Are Preferential trade Agreements with Non-trade Objectives a Stumbling Bloc for Multilateral Liberalization?

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Abstract

Increasingly, in regional agreements, large economies, e.g. U.S. and E.U., offer lower trade barriers in exchange for cooperation by small economies in environmental, intellectual property and other issues. What is the effect of such agreements on multilateral trade liberalization? We show that, even in the absence of trade creation or diversion, such preferential agreements increase the cost of multilateral tariff reductions for the goods exported from small to large countries. This occurs because multilateral tariff reductions decrease the threat that large countries can use in preferential agreements causing a loss in their bargaining power. The result is due to current exceptions in the WTO to the most-favorite-nation rule which allow for lower than MFN tariffs, e.g. art. XXIV and GSP. By explicitly modeling the interaction between preferential and multilateral negotiations we analyze the effects on multilateral tariffs and welfare of strengthening the MFN rule and show that large and small countries may not prefer the same regime of rules.

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1 Introduction

There has been an enormous proliferation of preferential trade agreements (PTAs) in the last 20 years.[1] An increasing number of the recent PTAs involve both developing and developed countries. Another distinguishing feature of several recent PTAs is that large developed economies lower their trade barriers in exchange for cooperation by small developing countries in non-trade issues such as labor, environment and intellectual property. This is the case with the Eastern European and Mediterranean agreements signed by the EU; the US agreements with Jordan, Mexico and other Latin American and Caribbean countries; and the preferential treatment that the EU and the US extend to most developing countries through the generalized system of preferences. We refer to this type of PTAs as Large-Small PTAs (LSPTAs).[2,3]

Both the US and some EU members have demanded similar concessions on non-trade issues in multilateral trade negotiations. This type of multilateral linkages was a contentious issue during the last round of multilateral trade negotiations and an important cause for the failure to start a new round in Seattle.[4] Fear that such linkage will block further multilateral liberalization has prompted suggestions that linkage should be pursued via preferential agreements if at all. However, if countries pursue linkage via preferential agreements the incentives for multilateral liberalization can change. Currently there is no analysis of the effect of this type of preferential agreements on the multilateral trading system and so it is unclear if they promote or hinder multilateral trade liberalization.[5]

A related question, whether PTAs are stumbling blocs towards multilateral trade liberalization,

[1] From 1948-94 there were 124 notifications to the WTO of distinct PTAs by its members. Since 1995 there have been at least an additional 90. <http://www.wto.org/>

[2] World Bank (2000) and Perroni and Whalley (1994). The latter is particularly clear on this point:

> "[T]hese new regional arrangements are the outcome of smaller countries with little negotiating power seeking safe-haven trade arrangements with larger countries, primarily so as to make their access to large markets more secure. In the resulting agreements, larger countries have been able to both extract a price for their participation, largely in the form of non-trade concessions, as well as enhance their power in bloc-wide negotiations." (p.1)

[3] See Elliot (2000), Bayard and Elliot (1994) and UNCTAD (1998) for details on conditionality in the GSP program. Perroni and Whalley (1994) and references therein provide details on conditionality in NAFTA whereas Winters (1993) and Grilli (1997) address the EU's Eastern European, Mediterranean and GSP programs.

[4] The Uruguay Round included a controversial agreement on Intellectual Property Rights which requires compliance with internationally agreed principles under the threat of trade sanctions. In 1999 President Clinton advocated the use of trade sanctions in the WTO to enforce core labor standards in an interview with the Seattle Post-Intelligence. For this reason the "US media ... laid the blame for last week's failed WTO meeting squarely on Bill Clinton's doorstep, accusing the president of mishandling Washington's international trade strategy." In : "US media blame Clinton for failed WTO meeting", Agence France Presse, December 5, 1999.

[5] This point has also been noted by trade lawyers in the context of the GSP but not yet analyzed, in the conclusion of a chapter on trade and labor rights, Trebilcock and Howse (1999) assert that the GSP system is important in holding back MFN concessions:

> "The main impact of this lack of agreements [regarding labor rights in the context of the WTO] is that

has been extensively analyzed but the results of that literature are not applicable here for two reasons.[6] First, the focus has been on agreements between countries of similar size and development that were common in the first wave of PTAs in the 1950's and 60's. Second, the emphasis is on traditional PTAs with reciprocal reductions in trade barriers that can lead to the creation or diversion of trade from a more efficient source towards the preferential partner. Empirically however, there is no consensus on the importance of trade creation and diversion in recent PTAs.[7] Yet trade creation and diversion effects are the major driving forces in existing theories of how PTAs affect multilateral liberalization.[8] This is true even of the rare cases when domestic policies unrelated to trade have been considered in the context of PTAs, as Panagariya notes in a review of the literature "Also excluded from consideration are issues such as ... harmonization of domestic policies. Though these issues figure in the current policy debate, they have not been seriously addressed in the theoretical literature." (2000, p.288).

We take these non-trade issues seriously and show that, even in the absence of trade creation or diversion effects, preferential agreements with non-trade objectives have an important effect on the multilateral trading system. In particular, we stress the following results. First, the current regime of trading rules creates an incentive for large countries to maintain high multilateral tariffs to use as a threat against small countries in LSPTAs. Second, alternative regimes can prevent this effect if they can be enforced, but simple changes in WTO rules such as banning LSPTAs may in fact lead to even higher multilateral tariffs. Third, we endogenize the rules regime assuming it is chosen by the large countries and show that it is not necessarily the one preferred by small countries.

> some of the most powerful developed countries will continue to impose their own sanctions through the withdrawal of GSP preferences- measures that are perfectly legal under existing multilateral trading rules. By failing to respond to the demand for a social clause within the WTO, the Organization has simply created an incentive for developed countries to make fewer offers for tariff cuts on an MFN basis in future rounds of negotiations (especially on products of interest to developing countries), so as to preserve the impact that comes from being able to grant–and withdraw–GSP treatment. This is a consequence that free traders who are dogmatic opponents of a place within the WTO for permissible trade sanctions should consider more carefully." (p.462-463).

I thank Kyle Bagwell for suggesting this quote.

[6] This terminology was first introduced and the issue systematically analyzed by Bhagwati (1991). See Winters (1996) for a review.

[7] See for example Frankel (1997) and World Bank (2000). Most of the empirical work on creation and diversion effects has not focused specifically on Large-Small PTAs. In this regard the evidence from the effects of GSP preferences on developing countries' exports is useful. According to Gillson (p.4,5) there is little evidence for the creation of trade due to GSP preferences, one of the studies he surveys concludes that the "failure can be increasingly associated with supply-side constraints amongst the GSP beneficiaries."

[8] In contrasting the earlier wave of PTAs and the more recent one, Ethier states that: "...the Vinerian paradigm of trade creation versus trade diversion drove analysis of the former, but it is by no means clear that it should drive the analysis of the latter. Yet it *has*." (1998, p. 1215) Fernandez and Portes (1998) discuss a number of different non-traditional returns to forming a PTA. A rare exception of a PTA model that explicitly addresses non-trade issues is Schiff and Winters (1997). They explicitly model the motivation for a PTA between two small, specialized countries as arising from the increase in security (valued directly in the utility) due to higher imports from each other. However,

We model two symmetric regional blocs, each containing a large and a small country. There exist two externalities within each bloc. First, Large and Small's governments provide a public good, which has regional spillovers. Small places a negligible weight on that good, which results in a severe underprovision from Large's perspective. Second, there is a terms-of-trade externality; Large can use a tariff to depress Small's export prices. The governments can internalize these effects via an LSPTA bargain where Large agrees to lower its tariffs on Small's goods and in exchange Small increases the provision of the public good. Cooperation is self-enforcing because countries interact repeatedly. Importantly, we ensure that the LSPTA does not entail trade creation or diversion even though similar goods are traded within and across regional blocs.

We first show that, for given multilateral tariffs between large countries, an LSPTA provides a strict welfare improvement for each member, even if Large has the bargaining power to make a take-it-or-leave-it offer to Small. This occurs since the LSPTA must be self-enforcing and it is a useful benchmark because, while negotiating multilateral tariffs with the other bloc, large countries know that if they subsequently propose an LSPTA it will be accepted.

Across blocs, there is a terms-of-trade externality between the large countries, which is addressed by multilateral trade negotiations. Multilateral tariffs are set by large countries prior to the LSPTAs and maximize their own joint welfare. Moreover, these tariffs must be self-enforcing. According to the first article of GATT/WTO, the Most-Favorite-Nation rule (MFN), a reduction in tariffs between two members must be extended to all members. A strict commitment to MFN effectively precludes LSPTAs because the preferential tariff must be extended to all WTO members. However, WTO rules allow exceptions in the form of lower than MFN tariffs.[9] More importantly, for our purposes, the current exceptions imply that the lower bound for Large's preferential tariff on Small is zero and the upper bound is the "MFN" or multilateral tariff value so we refer to this regime of rules as an **LSPTA exception to MFN**.

The first important result is that under an LSPTA exception to MFN large countries choose a positive multilateral tariff even if they are sufficiently patient to enforce free-trade between them.

because the countries modeled are small relative to the rest of the world, we cannot infer any implications from the formation of such a PTA on other countries' tariffs.

[9] Currently, three important provisions in WTO rules relating to trade in the context of PTAs constitute exceptions to the MFN rule. For a PTA to be GATT-legal it must fall under either article XXIV, the Enabling Clause or article V of GATS (the agreement on services). Article XXIV can be used by any country if: i) the tariff reductions are reciprocal and eventually zero, ii) the agreement covers substantially all trade and, iii) when a common external tariff is adopted, it does not exceed the average of the existing tariff of the member countries in the preferential agreement prior to it. These three conditions are waived for PTAs among developing countries under the Enabling Clause. Since 1979 the Enabling Clause also encompasses the GSP, which was originally granted as a 10-year waiver from MFN in 1971 (Jackson 1997, p. 164).

Intuitively, reductions in the multilateral tariff lower the threat that Large can use in the LSPTA and therefore reduce its regional bargaining power. This cost explains the positive multilateral tariff and it has two sources. First, if the LSPTA is not duty-free then the reduction in the threat tariff leads to a reduction in the preferential tariff, here the cost is lost tariff revenue from Small. This effect is analogous to the standard MFN externality and not our main focus. Second, if the LSPTA is already duty-free then a reduction in the multilateral tariff forces Large to accept a lower provision of the regional public good, which is more costly then the loss in tariff revenue. This shows that an LSPTA exception to MFN is a stumbling bloc to multilateral liberalization if the LSPTA is duty-free.

Note that we define the stumbling bloc effect in terms of the increase in the multilateral tariff over and above that caused by the standard MFN externality to stress its novelty. Our result implies that tackling non-trade issues through preferential agreements can actually bloc further reductions of multilateral tariffs. Interestingly if the current WTO requirement that PTAs eliminate all internal barriers were strictly enforced then only duty-free LSPTAs would exist and these are precisely the ones that have the worst impact on multilateral trade liberalization according to our model.

The stumbling effect is quantitatively important when Large places a high value on the public good. If the LSPTA is duty-free then exogenous increases in that weight lead Large to increase the multilateral tariff in order for Small to increase the provision of the public good. This contains an interesting testable prediction. Increases in the weight that Large places on the public good lead to an increase of the multilateral tariff of a good *if* it is imported from an LSPTA partner. Alternatively, if we also model an (exogenous) gradual multilateral liberalization process, the prediction is that multilateral liberalization is slower for goods imported from small LSPTA partners.

The stumbling effect may help in explaining why large countries have such high trade barriers on important exports from small developing countries. One common explanation is that the standard MFN externality causes large countries to hold back MFN reductions in those goods. However, if the exports from small countries are jointly small then the MFN externality cannot fully account for the magnitude of those barriers. On the other hand the stumbling bloc effect we analyze may be important even for small levels of exports if large countries highly value the public good.

A typical standard used to evaluate the desirability of preferential agreements, or the rules regime that permit them, is the effect on the welfare of non-members. The stumbling bloc effect has a negative effect on small non-members that export the set of goods in which the multilateral tariff is higher. Therefore, we analyze whether eliminating WTO articles that allow exceptions to MFN is sufficient to eliminate the stumbling bloc effect. That is we compare the multilateral tariff chosen under the

LSPTA exception regime and a regime of commitment to MFN that precludes LSPTAs. We show that the stumbling effect is indeed eliminated under the commitment regime if large countries are sufficiently patient. However, if the large countries are not sufficiently patient this result can be reversed.

When large countries are not sufficiently patient the multilateral tariff is determined by the incentive constraints that balance the incentive to deviate from the multilateral agreement against future losses from non-cooperation. Under commitment to MFN large countries threaten to revert to non-cooperation in the multilateral tariff if the other either increases that tariff or sets a discriminatory tariff. But if they punish each other can they still enforce non-discrimination? To analyze this we distinguish between two extreme cases: strong and weak commitment to MFN. Under **strong commitment to MFN** non-discrimination can be enforced costlessly, so LSPTAs never take place. Under **weak commitment to MFN** there is no instrument to enforce non-discrimination during trade wars, at which time LSPTAs would take place. We can interpret weak commitment as the simple elimination of WTO articles that allow exceptions to MFN. Strong commitment entails an additional rule, such as allowing a third country to punish the warring parties if they also set discriminatory tariffs. The three different regimes, LSPTA exception, weak and strong commitment to MFN, lead to different incentive constraints and therefore different levels of multilateral liberalization.

Our second main result is that the lowest sustainable multilateral tariff under the exception is lower than that under a regime of weak commitment to MFN when large countries are not sufficiently patient. Thus we can say that the LSPTA exception is a building bloc relative to weak commitment to MFN. Briefly, under weak commitment large countries do not sign LSPTAs while cooperating, but do so if they ever enter a trade war. This possibility to sign a welfare improving LSPTA during a trade war provides an extra incentive to deviate from the multilateral agreement under weak commitment. Similarly the gains from cooperation are lower under weak commitment due to the absence of an LSPTA.

We also show that the lowest sustainable tariff under the exception can be higher than that under strong commitment when large countries are not sufficiently patient. This confirms that the stumbling bloc result can also hold when large countries are not sufficiently patient. More importantly, the contrasting results under weak and strong commitment to MFN provide a strong warning to governments deciding to commit to MFN. Simply eliminating the current rules that allow exceptions to MFN will actually lead to higher multilateral tariffs. But, with additional rules that credibly sustain a strong commitment to MFN governments can enforce lower multilateral tariffs.

The second typical standard used to evaluate the desirability of preferential agreements is their effect on the welfare of members. LSPTAs are welfare improving for both members at given multilateral tariffs. But if, as explained above, those tariffs are higher than under commitment which regime is preferred by small and large countries and which is chosen? We assume that a regime of rules is chosen in the initial stage of each period, that is prior to setting the multilateral tariffs and forming LSPTAs, as shown in figure 1. Large countries choose the regime that maximizes their own joint welfare. This captures the historic lack of participation by small developing countries not just in multilateral tariff reductions but also in setting WTO rules, which is one important complaint driving the current push for the latest trade negotiations to be a "development" round.

Our model predicts that large countries choose the LSPTA exception regime over commitment to MFN when sufficiently patient. This is not surprising since in this case the only difference between the two regimes is that commitment requires a non-discriminatory tariff and therefore rules out LSPTAs. Moreover, because large countries choose the multilateral tariffs to maximize their joint welfare any negative effects on each other from higher multilateral tariffs are fully internalized. The model also predicts that large countries chose the exception regime over weak commitment if they are not sufficiently patient. Both of these predictions are reassuring since the exception regime is indeed the status quo.

The final important result is that small countries do not always prefer the exception regime. More specifically, if the LSPTA is duty-free then there exist sufficiently patient small countries that prefer the commitment regime. Intuitively, when the LSPTA is duty-free the exception regime entails higher multilateral tariffs, which has two opposing effects. It benefits Small because its exports enter duty-free in Large's market and receive the higher price that results from the tariff increase. On the other hand, the increase in the threat tariff forces Small to increase its provision of the public good. If Small is sufficiently patient then Large extracts most of the gains from the LSPTA and we show that the negative effect dominates, so Small prefers the commitment regime. This is an example of a potential cost to small countries from non-participation in the setting of multilateral trade rules.

We first develop the regional blocs' model. In section 3 we derive the equilibrium LSPTA policies for given multilateral tariffs. Next we analyze multilateral trade liberalization, the role of LSPTAs as stumbling blocs and whether alternative regimes remove that effect. In section 5 we analyze the effects of deepening regional integration, extend the results to deal with global spillovers and derive the preferred MFN regime for large and small countries. We discuss our conclusions in section 6. All proofs are in the appendix.

2 A model of Large-Small PTAs

2.1 Economic structure of the regional blocs

There exist two symmetric regional blocs. Each bloc is composed of two economies, Large and Small, where the names refer to the countries' relative endowment of the (non-numeraire) traded goods. Large's bigger endowment is the basis for its dominating regional bargaining power. However, Small must be important in the non-trade dimension; otherwise, Large would not seek its cooperation on non-trade issues. Thus we assume that both countries have the same population to ensure that Large places a non-negligible weight on those non-trade issues proportional to Small's population, e.g. human rights, labor rights or environmental externalities.

Each country, $j = L, S$, has a population of H individuals, each endowed with one unit of labor, which is the only factor. The numeraire, n, is produced with labor, $N = h_n$. In Large each individual is also endowed with one unit of each of the non-numeraire goods $i = l, l^*$. In Small each individual is endowed with a fraction $1/k$ of good l. The representative consumer has the following preferences:

$$U^j \equiv c_n^j + \sum\nolimits_i u_i^j(c_i^j) + \bar{\Psi}^j(E^j, E^{\setminus j}) \tag{1}$$

The subutility functions for the non-numeraire private goods, u, are twice continuously differentiable and strictly concave. The subutility function for the public good, E, is:

$$\bar{\Psi}^j(E^j, E^{\setminus j}) \equiv \lambda^j \Psi(E^j) + \alpha^j \lambda^j \Psi(E^{\setminus j}) \qquad \alpha^j, \lambda^j \geq 0; \Psi' \geq 0; \Psi'' \leq 0 \tag{2}$$

The weight placed on the public good, λ^j, varies across countries.[10] The public good has a regional spillover if α^j is positive. We can interpret E as public expenditures to address environmental problems with cross-border spillovers or for enforcing certain laws, e.g. protecting human and labor rights.[11]

For given prices and taxes the individual chooses the quantities of the private goods it consumes to maximize utility subject to a budget constraint, $c_n^j + \sum_i p_i^j c_i^j \leq y^j$. Given the assumptions on the subutility, the budget constraint is satisfied with equality and individuals demand $d_i^j(p_i^j) = u_i^{j\,\prime}(p_i^j)^{-1}$

[10] We also assume that $\Psi(0) = 0; \lim_{E\to 0} \Psi'(E) = \infty$ and $\lim_{E\to\infty} \Psi(E) \leq \bar{\psi}$. The boundary assumption ensures that as long as the population in Small is sufficiently large it is not exhausted in producing E so the wage is fixed at one.

[11] Some of these issues have global effects. As we show in section 5.2 our results also hold when spillovers are global, therefore the initial focus on regional spillovers is not restrictive.

of each of the non-numeraire goods. Thus the individual's indirect utility is:

$$W^j/H = y^j + \bar{\Psi}^j(E^j, E^{\setminus j}) \ + \sum\nolimits_i \upsilon_i^j(p_i^j) \tag{3}$$

where the last term represents consumer surplus from the non-numeraire goods.[12] We make the following assumptions regarding Small's preferences. First, we are interested in the case where Large places a higher weight than Small on the provision of the public good. Therefore, without loss of generality, we focus on the extreme case where Small places no weight on the public good. Second, we want to ensure that no trade diversion or creation effects take place due to the LSPTA even if the same good is traded across regional blocs. As we show below, this requires a particular trade pattern and a condition to obtain it is to assume that Small derives no utility from either good l or l^*. Thus the indirect utility for individuals in Small is simply given by their income. An individual's income sources are the wage, the proceeds from the sale of the endowment and net taxes. Net taxes are equal to the per capita tariff revenues and the tax used to finance the public good, e.[13]

The government sets trade policy and supplies the public good in order to maximize domestic aggregate welfare.[14] The public good is produced using labor, $E^j = b^j h_e^j$. We assume that the population is sufficiently large so that the numeraire is always produced in equilibrium, which fixes the wage at unity. Finally, the balanced budget condition implies that, in equilibrium, the amount of public good provided is $E^j = b^j H e^j$.[15]

The trade policy instruments available are specific tariffs on the imported (non-numeraire) goods. The governments also decide on their trade policy strategy, namely whether to pursue LSPTAs and, in the case of Large, multilateral trade agreements and their associated rules. Before addressing this issue we analyze the trade pattern.

2.2 Trade pattern

The trade pattern for the non-numeraire goods is illustrated in figure 2. The two large countries have similar endowments and therefore differences in demand determine their trade pattern. We label the

[12] Throughout we focus on a quadratic form of the sub-utility, $u = (ac - c^2/2)/b$, which gives rise to linear demand curves and implies that $\upsilon = (a - bp)^2/2b$.

[13] Therefore the individual's income is $y^L = w^L + \sum_i p_i^L + t^L - e^L$ in Large and $y^S = w^S + p_i^S/k + t^S - e^S$ in Small.

[14] If individuals in the same country had different endowments we could easily provide a political economy motive for the government's use of trade policy. This would change the level of the tariffs set but not the qualitative results in this paper since the main motivation for reciprocal trade agreements is the TOT externality, which is independent of political economy motivations (Bagwell and Staiger 2000).

[15] All the tariff revenue is distributed lump-sum and we assume that none of it can be used to finance the public good, which maintains the two policies separable in the game that follows.

good that Large has a stronger preference for as l, so it imports l and exports l^*. Small countries value only the numeraire good and therefore export their full endowment, H/k, to the large countries.[16]

In the absence of discriminatory tariffs a small country always exports to the large country in its own bloc. However, when discriminatory tariffs are possible, Large could potentially set a relatively higher tariff on the exports of good l from Small, e.g. during a trade war, in which case Small would sell in Large*. To rule out the possibility that Large* simultaneously imports and exports an homogenous good, we assume that the trading costs between a small and a large country in the opposite bloc are prohibitive. There is a compelling reason for this assumption as well as for the endowment and preference structure: to neutralize any potential trade diversion and creation effects and isolate a distinct effect of LSPTAs on multilateral tariffs.

Small countries do not set tariffs since they do not import the non-numeraire goods.[17] Since Small has no tariff reductions to offer to Large, the LSPTA consists of a tariff reduction by Large on Small's exports in exchange for Small's provision of the regional public good. Consequently, the only direct effect of the LSPTA on trade is to increase Small's export price. Moreover, because Small's exports are perfectly inelastic, the price changes do not affect the quantity exported. In sum the LSPTA does not cause trade creation nor diversion.

To determine the equilibrium prices of l and l^* we first note that Large sets a tariff τ^L and τ^m on imports from Small and Large* respectively. The equilibrium domestic price in Large for its import, p_l^L, is derived from the market clearing condition:

$$M_l^L(p_l^L) + M_l^{L^*}(p_l^L - \tau^m) + M_l^S(p_l^L - \tau^L) = 0 \tag{4}$$

where $M_l^j \equiv H(d_l^j - 1)$ for $j = L$, L^* and $M_l^S \equiv -H/k$. A similar condition holds for l^*. These conditions implicitly define the domestic prices in Large as functions of the tariffs, $p_l^L(\tau^m)$ and $p_{l^*}^L(\tau^{m^*})$. Note that these prices are not directly affected by the preferential tariff because the small countries' supply is perfectly inelastic. It is then simple to show that an increase in τ^m raises

[16] The balance of payments condition is satisfied through movements of the numeraire good.

[17] We can easily extend the model to provide a motivation for such tariffs. However, reductions in small countries' tariffs are not an important part of the types of PTAs we analyze and therefore we choose not to model them. For example, the GSP programs allowed by GATT do not require reciprocal trade concessions. However, "during the last twenty-five years or so the experience of the GSP in the GATT system has been that for a number of reasons the preference-granting national entities (i.e. the industrialized countries) often succumb to the temptation to use the preference systems as part of 'bargaining chips' of diplomacy." (Jackson 1997, p. 160) Also, trade liberalization by the smaller less developed countries has mostly been a result of a shift in ideology from import substitution towards unilateral liberalization rather than a result of reciprocal trade liberalization with developed countries. See for example Ethier (1998) and Foroutan (1998, p.8) on Mexico, Israel and Turkey.

p_l^L whereas an increase in τ^{m^*} lowers the price for Large's exporters.[18] We can now write the governments' objective functions in terms of the policy variables as follows.

$$W^S(\tau^L, e^S, \tau^m) = H(1 - e^S + (p_l^L(\tau^m) - \tau^L)/k) \tag{5}$$

$$\begin{aligned} W^L(\tau^L, e^S, \tau^m, \tau^{m^*}, e^L) &= H\{1 - e^L + \lambda^L \Psi(b^L H e^L) + \alpha^L \lambda^L \Psi(b^S H e^S)\} \\ &\quad + H\{p_{l^*}^L(\tau^{m^*}) + \upsilon_S^L(p_{l^*}^L(\tau^{m^*}))\} \\ &\quad + H\{p_l^L(\tau^m) + \upsilon_l^L(p_l^L(\tau^m))\} - \{M_l^S \tau^L + M_l^{L^*} \tau^m\} \end{aligned} \tag{6}$$

For Small the three terms in eq.(5) represent respectively the aggregate wage; the cost of producing the public good and export revenue. For Large the terms in eq.(6) represent respectively the aggregate wage; the cost of producing the public good; utility from the public good; surplus from good l^*; surplus from good l and tariff revenue.

3 Equilibrium analysis of LSPTAs

There exist two intra-bloc externalities. The first arises through the public good and the second is the terms-of-trade externality due to Large's market power in trade. These externalities are typically overcome through international self-enforcing agreements. We study such agreements in detail below. First we examine the non-cooperative Nash equilibrium for the LSPTA recalling that the LSPTA takes place after the multilateral tariff has been set and therefore takes it as given.

3.1 Non-cooperative solution

Small's supply of l is perfectly inelastic and it has no demand for the good, therefore Large can use a tariff that extracts all the surplus and Small will still export its full endowment.[19] Small sets its e-tax at zero because it does not value the public good. Thus for the policies of interest in the LSPTA the

[18] More specifically, $\partial p_l^L(\tau^m)/\partial \tau^m \in (0,1)$ and $\partial p_{l^*}^L(\tau^{m^*})/\partial \tau^{m^*} \in (-1,0)$.

[19] The results below go through if Small has a positive and sufficiently elastic demand for good l up to a maximum price $\bar{p}$. In that case Small exports all its endowment under a discriminatory tariff equal to $p^L - \bar{p}$. A tariff higher than $p^L - \bar{p}$ would lower Large's welfare if Small's offer is sufficiently elastic below $\bar{p}$. Note also that even if we allow Small to have access to an export tax in our current setup Small's best-response to τ^{NL} is indeterminate, any non-negative value for the export tax is a Nash equilibrium, including zero which is the value we implicitly assume.

Nash equilibrium value for given multilateral tariffs is:[20]

$$\tau^{NL} = p^L(\tau^m) \quad (7)$$

$$e^{NS} = 0 \quad (8)$$

In figure 3 point N represents the Nash equilibrium for these policies when Large is free to set a discriminatory tariff (below we analyze how the MFN rule affects this). Small's iso-welfare contour at the Nash is labelled $\bar{W}^{NS}$ and has a constant slope of $-k$, the ratio of Large to Small's endowments.[21] Small's welfare increases as τ^L or e^S are lowered, reaching the maximum at the origin. Large's contour is labelled $\bar{W}^{NL}$. Since Large's welfare is quasi-linear in τ^L, increases in that tariff simply generate a vertical shift of Large's contours until it imposes a tariff equal to p^L, at which point Small stops exporting the good. Large's welfare is increasing in e^S.

3.2 Bargaining solution to LSPTA

The Nash equilibrium for the LSPTA is constrained Pareto efficient when countries cannot make direct transfers nor exchange concessions across policies. Large would benefit from an increase in e^S, but Small would lose because of the provision cost. Whereas a reduction in τ^L transfers tariff revenue from Large to Small. But, if exchanges can be made across the two issues, a Pareto improvement is possible, as represented by the shaded area in figure 3.

Temporarily abstracting from enforcement constraints, the solution to an LSPTA resulting from an efficient bargaining process must lie on the locus $T^S T T^L$ in figure 3. This locus represents the set of Pareto efficient solutions which improve on the Nash.[22] The exact solution depends on the particular bargaining concept and relative bargaining powers. We are interested in the extreme case where Large has all the bargaining power. This is an important case empirically given the extreme size asymmetries in recent LSPTAs and because we want to answer whether Small is strictly better off with the LSPTA even if it has no bargaining power. If Large makes a take-it-or-leave-it (TOL) offer, the solution to the LSPTA is at T^L, which leaves Small at its Nash welfare level.[23]

[20] The $e-$tax set by Large is independent of the remaining policies because of the separability of W^L. This and the fact that Small does not value the public good imply that Large's $e-$tax is irrelevant for our analysis.

[21] A reduction of τ^L by k increases Small's export price by k and thus its export revenue increases by $kH/k = H$. Since H is the aggregate cost of increasing e^S by one unit, the slope of the iso-welfare is $-k$.

[22] The segment TT^L traces out the points at which Large and Small's iso-welfare contours are tangent. It is vertical because changes in Large's tariff on Small have only tariff revenue effects, which are constant and therefore have no impact on the slope of the iso-welfare curves.

[23] After discussing the accession policies in the context of NAFTA and the EU a recent World Bank report on regionalism states that:

Thus far we assumed that Large uses the Nash tariff as the threat in the LSPTA. However, if both countries are members of the WTO, there is an important constraint on the level of this threat tariff, which arises from one of the most important rules in the WTO. According to the **most-favoured nation rule (MFN)** a country must extend the same tariff on "like-products" to all WTO members. If this rule is strictly enforced then Large cannot extend a preferential tariff and LSPTAs are ruled out. However, current WTO rules allow exceptions to MFN, such as GSP, which explicitly allows large countries to offer tariffs below MFN values. Since the upper bound tariff is still tied to the MFN value an **LSPTA exception to MFN** entails $\tau^L \leq \tau^m$ during periods of cooperation between large countries. Therefore when LSPTAs are permitted the threat tariff Large uses against Small is:

$$\tau^T \begin{cases} \leq \tau^m & \text{if } \tau^m \text{ is set cooperatively and Small is a WTO member} \\ = \tau^{NL} = p^L(\tau^m) & \text{otherwise} \end{cases}$$

All our qualitative analysis still applies if we use the multilateral tariff as the maximum threat point. The basic intuition for the main results we derive below is now clearer. By reducing the multilateral tariff Large reduces the value of the threat tariff it uses in the LSPTA, either directly when $\tau^T \leq \tau^m$, or indirectly when $\tau^T = \tau^{NL}$ since a reduction in τ^m causes $p^L(\tau^m)$ to fall. This lowers Large's regional bargaining power and thus the LSPTA entails an extra cost of reducing the multilateral tariff. In figure 4 the locus $0T^{L'}T^L$ traces out the effect of changing this threat on the TOL LSPTA solution. If the starting multilateral tariff is equal to τ^{NL} the solution is at T^L, as before. Reductions in the multilateral tariff reduce the threat tariff, which initially simply reduce the preferential tariff. However, if the threat falls below $\tau^{T'}$ the LSPTA will have a zero preferential tariff and any further reductions in τ^T allow Small to reduce its provision of the public good. This is the extra cost of reducing multilateral tariffs that will drive the stumbling bloc effect.[24]

> "In practice, (...) any country is free to apply; but the price of entry is set separately for each entrant. This can lead to asymmetric agreements in which benefits to developing country candidates are reduced and possibly appropriated by existing members through side conditions on issues such as the environment, labor regulations, and rules of origin." (2000, p.100)

Abrego et. al (1997) do not address preferential agreements but they estimate the gains relative to non-cooperation of a Nash bargaining outcome in a 2-country general computable equilibrium model where a large country trades market access for environmental protection provided by a small country.

[24] In an independent paper that addresses WTO accession Bagwell and Staiger (2001) argue that a similar mechanism may explain why WTO members hold back tariff reductions on goods exported by countries expected to accede to the WTO.

3.3 Self-enforcing bargaining solution to LSPTA

Much like other international cooperative agreements, LSPTAs must be self-enforcing given the absence of a supra-national authority to punish a country if it does not comply. If the asymmetry in bargaining power allows Large to make a TOL offer then enforcement becomes a key issue. Intuitively, if the TOL solution T^L can't be directly enforced, then Small would accept the offer, get the higher export price in the first period and deviate, that is never provide the public good, since it gains nothing from cooperation. Thus the particular LSPTA solution just derived is not self-enforcing.

Cooperative self-enforcing agreements are well characterized by certain repeated games.[25] We analyze the self-enforcing bargaining solution to the LSPTA when Large makes a TOL offer to Small for given multilateral tariffs. We assume that governments observe each other's actions at the end of each period and focus on stationary subgame perfect equilibria. We adopt the simplest trigger strategies that maintain such equilibria–infinite Nash reversion. That is, after a deviation Small sets e^{NS} and Large sets τ^L at τ^T. The payoffs for each government are their respective welfare functions discounted at the rates δ^j.[26]

More formally, Large makes a TOL offer to Small specifying τ^L and e^S for a given level of the threat tariff τ^T as well as τ^m, which may be identical in equilibrium. This offer maximizes the present discounted value of Large's welfare subject to one incentive constraint for each country, IC^j. Since we focus on stationary strategies, we need only maximize welfare each period. Therefore, the self-enforcing tariff and e-tax for the LSPTA, are given by:

$$(\tau^B(\tau^T), e^B(\tau^T)) \equiv \underset{\tau^L, e^S}{\arg\max}\{W^L(\tau^L, e^S, \tau^m, \tau^{m^*}, .) : IC^L; IC^S\}$$

The incentive constraints require that the net gain from deviating in any one period, Ω^j, must not exceed the discounted value of the net benefit from future cooperation, $\delta^j\omega^j/(1-\delta^j)$.More specifically:

$$\omega^S \equiv W^S(\tau^L, e^S, \tau^m) - W^S(\tau^T, e^{NS}, \tau^m) \tag{9}$$

$$\Omega^S \equiv W^S(\tau^L, e^{NS}, \tau^m) - W^S(\tau^L, e^S, \tau^m) \tag{10}$$

[25] See for example Dixit (1987) , Bagwell and Staiger(1990) and Riezman (1991).

[26] We do not restrict the relative size of the discount factors. Note that when $\delta^L \neq \delta^S$ there may be a motive for intertemporal trading of payoffs (if $\delta^L > \delta^S$ the incentive is to have Small's payoffs being relatively larger initially and the opposite for Large). This suggests that it may be optimal to consider non-stationary strategies. However, simple non-stationary strategies involving first more cooperation by Large (until some period t) and then by Small would not be optimal for Large. The reason is that, seen from period t, the policies must still be self-enforcing. If they are indeed self-enforcing from t onwards then Large should have proposed those policies at the start and not at t because nothing is different at t (except for the history of play). So we focus on stationary strategies.

$$\omega^L \equiv W^L(\tau^L, e^S, \tau^m, .) - W^L(\tau^T, e^{NS}, \tau^m, .) \quad (11)$$

$$\Omega^L \equiv W^L(\tau^T, e^S, \tau^m, .) - W^L(\tau^L, e^S, \tau^m, .) \quad (12)$$

The solution to the LSPTA problem is as follows. In a self-enforcing LSPTA Large can no longer leave Small at the Nash welfare level, since if Small does not gain from cooperating then the only self-enforcing e-tax is zero. In figure 5a, $\overline{IC}^j$ represents the incentive frontier for country j, i.e. the combinations of τ^L and e^S that leave j indifferent between cooperating and deviating. As we just argued, $\overline{IC}^S$ is interior to Small's iso-welfare line at the Nash, $\bar{W}^{NS}$, so T^L is not self-enforcing. The incentive frontier for Large holds with equality at τ^L=τ^T and is flatter than its iso-welfare curves. Thus the shaded area between Large and Small's incentive frontiers represents the set of self-enforcing LSPTAs that improve on the Nash. Moreover, since Large makes a TOL offer, Small's IC must bind so the solution is on $\overline{IC}^S$, otherwise Large would offer a higher tariff or demand a higher e^S.

The LSPTA is duty-free as illustrated by point B in figure 5b if Large is sufficiently endowed relative to Small, that is when k is sufficiently large, as we show in the appendix. It is also possible to show that the LSPTA is duty-free if Large places a high weight on the public good or the spillover, α, is important since Large is then willing to give up all the tariff revenue for even a small increase in e^S. If Large is not sufficiently endowed we obtain one of two interior solutions. First, if Large's IC does not bind then the solution is at point BI in figure 5a where the MRS of the policies in Large's welfare and the MRS of the policies in enforcement for Small are equated. Otherwise the solution is at the intersection of $\overline{IC}^L$ and $\overline{IC}^S$ (not depicted). Subsequent results depend on whether the LSPTA is duty-free so the proposition below summarizes the alternative solutions.

Proposition 1 *(Self-enforcing LSPTA bargaining solutions):*
The self-enforcing LSPTA (TOL) bargaining solution for a threat of τ^T *is* $(\tau^L = \tau^B(\tau^T), e^S = e^B(\tau^T))$, *where* $e^B(\tau^T) = \frac{\delta^S}{k}(\tau^T - \tau^B(\tau^T))$ *and*
(i) $\tau^B(\tau^T) = 0$ *if and only if Large is sufficiently endowed relative to Small* ($k \geq max(k_1, k_2)$) *or*
(ii) Otherwise:
$\tau^B(\tau^T) = \tau^{BI} : \frac{W^L_{e^S}(e^B)}{W^L_{\tau^L}} = \frac{W^S_{e^S}}{W^S_{\tau^L}}\frac{1}{\delta^S}$ *(IC ^{L} does not bind) or*
$\tau^B(\tau^T) = \tau^{BII} : \tau^T - \tau^B = \frac{\delta^L k}{H} H\alpha^L\lambda^L\Psi(b^S H e^B)$ *when* $\frac{W^L_{e^S}(e^B)}{W^L_{\tau^L}} \geq \frac{W^S_{e^S}}{W^S_{\tau^L}}\frac{1}{\delta^S}$ *(IC ^{L} binds)*

Having established the alternative solutions to the LSPTA we note its welfare impact on the members.

Proposition 2 *(Welfare effect of LSPTA for given multilateral tariffs):*
For given multilateral tariffs, $\delta^S \in (0,1)$ and $\delta^L \in (0,1)$, a self-enforcing LSPTA is strictly welfare improving for both members relative to no LSPTA even if Large has all the bargaining power and makes a TOL offer to Small.

It was obvious from figure 3 that a Pareto improving area exists. However, in the absence of enforcement problems, this area includes LSPTAs which are not strictly welfare improving for both countries, e.g. Large's TOL offer at T^L. As is clear from the shaded area in figure 5 such LSPTAs are ruled out by enforcement constraints if countries discount the future. This is important because it ensures that Small does not refuse Large's proposal for a self-enforcing LSPTA. Thus, if Large countries chose a regime of trade rules that allows LSPTAs, it is reasonable for them to negotiate their multilateral tariffs assuming that subsequently each will sign a self-enforcing LSPTA.

We now model multilateral liberalization to show how LSPTAs lead to positive multilateral tariffs and analyze whether alternative regimes can avoid or mitigate this.

4 Multilateral trade liberalization

4.1 Structure and timing of MTL

LSPTAs have taken place in the context of broad multilateral trade liberalization governed by GATT/WTO rules. Much of this liberalization occurs between large countries and follows the principal supplier rule. That is, if country A is the biggest exporter to B of a given product then B proposes a tariff reduction to A on that product in exchange for A's tariff reduction on one (or several) of B's exports. After agreeing on a reciprocal tariff reduction large countries must extend it to all other WTO members which export similar goods due to the MFN rule. So, because of MFN, countries A and B commit to binding their maximum tariffs on imports from other countries at the level negotiated between themselves. We now address this effect of binding the maximum tariff and therefore "tying one's hands" in terms of the maximum threat that can be used in an LSPTA. More specifically, we answer the following question. Are LSPTA exceptions a building bloc or a stumbling bloc towards further MTL?[27]

[27] We do not attempt to model why, when there are only two large countries, they choose to enforce an MFN rule vis-a-vis small countries. We simply take this feature of the trading system as given. As Horn and Mavroidis (p.37) point out in their review of theoretical models of MFN: "a major weakness with the literature is the fact that there does not appear to exist models where MFN is an endogenous feature of an agreement." An exception to this is Cepi and Ludema (2001). See also Ghosh et. al (1998) for numerical simulation results on the value of MFN for developing countries.

The timing of agreements in our model captures the fact that regional agreements are typically "easier" to reach than multilateral ones. We implicitly assume that regional negotiation costs are negligible relative to multilateral ones, which implies that even after multilateral trade negotiations a country can sign an LSPTA. Thus LSPTAs should be modelled as the last stage of the game. As illustrated in figure 1, the first stage involves a choice of rules, which we analyze in section 5. Given the choice of rules, the second stage involves the choice of multilateral tariff levels and the third stage the LSPTA. This three-stage game takes place each period and is indefinitely repeated.

We model MTL as the self-enforcing solution to a repeated game. Large countries choose the multilateral tariffs to maximize their joint welfare subject to incentive constraints that ensure neither prefers to deviate from the agreement. We focus on subgame perfect Nash equilibria sustained by trigger strategies that involve infinite Nash reversion. The exact trigger depends on whether governments choose to have an LSPTA exception to the MFN rule or commit to MFN, that is to a non-discriminatory tariff. Below we provide the exact trigger strategies and the resulting incentive constraints. Before doing so we derive the equilibrium multilateral tariffs for the case when the large countries are sufficiently patient so that their incentive constraints for the MTL do not bind. This isolates the effect of the LSPTA on multilateral tariffs and points to a potential solution.

4.2 LSPTAs as stumbling blocs to MTL

Given the symmetry between large countries it is sufficient to focus on one country and, since the problem is stationary we can focus on maximizing welfare each period. Thus, after taking the symmetry into account, the cooperative multilateral tariffs set under the LSPTA exception, τ^{EXm}, and commitment to MFN, τ^{Cm}, are respectively:

$$\tau^{EXm} \equiv \arg\max_{\tau^c}\{W^L(\tau^L=\tau^B(\tau^T), e^S=e^B(\tau^T), \tau^c, \tau^{m*}=\tau^c, .) : IC^{EX}; \tau^L \leq \tau^c\} \quad (13)$$

$$\tau^{Cm} \equiv \arg\max_{\tau^c}\{W^L(\tau^L, e^S=0, \tau^c, \tau^{m*}=\tau^c, .)) : IC^{C}; \tau^L = \tau^c\} \quad (14)$$

The constraint imposed by the commitment to MFN is a non-discriminatory tariff, $\tau^L = \tau^m$, thus no LSPTA can take place and Small does not provide the public good. With the LSPTA exception large countries can not set a tariff on Small higher than the multilateral tariff and thus a threat to Small any higher than τ^m is not credible.[28] If **large countries are sufficiently patient**, that is if the incentive constraints for the MTL do not bind, then we can focus on the following FOC to determine

[28] Below we show when this constraint is itself self-enforcing so that large countries respect it.

the multilateral tariffs under the exception and commitment regimes respectively:

$$\tau^{EXm} \quad : \quad W^L_{\tau^m} + W^L_{\tau^{m*}} + W^L_{\tau^L}\frac{\partial \tau^B}{\partial \tau^T} + W^L_{e^S}\frac{\partial e^B}{\partial \tau^T} = 0 \tag{15}$$

$$\tau^{Cm} \quad : \quad W^L_{\tau^m} + W^L_{\tau^{m*}} + W^L_{\tau^L} = 0 \tag{16}$$

In the second condition the first two terms are standard and if they were the only ones then free trade would be the outcome. The last term, $W^L_{\tau^L}$, is the standard MFN externality and arises because large countries ignore the small countries' welfare when choosing the multilateral tariff. When Large imports the same good from Large* and Small an increase in the multilateral tariff also increases the tariff on Small's exports thus allowing Large to capture extra tariff revenue. This effect explains the initial increase in Large's welfare under commitment when we graph it against the cooperative multilateral tariff, as shown by the curve W^{CL} in figure 6.[29] In the first condition, instead of $W^L_{\tau^L}$, we have two terms representing the effect of raising the multilateral tariff on the threat tariff and consequently on the LSPTA preferential tariff and e-tax. If this effect via the threat tariff exceeds the tariff revenue effect under commitment then the tariff under the exception is higher than predicted by the standard MFN externality.

We can state the main proposition of this section using the following definition. A LSPTA exception to MFN is a **stumbling (building) bloc** to multilateral trade liberalization (MTL) if the multilateral tariff under this exception is higher (lower) than the tariff under a regime where no such exceptions are allowed, i.e. $\tau^{EXm} > \tau^{Cm}$ ($\tau^{EXm} < \tau^{Cm}$).

Proposition 3 *(LSPTAs as stumbling blocs, $\tau^{EXm} > \tau^{Cm}$, patient large countries):*
When large countries are sufficiently patient an LSPTA exception to MFN is a stumbling bloc to MTL if and only if the LSPTA is duty-free.

The intuition is as follows. An MFN reduction lowers the threat that Large can use in the LSPTA. Therefore Small's gain from cooperating in the LSPTA falls because it has less to loose from not cooperating. Since Small's gain from deviating remains unchanged the self-enforcing value of e^S falls for any given preferential tariff. In figure 5 this corresponds to a downward shift of Small's IC by the amount of the reduction in the multilateral tariff. To ensure that Small's IC holds Large must either lower the preferential tariff by the same amount as the reduction in the multilateral tariff or accept a lower e^S. Since W^L is linear in τ^L Large would prefer to lower τ^L by the amount of

[29] The standard MFN externality is well known, see for example Horn and Mavroidis (2000) and references therein.

the reduction in τ^m. If after such a reduction τ^L is non-negative then the MFN reduction has the same welfare effect under commitment and the LSPTA exception: to reduce τ^L by the amount of the reduction in τ^m. Thus there is no motive for higher multilateral tariffs under the LSPTA exception. However, if lowering τ^L by the amount of the MFN reduction would entail a negative tariff then Large is forced to accept a lower e^S. This is more costly then the loss in tariff revenue from Small's exports that occurs under commitment, which explains why multilateral tariffs are then higher under the LSPTA exception. So the tariff under the exception reflects the standard MFN externality, as does the tariff under commitment, and the *additional* effect which we refer to as the stumbling bloc effect.

Given that a number of LSPTAs are duty-free, e.g. the US GSP program, the effect we analyze is likely to be present. Interestingly if the current WTO requirement that PTAs eliminate all internal barriers were strictly enforced only duty-free LSPTAs would exist and these are precisely the ones that have a negative impact on multilateral trade liberalization. Below we determine when this effect is quantitatively significant and its welfare effects on the modelled countries.

A standard commonly applied to the desirability of preferential agreements is their effect on non-members. It is immediately clear that if we introduce countries, similar to Small but with nothing to offer to Large in an LSPTA, those countries would be harmed by the higher multilateral tariffs on their exports under the LSPTA exception. This provides one motivation to analyze which rules or type of agreements remove this stumbling bloc to MTL (below we show that it is not the only motivation). First, we note two basic institutional changes which are not sufficient to remove the stumbling bloc. Second, we show that the commitment alternative analyzed above may be difficult to enforce in the context of the WTO if large countries are not sufficiently patient.

We have considered the current set of WTO rules that require the maximum tariff to be bound by the multilateral tariff, however this is not a necessary condition for the stumbling bloc effect. If Large could threaten Small with the Nash tariff, τ^{NL}, then a reduction in the multilateral tariff would still lower the LSPTA threat point. Recall that τ^{NL} equals $p^L(\tau^m)$, which falls if the multilateral tariff is reduced. Thus even if Large can threaten Small with τ^{NL} the stumbling effect may be present depending on how much market power in trade Large has.[30]

Participation of the two small LSPTA partners in the multilateral negotiation is also insufficient to remove the stumbling bloc. If all countries have the same weight during this negotiation then

[30] The exact condition for the stumbling effect to be present is now $p_{\tau^m} W^L_{e^S} / W^L_{\tau^L} > \frac{k}{\delta^S}$, independently of whether the LSPTA is duty-free. This condition is less likely to hold if Large has significant market power in trade since then p_{τ^m} approaches zero.

free trade is optimal under commitment. At free trade a marginal increase in the multilateral tariff has no direct first-order effect on the joint welfare of the four countries but it allows large countries to exchange preferential access for public good provision. Thus a positive multilateral tariff would increase the joint welfare of these four countries but would continue to harm any excluded parties.

4.3 Enforcing commitment to alternative MFN regimes

The failure of the two simple alternatives above to eliminate the stumbling effect suggests that it is likely to hold in more general settings. If that is the case then according to proposition 3 implementing the commitment regime would certainly solve the problem when the large countries are sufficiently patient. But we now show that if they are not sufficiently patient, i.e. if the IC for the MTL do bind, then it is crucial to analyze how governments enforce not just the tariffs within a given regime but the *regime* itself. Importantly we show that simply removing WTO articles which allow for an LSPTA exception may actually lead to higher multilateral tariffs.

To analyze the case when the IC bind we must specify the trigger strategies, which depend on whether governments choose the LSPTA exception or commitment to MFN. To commit to MFN countries must remove the WTO rules that allow exceptions: article XXIV and/or the parts of the Enabling clause. To enforce the multilateral tariff and non-discrimination large countries can threaten each other to revert to Nash in that tariff. But if countries ever do revert to Nash there may be nothing else they can threaten to enforce non-discrimination. To analyze this point we distinguish between weak and strong commitment to MFN. Weak commitment represents one extreme case when there is no other threat available to enforce non-discrimination during trade wars between large countries. Strong commitment represents the other extreme when countries are assumed to have the instruments to enforce non-discrimination during trade wars. The three different regimes, LSPTA exception, weak and strong commitment to MFN, lead to different incentive constraints and therefore different levels of multilateral trade liberalization.

Under the LSPTA exception cooperation in multilateral tariffs is conditional on past cooperation by the large countries in those tariffs, i.e. $\tau^m = \tau^{m^*} = \tau^c$, *and* a tariff against the Small partner no higher than the multilateral value. Thus the highest credible threat Large can make to Small without incurring punishment from Large* is τ^c. But, when there is no cooperation in multilateral tariffs, governments are free to set discriminatory tariffs. Large then sets the multilateral tariff at the Nash level, τ^{Nm} (defined below in lemma 1), and threatens Small with $\tau^{NL} = p^L(\tau^{Nm})$. So, under this

regime, the incentive constraint in eq.(13), IC^{EX}, is $\Omega^{EX} \leq \frac{\delta^L}{1-\delta^L}\omega^{EX}$, where:

$$\omega^{EX} \equiv W^L(\tau^B(\tau^c), e^B(\tau^c), \tau^c, \tau^{m^*} = \tau^c, .) - W^L(\tau^B(\tau^{NL}), e^B(\tau^{NL}), \tau^{Nm}, \tau^{Nm^*}, .) \quad (17)$$

$$\Omega^{EX} \equiv W^L(\tau^B(\tau^{NL}), e^B(\tau^{NL}), \tau^{Nm}, \tau^{m^*} = \tau^c, .) - W^L(\tau^B(\tau^c), e^B(\tau^c), \tau^c, \tau^{m^*} = \tau^c, .) \quad (18)$$

Under **weak commitment to MFN** if either large country deviates in the multilateral tariff *or* sets a discriminatory tariff on the small partner then both large countries revert to Nash behavior in multilateral tariffs, τ^{Nm}. But, when there is no cooperation in multilateral tariffs, governments are free to set discriminatory tariffs since they then have no way to enforce non-discrimination. This implies that if Large countries were to ever stop cooperating in MFN tariffs they would sign LSPTAs and use τ^{NL}, the same threat as under the LSPTA when there is no cooperation. As the payoffs below show this means that weak commitment is exactly identical to the LSPTA exception during periods of deviation or punishment. So, under weak commitment, the gains from cooperation and deviation are respectively:

$$\omega^{WC} \equiv W^L(\tau^L = \tau^c, e^S = 0, \tau^c, \tau^{m^*} = \tau^c, .) - W^L(\tau^B(\tau^{NL}), e^B(\tau^{NL}), \tau^{Nm}, \tau^{Nm^*}, .)$$

$$\Omega^{WC} \equiv W^L(\tau^B(\tau^{NL}), e^B(\tau^{NL}), \tau^{Nm}, \tau^{m^*} = \tau^c, .) - W^L(\tau^L = \tau^c, e^S = 0, \tau^c, \tau^{m^*} = \tau^c, .)$$

Under **strong commitment to MFN** governments set a non-discriminatory tariff at all times and therefore cannot pursue LSPTAs. For this commitment to be credible in the current model, where governments always have *access* to discriminatory tariffs, we would require a trigger strategy similar to the one under weak commitment plus an extra instrument for governments to punish each other when they are off the equilibrium path in their MFN tariffs. Such an instrument would ensure that governments would not find it optimal to use discriminatory tariffs and sign an LSPTA, even after deviating from the MTL agreement. One way to achieve this is to replace infinite Nash reversion with temporary punishments. We can then have a longer punishment period when countries deviate from the multilateral tariff and form LSPTAs then when they deviate but do not form LSPTAs. We do not model alternative strategies here but assume them implicitly so that governments do not use discriminatory tariffs and set a single tariff on both partners. The trigger strategy in this modified model is to set the non-discriminatory tariff at the cooperative level if that was the history of play in previous periods for both large countries and otherwise revert to the Nash value, τ^N, defined below

in lemma 1. Under strong commitment the gains from cooperation and deviation are:

$$\begin{aligned}\omega^{SC} &\equiv W^L(\tau^L=\tau^c, e^B=0, \tau^c, \tau^{m^*}=\tau^c, .) - W^L(\tau^L=\tau^N, e^B=0, \tau^N, \tau^{N^*}, .)\\ \Omega^{SC} &\equiv W^L(\tau^L=\tau^N, e^B=0, \tau^N, \tau^{m^*}=\tau^c, .) - W^L(\tau^L=\tau^c, e^B=0, \tau^c, \tau^{m^*}=\tau^c, .)\end{aligned}$$

4.4 LSPTAs as building or stumbling blocs (impatient large countries)

We can now determine if the LSPTA exception is a stumbling bloc or a building bloc to MTL when Large countries are not sufficiently patient. To do so we compare the **most-cooperative tariff**, τ^R, that is the lowest tariff that is self-enforcing under each of the regimes $R = EX, WC, SC$:[31]

$$\Omega^R(\tau^R, .) = \frac{\delta^L}{1-\delta^L}\omega^R(\tau^R, .) \tag{19}$$

Focusing on the most-cooperative tariff is only meaningful if the constraints bind at the optimal solutions. As will be clear, for our comparison it is sufficient to ensure that the LSPTA constraint binds because $\tau^{EXm} \geq \tau^{Cm}$, as we show in proposition 3. For the constraint under the exception to bind we require $\delta^L < \delta^{EX}$, where δ^{EX} is implicitly defined by $\Omega^{EX}(\tau^R = \tau^{EXm}, .) = \frac{\delta^{EX}}{1-\delta^{EX}}\omega^R(\tau^R = \tau^{EXm}, .)$. We first compare the LSPTA and weak commitment regimes.

Proposition 4 *(LSPTA exception vs. weak commitment, $\tau^{EX} < \tau^{WC}$)*
A LSPTA exception to MFN is a building bloc to MTL relative to a weak commitment to MFN if $\delta^L < \delta^{EX}$.

When $\delta^L < \delta^{EX}$ the multilateral tariff under the LSPTA is determined by the most-cooperative tariff. We show that this tariff is lower under the LSPTA than weak commitment regime by evaluating the gain from deviation and cooperation under weak commitment at τ^{EX}. We find that both the gain from deviation is higher and the gain from cooperation lower than under the exception. Intuitively, deviating in multilateral tariffs under the exception allows large countries to extract more cooperation from the LSPTA by using a bigger threat, τ^{NL} instead of τ^c. However, deviating under weak commitment leads to an even larger gain because initially there was no LSPTA at all and after

[31] If Ω^R and ω^R are respectively convex and concave with respect to the cooperative MFN tariff then there is only one tariff lower than the Nash that satisfies eq.(19). It is simple to show that these conditions hold for all three regimes when excess demands are linear in prices. For the convexity of Ω^{SC} and Ω^{WC} we use the fact that $p_\tau < 1$. For the concavity of ω^R we make use of the symmetry: $M_l^L = M_s^{L^*}, M_s^L = M_l^{L^*}$ and in addition, for the LSPTA exception case, that Ψ is concave.

deviating Large uses τ^{NL} as a threat. Similarly the gains from cooperation for Large are lower under weak commitment because it foregoes the LSPTA.

Enforcement considerations completely reverse the stumbling bloc result of proposition 3 in the case of weak commitment. Consider now the case of strong commitment. Because the behavior for the exception and weak commitment regimes are equal under deviation and punishment periods the value of each policy, e.g. τ^{Nm}, is also equal across the two regimes in those situations. However, under strong commitment the Nash non-discriminatory tariff, τ^N, is different from the Nash multilateral tariff, τ^{Nm}, and we must know their relative values to compare payoffs during trade wars. The following definition allows us to compare these values. **Large has sufficient market power** if $p_\tau \leq \frac{k}{\delta^S} / \frac{W^L_{e^S}}{W^L_{\tau^L}}|_{e^B(\tau^{NL}=p^L(\tau^{Nm}))}$.

Lemma 1: *$\tau^N \geq \tau^{Nm}$ if Large has sufficient market power.*

To understand this lemma consider a case where Large has sufficient market power. Namely, assume that the LSPTA has the interior solution BI in figure 5a (note that this is still compatible with a duty-free LSPTA at a threat lower than $\tau^{NL} = p^L(\tau^{Nm})$). In this case Large's iso-welfare and Small's incentive frontier are tangent so $W^L_{e^S}/W^L_{\tau^L} = k/\delta^S$ and thus Large has sufficient market power because p_τ is less than one. Under commitment a marginal increase in the MFN tariff increases Large's welfare by the amount of its imports from Small, H/k. A similar increase under the LSPTA increases the threat tariff by p_τ, since the threat is τ^{NL} during a trade war and $\tau^{NL} = p(\tau^m)$. If the solution is at BI then the preferential tariff also rises by p_τ. This increases Large's welfare but only by p_τ times H/k, moreover, the higher Large's market power the lower p_τ is. There is then clearly a motive to increase τ^N above τ^{Nm}. When the LSPTA solution is not τ^{BI} we must take into account the extra benefit of higher threat tariffs from exchanging the tariff revenue into higher e^S.

This is important because when $\tau^N \geq \tau^{Nm}$ Large also faces $\tau^{N^*} \geq \tau^{Nm^*}$ which is sufficient to ensure lower welfare during a trade war under commitment. The possibility of a costlier trade war due to higher multilateral tariffs will then be one of the factors that sustains better cooperation in the multilateral tariff under commitment relative to the exception.

Proposition 5 *(LSPTA exception vs. strong commitment, $\tau^{EX} > \tau^{SC}$)*
A LSPTA exception to MFN is a stumbling bloc to MTL relative to a strong commitment to MFN if $\delta^L < \delta^{EX}$ and large countries have sufficient market power.

When $\delta^L < \delta^{EX}$ the multilateral tariff under the exception regime is determined by the most-cooperative tariff, this proposition provides a sufficient condition such that this tariff is higher than under strong commitment. Similarly to proposition 4 we evaluate the gains from cooperation and deviation for strong commitment at τ^{EX}. Relative to strong commitment the exception has a larger gain from deviating and a lower gain from cooperating in the MTL because of the gain from setting a discriminatory tariff on Small.

First, if the LSPTA is not duty-free during periods of cooperation between large countries (and therefore during trade wars) then the cost of lowering the multilateral tariff is identical under the exception and strong commitment regime, it is simply the lost tariff revenue on Small's imports (proposition 3). However, the stumbling bloc result still holds because the possibility of using discriminatory tariffs under the exception regime lowers the cost of trade wars between large countries if they have sufficient market power, i.e. if $\tau^N \geq \tau^{Nm}$. This ability to discriminate means that large countries need not maintain their multilateral tariffs as high to extract revenue from Small. Thus with the exception regime they can enjoy at least as high export prices as they would in a trade war under strong commitment and receive extra revenue from Small (since τ^{NL} exceeds τ^{Nm}). Second, there is an extra effect if the LSPTA is duty-free during trade wars between large countries (and therefore during periods of cooperation): a reduction of the multilateral tariff is relatively more costly under the LSPTA . This is the effect we discuss in proposition 3.[32]

The last two propositions show that if large countries are not sufficiently patient they must be extremely careful when deciding whether to enforce a regime of commitment to MFN. If they can credibly sustain a strong commitment then lower multilateral tariffs can be sustainable, a weak commitment to MFN however will lead to even higher multilateral tariffs than those under the LSPTA exceptions currently allowed in the WTO.

Our results answer an important positive question: the qualitative effect on multilateral tariffs of alternative WTO rules. However, we also want to quantify these effects and derive more specific welfare implications for the countries modelled. In particular we answer the following. What is the effect of "deepening" regional integration on multilateral tariff cooperation and welfare? Are our results valid if the public good has global spillovers? Which regime is preferred by large and small countries?

[32] In proposition 5 we establish when $\tau^{EX} > \tau^{SC}$. Clearly if at $\delta^L < \delta^{EX}$ we have $\tau^{SC} < \tau^{Cm}$, then τ^{Cm} is chosen as the strong commitment solution since it is the unconstrained optimum. This would not change the point of proposition 5 since $\tau^{Cm} \leq \tau^{EXm} < \tau^{EX}$. Note also that in proposition 3 the definition of "sufficiently patient" is implicitly $\delta \geq \max(\delta^{EX}; \delta^{SC}; \delta^{WC})$, where δ^{SC} and δ^{WC} are defined similarly to δ^{EX}. Therefore propositions 3,4 and 5 are mutually exhaustive if $\max(\delta^{EX}; \delta^{SC}; \delta^{WC}) = \delta^{EX}$. Otherwise there is an extra case to analyze when $\delta \in [\delta^{EX}, \delta^{LC})$.

5 Extensions

5.1 Deepening LSPTAs and MTL

We now show that the stumbling effect is increasing in the weight placed on the public good, λ^L, and its cross-border effect, α^L. Moreover, such increases, which are one factor driving the observed "deepening" of LSPTAs, have an ambiguous effect on the welfare of the small members. For a given tariff threat in the LSPTA, an increase in either α^L or λ^L "deepens" it, that is it lowers Large's optimal preferential tariff and increases the optimal level of the public good provided by Small. Deepening the LSPTA requires a higher threat tariff and therefore a higher multilateral tariff under the following conditions.

Proposition 6 *(Effect of deepening LSPTA on multilateral tariffs)*
Increases in α^L or λ^L increase the multilateral tariff and the stumbling bloc effect if and only if the LSPTA is duty-free.

Increases in α^L or λ^L imply a higher marginal benefit for Large from increases in the e-tax, so in addition to increasing its own e-tax, Large finds it optimal to offer a lower preferential tariff in exchange for more public good from Small. However, this is only feasible if the preferential tariff is not negative. After a duty-free LSPTA is reached Small has no further incentive to increase e^S and Large must then use a higher threat tariff. This higher threat is only credible if it does not exceed the multilateral tariff, otherwise it triggers retaliation from Large*, and therefore the equilibrium multilateral tariff must increase. Alternatively, if the LSPTA is not duty-free there is no reason for Large to distort the multilateral tariff, it can simply lower the preferential tariff. The stumbling bloc effect increases because under strong commitment the multilateral tariff is independent of the importance of the public good.[33]

The last proposition is particularly important since both α^L and λ^L appear to be increasing.[34] Therefore, a testable prediction from this model is that, ceteris paribus, increases in α^L and λ^L lead

[33] Bond, Syropoulos and Winters (2001) analyze the effect of a reduction in a customs union's internal tariff on its external one. They show that, for elasticities of consumption no greater than one, if the exogenous reduction of the internal tariff (which is assumed to be binding) is accompanied by a sufficiently large external tariff *reduction* (which must be self-enforcing) then the initial tariff set by the rest of the world on the customs union remains self-enforcing. So deepening can lead to lower multilateral tariffs. Theirs is a pure trade model and the results are driven by trade diversion. The fact that the prediction is the opposite of the one in our paper clearly shows the importance of modelling LSPTAs.

[34] One reason for this is the increased scientific knowledge regarding the interdependence of ecosystems, which has made it clear that a number of environmental problems have a wider regional or even global impact. The increase in λ^L is likely to be a consequence of development as long as the public good is normal in consumption.

to higher multilateral tariffs in the goods imported from a regional partner after a duty-free LSPTA is formed. Alternatively, if we modelled an exogenous process of gradual MTL, the prediction would be a slower reduction of multilateral tariffs in those goods. We now show this can have a negative effect on the welfare of the small LSPTA partners when **Small countries are sufficiently patient**, i.e. when $\delta^S > p_\tau$.

Proposition 7 *(Effect of deepening LSPTA on Small's welfare)*
Increases in α^L or λ^L are welfare improving for Small if the LSPTA is not duty-free. Otherwise increases in α^L or λ^L are welfare improving for Small if and only if it is not sufficiently patient.

To understand this result we first note that increases in α^L or λ^L affect Small only via changes in τ^B or e^B and recall that LSPTAs are welfare improving for Small at a given tariff threat. Thus, if the increase in α^L *or* λ^L simply result in a lower preferential tariff then Small is left better off. However, if the LSPTA is duty-free the threat tariff is increased thus forcing Small to increase e^S by δ^s/k. In exchange Small receives a higher price for its exports, by p_τ^L, and so it is better off if and only if the aggregate marginal benefit of the increase in the multilateral tariffs, $p_\tau^L H/k$, exceeds the cost, $\delta^S H/k$. This occurs if Small is not sufficiently patient since it is then that it can extract the most from the LSPTA.

Finally, note that a large enough increase in α^L or λ^L leads to a duty-free LSPTA and consequently an increase in the threat tariff. If that increase is sufficiently large and Small is sufficiently patient then it will be left worse off. Below we determine Small's preferred regime and provide the exact conditions under which that loss from a higher multilateral tariff offsets the initial gains to Small from lower preferential tariffs.

5.2 Global spillovers

The previous results show that multilateral trade rules must take into account preferential trade agreements even if they have no trade diversion or creation effects and deal only with regional spillovers. Although the spillovers for some public goods are mainly regional, many have global spillovers, e.g. global warming or "psychological" costs due to "poor" enforcement of human or core workers' rights. To evaluate the effect of dealing with such issues "outside" the WTO we show that the results thus far are also valid if the spillovers are global.

Small countries do not value the public good and therefore their welfare functions are unchanged. The original function for Large, W^L, must be generalized to reflect the public good spillovers from the other trade bloc.

$$\hat{W}^L = W^L + H\alpha^*(\lambda^L\Psi(b^{L^*}He^{L^*}) + \lambda^L\Psi(b^{S^*}He^{S^*}))$$

Given the separability of $\hat{W}^L$ the non-cooperative tariff τ^{NL} remains p^L. The self-enforcing solution to the LSPTA for a given tariff threat is also unchanged since it takes the other bloc's actions as given. Moreover, a large country cannot offer tariff reductions and form an LSPTA with the small country in the opposite bloc since they do not trade with each other. Therefore the results in section 3 continue to hold in the presence of global spillovers.[35]

We are interested in the impact of LSPTAs on multilateral tariffs when linking multilateral tariff cooperation and non-trade policies during MTL is not allowed in the WTO, i.e. countries deal with these non-trade issues "outside" the WTO. Therefore, the trigger strategies that enforce cooperation in multilateral tariffs must be independent of whether large countries cooperate with each other in the provision of the public good. Moreover, since the externality enters additively in welfare, the equilibrium level of the multilateral tariffs will also be independent of whether large countries enter into a separate self-enforcing agreement *with each other* to address the non-trade issue.[36]

From this it should be immediately obvious that the stumbling bloc result in proposition 3 is qualitatively unchanged. In fact when the stumbling effect is present it is now stronger. When spillovers are regional Large has nothing to gain from an increase in the multilateral tariff of Large*. In contrast, under global spillovers, this increase leads to more cooperation from Small* which also benefits Large.

To confirm the results in propositions 4 and 5, we need only verify how the IC must be modified because the trigger strategies during the MTL stage are unchanged. Starting with the LSPTA regime, the gains from cooperation expression under regional spillovers, ω^{EX}, is augmented:

$$\hat{\omega}^{EX} \equiv \omega^{EX} + H\alpha^*\lambda^L(\Psi(b^{S^*}He^B(\tau^c)) - \Psi(b^{S^*}He^B(\tau^{NL})))$$

There is an extra cost to multilateral tariff cooperation if spillovers are global. This cost corresponds to the foregone public good supply by the small country in the opposite bloc due to the lower tariff

[35] Here our assumption of prohibitive trade costs across regional blocs is clearly important.

[36] It is simple to model such a self-enforcing agreement with trigger strategies that resort only to changes in the non-trade policy. See for example Barret (1994) and Limão (2002).

threat that Large* imposes after MTL. The gains from deviation are unchanged. Therefore we conclude that the most-cooperative tariff under the LSPTA exception is higher when the spillovers are global if the LSPTA is duty-free since otherwise there is simply a reduction in the preferential tariff but no change in e.

Under weak commitment the gains from cooperation also reflect an extra cost:

$$\hat{\omega}^{WC} \equiv \omega^{WC} - H\alpha^{*}\lambda^{L}\Psi(b^{S^{*}}He^{B}(\tau^{NL}))$$

Notice that this extra cost is larger than under the exception and is present independently of whether the LSPTA is duty-free. Moreover, the gains from deviation remain unchanged and therefore the building bloc result from proposition 4 continues to hold and is now more pronounced.

Finally, under strong commitment, it is simple to show that the most-cooperative tariff is unchanged since no LSPTAs ever take place. This implies that the stumbling bloc effect is still present, under the conditions in proposition 5, and is possibly stronger when spillovers are global.

In sum, allowing the public good to have a global spillover does not change our previous results qualitatively. In fact it can reinforce the results in propositions 3, 4 and 5. We now return to the original setup with regional spillovers to show which regime is preferred by the different countries.

5.3 Welfare effects and the choice of MFN regime

A common complaint from developing countries is that most GATT/WTO rules are decided by developed countries.[37] To capture this we assume that, in addition to choosing the multilateral tariff level, large countries also choose the trading rules to maximize the present discounted value of their own joint welfare. Therefore we rank the payoffs for the large countries under the LSPTA and commitment regimes to show which they chose. We then contrast this to the small countries' preferred regime.

Proposition 8 *(Welfare ranking of regimes for Large)*
The LSPTA exception regime welfare dominates commitment to MFN for large countries if they are sufficiently patient.

We illustrate the result in figure 6, which depicts Large's welfare function during cooperation periods under the exception, W^{EXL}, and commitment, W^{CL}. For a given positive multilateral tariff

[37] See for example Srinivasan (1999).

the welfare function under commitment never lies above the exception because LSPTAs are welfare improving, strictly so if $\delta^S > 0$. Therefore, when the IC for the MTL do not bind, Large prefers the exception regime since it can always set the multilateral tariff at the commitment level and then improve its welfare by signing an LSPTA.

If the large countries are not sufficiently patient, so that the IC for the MTL do bind, then the LSPTA exception also welfare dominates weak commitment. This is simply because in periods of cooperation under weak commitment no LSPTAs take place and moreover any tariff that is self-enforcing under weak commitment is also self-enforcing under the exception as we show in proposition 4.

Finally, it is possible to show that Large prefers strong commitment if Small is very impatient. This can occur when the self-enforcing tariff under the exception exceeds that under strong commitment (proposition 5). Briefly, consider the case when Small is extremely impatient ($\delta^S = 0$) so that the only self-enforcing policies under an LSPTA are to set τ^B at τ^m and therefore Small sets the e-tax at zero. This implies that $W^{EXL}(\delta^S = 0)$ coincides with W^{CL}, as shown in figure 6. In this case the lowest self-enforcing tariff under the exception is higher than τ^{Cm} and Large is strictly better off under strong commitment as illustrated. We can then show that this is also true for strictly positive values of δ^S. Figure 6 illustrates a point at which the welfare under strong commitment and the exception are again equalized, $EX(\delta^S > 0)$.[38]

Having determined the regime preferred and therefore chosen by the large countries we now show that it is not always the one preferred by the small countries. We compare the LSPTA and commitment regimes when Large is sufficiently patient.

Proposition 9 *(Welfare ranking of regimes for Small)*
When Small is not sufficiently patient it prefers the LSPTA regime.
When Small is sufficiently patient:
(i) it prefers the LSPTA regime if the LSPTA under $\tau^{EXm}(\delta^S)$ is not duty-free.
(ii) there exists a $\delta^S \in (p_\tau, 1)$ s.t. Small prefers the commitment regime if the LSPTA under $\tau^{EXm}(\delta^S)$ is duty-free.

We illustrate this result in figure 7, which graphs Small's welfare as a function of the multilateral tariff for different discount factors. When the LSPTA is not duty-free then the multilateral is the

[38] See Limão (2001) for more details.

same under the commitment and exception regimes. Moreover, since at a given multilateral tariff, Small is better off under the LSPTA, it prefers this regime, point $EX1$, relative to commitment, C. If the LSPTA is duty-free then the multilateral tariff is higher under the exception regime and we must consider this extra effect on Small's welfare. As described in proposition 7 if Small is not sufficiently patient then the increase in p^L caused by the higher tariff leaves Small better off. So clearly in this case it also prefers the LSPTA because it leaves it at a point along the upward sloping line in figure 7, all of which dominate C. However, if Small is sufficiently patient then increases in the multilateral tariff leave it worse off. Consider the case when Small is extremely patient, so that its welfare is along $W^{EXS}(\delta^S = 1)$ and the LSPTA is duty-free so that $\tau^{EXm} > \tau^{Cm}$, then Small is strictly worse off under the LSPTA. It is then clear that, if the LSPTA is duty-free, a discount factor smaller than one exists such that the negative effect of the higher multilateral tariff offsets any gains from the LSPTA, as seen by comparing Small's welfare at point $EX0$ and C.

The LSPTA exception can hurt small countries which are not LSPTA members because it creates an incentive for Large countries to maintain higher multilateral tariffs. The last proposition shows that some small countries which are part of duty-free LSPTAs also prefer commitment to MFN if they are sufficiently patient. Thus, even if preferential agreements have no trade diversion or creation effects the choice of WTO rules that regulates them has important consequences not only for the level of the multilateral tariffs but also for the welfare of small countries.

6 Conclusion

Trade is not the only and often not even the main motivation for preferential trade agreements. Thus far we have neglected to model these other motives and the effects of such agreements on the multilateral trading system. But we clearly cannot continue to do so because the non-trade objectives in preferential agreements are now both pervasive and quite explicit.

We take these non-trade issues seriously and show that, even in the absence of trade creation or diversion effects, preferential trade agreements have important effects on the multilateral trading system. We model the non-trade issue as the provision of a public good, which plausibly covers a number of issues. More importantly, the basic intuition for our stumbling bloc result is likely to hold for different representations of non-trade issues that are valued by large countries. Lowering multilateral tariffs reduces the preferential margins that can be negotiated by any two WTO members. If these preferences have value, for example because they enforce cooperation on a non-trade issue, there is an extra cost to reducing multilateral tariffs relative to the case when there is no possibility

for a preferential agreement.

How important is this stumbling effect? This is a difficult question which must be settled empirically, however we argue that the effect is potentially important for two reasons. First, despite the low average multilateral tariffs in the US and the EU there are sectors, such as agriculture and textiles where those tariffs remain high. These are some of the sectors in which developing countries export to the US and EU and therefore precisely the sectors in which our model predicts higher tariffs. Moreover, multilateral tariff reductions have often been offset by increases in non-tariff measures so tariffs understate the degree of effective protection. A clear example of this is the increase in the use of anti-dumping and associated countervailing duties in the US. Clearly our model would have to be modified to deal with non-tariff barriers, which become the relevant threat point when multilateral tariffs are low. However, it is likely that the basic intuition for our result would again hold if these non-trade barriers became the subject of negotiation in the WTO. In that case, the US opposition to discuss proposals for stricter anti-dumping rules in the 1999 Seattle ministerial meeting of the WTO is consistent with the stumbling bloc prediction.

Second, not only is there an effect to be explained, the high trade barriers described above, but we also believe that our explanation may have an advantage over a common alternative explanation. According to the standard MFN externality explanation large countries have less of an incentive to lower tariffs if they must do so on all partners and they do not receive a reciprocal tariff reduction from some of those partners, in this case the small countries. However, if the exports from small countries are jointly small then the MFN externality cannot fully account for the magnitude of those barriers. On the other hand the stumbling bloc effect we analyze may be important even for small levels of exports if large countries highly value the public good.

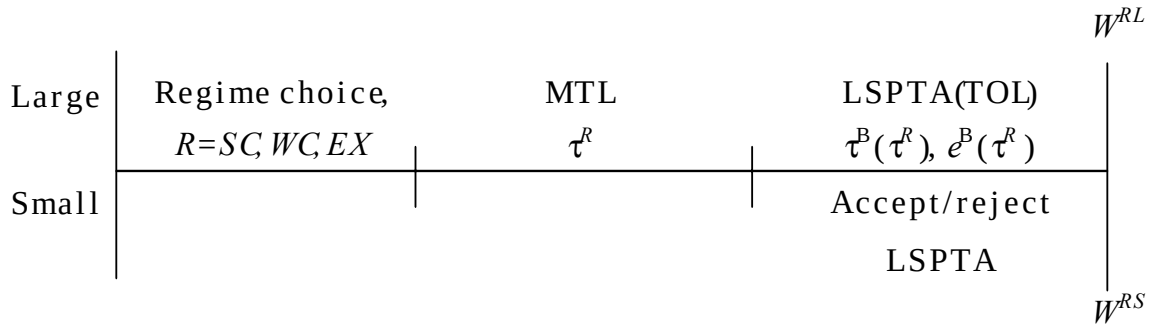
The stumbling bloc effect has a negative effect on small countries that are not members of any LSPTA and export the set of goods in which the multilateral tariff is higher. This provides a strong motivation for the WTO to regulate LSPTAs more carefully. However, governments must take great care to ensure they can enforce an alternative rules regime. As we show, simply eliminating the current rules that allow exceptions to MFN may actually lead to higher multilateral tariffs. But, with additional rules that credibly sustain a strong commitment to MFN governments can enforce lower multilateral tariffs.

Finally, the model predicts that large countries choose the LSPTA exception regime over commitment to MFN when they are sufficiently patient. Similarly they chose the exception regime over weak commitment if they are not sufficiently patient. Both of these predictions are reassuring since

the exception regime is indeed the status quo. More importantly however, small countries do not always prefer the exception regime. When the exception regime entails higher multilateral tariffs than a commitment regime and small countries do not gain much from the LSPTA they prefer the commitment regime. This shows the potential gain for small countries of actively participating in setting multilateral trade rules in future trade rounds.

Figure 1

Timing of governments' actions in each period of the repeated game

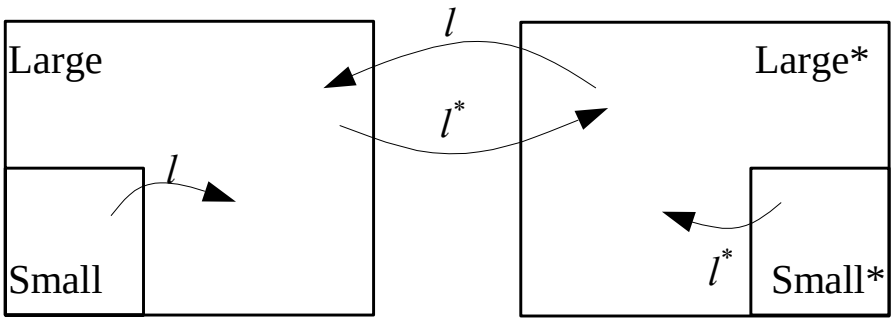


Notes:

Large countries first choose a regime (R), which specifies their commitment to MFN. We consider commitment to MFN (no preferential tariffs allowed) or an LSPTA exception (lower than MFN tariffs allowed). When large countries are not sufficiently patient we distinguish further between strong and weak commitment to MFN (SC and WC) depending on whether countries can enforce MFN during trade wars between themselves (SC) or not (WC). Given the regime large countries choose a level for the MFN tariff (τ^R). This is also the maximum credible threat that can be subsequently used to make a take-it-or-leave-it offer (TOL) for a LSPTA, during periods of multilateral cooperation, which Small can accept or reject. This offer occurs in the final stage of each period and is simply the vector (τ^B, e^B), the value for Large's preferential tariff on Small and a tax level for Small's provision of the public good. The payoffs are W^{Rj} for regime R and country j.

Figure 2

Pattern of Trade



Notes:

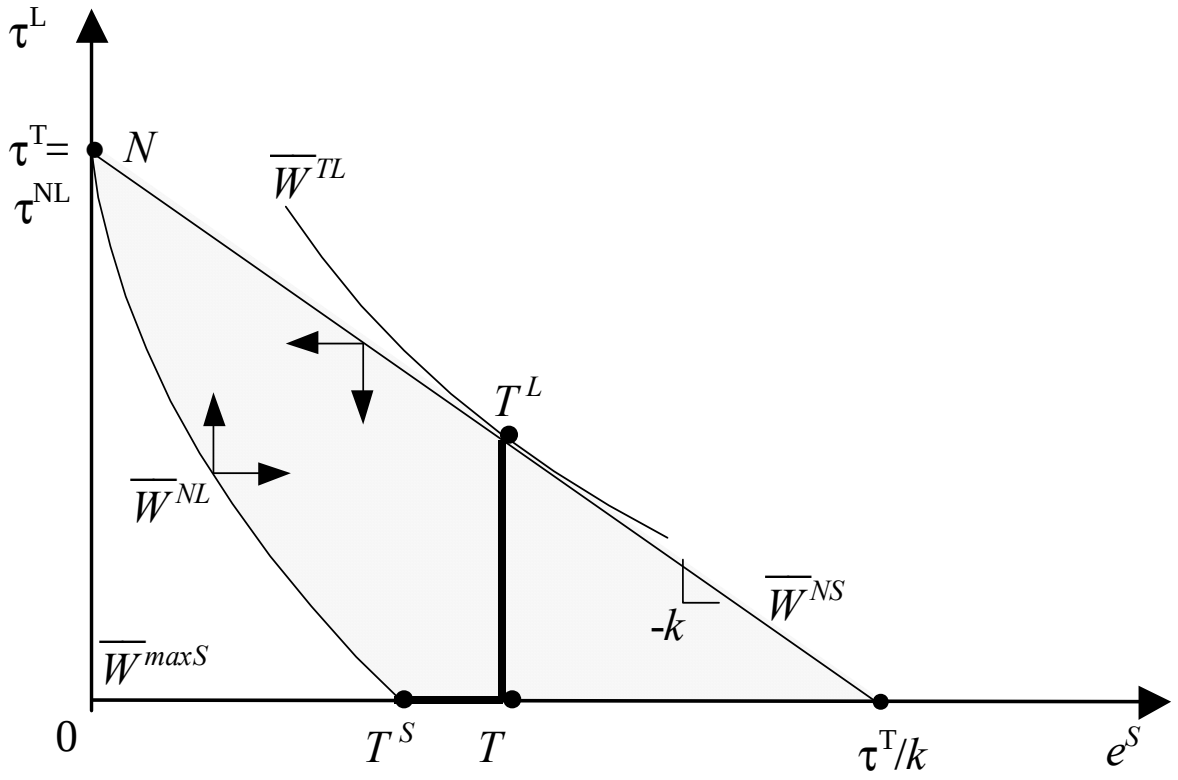
The arrows represent the direction of exports of the non-numeraire goods. We assume that trading costs (due to transport or information for example) are prohibitively high between small and large countries in opposite blocks. The balance of payments condition is satisfied via the numeraire good.

Figure 3

Non-cooperative regional outcome (*N*) and

Pareto efficient LSPTAs ($T^S TT^L$): Nash tariff as threat

(no enforcement constraints)



Notes:

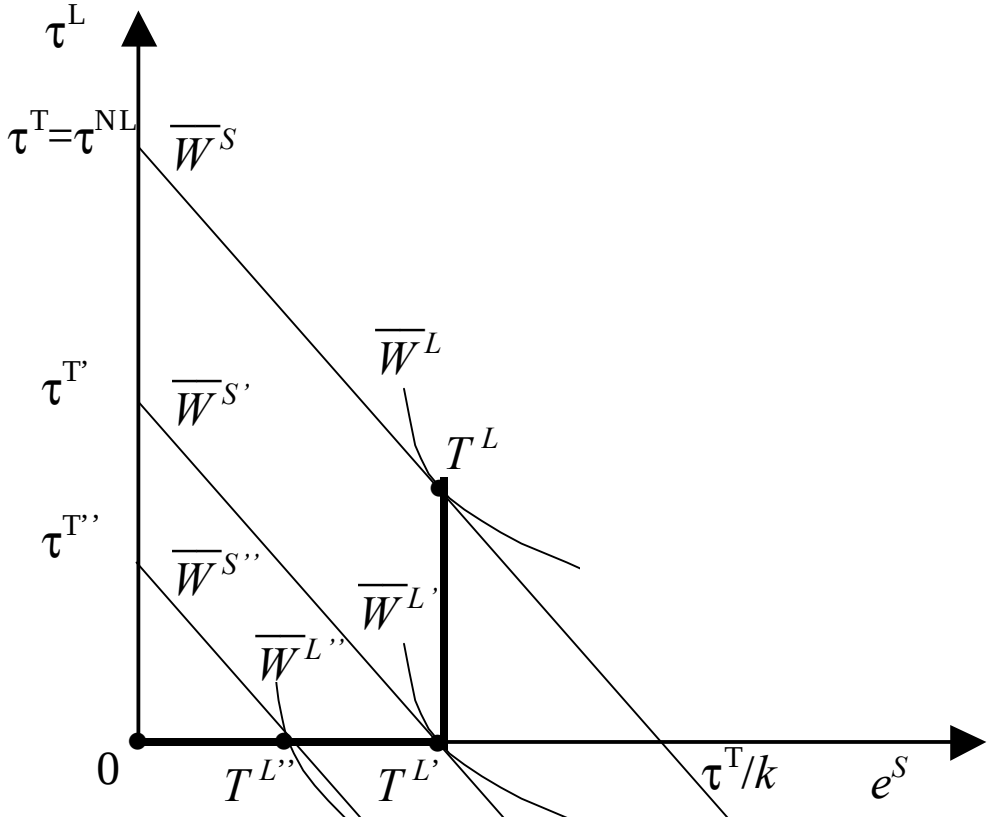
Point *N* denotes the non-cooperative solution to Large's tariff on Small and the latter's e-tax, ($\tau^{NL}=p^L$, $e^S=0$). The shaded area represents potential LSPTAs which are Pareto improving. The slope of Small's iso-welfare line is $-k<-1$, the ratio of Large to Small's endowments. Large's welfare is quasi-linear in τ^L.

The segment $T^S TT^L$ represents LSPTAs that are both Pareto improving and Pareto efficient. Any efficient bargaining solution must lie on $T^S TT^L$. If Large (Small) has all the bargaining power and makes a take-it-or-leave-it offer then the solution is at T^L (T^S). The segment TT^L is vertical because changes in Large's tariff on Small have only tariff revenue effects, which are constant and thus have no impact on the slope of the iso-welfare curves.

Figure 4

Pareto efficient TOL LSPTAs ($0T^{L''}\ T^{L'}\ T^{L}$) at different tariff threats (τ^{T})

(no enforcement constraints)



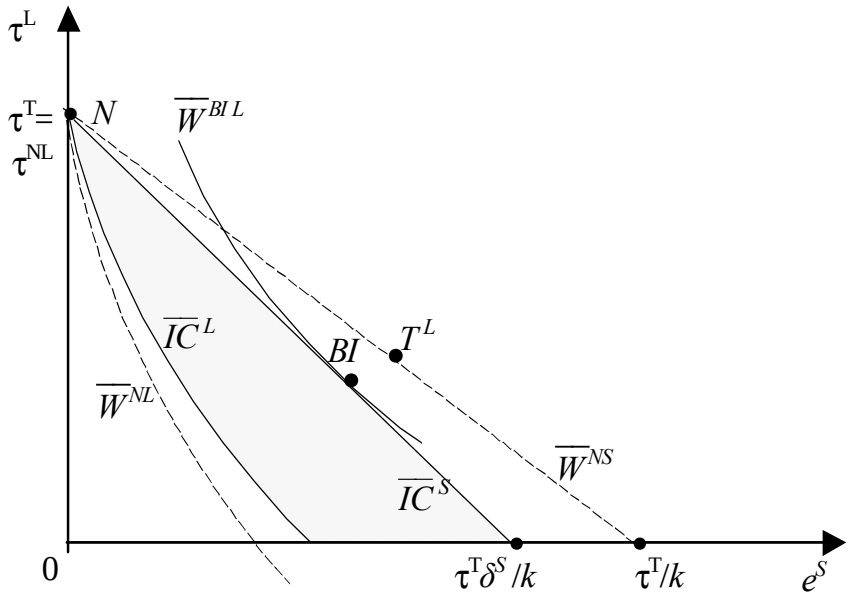
Notes:

If the threat tariff is τ^{NL} then the TOL LSPTA solution is at T^{L}, as in figure 3. For threat tariffs no higher than $\tau^{T'}$ the TOL LSPTA solution requires a zero preferential tariff, thus the solution is along $0T^{L'}$.

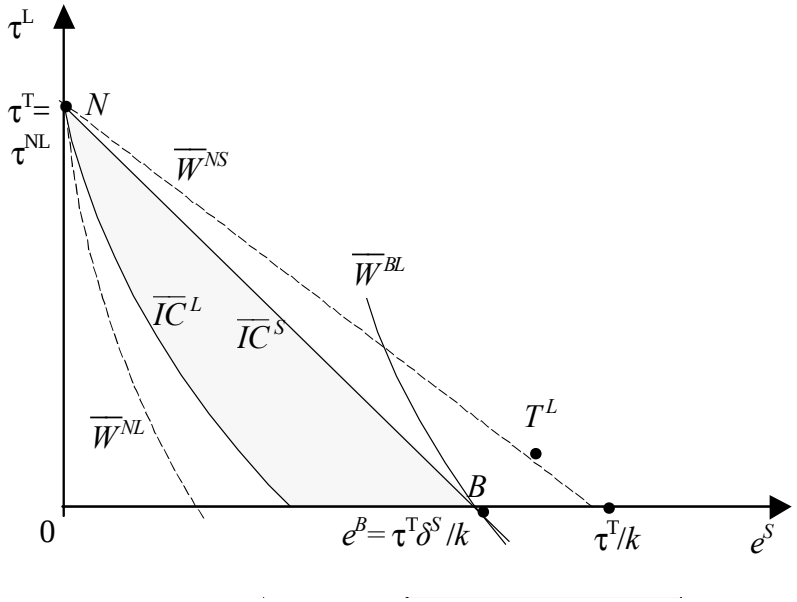
The segment $T^{L}T^{L'}$ is vertical because changes in Large's tariff on Small have only tariff effects, which are constant and thus have no impact on the slope of the iso-welfare curves.

Figure 5 Self-enforcing Pareto efficient LSPTA solutions

5a. Large not sufficiently endowed relative to Small (*BI*)



5b. Duty-free LSPTA: Large sufficiently endowed relative to Small (*B*)

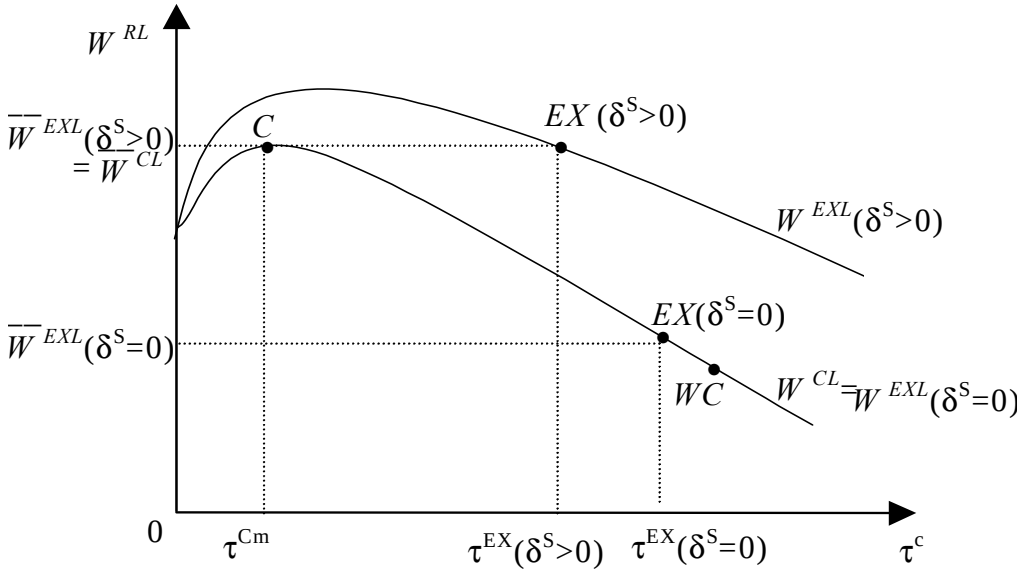


Notes:

The shaded area represents the set of self-enforcing LSPTAs that improve on the Nash; it is delimited by each country's incentive frontiers. *BI* represents the self-enforcing TOL LSPTA solution proposed by Large when it is not sufficiently endowed relative to Small, i.e. when *k* is not sufficiently high. Under this condition an alternative solution occurs if Large's IC binds and would lie at the intersection of Large and Small's incentive frontiers (*BII* not depicted). In 5b point *B* represents the self-enforcing TOL LSPTA solution proposed by Large when it is sufficiently endowed relative to Small, i.e. when *k* is sufficiently high.

Figure 6

Optimal MFN regime for large countries

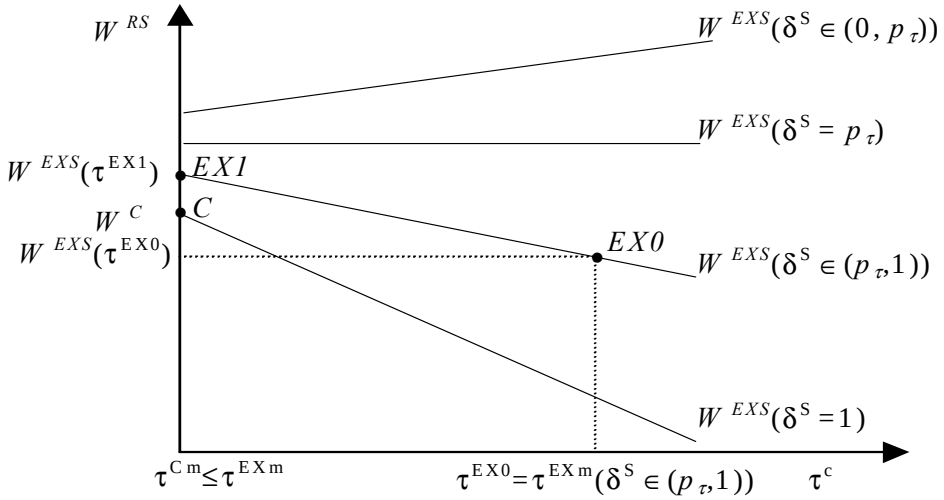


Notes:

When $\delta^S=0$ the welfare functions for Large under commitment and the LSPTA exception are identical and the exception solution is at *EX* ($\delta^S=0$). The welfare function under the exception is also illustrated for a critical value of δ^S at which the maximized value under strong commitment and the exception are equalized.

Figure 7

Optimal MFN regime for small countries



Notes:

Small's welfare is linear in the MFN tariff. If $\delta^S \in (p_\tau,1]$ then increases in the MFN tariff leave Small worse off. When $\delta^S=1$ W^{EXS} and W^{CS} coincide. The equilibrium under commitment is at *C*, under the exception it is at $\tau^{EX} \ge \tau^C$. If the LSPTA is duty-free then $\tau^{EXm} > \tau^{Cm}$ and a $\delta^S \in (p_\tau,1)$ exists such that Small is worse off under the exception, e.g. point *EX0.*

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A Appendix

A.1 Proofs

Proposition 1: $(\tau^B(\tau^T), e^B(\tau^T))$
We say that **Large is sufficiently endowed relative to Small if** $k \geq \max(k_1, k_2)$, where k_1 is defined by $\{\frac{W^L_{e^S}(k_1)}{W^L_{\tau^L}} = \frac{W^S_{e^S}}{W^S_{\tau^L}}\frac{1}{\delta^S}\}|_{\tau^L=0, e^S=\frac{\tau^T\delta^S}{k_1}}$ and k_2 by $\{\Omega^L(\tau^L, e^S, k_2) = \frac{\delta^L}{1-\delta^L}\omega^L(\tau^L, e^S, k_2)\}|_{\tau^L=0, e^S=\frac{\tau^T\delta^S}{k_2}}$.
Using equations 5,6,11 and 12 our conditions reduce to $\alpha^L\lambda^L\delta^S Hb^S\Psi'(b^S He^S)|_{e^S=\tau^T\delta^S/k_1} = 1$ for k_1 and $\alpha^L\lambda^L\delta^L\Psi(b^S He^S)|_{e^S=\tau^T\delta^S/k_2} = \tau^T/k_2$ for k_2.
Forming the Lagrangian with μ^j and ϕ^g as the multipliers for the incentive and non-negativity constraints respectively we have the following necessary conditions for $j = L,\ S$ and $g = \tau^L,\ e^S$:

$$\partial W^L/\partial g - \Sigma_j\mu^j(\partial\Omega^j/\partial g - \frac{\delta^j}{1-\delta^j}\partial\omega^j/\partial g) \ + \phi^g = 0$$

$$\mu^j(\Omega^j - \frac{\delta^j}{1-\delta^j}\omega^j) = 0; \phi^g g = 0; \mu^j,\ \phi^g \geq 0$$

First, if $\Omega^S < \frac{\delta^S}{1-\delta^S}\omega^S$ at the solution then an increase in e^S is feasible and optimal which implies that $\Omega^S = \frac{\delta^S}{1-\delta^S}\omega^S \Leftrightarrow e^B = \frac{\delta^S}{k}(\tau^T - \tau^B)$, using the definitions in eqs.(5, 9, 10).
If $k = k_2$ then, by definition, $\Omega^L = \frac{\delta^L}{1-\delta^L}\omega^L$ at $\tau^B = 0,\ e^B = \frac{\delta^S\tau^T}{k}$, thus in figure 5 $\overline{IC}^L$ and $\overline{IC}^S$ intersect at $\tau^L = 0$. An increase in k relaxes IC^L at any given τ^T since it reduces $\Omega^L = \frac{H}{k}(\tau^T - \tau^L)$ and increases $\omega^L = \frac{\delta}{1-\delta}(-\frac{H}{k}(\tau^T - \tau^L) + H\alpha^L\lambda^L\Psi(b^S He^S))$. Thus $\Omega^L \leq \frac{\delta^L}{1-\delta^L}\omega^L$ at $\tau^B = 0,\ e^B = \frac{\delta^S\tau^T}{k}$ iff $k \geq k_2$. The FOC then yield $W^L_{e^S}/W^L_{\tau^L} \geq W^S_{e^S}/W^S_{\tau^L}\delta^S$. Now, if $k > k_2$ then IC^L does not bind and e^B is determined by $W^L_{e^S}/W^L_{\tau^L} = W^S_{e^S}/W^S_{\tau^L}\delta^S$. A further increase in k lowers τ^B but not e^B (because$W^L_{e^S}/W^L_{\tau^L} = W^S_{e^S}/W^S_{\tau^L}\delta^S$ is independent of k). If in addition $k = k_1 \geq k_2$ then $W^L_{e^S}/W^L_{\tau^L} = W^S_{e^S}/W^S_{\tau^L}\delta^S$ at $(\tau^B = 0,\ e^B = \delta^S\tau^T/k)$. Thus, since we rule out $\tau^B < 0$ it must be that, at the given τ^T, $e^B = \delta^S\tau^T/k$ falls and therefore at $k \geq k_1$ we have $W^L_{e^S}/W^L_{\tau^L} > W^S_{e^S}/W^S_{\tau^L}\delta^S$.
When $k < k_2$ then, by definition, $\overline{IC}^L$ and $\overline{IC}^S$ intersect at $\tau^L > 0$ and two cases arise. First, if $\Omega^L < \frac{\delta^L}{1-\delta^L}\omega^L$ at $(\tau^B,\ e^B)$ then e^B is determined by $W^L_{e^S}/W^L_{\tau^L} = W^S_{e^S}/W^S_{\tau^L}\delta^S$ and τ^B by $e^B = \frac{\delta^S}{k}(\tau^T - \tau^B)$. Second, if $\Omega^L = \frac{\delta^L}{1-\delta^L}\omega^L$ then $\tau^T - \tau^B = \delta^L k\alpha^L\lambda^L\Psi(b^S He^B)$ by using eqs.(6, 11, 12). In the second case the FOC require $W^L_{e^S}/W^L_{\tau^L} \geq W^S_{e^S}/W^S_{\tau^L}\delta^S$.□

Proposition 2: *Welfare effect of LSPTA for given multilateral tariffs*
If δ^S or $\delta^L = 0$ the only self-enforcing solution is the Nash point. In a self-enforcing LSPTA $\Omega^S = \frac{\delta^S}{1-\delta^S}\omega^S$. Moreover, if $\delta^S \in (0, 1)$ then $e^B > 0 \Rightarrow \Omega^S = He^B > 0$ (proposition 1)
$\therefore \omega^S \equiv W^S(\tau^L, e^S, \tau^m) - W^{NS} > 0$, where W^{NS} is Small's payoff under the Nash and $W^S(\tau^L, e^S, \tau^m)$ the payoff under the LSPTA. Similarly for Large since $\Omega^L \leq \frac{\delta^L}{1-\delta^L}\omega^L$ and $\Omega^L = \frac{H}{k}(\tau^T - \tau^B(\tau^T)) > 0$.□

Proposition 3: $\tau^{EX} \geq \tau^C$
If large countries are sufficiently patient s.t. neither IC^{EX} nor IC^C bind then the FOC in eqs.(15,16) are necessary and sufficient to determine τ^{EX} and τ^C (since the respective second derivatives are negative). Evaluating eq.(16) at τ^{EXm} we obtain $\{W^L_{\tau^L}(1 - \frac{\partial\tau^B}{\partial\tau^T}) - W^L_{e^S}\frac{\partial e^B}{\partial\tau^T}\}|_{\tau^{EXm}}$. We must generally consider two cases, which we define as follows:

- *Case 1:* LSPTA is not duty-free or is "just" duty-free at τ^T if $\tau^B(\tau^T = \tau^{EXm}) \geq 0 \wedge \tau^B(\tau^T \rightarrow \tau^{EXm+}) > 0$

From implicit differentiation of either (τ^{BI}, e^B) or (τ^{BII}, e^B) in proposition 1 we obtain $\partial\tau^B/\partial\tau^T = 1$ and $\partial e^B/\partial\tau^T = 0$.
$\therefore \{W^L_{\tau^L}(1 - \frac{\partial\tau^B}{\partial\tau^T}) - W^L_{e^S}\frac{\partial e^B}{\partial\tau^T}\}|_{\tau^{EXm}} = 0 \Rightarrow \tau^{EXm} = \tau^{Cm}$.

- *Case 2:* LSPTA is duty-free at τ^T if $\tau^B(\tau^T = \tau^{EXm}) = 0 \wedge \tau^B(\tau^T \rightarrow \tau^{EXm+}) = 0$

From implicit differentiation of either (τ^{BI}, e^B) or (τ^{BII}, e^B) in proposition 1 we obtain $\partial\tau^B/\partial\tau^T = 0$ and $\partial e^B/\partial\tau^T = \frac{\delta^S}{k}$. Thus $\{W^L_{\tau^L}(1 - \frac{\partial\tau^B}{\partial\tau^T}) - W^L_{e^S}\frac{\partial e^B}{\partial\tau^T}\}|_{\tau^{EXm}} < 0$ because $\frac{W^L_{e^S}}{W^L_{\tau^L}} > \frac{W^S_{e^S}}{W^S_{\tau^L}}\frac{1}{\delta^S} = \frac{k}{\delta^S}$ (proposition 1).
$\therefore \{W^L_{\tau^L}(1 - \frac{\partial\tau^B}{\partial\tau^T}) - W^L_{e^S}\frac{\partial e^B}{\partial\tau^T}\}|_{\tau^{EXm}} < 0 \Rightarrow \tau^{EXm} > \tau^{Cm}$.□

Proposition 4: $\tau^{EX} < \tau^{WC}$
By definition at τ^{EX}, $\Omega^{EX}(\tau^{EX}) = \frac{\delta^L}{1-\delta^L}\omega^{EX}(\tau^{EX})$ and $\tau^{EX} > \tau^{EXm}$ if $\delta^L < \delta^{EX}$ thus $\tau^{EX} > \tau^{Cm}$.
Now, $\tau^{EX} < \tau^{WC}$ if $\Omega^{WC}(\tau^{EX}) > \frac{\delta^L}{1-\delta^L}\omega^{WC}(\tau^{EX})$. For this it is sufficient to establish that:

$$\begin{aligned} \Omega^{WC}(\tau^{EX}) &> \Omega^{EX}(\tau^{EX}) \\ \omega^{WC}(\tau^{EX}) &< \omega^{EX}(\tau^{EX}) \end{aligned}$$

Using the definitions of the gains from deviation and W^L (all τ^c evaluated at τ^{EX}):

$$\begin{aligned} \Omega^{WC}(\tau^{EX}) - \Omega^{EX}(\tau^{EX}) &= (\tau^B(\tau^c) - \tau^c)H/k + H\alpha^L\lambda^L\Psi(b^S He^B(\tau^c)) \\ &> (\tau^B(\tau^c) - \tau^c)H/k + \delta^L H\alpha^L\lambda^L\Psi(b^S He^B(\tau^c)) \\ &\geq 0 \end{aligned}$$

The first inequality results because $\delta^L < 1$ and $\Psi > 0$ if $e^B(\tau^c) > 0$. The last inequality follows from proposition 1 since it requires IC^L to be satisfied by a self-enforcing LSPTA with $\tau^T{=}\tau^c$.
Similarly, $\omega^{WC}(\tau^{EX}) < \omega^{EX}(\tau^{EX})$ since $\omega^{WC}(\tau^{EX}) - \omega^{EX}(\tau^{EX}) = -(\Omega^{WC}(\tau^{EX}) - \Omega^{EX}(\tau^{EX}))$.
$\therefore \Omega^{WC}(\tau^{EX}) > \Omega^{EX}(\tau^{EX}) = \frac{\delta^L}{1-\delta^L}\omega^{EX}(\tau^{EX}) > \omega^{WC}(\tau^{EX}) \Longrightarrow \tau^{EX} < \tau^{WC}$.□

Lemma 1: $\tau^N \geq \tau^{Nm}$ if $p^L_\tau \leq \frac{k}{\delta^S}/\frac{W^L_{e^S}}{W^L_{\tau^L}}|_{e^B(\tau^{NL}=p^L(\tau^{Nm}))}$

$$\begin{aligned} \tau^{Nm} &\equiv \arg\max_{\tau^m}\{W^L(\tau^L = \tau^B(\tau^{NL}), e^S = e^B(\tau^{NL}), \tau^m, \tau^{m*}, .)\} \\ \tau^N &\equiv \arg\max_{\tau^m}\{W^L(\tau^L, e^S = 0, \tau^m, \tau^{m*}, .) : \tau^L = \tau^m\} \end{aligned}$$

$$\tau^{Nm} \quad : \quad W^L_{\tau^m} + W^L_{\tau^L}\frac{\partial\tau^B(\tau^{NL})}{\partial\tau^m} + W^L_{e^s}\frac{\partial e^B(\tau^{NL})}{\partial\tau^m} = 0 \tag{21}$$

$$\tau^N \quad : \quad W^L_{\tau^m} + W^L_{\tau^L} = 0 \tag{22}$$

Evaluating the condition for τ^N at τ^{Nm} we obtain:

$$\{-(W^L_{\tau^L}\frac{\partial\tau^B(\tau^{NL})}{\partial\tau^m} + W^L_{e^s}\frac{\partial e^B(\tau^{NL})}{\partial\tau^m}) + W^L_{\tau^L}\}_{\tau^m=\tau^{Nm}} \tag{23}$$

- *Case 1:* $\tau^B(\tau^T = \tau^{NL}) \geq 0 \wedge \tau^B(\tau^T \rightarrow \tau^{NL+}) > 0$

From proposition 1 we know that $\frac{\partial e^B(\tau^{NL})}{\partial \tau^m} = 0$ and $\frac{\partial \tau^B(\tau^T)}{\partial \tau^T} = 1$. Thus $\frac{\partial \tau^B(\tau^{NL})}{\partial \tau^m} = \frac{\partial \tau^B(\tau^{NL})}{\partial \tau^{NL}} \frac{\partial \tau^{NL}}{\partial \tau^m} = \frac{\partial \tau^{NL}}{\partial \tau^m} = p_\tau^L$, since $\tau^{NL} = p^L(\tau^m)$. Substituting in eq.(23) we obtain $W^L_{\tau^L}(1 - p_\tau^L) > 0$ which implies that if $\tau^T = \tau^{NL} = p^L(\tau^{Nm})$ then $\tau^N > \tau^{Nm}$.

- *Case 2:* $\tau^B(\tau^T = \tau^{NL}) = 0 \wedge \tau^B(\tau^T \rightarrow \tau^{NL+}) = 0$

From proposition 1 we know that $\frac{\partial e^B(\tau^{NL})}{\partial \tau^m} = \frac{\delta^s}{k} p_\tau^L$ and $\frac{\partial \tau^B(\tau^T)}{\partial \tau^T} = 0$ Thus, substituting in eq.(23), we obtain$\{-W^L_{e^s} \frac{\delta^s}{k} p_\tau^L + W^L_{\tau^L}\}_{\tau^m = \tau^{Nm}}$ which implies that if $\tau^T = \tau^{NL} = p^L(\tau^{Nm})$ then $\tau^N \geq \tau^{Nm}$ if and only if $p_\tau^L \leq \frac{k}{\delta^S} / \frac{W^L_{e^S}}{W^L_{\tau^L}}|_{e^B(\tau^{NL} = p^L(\tau^{Nm}))}$. Note that if the LSPTA is duty-free then $\frac{W^L_{e^S}}{W^L_{\tau^L}} \geq \frac{k}{\delta^S}$ (proposition 1) so case 2 requires $\frac{W^L_{e^S}}{W^L_{\tau^L}} \in [\frac{k}{\delta^S}, \frac{k}{\delta^S} / p_\tau^L] \neq \emptyset$ since $p_\tau^L \in (0, 1)$.□

Proposition 5: $\tau^{EX} > \tau^{SC}$
By definition at τ^{EX}, $\Omega^{EX}(\tau^{EX}) = \frac{\delta^L}{1-\delta^L} \omega^{EX}(\tau^{EX})$ and $\tau^{EX} > \tau^{EXm}$ if $\delta^L < \delta^{EX}$, thus $\tau^{EX} > \tau^{Cm}$. Following proposition 4 we prove $\tau^{EX} > \tau^{SC}$ by finding the sufficient condition such that:

$$\begin{aligned} \Omega^{SC}(\tau^{EX}) &< \Omega^{EX}(\tau^{EX}) \\ \omega^{SC}(\tau^{EX}) &> \omega^{EX}(\tau^{EX}) \end{aligned}$$

We need only show when $\omega^{SC}(\tau^{EX}) > \omega^{EX}(\tau^{EX})$ since $\Omega^C(\tau^{EX}) - \Omega^{EX}(\tau^{EX}) = -(\omega^C(\tau^{EX}) - \omega^{EX}(\tau^{EX}))$. Adding and subtracting both $W^L(\tau^L = \tau^{Nm}, 0, \tau^{Nm}, \tau^{Nm^*}, .)$ and $W^L(\tau^B(\tau^c), e^B(\tau^{NL}), \tau^c, \tau^{m^*} = \tau^c, .)$ we obtain (all τ^c evaluated at τ^{EX}):

$$\omega^{SC}(\tau^{EX}) - \omega^{EX}(\tau^{EX}) = \varsigma + \epsilon + \varrho$$

$$\varsigma = W^L(\tau^L = \tau^{Nm}, 0, \tau^{Nm}, \tau^{Nm^*}, .) - W^L(\tau^L = \tau^N, 0, \tau^N, \tau^{N^*}, .)$$

$$\epsilon = W^L(\tau^B(\tau^c), e^B(\tau^{NL}), \tau^c, \tau^{m^*} = \tau^c, .) - W^L(\tau^B(\tau^c), e^B(\tau^c), \tau^c, \tau^{m^*} = \tau^c, .)$$

$$\varrho = W^L(\tau^B(\tau^{NL}), e^B(\tau^{NL}), \tau^{Nm}, \tau^{Nm^*}, .) - W^L(\tau^B(\tau^c), e^B(\tau^{NL}), \tau^c, \tau^{m^*} = \tau^c, .)$$

$$+W^L(\tau^L = \tau^c, e^B = 0, \tau^c, \tau^{m^*} = \tau^c, .) - W^L(\tau^L = \tau^{Nm}, 0, \tau^{Nm}, \tau^{Nm^*}, .)$$

where ς represents the welfare effect of changing all tariffs from τ^{Nm} to τ^N in the absence of LSPTAs; ϵ is the extra welfare from Small's change in e^S due to the increased threat tariff in a trade war (from τ^c to τ^{NL}); ϱ represents changes in tariff revenues from Small's exports when different tariffs are used. We use two lemmas to prove that $\epsilon + \varrho$ is always positive but $\varsigma \geq 0$ iff $\tau^N \geq \tau^{Nm}$.

Lemma 2: $\varsigma \geq 0$ iff $\tau^N \geq \tau^{Nm}$.
Proof:

- $\frac{\partial}{\partial \tau^m} W^L(\tau^L = \tau^m, e^S = 0, \tau^m, \tau^{m*} = \tau^m, .) < (>) 0$ if $\tau^m > \tau^{Cm}$ ($\tau^m < \tau^{Cm}$) from eq.(16) and the concavity of $W^L(\tau^L = \tau^m, e^S = 0, \tau^m, \tau^{m*} = \tau^m, .)$ in τ^m.
- $\tau^N > \tau^{Cm}$: by comparing eqs.(16, 22) and noting $W^L_{\tau^{m*}} < 0$.

- $\tau^{Nm} > \tau^{EXm} \geq \tau^{Cm}$: the first inequality follows from comparing eqs.(15, 21) and noting $W^L_{\tau^{m*}} < 0$.The second from proposition 3.

$\therefore \varsigma \geq 0$ iff $\tau^N \geq \tau^{Nm}$ and from lemma 1 we know that $\tau^N \geq \tau^{Nm}$ if $p^L_\tau \leq \frac{k}{\delta^S} / \frac{W^L_{e^S}}{W^L_{\tau^L}}|_{e^B(\tau^{NL}=p^L(\tau^{Nm}))}$.□

Lemma 3: $\epsilon + \varrho > 0$.
Proof:

$$\begin{aligned}
\epsilon &= H\alpha^L\lambda^L(\Psi(b^S He^B(\tau^{NL})) - \Psi(b^S He^B(\tau^c))) \\
\varrho &= \frac{H}{k}(\tau^B(\tau^{NL}) - \tau^{Nm} + \tau^c - \tau^B(\tau^c)) \\
&= \frac{H}{k}(\tau^c - \tau^B(\tau^c) - (\tau^{NL} - \tau^B(\tau^{NL}))) + \frac{H}{k}(\tau^{NL} - \tau^{Nm}) \\
&= \frac{H}{\delta^S}(e^B(\tau^c) - e^B(\tau^{NL})) + \frac{H}{k}(\tau^{NL} - \tau^{Nm})
\end{aligned}$$

Where we use eq.(6). For ϱ the second equality follows after adding and subtracting $\tau^{NL}H/k$ and the third from using IC^S (proposition 1).

- *Case 1:* $\tau^B(\tau^T = \tau^c) \geq 0 \wedge \tau^B(\tau^T \to \tau^{c+}) > 0$

From proposition 1 $e^B(\tau^c) = e^B(\tau^{NL})$ if $\tau^{NL} > \tau^c$. Moreover, $\tau^{NL} > \tau^c$ because $\tau^{NL} = p^L(\tau^{Nm}) > \tau^{Nm} \geq \tau^c$, the first inequality holds or otherwise Large* would not sell in Large (and autarky is not a Nash equilibrium in this model) and the second because the repeated game improves cooperation relative to the Nash.
$\therefore e^B(\tau^c) = e^B(\tau^{NL}) \Rightarrow \epsilon = 0$ and $\varrho = \frac{H}{k}(\tau^{NL} - \tau^{Nm}) > 0$.

- *Case 2:* $\tau^B(\tau^T = \tau^c) = 0 \wedge \tau^B(\tau^T \to \tau^{c+}) = 0$

$$\epsilon + \varrho = V + \frac{H}{k}(\tau^{NL} - \tau^{Nm})$$

$$V \equiv \frac{H}{\delta^S}(e^B(\tau^c) - e^B(\tau^{NL})) + H\alpha^L\lambda^L(\Psi(b^S He^B(\tau^{NL})) - \Psi(b^S He^B(\tau^c))) > 0$$

$V > 0$ since $\frac{H\alpha^L\lambda^L(\Psi(b^S He^B(\tau^{NL})) - \Psi(b^S He^B(\tau^c)))}{e^B(\tau^{NL}) - e^B(\tau^c)} > H/\delta^S$. To see this note that $e^B(\tau^{NL}) > e^B(\tau^c)$ and the strict concavity of Ψ imply that $\frac{H\alpha^L\lambda^L(\Psi(b^S He^B(\tau^{NL})) - \Psi(b^S He^B(\tau^c)))}{e^B(\tau^{NL}) - e^B(\tau^c)} > W^{Le^S}_{e^S}|_{e^B(\tau^{NL})} \geq H/\delta^S$. Where the last inequality holds because $W^{Le^S}_{e^S} \geq H/\delta^S \Leftrightarrow \frac{W^L_{e^S}}{W^L_{\tau^L}} \geq \frac{W^S_{e^S}}{W^S_{\tau^L}}\frac{1}{\delta^S}$ and the last inequality must be true in any self-enforcing LSPTA with $\tau^T = \tau^{NL}$.
$\therefore V > 0$ and $\tau^{NL} > \tau^{Nm} \Rightarrow \epsilon + \varrho > 0$.□

Proposition 6: *Effect of deepening LSPTA on multilateral tariffs*
We consider explicitly the effect of α^L, noting that λ^L enters W^L symmetrically. The two situations of interest are:

A. $\tau^m = \tau^{EXm}$ **or** τ^{Cm}

First, $d\tau^{Cm}/d\alpha = 0$ since under commitment no LSPTA occurs. Implicit differentiation of eq.(15)

yields:

$$\begin{aligned}\frac{d\tau^{EXm}}{d\alpha} &= \frac{\partial(W^L_{\tau^L}\frac{\partial\tau^B}{\partial\tau^T}+W^L_{e^S}\frac{\partial e^B}{\partial\tau^T})/\partial\alpha}{-\partial^2W^L/\partial(\tau^m)^2}\\ sign(\frac{d\tau^{EXm}}{d\alpha}) &= sign(\partial(W^L_{\tau^L}\frac{\partial\tau^B}{\partial\tau^T}+W^L_{e^S}\frac{\partial e^B}{\partial\tau^T})/\partial\alpha)\end{aligned}$$

where the second line follows from the concavity of $W^L(\tau^L=\tau^B, e^S=e^B, \tau^m, \tau^{m*}=\tau^m, .)$ in τ^m.

- *Case 1:* $\tau^B(\tau^T=\tau^{EXm})\geq 0 \wedge \tau^B(\tau^T\rightarrow\tau^{EXm+})>0$

From proposition 1 $\frac{\partial\tau^B}{\partial\tau^T}=1$, thus $\frac{\partial}{\partial\alpha}(\frac{\partial\tau^B}{\partial\tau^T})=0$. Moreover $\frac{\partial e^B}{\partial\tau^m}=0$ and $\frac{\partial}{\partial\alpha}(W^L_{\tau^L})=0$ since $W^L_{\tau^L}=H/k$.
$\therefore d\tau^{EXm}/d\alpha = d\tau^{Cm}/d\alpha = 0.$

- *Case 2:* $\tau^B(\tau^T=\tau^{EXm})=0 \wedge \tau^B(\tau^T\rightarrow\tau^{EXm+})=0$

From proposition 1 $\frac{\partial\tau^B}{\partial\tau^T}=0$ and thus $\frac{\partial}{\partial\alpha}(\frac{\partial\tau^B}{\partial\tau^T})=0$. Moreover $\frac{\partial}{\partial\alpha}(\frac{\partial e^B}{\partial\tau^m})=0$, since $\frac{\partial e^B}{\partial\tau^m}=\delta^S/k$. $\frac{\partial}{\partial\alpha}(W^L_{\tau^L})=0$ since $W^L_{\tau^L}=H/k$.
$\therefore \partial(W^L_{\tau^L}\frac{\partial\tau^B}{\partial\tau^T}+W^L_{e^S}\frac{\partial e^B}{\partial\tau^T})/\partial\alpha = (\delta^S/k)\partial(W^L_{e^S})/\partial\alpha > 0 \Rightarrow d\tau^{EXm}/d\alpha > d\tau^{Cm}/d\alpha = 0.$

B. $\tau^m=\tau^{EX}$ **or** τ^{SC}
From direct observation of ω^{SC} and Ω^{SC} it is obvious that $d\omega^{SC}(\tau^c)/d\alpha = d\Omega^{SC}(\tau^c)/d\alpha = 0$.

- *Case 1:* $\tau^B(\tau^T=\tau^{EX})\geq 0 \wedge \tau^B(\tau^T\rightarrow\tau^{EX+})>0.$

We first show that in this case the tariff that is self-enforcing before α or λ increase remains self-enforcing. Note that in this case the unconstrained optimum multilateral tariff is unchanged and so is the threat tariff (shown above). For a given τ^T we have $de^B=-(\delta^S/k)d\tau^B$ (from IC^S in proposition 1) and therefore $de^B/d\alpha=-(\delta^S/k)d\tau^B/d\alpha$. Using this relationship and differentiating eq.(17) at the initial tariff we obtain:

$$\begin{aligned}\frac{d\omega^{EX}}{d\alpha} &= \{W^L_{\tau^L}\frac{\partial\tau^B}{\partial\alpha}+W^L_{e^S}\frac{\partial e^B}{\partial\alpha}\}|_{e^B(\tau^{EX})}-\{W^L_{\tau^L}\frac{\partial\tau^B}{\partial\alpha}+W^L_{e^S}\frac{\partial e^B}{\partial\alpha}\}|_{e^B(\tau^{NL})}+W^L_\alpha|_{e^B(\tau^{EX})}-W^L_\alpha|_{e^B(\tau^{NL})}\\ &= \{(W^L_{e^S}-W^L_{\tau^L}\frac{k}{\delta^S})\frac{\partial e^B}{\partial\alpha}\}|_{e^B(\tau^{EX})}-\{(W^L_{e^S}-W^L_{\tau^L}\frac{k}{\delta^S})\frac{\partial e^B}{\partial\alpha}\}|_{e^B(\tau^{NL})}+W^L_\alpha|_{e^B(\tau^{EX})}-W^L_\alpha|_{e^B(\tau^{NL})}\\ &= 0 \qquad (24)\end{aligned}$$

where the last equality follows from $e^B(\tau^{EX})=e^B(\tau^{NL})$ since $\tau^B(\tau^T=\tau^{EX})\geq 0 \wedge \tau^B(\tau^T\rightarrow\tau^{EX+})>0$ and $\tau^{NL}>\tau^{EX}$, i.e. higher threats are passed as higher τ^B at given e^B. Similarly, $d\Omega^{EX}/d\alpha=-d\omega^{EX}/d\alpha=0$.

$\therefore d\Omega^{EX}/d\alpha=-d\omega^{EX}/d\alpha=0 \Rightarrow d\tau^{EX}/d\alpha=d\tau^{SC}/d\alpha=0.$

- *Case 2:* $\tau^B(\tau^T=\tau^{EX})=0 \wedge \tau^B(\tau^T\rightarrow\tau^{EX+})=0$

Now suppose that we start at a duty-free LSPTA so that at a given threat tariff $\frac{\partial \tau^B}{\partial \alpha} = \frac{\partial e^B}{\partial \alpha} = 0$. Substituting in the first line of eq.(24) we obtain:

$$\begin{aligned} \frac{d\omega^{EX}}{d\alpha} &= W^L_{\alpha}|_{e^B(\tau^{EX})} - W^L_{\alpha}|_{e^B(\tau^{NL})} \\ &= H\lambda^L(\Psi(b^S H e^B(\tau^{EX})) - \Psi(b^S H e^B(\tau^{NL}))) < 0 \end{aligned}$$

The final inequality is true iff the LSPTA is duty-free, i.e. if $\tau^B(\tau^T = \tau^{EX}) = 0 \wedge \tau^B(\tau^T \to \tau^{EX+}) = 0$ s.t. $e^B(\tau^{EX}) < e^B(\tau^{NL})$. Similarly, $d\Omega^{EX}/d\alpha = -d\omega^{EX}/d\alpha > 0$.

$\therefore d\Omega^{EX}/d\alpha = -d\omega^{EX}/d\alpha > 0 \Rightarrow d\tau^{EX}/d\alpha > d\tau^{SC}/d\alpha = 0.\square$

Proposition 7:*Effect of deepening LSPTA on Small's welfare*
We consider explicitly the effect of α^L, noting that λ^L enters W^L symmetrically.

$$\frac{dW^S}{d\alpha} = W^S_{e^S}\frac{de^B}{d\alpha} + W^S_{\tau^L}\frac{d\tau^B}{d\alpha} + W^S_{\tau^m}\frac{d\tau^m}{d\alpha} \tag{25}$$

- *Case 1:* $\tau^B(\tau^T = \tau^{EXm}) \geq 0 \wedge \tau^B(\tau^T \to \tau^{EXm+}) > 0$

From the proof of proposition 6: $d\tau^m/d\alpha = 0$ and $d\tau^B/d\alpha = -\frac{k}{\delta^S}\frac{de^B}{d\alpha}$, substituting in eq.(25) we obtain:

$$\begin{aligned} \frac{dW^S}{d\alpha} &= (W^S_{e^S} - \frac{k}{\delta^S}W^S_{\tau^L})\frac{de^B}{d\alpha} \\ &= -H(1 - \frac{1}{\delta^S})\frac{de^B}{d\alpha} \end{aligned}$$

$\Rightarrow sign\frac{dW^S}{d\alpha} = sign\frac{de^B}{d\alpha}$. To derive this implicitly differentiate the relevant FOC in proposition 1 for each interior solution:

- τ^{BI}: $\frac{de^B}{d\alpha} = -\frac{W^L_{e\alpha}}{W^L_{ee}} > 0$, since $\Psi'' < 0$ and $W^L_{e\alpha} = Hb^S H\lambda^L\Psi'(b^S H e^B) > 0$.
- τ^{BII}: $d\tau^B = -\frac{k}{\delta^S}de^B$ and thus:

$$\frac{de^B}{d\alpha} = \frac{\frac{\delta^L k}{H}H\lambda^L\Psi(b^S H e^B)}{k/\delta^S - \delta^L k b^S H\alpha^L\lambda^L\Psi'(b^S H e^B)} = \frac{\delta^L k\lambda^L\Psi(b^S H e^B)}{k/\delta^S - \delta^L W^L_e/W^L_{\tau^L}} > 0$$

The inequality follows from $\delta^L k\lambda^L\Psi(b^S H e^B) > 0$ and $k/\delta^S > \delta^L W^L_e/W^L_{\tau^L}$. To see the latter recall from proposition 1 that if $\tau^B = \tau^{BI}$ then $W^L_e/W^L_{\tau^L} = W^S_e/W^S_{\tau^L}\delta^S$. Now suppose that δ^L is such that τ^{BII} coincides with τ^{BI}. Then we would have $k/\delta^S = W^S_e/W^S_{\tau^L}\delta^S = W^L_e/W^L_{\tau^L} > \delta^L W^L_e/W^L_{\tau^L}$ at τ^{BII}. Therefore, this is also true for lower δ^L,i.e. when τ^{BII} and τ^{BI} do not coincide, since k/δ^S is constant. If δ^L were higher then IC^L would not bind and τ^{BI} would be the relevant solution.
$\therefore \frac{dW^S}{d\alpha} > 0$.

- *Case 2:* $\tau^B(\tau^T = \tau^{EX}) = 0 \wedge \tau^B(\tau^T \to \tau^{EX+}) = 0$

Implicit differentiation of the FOC in proposition 1 when $\tau^B = 0$ yields $\frac{d\tau^B}{d\alpha} = 0$, $\frac{de^B}{d\alpha} = \frac{\delta^S}{k}\frac{d\tau^m}{d\alpha}$. Substituting in eq.(25) and rearranging we obtain:

$$\begin{aligned}\frac{dW^S}{d\alpha} &= (\frac{\delta^S}{k}W^S_{e^S} + W^S_{\tau^m})\frac{d\tau^m}{d\alpha} \\ &= (p_\tau - \delta^S)\frac{H}{k}\frac{d\tau^m}{d\alpha}\end{aligned}$$

From proposition 6 $\frac{d\tau^m}{d\alpha} > 0$ and
$\therefore \frac{dW^S}{d\alpha} \geq 0$ iff $p_\tau \geq \delta^S$.□

Proposition 8: *Welfare ranking of regimes for Large*
Rewriting the problem in eq.(14) by explicitly allowing LSPTAs under commitment we can show that the equilibrium solution is still $\tau^m = \tau^{Cm} = \tau^L$ and $e^S = 0$. Note that $e^B(\tau^T) = \frac{\delta^S}{k}(\tau^T - \tau^B(\tau^T)) = 0$ because the constraint $\tau^L = \tau^c$ means both that $\tau^B(\tau^T) = \tau^c$ and τ^T cannot be higher than τ^c.

$$\tau^{Cm} \equiv \arg\max_{\tau^c}\{W^L(\tau^L = \tau^B(\tau^T), e^S = e^B(\tau^T), \tau^c, \tau^{m*} = \tau^c, .)) : IC^C; \tau^L = \tau^c\} \tag{26}$$

When large countries are sufficiently patient their IC in the MTL do not bind and the only difference between τ^{EXm} in eq.(13) and the modified in eq.(26) is that in the latter the constraint $\tau^L = \tau^c$ binds because the LSPTA is welfare improving at any given multilateral tariff.
∴Since eq.(26) and eq.(14) are equivalent we have $W^L(\tau^{EXm}, .) > W^L(\tau^{Cm}, .)$ for $\delta^S > 0$.□

Proposition 9: Welfare ranking of regimes for Small
We show that a necessary and sufficient condition for $W^{EXS} > W^{CS}$ is:

$$\delta^S < 1 - \frac{(\tau^{EXm} - \tau^{Cm})(1 - p^L_\tau)}{\tau^{EXm} - \tau^B(\tau^{EXm})} = \begin{cases} 1 & \text{when the LSPTA at } \tau^{EXm} \text{ is not duty-free} \\ p^L_\tau + \frac{\tau^{Cm}}{\tau^{EXm}}(1 - p^L_\tau) < 1 & \text{when the LSPTA at } \tau^{EXm} \text{ is duty-free} \end{cases}$$

Moreover, $\delta^S < p^L_\tau$ is a sufficient condition for $W^{EXS} > W^{CS}$ since $\min(1 - \frac{(\tau^{EXm} - \tau^{Cm})(1-p^L_\tau)}{\tau^{EXm} - \tau^B(\tau^{EXm})}) \geq p^L_\tau$.

$$\begin{aligned}W^{EXS} - W^{CS} &= \{\frac{H}{k}(p^L_l(\tau^{EXm}) - \tau^B(\tau^{EXm})) - He^B(\tau^{EXm}))\} - \frac{H}{k}(p^L_l(\tau^{Cm}) - \tau^{Cm}) \\ &= \frac{H}{k}(p^L_l(\tau^{EXm}) - \tau^B(\tau^{EXm}) - (p^L_l(\tau^{Cm}) - \tau^{Cm}) - \delta^S(\tau^{EXm} - \tau^B(\tau^{EXm}))) \\ &= \frac{H}{k}(p^L_l(\tau^{EXm}) - p^L_l(\tau^{Cm}) - (\tau^{EXm} - \tau^{Cm}) + (\tau^{EXm} - \tau^B(\tau^{EXm}))(1 - \delta^S)) \\ &= \frac{H}{k}((\tau^{EXm} - \tau^B(\tau^{EXm}))(1 - \delta^S) - (\tau^{EXm} - \tau^{Cm})(1 - p^L_\tau))\end{aligned}$$

In the first line we use eq.(5); in the second IC^S to substitute e^B; in the third we add and subtract τ^{EXm}. The fourth line follows from the linearity of prices in tariffs that implies $p^L_l(\tau^{EXm}) - p^L_l(\tau^{Cm}) = (\tau^{EXm} - \tau^{Cm})p^L_\tau$. Solving for δ^S we obtain $\delta^S < 1 - \frac{(\tau^{EXm} - \tau^{Cm})(1-p^L_\tau)}{\tau^{EXm} - \tau^B(\tau^{EXm})}$.

∴ When the LSPTA is not duty-free at τ^{EXm} then $\tau^{EXm} = \tau^{Cm}$
$\Rightarrow \delta^S < 1$ is necessary and sufficient for $W^{EXS} > W^{CS}$
∴ When $\tau^B(\tau^{EXm}) = 0$ then $\tau^{EXm} > \tau^{Cm}$
$\Rightarrow \delta^S < 1 - \frac{(\tau^{EXm} - \tau^{Cm})(1-p^L_\tau)}{\tau^{EXm}} = p^L_\tau + \frac{\tau^{Cm}}{\tau^{EXm}}(1 - p^L_\tau) \in (p_\tau, 1)$ is necessary and sufficient for $W^{EXS} > W^{CS}$ and thus a $\delta^S \in (p_\tau, 1)$ exist s.t. Small prefers the commitment regime.□