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Things have changed (or Have they?) Tariff protection and environmental concerns in the WTO

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Things have changed (or Have they ?) Tariff protection and environmental concerns in the WTO*

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Abstract

This paper considers the APEC and proposed EGA agreements which grant tariff concession in favor of "green" goods. We find that the practical significance of the APEC agreement should not be overestimated as it involves modest tariff concessions over a subset of goods which are not heavily traded. Still, these agreements involve a paradigm shift to the extent that they use tariffs concessions negotiated on a purilateral basis as a policy instrument to meet public policy concern, instead of making market access conditional on meeting national regulations. We model the mechanism through which these tariff preferences provide incentives to change production in favor of green goods in exporting countries and highlight the challenges that the implementation of these agreements involve.

JEL Classification:K40

Key Words: WTO, APEC, EGA, Tariffs, Terms of Trade, ex outs

1 Introduction

This paper focuses on the recent (plurilateral) initiatives to reduce tariffs on "environmental" or "green" goods. There are two iniatives on this front; first, the APEC (Asian Pacific Economic Cooperation) initiative which involves a

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voluntary reduction of tariffs across 21 WTO members[1] and 54 HS 6 products categories, and second, the EGA (Environmental Goods Agreement) in which a number of other WTO members attempt to include tariff reductions on the APEC list of products in their schedules of concessions.

In these agreements, participating countries create new subcategories of products that are meant to be environmentally friendly (so called, "ex outs") within HS categories and provide lower tariffs for these products. For instance, a new subcategory labeled solar heaters was introduced among the category of 'instantaneous or storage water heaters' (HS 841919). The tariff applied to this subcategory is lower than the tariff applied to others goods in the six digit category, reflecting the objective to encourage the imports of environmentally friendly goods. APEC target was to ensure that signatories would reduce duties for the listed goods to maximum 5% ad valorem.

APEC members have now, in large part, implemented the agreed tariff reductions and apply them on a most favored nation (MFN) basis (i.e. without discrimination). The EGA negotiations are, at the time of writing, still inconclusive. These initiatives raise important issues from a number of different perspectives.

First, this is (possibly) a change of paradigm with respect to the motivation underlying the determination of tariffs. The prevailing view is that tariffs are determined within the GATT/WTO as an exchange of market access which improves on the outcome of unilateral tariff setting which otherwize optimise the terms of trade. Each country reduces tariffs below what would be (unilaterally) optimal for some imports in exchange for a reduction of the tariff that trading partners would apply to its exports. The APEC and EGA intiatives introduce environmental protection as another motivation when deciding on the level of tariffs. But nothing would prevent to modulate tariffs according to other public policy concerns.

By the same token, the APEC and EGA agreement might represent a paradigm shift with respect to the way in which public policy concerns are dealt with in the GATT/WTO. The GATT discipline was, for all practical purposes, a tariff bargain with insurance against concession erosion that might arise because of domestic regulations, possibly reflecting legitimate public policy concerns. Tariffs would be curbed through 'tariff bindings' (tariff concessions), a promise to the effect that the level of tariffs would not increase above and beyond a multilaterally agreed threshold. Concession erosion would be adressed by the commitment that domestic policies, e.g., policies applied to domestic goods and imported goods after customs clearance, should be applied in nondiscriminatory manner. Since domestic policies were unilaterally defined (as opposed to tariffs that were multilaterally negotiated), nondiscrimination would guarantee that trading nations would not be in position to provide domestic goods with an advantage beyond that embedded in tariff protection. For instance, domestic policies in favor of the environement should not discriminate in favor

[1] Australia, Brunei, Canada, Chile, China, Hong Kong, Taiwan, Indonesia, Japan, Korea, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, Philippines, Russia, Singapore, Thailand, USA, Vietnam

of domestic goods. Nonviolation complaints is an additional, GATT idiosyncratic, element that protects concessions, allowing affected trading nations to request compensation for lost (expected) trade resulting from otherwise GATT-consistent measures. The rationale for this approach was that the GATT contract was (necessarily) incomplete, and a number of policies that had not found their way into the contract explicitly could (negatively) affect the value of tariff concessions. The best example of successful nonviolation complaints concerns litigation against subsidies, an instrument that only gradually came under the multilateral disciplines.

Hence, whereas environmental protection normally takes the form of regulation for which trading nations have discretion subject to the discipline of non discrimination, the APEC and the EGA approaches it through tariff preferences. We discuss the consequences of such an approach for domestic and foreign firms below, in the context of a simple model which emphasizes the incentive to develop new green goods.

The paper is organised a follows. Section 2 provides further background on the APEC and EGA agreements. Section 3 provides an overview of the outcome of APEC negotiations. We find that there are only 14 countries (out of 21) for which the APEC agreement is relevant as some countries had nothing to adjust in the first place and some others did not implement any change. We also find that the share of trade affected by the concessions is very small, mostly because the 54 products concerned by the agreement are not heavily traded. Second, focusing on these products, we find that the tariff preference granted under the agreement are on average quite modest. This does not come as surprise given that outstanding tariffs are generally rather low. Still, there is a great disparity across countries; Mexico is outlier with a (trade weighted) average reduction of tariffs in excess of 10%. Korea and to a lesser extent Vietnam, Russia, Canada and China have also granted significant concessions. At the other extremes, the concessions are negligible for the US (as well as the Philippines and Indonesia).

Section 4 develops a simple model of tariff setting in which a country can differentiate tariffs that were initially set to optimise the terms of trade in order to encourage the imports of goods that are environmentally friendly. We find that such a policy can encourage foreign firms to produce green variant of their goods and that the level of tariff concessions depend on cost incurred in producing these variants. We also find that when the external benefit from inducing the import of green goods is such that a tariff preference is attractive in terms of welfare, importing countries have an incentive to set the tariff preferences at a level such that all foreign firms produce a green variant. This arises because the greater competition induced by further entry ensures that a smaller proportion of the tariff concession is appropriated by foreign firms.

Section 5 discusses how the APEC and EGA agreements fit into the WTO system. We discuss the motivation behind these agreements as a response to the way in which the WTO has dealt with the issue on non discrimination and the uncertaintly surrounding the legal status of these agreements. Section 6 concludes.

2 Background on APEC and EGA negotiations

As mentioned above, the APEC and EGA negotiations involve the definition of tariffs beyond the six digit level. The approach towards the level of tariff concessions has changed since the early GATT days. Some WTO members continued negotiating at the HS six-digit level, where tariff lines are expressed in a 'regulation-neutral' manner. Others nevertheless, have stopped doing so. Indeed, the post-Tokyo round era marks the widespread negotiation of concessions at the eight-, ten-, or twelve-digit level. At first, it was the European Union (EU) and the U.S. that had adopted this approach. Many industrialized countries, members of the OECD (Organization of Economic Cooperation and Development) have since emulated the attitude of the trans-Atlantic partners. Article 3.3 of HS allows for subclassifications of the six-digit harmonized classifications of all goods:

> Nothing in this Article shall prevent a Contracting Party from establishing, in its Customs tariff or statistical nomenclatures, subdivisions classifying goods beyond the level of the Harmonized system, provided that any such subdivision is added and coded at a level beyond that of the six-digit numerical code set out in the Annex to this Convention.

Subclassifications can be unilateral (the majority of times so far), plurilateral or multilateral. The negotiation of the APEC list is the first plurilateral effort. Importantly, however, the subcategories are not (so far) harmonised, so that different countries have different subcategories. Countries can thus express their societal preferences through elaborate tariff lines instead of regulation. The original (pre-EGA) unilateral recourse towards elaborate classifications is to some extent paradoxical, as the whole purpose of the 'Brussels Nomenclature', and the Harmonized System (HS) that it led to, was to introduce a common language to describe goods on which tariff concessions would be subsequently negotiated. It was felt nevertheless, that a balance had to be struck between uniform tariff descriptions, and "breathing" space for those trading nations that produced wider range of goods and their varieties. The APEC and EGA negotiations are an application of the possibility offered through Article 3.3 of HS.

Vossenaar (2014) and (2016) provides a very comprehensive discussion of the negotiation of the APEC list of environmental goods. The 21 APEC members essentially pledged that the tariff imposed on various environmental goods would not exceed 5% by the end of 2015. The APEC negotiators worked on the basis of HS commitments and had to devise "ex outs", that is, subheadings that covered environmental goods only out of a wider category, which as mentioned above, might differ across countries[2]. The APEC tariff reductions have not, at the

[2] The full list of products covered, as well as the ex outs, that is the products that come under the HS 6 headings that qualify as environmental goods is accessible in https://www.apec.org

moment of writing, been incorporated into national schedules. APEC members apply them on voluntary basis. As already stated supra, they are applied on an MFN-basis[3].

In 2014, 14 WTO members (counting the EU as one[4]) initiated the EGA negotiations. The number of negotiators has now risen to 18, representing 46 members. Negotiations were supposed to wrap up by December 2016. Recently, the two co-chairs, Mike Froman (US), and Cecilia Malmstrom (EU), issued a statement to the effect that negotiations had failed to conclude. The process is now frozen but it does not mean that EGA has been abandonned and negotiators are contemplating the next steps[5]. Failure to conclude the EGA though, has not led to revocation of the APEC concessions, which continue to apply. EGA negotiators followed the APEC model of "ex outs", as Santana (2015) explains in his account of the first phase of talks.

Finally, it is striking that the APEC ex outs have been used to enhance environmental protection at home by improving access to "green" goods but not to enhance environmental protection abroad. To provide but an illustration: there are tariff lines for solar heaters (as per the APEC list), but no tariff lines for the manner in which solar heaters have been produced in the exporting market. So, even if a foreign country produces solar heaters in the most environment-unfriendly manner, it will still receive a low tariff for exporting an environmental good to Home. APEC countries, in other words, do not appear to be concerned about the environmental incidence of externalities at the production level but solely at the consumption stage. This feature could, of course, change in the future, as the negotiations is still ongoing, and more ex outs can always be devised.

3 The outcome of the APEC agreement

This section discusses the outcome of the APEC agreement. Table 1 reports on the mean, standard deviation and median of the tariffs imposed by the 21 countries participating in the APEC before (in 2015) and after the agreement in the

Since ex outs are usually expressed at the eight-digit level, their numbering might differ across national schedules. The reader will have to compare national descriptions of the eight digit headings in order to evaluate commensurability of concessions entered. On the overall level of duties, see Bown and Irwin (2016). Hoekman and Mavroidis (2017) explain the modalities of scheduling.

[3] According to the APEC reports, the commitments for Thailand and Malaysia are still under considerations. Will not consider these two countries any further. See 2016 APEC Economy Progress in Implementing their Commitments to Reduce Tariffs on the 54 Products in the APEC List of Environmental Goods to Five Percent by the End of 2015, 2016 CTI Report to Ministers.

[4] Counting the UK as part of the EU.

[5] There is potentially a lot at stake. For instance, the USTR estimates trade in environmental goods to approximate $1 trillion in 2015 prices. The New Zealand Foreign Affairs and Trade Ministry estimates that trade in environmental goods will rise up to $3 trillion by 2020.

54 product categories concerned by the agreement[6]. It is immediately apparent that the agreeement is irrelevant for Hong Kong, Japan, Peru and Singapore as these countries did not impose any tariff for the products concerned prior to the agreement. Table 2, which reports the change in the mean and standard deviation in tariffs following the commitments, reveals that Australia, New Zealand and Brunei did not make any change to their tariffs. Hence, there are only 14 countries for which the APEC agreeement is at all relevant. The highest reductions in average tariffs are found in Chile, China, Korea and Mexico, with a reduction of roughly one percentage point. Russia (0.59) and Taiwan (0.27) have an intermediate reduction in tariffs. The reduction is negligible in the US, The Philippines and Vietnam. In any event, the reduction in the average tariff is very modest.

Table 1:

	Mean 2015	Std.Dev. 2016	Median 2015	Mean 2016	Std.Dev. 2016.1	Median 2016
Australia	2.600	2.520	5	2.600	2.520	5
Brunei	1.970	2.450	0	1.970	2.450	0
Canada	0.360	1.350	0	0.260	1.150	0
Chile	6	0	6	5	0	5
China	5.010	5.680	5	3.990	4.290	5
Taiwan	1.950	2.740	0	1.680	2.300	0
Hong Kong	0	0	0	0	0	0
Indonesia	5.060	2.160	5	4.970	2.050	5
Japan	0	0	0	0	0	0
Korea	6.130	3.290	8	5.170	3.030	5
Mexico	3.570	6.090	0	2.600	4.940	0
New Zealand	3.110	2.440	5	3.110	2.440	5
Peru	0	0	0	0	0	0
Philippines	1.660	1.790	1	1.560	1.510	1
Papua New Guinea	0.270	2.020	0	0.090	0.670	0
Russia	1.040	2.150	0	0.450	1.350	0
Singapore	0	0	0	0	0	0
USA	1.580	2.320	0	1.510	2.180	0
Vietnam	0.380	1.680	0	0.270	1.070	0

Table 2:

	Difference Mean	Difference Std.Dev.
Australia	0	0
Brunei	0	0
Canada	0.100	0.619
Chile	1	0
China	1.030	3.428
Taiwan	0.270	1.361
Hong Kong	0	0
Indonesia	0.090	0.678
Japan	0	0
Korea	0.960	1.400
Mexico	0.960	2.840
New Zealand	0	0
Peru	0	0
Philippines	0.090	0.519
Papua New Guinea	0.180	1.348
Russia	0.590	1.771
Singapore	0	0
USA	0.070	0.366
Vietnam	0.110	0.750

These averages can however conceal significant disparities at the product

[6]Descriptive statistics are computed over all independent tariff lines, including ex outs for boh years. As mentioned above, the tariff commitments of Malaysia and Thailand are still under negotiation.

level. A list of the HS categories and ex out for which the members have provided a reduction in tariffs is provided in the appendix. We observe important individual reductions in China (up to 30 percentage points for one product, a reduction of 20 percentage point for another products and roughly 10 percentage points for another two). Mexico has reduced tariffs by 10 percentage points for as many as 22 ex outs. Russia has a tariff reduction of 7.5 percentage points for three products.

Table 3 considers the significance of the products for which concessions have been made. We do not have trade data the level of the ex outs but only at the HS 6 level. Hence, we assume that whenever a concession has been granted for an ex out within an HS6 category, the concession applies to the overall value of trade within the HS category. This is a very conservative assumption which biases upwards our assessment of the significance of the concessions. We observe that the product category in which concessions have been made account for less than six percent of overall imports in all countries concerned[7].

Table 3: Overall imports impacted by tariff reduction, as percentage of total imports

Country	% tot imports
Canada	0.117
Chile	2.53
China	2.53
Indonesia	0.041
Korea	5.995
Mexico	2.298
Philippines	0.027
Russia	1.114
USA	0.058
Vietnam	0.18

In order to further assess the significance of the concessions offered by the members, we consider, for each member, the value of imports for which it has provided a concession as a percentage of the value of trade on which concessions could have been granted in the context of the agreeement. This is measured by the value of trade for which the import tariffs were strictly positive in 2015. Result can be found in table 4, which also reports the weighted average reduction in the tariff (namely the reduction in tariffs, in percentage points, weighted by the share of the value of imports that the product accounted for in 2015 in total imports of products in the APEC list for which tariffs were strictly positive).

We observe that Korea and Mexico have made important concessions. The former has reduced (trade weighted) tariffs by 5 percentage points on almost

[7] We consider overall imports of the products in which concessions have been made and not only the imports from the APEC members as tariff reductions are applied on a MFN basis.

all goods under the agreement. Mexico has granted a 11% (trade weighted) reduction in tariffs for roughly 70% of its imports. Chile provides a very modest (1%) reduction over all categories. Russia provides a moderate reduction (2.5%) over 50% of its imports and China a 1% reduction over 26% of its imports. At the other extreme, the concessions of the US are symbolic.

Table 4: Total tariff reductions

Country	% of volumes for nonzero 2015 tariffs	Weighed average reduction in tariffs
Canada	30.64	1.212
Chile	100	1
China	26.41	1.044
Indonesia	1.37	0.136
Korea	96.55	5.204
Mexico	69	11.914
Philippines	2.65	0.194
Russia	48.83	2.569
USA	1.52	0.082
Vietnam	23.28	3.432

Finally, we consider whether the concessions have been concentrated in particular product category. Table 5 presents the overall import values and trade weighted reductions in tariffs per HS category.

We observe that there are few product categories for which both the trade weighted reduction in tariffs and overall trade is significant. Taking a 3% trade weighted reduction in tariffs and overall trade in excess of a billion as thresholds, we see that the impact is significant only for "Water filters" (8421.21), "Wind Powered electric generating sets" (8502.31 and 8502.39) an" Optical measuring and checking instruments" (9031.49). Overall, one should thus not overestimate the aggregate significance of the APEC agreement.

4 A model of preferential tariffs for green goods

This section develops a model of tariff setting in which a preferential treatement can be given to green goods. It is obvious that if some "green" goods generate positive consumption externalities, it will be attractive to provide tariff concessions in order to reflect them. In this section, we consider another feature of tariff concession, namely the extent to which they can provide incentives for the development of green goods. The objective of the model is to investigate whether such a policy is effective in encouraging the development and imports of green goods and identify the factors which affect its optimal design. We assume that countries initially set optimal tarifs which maximise domestic welfare. In line with the description of the EGA and APEC above, we assume that countries

Table 5:

	Total Imports	Trade weighted measure of concession
4418.72	303, 037, 827	3.661
8402.90	914, 994, 139	0.488
8404.10	363, 596, 115	0.237
8404.20	81, 718, 897	0.971
8404.90	252, 325, 448	0.678
8406.90	1, 286, 187, 538	1.389
8411.82	1, 238, 532, 920	1.800
8411.99	6, 276, 275, 496	0.256
8412.90	2, 773, 153, 711	0.453
8417.80	933, 109, 028	1.330
8417.90	750, 025, 630	0.206
8419.19	633, 480, 097	0.542
8419.39	863, 900, 838	1.358
8419.60	906, 329, 711	3.837
8419.89	3, 565, 745, 864	1.135
8419.90	2, 325, 370, 163	0.218
8421.21	2, 897, 826, 523	3.545
8421.29	2, 923, 191, 038	1.206
8421.39	7, 136, 261, 639	3.162
8421.99	3, 924, 245, 951	1.622
8474.20	1, 052, 782, 225	0.995
8479.82	1, 722, 758, 245	1.366
8479.89	17, 125, 203, 699	1.498
8479.90	5, 513, 141, 144	0.564
8501.64	1, 095, 696, 884	0.809
8502.31	1, 352, 159, 824	3.223
8502.39	1, 980, 379, 992	3.151
8503.00	5, 092, 036, 275	0.843
8504.90	3, 282, 217, 252	1.339
8514.10	982, 909, 362	0.323
8514.20	294, 475, 124	0.759
8514.30	470, 635, 019	0.098
8514.90	484, 226, 729	0.314
8541.40	25, 583, 596, 172	0.034
8543.90	2, 734, 250, 282	0.316
9013.80	49, 030, 242, 447	0.166
9013.90	5, 911, 549, 418	2.705
9015.80	1, 435, 960, 738	0.451
9026.10	1, 966, 007, 539	0.015
9026.20	3, 604, 256, 190	0.887
9026.80	990, 279, 469	0.008
9026.90	1, 623, 466, 775	0.006
9027.10	2, 180, 638, 801	0.981
9027.20	1, 405, 996, 496	0.032
9027.30	1, 413, 975, 923	0.007
9027.50	2, 849, 195, 072	0.004
9027.80	5, 138, 240, 703	0.076
9027.90	3, 216, 393, 877	0.290
9031.49	3, 710, 381, 992	3.481
9031.80	10, 574, 806, 155	0.351
9031.90	2, 811, 870, 718	0.406
9032.89	10, 180, 086, 765	0.950
9032.90	1, 869, 442, 099	0.430
9033.00	470, 110, 904	0.607
	219, 498, 678, 882	

can subsequently provide a tarif discount in order to encourage foreign firms to invest in the production of green goods (but this opportunity is not anticipated at the time at which the baseline tariff is set). The production of the green variant requires an investment, which takes the form of a fixed sunk cost. The imports of these green goods generate a positive externality in the importing country. The production of green goods however does not generate any positive externality in the exporting country, which could arise for instance through the choice of production methods that are more environmentally friendly.

We proceed in stages. We will first derive the outcome without green goods. It is the subgame perfect equilibrium of a two stage game in which governments set an import tariffs in the first stage and firms compete in price in the second stage. The market is represented as an oligopoly with symmetric product differentiation in which domestic firms compete with foreign producers. Second,

we derive the outcome in which governments can provide a discount for green goods. Such a policy will decrease domestic welfare in the absence of positive external effects generated by the green goods. This arises because the initial tariff level has been set to as to maximise domestic welfare and a reduction in the tariff even for a subset of firms can only reduce welfare. Rather than deriving the optimal discount, which would naturally depend in a straightforward manner on the value of the external effects generated by green goods, we identify for each discount a lower bound on the value of the external effect that would be required in order to justify that policy in the sense that it would keep welfare constant. We also describe the range of values of the external effect for which the policy is feasible, i.e. for which there is a discount such that it induces the amount of production and imports of green goods which guarantees that welfare is constant. This range is naturally also a function of technology and in particular the fixed cost that is incurred for developing green varieties.

The outcome with the tariff discount is thus the subgame perfect equilibrium of a two stage game in which foreign firms choose in the first stage whether to produce a green variant of the differentiated products and such that firms compete in price in the second stage. At the second stage, there are then three types of firms; domestic firms which produce "brown" goods, foreign firms which produce "brown" goods with a the optimal tariff and foreign firms which produce "green" goods with a tariff discount[8].

4.1 Equilibrium without preferential tariffs

We assume that there are two countries A and B with n^A and n^B firms, respectively. The firms $i = 1 \dots n^A$ are based in country A and $j = 1 \dots n^B$ in country B. Each firms produces a different variety of a differentiated product. The pattern of differentiation is symmetric and the demand for each good produced by firms from country A, indexed by i is given by the following demand system respectively in country A and in country B ;

$$
\begin{aligned}
q_i^A &= \frac{1}{n^A + n^B} \left\{ v^A - p_i^A - \gamma \left[p_i^A - \frac{1}{n^A + n^B} \left(\sum_{h=1}^{n^A} p_h^A + \sum_{j=1}^{n^B} p_j^A \right) \right] \right\} \\
q_i^B &= \frac{1}{n^A + n^B} \left\{ v^B - p_i^B - \gamma \left[p_i^B - \frac{1}{n^A + n^B} \left(\sum_{h=1}^{n^A} p_h^B + \sum_{j=1}^{n^B} p_j^B \right) \right] \right\}
\end{aligned}
$$

in which γ represents the degree of differentiation among products. It ranges from 0 which corresponds to independent products to ∞ which corresponds to homogenous goods. Similar expression would obtain for the products produced

[8] In this model, domestic firms have no incentive to swith to the production of green variants. As consumers do not have a higher willingness to pay for green goods, the only incentive to produce them arises from differential tariffs (or potentially lower domestic taxes, that we do not consider in the present model).

by firm from country B (indexed by j). In this set up, each firm from each country produces a different variant which can be sold in both countries. This demand system, due Shubik and Levitan (1980) has the attractive property that the market size does not vary with the degree of substitution among products and the number of products (firms). The profit functions with ad valorem tax are

$$\begin{aligned}\Pi_i &= (p_i^A - c^A)q_i^A + [p_i^B(1-\tau_B) - c^A]q_i^B \\ \Pi_j &= [p_j^A(1-\tau_A) - c^B]q_j^A + (p_j^B - c^B)q_j^B.\end{aligned}$$

respectively for firms located in country A and in country B and in which c^i refers to the marginal cost of firms located in country i. The maximization of the profit functions with respect to the prices yields the Bertrand-Nash equilibrium $p_i^{*A}, p_j^{*A}, p_i^{*B}, p_j^{*B}$. The system of first order conditions is such the prices charged by firms from a given country in their domestic market are independent of the prices charged in the foreign market. Hence, the equilibrium in any country can be obtained by solving the first order conditions for the maximisation of the profit of domestic firms with the respect to the prices in their own market (independently of the first order conditions for the maximisation of their profit in the foreign market) together with the first order conditions for the maximisation of the profit of the foreign firms with respect to their prices in the domestic market .

One can obtain analytic expressions for the equilibrium prices that can be obtained upon request from the authors. The taxes are determined by the governments in the first stage:

$$\begin{aligned}\max_{\tau_A} \quad & CS_A + \sum_{i=1}^{n^A} \Pi_i^* + \tau_A \sum_{j=1}^{n^B} p_j^{*A} q_j^A(p^*) \\ \max_{\tau_B} \quad & CS_B + \sum_{j=1}^{n^B} \Pi_j^* + \tau_B \sum_{i=1}^{n^A} p_i^{*B} q_i^B(p^*)\end{aligned}$$

with CS_A, CS_B the consumer surplus for the respective countries.

Consumer utility (from which the demand functions are derived, see Shubik and Levitan (1980)) in country A is given by

$$U^A\left(\sum q_i, \sum q_j\right) = v^A\left(\sum_{i=1}^{n^A} q_i^A + \sum_{j=1}^{n^B} q_j^A\right) - \frac{n^A + n^B}{2(1+\gamma)}\left[\sum_{i=1}^{n^A} q_i^{A2} + \sum_{j=1}^{n^B} q_j^{A2} + \right.$$
$$\left. + \frac{\gamma}{n^A + n^B}\left(\sum_{i=1}^{n^A} q_i^A + \sum_{j=1}^{n^B} q_j^A\right)^2\right]$$

So that total consumer surplus is written:

$$CS^A = U\left(\sum q_i, \sum q_j\right) - \sum_{i=1}^{n^A} q_i^A p_i^A - \sum_{j=1}^{n^B} q_i^A p_i^A$$

–

One can obtain a unique closed form solutions for the optimal taxes. The solutions vector of the first stage system includes three roots for each tax, two of which are complex and therefore discarded. The explicit solutions can be obtained upon request from the authors.

The equilibrium of the model can be illustrated for particular parameter values. The prices of the second stage and optimal taxes are calcuated with the following parameter values: with $v^A = v^B = 1$, $c^A = c^B = 0.1$ with $n^A = n^B = 2$ and then equal to 5 and 10, and $\gamma = 0, 1, 5$.

Table 6. Illustration of the equilibrium without green variants

	p_i^{*A}	p_i^{*B}	p_j^{*A}	p_j^{*B}	τ_A	τ_B
$Base$	0.218	0.313	0.313	0.218	0.549	0.549
$\gamma = 0$	0.219	0.336	0.336	0.219	0.6	0.6
$\gamma = 5$	0.215	0.269	0.269	0.215	0.409	0.409
$n^A = n^B = 10$	0.215	0.260	0.260	0.215	0.366	0.366
$v_A = v_B = 5$	0.233	0.569	0.569	0.233	0.811	0.811
$v_A = 1, v_B = 0.5$	0.218	0.313	0.262	0.215	0.549	0.374

We observe, as one would expect that the prices are higher the higher is the degree of product differentiation (the lower is γ). In addition, a lower concentration leads to lower prices. The optimal taxes also fall as the degree of product differentiation falls. This arise because the government's ability to extract rents from foreign firms is reduced as competition is more intense; an import tax can be seen as an increase in the marginal cost of foreign firms. With more substitution between products, an increase in the cost of foreign firms will have a stronger beneficial effect on the profit of domestic firm (as consumers switch to domestic products) and a weaker (negative) effect on consumer surplus but tax revenues will also be more sensitive (as the output of foreign firms falls

more quickly). Overall, the optimal taxes fall. Finally, as the market becomes more profitable (the intercept increases relative to marginal cost), the optimal tax increases.

4.2 Equilibrium with preferential tariffs for "Green Goods"

In this section, we present the model with a preferential tariff for "green goods". The demand system has n^A firms based in A, and n^B firms based in B, both selling in market A. Out of the n^B firms in B, n^{GB} produce a "green" variant of their differentiated product and $n^{BB} = n^B - n^{GB}$ sell a " brown" variant of their differentiated good. The demand system for the three types of products sold in country A (domestic, foreign brown variant and foreing green variants), is as before

$$
\begin{aligned}
q_i^A &= \frac{1}{n^A + n^B}\left\{v^A - p_i^A - \gamma\left[p_i^A - \frac{1}{n^A + n^B}\left(\sum_{h=1}^{n^A} p_h^A + \sum_{j=1}^{n^{GB}} p_j^{GA} + \sum_{k=1}^{n^B - n^{GB}} p_k^{BA}\right)\right]\right\} \\
q_j^{GA} &= \frac{1}{n^A + n^B}\left\{v^A - p_j^{GA} - \gamma\left[p_j^{GA} - \frac{1}{n^A + n^B}\left(\sum_{h=1}^{n^A} p_h^A + \sum_{m=1}^{n^{GB}} p_m^{GA} + \sum_{k=1}^{n^B - n^{GB}} p_k^{BA}\right)\right]\right\} \\
q_k^{BA} &= \frac{1}{n^A + n^B}\left\{v^A - p_k^{BA} - \gamma\left[p_k^{BA} - \frac{1}{n^A + n^B}\left(\sum_{h=1}^{n^A} p_h^A + \sum_{m=1}^{n^{GB}} p_m^{GA} + \sum_{n=1}^{n^B - n^{GB}} p_n^{BA}\right)\right]\right\}
\end{aligned}
$$

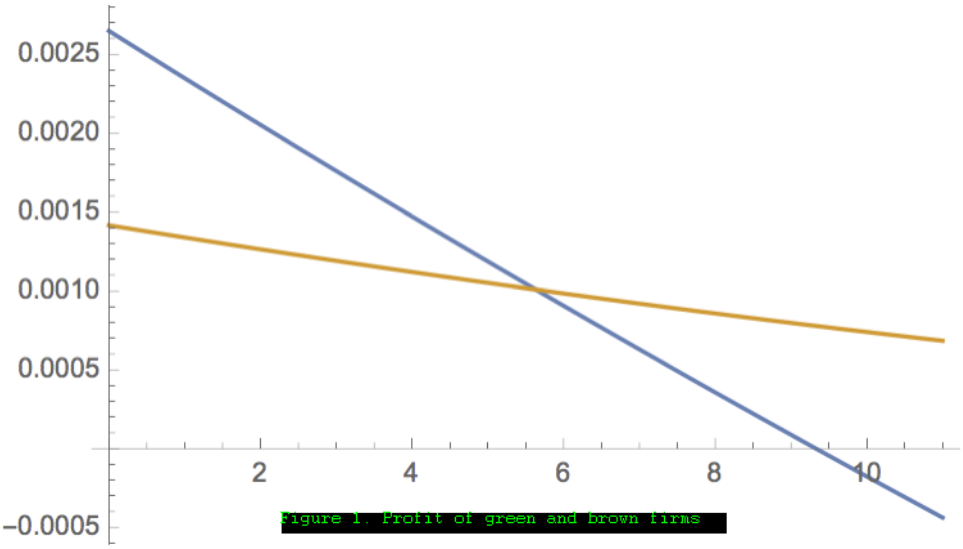
for $i = 1 \ldots n^A, j = 1 \ldots n^{GB}, k = 1 \ldots (n^B - n^{GB})$. Note that in terms of demand, there is no difference between the green and the brown variants of the differentiated product of the foreign firm (the demand system is completely symmetric). The profit functions are:

$$
\begin{aligned}
\Pi_i &= (p_i^A - c^A) q_i^A \\
\Pi_j^G &= [p_j^{GA}(1 - \alpha\, \tau_A) - c^B] q_j^{GA} - \phi \\
\Pi_k^B &= [p_j^{BA}(1 - \tau_A) - c^B] q_k^{BA}
\end{aligned}
$$

where $0 \leq \alpha \leq 1$ is the tax discount for the firms that produce the green good and $\phi > 0$ is the fixed cost incurred by the foreign firms that decide to produce a green variant. The second stage yields the Bertrand-Nash equilibrium $p_i^{*A}, p_j^{*GA}, p_k^{*BA}$ by maximizing the profit functions.

The equilibrium number of firms n^{*GB} that produce the green good is given by a free "transformation" condition. It is such that the profit of a "green" variant and a "brown" variant are identical.

$$
\Pi_j^G(\tau_B, \alpha, \phi, c^A, c^B, v^A, \gamma, n_A, n^B, n^{*GB}) = \Pi_k^B(\tau_B, c^A, c^B, v^A, \gamma, n_A, n^B, n^{*GB})
$$



The existence of a single solution for the number of green variants is guaranteed by the fact that the profit of firms having chosen to produce a green variant (green firms for short) are more sensitive to the entry of green firms than the profit of brown firms. Assume that the profit of a green firm is larger than profit of a brown firm when the first firm decides to produce a green variant[9]. The external effect that the second green firm exercises on the profit of the existing green firm is larger than the external effect that it exercises on a brown firm. This arises because green firms, having the same tax and hence the same marginal cost, are closer competitor to one another than they are to brown firms. As a consequence, the profit of green firms fall faster than the profit of brown firms as the number of green firm increases. There is a single crossing point between the profit of green firms and the profit of brown firms as functions of the number of green firms. This is illustrated in figure 1 for particular parameter values. The blue line represents the profit of green firms whereas the brown line represents the profit of brown firms, as a function of the number of green firms in the market.

The existence of an interior solution for the number of green firms will then also depend on the value of the fixed cost. If the fixed cost is too large, even the first firm to become green would obtain less profit that a brown firm and none will switch. There will be a corner solution with no green firm. At the opposite, if the fixed cost is very small, all firms will prefer to become green and there is a corner solution with no brown firm.

It is worth considering how for a given fixed cost a change in the discount affects the green output. There are two effets at play which reinforce each other.

[9] In the opposite case, there will be a corner solution such that no firm is choosing to become green.

An increase in the discount (a fall in α) will induce more firms to produce a green variant because the profit per green firm increases. However, it will also increase the output per green firm (as the discounts increases relative market access).

Finally, the welfare function in A as a function of the discount α will be the sum of the consumer surplus in A, profits of firms from A and all tax revenues from brown and green firms :

$$W(\tau_A, \alpha) = CS_A + \sum_{i=1}^{n^A} \Pi_i^* + \tau_A \left(\alpha \sum_{j=1}^{n^{GB}} p_j^{*GA} q_j^{GA}(p^*) + \sum_{k=1}^{nB-n^{GB}} p_k^{*BA} q_j^{BA}(p^*) \right)$$

The utility for A is written:

$$U^A \left(\sum q_i, \sum q_j, \sum q_k \right) = v^A \left(\sum_{i=1}^{n^A} q_i^A + \sum_{j=1}^{n^{GB}} q_j^{GA} + \sum_{k=1}^{n^B - n^{GB}} q_j^{BA} \right)$$
$$- \frac{n^A + n^B}{2(1+\gamma)} \left[\sum_{i=1}^{n^A} (q_i^A)^2 + \sum_{j=1}^{n^{GB}} (q_j^{GA})^2 + \sum_{k=1}^{n^B - n^{GB}} (q_k^{BA})^2 + \right.$$
$$\left. + \frac{\gamma}{n^A + n^B} \left(\sum_{i=1}^{n^A} q_i^A + \sum_{j=1}^{n^{GB}} q_j^{GA} + \sum_{k=1}^{n^B - n^{GB}} q_k^{BA} \right)^2 \right]$$

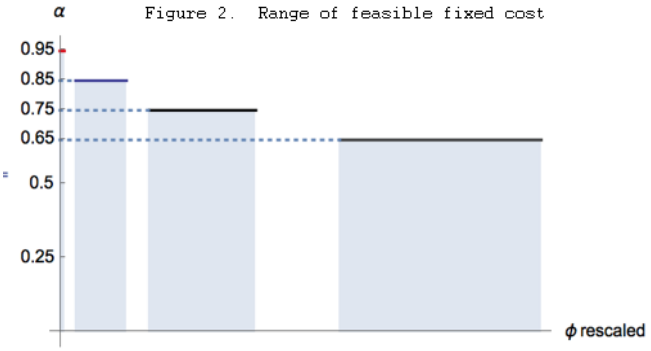
So that the Consumer Surplus (utility minus all the total expenditures for goods sold in country A by firms i of A, by green firms j and brown firms k) is given by :

$$CS^A = U^A \left(\sum q_i, \sum q_j, \sum q_k \right) - \sum_{i=1}^{n^A} q_i^A p_i^A - \sum_{j=1}^{n^{GB}} q_j^{GA} p_j^{GA} - \sum_{k=1}^{n^B - n^{GB}} q_k^{GA} p_k^{GA}$$

4.3 Discussion of the preferential tariff

The ability to encourage the entry of green firms will naturally be constrained by the fixed cost that is incurred to invest into green goods. More precisely, for any discount in the tariff α, there is a range fixed cost ϕ for which entry can be encouraged. The upper bound of this range corresponds to the entry of a single green firm and the lower bound corresponds to a switch of all brown firms into a green variant. There is thus only some many green firms than can be encouraged with a given tariff discounts, depending on the fixed cost. When the fixed cost are high, higher tariff discounts are required to induce firms to produce green variants.

This is illustrated in figure 2, which represents for different values of α the range of fixed cost for which the entry of green firms can be encouraged (this



picture is drawn for our base case case in terms of parameters)[10]. As one can see, a higher discount (a lower α) will induce the entry of green firms for a higher range of fixed cost. For each α,the leftmost point of the range corresponds to the switch of all firms (10 in the particular parameter configuration) to green variants. The rigthmost point corresponds to the switch a single firm to a green variant, so that for each α, the figure presents the range of fixed cost for which there is an interior solution[11].

We now consider the welfare consequences of the policy inducing the development of green firms. As discussed above, any tariff discount will induce a reduction in welfare, taken as the sum of taxes, consumer and producer surplus (and thereby ignoring the positive external effect induced by the consumption of green goods). The following picture represents the change in welfare (in %), between the equilbrium without concessions and the equilbrium in which green firms are encouraged to enter, on the vertical axis. On the horizontal axis, we find the tariff discount ranging from a high discount equal ($\alpha = 0.5$) on the lower corner to a low discount ($\alpha = 0.985$) in the upper part. The other horizontal axis presents the range of fixed cost, for any given discount, which induces respectively all firms to switch to a green variant at the extreme left to a situation in which none of the firm is induced to invest into a green variant at the extreme right ($(\phi(\alpha) \rightarrow (nB - nGB))$). The two variables on the two horizontal axis are thus not independent. For each α there is a different range of fixed cost for which zero to 10 firms (for the base case parameter constellation underlying the figure, which has 10 firms in country B) are induced to become green.

We observe that for any α, inducing the entry of more green firms, (over the range over which it is feasible) induces a higher reduction in welfare (in % terms). Indeed, the surface increases as one moves to the left for a given

[10] The value of the fixed cost on this horizontal axis has been rescaled for the purpose of fitting the different ranges on the same graph. It should thus be interpreted as a fixed cost index

[11] Of course, for any given discount, a value fo the fixed cost below the leftmost part of the range will involve a corner solution, in which all firms switch to green production, but in which the output of foreign (green) firms increase at the expense of domestic firms.

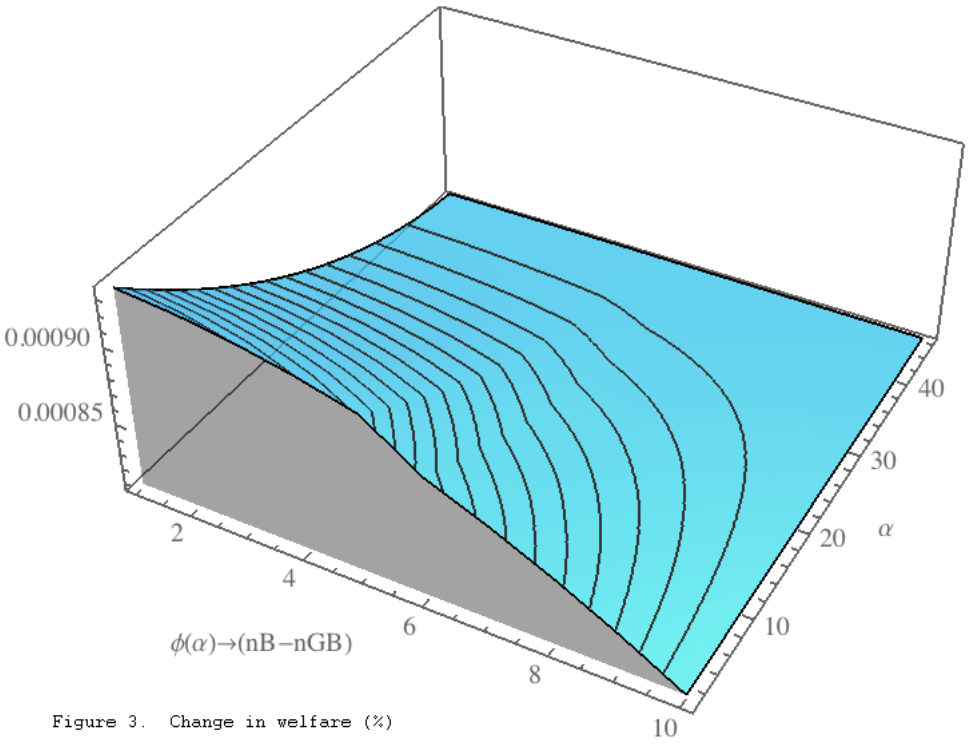


Figure 3. Change in welfare (%)

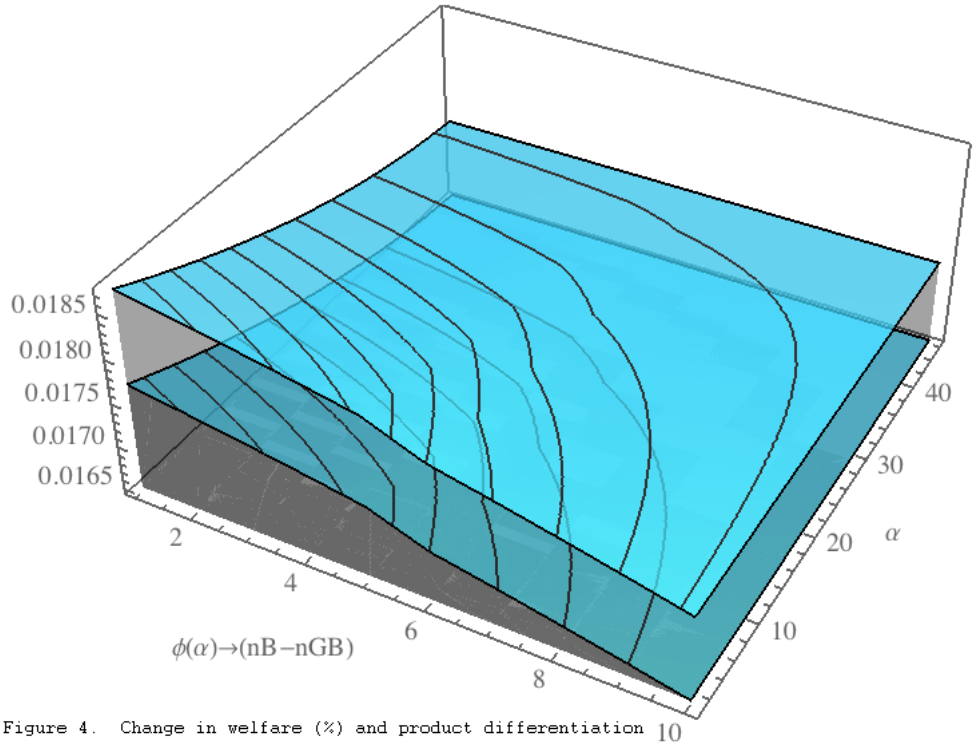


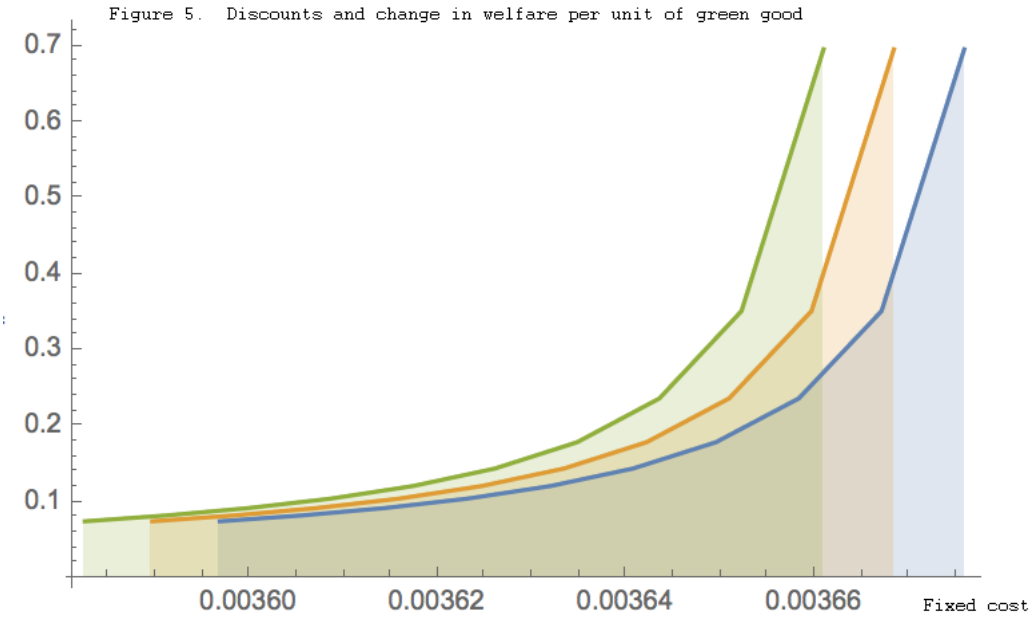
Figure 4. Change in welfare (%) and product differentiation

discount (along a ray perpendicular to α). The figure also illustrates that lower discounts will in general induce lower welfare losses (as the surface slopes downwards as one moves along a ray perpendicular to ϕ). This accords with intuition that a smaller distortion induces a lower welfare loss but of course, as mentioned above, a lower distortions can induce entry of green firms only for a range of lower fixed cost.

The following figure presents the change in welfare for different values of γ.

The upper surface is drawn for a lower value of γ, i.e., a higher degree of product differentiation. We observe for any tariff discount (and associated range of fixed cost) the reduction in welfare increase as there is more product differentiation. This arises presumably because the profit of firms that are more differentiated is less sensitive to a tariff discount so that the instrument is less effective.

By inducing the entry of green firms, tariff discounts will thus generate consumption externalities. Tariff concessions can be justified when the loss of welfare (defined as the sum of producer surplus, consumer suplus and tax revenues) is compensated by the externalities. We assume that the externalities are proportional to the consumption of green goods and we identify for each value of the externality generated by unit of consumption of the green good,



and for a given technology (as represented by the fixed cost of producing a green variant), the policy that will at least keep the country as well off (considering both welfare and the benefit from the externality). This broader notion of welfare, which can be though out as some social welfare), is constant when the loss of welfare per unit of consumption of the green good is equal to the value of the externality generated by one unit of consumption of the green good. Hence, we consider how equilibrium outcomes which involve a given reduction in welfare per unit of green good can be induced. This will also identify for any given value of the externality generated by one unit of green good, the policy that would be worthwhile for the country concerned (if feasible, given the technology).

This is illustrated in figure 5, in which the unit value of the externality (or equivalenty the change in welfare per unit of green good) is on the vertical axis and the fixed cost is on the horizontal axis. Each of the functions on the figure represents the change of welfare per unit of green good in an interior equilibrium as a function the fixed cost for a given value of the discount (α). For each function, the left most point corresponds to the fixed cost such that the maximum number of firms is induced to switch to a green variant (10 firms for this particular parameter configuration). The rightmost point correspond to the fixed cost for which a single firm is induced to switch to a green variant. We observe that this function is increasing; even though (as observed above), the change in welfare, for a given discount, is larger when more firms are induced to become green, the change in welfare per unit of green output actually falls when the number of green firms increases. As there are more green firms, they all produce more green output and even tough the welfare loss increases, the

welfare loss per unit of green output actually falls.

The three function in this figure correspond to increasing values of the discount (decreasing values of (α). As a higher discount is granted, the leftmost point (corresponding to 10 green firms) is naturally achieved for a higher value of the fixed cost. The blue curve (to the right) thus corresponds to the highest discount (0.5 for the parameter configuration used for the graph). We also observe that the functions never intersect; this implies that for any given fixed cost, there is a single value of the discount (and associated number of green firms) for which the loss of welfare due to the discount is equal to the external effect generated by the green output. Consider for instance the blue function on the graph which corresponds to $\alpha = 0.5$ and compare it with the function immediately to its left, which is drawn for a lower discount (a higher α). It will be everywhere to the left. This implies that there is a single function (corresponding to a particular value of α) that goes through any point in this graph (any combination of fixed cost (on the horizontal axis) and value of the externality (per unit, on the vertical axis)), if at all. Hence, if the value of the fixed cost allows it, there is a single policy which leaves the importing country indifferent in terms of social welfare (such that the loss of welfare is exactly compensated by the external effects generated by the green good). As the fixed cost falls, for a given value of the external effect, the value of the discount that leaves the country indifferent falls (α increases). This arises because as the fixed cost falls, more green firms enter, leading to a higher level of green output but also higher welfare cost (in particular because the tariff revenue falls). It is then optimal to reduce the discount, which will reduce the output per green firm and readjust the number of green firms. Intuitively, as the policy instrument becomes more effective, less of it has to be used in order to reach a given objective.

Another implication of this analysis is that starting from the policy that leaves the country indifferent, an increase in the discount will always be attractive (will increase social welfare) up to point where all brown firm have switched to producing a green variant. Consider a particular value of the fixed cost and of the externality, for which a given α will ensure that the country is indifferent. An increase in the discount will lead to a welfare cost per unit of green output which is lower (one moves to a function, for a higher discount, which is everywhere below, within the range for which the function is defined). As there is a wedge between the welfare cost per unit of green output and the externality per unit of green output, social welfare increases. It is then attractive to increase the discount up to point where all firms have switched to a green variant. Graphically, for a given fixed cost, this will be the value of the discount for which the function on the graph above becomes defined (its leftmost point).

Hence, it appears that when fixed costs allow for the transformation of brown to green firms, it is always best to choose the discount such that all firms become green. The optimal solution is thus a corner solution involving a shift of the entire foreign industry into green variant. The welfare cost of a unit of green ouput falls as one induces more green firms. This is presumably associated with the benefit of competition that more green firms entails. As there are more

green firms, competition between them increases, which reduces their margins, so that a smaller fraction of the market access benefit is appropriated by the foreign firms.

We have explored a range of parameter values[12] to confirm these insights. We found that the welfare cost per unit of green output is systematically increasing in the fixed cost, for any given discount and that higher discounts for any given fixed cost lead to a lower level of welfare cost per unit of green output (up to the point where all firms have switched to green variants). We find that that as the degree of product differentation falls (γ increases) or the number of firms increases, the welfare cost per unit of green output falls for any given discount. This arises presumably because greater homogeneity and less concentration lead to lower margins. Inducing green output is then less costly (for a given discount) because a smaller proportion of the tariff concession is appropriated by foreign firms.

5 APEC and EGA in the WTO

This section discusses how the APEC and EGA initiatives fit into the WTO. We discuss in particular the legal status of the tariff commitments under these agreements and the reasons that may have prompted members to choose tariff concessions instead of the traditional route of regulation and non disrimination, as a policy tool.

During most of the GATT-era, revealed preferences would take the form of domestic policies[13]. The advantage was that they would be unilaterally defined, and negotiations would not be burdened as the only discipline they had to observe was non discrimination. Non discrimination served as an insurance policy against concession erosion. Thus, trading partners would maintain their incentive to continue negotiating their tariff down, safe in the knowledge that the outcome of their negotiation would not be undone through subsequent unilateral actions beyond their control. The drawback would be that adjudicating bodies would have to, in case of litigation, design a non discrimination benchmark. Non discrimination was of course, from day one legalese for nonprotectionism, a rather elusive concept. Indeed, the GATT/WTO adjudicating bodies have struggled with the notion.

The APEC/EGA intiatives involve a fontloading of preferences. From a legal policy perspective, the question arises why frontload policies that until now had usefully found their way through domestic instuments. To make matters worse for proponents of frontloading, the very fact that a product classification is inserted into a schedule does not confer ipso facto legality under WTO law, as the Appellate Body report on EC-Bananas III has made it unambiguously

[12] For values of γ up to 20 and for symmetric numbers of firms from 2 to 20 and for asymmetric patterns involving a smaller number of domestic firms.

[13] Baldwin (1970) explains the GATT recipe for integration.

clear. This view might disturb the 'contractualist', but is quite reasonable as it is almost impossible to decide by consensus on the legality of each and every deposited instrument at the end of a negotiating round. There is thus, no guarantee that the concessions granted under APEC are lawful, and thus they can be challenged before the WTO for not observing Article 3.3 of HS. For instance, the exporter of a product within an HS classification for which concessions have been granted but for which the concession would not apply could challenge the measure, arguing that its product and those benefitting from the concession are "like".

Nevertheless, a proper reading of the MFN clause should lead to the conclusion that it is only discrimination by virtue of origin that is prohibited, and not by virtue of properties of specific products that could have been produced anywhere so that such a case may be difficult. Still, de facto discrimination can also be established, if it can be shown for instance that the product classification and associated preferences, have the effect of disriminating in favor of products from a particular origin but the evidentiary threshold is higher. In any event, the 'multilateralization' of similar classifications, as evidenced through the EGA, under negotiation at the moment of writing, should be a strong argument in support of lawfulness of elaborate classifications.

Still, the fact that a challenge along the lines discussed above would, in all likelihood not be successful, is not reason enough to move from unilateral expression to a negotiated agreement. And yet, the reason they might prefer to do as much has probably to do with the uncertainty regarding the actual parameters of case law regarding national treatment. If the counterfactual to the APEC/EGA initiatives is the current regime, where environmental taxes are imposed behind the border, the question arises whether such taxes are WTO-consistent or not[14]. The point here is that, the implementation of the APEC initiative (and the interest of some additional WTO members for the EGA initiative) may be associated with increasing difficulty to implement the traditional route of regulation and non discrimination. It is important to observe in this respect that the APEC tariff concessions are not concerned with domestic production with rather with consumption externalities. Indeed, the strong heterogeneity among APEC members with diverse production lends support to the presumption that the concessions are not focused on domestic production and the protection of national champions. Hence, expressing preferences through these lower tariffs considerably reduces the risk to see the measure challenged because an advantage has been conferred to domestic producers.

Art III roughly requests from WTO members to apply the same legal regime to same facts irrespective whether they are dealing with domestic or imported goods. Grossman et al. (2013) have reviewed the case law in this context from the advent of the GATT until 2012[15]. Their conclusion is that case law is quite erratic, and, as a result, it is difficult to predict how the marginal litigation will be resolved.

[14] See Horn and Mavroidis (2011)

[15] Compare Neven (2001) and Mavroidis (2016).

Terms like "applied so as to afford protection", a critical term in the case of environmental protection have been interpreted in a manner that it is hard to decipher. In Chile-Alcoholic Beverages, the Appellate Body held that differential taxation is applied so as to afford to protection if the tax differential (lower tax on domestic goods, higher on imported like goods) is larger than de minimis. If it is also substantial, then the tax differential in and of itself suffices to show that the measure has been applied so as to afford protection. If it is more than de minimis, but not substantial, then the interpreter would have to look into the design, and architecture of the contested measure in order to form an opinion on its consistency with the relevant multilateral rules.

The Appellate Body though, did not interpret neither the term "de minimis" nor the term "substantial". As a result, we simply do not know when a look into the design and architecture of the contested measure is warranted. Furthermore, we also lack an understanding of the steps that the adjudicator needs to take when looking into the design, and architecture of the agreement.

One can thus, understand that, expressing a preference for environmental goods through domestic taxation (in lieu of customs duties) could be risky, especially if it subject to an review by WTO judges that do not tend to understand the key terms in contextual manner.

By expressing the same measure through tariff preferences, WTO members might thus take less of a risk.

6 Concluding Remarks

It is worth noting at the outset that the EGA/APEC initiatives are not multilateral and from that perspective are part of a trend. Indeed, since the advent of the WTO, there has not been any successful multilateral tariff negotiation. More generally, except for the Agreements on Aid for Trade, and Trade Facilitation, two initiatives largely designed towards helping with development efforts of the developing countries members of the WTO, there has been no successful multilateral negotiation for over twenty years now under the aegis of the WTO. The various initiatives that were successfully concluded (like the Agreements on Information Technology, ITA I, and ITA II), were de facto plurilateral agreements. Participants agreed to negotiate even though the whole membership was not in agreement to do so, and did not seek for authorization to implement their results (as they should under the relevant provisions concerning plurilateral agreements). They simply went ahead and did so when a critical mass of members had locked in tariff concessions (so as to reduce the potential for free-riding), and further agreed to implement their results on nondiscriminatory (MFN) basis. As Hoekman and Mavroidis (2015) explain, the increasing heterogeneity of the WTO membership has had an impact on the number of multilateral agreements that can plausibly become credible negotiating items at the WTO.

Viewed from this perspective, the APEC/EGA initiative is thus part of a recent trend to negotiate among few. Arguably, APEC/EGA goes one step

further than ITA I & II, since the original signatories did not even condition the extension of the trade advantages on an MFN-basis upon first guaranteeing that a critical mass of producers had acceded to their arrangement. This is of course a disturbing trend which raises questions about the role of the WTO. These questions are however beyond the scope of this paper.

As discussed in the paper, the APEC/EGA encourage environmental protection through tariff preferences. This is a significant innovation from the perspectives of tariff determination and the expression of public policy concerns over a particular issue.

Up until then, tariff preferences were granted mostly in favour of developing countries and did not involve any form of regulatory conditionality. Indeed, some WTO members occasionally implemented tariff preferences conditional on regulation. The litigation on EC-Tariff Preferences, where the EU conditioned tariff reduction upon adoption of policies to combat production and trafficking of drugs is a case to the point. The APEC/EGA initiative nevertheless, goes much beyond and is not confined to preferences for developing countries. It is preferences for all that produce environmental goods.

Previously, similar preferences were consistently "regulatory". WTO members conditioned market access upon satisfaction of market access criteria, which could include satisfaction of domestic environmental laws. This is the natural consequence of the fact that the nature of the GATT/WTO regime is negative integration, and societal preferences across WTO members differ for a variety of reasons. The APEC/EGA is not a substitute, but a complement to this and it is not unilateral anymore. Twenty-one WTO members so far have expressed a joint preference. Many more will do so when the EGA initiative concludes.

Assuming that the questions regarding the legality of this initiative have been overcome, and we have explained in this paper why this should be the case, the APEC/EGA initiative will be the first joint initiative where a preference for the protection of common public good has taken the form of a trade instrument.

When setting their tariffs, APEC signatories were not thinking only of their terms of trade, but also in terms of environmental protection. In fact, for some participants like China, with substantial bargaining power, it seems that the latter motive dominated the former, since it did not receive major tariff concessions from its partners with significant market power. Indeed, the United States made only insignificant tariff concessions, as we have seen in this paper. This observation, in and of itself, casts doubt as to whether the terms of trade theory[16], eloquently used as the framework to explain the GATT (where tariff classifications were expressed in terms void of any regulatory content) is the only relevant framework in a world where the level of tariffs agreed is often the expression of mixed motives (in our case, environmental concerns, as well as the continuing strive to improve terms of trade).

[16] See Bagwell and Staiger (2002).

References

[1] Bagwell, Kyle, and Robert W. Staiger. 2002. The Economics of the World Trading System, MIT Press: Cambridge, Massachusetts.

[2] Baldwin, Robert E. 1970. Non-tariff Distortions in International Trade, Brookings Institution: Washington, DC. Bown

[3] Chad P., and Douglas A. Irwin. 2016. The GATT's Starting Point: Tariff Levels circa 1947, in Manfred Elsig, Bernard Hoekman, and Joost Pauwelyn, (eds.), Assessing the World Trade Organization: Fit for Purpose? Cambridge University Press: Cambridge, UK.

[4] Grossman, Gene M., Henrik Horn, and Petros C. Mavroidis. 2013. Domestic Instruments, pp. 205-345 in Henrik Horn and Petros C.

[5] Mavroidis (eds.), Legal and Economic Principles of World Trade Law, ALI, The American Law Institute Reporters' Studies on WTO Law, Cambridge University Press: New York City.

[6] Hoekman, Bernard M., and Petros C. Mavroidis. 2017. MFN Clubs and Scheduling Additional Commitments in the GATT: Learning from GATS, European Journal of International Law, 28: 387-407.

[7] Hoekman, Bernard M., and Petros C. Mavroidis.2015. WTO à la carte or WTO menu du jour? European Journal of International Law, 26: 319-343.

[8] Horn, Henrik and Petros C. Mavroidis. 2011. To B(TA) or Not to B(TA)? On the Legality and Desirability of Border Tax Adjustments from a Trade Perspective, The World Economy, 34: 1911-1937

[9] Mavroidis, Petros C. 2016. The Regulation of International Trade, Volume I and II, MIT Press: Cambridge, Massachusetts.

[10] Neven, Damien J. 2001. How Should Protection be Evaluated in Article III GATT Disputes? European Journal of Political Economy, 17: 421–44.

[11] Santana, Roy. 2015. Options for Defining Products Covered by the Environmental Goods Agreement, BioRes 9:5: ICTSD, Geneva (available at https://www.ictsd.org/about-us/roy-santana)

[12] Shubik, M. and R. Levitan, (1980), Market structure and behavior, Cambridge MA, Harvard University Press

[13] Vossenaar, René. 2014. Securing Climate Benefits in the Environmental Goods Agreement, BRIDGES, December 8, 2014, ICTSD: Geneva, Switzerland.

[14] Vossenaar, René. 2016. Reducing Import Tariffs for Environmental Goods: the APEC Experience, ICTSD: Geneva, Switzerland.

Appendix

Table 6: Canada

HS6	HS8	2015 Tariff (%)	Change (%)
8411.82	8411.82.90	5	5
8502.39	8502.39.10	3	3
9015.80	9015.80.20	6.5	1.5

Table 7: Chile

HS6	HS8	2015 Tariff (%)	Change (%)
4418.72	4418.72	6	1
8402.9	8402.9	6	1
8404.1	8404.1	6	1
8404.2	8404.2	6	1
8404.9	8404.9	6	1
8406.9	8406.9	6	1
8411.82	8411.82	6	1
8411.99	8411.99	6	1
8412.9	8412.9	6	1
8417.8	8417.8	6	1
8417.9	8417.9	6	1
8419.19	8419.19	6	1
8419.39	8419.39	6	1
8419.6	8419.6	6	1
8419.89	8419.89	6	1
8419.9	8419.9	6	1
8421.21	8421.21	6	1
8421.29	8421.29	6	1
8421.39	8421.39	6	1
8421.99	8421.99	6	1
8474.2	8474.2	6	1
8479.82	8479.82	6	1
8479.89	8479.89	6	1
8479.9	8479.9	6	1
8501.64	8501.64	6	1
8502.31	8502.31	6	1
8502.39	8502.39	6	1
8503	8503	6	1
8504.9	8504.9	6	1
8514.1	8514.1	6	1
8514.2	8514.2	6	1
8514.3	8514.3	6	1
8514.9	8514.9	6	1
8541.4	8541.4	6	1
8543.9	8543.9	6	1
9013.8	9013.8	6	1
9013.9	9013.9	6	1
9015.8	9015.8	6	1
9026.1	9026.1	6	1
9026.2	9026.2	6	1
9026.8	9026.8	6	1
9026.9	9026.9	6	1
9027.1	9027.1	6	1
9027.2	9027.2	6	1
9027.3	9027.3	6	1
9027.5	9027.5	6	1
9027.8	9027.8	6	1
9027.9	9027.9	6	1
9031.49	9031.49	6	1
9031.8	9031.8	6	1
9031.9	9031.9	6	1
9032.89	9032.89	6	1
9032.9	9032.9	6	1
9033	9033	6	1

Table 8: China

HS6	HS8	2015 Tariff (%)	Change (%)
8404.10	84041010	7	2
8404.10	84041020	10	5
8404.20	84042000	14	9
8404.90	84049010	10	5
8404.90	84049090	7	2
8412.90	84129090	8	3
8417.80	84178050	10	5
8417.90	84179090	7	2
8419.19	84191910	35	30
8419.39	84193990	9	4
8419.60	84196090	10	5
8421.21	84212110	25	20
8421.39	84213910	15	10
8421.99	84219910	10	5
8479.82	84798200	7	2
8501.64	85016410	10	5
8501.64	85016420	5.8	0.8
8501.64	85016430	6	1
8502.31	85023100	8	3
8502.39	85023900	10	5
8503.00	85030090	8	3
8504.90	85049090	8	3
9013.90	90139090	8	3
9027.10	90271000	7	2
9031.49	90314910	10	5
9032.89	90328990	7	2
9033.00	90330000	6	1

Table 9: ChinaTaipei

HS6	HS8	2015 Tariff (%)	Change (%)
8412.90	8412.90.00	6.8	1.8
8501.64	8501.64.10	8.5	8.5
8501.64	8501.64.90	10	5
8502.31	8502.31.00	10	5
8502.39	8502.39.10	10	10
8502.39	8502.39.90	10	5

Table 10: Indonesia

HS6	HS8	2015 Tariff (%)	Change (%)
8502.31	8502.31.20.00	10	5
8502.39	8502.39.31.00	10	5
8502.39	8502.39.39.00	10	5

Table 11: Korea

HS6	HS8	2015 Tariff (%)	Change (%)
4418.72	4418.72 1000	8	3
4418.72	4418.72 9000	8	3
8402.90	8402.90 1000	8	3
8402.90	8402.90 2000	8	3
8404.10	8404.10 1000	8	3
8404.10	8404.10 2000	8	3
8404.10	8404.10 3000	8	3
8404.10	8404.10.4000	8	3
8404.10	8404.10.9000	8	3
8404.20	8404.20.0000	8	3
8404.90	8404.90.1000	8	3
8404.90	8404.90.2000	8	3
8404.90	8404.90.9000	8	3
8406.90	8406.90.9000	8	3
8411.82	8411.82.9090	8	3
8411.99	8411.99.9000	8	3
8412.90	8412.90.9000	8	3
8417.80	8417.80.9000	8	3
8417.90	8417.90.0000	8	3
8419.19	8419.19.0000	8	3
8419.39	8419.39.9000	8	3
8419.60	8419.60.0000	8	3
8419.89	8419.89.9020	8	3
8419.89	8419.89.9030	8	3
8419.89	8419.89.9040	8	3
8419.89	8419.89.9090	8	3
8419.90	8419.90.9010	8	3
8419.90	8419.90.9090	8	3
8421.21	8421.21.1000	8	3
8421.21	8421.21.9010	8	3
8421.21	8421.21.9090	8	3
8421.29	8421.29.2000	8	3
8421.29	8421.29.9000	8	3
8421.39	8421.39.1000	8	3
8421.39	8421.39.2000	8	3
8421.39	8421.39.9010	8	3
8421.39	8421.39.9090	8	3
8421.99	8421.99.1000	8	3
8421.99	8421.99.9010	8	3
8421.99	8421.99.9020	8	3
8421.99	8421.99.9090	8	3
8479.82	8479.82.1000	8	3
8479.82	8479.82.2000	8	3
8479.82	8479.82.3000	8	3
8479.82	8479.82.4000	8	3
8479.82	8479.82.9000	8	3
8479.89	8479.89.9010	8	3
8479.89	8479.89.9099	8	3
8479.90	8479.90.9040	8	3
8479.90	8479.90.9050	8	3
8479.90	8479.90.9060	8	3
8479.90	8479.90.9090	8	3
8502.31	8502.31.1000	8	3
8502.31	8502.31.2000	8	3
8502.31	8502.31.3000	8	3
8502.31	8502.31.4000	8	3
8502.39	8502.39.1000	8	3
8502.39	8502.39.2000	8	3
8502.39	8502.39.3000	8	3
8502.39	8502.39.4000	8	3
8503.00	8503.00.2090	8	3
8504.90	8504.90.9000	8	3
8514.10	8514.10.9000	8	3
8514.20	8514.20.9000	8	3
8514.30	8514.30.0000	8	3
8514.90	8514.90.9000	8	3
8543.90	8543.90.9090	8	3
9013.80	9013.80.9000	8	3
9013.90	9013.90.9000	8	3
9015.80	9015.80.1000	8	3
9015.80	9015.80.2000	8	3
9015.80	9015.80.3000	8	3
9015.80	9015.80.4000	8	3
9015.80	9015.80.5000	8	3
9015.80	9015.80.9000	8	3
9027.10	9027.10.0000	8	3
9027.90	9027.90.1000	8	3
9027.90	9027.90.9091	8	3
9031.49	9031.49.4090	8	3
9031.49	9031.49.9000	8	3
9031.80	9031.80.9099	8	3
9031.90	9031.90.9000	8	3
9032.89	9032.89.9090	8	3
9032.90	9032.90.9000	8	3
9033.00	9033.00.0000	8	3

Table 12: Mexico

HS6	HS8	2015 Tariff (%)	Change (%)
4418.72	4418.72.02	15	10
8417.80	8417.80.04	15	10
8417.80	8417.80.05	15	10
8419.19	8419.19.02	10	5
8419.19	8419.19.03	10	5
8419.89	8419.89.03	15	10
8419.89	8419.89.15	15	10
8421.29	8421.29.03	15	10
8421.39	8421.39.01	15	10
8421.39	8421.39.04	15	10
8474.20	8474.20.01	15	10
8474.20	8474.20.02	15	10
8474.20	8474.20.03	15	10
8474.20	8474.20.05	15	10
8474.20	8474.20.06	15	10
8474.20	8474.20.99	10	5
8479.82	8479.82.05	15	10
8479.89	8479.89.03	15	10
8479.89	8479.89.19	15	10
8501.64	8501.64.03	15	10
8502.31	8502.31.99	15	10
8502.39	8502.39.04	15	10
8514.10	8514.10.04	10	5
8514.20	8514.20.05	10	5
9015.80	9015.80.02	15	10
9015.80	9015.80.06	15	10
9015.80	9015.80.07	10	5
9015.80	9015.80.99	10	5
9026.20	9026.20.04	15	10

Table 13: Philippines

HS6	HS8	2015 Tariff (%)	Change (%)
8404.20	8404.20.00	10	5
8417.80	8417.80.00A	7	2
8421.21	8421.21.11	7	2
8421.21	8421.21.19	7	2
8421.21	8421.21.22	7	2
8421.21	8421.21.23	7	2

Table 14: PapuaNewGuinea

HS6	HS8	2015 Tariff (%)	Change (%)
4418.72	4418.72.00	15	10

Table 15: Russia

HS6	HS8	2015 Tariff (%)	Change (%)
4418.72	4418.72.000.0	11	11
8402.90	8402.90.000.9	7.5	7.5
8406.90	8406.90.100.0	6.3	6.3
8412.90	8412.90.200.1	7.5	7.5
8412.90	8412.90.800.1	7.5	7.5
8419.60	8419.60.000.0	5	5
8421.39	8421.39.800.2	4.7	2.7
8541.40	8541.40.100.0	3.3	3.3
8543.90	8543.90.000.0	1.7	1.7
9026.20	9026.20.400.0	3.3	3.3
9026.20	9026.20.800.0	3.3	3.3
9027.20	9027.20.000.0	1.7	1.7
9027.80	9027.80.050.0	3.3	3.3
9027.80	9027.80.990.0	3.3	3.3
9027.90	9027.90.100.0	3	3
9027.90	9027.90.500.0	3.3	3.3
9027.90	9027.90.800.0	5	2

Table 16: USA

HS6	HS8	2015 Tariff (%)	Change (%)
4418.72	4418.72.95	8	3
8404.20	8404.20.00	5.6	0.6
8406.90	8406.90.20	6.7	1.7
8406.90	8406.90.30	6.7	1.7
8406.90	8406.90.40	6.7	1.7
8406.90	8406.90.45	6.7	1.7

Table 17: Vietnam

HS6	HS8	2015 Tariff (%)	Change (%)
8419.19	8419.19.10	10	5
8419.19	8419.19.90	10	5
8421.21	8421.21.11	10	5
8421.21	8421.21.19	10	5
8421.21	8421.21.23	10	5