it is infeasible for one trading partner to impose unilaterally its environmental policy on another unless the latter country accepted such an externally imposed environmental policy.<sup>19</sup> In essence, acceptance of an externally imposed environmental policy signals a change in a political regime away from rent-seeking behavior and corruption in a government with regard to the formulation of environmental policy.

We have also established an important caveat to the conventional economic argument against environmental policy harmonization: if the lower environmental policy in one trading partner is due to failures in governance, then harmonization could benefit both countries, as well as the environment. Of course, whether the latter country is willing to accept environmental policy harmonization will in itself signal its willingness to overcome inherent governance failures. Unfortunately, many developing countries appear to be persistently "stuck at the bottom" with respect to both environmental policies and corruption (Vogel 2000; ESI 2001). This suggests that the political willingness to overcome governance failures may be difficult to achieve for many developing countries, even if they are offered the incentives of a comprehensive trade-environment agreement.

The results of our paper are subject to several additional caveats. We assumed away transboundary pollution, management of a global commons, and the fact that countries with similar incentives may face a prisoner's dilemma situation where environmental policies are lower than a globally optimal policy. However, for the latter case there is no reason to believe that the world is better off by adopting the policies of the country whose geography and social preferences indicate a relatively stricter policy choice. In addition, the entire discussion hinges on global markets being imperfectly competitive. If markets are competitive, then there is no incentive for countries to distort their environmental regulations, and consequently harmonization efforts must be welfare reducing.

### Appendix: Proof of Proposition 1

As noted in the text, the first part of proposition 1 is self-evident in that, if  $e^{B*}$  is the optimal environmental policy for country B, any other environmental policy must lower its net benefits. From equation (5), the partial derivatives  $q^{IA*}_{eB} = q^{IB*}_{eB} = 1/3b$ , so that firm 1 in country A will raise its production after country B's environmental policy is raised. This means that profits shift to country A from country B. Country A's net benefits are given by

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<sup>19</sup> This might be another reason for why modern trade agreements tend to include "harmonization" efforts. If a nation wishes to impose its environmental policy on another nation, it may be able to use a trade agreement to sidestep the WTO rules. This is indeed allowed under the General Agreement on Tariffs and Trade's Article XXIV.

$$NB^A = \pi^1 + CS^A(q^{1A} + q^{2A}) + e^A \cdot (q^{1A} + q^{1B}) + t^{BA} \cdot q^{2A} - \gamma^A \cdot (q^{1A} + q^{1B})^2,$$

which are maximized at the optimal choice  $e^{A*}$ . Intuitively, if firm 1's increase in profit outweighs the accompanying increase in environmental damage in country A, then country A will gain from country B's adoption of its stringent environmental policy. To explore this result formally, we consider how country A's net benefit function changes due to a change in environmental policy in Country B:

$$\begin{aligned} \frac{dNB^A}{de^B} &= \pi_{q^{2A}}^1 q_{e^B}^{2A} + \pi_{q^{2B}}^1 q_{e^B}^{2B} + 2 \cdot \left(\frac{b}{2}\right) \cdot (q^{1A} + q^{1B})(q_{e^B}^{1A} + q_{e^B}^{2A}) + e^A (q_{e^B}^{1A} + q_{e^B}^{1B}) + t^{BA} \cdot q_{e^B}^{2A} \\ &\quad - 2\gamma^A (q^{1A} + q^{1B})(q_{e^B}^{1A} + q_{e^B}^{1B}) \end{aligned}$$

Simplifying using the partial derivatives from equation (5) and our chosen inverse demand function yields

$$\frac{dNB^A}{de^B} = \left(\frac{2}{3}\right) \cdot (q^{1A} + q^{1B}) - \left(\frac{1}{3}\right) \cdot (q^{1A} + q^{2A}) - \left(\frac{4\gamma^A}{3b}\right) \cdot (q^{1A} + q^{1B}) + \left(\frac{2}{3b}\right) \cdot e^A - \left(\frac{2}{3b}\right) \cdot t^{BA}$$

Substituting in for the optimal quantities from equation (4) and assuming that marginal costs are the same and equal to zero,  $c^1 = c^2 = 0$  and also letting  $e^A = e^B$  and  $t^{BA} = t^{AB}$ :

$$\begin{aligned} \frac{dNB^A}{de^B} &= \left(\frac{1}{9b}\right) \cdot (2a - 2e^A - t^{BA}) - \left(\frac{4\gamma^A}{9b^2}\right) (2a - 2e^A - t^{BA}) + \left(\frac{2}{3b}\right) \cdot e^A - \left(\frac{2}{3b}\right) \cdot t^{BA} \\ &= \left(\frac{1}{9b}\right) \cdot \left[ \left(1 - \frac{4\gamma^A}{b}\right) \cdot (2a - 2e^A - t^{BA}) + 6 \cdot (e^A - t^{BA}) \right]. \end{aligned}$$

From the latter equation, and assuming that country A imposes an environmental tax and  $e^A - t^{BA} > 0$ , it is clear that country A will benefit if  $\gamma^A$  is sufficiently small ( $\gamma^A = (b/4)$ ). That is, as long as the profit-shifting effect is not outweighed by an increase in domestic environmental damage, country A will benefit from imposing its environmental policy on country B.

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