Abstract

At the fourth WTO Ministerial Conference in Doha (November 2001), WTO members agreed to negotiations on "the reduction, or as appropriate, elimination of tariff- and non-tariff barriers to environmental goods and services" (Vikhlyaev 2004). While the definition of EGS remains unclear, several countries, supported by UNCTAD, suggested that the negotiations should not be limited to "clean" or remediation technologies which are produced by Northern countries and face already low levels of protection, and that developing countries could also benefit, provided that the definition of EGS would be extended to "Environmentally Preferable Products" (EPPs), like sustainably grown timber products or organic food. This raises the question of the nature and the distribution of welfare gains under a preferential liberalization scheme for environmentally preferable products. The aim of this paper is to assess the welfare implications of a preferential tariff reduction in organic products ("green"), as compared to a non-specific tariff reduction (green and conventional products). We use a simple model, in which the "green" technology consists of a limited use of a polluting input, and domestic consumers prefer the EPP (vertical differentiation). We show that a preferential tariff cut for organic products increases welfare; however, the gain in welfare is always lower than under a global liberalization scenario (free trade). We finally discuss some non-tariff issues like certification costs and mutual recognition of certification schemes, that are likely to restrict the (limited) benefits from trade liberalization in Environmentally Preferable Products.

Keywords: Commercial Policy; Trade Negotiations; Trade and Environment; Organic Products.

JEL Classification: F130; F180
1 Introduction: The Doha Agenda on Trade Liberalization in Environmental Goods and Services (EGS)

At the fourth WTO Ministerial Conference in Doha (November 2001), WTO members agreed to negotiations on "the reduction, or as appropriate, elimination of tariff- and non-tariff barriers to environmental goods and services" (Vikhlyaev 2004). While the obvious intent is to show that gains from trade and environmental objectives can be reached simultaneously through multilateral negotiations, the Ministerial Declaration raises two questions. The first one is a practical problem linked to the very definition of the "Environmental Goods" or environmental characteristics to be included in the negotiation. The second one -which is the motivation for this paper- is to identify, on a theoretical point of view, the nature and the distribution of welfare gains expected under an environmental-preferential liberalization scheme. In particular, our goal is to assess whether preferential trade liberalization in EGS may be preferable to an unspecific complete liberalization scenario (free trade).

1.1 The debate about the relevant Criteria for Environmental Preferences

The definition of environmental goods and services (EGS), which is the key of the preferential tariff cut in EGS trade, is far from being consensual. Many countries have made their own proposals to define EGS at the WTO Committee on Trade and Environment, and three approaches have been hold: the "Environmental Project Approach", proposed by India; the "List Approach" which is a list of environmental goods submitted by some OECD and APEC’s countries; and the "Integrated Approach" proposed by Argentina, which is a combination of the two former approaches. OECD and APEC’s definition of EGS introduces the idea of technologies, products and services which minimize the environmental risks and damages, e.g. the renewable energies and "end-of-pipe" technologies. In contrast, the UNCTAD sets out the concept of Environmental Preferable Products (EPPs) which "cause significantly less environmental harm at some stage of their life cycle than alternative products that serve at the same purpose, or products whose production and sale contribute significantly to the preservation of the environment". This definition also considers the Process and Production Methods (PPMs) environmentally preferable and leads to include organic agricultural products, fish products from sustainably-managed fisheries or natural fibres products among the EGS (Howse and van Bork 2005, ICTSD and IISD 2005, WTO Committee on Trade and Environment 2005).

Some developing countries fear that PPMs standards could be misused for a "green" protectionism; however, other developing countries such as Brazil have also supported the EPP definition (PPMs standards) which would add up to the original list some items from chapters 1 to 24 (agricultural, food and fishery products) (Howse and van Bork 2005, ICTSD and IISD 2005).

Previous disputes on environmental grounds within the multilateral trade system (GATT and later

\footnote{Canada, the European Communities, Japan, Korea, New Zealand, Qatar, Switzerland, Chinese Taipei and the United States}
WTO) tended to suggest that using PPMs (the way products are made) to discriminate among imports would be a violation of the Article I (MFN treatment) and Article III (National Treatment) of GATT (Melser and Robertson 2005). In this case, the extension of the negotiations on EGS in order to include Environmentally Preferable Products relying on "green" PPMs would be difficult. Nevertheless, this argument doesn’t remain valid within the multilateral context of trade negotiation on EGS products. In GATT and WTO disputes (Tuna-Dolphin dispute, Shrimp-Turtle dispute, Spanish Coffee case) the panels punished the unilateralism of measures against the equity between countries and in favor of "green" protection. The EGS preferential liberalization issue differs from the previous cases because PMMs would be used in a multilateral sense, not as a unilateral trade restriction (Howse and van Bork 2005).

1.2 Trade Policy and the Environment: theoretical arguments

Few theoretical papers have studied the practical implications of WTO trade liberalization on EGS. Carpentier et al. (2005) and Singh (2004) have analyzed the issue related to market access and development, while Tothova (2005) is the first contribution that also introduces the notion of EPP in the definition of EGS and its consequences on the EGS trade liberalization. Finally, LeClair and Franceschi (2006) provide some empirical estimates for differential tariffs taking into account (positive and negative) externalities in international trade.

However, over the last 30 years, many theoretical papers have studied the welfare effects of trade liberalization in the presence of environmental damages. More specifically, one wave of the trade-and-environment literature has analyzed the consequences of (unilateral and multilateral) trade policies on the environment and conversely, the effects of environmental policies (taxes and standards) on the patterns of trade and welfare. More recent contributions deal with the coexistence and coordination of trade and environmental policies.

Copeland and Taylor (2003) state that while trade liberalization itself does not result in environmental damages, the consequences of an inefficient environmental policy (rigidity vs. flexibility) can be worsened under free trade. However, the net consequences of trade on the environment depend on comparative advantages and on complex income and substitution effects.

International trade agreements (ITA) have reduced governments’ latitude in defining trade policies and thus policy makers may be tempted to use other instruments such as environmental regulation (Rauscher 1999): indeed environmental policy may be used to reinforce monopoly power in trade by improving the terms of trade (Ludema and Wooton 1994) and its stringency and differences between countries may lead to changes in comparative advantages and specialization (Cole et al. 1998, Cropper and Oates 1992, Chichilnisky 1994, Jenkins 2003). Though ITA sometimes incite to environmental dumping behavior, they may also help to motivate some countries to increase their environmental standards (e.g., technical assistance of the TBT Committee). This mechanism may be beneficial to the environment when countries are not initially very concerned by environmental problems but in same cases it can lead to stricter environmental regulations than needed due to strategic behaviors (Bommer and Schulze 1999).
The economic analysis of the cross effects between trade and environmental policies has started with the pioneering article of Markusen (1975) and has become an important part of the trade-and-environment literature in the nineties. This paper analyzes second best policies when only one policy is available to deal with environmental and trade problems.

Policy coordination (that is, coordination of trade and environmental objectives in the national level) and "the pollution content tariff" try to correct the inefficiencies introduced by trade liberalization with a non-optimal environmental policy. The pollution content tariff emerges as the solution of a transboundary pollution problem. Since a country cannot tax foreign producers due to their polluting emissions, a pollution content tariff helps to implement the internalization of the damage by the polluting country (Copeland and Kotwal 1996).

While public regulators in large countries may have an incentive to distort environmental policies in order to achieve competitive advantage, for a small economy, trade liberalization is always beneficial when paired with the appropriate environmental policy instrument (Krutilla 1991, Conrad 1993, Barrett 1994, Kennedy 1994, Krutilla 1999). More generally, when a country suffers from a domestic pollution problem, policy coordination leads to a first best solution: Pigouvian tax and the standard optimal tariff. However, Pigouvian taxes may not always be an available instrument for the domestic policy maker, due to political reasons or pressure. This is especially true when it comes to agriculture, where the strict implementation of the polluter-country-principle should be translated e.g. into a tax on polluting inputs (fertilizers, pesticides...), while many European governments are reluctant to face farmers' hostile reactions.

The aim of this paper is to investigate whether a differentiated trade policy for EGS and conventional products may be an alternative to a first best regime. In section 2 we develop our analytical framework. We then compare the welfare consequences of a preferential tariff cut for "green" products and a full trade liberalization (free trade) and we illustrate the results with a numerical analysis. Then last section discusses the consequences of the EGS trade liberalization for a large country and some non-tariff barriers issues (certification costs and mutual recognition of certification schemes), and provides some conclusions.

2 The analytical framework: a small economy with a production externality

We start with a simple partial equilibrium model of a small, competitive, two-sector economy which is a net importer in a given agricultural commodity, while domestic production also takes place. The agricultural commodity can be grown with two alternative production methods which we call hereafter green "G" (e.g., organic) or conventional "C", resulting in more or less pollution. The negative production externality is assumed to be borne domestically (i.e. no transboundary pollution). Moreover, we assume that consumers are able to distinguish green products from conventional ones (perfect labeling), and that
they display some preferences for organic products, whatever the origin\(^2\).

The production of C and G requires two production factors, labor (L), and capital (K), which is considered a "dirty" input to some extent - e.g. pesticides, fertilizers. The production technology displays decreasing returns to scale and is the same in both sectors (green and conventional). However, the product can be sold as "green" only if it was produced with a limited use of the polluting input: in other words, we assume that there is an exogenous threshold \(K\) (defined by regulation) on the use of \(K\) by unit of output \(y\):

\[
    \frac{K}{y} \leq \bar{K}  \tag{1}
\]

To simplify the analysis, we suppose that the value of the threshold \(\bar{K}\) is low enough to ensure that, for the range of input prices considered, the constraint is always binding for the green producers. Since the cost minimization program for G is the same than for C but is constrained, without loss of generality we can write that :

\[
    c_C(y) \leq c_G(y)  \tag{2}
\]

We also assume that the definition of a "green" product is the same everywhere in the world, and that there is no regulatory barrier to the import of organic products.

Decreasing returns imply that cost functions are increasing and convex, marginal costs strictly increasing, and as producers are price takers this defines the supply functions\(^3\) \(S_G(p_G) = C_{mG}^{(-1)}\).

On the demand side, we assume that domestic consumers display preferences for the "green" product. This is translated into a quasi-linear utility function of a representative consumer, consuming various amounts of green products, conventional products and a numeraire. The traditional assumptions are made (increasing in each of its arguments \(U_G > 0, U_C > 0\), concavity of the utility function is granted by the positive sign of the determinant of the Hessian \((U_{CC}U_{GG} - (U_{CG})^2 > 0))\). Parameters of the utility function are such that products are imperfect substitutes and G is preferred to C for the same price (the marginal utility of an extra unit of C is smaller than the marginal utility of an increase in G consumption \((U_C < U_G))\).

Since G and C are imperfect substitutes, demand functions for each type variety depend negatively on its own price and positively on the price of the substitute.

\[
    D_C = D_C(p_C, p_G)  \tag{3}
\]

\(^2\)This is an important assumption, meaning that what consumers value in the green product is the limited use of a polluting input itself, and not the protection of the *domestic* environment. This can mean either that they value the preservation of soils as a global public good, or that they think that organic products are healthier.

\(^3\)Note that, because the technology is the same for G and C, there is one value of \(y\), when the constraint (1) becomes binding, such that \(c_C(\bar{y}) = c_G(\bar{y})\). This means that for all values of \(y \geq \bar{y}\), the marginal cost \(C_{mG}(y)\) is greater than \(C_{mC}(y)\): in other words, the conventional supply function is more price-elastic than the "green" one.
\[ D_G = D_G(p_C, p_G) \]  

The domestic welfare for this small open economy is decomposed into consumer surpluses, producer surpluses, tariff revenues and environmental externalities \( E_i, i = C, G \) in both sectors. Indeed, even though the “green” sector makes a limited use of the polluting input relative to the conventional sector, the negative externality from production is not zero. We assume a simple linear damage function, where \( \phi \) is a positive parameter, \( r \) and \( w \) the prices of the polluting- and non-polluting-inputs (capital and labor), and \( K_C(y_C, w, r) \) the demand of polluting input in the conventional sector:

\[ E_C = \phi K_C(y_C, w, r) \]  

\[ E_G = \phi K_G y_G \]  

On the policy side, we assume that the initial situation is as follows:

- There is no environmental regulation implemented (e.g., no taxes on polluting inputs) other than an efficient control for organic products\(^4\) (domestic and imported);
- The country imports both the green and the conventional commodity with the same MFN tariff \( \tau \);
- The country is taking part in multilateral negotiations on tariff reductions, which shall result either in an uniform reduction of \( \tau \), either in a preferential tariff reduction for green products \( \tau_G < \tau_C \).

The initial equilibria on both markets, when domestic prices are given by world prices and the uniform ad valorem tariff \( \tau \), are depicted in figure 1. Following Krutilla (1991), we also represent, above the inverse supply curves (private marginal cost), the social marginal cost; thus the grey shaded areas, between the private- and social- marginal cost functions and the domestic equilibrium supply \( S^* \), represent the value of the environmental damage in both productions.

\(^4\)As mentioned above, the absence of environmental regulation may result from heavy agricultural lobbying; another explanation may be a government assuming that the very existence of “green” substitutes is enough to solve the pollution problem.
3 Reducing tariffs: Free trade vs. ”green” trade liberalization

One of the key issues in discussing the expected benefits from preferential liberalization in Environmental Goods and Services is: does it make sense to distort tariffs, when the ultimate goal of multilateral negotiations should be a complete removal of all tariffs? In line with the aforementioned literature, the answer to this question for an individual country depends on several factors:

- First, the nature of the externality (production vs. consumption, local, global or transboundary), because it determines the distribution of environmental benefits;

- Second, the trade specialization pattern (importing or exporting country);

- Third, the size of the economy (market power) with optimal tariffs aimed at improving terms of trade

In our simple case of a small importing country with a local production externality, the analysis is complicated by the fact that domestic consumers distinguish and value green products differently.

3.1 Direction of Welfare effects

We now focus on the consequences of a reduction in tariffs. The expected welfare variations are as follows:

- Consumers: gain from lower prices, with some substitution effects between consumption of green and conventional products;

- Producers: loss from increased competition with world market commodities;

- Externality: the shift from domestic production to more imports results in less domestic pollution;

- Government: losses from tariff revenue.

For the sake of simplicity, we assume that in the uniform tariff reduction scenario, tariffs will be set to zero for both green and conventional products\(^5\) (free trade), while in the preferential liberalization scenario, the tariff of the green product will be set to zero while the tariff for the conventional good will remain unchanged.

Table 1 summarizes the mechanisms at stake in the variation of domestic welfare under the two tariff-reduction scenarios:

\(^5\)For a small importing economy, the domestic prices are given by the world prices (denoted with a star) increased by the amount of the initial ad valorem tariff \(\tau\) : a complete removal of tariffs on both the conventional and the green good results in multiple price change. Thus a change in consumer’s surplus through multiple price change depends on the order in which these price changes are considered. For consumers, a change in income leads to both income and substitution effects between goods which the individual holds preferences. Thus, in order to have a unique consumer’s surplus measure, the income effect for the individual must be zero. Since it is obviously not, in the present preliminary version we approximated the variation in consumer surplus by the variation in the indirect utility (to be changed).
Table 1: Variation in domestic surpluses under the alternative liberalization scenario

<table>
<thead>
<tr>
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<th>Free Trade</th>
<th>EGS Preferential Liberalization</th>
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<tbody>
<tr>
<td>Δ Consumer surplus</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>ΔπG</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ΔπC</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Δ Tariff Revenue</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Δ Externality</td>
<td>++</td>
<td>+</td>
</tr>
</tbody>
</table>

So free trade is always a better alternative not only (obviously) for consumers, but also for the environment. This is because of the shift from domestic production of conventional (polluting) products to imports - while the conventional sector remains protected from international competition under a preferential liberalization for environmental goods. However, the overall gain from tariff cuts under both scenarios cannot be immediately compared - and require some functional specifications.

3.2 A numerical analysis

In order to explore the previous welfare effects we gave some particular forms to utility and production functions. The utility is a quadratic utility function whose parameters values fulfill all the conditions detailed in the theoretical model. The production function is a Cobb-Douglas with decreasing returns to scale where parameter α and β are both equal to 0.25.

Though the equilibria and surpluses have been derived analytically under the initial situation (homogenous tariffs on green and conventional products) and the two alternative scenarios (free trade and preferential liberalization in green products), the complexity of results leads us to illustrate them by numerical simulation in order to keep the paper readable.

In the first set of simulations (used to draw the figures), we set the initial tariff to 0.5, assume high demand parameters, a high environmental impact (ϕ = 0.5) and a threshold value K = 0.3 in the use of the polluting input (by unit of output) for the green product.

In this case, though both liberalization scenarios are welfare improving, free trade results in a higher increase in domestic welfare (+11.4%) than the preferential liberalization in green products (+6.3%).

![Figure 2: Scenario 1: Free trade](image-url)
More generally, in all our simulations sets, free trade performs better. In the other sets of simulations, we tested the following changes in parameters:

- Case 2: same than 1 with lower parameters in the demand function;
- Case 3: same than 1 with lower initial tariffs ($\tau = 0.3$);
- Case 4: same than 1 with lower environmental impact of the polluting input ($\phi = 0.3$).

<table>
<thead>
<tr>
<th>Case 1</th>
<th>Case 2</th>
<th>Case 3</th>
<th>Case 4</th>
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<tr>
<td>FT EGS</td>
<td>FT EGS</td>
<td>FT EGS</td>
<td>FT EGS</td>
</tr>
<tr>
<td>$\Delta$ Welfare</td>
<td>11.4% 6.3%</td>
<td>11.4% 6.3%</td>
<td>8% 2.4%</td>
</tr>
<tr>
<td>$\Delta$ Consumer surplus</td>
<td>79.4% 62.6%</td>
<td>59.4% 48.1%</td>
<td>55.2% 41.4%</td>
</tr>
<tr>
<td>$\Delta \pi_C$</td>
<td>-13.7% -13.7%</td>
<td>-13.7% -13.7%</td>
<td>-8.5% -8.5%</td>
</tr>
<tr>
<td>$\Delta \pi_C$</td>
<td>-3.5% 0%</td>
<td>-3.5% 0%</td>
<td>-4.3% 0%</td>
</tr>
<tr>
<td>$\Delta$ Tariff Revenue</td>
<td>-55.3% -43.6%</td>
<td>-35.3% -29.1%</td>
<td>-39.4% -31.3%</td>
</tr>
<tr>
<td>$\Delta$ Externality</td>
<td>-4.5% -1%</td>
<td>-4.5% -1%</td>
<td>-5% -0.7%</td>
</tr>
</tbody>
</table>

Tariff revenue decreases more under a total trade liberalization than under a preferential-liberalization in EGS. The reduction of the environmental damage is also greater in the first scenario than in the second one, because the elimination of the EGS tariffs doesn’t affect conventional production and thus the environmental damage linked to this sector.

In any case, the highest net increase in welfare is obtained under free trade. From an environmental perspective, the local pollution is avoided, consumers benefit from lower prices. The only domestic winners from a preferential trade liberalization scenario for EGS are the domestic polluters (producers of conventional goods), because their prices are not affected by the tariff cut, and the government, thanks to a smaller reduction in tariff revenue.

Comparing the effect of parameter’s changes, the simulations suggest that demand parameters don’t matter for the total welfare variation. In this case, consumer surpluses variation and tariff revenue
variation are exactly compensated as in the initial situation. However, the initial level of protection and the environmental impact of production seem to be important parameters for welfare variation: the lower the initial tariffs and the environmental impact parameter, the smaller welfare variation.

4 Concluding remarks and extensions

Rather unsurprisingly, our results show that free trade is optimal for a small importing country even when it is not possible for the domestic regulator to implement an optimal environmental policy allowing for an internalization of the damage. Even on an environmental point of view, free trade is a better alternative to the missing environmental regulation than a preferential trade liberalization in environmental goods and services. This is because we considered a production externality, so that importing cheaper products while the pollution is shifted to foreign producers is of course a win-win solution from a domestic point of view.

Under our assumptions, an net importing country has no rationale for discriminate among imports depending on environmental PPMs (and this is true even though domestic consumers may display strong preferences for the green product). However, this is a very simple model, and before burying the WTO negotiations on EGS, more work is needed in order to take into account, e.g., bilateral trade, consumption externalities, terms of trade effects, etc.

The definition of an “environmentally preferable product” that we used -an exogenous constraint on the use of the polluting input- also deserves a deeper analysis. Indeed, this definition is an environmental standard and it could work as a non-tariff barrier for trade.

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