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TRADE, ENVIRONMENT AND THE REGIONAL AGREEMENTS: THE CASE OF CANADA AND EUROPE[1]

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I. INTRODUCTION

Environmental economics is now vitally important within the study of economics, as we become increasingly concerned with pollution and other forms of environmental damage. A particular concern relates to emissions of greenhouse gases and global climate change. The world at the beginning of the twenty-first century must place the highest priority on constructing a sustainable socio-economic system that can cope with the rapid ageing of population in developed countries and with the limited environmental resources available in both developed and developing countries.

In recent years, environmentalists and the trade policy community have squared off over the environmental consequences of liberalized trade. Much concern has been raised over whether or not freer trade causes «dirty industries» to migrate to developing countries. Theoretically, the impact of trade liberalization on pollution levels is not clear. Relatively lenient environmental regulations suggest that the use of environment is relatively cheap for companies. In the standard Heckscher–Ohlin (H-O) trade model, a country with such relatively low factor price ratio (or relatively large physical stock of a factor) would be classified as relatively «environment» abundant. Freer trade would then lead to increased specialization in pollution-intensive goods. This environmentally detrimen-

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tal «composition effect» lies behind the popular concern. Yet following the Stolper-Samuelson theorem, the price paid for using the environment would be bid-up (assuming the externality was internalized), and all firms would shift to less pollution-intensive production techniques (the «technique effect»).

According to Grossman and Krueger (1995), the amount of environmental damage in a country at any point in time is endogenous and depends upon the income level of the country. Income growth has three effects on the existing amount of pollution emission. First, greater economic activity raises demand for all inputs, increasing emissions (the «scale effect»). Second, higher income causes the population to increase their demand for a clean environment (a normal good) and to tolerate higher levels of pollution only if effluent charges are higher. This encourages firms to shift towards cleaner production processes, reducing emissions (the «technique effect»). Third, income growth increases demand for relatively cleaner goods. This causes the share of pollution-intensive goods in output to fall; reducing emissions (the «composition effect»). The inverted-U hypothesis states that at low levels of income, the scale effect outweighs composition and technique effects. Thus, as a poor country begins to grow, it sees a net increase in environmental damage. Over time, income reaches some critical level, and the latter two effects outweigh the former. Growth then leads to a net reduction in environmental damage.

The econometric studies[2] that test for a relationship between trade openness and environmental damage find some counter-intuitive results. Tobey (1990) and Grossman and Krueger (1993) focus on the composition effect of freer trade. These authors investigate whether relatively lenient environmental regulations lead to a comparative advantage in pollution intensive goods. Using an H-O trade model, each study specifies a single equation in which net exports (imports) are determined by relative factor abundance. The stock of environment (assumed to be exogenous) is treated as an additional input which, along with conventional inputs, should affect the pattern of trade. Tobey uses an index of relative leniency of environmental regulations across countries to proxy environmental «abundance». He finds no relationship between environmental abundance and countries' exports of pollution intensive goods. Grossman and Krueger use pollution abatement costs to proxy relative pollution intensity across sectors. They find no relationship between pollution intensity and the pattern of U.S. imports from Mexico[3].

Antweiler, Copeland and Taylor (1998) develop a theoretical model to split the effect of income growth on emissions into scale, composition, and technique

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[2] For a more in-depth review of these studies, see Dean (1998). For surveys of the literature, see Dean (1992, 2001) and Jaffe et al. (1995).

[3] Perroni and Wigley (1994) use a CGE model to assess the impact of trade liberalization on environmental damage. They find that while the choice of environmental policy significantly influences pollution levels, the choice of trade policy has a negligible effect.

effects. They then estimate changes in SO_2 emissions using a single equation reduced-form model and pooled cross-country time series data. The authors acknowledge that such estimation will not distinguish the extent to which trade policy has affected emissions, since trade policy itself will generate the three effects above. From separate estimates, they find that trade liberalization does shift the composition of output towards dirty goods for low income countries. However, the impact of this effect is small. In addition, when composition effects are added to indirect calculations of the impact of trade liberalization on scale and technique, the authors find that trade liberalization appears to be «good for the environment».

Trade liberalization clearly has multiple simultaneous effects on environmental damage. Because these effects may work in opposite directions, it is not surprising that single-equation models with a single variable representing trade openness yield such counterintuitive results. At the same time, policies designed to ameliorate detrimental effect on the environment of production will also affect the pattern of international trade. The impact of liberalization on the environment depends too, as indicated by Barrett (2000), on how environmental policies change with the new trade regime. Countries that impose and enforce a high standard of environmental quality, for example, automatically limit the damage associated with the scale and composition effects. Decisions on trade will unavoidably influence the global environment and vice versa. It is worth saying that production patterns in one country will affect not only the environment within its borders but also abroad, as is the case of acid rain problems in Europe, the US and Canada. This is particularly clear for transboundary pollution problems. Even if one country internalizes the effect of its emissions of pollutants for its own welfare, there will be externalities when it does not take into account the effect of these emissions on other countries' welfare. Externalities in a cross boundary pollution problem imply that optimal policies from an individual country's perspective do not need to be optimal from a global perspective. For that reason, international coordination of environmental policy is required

A number of international treaties have been signed with the intention, perhaps not to solve this global sub-optimality, but to create an atmosphere conducive to further discussion and cooperation. Transboundary pollution problems could also appear even when no trade relationship among countries is considered. Nevertheless, international trade policies can be useful in order to achieve better international agreement on an environmental issue. A country which causes too much environmental damage could be punished through a stricter trade policy. Likewise, a more respectful country could be rewarded through a more relaxed trade policy.

This reasoning is in concordance with the literature that points out how the success in international environmental agreement is more likely when linked to other international agreements. Thus, Carraro & Siniscalco (1995, 1997) and Katsoulacos (1997) suggest relating technological cooperation to environmental

bargaining. This notion already appears in the climate change convention. Another idea is suggested by Barrett (1995) who proposes linking environmental negotiations to trade liberalization. The interaction between environmental policy and trade policy has been the focus of considerable debate in recent years, caused by the moves towards further trade liberalization in the Single European Market, the Uruguay round of GATT, and NAFTA (see, e.g. Bhagwati & Daly 1993). Linking international trade and environmental agreements could make a global agreement more profitable in the sense that all countries signing the agreement would be better off. Those countries with lower gains from the environmental agreement could obtain compensation from the trade agreement which reduces their incentive to free ride.

Many authors tackle transboundary pollution problems in a dynamic framework by using differential games. They analyze how production in several countries is linked to the emissions of pollutants which negatively affect environmental quality. The paper of Ploeg & Zeeuw (1992) is one of the more frequently cited papers applying differential games to the environment. Other authors who deal with this problem using the same methodology are Dockner & Long (1993), Kaitala & Pohjola (1995) and Jørgensen & Zaccour (2001). The main outcome in all these papers states that countries are better off using cooperative strategies. Under cooperation, total welfare increases, while emissions and consequently the pollution stock decreases. Then, if cooperation is in the interest of all signatory countries, why is it so difficult to maintain environmental agreements in practice? Carraro (1999a) gives two main reasons for this instability: asymmetries and free ride. The assymetry between countries, where poor countries that may lose from an agreement and are consequently more reluctant to reduce their emissions as cooperation obliges, and on the other hand, as most authors state, the incentive to free ride also explains the difficulty in maintaining the agreement. Carraro (1999b) defines a self-enforcing agreement as one that is profitable and stable. It will be profitable if each player is better off under cooperation than when no players cooperate. It will be stable if no player is better off by leaving the agreement, but this is maintained by the rest of the players. In the case of only two players, as in the model we present here, a profitable agreement is a stable agreement and vice versa. Therefore a self-enforcing agreement is equivalent to a stable or a profitable agreement.

One of the key issues arising from this dispute is about whether agreements on trade and environment policies should be linked. Essentially, the two issues have been addressed in a separate way. Trade agreements such as GATT, dealt with trade issues, while environmental policy was domestic, in the case of local pollution, or led to multilateral environmental agreements as in the case of transboundary pollution. Many economists like Bhagwati and Srivastava (1996) have indicated that this mechanism is prudent and efficient. Efficiency is derived from the literature of achieving goals of economic policy, which shows that trade problems are best solved using trade policy instruments, and environmental pro-

blems using environmental policy instruments. The problem comes from the link between the two, which may harm trade.

An environmental problem is often characterized by a transnational dimension, by binding with other economic policy objectives and its interface with various types of externalities. This implies that environmental policy has to be redesigned in order to be effective even in a world where running economic policy involves multiple targets and an incomplete set of economic policy instruments. International agreements are seeking solutions to environmental problems but their effectiveness is diminished by a double difficulty: first, associated with the dimension of the problem, the emergence of countries that behave as «free riders», secondly the problem that comes from companies that leave a country and go to another with less stringent environmental standards. This usually leads to the inclusion of trade measures in environmental agreements that may contradict the agreements of the World Trade Organization. The question we ask is: 'Is the objective pursued by the WTO aimed at achieving free trade good or bad for the environment? What happens in Europe and Canada?

II. COORDINATION IN THE CASE OF LOCAL ENVIRONMENTAL DAMAGE

There is a strong presumption that an effective environmental policy should differ between countries to reflect the differences in the conditions of each country, that is: we do not need harmonization of environmental policy. However, the question to be considered is the need or not for coordination. According to the analysis of the foundations of economic theory, this is desirable. The reason lies in the weakening environmental option that can provide an adequate escape in a trade agreement

All trade agreements are incomplete contracts that restrict and eliminate some but not all the instruments of trade protection. When tariffs disappear, governments face the same incentive to protect as they did before signing the trade agreement, and are therefore seeking alternative instruments of protection. A weakening of environmental policy can become an instrument, but simply to obtain a suboptimal of Pareto, when a more advantageous instrument is restricted by the treaty (subsidies, tariffs, quotas ...). One solution for this is to close this loophole by incorporating restrictions on environmental policy in trade agreements.

A very simple model proposed by Copeland (2000) shows how coordination is necessary if the objective is to achieve the best possible outcome, after reaching a free trade agreement. Following Copeland (2000), we consider a theoretical model with two factors, labour and capital, two goods and two perfectly competitive markets. The production of one of them uses capital and is a pollutant (dirty good).The production of the other uses only labour and does not

pollute (clean good). Let us suppose a world divided into North (developed countries) and South (developing countries); the only difference is in their levels of income. Each country sets an environmental tax so as to equalize its environmental marginal cost, thus giving rise to the establishment of trade relations. Because the North has a greater production capacity, its environmental quality is relatively low, and therefore pollution causes the price of the goods obtained from the physical capital to be higher than in the South. Consequently, the North has a comparative advantage in the production of clean good and South in the production of dirty good. If countries differ not only in income, but also in the factor endowments, the pattern of trade is determined by conflicting forces as set out by Copeland and Taylor (1997). If a rich country is also abundant in capital, pollution tends to make the price of a dirty good high, but its relative abundance of capital tends to make the price low. The pattern of trade depends on the strength of the two opposite effects. We assume that the North is exporting the clean good and importing the dirty good. That is, the income effect on the price exceeds the endowment effect.

The government maximizes the utility of the representative consumer and has two instruments of economic policy: import tariffs and taxes on pollution. The solution is standard on international trade theory: the government should internalize the environmental externalities with a tax on pollution, and tariffs should be used to obtain the desired terms of trade, as evidenced by Dixit (1985). Defining wealth in the usual economic sense for a small country without influence on its terms of trade, free trade is the best policy, with its own pollution taxed properly, regardless of the environmental tax set by a big country. If the pollution is not taxed in an optimal way, or in the case of renewable resources, there is not an institutional arrangement to prevent the overuse of common property, this may involve loss of wealth compared to autarky and therefore is not the free trade optimum as evidenced by Chichiliski (1994). This result is standard in international trade theory: when there are mismatches domestically that are not internalized, trade can reduce wealth. If the country is large, and sets an optimal tax on pollution, free trade is not the optimal policy for the country. Kennan and Riezman (1988) suggest that big countries can gain from a trade war, and therefore require a transfer or other concession to be compensated in the event of accepting a free trade agreement. If we impose a fee that could be considered optimal, this solution would not be in any case a Pareto optimal for the global economy, as evidenced by Harry Johnson (1954). But with free trade between two countries (small or large) and taxes on optimal pollution in each country, it is easy to demonstrate the achievement of a global Pareto optimal as indicated by Bhagwati and Srivastava (1996).

Suppose that the two countries are large in the international context and reach a free trade agreement. If there are no tariffs, the government of each country has a monopoly power on trade and therefore has an incentive to distort their environmental policy in order to manipulate the terms of trade. Although environ-

mental policy is not the best instrument to protect an industry, it can act as a «second best» for protection. The countries that import the dirty good (the North) have incentives to stimulate the production of this kind of goods by reducing environmental barriers and they thus reduce its environmental regulation by establishing an environmental tax below the marginal cost. However, a weaker environmental policy not only stimulates production but also increases pollution and harms consumers. Trade may or may not be beneficial depending on whether the profits of removing tariffs are large enough to offset the increase in the cost of environmental protection. The South will clearly benefit if after the trade agreement, a tougher environmental policy is implemented, thus increasing the price of the goods that it sells in world trade while simultaneously reducing marginal environmental cost. As pointed out by Copeland (2000), if countries are able to negotiate and to force an agreement on trade barriers as well as tax on environmental damage, and no other tools are available, it will be possible to draw points along the Pareto Border. The liberalization of global trade requires countries to coordinate their environmental policy and trade policy. If there is no coordination in environmental policy, it can be used as a substitute for trade policy, which can significantly reduce the benefits of the trade agreement. If countries anticipate that trade liberalization will affect the outcome of its environmental policy, they will have incentives to take this into account when negotiating trade agreements. Free trade can be a self-imposed outcome of this negotiation, but this is not a Pareto optimal result. In short, without a free trade agreement, each country sets its environmental tax according to the environmental damage in that country. With a free trade agreement, that would probably not happen, so coordination is necessary. The union of these two objectives requires that those countries are subject to some form of punishment if they deviate from their optimal environmental policy.

Let us suppose now that markets are imperfectly competitive. The optimal policy from the perspective of each government is again the use of trade policies to achieve business goals and Pigouvian environmental policies to address environmental externalities. Suppose further that a free trade agreement between North and South and trade policies cannot be used. It is possible to build models, such as extensions of the well known «rent-shifting» model of Brander and Spencer (1985) to include pollution: Barrett (1994a,b), Ulph (1996), which will lead all governments to establish environmentally weaker policies as a proxy for an export subsidy. While this may explain a worsening environment for all countries, it is important to note that this is a result of «second-best.» Moreover, even if the environmental loss were the result of imperfectly competitive markets and free trade, the appropriate response would be to coordinate environmental policies, so that all countries improved regardless of any environmental deterioration (sometimes this means policies even more rigorous than Pigouvian). But such coordination does not mean harmonization. As noted by Ulph (1999), harmonization could be worse for some countries than allowing its environment to be damaged.

In the real world, governments have many economic policy tools with which they can replace tariffs. A result of standard international trade theory is that a tariff is equivalent to a tax on domestic consumption combined with a subsidy on domestic production. Assuming that there are no administrative costs or costs of collection, and the government signed an agreement through eliminating tariff barriers, such barriers can be replaced by an equivalent package of subsidies to production and consumption taxes, making them therefore a loophole in free trade. There will be no incentive to use environmental policy as a substitute for trade policy. Although there is no perfect substitute for a fee, there may be imperfect substitutes that can serve as a loophole in a trade agreement, also involving a marginal cost of protection higher than the tariff, but lower than that of an environmental policy. This suggests that if an agreement is very specific and covers only trade barriers such as NAFTA, it will have little interest in limiting any environmental policy that is unlikely to prove a barrier to trade. However, if a trade agreement is broad, organs such as the European Union will require a coordinated international environmental policy.

As for the empirical relevance of the effects of environmental policy in the countries on trade and location of business, the main conclusion is that environmental regulations have a small effect on trade patterns and on the location of businesses. One possible reason is that the cost of compliance of environmental regulations has been very small. If this is so their effects can not be measured empirically. If this explanation is true, as the regulations become stronger in some countries, they may be seen to have more impact on previous competitiveness. Another possibility is that the effects of environmental policy are subtle and difficult to measure. The conclusion is always the same: we must be very careful in the choice of data. Moreover, there is a big difference between what individuals think about the effects of environmental policy on competitiveness and the results derived from empirical studies, without forgetting that government policy is clearly influenced by the views of citizens.

Coordination between trade policy and environmental policy, according to the foundations of economic theory, should be an objective when countries pursue the selfish maximization of their wealth, even though many empirical studies are necessary to determine the extent to which trade policies and the environment are being substituted. Finally, as noted by Bhagwati (2000) if one seeks the link between trade and environmental policies for altruistic reasons, considering trade as an instrument through which it hopes to change the offensive morality of some practices abroad, the best option is an overall coordination. The solution must never weaken organizations like the WTO and the United Nations Commission for the Protection of the Environment (UNEP), among others, but rather strengthen governmental organizations in their will to discuss these issues.

III. COORDINATION IN THE CASE OF TRANSNATIONAL ENVIRONMENTAL DAMAGE

When pollution and its effects are not confined to one country but are associated with cases where an activity creates negative externalities not only in this country but also in other states, policies that regulate environmental externalities have acquired international dimensions. These environmental problems include pollution of rivers and lakes that cover more than one country, acid rain or global warming. Transboundary pollution has two implications for environmental policy: first, the problem of «free rider» which implies that each country considers the national impact of the pollution that it generates, and ignores the costs involved for other countries. Solving this problem involves reaching international environmental agreements. Second, even if the state ignores the environmental damage it imposes on other states, it will be concerned about the harm that other states impose on it, and specifically about the escape of businesses to countries with more lax environmental standards, which will increase their production and transboundary pollution.

Economic theory suggests that the analysis of global environmental damage belongs to the theory of voluntary provision of public evils because it meets the conditions of non-competition in consumption and not exclusiveness. The general theory to analyze the problem of global pollution includes the following steps: first, to determine the non- cooperative emissions there, where the countries choose their emissions without taking into account external costs imposed by their emissions to other countries through the increase in global warming; second, to determine the cooperatives emissions, where the countries choose their emissions, taking into account the cost of their emissions for the rest of the country, so achieving a Pareto optimal; third to set the inefficiency of the «laissez-faire» in a non-cooperative equilibrium compared with the cooperative, and finally, to propose an action that can achieve an efficient outcome; that is, one that meets the criterion of Pareto.

This approach is very similar to that used to regulate the domestic problems of pollution. There is one important institutional difference between the problems of domestic and global pollution. In a domestic problem, the local policy chosen by the environment regulator may be imposed inside a legal body. In a global environmental problem, there is not a regulator invested «per se» with the power to impose a given policy in a number of nations. In the absence of such authority, the policy needs to be agreed. This particularity related to the global environmental problem suggests, as is indicated by Carraro and Siniscalco (1991) that the analysis should move from a context of government intervention into a context of negotiations between countries and to a policy of international coordination.

Let us suppose again two countries, North-South, which produce and consume two goods, one of which is polluting and the other is not. When pollution

is just local, large differences between countries, in their desire to improve environmental quality, can be met simply by allowing the establishment of environmental policies that reflect their national concerns. As seen previously, it is not necessary to harmonize their policies. The only real concern for negotiators is to establish a mechanism to ensure that governments do not use environmental policy as a disguised trade barrier. If pollution is transnational, this is a channel linking them because each country is directly affected by external contamination. If the countries do not trade, they have two sources of inefficiency as noted by Copeland (2000), namely high trade barriers and pollution. Therefore, they should negotiate both questions. Pareto optimal is obtained when the prices are equal across countries and the level of global pollution can be chosen efficiently, implying that the marginal cost of reducing pollution is equal between countries. Clearly, if the countries differ in their marginal damage functions, such equality is not in the interest of all countries unless there is some compensation.

Since there are two goals to negotiate, it is natural to consider that trade and environment should be linked. The link is unavoidable because changes in trade barriers will change the curves of marginal damage associated with pollution within each country, and its reaction function, affecting the global pollution. Conversely, the restrictions on pollution affect the overall volume and possibly the model of trade. The order is important in the negotiation. If countries are negotiating on trade and environment, but there was initially a trade liberalization, this affects the bargaining power of each. Suppose a game between the North-South as established by Copeland (2000): as a first move, countries are committed to free trade, and as a second move they negotiate an agreement on pollution. The points on the Pareto border involve joint negotiations on both goals. After the free trade agreement, the country that exported the dirty good has a permit to pollute more and is benefited by the free trade agreement. The threat consists in the Nash equilibrium between free trade and pollution. The outcome of the negotiations on the pollution at the second move is a point on the Pareto border. The outcome of the game depends, therefore, on whether or not there is coordination in the negotiations on both goals, free trade and reducing pollution.

Environmental negotiations should lead to some international agreements that specify which policies should be adopted by countries involved in the agreement. The biggest obstacles to the successful establishment of international agreements to reduce emissions associated with global environmental issues are, as we noted earlier, the incentives to become a «free-rider» and the asymmetries between countries. The incentives to become a free rider appear because the environment is a public good. There may be a country not interested in participating in an agreement to reduce emissions while the rest of the countries are involved, because doing so they can eliminate their own cost of reducing pollution and enjoy the benefits associated with a reduction of global pollution resulting from the cooperation with other countries. If countries have strong incentives to behave as «free-riders» the agreement will not be sustainable. Moreover,

when countries are asymmetric in their fundamentals, there are strong incentives not to cooperate. If the states that negotiate with each other are very different, the movement from a non-cooperative equilibrium to cooperation, can produce winners and losers. This is the most likely situation in an asymmetric world where countries contribute to global pollution. An individual country may not be interested in joining the agreement because the environmental cost of reducing emissions to this country included in the agreement may exceed the benefits to that country arising from the reduction in global pollution.

Economists attributed the disincentives to conserve the environment to a failure of the global market. The key problem is that unless there are institutions or markets created to facilitate the capture of the values associated with environmental protection, it is unlikely that many countries will consider these benefits in their decisions to keep them. Carraro and Siniscalco (1994) suggest that an international environmental agreement to reduce emissions will be sustainable and self-enforcing if it is profitable, that is, each country gets a greater profit by joining the coalition than if it does not. Moreover, it needs to be stable, that is, there should be no incentive for countries inside the agreement to abandon the coalition, and no incentives for countries that are outside to join it. If we consider the asymmetry and the problem of «free-rider» as two distortions that prevent the achievement of a profitable and stable agreement, economic theory tells us that we need two instruments to address both problems. The instruments that Carraro (1999b) proposed are transfers and issue linkages.

Transfers seek to make an environmental coalition profitable. The main idea is that the winners in the agreement should compensate the losers through a transfer mechanism, so that everyone is better off in relation to a non-cooperative situation. Linking objectives introduced by Folmer, van Mouche and Ragland (1993), Cesar (1994) and Cesar and Zeeuw (1998) refer to the idea of joining an agreement on the environment and an agreement among the same group of countries over another issue. Formally, the link of goals can help set stable and beneficial coalitions, without the requirement of self-enforcing that must be present in the case of transfers, and is very difficult to find in the real world. An agreement on environmental cooperation with R&D has been proposed by Carraro and Siniscalco (1995, 1997) and Katsoulacos (1997). There have been discussions about the link of environmental agreements and agreements on trade liberalization, and the use of trade to impose environmental obligations has been proposed. What is clear is that the achievement of sustainable agreement requires some link between the environment and other economic objective of concern for the countries involved in the coalition. Given the strong link established between environmental and trade negotiations it seems desirable to achieve a Pareto optimal global union between trade liberalization and environmental preservation.

To operate as an effective incentive in conserving the environment, any bilateral or multilateral agreement on the regulation of trade in environmental goods should try to obtain an overall prize for countries that have invested in the sus-

tainable production of these goods. This award will provide compensation for those countries that already invest in the sustainability of the environmental values and incentives for those who do not. In addition, a scheme of market regulation should be voluntary, non-discriminatory and transparent to all producers and consumers involved in the trade. The overall goal, should be a mutual agreement on the regulation of trade or market incentives to strengthen the management and conservation of environmental resources, not reduction of trade *per se*. This mutual agreement to improve environmental conservation efforts can be termed «exchange trading by nature».

Although progress has been made in establishing a mechanism for the conservation of environmental values, there is not an international agreement that explicitly requires compensation across countries. One may have strong incentives, particularly for developed countries to negotiate an international agreement on preserving the global environment, but the fact is that conservation efforts so far generated by the international compensation mechanisms seem to be short. It is also possible that the additional benefits for the global community of an international agreement on trade and environment are not significant enough to secure their negotiation and implementation.

IV. A MODEL OF POLLUTION AND TRADE

We analyze a transboundary pollution problem. Suppose we have two different regions interconnected by a double relationship. On the one hand, pollution is a by-product of the productive processes in each region. These regions must take decisions about their production activities affecting the emissions of pollutants. On the other hand, trade among countries must be taken into consideration. It is assumed that a good produced in the North is traded to the South. Taking decisions on trade, the international price and the amount of this traded good are determined. According to that, each one of the two regions should take decisions on its productive process as well as on its trade relationship with the other region. However this specification with four decision variables will lead to a very complex model, which will make difficult or even impossible to obtain significant conclusions. Owing to this inconvenience, the model is settled as simply as possible, in such a way that each one of the players only decides on a unique control variable. Thus, one of the regions chooses production and consequently emissions, while the other makes trade decisions.

Each region's welfare is mainly a function of the benefits from production, but it also depends on the amount and the price of the traded good. At the same time pollution leads to welfare losses. These losses are not uniquely caused by current emissions, but in a more realistic way, and following Bovenberg & Smulders (1995) and Musu (1996), we assume that they are caused by the accumulated pollution stock.

An intermediate good, y(t), is produced only in the North. This good is demanded by the South which uses it as productive input. This input is traded in the international market. The function of production benefits is given by the income from the exported good, minus a quadratic function representing the production costs. Likewise the pollution damage function is assumed to be quadratic. Thus, the welfare function is given by:

$$p(t)y(t) - p^2(t)/2 - \beta_N s^2(t)/2,$$

where $p(t), s(t)$ are the price of the traded good and the pollution stock at time t, and β_N is the constant North's damage coefficient.

Each unit of pollution generated by the production process reduces the environmental quality. In this sense, the pollution stock can be interpreted as the opposite of environmental quality. This environmental quality has a double positive effect on society welfare (see, Bovenberg & Smulders, 1995; Smulders, 2000). First, environmental quality acting as a public good directly improves productivity (e.g. the health of the workers is improved and so is labour productivity, the depreciation of buildings and equipment diminishes, the capacity of natural inputs in farming to produce consumption goods increases). Second, the amenity or existence value also has to be taken into account as part of people's utility. Thus, pollution's negative impact on welfare is due to these two different aspects. The marginal damage caused by additional units of pollution stock is continuously growing with the stock. The same is true for the marginal increment of the price.

The South demands the intermediate good, y(t), which is used as the unique input in its production process. For the sake of simplicity, South production is assumed proportional to North production. Therefore total world production at any time t is proportional to the amount of traded good at this time, y(t). There are no investment activities in the South and the produced good is not exported to the North either. Therefore, total income in the South equates production minus the amount paid to the North for the intermediate good. Assuming again quadratic benefits and damage functions, the welfare in this region can be written as:

$$\mu y(t) - p(t)y(t) - y^2(t)/2 - \beta_S s^2(t)/2,$$

where μ is the South-North output ratio and β_S the constant South's damage coefficient.

Although pollution is generated by emissions in both regions, the damage caused by pollution differs from North to South. It has been assumed here that the existence value grows with the individual's wealth. People in developed countries are more concerned about environmental problems (see, e.g.

Verbruggen 1999). Thus, pollution reduces welfare in the North to a greater extent than in the South, that is, $\beta_N > \beta_S$. The dynamics of the pollution stock is given by the following ordinary differential equation:

$$\dot{s}(t) = \gamma y(t) - \delta s(t), \qquad s(0) = s_0 > 0. \quad (1)$$

The right-hand side of this equation has two terms. The first term is the flow of emissions at time t. Emissions of pollutants in each region are proportional to production. Moreover, since production is proportional in North and South, total emissions are linear with the production of the traded good. Parameter g represents the emissions-traded good ratio. The second term represents the natural degradation or depreciation of the pollution stock. That is, the capacity of the environment to absorb pollution, where $\delta \geq 0$ represents the constant depreciation rate. Finally, s0 is the pollution stock at the initial time, $t = 0$.

Most of the authors studying transboundary pollution problems among countries by using differential games methodology make the assumption of homogeneous countries, which leads to symmetric games (see, e.g. Ploeg & Zeeuw, 1992; Dockner & Long 1993; Jørgensen & Zaccour, 2001). Countries have to decide on either their production or their emissions at any time. Taking decisions on production, emissions are determined or vice versa. Global pollution stock is the addition of the emissions in all countries minus depreciation. Therefore all countries contribute to the generation of pollution stock in the same way and take decisions on the same variable, which is either production or emissions. These symmetries of the game make easier the analysis of the problem.

Conversely, two heterogeneous regions are presented in this paper giving rise to asymmetric behaviour. Developed and developing countries play a differential game in which the South decides the demand for the traded good and, as a result of that, total production. This region takes decisions on production which indirectly determine the emissions of pollutants and finally the pollution stock. Correspondingly, the North chooses the price of this traded good. Thus decisions about production, and consequently pollution, are influenced by decisions concerning North-South trade and vice versa. Negotiations about transboundary pollution problems are necessarily linked to international trade bargaining. The introduction of asymmetries in the formulation of the game leads to a more difficult study.

Each region maximizes its welfare function through time. The objective functions in North and South are given by their stream of welfare discounted at a constant rate, r, which is assumed the same in both regions. The specified benefits and costs functions guarantee each player's welfare function to be concave in its control variable. Thus the maximization problem for each region can be written as[4]:

[4] Henceforth time arguments are omitted when no confusion is caused by doing so.

$$\max_{p} W_N = \max_{p} \int_0^{\infty} \left[py - p^2/2 - \beta_N s^2/2 \right] \exp(-rt) dt,$$

$$\max_{y} W_S = \max_{y} \int_0^{\infty} \left[(\mu - p) y - y^2/2 - \beta_S s^2/2 \right] \exp(-rt) dt,$$

subject to equation (1) governing the accumulation of pollutant.

With this specification that assumes quadratic welfare functions in state, s, and control variables, p, y, together with a linear state equation (1) in these variables, the problem is called linear-quadratic.

The North's dilemma reads: if it fixes a low price of the traded good, will the South decide a reduction in production leading to a lower pollution stock? The South's dilemma states: if it decides a short production to improve the environmental quality, will the North reduce the price to bear part of the sacrifice associated with a lower pollution stock?

V. A SELF-ENFORCING AGREEMENT

In this case, North and South decide the price and the total amount of the traded good taking into account the current value of the pollution stock. Using feedback strategies allows the players to introduce memory into their strategies. North and South may use the non-cooperative feedback strategies as a threat to be applied when the other region deviates from cooperation. The concept of cooperative equilibrium obtained by combining an open-loop control pair with a pair of threats defined as feedback strategies was first introduced in Tolwinski, Hauri & Leitman (1985) (among others, Haurie & Pohjola, 1987; Kaitala & Pohjola, 1995, also use this concept). Using feedback strategies makes the threats credible. Any time one region fails to cooperate, the other region would be in equilibrium by applying non-cooperative feedback strategies from then on. For the cooperation to be sustainable, each region's welfare has to be proved greater under cooperation than under the feedback non-cooperative punishment.

The feedback solutions are obtained by using the Hamilton-Jacobi-Bellman equations. In general it is arduous or even impossible to find a solution for this type of equations. Nevertheless, this is not the case when a linear-quadratic specification is considered. For this type of problem, using the «guess method» allows us easily to determine the feedback Nash solution. The process followed to find the solution although simple is also tedious, and so it is not presented here. The optimal feedback controls for North and South are then,

$$p = y = \left(\mu + \gamma \partial V_S(s,t) / \partial s \right) / 2,$$

where $V_S(s,t)$ represents the maximum value of the South's discounted welfare from then on. Note that these expressions are equivalent to the open-loop optimal controls but replacing the marginal value of an additional unit of pollution stock in the South, λ_S, by the marginal variation of the value function with respect to the pollution stock, $\partial V_S(s,t)/\partial s$.

The price of and the demand for the traded good as well as the pollution stock in steady-state are all constant and given by:

$$s^F = \gamma(r+\delta)\mu/\left(\gamma^2\beta_S + 4\delta(r+\delta)\right)\left(r-\Psi\right)/\left((r+\delta)-\Psi\right),$$

$$p^F = y^F = \delta s^F/\gamma,$$

where $\sqrt{\gamma^2\beta_S + (r+2\delta)^2}$.

As in the open-loop non-cooperative game, the steady-state pollution stock does not depend on how pollution damages welfare in the North. Likewise the relationship connecting the price of and the demand for the traded good with the pollution stock is the same as before. Depending on the information sets of the players, the outcomes of the game differ by assuming an open-loop or a feedback mode of play. That is, the optimal price and the total production of the traded good as well as the optimal pollution stock differ depending on whether players decide their optimal strategies only considering the initial value of the pollution stock or taking into account the current value of this variable.

It can be proved that in steady-state, the pollution stock is greater when players follow feedback strategies than when they follow open-loop strategies. Likewise the price of and the demand for the traded good are higher when subgame-perfect strategies are considered. This is an unsurprising result. For a transboundary pollution problem Ploeg & Zeeuw (1992) and Mason (1997) also show that the open-loop Nash equilibrium underestimates the damage of not coordinating policies and leads to too low emission in contrast with the feedback strategies. Likewise Ploeg (1987), considering a model of the extraction of renewable resources, obtains a similar result.

The steady-state equilibrium, assuming feedback strategies coincides with a conjectural variation equilibrium (see Dockner 1992). In this equilibrium, each region takes into account not only the initial but the current pollution stock as well as the reaction of the other region to its own actions. In a symmetric game of the type described by Ploeg & Zeeuw (1992) in which each region decides production and consequently pollution, conjectures are rather simple. Each region perceives that after a marginal increment in production that enhances the pollution stock, its rival will reply by reducing its own production in order to reduce the pollution stock. This leads each player to fix too high a production and consequently greater pollution in the feedback than in the open-loop equilibrium which represents a zero conjectural variation. Conversely in an asymme-

tric game where only the South can take decisions about production and hence pollution, while the North controls the price of the traded good, conjectures are rather different from one region to the other.

In the feedback equilibrium, price, production and pollution are too highly fixed with respect to the open-loop equilibrium. This fact indicates that the North believes that the South will reduce production after a marginal increment in price, while the South believes that the North will reduce the price after a marginal increment in production. This feature suggests differing conjectural variations in North and South, which can be explained as follows. The North conjectures that marginally increasing the price of the traded good, the South would decrease production to reduce losses from trade and to obtain environmental benefits. Conversely, the South believes that marginally increasing the demand for the traded good, the North would cut down the price to allow a better relative trade position to the South.

Although total welfare is higher under cooperation, nothing assures a higher welfare for each single region. As a matter of fact, the North can easily obtain a lower welfare since it fixes a zero price for the traded good. North and South would be better-off if each region had an equal part of the surplus of cooperation. This is called the egalitarian principle (see Moulin, 1988; Jørgensen & Zaccour, 2001). To attain this goal a side payment from the region that obtains higher benefits of cooperation to the other region could be used. This side payment is defined as half the difference between the gains of cooperation of the region with higher benefits and the gains (or losses) of the other region.

After this side payment each region obtains the same welfare as when they play non-cooperative feedback strategies plus half of the surplus of cooperation. Therefore both North and South are better off under cooperation and no one is willing to deter others from cooperation. North and South agree on open-loop cooperative strategies and the corresponding side payment that guarantees each player to be worse-off if it deviates from cooperation. As long as one of the regions fails to cooperate, the other region applies its threat strategy for the rest of the game. These threats are given by the non-cooperative feedback strategies which are credible because they are in equilibrium. As Haurie & Pohjola (1987) state, this deterrent mechanism is so perfect that neither the cheating nor the punishment are ever observed: the equilibrium is efficient. Once regions reach the saddle point and a steady state under cooperation, the cooperation is observed from then on.

VI. LOBBYISTS, IMPERFECT INFORMATION AND ENVIRONMENTAL COORDINATION

One of the basic assumptions we have made so far is that the government was trying to maximize the wealth of all its citizens, however, as Anderson and

Balckhurst (1992) suggest, the relationship between trade and environment, is likely to be exploited by lobbyists. The incorporation of this case involves a much more realistic treatment of the problem, but the findings so far suggest that the influence of lobbyists does not lead governments to use inefficient instruments (trade policy) to address environmental issues when other more efficient ones are available. It would be important to know under what circumstances the interests of business lobbyists and environment lobbyists match. While the models of political economy provide examples of when they are agree, as do Rauscher (1997), there is no robust generalization about it.

The key issue is whether the models of political economy suggest that governments will respond to a trade liberalization relaxing environmental policies and how the predictions of different models of political economy are different from the predictions of the models in which governments seek to maximize global wealth. Ulph and Johal (2002) point out that if countries do not act cooperatively in a political equilibrium, the pressures increase the likelihood of electing governments more concerned with the environment. They point to two reasons: first, despite the assumption that environmentalists are the only ones to care about the environment of the country, they share with business an interest in maintaining a high environmental quality, and this encourages them to use political pressure both inside and outside the country. Second, weak environmental policies in all countries reduce profits of expanding industrial production, and this reduces the incentive for employers to support governments with little environmental interest. In conclusion, including the influence of special interest groups does not provide more robust support for the concern that trade liberalization will mean a decline in environmental quality.

There is a big difference between the theoretical and empirical findings on the little impact of environmental policy on a country's competitiveness and the public perception of this problem. WTO (1999) pointed out the example of a survey conducted by the Wall Street Journal «in which one third of respondents indicated that their jobs were at risk owing to environmental regulations, while the data indicated that between the years 1987 and 1990 only 0.1% of layoffs in the United States could be attributed to environmental regulations». There are two reasons in the models of political economic that can explain this discrepancy: first, that the impact on competitiveness is really small, and the gap between public perceptions and reality reflects the success of lobbyists to create public fear of an environmental regulation. Second, the impact on competitiveness is the largest data suggesting that, but employers have been successfully lobbying, where environmental legislation has been strong, to allow the introduction of protectionist measures and subsidies to compensate for this environmental legislation.

Finally, the last question that we confront about lobbyists, is whether their influence both at national and international levels, can lead to unnecessary

coordination of environmental policies or cause important distortions that make it impossible. The answer is that there is no general support in the economics models for the conclusion that the introduction of political pressures makes the coordination of environmental policies to address the loss of environmental quality and transboundary pollution unnecessary or less desirable than not having such coordination. The main conclusion that can be obtained from these models is that discrimination between countries in environmental standards can result from attempts to exploit a comparative advantage or from a special treatment of lobbyists. Harmonization could be justified to limit the influence of lobbyists.

VII. LESSONS FROM THE EUROPEAN UNION MODEL OF REGIONALIZATION FOR CLIMATE CHANGE REGIME INFORMATION

The European Model of regionalization has been based on three principles: (sub-) regionalism, differentiation and issue linkage. The principle of differentiation and progressive engagement is particularly relevant to the ongoing discussion of the post-2012 framework for international negotiations on climate change. In the run-up to the Kyoto Protocol negotiations there was a proposal for the concept of «graduation» of developing countries from the Non Annex I status, according to levels of development by taking on quantified commitments for Greenhouse Gas Emission reductions. The EU model assumes a country move from one to another category at certain thresholds («graduation», «accession» or « Europeanization»). While the former has received a number of proposals for creation of a performance oriented and measurable index, the latter relies on normative and legally fixed thresholds. Hence, it would not be so straightforward to apply EU notions of differentiation and progressive engagement to international change negotiations.

Issue linkage as a negotiation tool has both merits and demerits. Linking negotiations tracks, which require sequential bargaining leading to a package deal, is more complicated than running single tracks in parallel. Another demerit would be possible transaction costs if a new negotiation platform has to be created. It appears that the EU case turned these disadvantages into advantages: a package deal in not only favoured but appears to be accepted as routine, and there is no shortage of an existing framework for linking more than one track.

Therefore another lesson from the European experience is the effective use of issue linkages based on EU members' commitments to the ideal of regional integration *per se* and candidates' obligation to make their regulations conform to EU law (that is, «regulatory approximation»). With its neighbours and partners the EU is prepared to enter into contractual relations or at least long-term stable relations, which are conditional upon their progress in commitments to

regulatory approximation. The structure of EU external relations can help to broaden the possibilities for issue linkage. Issue linkages can be facilitated by not only regulatory approximation but also by policy integration. Some experiences from the EU practice of conditionality for the purposes of environmental integrity could be useful in widening the scope for a package of settling different interests and working out issue linkages. Since environmental integrity is also central to the selection of Clean Development Mechanism, projects by the Executive Board, hosting countries would be more willing to accept such a requirement from the EU and, more interestingly, might find EU- sponsored programmes useful to practice «learning by doing». It is clear however that the best that we can expect from international cooperation would be policy coordination, not regulatory approximation or commitment treaties than in the contractual and institutionalized relations that the EU has developed with its neighbours in establishing region-wide communities.

In the context of a more politically integrated entity, the EU offers the most comprehensive coverage of the trade-environment linkage. In 1985, the Single European Act (SEA) integrated Community environment policy into the treaties (Art. 175 TEC). Since then, protection of the environment has become one of the Union's central policy objectives. It is included in the Community's principles and tasks (Art. 2,3 TEC) and must be taken into account in all Community policies including trade (Art. 6 TEC) In contrast to the WTO framework, environment no longer has the status of an exception which must be positively argued for within strict constraints, but is « a competing or co-equal policy in its own right.»

In contrast to other Community policies such as trade, the EU competence in environment is based on shared responsibility among the member states. The EU has set up a system of common standards and binding norms that can be enforced by the European Court of Justice. Directives are the major legislative instrument used to translate European Environmental objectives into concrete national policies and measures. In fact, EU environmental legislation is very broad and covers more than 300 items, dealing with every aspect of environmental policy. EU sustainable trade is an emblematic example of trade-environment integration. The trade-environment link is addressed not only within environment policy, but all Community policies should be integrated with the environmental dimension.

In EU-Canada relations the first commitment to environmental protection was made in the Framework Agreement for Commercial and Economic Cooperation in 1976, in the chapter on economic cooperation. The EU-Canada partnership Agenda and the Trade and Investment Enhancement Agreement (TIEA) in 2004[5] has enhan-

[5] The EU-Canada Partnership Agenda 2004 is based on the former agreements and it was launched alongside the framework for the Trade and Investment Enhancement Agreement (TIEA), which deals more specifically with trade liberalization.

ced and strengthened the original agreement by adding more specific provisions on environmental cooperation. The Partnership Agenda has a specific section addressing «Cooperation on Global and regional Challenges». Within this context, the importance of environmental cooperation is acknowledged, and the EU and Canada have committed themselves to working together in order to bring the Kyoto Protocol into force. The EU- Canada trade initiative (TIEA) also addresses sustainable development and it requires cooperation on environmental regulations.

The Chile-Canada relationship has a completely different structure, which reflects the NAFTA approach. As NAFTA has a side environmental agreement (NAAEC), symmetrically CAFTA came along with the Canada-Chile Agreement on Environmental Cooperation (CCAEC). It must be said that the environmental institutions of the CCAEC are advanced when compared to the EU bilateral agreements with non-candidate countries which do not tend to set up specific environmental bodies. CCAEC relies on activities of the Commission for Environment Cooperation and the enforcement mechanism, different from NAAEC, based more on cooperative solutions than trade sanctions.

A common characteristic of most Regional Trade Agreements (RTA) is the recognition of the value of information exchange, technical assistance, capacity building, training and education as fundamental practices aimed at increasing the perception of environmental challenges and thus at creating a more favourable context for environmental cooperation. In particular, RTAs do seem to include more climate-friendly provisions than multilateral trade agreements in three important areas. First, RTAs have gone beyond the multilateral trading system in the sense of including provisions preventing the relaxation of domestic environmental laws and the enforcement of those laws. Second, they appear to have promoted technological cooperation on the environment; and third, they have far exceeded present levels of multilateral ambition in requiring each party to prepare periodically, and make publicly available, a report on the state of its environment.

As regards individual differences among RTAs in the manner of addressing environmental protection, individual trading blocs such the EU have all gradually extended regional cooperation from trade outwards to the environment. They have done this by adding in side-protocols or agreements dealing specifically with environmental protection and climate change mitigation. Contrastingly, most inter-bloc agreements have encompassed trade liberalization and issues related to climate protection simultaneously, in the same agreement. Only the Canada-Chile free trade area relies on a side-agreement which was however established along with the trade agreement, exactly following the NAFTA approach.

The conclusion is that the fear of «regulatory regionalism» does not seem to be well founded and RTAs can reasonably be expected to represent a stepping stone towards multilateral agreements rather than a serious impediment. Moreover, regulatory cooperation is not only of increasing interest within indi-

vidual RTAs, but the process of vertical integration is prompting a widening in regional integration across regions, which in the long run might even lead to a convergence between different regulatory systems (see Pelkmans et al., 2000) . In this process of promoting regulatory cooperation, the EU has played a leading role. How far the political stance of the EU in promoting sustainable trade and regulatory harmonization will go in this direction in the future is a real issue. European members states have discovered that operating with a unified position can strengthen their bargaining power.

VIII. BILATERAL COOPERATION IN TRADE AND ENVIRONMENT BETWEEN THE EUROPEAN UNION AND CANADA

Both the EU and Canada share the view that a sustainable environment and a sustainable economy are key to the well-being of their respective societies. Both are active players on sustainable development issues (including their environmental, social and economic aspects), domestically and internationally, and recognise the important contribution that trade and investment policy can play in the development of those objectives.

The formal relationship between the EU and Canada in trade and economic cooperation dates back to 1976, when they signed the bilateral Framework Agreement for Commercial and Economic Cooperation. Formal economic relations between EU Members States and Canada go back much further than EU-Canada relations, long before the European Coal and Steel Community (ECSC) came into force in 1952 and even before Canada became a sovereign nation state in 1867. Excluding various peace treaties, the oldest bilateral economic agreement still in force with an EU Member State that concerns Canada is the 1654 Treaty of Peace and Commerce between Great Britain and Sweden. Since then, there have been over 400 agreements between individual EU Member States and Canada covering a broad range the economic and non-economic issues as Environment and Energy.

The EU and Canada are close trading partners. Europe is the second largest partner for Canada, while Canada, in 2007, was the 11th most important trading partner for the EU. Total EU exports goods to Canada were 27 billion in 2006 and imports from Canada were valued at 20 billion. In 2006, the EU had a trade surplus vis-à-vis Canada of nearly 7 billion and an import coverage of 134%, meaning that export value is 34% higher than import value. The trade surplus corresponded to 15% of total trade between EU and Canada in 2006. Looking at the next Table, it appears that the EU-Canada relationship is significantly under-traded.

The EU's Main Goods Trade Partners 2006, billions of €

	Country	GDP	Exports (fob)	Imports (cif)	Trade Balance	Total Trade Value
1	United States	10.509	268.86	177.88	90.99	446.74
2	China (Excluding Hong Kong)	2.106	63.59	194.27	-130.68	257.86
3	Russian Federation	975	72.41	140.63	-68.23	213.04
4	Switzerland	309	87.00	71.51	15.49	158.51
5	Japan	3.478	44.75	77.26	-32.51	122.01
6	Norway	267	38.44	79.19	-40.74	117.63
7	Turkey	384	49.82	41.65	8.17	91.47
8	South Korea	707	22.83	39.09	-16.26	61.92
9	India	696	24.27	22.57	1.70	46.84
10	Canada	1.120	26.62	19.83	6.79	46.45
	Rest of World		458.61	486.32	-27.72	944.93
	Total World		1157.20	1350.20	-193.00	2.507.40

Note: Countries are ranked by total trade value. GDP is measured in current prices, billions of Euros. Values converted into Euro using ECB annual average exchange rate for 2006.
Source: Eurostat, IMF World Economic Outlook Database, October 2007

The EU has become a more trading partner for Canada, while Canada's relative importance as a trading partner for Europe has slightly diminished over the last five to seven years. Even though trade with Canada has increased, the share of the EU's total exports to Canada has declined slightly from 2.5% in 1999 to 2.2% as has the Canadian market share in EU imports from 2% to 1.5% in 2006. The largest manufacturing sectors in Europe, chemicals and machinery and equipment , are also the largest exports to Canada. These sectors accounted each for 22% of total manufacturing exports in 2007. They are followed by motor vehicles and parts and transport equipment, which accounted for 10.8% and 8.1% respectively.

Canada's main trading partner is the United States, with a total goods trade volume of 390 billion, or 68% of Canada' total goods foreign trade. Canada' trade with the US is six times the volume of trade with the EU, its second largest partner (see the next Table).

Canada's Main Goods Trade Partners 2007, billions of €

		GDP (2006)	Exports (fob)	Imports (fob)	Trade Balance	Total Trade Value
	Country					
1	United States	10,509	240.71	149.60	91.11	390.31
2	European Union	11,636	24.20	33.53	-9.33	57.74
3	China	2,106	6.30	26.00	-19.70	32.30
4	Japan	3,478	6.22	10.49	-4.27	16.70
5	Mexico	669	3.36	11.65	-8.29	15.01
6	Norway	267	2.50	3.62	-1.12	6.12
7	South Korea	707	2.04	3.64	-1.60	5.68
8	Algeria	91	0.34	3.44	-3.10	3.78
9	Taiwan (Taipei)	290	1.03	2.65	-1.61	3.68
10	Brazil	850	1.03	2.27	-1.24	3.30
	Rest of World		17.54	29.20	-11.66	46.74
	Total World		305.27	276.09	29.18	581.36

Note: Countries are ranked by total trade value. GDP is measured in current prices, billions of €. Values converted into Euro using ECB annual average exchange rate for 2006 and 2007.
Source: Government of Canada Trade Data, IMF World Economic Outlook Database, October 2007 and ECB Statistical Data Warehouse.

Canadian goods trade with the EU showed a trade deficit of more than 9 billion in 2007. The importance of trade with the EU has increased over recent years, both as the share of EU products in total Canadian imports, and as the share of exports to Europe out of total Canadian exports. In 1999, Canada bought 10% of its imported goods from Europe. This share increases to about 12% in 2003, and has since remained stable. The share of total exports to the EU has increased steadily from around 5% of total exports in 2003 to over 6% in 2006.

The chemical sector is the most important sector, accounting for almost 16% of imported goods from Canada to the EU. Canada's chemical exports to the EU more than tripled over the period 2002-2007, largely attributable to growth in exports of natural uranium. The transport equipment and metals sectors also account for a large share of imported goods from Canada to the EU, 14% and 13% respectively. Metals exports tripled, driven by significant increases in exports of iron ores, nickel and aluminium. Conversely, while transport equipment exports from Canada to the EU remain significant, they have dropped 15% from 2002 to 2007, seen mainly in decreased exports of aircraft.

Environmental relations between European Union and Canada were launched in 1975 with the signing of an exchange of letters on environmental coo-

peration. The purpose was and is to facilitate exchanges of environmental information and expertise in areas of common interest such as the evaluation of risks to human health and the environment from pollution; the establishment of quality objectives in dealing with environmental pollution, particularly in the areas of water pollution and protection of the natural environment. The established mechanism for policy consultations is the High–Level Dialogue on Environment. High-Level consultations on environmental policy were held until 1983, restarted in 1991 and now take place on a regular basis every 18 months. The consultations are intended to cover a broad range of domestic and international environmental issues of common interest.

In the EU, the division of competence in the field of environmental policy and legislation, both externally and internally, is shared between the Community and the Member States. In Canada, the division of competence in the field of environmental policy and legislation is also shared. Under the Constitution, the federal government and the provinces have the power to make laws concerning the environment and natural resources. Canada and the European Union, participate in the following key multilateral agreements, which also provide the basis for bilateral discussions: The United Nations Framework Convention on Climate Change, the Convention on Biological Diversity, The Stockholm Convention (Chemicals/persistent organic pollutants), The Montreal Protocol (ozone layer depletion), the Basel Convention (trans-boundary movement of hazardous waste and their disposal), the G-8 process (environment), and the Organisation for Economic Cooperation and Development (specifically the chemicals and waste group).

Through the EU-Canada High-Level Dialogue on the Environment, several areas have been identified that would benefit from future discussion and cooperation. One of the most important is the Climate Change. Canada and The European Union have decided to work actively together and with other states to advance negotiations toward a global and comprehensive post-2012 agreement. They will work together and with other states to deliver results in global efforts to confront climate change through the G8, the Major Economies Meetings (MEM) and other complementary processes and multilateral partnerships. Within the Trade and Investment Enhancement Agreement (TIEA), they have proposed to establish a comprehensive dialogue on sustainable trade. Such a dialogue would not be limited to environmental issues but also cover aspects of sustainable development such as corporate social responsibility and the social dimension.

As far as environmental issues are concerned, the proposal EU-Canada dialogue could consist of exchanges of views and information on existing or future initiatives to further promote international sustainable trade, between the EU and Canada as well as multilaterally and in the context of bilateral and regional free trade agreements pursued by the two countries.

CONCLUSIONS

Trade liberalization and the conservation of the environment are important goals taken individually, but given the relationship between the two, it is necessary to coordinate economic policies that lead to their achievement. Locally, trade reforms may be good for the environment, however, so that they must be accompanied by environmental reform measures. The countries are at risk of using environmental policy as a substitute for trade instruments to protect domestic industry providing a suboptimal of Pareto. When the environmental problem is international, the linkage between trade and environment is essential because trade liberalization is likely to affect the bargaining power of countries in environmental agreements, and vice versa, environmental agreements may affect trade. Although there are many links between trade and environment that can increase wealth, the fundamental problem is to build institutions and mechanisms necessary to deal with international environmental externalities. The link between trade and environment requires the internalization of environmental costs in the prices of goods traded internationally, which, can be very complicated, but it is one of the objectives that the economic policy of countries have to focus on. Walley and Zissimos (2000) proposed the creation of a global environmental organization (WEO), which should have the ability to internalize global environmental externalities. It would establish markets where environment could be considered a good, but it would also have a mechanism of coordination between environmental agreements and other multinational agreements to which it relates.

The social costs of environmental policies should not be forgotten. There are several strategies through which the regulator can reduce the costs paid by companies and consumers. For example, designing a joint environmental policy, the regulator can use the gains of environmental taxation to provide incentives to stimulate economic growth. The regulator may also take low-cost instruments, namely, information-based policies and incentive schemes to improve the environmental performance of companies while reducing the impact on its profit. Alternatively, the regulator can adopt policies that encourage trade cooperation and environmental policies that discourage the outflow of capital or the mobility of businesses to countries with a softer environmental standard.

In order to guarantee a self-enforcing agreement a dynamic and necessarily very simplified model has been settled. However, this model takes into account not only the transboundary pollution problem but also the trade relationship between two regions. This specification allows to prove the stability of the cooperation when players are restricted to follow steady-state equilibrium strategies. The analysis of the agreement stability when players are not in the steady state but on the stable path converging to this point could be an interesting extension of this work. This task would require either the use of numerical methods to characterize the equilibrium paths or even a more simplified model.

Both, the European Union and Canada share the view that a sustainable environment and a sustainable economy are the key to the well-being of their respective society. Both are active players on sustainable trade issues. According to Canadian data, The EU is Canada's second largest trading partner, and according to EU data, Canada is the EU's 11th largest good trading partner. Recent studies suggest that liberalization would lead to mutual gains for the EU and Canada, mainly in value added sectors such as transportation equipment, and machinery and equipment.Then, the European Union and Canada have had a High-Level dialogue on environmental issues since 1975. They have decided to work together bilaterally and multilaterally to advance negotiations towards a global comprehensive post-2012 agreement, as well to continue working together and with others countries to deliver results in global efforts to confront climate change through the G-8, the Major Economics Meetings, and the complementary processes and partnerships.

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Resumen

Todos los acuerdos comerciales son contratos incompletos que restringen o eliminan algunos, pero no todos los instrumentos de protección comercial. Una relajación de la política medioambiental puede convertirse en un instrumento alternativo de protección para un país. En el mundo real, los gobiernos tienen muchos instrumentos con los que pueden reemplazar las barreras comerciales. Cuando los países persiguen la maximización de su riqueza, la coordinación de la política comercial y medioambiental debería ser un objetivo a conseguir. Las cuestiones comerciales y medioambientales requieren cooperación internacional, un sistema en el que los países interactúen bajo un conjunto de normas multilaterales, determinadas en negociaciones multilaterales y supervisadas por organismos internacionales. La Unión Europea y Canadá tienen un diálogo sobre cuestiones medioambientales al más alto nivel desde 1976. Unas negociaciones entre Europa y Canadá sobre comercio sostenible, pueden proporcionar un buen escenario para un intercambio de información sobre iniciativas existentes o futuras que pretendan promover un comercio internacional sostenible.