

# Are Preferential Trade Agreements with Non-trade Objectives a Stumbling Block for Multilateral Liberalization?

Nuno Limão\*

University of Maryland and CEPR

July 24th 2006

## Abstract

In many preferential trade agreements (PTAs) countries exchange not only reductions in trade barriers but also cooperation in non-trade issues such as labor and environmental standards, intellectual property, etc. We provide a model of PTAs motivated by cooperation in non-trade issues and analyze its implications for global free trade and welfare. We find that such PTAs increase the cost of multilateral tariff reductions and thus cause a stumbling block to global free trade. This occurs because multilateral tariff reductions decrease the threat that can be used in PTAs and thus the surplus that can be extracted from them. By explicitly modeling the interaction between preferential and multilateral negotiations we derive a testable prediction and provide novel econometric evidence that supports the model's key prediction. The welfare analysis shows that the current WTO rules allowing this type of PTAs may be optimal for economically large countries, thus the model can predict the rules we observe. We also analyze alternative rules that constitute a Pareto improvement.

JEL classification: F13; F15; F18; F42; H77.

Keywords: Multilateral trade negotiations; regional integration; cross-border externalities; environment; labor standards.

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\*Department of Economics, University of Maryland, College Park, 20742, USA. Email: limao@econ.umd.edu. I thank Piyush Chandra, Rod Ludema, John McLaren, Helen Milner, Arvind Panagariya, Michael Riordan, David Weinstein, Eric Van Wicoop and participants at seminars in UPenn, the USITC, NBER Summer Institute 2003 and the World Bank for comments. I am grateful to Stephanie Aaronson, Kyle Bagwell and Don Davis for helpful discussions. I especially thank the editor, Maitreesh Ghatak, and two anonymous referees for extremely useful suggestions. The usual disclaimer applies.

# 1 Introduction

Preferential trade agreements (PTAs) are currently among the most important instruments of international economic policy. Since 1995 at least 130 new PTAs were created worldwide, more than doubling the number created in the previous 50 years. More than a third of world trade is estimated to be carried out under them. Traditionally, PTAs are studied simply as a reciprocal reduction of trade barriers, such as tariffs, among a set of countries. However, such reductions are often not the only or even the main motivation for PTAs. Many PTAs require cooperation on issues that are not related to trade policy. The most obvious such agreement is the European Union and its predecessors, which requires countries that want to accede to change their behavior on a broad set of issues such as environmental and labor standards, intellectual property, human rights, etc. As we describe below this is far from an isolated case.

Economists generally support free trade, i.e. non-preferential trade liberalization, but there is no such consensus about the preferential liberalization that characterizes PTAs. The key concern is that PTAs may be “stumbling blocks” to multilateral liberalization (Bhagwati, 1991); that is PTAs may halt or reverse the process that has allowed GATT/WTO members to reduce their multilateral tariffs by over 90 percent in the last 60 years. (Staiger, 1995) One important channel through which this can occur is when PTA partners try to prevent reductions in their preference margins. This leads them to oppose multilateral liberalization because it entails a reduction of tariffs that apply to all partners and thus it erodes preference margins. This problem was foreseen by Johnson (1967) and nearly caused the collapse of multilateral negotiations in 2004, prompting the International Monetary Fund to create a special lending program aimed at developing countries “to mitigate concerns (...) that broad-based tariff liberalization might erode the value of their preferential access to important export markets.”<sup>1</sup>

Given the prevalence and importance of non-trade issues in PTAs it is important to have a model that allows us to analyze their effects on trade and non-trade issues, welfare and the international rules that govern globalization. Among other things, the model we develop generates interesting insights about the number and membership of PTAs and their effect on cooperation on non-trade issues. To demonstrate the importance of PTAs with non-trade objectives we examine the central concern with PTAs: how they change the incentives of countries to pursue global free trade. We find robust empirical evidence for the model’s prediction that these PTAs cause a stumbling block to multilateral trade liberalization (MTL).<sup>2</sup>

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<sup>1</sup>IMF Press Release No. 04/73, 13/04/04.

<sup>2</sup>The possibility that linkage of preferences to cooperation on non-trade issues could slow down multilateral liberalization has also been conjectured by international trade lawyers. Trebilcock and Howse assert that: “By failing to respond to the

Before presenting our specific results we show the importance of non-trade issues by describing how prevalent and important they are in the preference programs of the United States (US) and European Union (EU). The reason to focus on them is simple: since they are the two largest traders any effects of their PTAs on their MTL will have worldwide effects. The scope of the non-trade issues and their importance in motivating individual PTAs varies. For example, the US PTA with Canada and Mexico contained clauses on the enforcement of intellectual property rights as well as labor and environment provisions. The latter two, despite being added as side agreements, were important in its approval by the US congress. All seven PTAs the US has negotiated since then have included chapters on enforcement of intellectual property, labor and environmental standards. Compliance with these and other criteria is required in order for Caribbean, African and dozens of other developing countries to be eligible for US trade preferences. Failure to comply has led some of them to lose preferential access to the US.<sup>3</sup> Although it is difficult to precisely quantify and assess the relative importance of these non-trade issues in motivating PTAs some cases are unambiguous. For example, the recent wave of US “...free trade agreements in the Middle East carry out the recommendation in the 9/11 Commission Report...” that “... a comprehensive US strategy to counter terrorism should include economic policies that encourage development, more open societies, and opportunities for people to improve the(ir) lives”.<sup>4</sup> The US trade preferences to Andean countries—currently named the “Andean Trade Promotion and Drug Eradication Act”—were enacted specifically to ensure their cooperation in combating drug production and trafficking. The examples above focus on the US because it is the subject of our empirical analysis, but many exist for the EU as well.<sup>5</sup>

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Quantifying the exact economic importance of cooperation with non-trade issues in trade agreements is demand for a social clause within the WTO [enforcing labor rights through the threat of trade sanctions], 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—[preferential] GSP treatment.” (1999, p.462-463).

<sup>3</sup>For example, according to the US GSP handbook some countries have lost eligibility for trade preferences under that program “because of worker rights or intellectual property concerns.” p.6. Accessed at <[www.ustr.gov/assets/Trade\\_Development/Preference\\_Programs/GSP/asset\\_upload\\_file267\\_8359.pdf](http://www.ustr.gov/assets/Trade_Development/Preference_Programs/GSP/asset_upload_file267_8359.pdf)> In 2005 the US revoked Cote d’Ivoire’s eligibility for trade preferences under the AGOA program because of its failure to comply with the U.N.’s cease fire resolution. Morocco enacted a comprehensive new labor law recently and, according to US trade negotiators it was “the prospect of a free trade agreement with the United States [that] helped to forge a domestic consensus for labor law reform in Morocco, spurring reform efforts that had been stymied for more than 20 years.” Accessed at <[www.ustr.gov/Document\\_Library/Fact\\_Sheets/2004/Morocco\\_FTA\\_Leads\\_to\\_Progress\\_on\\_Labor\\_Reform.html](http://www.ustr.gov/Document_Library/Fact_Sheets/2004/Morocco_FTA_Leads_to_Progress_on_Labor_Reform.html)>

<sup>4</sup>The US has negotiated PTAs with Jordan, Morocco and Bahrain. It is negotiating with Oman and United Arab Emirates. Its objective is to establish a Middle East Free Trade Area by 2013. Accessed at <[www.ustr.gov/Document\\_Library/Press\\_Releases/2005/October/United\\_States\\_Oman\\_Conclude\\_Free\\_Trade\\_Agreement.html](http://www.ustr.gov/Document_Library/Press_Releases/2005/October/United_States_Oman_Conclude_Free_Trade_Agreement.html)>

<sup>5</sup>The EU seeks cooperation in non-trade issues via its preferential agreements, even when they do not entail full membership. See Winters (1993) and Grilli (1997) for details on such conditions in the EU’s Eastern European, Mediterranean and GSP programs. More recently the EU has actually implemented what it calls “special incentive arrangements” whereby developing countries can apply for additional preferential tariff reduction if they satisfy either certain labor, environmental or drug combat criteria. On the importance of the exchange of trade preferences for cooperation in non-trade issues see also World Bank (2000), Perroni and Whalley (2000), and Jackson (1997, p. 160).

very difficult given that many are public goods. In fact, an important objective of this paper is to provide evidence that they are sufficiently important to change the multilateral tariffs the US sets on the rest of the world. The official US agency in charge of the economic analysis of its PTAs admits that the effect of most of those issues are not quantifiable.<sup>6</sup> However, there is indirect evidence from multilateral negotiations in the WTO that suggests they are quite important. For instance, the attempt by developed countries to link cooperation in labor standards to MTL in the WTO was met by the opposition of developing countries and was one of the main causes for the failure to start a new trade round in 1999 in Seattle. Thus the issue is important enough to forego the gains from MTL. McCalman (2001) provides more specific evidence on the importance of non-trade issues. He estimates the net present value of the transfers that would occur across countries from stronger enforcement of patents, which is now required by the WTO. The net transfer to the US is \$4.5 billion (1988 dollars). For developing countries the transfers are negative and large: about \$1 billion for Brazil and half a billion dollars each for India and Mexico. According to McCalman these transfers are of the same order of magnitude as the estimated net welfare gains from reciprocal trade liberalization in the last trade round.

We model non-trade issues as the key motive for PTAs between a country with a large import market, *Large*, that offers tariff reductions to a “regional” partner in exchange for the latter’s cooperation in non-trade issues, which we model as regional public goods. We show that these PTAs have an important effect on multilateral tariffs and welfare. Most importantly, these PTAs create an incentive for *Large* to maintain higher multilateral tariffs. Intuitively, the PTA is valuable to *Large* because it allows it to extract cooperation in the non-trade issue. To do this it must offer a preference to the regional partner, i.e. a tariff below the multilateral tariff that it applies to all WTO members. This implies that reductions in this *multilateral* tariff lower the preference margin that *Large* can offer in the PTA and consequently the level of cooperation it can extract. Therefore, these PTAs—currently allowed by WTO rules—are a stumbling block to multilateral liberalization, i.e. they generate an incentive to maintain higher multilateral tariffs.

There is a theoretical literature that analyzes if PTAs are stumbling blocks to MTL.<sup>7</sup> It focuses on traditional trade models where countries exchange reductions in trade barriers, ignoring PTAs driven by cooperation in non-trade issues, which are the focus of our analysis.<sup>8</sup> This difference has two important

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<sup>6</sup>As is clear from its evaluation of the agreement with the central American countries for example, p. 117 at <http://hotdocs.usitc.gov/docs/pubs/2104f/pub3717.pdf>.

<sup>7</sup>Interesting contributions include Bagwell and Staiger (1998), Krishna (1998) and Levy (1997).

<sup>8</sup>Bond and Park (2002) and Schiff and Winters (1998) study PTAs that stress non-trade issues, typically modelled as a side payment. However, they do not analyze their interaction with multilateral trade agreements.

implications. First the existing literature cannot explain the formation of many PTAs. Second, in those traditional models the only direct effect of a PTA is to change quantities and prices of the traded goods and it is only when such changes occur that the PTA changes the incentives for multilateral tariff setting. But many trade preferences are extended by economically large countries to small ones and these are unlikely to affect quantities and prices in the large country. So, according to the traditional models these agreements should have no effect on the multilateral tariffs of large countries. In contrast, the stumbling block effect predicted by our model is present for the large and increasing number of agreements where the partner is relatively small in economic terms, e.g. Colombia relative to US, provided that it is important in terms of the non-trade issue, e.g. the war on drugs.

We also derive precise comparative statics and testable predictions from the model. This is an important and unique feature of our paper since the traditional models of the effect of PTAs on multilateral tariffs have generated few testable predictions and almost no empirical evidence. Our model's key prediction is that, once the PTA is signed, *Large's* multilateral tariffs increase in the goods exported both by its PTA partner and the rest of the world relative to those products in the same industry not exported under the PTA. This allows us to construct a good counterfactual for what *Large's* multilateral tariffs in those PTA products would have been in the absence of those PTAs.

Some of the US PTAs fit the assumptions of the model particularly well and thus we use them to test the key prediction. Specifically, we analyze the effect of those PTAs on US specific tariff changes negotiated during the last multilateral trade round. We use a difference-in-differences approach, over time and across PTA vs. non-PTA type goods. The econometric estimates support the key prediction. For the PTAs with non-trade objectives the US maintained higher multilateral tariffs in PTA-imported goods relative to similar goods imported from the rest of the world. The estimation and robustness tests control for various determinants of multilateral liberalization and address various econometric issues such as the potential for endogeneity arising from possible reverse causation and omitted variable bias. The economic significance is also noteworthy, in the goods exported under the relevant PTAs these agreements caused an average increase of 33 percent in the specific tariffs that the US applies multilaterally.<sup>9</sup>

Given the evidence we find for PTAs with non-trade objectives as a stumbling block to MTL it is important to analyze their welfare predictions and derive implications for WTO rules. We do so both from

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<sup>9</sup>In a recent empirical paper, Limão (2006) explores our comparative static result but focuses mostly on the aggregate effect of US PTAs on its advalorem tariffs. Karacaovali and Limão (2005) do so for the EU. Both provide some evidence of a stumbling block effect that is complementary to ours. However, we analyze a different form of multilateral trade protection: specific tariffs, which we will see is still important in the US and covers a largely different set of goods.

a positive and a normative perspective. From a positive perspective the model can explain some features of the current multilateral system. Most significantly, the current WTO rules that permit these PTAs arise endogenously from our model. Large countries, which in practice have chosen such rules in the WTO, prefer them to an alternative regime that forbids these PTAs. In our model the motive why large states, such as the US and EU, benefit and thus choose such rules is that they can cooperate in setting multilateral tariffs and thus internalize any effect their PTAs have on those tariffs. However, we also show that when the PTAs cause higher multilateral tariffs they may hurt both the regional PTA partner that cooperates in the non-trade issue and non-member countries. Therefore we propose an alternative rule: allowing preferential import subsidies that can be exchanged for cooperation in non-trade issues. We show that switching to these subsidies eliminates the stumbling block effect and generates a Pareto improvement and, according to recent simulation results would increase the aggregate welfare gains in the current multilateral trade round by about 10%. (Limão and Olarreaga, 2006)

The paper is organized as follows. We first show the regional gains to forming PTAs with non-trade objectives. We then show how these PTAs generate a stumbling block to MTL; first illustrating this result in a static model with full enforcement and then proving it in a more realistic dynamic self-enforcing environment. In section 3 we derive comparative statics and test one of the predictions: that US PTAs with non-trade objectives caused it to set higher multilateral tariffs. In section 4 we analyze the positive and normative implications of the model for WTO rules. We discuss our results in the conclusion. All proofs are in the appendix.

## 2 Theory

### 2.1 Model Setup

We develop a model of regional agreements between countries of asymmetric size in which lower trade barriers are exchanged for cooperation in a non-trade issue. We first describe individual preferences and derive the indirect utilities. We then explain the government's objective and policy instruments. Finally, we write the governments' objective functions in terms of the relevant policy instruments.

Each of the two symmetric regional blocs is composed of two economies, *Large* and *Small*. *Large*'s bigger endowment of the (non-numeraire) goods is the basis for its regional power relative to *Small*. However,

*Small* must be important in the non-trade dimension to justify *Large* seeking its cooperation. Thus we assume that *Small* can produce a public good with a cross-border externality, which is valued by its regional partner, e.g. enforcement of human and labor rights, immigration and environmental laws, etc.

Given the symmetry across regional blocs we describe only one of them. For simplicity we assume that countries have the same population,  $H$ . Each individual is endowed with one unit of labor—the only factor. The numeraire good is produced with labor according to a constant returns production with a marginal product normalized to unity. In *Large* each individual is endowed with one unit of each of the non-numeraire goods  $i = l, l^*$ . Throughout we use an “\*” to denote variables in the other regional bloc. Thus good  $l$  denotes the import good in *Large* and  $l^*$  the import for *Large*\*. In *Small* each individual is endowed with a fraction  $1/k$  of good  $l$ , and none of  $l^*$ ; thus  $k$  represents the relative size of the countries in terms of their endowment of  $l$ .

The representative consumer in country  $j = L(\text{arge}), S(\text{mall})$  has preferences defined over consumption of the numeraire,  $c_n^j$ , the non-numeraire goods,  $c_i^j$ , and a public good,  $E$ . We write the individual utility as

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

The subutility function for the public good is:

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

The weight placed on  $E$ ,  $\lambda^j$ , varies across countries and a regional spillover occurs if  $\alpha^j$  is positive.<sup>10</sup> We can interpret  $E$  as public expenditures to address issues with regional spillovers. Below we describe how the governments determine its level.

For given prices, taxes, income (denoted by  $y$ ) and level of  $E$  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 utility, the budget constraint is satisfied with equality, thus individuals demand  $d_i^j(p_i^j) = [u_i^j{}'(p_i^j)]^{-1}$  of each of the non-numeraire goods. Thus we write the individual’s indirect utility as follows:

$$W^j/H = y^j + \bar{\Psi}^j(E^j, E^{\setminus j}) + \sum_i v_i^j(p_i^j) \quad (3)$$

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<sup>10</sup>We also assume that  $\Psi(0) = 0; \lim_{E \rightarrow 0} \Psi'(E) = \infty$  and  $\lim_{E \rightarrow \infty} \Psi(E) \leq \bar{\psi}$ .

where the last term represents consumer surplus.<sup>11</sup> An individual's income sources are the wage, the value of the endowment and net taxes. Net taxes are equal to the per capita tariff revenues minus the tax used to finance the public good,  $e$ .<sup>12</sup>

We make the following additional assumptions regarding *Small's* preferences. First, we are interested in the case where it places a smaller weight on  $E$  than *Large*. Therefore, without loss of generality, we focus on the extreme case where *Small* places no weight on the public good. Second, we want to focus on a case where the effect of PTAs on multilateral liberalization is driven by the non-trade issue and not changes in trade flows. As we show below we can neutralize any trade diversion or creation effects from the PTA under a particular trade pattern. A sufficient condition to obtain such a pattern is to assume that *Small* derives no utility from either good  $l$  or  $l^*$ , it values only the numeraire. Thus the indirect utility for individuals in *Small* is simply given by their income.

We now describe the government's objective and role. The government sets trade policy and chooses  $E$  in order to maximize domestic aggregate welfare. We can incorporate political economy motives for the use of tariffs but these do not change the qualitative stumbling block results, as we note in section 2.5.2.

The public good is produced using  $h_e^j$  units of labor according to a linear production function:  $E^j = b^j h_e^j$ . We assume that the population is sufficiently large so that the numeraire is always produced in equilibrium, which fixes the wage at unity. Therefore the cost of producing a given level  $E^j$  is simply  $h_e^j$ , the labor bill. According to the government's balanced budget condition this cost must equal total revenue of the taxes used to fund it,  $He^j$ , and so in equilibrium  $E^j$  must equal  $b^j He^j$ . We impose this condition and focus on the government's choice of  $e^j$ , the per capita tax required to fund  $E^j$ .<sup>13</sup>

The trade policy instruments available to the government are specific tariffs on the imported (non-numeraire) goods. The governments also decide on PTAs and multilateral trade agreements and their associated rules. Before analyzing the equilibrium agreements we must show how each government's objective depends on the policy variables and for this we must describe the trade pattern.

Figure 2 illustrates the trade pattern. The two large countries have similar endowments and therefore differences in demand determine their trade pattern. We label the good for which *Large* has a stronger

<sup>11</sup>We focus on quadratic sub-utilities,  $u_i$ , which imply linear demands. This can be relaxed for some but not all results.

<sup>12</sup>More specifically, if we let  $w$  denote the wage,  $tr$  the per capita tariff revenue and  $e$  the tax charged for the public good, then the individual's income is  $y^L = w^L + \sum_i p_i^L + tr^L - e^L$  in *Large* and  $y^S = w^S + p_i^S/k + tr^S - e^S$  in *Small*.

<sup>13</sup>The tariff revenue is distributed lump-sum and we assume that none is used to finance the public good, which maintains the two policies *within* each country separable in the model.



preference as  $l$ , so it imports  $l$  and exports  $l^*$ .<sup>14</sup>

*Small* values only the numeraire good and so it exports its full endowment of the non-numeraire good,  $H/k$ , to *Large*. We assume that the trading costs between a small and a large country in opposite blocs are prohibitive. This simplifying assumption, along with the endowment and preference structure, allows us to neutralize any potential trade diversion and creation effects and thus isolate a distinct effect of PTAs on multilateral tariffs driven by non-trade objectives. To see this clearly note that *Small* does not set tariffs since they do not import the non-numeraire goods.<sup>15</sup> Since *Small* has no tariff reductions to offer to *Large*, the PTA 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 PTA on trade is to increase the price that *Small* receives for the  $H/k$  units of good  $l$  it exports to *Large*.

To determine the equilibrium prices of goods  $l$  and  $l^*$  we first note that *Large* sets a tariff  $t$  on imports from *Small* and a tariff  $\tau$  on imports from *Large*\*. The price received by *Large*\* for its export is  $p_l^L - \tau$ , where  $p_l^L$  is the domestic price in *Large* and is derived from the market clearing condition requiring net import demands to sum to zero.

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

Net imports are defined by  $M_l^j \equiv (d_l^j(p_l^j) - 1)H$  for  $j = L, L^*$  and  $M_l^S \equiv -H/k$ . A condition similar to (4) holds for  $l^*$ . These conditions define the domestic prices in *Large* as functions of the tariffs,  $p_l^L(\tau)$  and  $p_{l^*}^L(\tau^*)$ . These prices are not directly affected by the preferential tariff because the small countries' supplies are perfectly inelastic. It is then simple to show that an increase in  $\tau$  raises the domestic price in *Large*,  $p_l^L$ , which includes the tariff. However, it lowers the price net of tariff,  $p_l^L(\tau) - \tau$ , which is received by exporters in *Large*\*. For a similar reason an increase in  $\tau^*$  lowers the price for *Large*'s exports of  $l^*$ . This effect of tariffs is the motive we model for the multilateral trade negotiation in section 2.5.<sup>16</sup>

<sup>14</sup>We could alternatively allow the large countries to have identical preferences but endow each with a larger amount than the other in their respective export product. In either case the balance of payments condition is satisfied through movements of the numeraire good.

<sup>15</sup>We can extend the model to provide a motivation for such tariffs in *Small*. However, since reductions in small countries' tariffs are not a central component of the PTAs with large countries that motivate our analysis we choose not to model them. In fact, trade liberalization by the smaller less developed countries has mostly been a result of a shift in ideology from import substitution towards unilateral liberalization (Ethier, 1998).

<sup>16</sup>Implicit differentiation of (4) yields  $\partial p_l^L(\tau)/\partial \tau \in (0, 1)$  and  $\partial p_{l^*}^L(\tau^*)/\partial \tau^* \in (-1, 0)$ .

We can now write the objective functions for *Small* and *Large* in terms of the policy variables.

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

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

For *Small* the three terms in (5) represent respectively aggregate wages ( $H$ ); the cost of producing the public good ( $H e^S$ ) and export revenue. For *Large* the terms in (6) represent respectively in the first line: aggregate wages ( $H$ ); the cost of producing the public good ( $H e^L$ ); utility from the public good and tariff revenue on imports from *Small* and *Large*<sup>\*</sup> ( $-\{M_l^S t + M_l^{L*}(\tau)\tau\}$ ). The terms in the second line represent surplus from good  $l^*$  and  $l$ .

## 2.2 Regional externalities and gains from PTAs

We begin by examining the incentive to form PTAs with non-trade objectives. The timing of actions is illustrated in figure 1. First, the rules are chosen; we analyze this in section 4. Given these rules, the second stage involves the choice of multilateral tariff levels,  $\tau$  and  $\tau^*$ , analyzed in section 2.5. In the third stage a PTA may be formed. This three-stage game takes place each period and is indefinitely repeated.<sup>17</sup>

There exist two externalities in a regional bloc. The first arises through the public good and the second is the terms-of-trade externality: *Large*'s market power in trade implies that by imposing a tariff it can lower the prices received by *Small*'s exporters. These externalities are typically overcome through international self-enforcing agreements. These agreements are sustained by repetition and the threat of non-cooperation. The Nash non-cooperative outcome within a regional bloc in the absence of any constraints is given by a tariff  $t^N$  that *Large* sets on *Small* and a level of *Small*'s regional public good,  $e^{NS}$ . These are found by maximizing (6) and (5) respectively taking the other countries policies, including  $\tau$ , as given.

$$t^N = p_l^L(\tau) ; e^{NS} = 0 \quad (7)$$

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<sup>17</sup>We implicitly assume that the regional negotiation costs are negligible relative to multilateral ones, which implies that even after multilateral trade negotiations a country can easily sign a PTA. Thus PTAs are modelled as the last stage of the game. In section 2.5.2 we show that the key result is independent of the timing of the self-enforcing agreements.

The basic intuition is simple. *Small* supplies none of the public good because it does not value it. *Large* increases the tariff until *Small's* exporters are indifferent between exporting or not. This occurs at the point where the specific tariff equals the price. Since *Small's* export supply of  $l$  is perfectly inelastic *Large* can use a tariff that just extracts all the surplus and *Small* will still export its full endowment.

In figure 3,  $N$  represents the Nash equilibrium when *Large* can set a discriminatory tariff. As we will show some WTO rules constrain the maximum level of  $t$ , so in general we refer to that level as the threat tariff and denote it by  $t^T$ . *Small's* iso-welfare contour at the Nash is labelled  $\bar{W}^{NS}$ . *Small's* welfare increases as  $t$  or  $e^S$  are lowered, reaching the maximum at the origin.<sup>18</sup> *Large's* welfare is increasing in  $t$  and  $e^S$  and its contour at the Nash is  $\bar{W}^{NL}$ . A PTA with non-trade objectives where *Large* exchanges a reduction in  $t$  for an increase in  $e^S$  generates a Pareto improvement for the region, as represented by the shaded area.

### 2.3 Interaction of PTAs and multilateral liberalization: the basic mechanism

We first illustrate one of the key results, the stumbling block effect of PTAs, in a simple setting that ignores enforcement constraints. Once the intuition is clear we prove it for the more realistic case where enforcement is important and provide a full characterization of the PTA and a welfare analysis of alternative WTO rules.

We start by considering the PTA stage; recall that this is the final stage and thus takes the rules and multilateral tariffs as given. As we noted above there exist regional gains from trade to be made if *Large* reduces the preferential tariff,  $t$ , for an increase in  $e^S$  by *Small*, as represented by the shaded area in figure 3. The PTA resulting from an efficient bargaining process must lie on the locus of tangencies represented by  $T^S T T^L$  in that figure. The exact solution depends on the chosen bargaining concept and relative bargaining power. We focus on the case where *Large* has all the bargaining power. This is an important case empirically given the extreme size asymmetries in recent PTAs. If *Large* makes a take-it-or-leave-it (TOL) offer, the solution to the PTA is at  $T^L$ , which leaves *Small* at its Nash welfare level.<sup>19</sup> More formally, for a given

<sup>18</sup>The slope is constant because a reduction of  $t$  by  $k$  increases *Small's* export price by  $k$  and thus its export revenue increases by  $kH/k = H$ . Since  $H$  is the marginal cost for *Small* of increasing  $e^S$ , the slope of the iso-welfare is  $-k$ .

<sup>19</sup>According to the World Bank report on regionalism the accession policies of NAFTA and the EU "...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 (2001) 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, however they do not address preferential agreements or the interaction with multilateral liberalization.

MFN tariff,  $\tau$  and threat tariff,  $t^T$ , the PTA is defined by the following preferential tariff and level of  $e^S$

$$\{t^B(t^T), e^B(t^T)\} \equiv \arg \max_{t, e^S} \{W^L(t, e^S, \tau, \tau^*, \cdot) : W^S(t, e^S, \tau) \geq W^S(t = t^T, e^S = 0, \tau)\} \quad (8)$$

Since *Large* benefits from increases in  $e^S$  for any given preference it prefers *Small* to increase  $e^S$  up to the point where the participation constraint binds, so that *Small* is just indifferent between this and a situation where it does not supply the regional good and faces the threat tariff  $t^T$ . Using the definition of  $W^S$  in (5) it is simple to confirm that the equilibrium per-capita cost to *Small* of supplying the regional good,  $e^B$ , is equal to the per-capita benefit from the preference margin,  $(t^T - t)/k$ . Replacing this condition in (8) and taking the first order condition with respect to  $t$  we can describe the general PTA solution as

$$e^B(t^T) = (t^T - t^B)/k \quad (9)$$

$$W_t^L - W_{e^S}^L/k \leq 0 \quad (10)$$

where the subscripts denote partial derivatives. When the PTA is not duty-free (10) holds with equality and has the simple interpretation that the marginal cost for *Large* of decreasing  $t$ ,  $-W_t^L$ , equals the marginal benefit from the resulting increase in  $e^S$ . When the inequality in (10) is strict the PTA is duty-free, which will be significant since it indicates that *Large* would benefit from increasing the preferential margin,  $t^T - t^B$ , in exchange for additional  $e^S$  but it cannot do so by lowering the preferential tariff further when it is already zero and will instead increase the threat tariff,  $t^T$ . In this section we focus on the duty-free case but in section 2.4 we analyze both and provide sufficient conditions for each to be the equilibrium.

Note that, for a given threat tariff, neither PTA policy in the solution above depends on the MFN tariff directly. But the threat tariff itself is a positive function of the MFN tariff and this is the source of the interaction between these PTAs and MTL, as we now show.

Thus far we assumed that *Large* uses the Nash tariff as the threat in the PTA. However, if both countries are members of the WTO, there is an important constraint on the level of this threat. According to the **Most-Favorite-Nation rule (MFN)** a country must extend the same tariff on “like-products” to all WTO members. Therefore the highest credible threat tariff that *Large* can use against *Small* is the multilateral tariff  $\tau$ . If the MFN rule was strictly enforced then *Large* would be unable to extend a preferential tariff and have a PTA. However, current WTO rules allow exceptions to MFN, which permit countries to offer

preferential tariffs below MFN values. Under such exceptions the upper bound of the tariff is the “MFN” value. We describe the current rule as a **PTA exception to MFN** and note that it allows  $t \leq \tau$ . The value of  $\tau$  when the PTA is decided is taken as given because it is determined in the previous stage. Therefore the maximum threat tariff,  $t^T$ , under the current rules depends on whether *Small* is a WTO member:

$$t^T \begin{cases} \leq \tau & \text{if } \tau \text{ is set cooperatively and } \textit{Small} \text{ is a WTO member} \\ = t^N & \text{otherwise} \end{cases} \quad (11)$$

Our qualitative analysis still applies if we use  $\tau$  instead of  $t^N$  as the threat tariff. The intuition for the stumbling block result should now become clearer. By reducing the multilateral tariff,  $\tau$ , in the WTO, *Large* reduces the threat tariff it uses in the PTA. When *Small* is a WTO member that effect on the threat is direct since *Large* uses the maximum threat,  $t^T = \tau$ , in equilibrium. If the preferential tariff given to *Small* is already at zero then any reduction in the threat tariff that *Large* can use will cause *Small* to reduce its provision of the public good. It is this extra cost of reducing multilateral tariffs that drives the stumbling block effect. To see this clearly we must model the MTL process that precedes the PTA stage.<sup>20</sup>

We follow Bagwell and Staiger (1999) who argue that the motive for reciprocal trade liberalization in the WTO is to overcome a terms-of-trade externality between large countries. Their view has proved useful in explaining several rules of the world trading system and has therefore gained considerable support among several, although not all, economists.<sup>21</sup> Consistent with this view much of the MTL occurs between large countries and follows what is known as the principal supplier rule. That is, if *Large* is the largest exporter of a product, say good  $l^*$ , to *Large*<sup>\*</sup> then the latter proposes to reduce its tariff on  $l^*$ . In exchange *Large*<sup>\*</sup> requests a reduction in the tariff imposed on its export to *Large*, good  $l$ . As noted above, the MFN rule requires these reductions to be extended to all other WTO exporters of similar goods. Thus we model MTL

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<sup>20</sup>We focus on the case when *Small* is a WTO member but the effect is also present if it was not and  $t^T = t^N$ . In this case the effect of a reduction of  $\tau$  occurs indirectly by lowering  $p_l^L(\tau)$ . To see this recall that a reduction in  $\tau$  causes a fall in  $p_l^L(\tau)$  and consequently in the threat tariff.

<sup>21</sup>Although the view in Bagwell and Staiger (1999) has become increasingly accepted it has faced two criticisms. The first is due to Ethier (2004) who has argued that if the objective of the GATT/WTO was to internalize terms-of-trade (TOT) effects it should restrict not only import tariffs but export taxes and yet it does not. This is an interesting point but there may exist a plausible explanation for it. There are at least two potentially important incentives for trade protection: redistributing income to producers, i.e. a political economy motive, and a TOT motive (c.f. Grossman and Helpman, 1995). In the case of imports both motives imply a positive tax on imports but in the case of exports they go in opposite directions: the TOT motive implies export taxes but the political economy motive entails export subsidies. This suggests that the GATT/WTO has less of a need to restrict export rather than import taxes explicitly because in equilibrium countries have less of an incentive to pursue TOT gains through exports. The second criticism is that most countries do not have market power in trade and even if they did they would not exert it by raising tariffs. However, there is recent evidence to the contrary on both accounts. Chang and Winters (2002) find that Brazil’s increase in tariffs vis-a-vis the world relative to Argentina, as they formed Mercosur, caused a decrease in the prices the exporters from the rest of the world received from Brazil. Broda, Limão and Weinstein (2006) estimate that both small and large countries have a reasonable amount of market power across a variety of their imports and find that non-WTO members do set higher tariffs on products where their market power is largest.

as the reciprocal tariff reduction between the large countries that is extended to the small ones.

Given the symmetry between the two large countries it is sufficient to focus on one of them and impose the equilibrium condition that their multilateral tariffs are identical, i.e.  $\tau^* = \tau$ . The multilateral tariff set under the PTA exception,  $\tau^{EX}$  is then given by:

$$\tau^{EX} \equiv \arg \max_{\tau} \{W^L(t = t^B(t^T), e^S = e^B(t^T), \tau, \tau^* = \tau, \cdot) : t \leq \tau\} \quad (12)$$

*Large* always uses the maximum possible threat against *Small* in the PTA. When both are WTO members this is the multilateral tariff,  $\tau^{EX}$ , so its equilibrium is given by the following FOC

$$\tau^{EX} : W_{\tau}^L + W_{\tau^*}^L + W_t^L \partial t^B / \partial t^T + W_{e^S}^L \partial e^B / \partial t^T = 0 \quad (13)$$

The first two terms represent the effect of increases in the tariffs of *Large* and *Large*\*. If *Small* did not export this good these would be the only effects and free trade would be the outcome. The reason is simple, the gain from an increase in own tariffs is achieved by lowering the price paid for imports in the world market. However, this gain occurs at the expense of lower prices received by the exporter. So, when countries are symmetric, any gain for *Large* from a tariff,  $W_{\tau}^L$ , is offset by the cost of facing an identical tariff from *Large*\* on its exports,  $W_{\tau^*}^L$ .

When the PTA is duty-free, marginal changes in the threat tariff do not affect the preferential tariff, since  $t^B = 0$ , but they do affect  $e^B$ . Therefore in this case the interaction between PTAs and MTL is fully captured by the last term,  $W_{e^S}^L \partial e^B / \partial t^T$ . This term is positive because increases in  $t^T$  increase the supply of the public good,  $e^B$ , which *Large* values. Therefore the multilateral tariff under the duty-free PTA is higher than in its absence. The magnitude of this stumbling block effect of PTAs depends on the weight that *Large* places on the public good and can therefore be quite high even if *Small*'s exports are negligible.<sup>22</sup>

In section 3 we derive comparative statics of the multilateral tariff under PTAs relative to the one when they are prohibited and test the resulting prediction. But first we prove the result formally and show how robust it is to alternative enforcement and timing considerations that characterize observed agreements.

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<sup>22</sup>We can verify that the strategic effect is strictly positive as follows. When the PTA is duty-free we know that (i)  $W_{e^S}^L/k > W_t^L$  (from (10)) and (ii)  $W_{e^S}^L \partial e^B / \partial t^T = W_{e^S}^L/k$  (from (9)) and therefore  $W_{e^S}^L \partial e^B / \partial t^T > W_t^L = H/k > 0$ .

## 2.4 Endogenous formation of self-enforcing PTAs

The solution above ignored enforcement. However, international agreements must be self-enforcing given the absence of an 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 described above can't be directly enforced, then *Small* would accept it, get the higher export price and not provide the public good. Thus this PTA solution is not self-enforcing even if *Small* is extremely patient.

Cooperative self-enforcing agreements are well characterized by certain repeated games (c.f. Bagwell and Staiger, 1990) We derive the self-enforcing bargaining solution to the PTA 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, if a deviation occurred then afterwards *Small* sets  $e^S$  equal to zero and *Large* sets  $t$  at the threat tariff defined in (11). The payoffs for each government are given by their respective welfare functions discounted at a rate  $\delta^j$ .<sup>23</sup>

More formally, *Large* makes a TOL offer to *Small* specifying  $t$  and  $e^S$  for a given level of the threat tariff,  $t^T$ , and the multilateral tariff,  $\tau$ . 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. We continue to denote the equilibrium values by a superscript  $B$ , noting that henceforth it refers to the self-enforcing bargaining solution given by:

$$\{t^B(t^T), e^B(t^T)\} \equiv \arg \max_{t, e^S} \{W^L(t, e^S, \tau, \tau^*, \cdot) : IC^S; IC^L\} \quad (14)$$

The key difference relative to the solution in (8) is the incentive constraints. The one for *Small*,  $IC^S$ , requires that its gain from deviating today by not supplying the public good, given by the left side of (15) below, does not exceed the net benefit from future cooperation that arises from facing a lower tariff on its exports. The constraint for *Large* is given by (16), where the left side represents the gain from deviation that would arise from the extra tariff revenue it would collect if it were to increase the tariff on *Small*. In equilibrium this deviation gain must not exceed the discounted net gain from cooperation that arises from

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<sup>23</sup>It may be possible to design more efficient agreements with non-stationary strategies because when  $\delta^L \neq \delta^S$  there is a motive for intertemporal trading of payoffs. Moreover, in a paper analyzing gradualism in PTAs, Bond and Park (2002) show that under certain cases agreements between asymmetric countries that use non-stationary strategies are more efficient. Our focus on stationary strategies makes the model tractable when we consider the interaction with multilateral liberalization. More efficient agreements should not change the stumbling block result because the PTA would still be valuable to *Large* and thus create an extra cost to lowering the multilateral tariff.

*Small's* supply of the regional public good—the RHS of (16).

$$W^S(t, e^{NS}, \tau) - W^S(t, e^S, \tau) \leq \frac{\delta^S}{1 - \delta^S} (W^S(t, e^S, \tau) - W^S(t^T, e^{NS}, \tau)) \quad (15)$$

$$W^L(t^T, e^S, \tau, \cdot) - W^L(t, e^S, \tau, \cdot) \leq \frac{\delta^L}{1 - \delta^L} (W^L(t, e^S, \tau, \cdot) - W^L(t^T, e^{NS}, \tau, \cdot)) \quad (16)$$

In figure 4,  $\overline{IC}^j$  represents the incentive frontier for country  $j$ , i.e. the combinations of  $t$  and  $e^S$  that leave  $j$  indifferent between cooperating and deviating. In a self-enforcing PTA *Small* must be left above the Nash welfare level, otherwise the only self-enforcing level for  $e^S$  is zero. This implies that  $\overline{IC}^S$  is interior relative to  $\bar{W}^{NS}$ , i.e. relative to *Small's* iso-welfare contour under no cooperation. The motive is simple: *Small* is now willing to provide less of the public good for any given reduction in the preferential tariff because the gains from deviating are enjoyed today whereas future cooperation gains are discounted. Therefore the bargaining outcomes considered in section 2.3, those along  $\bar{W}^{NS}$ , are not self-enforcing for *any*  $\delta^S \in (0, 1)$ . The incentive frontier for *Large* holds with equality at  $t=t^T$  and it is flatter than  $\bar{W}^{NL}$ , the reason is also the discounting. Thus the shaded area between *Large* and *Small's* incentive frontiers represents the set of self-enforcing PTAs that improve on the Nash. Moreover, since *Large* makes a TOL offer, *Small's* incentive constraint binds and so the solution is on  $\overline{IC}^S$ , otherwise *Large* would increase the preferential tariff or demand a higher  $e^S$ . Therefore  $\overline{IC}^S$  is used to determine  $e^S$  as a positive function of the difference between the threat and preferential tariffs.

The shaded areas in figures 4a and 4b show the existence of self-enforcing PTAs that are strictly welfare improving for both countries. The last question we address here is whether the PTA is duty-free. This will be an important determinant of whether these agreements are a stumbling block for MTL. As we show in proposition 1 the PTA is duty-free if *Large* is sufficiently endowed relative to *Small*. Before formally stating the proposition we provide the basic intuition. Recall that we assume that *Small's* endowment of good  $l$  is  $H/k$  and *Large's* is  $H$ , which is  $k$  times larger. So, the more endowed *Large* is relative to *Small*, i.e. the larger  $k$  is, the fewer units of *Small's* exports the preference margin applies to. Therefore, as  $k$  increases *Large* must lower the preferential tariff in order to be able to extract a given level of  $e^S$ . For a sufficiently large  $k$  we have a duty-free PTA.<sup>24</sup>

We say that **Large is sufficiently endowed relative to Small** if  $k \geq \max(k_1, k_2)$ , where the exact mathematical definitions for the thresholds  $k_1$  and  $k_2$  are provided in the appendix. Here we describe them,

<sup>24</sup>The PTA is also duty-free if *Large* places a high weight on the public good or if the spillover,  $\alpha$ , is important since *Large* is then willing to give up all the tariff revenue for even a small increase in  $e^S$ .



starting with the cases where  $t^B(t^T) > 0$  and then arguing that as  $k$  increases above  $k_1$  or  $k_2$  we obtain  $t^B(t^T) = 0$ . We need to consider the situation when *Large's IC* binds and when it does not. First, if *Large's IC* does not bind then the solution is at point *BI* in figure 4a. This point is defined by the equality of the marginal rate of substitution of the policies in *Large's* welfare and the substitution of the policies in enforcement for *Small*. In this case, as we increase  $k$ , *Small's* exports,  $H/k$ , fall and therefore, for a given level of the tariff and of  $e^S$ , *Small's* gain from cooperation falls because the preference margin is applied to fewer exports. Thus the increase in  $k$  implies that a reduction in the preferential tariff is required to maintain a given supply of the public good by *Small*. The increase in  $k$  also implies that *Large's* marginal cost of reducing the preferential tariff falls—it foregoes less tariff revenue—whereas its marginal benefit from the regional public good is unchanged. Thus the equilibrium preferential tariff falls as  $k$  increases. If  $k$  reaches a critical value  $k_1$ —the level at which the MRS of the policies in welfare in *Large* and enforcement in *Small* are identical *and* the equilibrium preferential tariff is zero—then the PTA is duty-free. This is illustrated by point *B* in figure 4b. When *Large's IC* does bind the solution is at the intersection of  $\overline{IC}^L$  and  $\overline{IC}^S$  (not depicted in the figure). Using a reasoning similar to the first case we can establish a critical value  $k_2$  above which the PTA is duty-free. That is as we raise  $k$  it eventually reaches a level  $k_2$  defined by the intersection of  $\overline{IC}^L$  and  $\overline{IC}^S$  when  $t^B(t^T) = 0$ .

Using the definition above we characterize the self-enforcing PTAs in the following proposition.

**Proposition 1** (*Self-enforcing PTA bargaining solutions*):

The self-enforcing PTA (TOL) bargaining solution for a threat of  $t^T$  is  $\{t = t^B(t^T), e^S = e^B(t^T)\}$ , where

$$e^B(t^T) = \frac{\delta^S}{k}(t^T - t^B(t^T)) \text{ and}$$

(i)  $t^B(t^T) = 0$  if and only if *Large* is sufficiently endowed relative to *Small* or

(ii)  $t^B(t^T) = t^{BI} : W_{e^S}^L(e^B)/W_t^L = (W_{e^S}^S/W_t^S)/\delta^S$  (*IC*<sup>L</sup> does not bind) or

$t^B(t^T) = t^{BII} : t^T - t^B = \delta^L k \alpha^L \lambda^L \Psi(b^S H e^B)$  when  $W_{e^S}^L(e^B)/W_t^L \geq W_{e^S}^S/W_t^S)/\delta^S$  (*IC*<sup>L</sup> binds)

For given multilateral tariffs, the PTA is *strictly* welfare improving for both countries relative to no PTA. Thus in this section we explained the endogenous formation of the many PTAs we observe that are motivated by the desire of large countries to obtain cooperation in non-trade issues. To the extent that WTO rules permit these PTAs they contribute to their proliferation. Models that ignore non-trade issues cannot explain why developed countries lower their tariffs on products from small countries, particularly

when the latter do not reciprocate by lowering their own trade barriers. We now show how these PTAs can cause higher multilateral tariffs.

## 2.5 Multilateral trade liberalization

We model MTL as the second stage of the game, after the rules are set and before the PTAs are signed. The basic structure is similar to section 2.3. The two large countries choose the multilateral tariffs to maximize their joint welfare but now they do so subject to incentive constraints that ensure neither prefers to deviate.<sup>25</sup> We focus on subgame perfect equilibria sustained by the threat of infinite Nash reversion. The exact trigger strategy depends on which rules are chosen; that is on whether governments choose to have a PTA exception to the MFN rule or commit to MFN, which we address in section 4. Here, we derive the tariffs when the large countries are sufficiently patient such that their incentive constraints for the MTL do not bind. In section 2.5.2 we extend the analysis to the case when they bind.

### 2.5.1 PTAs as stumbling blocks to MTL

Given the symmetry between the two large countries it is sufficient to focus on one and, since the problem is stationary, we can maximize welfare each period. Imposing the symmetry condition,  $\tau^* = \tau$ , the multilateral tariffs set under the PTA exception,  $\tau^{EX}$ , and under commitment to MFN,  $\tau^C$ , are respectively:

$$\tau^{EX} \equiv \arg \max_{\tau} \{W^L(t = t^B(t^T), e^S = e^B(t^T), \tau, \tau^* = \tau, \cdot) : IC^{EX}; t \leq \tau\} \quad (17)$$

$$\tau^C \equiv \arg \max_{\tau} \{W^L(t, e^S = 0, \tau, \tau^* = \tau, \cdot) : IC^C; t = \tau\} \quad (18)$$

When the incentive constraints for the MTL (represented by  $IC^{EX}$  and  $IC^C$ ) do not bind there are only two differences between these two maximization programs. First, under a commitment to MFN no PTAs are allowed so  $t = \tau$ , whereas under the PTA exception the preferential tariff may be lower. Second, under a rule of commitment to MFN *Small* sets  $e^S = 0$  because it cannot be compensated by a preferential tariff. Under the PTA exception rule *Small* can be compensated with a preferential tariff and so it will supply the public good up to some level. Using the fact that the maximum threat that *Large* can use against *Small* (if both are WTO members) is the multilateral tariff,  $\tau^{EX}$ , we obtain the following when **large countries**

<sup>25</sup>Because the large countries are symmetric none “wins” a trade war, i.e. none prefers the non-cooperative outcome to free-trade. This could happen if the large countries were of asymmetric size, as shown by Johnson (1954). Syropoulos (2002) shows exactly how country size matters for the outcome of tariff wars.

are sufficiently patient, that is when  $IC^{EX}$  and  $IC^C$  don't bind:

$$\tau^{EX} : W_{\tau}^L + W_{\tau^*}^L + W_t^L \partial t^B / \partial t^T + W_{e^s}^L \partial e^B / \partial t^T = 0 \quad (19)$$

$$\tau^C : W_{\tau}^L + W_{\tau^*}^L + W_t^L = 0 \quad (20)$$

Note that the condition for  $\tau^{EX}$  is similar to the one derived in section 2.3. So the first two terms continue to represent the effect of increases in the tariffs of *Large* and *Large*\*. Recall that if these were the only effects then free trade would be the outcome. These two terms are similar for the commitment tariff in (20), but  $\tau^C$  also includes a third term,  $W_t^L$ , which represents an MFN externality effect. This effect arises when *Large* imports the same good from *Large*\* and *Small* since an increase in  $\tau$  also increases the tariff on *Small*'s exports thus allowing *Large* to capture extra tariff revenue. Since *Small* is assumed not to offer any reciprocal liberalization in the MTL there is no offsetting effect for this term, which vanishes when *Small*'s exports,  $H/k$ , are negligible, or equivalently when  $k$  is large.

To establish whether  $\tau^{EX}$  exceeds  $\tau^C$  we must determine if the last two terms in (19)—which represent the effect of raising the multilateral tariff on the PTA solution—exceed the MFN externality effect,  $W_t^L$ , in (20). The following proposition establishes this and makes use of the following definition. A PTA exception to MFN is a **stumbling block** to multilateral trade liberalization (MTL) if the multilateral tariff under this exception is higher than the tariff under a regime where no such exceptions are allowed, i.e. if  $\tau^{EX} > \tau^C$ .

**Proposition 2** (*PTAs as stumbling blocks,  $\tau^{EX} > \tau^C$ , patient large countries*):

*When large countries are sufficiently patient a PTA exception to MFN is a stumbling block to MTL if and only if the PTA is duty-free.*

The intuition is as follows. Suppose the large countries always set the multilateral tariff at the same level,  $\tau^C$ , independently of whether PTAs are used. This is optimal only if the preference margin that they can offer in the PTA,  $\tau^C - t^B(\tau^C)$ , is sufficiently large to ensure that the small countries provide the amount of the public good that the large countries desire. However, if the PTA is duty-free, i.e. if the preferential tariff  $t^B(\tau^C)$  is zero, the large countries would benefit from being able to offer a lower preferential tariff and thus increase the preference margin and extract more cooperation in the non-trade issue. But when  $t^B(\tau^C) = 0$  they can only increase the preference margin by increasing the multilateral tariff, so  $\tau^{EX} > \tau^C$ .

As pointed out in proposition 1 the PTA is duty-free if *Large* is sufficiently endowed (or values the public good sufficiently). In practice a number of PTAs are duty-free so that condition for the stumbling block effect is likely to be satisfied. In section 3 we determine when the stumbling block effect is quantitatively significant and its welfare effects on the modeled countries but first we discuss some extensions.

### 2.5.2 Effect of PTAs on MTL: extensions and qualifications

Proposition 2 can be extended to address various factors. It is also subject to an interesting qualification when countries are impatient so that their incentive constraints in multilateral agreements bind. We provide a brief discussion of these here and provide further details in the appendix.

Proposition 2 is robust to including political economy motives for the use of tariffs since the extra terms determining the tariffs would enter similarly in (19) and (20). We can also relax the assumptions of inelastic export supply from small countries and their high trading costs with countries in the opposite regional bloc. These were used to simplify the analysis and highlight the effect that PTAs have on MTL due solely to the non-trade issue. Karacaovali and Limão (2005) extend our model and show that the stumbling block result is robust to these two issues.

Although public goods are more likely to have a regional rather than a global effect there are some non-trade issues with important global spillovers, e.g. global warming, concern with child labor. If countries address these issues “outside” the WTO, as modelled thus far, then we can show that the stumbling block effect of PTAs is still present. In fact that effect is stronger than in proposition 2 because large countries have more to gain from the PTA and thus maintain even higher multilateral tariffs (as proved in Limão, 2002). Global spillovers introduce an additional element of cooperation between the large countries and raises the issue of whether countries could use more sophisticated strategies, which we discuss in the appendix.

The stumbling block result is also robust to changes in the timing of the PTA and MTL. To see this we can collapse the PTA and MTL decisions into a single stage and compare the resulting multilateral tariff with the solution under commitment. The commitment problem is independent of timing because no PTA takes place. But the exception problem changes. The *IC* for the PTA are still given by (15) and (16) with the threat tariff equal to the multilateral tariff. The solution for all policies is now the following:

$$\{\tau^{EX}, t^B, e^B\} \equiv \arg \max_{\tau, t, e^S} \{W^L(t, e^S, \tau, \tau^* = \tau, \cdot) : IC^{EX}; IC^S; IC^L; t \leq \tau\} \quad (21)$$

We can then show the stumbling block result as in the last section by deriving the FOC and comparing  $\tau^{EX}$  with the tariff obtained under commitment in (20). We do so in the appendix and show that, when large countries are sufficiently patient, a duty-free PTA is a stumbling block to MTL even if the preferential and multilateral agreements occur simultaneously. The intuition is identical so we do not repeat it here.

Proposition 2 may be reversed when the large countries are not sufficiently patient. Whether that occurs or not depends on whether large countries can commit to not having PTAs under all circumstances, including during a trade war between these large countries. We discuss the case when problems with enforcement imply that the PTA is a building block to MTL and provide the details in the appendix.

To analyze the enforcement issue we distinguish between two extreme cases: strong and weak commitment to MFN. Under **strong commitment to MFN** countries can costlessly enforce non-discrimination, i.e. the same tariff on all partners, so PTAs never take place. Under **weak commitment to MFN** there is no instrument to enforce non-discrimination during trade wars between large countries, at which time PTAs can take place. In our setup we can interpret weak commitment as the simple elimination of WTO articles that allow exceptions to MFN. Strong commitment would entail a different punishment or an additional rule, such as allowing a third country to punish the warring parties if they also set discriminatory tariffs. The three regimes, PTA exception, weak and strong commitment to MFN, lead to different incentive constraints and thus different levels of multilateral liberalization.

The multilateral tariff is lower under the PTA exception than under weak commitment to MFN when the *IC* for the multilateral agreement bind. As we prove in the appendix the motive for the reversal of the result in proposition 2 is that under weak commitment the gain from deviating from the multilateral agreement is higher and the gain from cooperating lower than under the PTA exception. The motive is that under weak commitment large countries do not sign PTAs while cooperating, but do so if they ever engage in a trade war with each other. This possibility provides an extra incentive for them to deviate from the multilateral agreement. Similarly, the gains from cooperation are lower under weak commitment due to the absence of a PTA when the large countries do cooperate. Thus, a multilateral tariff that is just self-enforcing under the PTA exception rule is not self-enforcing under a weak commitment to MFN.

Enforcement considerations reverse the stumbling block result of proposition 2 in the case of weak commitment. However, we can still obtain the result that the PTA exception is a stumbling block to MTL relative to strong commitment to MFN (Limão 2002 provides a proof with the exact conditions). The contrasting results under weak and strong commitment to MFN have two related implications. First, they

indicate that the stumbling block result does not rest crucially on whether countries are sufficiently patient. Second, they provide the following important warning to governments deciding to commit to MFN. Simply eliminating the current rules that allow exceptions to MFN leads to higher multilateral tariffs if countries are not sufficiently patient. But, with additional rules that credibly sustain a strong commitment to MFN governments can enforce lower multilateral tariffs.

Modelling the interaction of PTAs and MTL carefully allows us to achieve three objectives. First, to derive the result in proposition 2 and show how it can be extended and qualified. Second, to determine the welfare ranking of different types of rules for each country, which is not obvious in this environment with externalities, and is done in section 4. Third, to derive comparative statics and testable predictions that can be used to test the model, which we now do.

### 3 Predictions and Evidence

In this section we derive comparative statics and show how they can be used to construct a counterfactual, which we employ to provide novel econometric evidence in support of the model. We also discuss additional evidence on the key prediction of the model as well as on auxiliary predictions, which may be useful in validating some of its more specific features.

#### 3.1 Predictions and Construction of a Counterfactual

Since its inception the GATT has contained exceptions to the MFN rule. So how can we test if a stumbling block effect is present when we have not observed the counterfactual commitment regime? The following proposition allow us to answer this.

**Proposition 3** (*Comparative static*)

*Increases in  $\alpha^L$  or  $\lambda^L$  increase the multilateral tariff,  $\tau^{EX}$ , and the stumbling block effect,  $\tau^{EX} - \tau^C$ , if and only if the PTA is duty-free.*

Increases in the weight,  $\lambda^L$ , or scope of the spillover,  $\alpha^L$ , imply a higher marginal benefit for *Large* from increases in  $e^S$ , so *Large* finds it optimal to offer a lower preferential tariff in exchange for the public good

from *Small*. However, this is only feasible if the preferential tariff is positive. When the PTA is duty-free *Large* must use a higher threat tariff for *Small* to increase  $e^S$ . This higher threat is only credible if it does not exceed the multilateral tariff and thus the equilibrium multilateral tariff must increase. The magnitude of the stumbling block effect,  $\tau^{EX} - \tau^C$ , increases because the multilateral tariff under commitment,  $\tau^C$  in (20), is independent of  $\alpha^L$  and  $\lambda^L$ .<sup>26</sup>

According to proposition 3 multilateral tariffs are increasing in the weight that *Large* places on the regional public. Both the weight  $\lambda^L$ , a preference parameter, and the degree of the cross-border effect in the issue  $\alpha^L$ , generally a fixed characteristic of the issue, are likely to be exogenous relative to the multilateral tariffs. Moreover, it is also unlikely that those parameters affect multilateral tariffs directly through other channels. One potential difficulty is finding good proxies for marginal changes in  $\alpha^L$  and  $\lambda^L$  so we consider a closely related alternative, which is a limit case.<sup>27</sup>

In our model if  $\alpha^L$  or  $\lambda^L$  are zero we observe no PTA and the equilibrium MFN tariff is equal to the commitment tariff,  $\tau^C$ . When both  $\alpha^L$  and  $\lambda^L$  are positive a PTA is signed and the MFN tariff is  $\tau^{EX}$ . Thus, if all else were equal, changes in the MFN tariffs, before and after a PTA, for exports from the small to the large regional partner can provide an estimate of the stumbling block effect. The obvious problem is that all else is not equal. In particular MFN tariff changes are infrequent and typically take place in negotiation rounds where various other factors affect the multilateral tariff. Thus we must construct a reasonable counterfactual. To do so we use a control group of products that are similar, e.g. in the same industry or sector, to the ones exported by the small partner but are exported only by the rest of the world. We refer to these as non-PTA goods. Adding non-PTA goods is straightforward in our model because of the quasilinear utility. The resulting objective function,  $\tilde{W}$ , would reflect these extra goods and the tariffs associated with them. The multilateral tariff for these goods under the exception regime, denoted  $\tau_{npta}^{EX}$ , is

<sup>26</sup>Note that the result also holds if the large countries are not sufficiently patient as we prove in the appendix. Bond, Syropoulos and Winters (2001) show that a deepening of a customs union, i.e. an exogenous reduction in its internal tariff, 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 model clearly shows the importance of modelling PTAs.

<sup>27</sup>Throughout we take  $\alpha$ ,  $\lambda$  as exogenous. However, it is possible that certain public goods, e.g. clean environment, human rights, etc., are normal goods. So we could postulate that  $\lambda$  increases with income and ask whether the source of the increase in income, and thus of  $\lambda$ , affects the result in proposition 3. If the increase in income was in the form of more numeraire good the answer is no since none of the tariffs depend on that level. But if it was caused by an increase of *Large's* endowment of the non-numeraire import relative to *Small* then the incentives to set tariffs would be affected. In this case the stumbling block effect would be more likely than if the increase in  $\lambda$  was due to purely exogenous motives (e.g. due to a change in preferences). The reason is that if *Large* is initially not sufficiently endowed relative to *Small* then the PTA that results after an exogenous increase in  $\lambda$  is not duty-free and thus there is no stumbling block effect (propositions 1 and 2). However, if the increase in  $\lambda$  is due to a shock to endowments that is sufficiently strong to ensure that *Large* becomes sufficiently endowed relative to *Small* then the resulting PTA is duty free and causes a stumbling block effect under the conditions in proposition 2.

defined by the expression below, which is analogous to  $\tau^C$  and captures the reciprocity effect.<sup>28</sup>

$$\tau_{npta}^{EX} : \tilde{W}_{t_{npta}}^L + \tilde{W}_{t_{npta}^*}^L = 0$$

Thus the model strongly suggests a difference-in-differences approach, comparing the changes in MFN tariffs for a given large country of two types of products: the non-PTA goods exported only by the rest of the world (the control group) against those also exported by the PTA partner. This approach is further supported by actual examples that countries respond to concerns of PTA partners by maintaining higher multilateral tariffs on PTA products even though they lower them for similar non-PTA goods.<sup>29</sup>

We now describe the data and econometric approach that we use to test the stumbling block prediction.

### 3.2 Data

Two agreements that fit the assumptions of our model particularly well are the Caribbean Basin Initiative (CBI) and the Andean Trade Preference Act (ATPA). The large partner in both cases is the US and it provides duty-free access to a large set of products exported by the small Caribbean and Andean countries. These countries do not grant preferential treatment to US exports but must comply with various labor standards, respect intellectual property and, in the case of the Andean countries, assist in the war on drugs. Moreover, the main destination for their exports is the US and these small countries have little direct effect on multilateral trade negotiations.

Both the ATPA (1992) and the CBI (1984) were signed between the last two multilateral trade rounds, the Tokyo and Uruguay Rounds (UR). Moreover, when the Tokyo Round was negotiated, 1973-79, neither was expected with certainty. However, both were in place in 1994, when the multilateral negotiations for the UR, were concluded. Thus the MFN tariffs the US set in the Tokyo round should reflect  $\tau^C$  and the

<sup>28</sup>The MFN externality term present in  $\tau^C$  is now absent since we assume this good is not exported by the small country and, as we noted before that term disappears when its export are negligible. In a more realistic extension of the model with additional small countries that export this good to *Large* but do not have a PTA with it, such a term is present in determining

<sup>29</sup> $\tau_{npta}^{EX}$ . One of the largest exports from several Caribbean countries to the US is low-valued bottled and bulk rum that enters the US duty-free under the Caribbean Basin Initiative. "In WTO tariff negotiations in 1996, US and E.U. negotiators had initially agreed to phase out all tariffs on rum and other 'white spirits' by 2000. Caribbean governments, Administration officials and Members of Congress (...) emphasized to the trade negotiators that such a drastic change in the tariff structure for rum would deal a severe blow to the economies of the USVI, Puerto Rico, and the Caribbean. In response to this outcry (...) the United States agreed to substantially liberalize duties on expensive rum. However, to protect the interests of the USVI and other Caribbean island producers, the United States also agreed to maintain existing MFN duties on low-value bottled and bulk rum." Testimony before the House Committee on Ways and Means. Accessed June 2003 on <<http://waysandmeans.house.gov/legacy/trade/107cong/5-8-01/5-8chri.htm>>



ones in the UR should reflect  $\tau^{EX}$  for the products exported by the CBI and ATPA to the US.

We must construct two key variables: a measure of MFN trade protection and the PTA variable. For trade protection we employ the US specific tariffs collected from the WTO's schedule of tariff concessions during the UR. This data contains the level of the tariff negotiated in the Tokyo and UR at the 8-digit harmonized standard, which is the most disaggregate level at which negotiations occur. Since these tariffs are defined as a monetary value per unit we divide them by the unit value of the product to obtain an ad valorem equivalent, which is comparable across products.

An important motive to focus on specific tariffs is that they are a relatively important component of protection in the US in the set of products exported under the ATPA and CBI. For example, in the set of products with positive specific tariffs (over 1000) their average ad valorem equivalent was about 6.9% with a median of about 1.9%, which indicates some highly protected products where preference margins are high. Moreover, in a large majority of such products there was no other type of tariff, e.g. in rum, which is one of the CBI's largest exports. The fraction of exports from ATPA or CBI to the US in 1994 in the products in our sample with positive specific tariffs is about 18% relative to their total exports in products with positive specific or ad valorem tariffs. For NAFTA (the US PTA with Canada and Mexico) that figure is less than 9%. Therefore if the ATPA and CBI cause a stumbling effect we should expect to see it in US specific tariffs.

The other key variable is whether an 8-digit good  $i$  is a PTA good, that is whether it was exported to the US by a PTA partner and received a preference in 1994. So in table 1, which provides summary statistics, ATPA corresponds to the PTA variable for the Andean countries, etc. The reason for choosing 1994 is the following. In 1994 the negotiations for the UR, which defined the current level of MFN tariffs, had just been concluded, and it was implemented in the period 1995-99. The US did not conclude any new PTAs in the period 1995-2001 so we assume that at the time the UR final negotiations took place, 1992-93, the only US PTAs that could affect its MFN tariffs were those PTAs in place by 1994. We do not choose a date between 1995-99 because whether a good is exported by a PTA partner and receives a preference in that period may depend on the MFN tariff, which may generate an endogeneity problem as we discuss below.

Using this data we can calculate some preliminary statistics. The average specific tariff reduction for goods that the US did not import under PTAs was approximately 2.2 percentage points. The reduction for the set of PTA goods exported under the ATPA or CBI to the US was 1.4. The difference of 0.8 is statistically significant according to a t-test (s.e.=0.35) and provides preliminary evidence of a relative increase of the MFN tariff in PTA goods. The difference does not appear to be driven by any single industry since several

industries have both PTA and non-PTA goods. However, to properly address this issue and also to test if this difference reflects a spurious correlation or a causal effect of these PTAs we employ the following econometric approach.

### 3.3 Econometric Approach

As noted above, when the Tokyo Round was negotiated neither the ATPA nor the CBI were expected with any certainty. However, both were in place when the UR was concluded. Thus we take the Tokyo Round tariff to reflect the model’s commitment level and the UR tariff as the exception level. We then take the difference for each product  $i$  over time and denote it by  $\Delta\tau_i$  to write the basic estimating equation as

$$\Delta\tau_i = \pi PTA_i + \Delta\mathbf{x}_i\beta + u_i \tag{22}$$

where  $PTA_i$  is the indicator variable for the PTA goods and therefore the main prediction is that  $\pi$  is positive if the PTA causes a stumbling block. Econometrically,  $\pi$  measures the average difference in the reduction in tariffs of PTA vs. non-PTA goods. To ensure this measure is not biased we require that the MFN tariff changes of non-PTA goods provide a reasonable counterfactual for the PTA goods in the absence of PTAs. Therefore we control for some important variables, in  $\Delta\mathbf{x}$ , which we describe in detail below. The tariff change measure we use is the log growth of the tariff factor,  $\Delta\ln(1 + \tau_{it})$ , which, given that we use the ad valorem equivalent, provides a useful economic interpretation in terms of price changes that we explore in section 3.5. But the results are identical when we use simple differences.

To establish causality we must address the potential endogeneity arising from reverse causation in (22). The negotiated MFN tariff changes—the dependent variable in (22)—were implemented in 1995-99 so they should not affect whether the good was exported by a PTA in 1994. However, the tariff changes may have affected whether a good received a preference in 1994 because when some of those preferences were negotiated (e.g. ATPA in the early 90’s) they were expected to be in place for some part of the 1995-99 period, while the MFN tariff changes were due to be implemented. So if those MFN tariff changes were expected they could have affected which goods received preferences.<sup>30</sup> Therefore we instrument for the PTA variable using whether the good was exported in 1994 by the PTA partners to the US whether or not it

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<sup>30</sup>For example suppose that during the ATPA negotiations there is product for which the Andean countries expect the US to reduce its MFN tariff, and thus any preference margin, to zero while in another they expect no change for reasons unrelated to its PTAs. The Andean countries are then more likely to lobby for a preference in the latter, which would generate a positive correlation between the PTA good variable and the MFN tariff change.

received a preference. The instrument is correlated with the PTA variable but excludes the potentially endogenous component, i.e. the preference. We also test the validity of this instrument by employing additional excluded instruments that predict whether a good is likely to be exported by the ATPA and CBI. These instruments are transport cost levels and changes in the US prices at the border (exclusive of tariffs) between 1990-94.<sup>31</sup>

Our econometric approach is similar to Limão (2006) in its use of difference-in-differences and choice of instruments. However, there are a number of important differences, two of which we highlight here. First, the objective of that paper is to model multilateral negotiations empirically and estimate the effect of *aggregate* US PTA variables on its ad valorem tariffs; so it contains no theory and it focuses mostly on whether a good is subject to preferences in any or every PTA rather than the specific PTAs that fit our theory.<sup>32</sup> Second, and perhaps more importantly, here we employ different data. More specifically, we analyze a different trade policy—specific rather than ad valorem tariffs—and (as a result) a significantly different sample of goods.

The differences in the sample and trade policy measure are important for at least two reasons. First, although average US ad valorem tariffs are among the lowest in the world, it has relatively high specific tariff rates, so high they are often criticized in WTO reports, particularly by developing countries whose products are disproportionately hit.<sup>33</sup> Second, because they were not subject to any ad valorem tariff, nearly two-thirds of the products in our sample are not included in Limão (2006). As we describe in the data section these products constitute an important part of the ATPA and CBI’s exports. Moreover, the new wave of US PTAs with non-trade objectives is precisely with developing countries that export similar goods so it is essential to include those goods. If our empirical test for them fails the theory is seriously thrown into doubt.

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<sup>31</sup>Goods with higher average transport costs to the US are more likely to be supplied by the relatively closer, lower transport cost, countries, such as the members of the ATPA and CBI. Increases in the US border prices of a good between 1990-94, while US MFN tariffs were constant, will increase the probability that any given country exports the good to the US.

<sup>32</sup>It reports a single specification with all the individual PTA variables, which provides some complementary evidence for the theory in this paper.

<sup>33</sup>For example, as recently as 2001 the WTO’s trade policy review of the US stated that “High specific and compound rates on agri-food and tobacco products, clothing, footwear and headgear and textiles continued to act as barriers to trade, and were of great concern to developing countries” p. 23 of document WT/TPR/M/88 at <www.wto.org>.

### 3.4 Estimation Results

Table 3 provides the estimates for the stumbling block effect, the coefficient  $\pi$  in (22). To address potential endogeneity problems we employ the instrumental variables approach just described. We also discuss formal tests of endogeneity and of the instruments that further justify this procedure and present alternative specifications to test the robustness of the results.

In addition to employing IV there are three other features common to all specifications in Table 3, which we note before discussing the estimates. First, the sample contains all the products that were subject to positive specific tariffs before the UR and therefore could potentially be given a preference.<sup>34</sup> Second, since both the ATPA and CBI receive preferences in the exact same goods in this sample we restrict their PTA effect to be identical. So ATPA\_CBI is constructed as the sum of ATPA and CBI as defined above. We test this restriction for all specifications and the data does not reject it.<sup>35</sup> Third, lobbying for protection typically occurs at the industry level and can affect how large the tariff reductions are. To account for these, as well as other unobservable industry characteristics that could influence the changes in MFN tariffs and bias the PTA coefficient we include a full set of industry dummies.

Column 1 of Table 3 contains the estimates for the basic specification. The stumbling block effect is positive, as predicted by the model, and significant at the 1% level. There was an average increase of 0.53 in the MFN tariff factor for goods exported under either the ATPA or CBI relative to the non-PTA goods. The magnitude of the effect is not negligible since the average reduction in the non-PTA goods—the average over the estimated industry effects—was -1.65, as indicated in the row labelled “Mean Reduction”. Before providing an economic quantification we provide diagnostic and robustness tests for this result.

The first stage regression results in column 1 of Table 4 indicate that the instruments explain a considerable amount of the variation in the endogenous PTA variable. The R-Square is 0.84 and we strongly reject the null of insignificance of the excluded instruments. The sign of the significant instruments is as expected: whether a good is exported is positively correlated with whether it is exported *and* receives a preference; higher average transport costs with all partners predict that the regional partners, with relatively lower costs, are more likely to export the good. Moreover, the over-identifying restriction test supports the

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<sup>34</sup>There are two reasons to focus on products with positive tariffs before the UR. First, all the tariffs in the sample that were initially zero remained unchanged and are likely to share an unobserved common characteristic. Thus including those observations could bias the estimates if the proportion of zero tariffs is different for PTA goods relative to the rest of the goods. Second, when the MFN tariff is zero there is often no information about whether a preference exists, since it is in effect irrelevant at that point. We can address this by setting the preference variable to zero and including all observations. We did so and found that the parameter of interest,  $\pi$ , was still positive and statistically significant.

<sup>35</sup>We can identify the effects separately because the ATPA and CBI do not export the same goods.

orthogonality of the instruments relative to the error and their exclusion. The p-value is 0.16, given in the row labelled “Hansen’s J (p)” in Table 3. This strongly suggests that the estimates from the parsimonious specification reflect a causal relationship rather than a spurious correlation due to reverse causation or omitted variable bias. Nonetheless, it is important to test if the result is robust to the inclusion of other variables, particularly if these can help rule out plausible alternative explanations for the finding.

The first important product-level control variable that we must analyze is reciprocity in tariff negotiations, which, as discussed in the theory section, is a central part of the trading system. Omitting reciprocity raises an important concern about our estimate of  $\pi$ . The members of ATPA and CBI are developing countries so at least a subset of the goods they export is common to other developing countries. If that subset is large and those other developing countries have not liberalized much then the US would have little motive to lower its tariffs in those products even in the absence of a stumbling block effect. That is we would find a smaller reduction by the US in those products exported by developing countries and attribute it to the PTA when it is really an MFN externality effect, of the type found in our by the model. We can test if this is the case by controlling for reciprocity.<sup>36</sup>

The reciprocity variable is constructed as a measure of market access “concessions” that is consistent with the practice in multilateral tariff negotiations. It is defined at the product level as a weighted average of the aggregate tariff reductions of US trade partners. The weights vary by product and are given by those partners export shares on product  $i$  into the US. Since the negotiation for reducing US tariffs in product  $i$  occurs only with its principal suppliers only the top 5 exporters are taken for each product.

The theory predicts a positive sign for the reciprocity variable. If a country offers relatively larger concessions then the US reciprocates through larger MFN tariff reductions in the products it imports from that country. This generates another potential source of endogeneity due to reverse causation since the total tariff reduction by that country will, through reciprocity, partially depend on the US’s reductions. We address this by instrumenting for reciprocity similarly to Limão (2006). The instrument is the unilateral portion of the total tariff reductions of US partners that were eventually offered at the UR. More specifically, several countries undertook unilateral trade liberalizations between 1986 and 1992. They were unilateral because they were undertaken outside of GATT negotiations, without an expectation that they would be reciprocated since the very completion of the UR was in doubt until 1992. However, when the final

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<sup>36</sup>It is also possible that these US PTAs may affect how much MTL the non-PTA countries are willing to negotiate, which then has an indirect effect on the US’s own liberalization. The reciprocity variable controls for this indirect effect allowing us to estimate direct effect that the theory highlights.

multilateral cuts were negotiated, between 1992 and 1994, the unilateral reductions undertaken from 1986 to 1992 were retroactively reciprocated because they had taken place after the official start date of the round (Finger et al., 2002, p. 121). Therefore, we employ the unilateral liberalization by GATT/WTO members between 1986 and 1992 as an instrument for what was eventually used as a basis for their reciprocal liberalization—the amount between 1986 and 1995. We also use the exporter countries’s GDP growth between 1977 and 1990 as an instrument for their liberalization.

Column 2 of Table 3 contains the estimates when controlling for reciprocity. This determinant has the expected positive effect, larger liberalization by exporters of a particular good to the US causes the US to reciprocate by lowering its own MFN tariffs in that good. The effect is quantitatively significant since if there were no liberalization by other countries, i.e. if the reciprocity variable was zero, then the estimated mean reduction is only -0.82 for non-PTA goods, which is about half of the effect we find without reciprocity. Although reciprocity has a significant impact on the average reduction it does not affect the sign, significance or magnitude of the stumbling block estimate, which is now 0.55 instead of 0.53.

In addition to the industry effects, which we include throughout, and reciprocity, other US PTAs may be a potential determinant of its MTL. In 1994 the US also provided preferences under the North American Free Trade Agreement (NAFTA: Canada and Mexico), the Generalized System of Preferences (GSP: various developing countries) and Israel. Since our objective is to stay as close as possible to the assumptions of the model we chose not to focus on these agreements. Both Canada and Mexico and the group of GSP beneficiary countries have non-negligible market shares in the US and direct impact in multilateral negotiations. This is not true of Israel but it has a special relation with the US and it is one of the largest recipient of US official aid, which implies that in this case preferences are not required to “purchase” Israeli cooperation in non-trade issues. This explains our focus on the ATPA and CBI: their characteristics fit particularly well with the theoretical model. However we should control for the other agreements to ensure that the effect of the ATPA and CBI is not driven by other agreements with similar PTA goods.

Column 3 of Table 3 controls for the key determinants in  $\Delta\mathbf{x}$ : industry effects, reciprocity and other PTAs. The stumbling block effect for the agreements that fit the assumptions of our model remains positive and significant at 1%. The reciprocity effect is also unchanged. The effect of the other agreements is statistically insignificant. Although controlling for the other PTAs in this sample and for this measure of protection does not change the results we believe that conceptually this is the best specification since it ensures that the control group of non-PTA goods are defined with respect to goods that are not exported under any PTA.

Therefore the additional robustness results discussed below will be based on this specification.<sup>37</sup>

Finally, we note that, for the preferred specification 3, the first stage results (in the last 4 columns of Table 4) strongly support the instruments we use both in terms of their explanatory power and expected sign. This is the case for the PTA and reciprocity variables. The over-identifying restrictions test does not reject the hypothesis that the excluded instruments are orthogonal to the error and correctly excluded.<sup>38</sup>

### 3.5 Quantification

To provide some interpretation and economic quantification of the importance of the estimated effect recall the following. First,  $\pi$  measures the average difference in the reduction in tariffs of PTA vs. non-PTA goods. Second, conditional on the determinants in  $\Delta\mathbf{x}$ , the reduction in tariffs for non-PTA goods captures the reduction that would have occurred in the PTA goods in the absence of a PTA, i.e. under commitment to MFN. So we can ask what was the relative magnitude of the reduction in tariffs for PTA goods under the exception vs. what it would have been under commitment. We find that magnitude is large: it ranges from 43 to 72% in our preferred specification (column 3 of Table 3). We obtain this from calculating  $(\pi + c)/c$ , where  $c$  is the estimated mean reduction for non-PTA goods and  $\pi$  is the PTA parameter in (22). With no stumbling block effect  $\pi$  would be zero and this relative magnitude is 100%. So the larger the stumbling block effect the lower this statistic is. The stronger effect of 43% corresponds to goods exported by countries that did not lower their tariffs, i.e. it calculates  $c$  net of the reciprocity effect, -0.89. Since the change for the PTA goods was 0.5-0.89 we have  $(\pi + c)/c = 0.43$ . The estimate of 72% includes the reciprocity effect.<sup>39</sup>

The relative magnitudes above also have an interpretation as “mean price effects” as we label them in Table 3. Since we calculate an ad valorem equivalent to the specific tariff the domestic price of a good in the US can be written as  $p = p^*(1 + \tau)$ , where  $p^*$  is the world price. When there is full pass-through from tariffs to domestic prices the world price remains unchanged and so the ratio of the growth in domestic price for

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<sup>37</sup>Limão (2006) examines ad valorem tariffs and finds evidence of a stumbling block effect in the US that is stronger for products in which PTA partners have large export values and that it is present for GSP and NAFTA in addition to the CBI and ATPA. This along with our finding here that for products subject to specific tariffs the effect is only significant for the ATPA and CBI provide additional supporting evidence for the model once we note that NAFTA and GSP have a lower share of their exports in products where the US applies specific tariffs than the ATPA and CBI.

<sup>38</sup>We treat the ISRAEL and GSP variables as endogenous for the same reason presented for the ATPA and CBI: the selection of goods receiving preferences may depend on expected MFN tariff changes. Since for NAFTA all the products in the sample receive preferential treatment this issue does not arise and we treat it as exogenous. We omit the first stage results for ATPA\_CBI and RECIPROCITY for specification (2) in Table 3 for space considerations and because they are very similar to those for specification (3). They are available upon request.

<sup>39</sup>These two estimates provide information about different counterfactuals. Strictly speaking we do not know what value the reciprocity variable would have taken in the absence of PTAs so we can either ask about this relative effect if the US had unilaterally changed its tariffs without responding to its partners in the UR, the estimates net of reciprocity (43%), or ask what the effect was given the observed level of reciprocity (72%).

a PTA and a similar non-PTA good is simply  $\Delta \ln p_{pta} / \Delta \ln p_{npta} = \Delta \ln(1 + \tau_{pta}) / \Delta \ln(1 + \tau_{npta})$ . Using (22) this expression is equal to  $(\pi + c)/c$ . This expression also provides an approximate measure of the relative world price effects for goods when there is imperfect pass-through, that is when some of the tariff reductions are passed to exporters in the form of higher prices, as we assumed in the theoretical model. In this case we have  $\Delta \ln p_{pta}^* / \Delta \ln p_{npta}^* \approx (\pi + c)/c$  provided the pass-through rate across PTA and non-PTA goods is similar.<sup>40</sup> This implies that a country that is not a member of the ATPA or CBI but exports the same goods to the US received only 43-72% of the price increase relative to a situation where the US did not have those preferential agreements.

Using the theoretical model we can also calculate the counterfactual average tariff *level* for PTA goods in the absence of PTAs. To do so we start with the average tariff from the Tokyo Round for ATPA or CBI goods in the sample. This was 3.3% for goods with positive MFN tariffs. We then subtract the average change that would have taken place in the absence of PTAs, calculated from our counterfactual as the estimated average reduction in non-PTA goods gross of reciprocity, -1.8%. Thus the predicted US MFN tariff level for ATPA or CBI goods in the absence of these agreements is 1.5%. The stumbling block effect added 0.5 percentage points thus causing the average tariff *level* on those PTA goods to be 33% higher.

### 3.6 Robustness tests and additional evidence

We now test the robustness of the results with respect to additional regressors and alternative definitions of the dependent variable. We also discuss additional evidence for the European Union.

The average initial MFN tariff for the ATPA and CBI PTA-goods in the sample is higher than for non-PTA goods. This could bias the stumbling block estimate upwards if products with higher initial tariffs were associated with certain unobservable characteristics, e.g. strong lobbies in industries specialized in very specific products, that simultaneously cause higher initial tariffs and smaller reductions. To test if this affects our estimates we include the initial tariff as an endogenous regressor and re-estimate the preferred specification. The estimates in column 4 of Table 3 indicate that products with higher initial tariffs actually had significantly larger rather than smaller reductions. The stumbling block effect remains positive and significant and it is statistically indistinguishable from the previous estimate.<sup>41</sup>

<sup>40</sup>Define the pass-through as  $\zeta_i \equiv \Delta \ln p_i / \Delta \ln(1 + \tau_i)$ , where  $i = pta$  or  $npta$ . Then, since we can write the domestic price as  $\ln p_i = \ln(1 + \tau_i) + \ln p_i^*$  we have  $\zeta_i = 1 + \Delta \ln p_i^* / \Delta \ln(1 + \tau_i)$ . We can then write the ratio of world price effects as  $\Delta \ln p_{pta}^* / \Delta \ln p_{npta}^* = [\Delta \ln(1 + \tau_{pta}) / \Delta \ln(1 + \tau_{npta})](\zeta_{pta} - 1) / (\zeta_{npta} - 1) \approx (\pi + c)/c$  if  $\zeta_{pta} \approx \zeta_{npta} < 1$ .

<sup>41</sup>Since we previously had more excluded instruments than endogenous variables we do not require any additional instruments to identify the initial tariff in the first stage; its R-square is 0.43 and we reject the insignificance of the instruments with a



It is possible that the industry dummies we included thus far do not fully capture the political economy effects or other industry characteristics that affected the tariff reductions. Therefore in column 5 we include a finer set of dummies: one for each 2 digit industry of the Harmonized System in the sample that divide the hs-8 digit products into 96 possible industries. Note that this is a strict test because it eliminates a considerable amount of the variation in the tariff measure and leaves us with an average of 15.5 observations per industry with which to identify differences between PTA and non-PTA goods. Nonetheless we continue to find that the stumbling block result is positive and significant.

The estimated effect,  $\pi$ , is also unchanged if instead of taking the difference of the log tariff factor we use the difference of the tariffs. This is clear from column 6 where the estimate of 0.52 has the immediate interpretation that the MFN tariff for a PTA good exported by the ATPA or CBI increased by one half a percentage point relative to the non-PTA goods. If exported by both the increase was 1 percentage point and it fully offset other motives for reduction (-.98 was the average decrease for non-PTA).

We conclude this section with a brief discussion of additional evidence that supports our theoretical model. Karacaovali and Limão (2005) use data for the European Union to estimate a structural equation derived by extending our theoretical model. They find the EU's PTAs caused it to maintain higher multilateral tariffs in PTA goods. Interestingly they also estimate that the effect is not present in goods that face a positive preferential tariff, i.e. PTA goods that do not benefit from duty-free status. Recall that duty-free status is an important condition to obtain the stumbling block effect in proposition 2 and thus the finding provides strong support for a fairly specific prediction of our model.<sup>42</sup> They also find no stumbling block effect for the goods exported by countries that became European Union members, which is another prediction of the extended model since there are extensive cash transfer mechanisms among EU members and thus trade preferences need not be used as transfers.

## 4 Implications for WTO rules

The evidence strongly supports the theoretical prediction that US and EU PTAs have caused a stumbling block effect. Therefore it is important to analyze the welfare consequences of such agreements and the implications of our model for WTO rules. We do so both from a positive and a normative perspective.

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p-value of 0.0001.

<sup>42</sup>We cannot test that prediction with the US data because none of the PTA goods under ATPA and CBI in our sample face positive preferential tariffs.

From a positive perspective we show how the model can explain two features of the current system. First, the current regime of exceptions to MFN. Second, the recent attempt to change this regime and move cooperation in non-trade issues into the WTO, which was generally supported by large developed countries and opposed by small developing ones. From a normative perspective we analyze the welfare consequences of different rules and propose a new rule, allowing import subsidies, that constitutes a Pareto improvement relative to the current exception to MFN.

#### 4.1 Positive implications

We have analyzed trade agreements under two alternative rules or regimes: MFN commitment or exception. We now show which emerges in equilibrium. Until recently developing countries often complained that most GATT/WTO rules were decided by developed countries. (Srinivasan, 1999) We capture this by allowing large countries to choose the trading rules in order to maximize their own joint welfare. By ranking the payoffs for the large countries under the alternative regimes we show which they chose in the initial stage. We then contrast it to the small countries' preferred regime.

**Proposition 4** (*Welfare ranking of regimes*)

*i. When large countries are sufficiently patient*

*a) the PTA exception regime welfare dominates commitment to MFN for large countries*

*b) the PTA exception regime welfare dominates commitment to MFN for small countries if the PTA is not duty-free or if small countries are not sufficiently patient.*

*ii. When large countries are sufficiently patient and the PTA is duty-free then there exist some sufficiently patient small countries for which commitment to MFN welfare dominates the PTA exception regime.*

Let us first consider the result for *Large*. As we have shown in section 2.4 *Large* gains from a PTA for a *given* multilateral tariff. Since a PTA that is not duty-free has no effect on the multilateral tariff (proposition 2) it is clear that *Large* chooses a rule that allows PTAs in that case. However, when large countries are sufficiently patient they prefer the exception regime even if the PTA affects the multilateral tariff. This occurs because their *IC* for the MTL do not bind and thus they continue to choose the cooperative tariff that maximizes their joint welfare. This allows them to internalize the effects of each other's PTAs on their MTL. Thus the model predicts the regime we observe since it was large countries that chose the current GATT/WTO rules regarding MFN commitment.

It is also interesting to ask what the welfare ranking of regimes is for small countries both from a normative and positive perspective. In the last ten years, as the WTO replaced the GATT, the power of small developing countries in the world trading system appears to have increased (Mattoo and Subramanian, 2004). So, even if large countries still set the agenda, it is plausible that smaller ones have acquired some veto power. Proposition 4 answers whether small countries support the current set of rules.

*Small* prefers the exception regime when the PTA is not duty-free. In that case the agreement does not affect multilateral tariffs and, as shown in section 2.4, for given multilateral tariffs the PTA is strictly welfare improving for *Small*. However, when the PTA is duty-free there is an offsetting effect for them. The multilateral tariff is higher and thus so is the threat tariff. When *Small* is not sufficiently patient it can extract enough surplus through the PTA to achieve a higher welfare under the exception regime (since its threat to stop cooperating is more credible). But, as part (ii) of the proposition shows there exist sufficiently patient small countries for which an increase in the threat tariff allows *Large* to demand a significant increase in their supply of the public good. This leaves *Small* worse off than if no PTAs were allowed.

Thus far the focus has been on whether the model predicts one of two alternative rules. But there are other plausible and empirically important alternatives. Recently the US and the EU for example supported linking cooperation on non-trade issues to multilateral tariffs in the WTO. This has been vigorously opposed by most small developing countries. Our model provides an explanation for both positions. According to the proposals, linkage in the WTO can be translated into our model as allowing *Large* to threaten *Small* with a tariff above the multilateral tariff. Thus in our model the threat tariff used if *Small* stops supplying the public good can now be higher than  $\tau$ . In the absence of a prohibition of preferential treatment then, from the perspective of our model, the only difference between the PTA exception rule and linkage in the WTO is that the latter allows large countries to use a higher threat tariff against small ones. Our model then predicts that large countries favor linkage in the WTO and *Small* oppose it because the higher threat, which is not implemented along the equilibrium path, allows *Large* to extract more cooperation from *Small* at any given tariffs that are implemented in equilibrium. Thus our model predicts the recent attempt to move cooperation in non-trade issues into the WTO—both the support of large developed countries and the opposition of small developing ones.<sup>43</sup>

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<sup>43</sup>An interesting alternative would be to allow for linkage in the WTO but simultaneously require that no preferences be given to small countries. The choice between this and the PTA exception for large countries is no longer obvious. The threat tariff they can use under linkage is higher but what is important in determining how much they can extract from *Small* is the difference between that threat and the actual tariff charged on *Small*'s exports. That difference is  $t^N(\tau) - \tau$  under linkage and  $\tau^{EX} - t^B(\tau^{EX})$  under the exception. When  $t^N(\tau) - \tau$  is sufficiently large then large countries prefer to link in the WTO. Otherwise they prefer the PTA exception. Suppose then that cooperation in multilateral tariffs is gradual as we have observed

## 4.2 Normative implications

To analyze the normative implications of the model for WTO rules it is useful to start with a welfare benchmark for the rules. As we noted before if the PTA is not duty-free then the multilateral tariffs remain unchanged. In this case the PTA actually delivers the exact same solution as the unconstrained first best, that is the solution is identical to one where large countries make direct transfers of the numeraire to “purchase” *Small*’s supply of the regional public good. The reason is simple: the quasilinearity of preferences and the inelastic export supply imply that a preference is simply a transfer of income that causes *Small* to supply the regional good but distorts no other decision. However, when the PTA is not duty-free it distorts the MFN tariff, which raises the question of what alternative rules could be used.

One criteria is for the alternative to eliminate the stumbling block effect. If *Large* could use lump-sum transfers to ensure that *Small* provides the public good there would be no motive for a PTA and consequently no stumbling block. But, to the extent that we do observe PTAs there must exist a constraint that prevents countries from simply using lump-sum transfers.<sup>44</sup> Another obvious alternative is eliminating the WTO articles that allow exceptions to MFN, i.e. implementing commitment to MFN. However, this would be opposed by the large countries, as we show in proposition 4.

A more interesting normative criteria is for the alternative rule to generate a Pareto improvement relative to the PTA exception. Allowing import subsidies, that is negative preferential tariffs, would satisfy this criteria. It is simple to understand why import subsidies improve the welfare of large countries. As we note after proposition 2 in offering a preferential margin the large countries always prefer to use lower preferential tariffs than higher multilateral tariffs. A lower preferential tariff works as a cash transfer and does not distort any economic decisions in *Large* but the higher multilateral tariff distorts the consumption of the non-numeraire goods and moves them away from the optimum. By removing the non-negativity constraint on preferential tariffs, i.e. allowing import subsidies, the large countries no longer need to distort the multilateral tariff. When that non-negativity constraint is binding, i.e. when the PTAs are duty-free, these countries will gain from the switch. *Small* also prefers to be compensated via an import subsidy rather

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it in the last 60 years. This means that initially the difference between cooperative and non-cooperative tariffs is small and it increases over time. In this case our model predicts that, all else equal, large countries are increasingly more likely to try to pursue linkage in the WTO.

<sup>44</sup>For example, if some individuals in the preference granting country do not value the cooperation then they will oppose a direct transfer to obtain it. This is more difficult with the indirect transfer that arises with the preference because trade policy is not revised every year whereas budgets are. Moreover, the indirect transfer through a preferential tariff may be somewhat more “disguised” than the direct transfer. In the receiving country, cash from a direct transfer may end up in a politician’s pocket and thus not provide the incentives for the intended supply of cooperation. For example, one of the stated aims of the US in providing preferences to the Andean countries is to raise the relative price to activities other than drug production.

than face a higher threat in the form of higher multilateral tariffs.<sup>45</sup>

Just as the exception rule delivers the unconstrained first best when the PTA is not duty-free, the import subsidy delivers the first best even if the PTA was duty-free (before a subsidy is implemented). In addition to generating a Pareto improvement for the PTA members the subsidy would also generate a welfare improvement for non-members that export goods similar to the small countries to *Large* since their exports would now face lower multilateral tariffs. This would be an important advantage since the costs of PTAs for non-members are generally an important criteria in designing WTO rules on PTAs.

The welfare cost from maintaining these preferences instead of an import subsidy scheme is estimated by Limão and Olarreaga (2006). They apply a general computable equilibrium model to disaggregated trade data to estimate the welfare impact of lost multilateral liberalization by the US, EU and Japan due to their PTAs. They find that the aggregate gains in the trade round currently under negotiation would increase by about 10% even if we consider only the preference schemes those countries use for the least developing countries. Moreover, they find that all groups of countries would gain from the switch.<sup>46</sup>

## 5 Conclusion

Trade is not the only motivation for preferential trade agreements, cooperation in issues not directly related to trade is often just as important. Thus far these other motives and the effects of such agreements have generally been ignored. We cannot continue to ignore these non-trade objectives in PTAs since they are now both pervasive and quite explicit. More importantly, when we account for the non-trade motives behind many PTAs we can better explain which are formed and their consequences on the multilateral system.

We show that PTAs have important effects on the multilateral trading system—and in particular on

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<sup>45</sup>Although the argument for *Small* is less obvious the basic intuition can be made clear without going into much detail. Recall from proposition 1 that *Small's* equilibrium supply of the public good is  $e^B = (\delta^s/k)(\tau - t^B)$ . A given increase in the preferential margin,  $\tau - t^B$ , has the same cost to *Small* in terms of the extra amount of  $e$  it must provide. This aggregate marginal cost is  $H\delta^s/k$ , which is independent of whether the increase in  $\tau - t^B$  is due to an increase in  $\tau$  or a decrease of similar magnitude in  $t^B$ . However, the benefit in terms of export value depends on which of these tariffs changes. *Small* obtains  $(p^L(\tau) - t^B)H/k$  for its exports so a marginal decrease in the preferential tariff increases small's welfare by  $H/k$ . But, for a given  $t^B$ , the benefit of a marginal increase of similar magnitude in  $\tau$  is  $(\partial p/\partial \tau)H/k$ . The higher tariff generates an increase in the domestic price but that pass through is less than one because *Large* has market power and this tariff is imposed on goods from *Large\** so  $\partial p/\partial \tau < 1$ . To close this argument we need to show that the equilibrium decrease in the preferential tariff under the subsidy is not smaller than the increase in the multilateral tariff. This will indeed be the case because it is relatively more costly for *Large* to use the multilateral tariff. By starting from a situation where the PTA is just duty-free and increasing  $\alpha$  or  $\lambda$  we can show that the increase in the multilateral tariff under the exception is smaller in magnitude than the fall in the preferential tariff.

<sup>46</sup>More specifically, they combine the stumbling block estimates of Limão (2006) to calculate the effects of the additional MTL that would result if the preferences of these three countries were replaced by import subsidies.

multilateral tariffs of large countries—even if the agreement is signed with an economically small country. The model allows us to map the outcome from different rules into an empirical test of whether PTAs with non-trade objectives cause a stumbling block to MTL. The novel evidence we present strongly supports the model. In the goods exported under the relevant PTAs these agreements caused an average increase of 33 percent in the specific tariffs that the US applies multilaterally. This and other recent evidence indicates that PTAs formed by the US and the EU have caused them to maintain higher multilateral tariffs.

The model correctly predicts the current set of rules for PTAs in the WTO. However, the welfare analysis shows that even though the current rules are optimal for large countries they are not necessarily so for small PTA partners and non-members. This provides a strong motivation for the WTO to regulate PTAs more carefully, for small countries to seek a more active role in determining WTO rules and explore alternatives such as import subsidies.

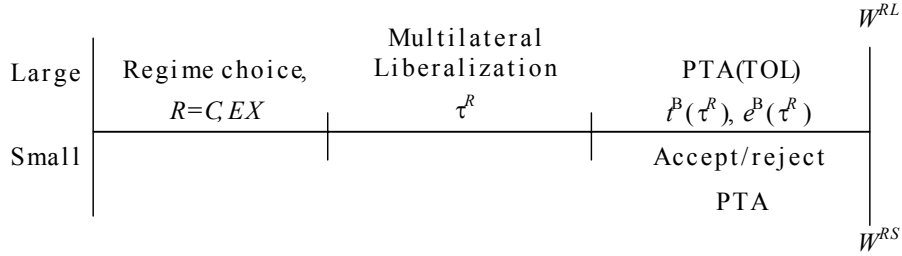
# References

- Abrego, L. E., C. Perroni, J. Whalley, and R.M. Wigle. 2001. "Trade and Environment: Bargaining Outcomes from Linked Negotiations." *Review of International Economics*, 9(3); 414-28.
- Bagwell, K. and R. Staiger. 1999. "An Economic Theory of GATT." *American Economic Review* 89 (1); 215-248.
- . 1998. "Will Preferential Agreements Undermine the Multilateral Trading System?" *Economic Journal*; 108(449), 1162-82.
- . 1990. "A Theory of Managed Trade." *American Economic Review*, 80; 779-95.
- Bhagwati, J. *The World Trading System at Risk*, Princeton: Princeton University Press, 1991, viii, 156.
- Bond, E., C. Syropoulos and Alan Winters. 2001. "Deepening of Regional Integration and Multilateral Trade Agreements." *Journal of International Economics*, 53; 335-61.
- Bond, E.W and J. Park. 2002. "Gradualism in Trade Agreements with Asymmetric Countries." *Review of Economic Studies*, 69(2); 379-406
- Broda, C., N. Limão and D. Weinstein. 2006. "Optimal Tariffs: The Evidence." NBER WP No. 12033.
- Chang, W. and A. Winters. 2002. "How Regional Blocs Affect Excluded Countries: The Price Effects of Mercosur." *American Economic Review*, 92(4); 889-904.
- Ethier, W. 2004. "Political Externalities, non-discrimination, and a Multilateral World." *Review of International Economics*, 12(3); 303-20.
- . 1998. "Regionalism in a Multilateral World." *The Journal of Political Economy*, 106(6); 1214-45.
- Feenstra, R.; Romalis, J. and Peter Schott. 2002. "U.S. Imports, Exports and Tariff Data, 1989-2001," NBER WP No. W9387.
- Finger, J. M., U. Reincke and A. Castro. 2002. "Market Access Bargaining in the Uruguay Round: Rigid or Relaxed Reciprocity?" in Bhagwati, Jagdish ed., *Going Alone: The Case for Relaxed Reciprocity*. Cambridge, MA: MIT Press.
- Grilli, E. 1997. "EU Trade and Aid Policies Towards the LDCs and CEECs" in *Economic Integration Worldwide*, Ali M. El-Agra (ed.), London, MacMillan Press; 135-174.
- Grossman, G. and E. Helpman. 1995. "Trade Wars and Trade Talks." *Journal of Political Economy*, 103(4); 675-708.
- Jackson, J. *The world trading system: law and policy of international economic relations*, 2nd ed. Cambridge, MA: MIT Press; 1997, xi, 441.
- Johnson, H. 1954. "Optimum Tariffs and Retaliation." *Review of Economic Studies*, 21; 142-53.
- Karacaovali, B. and N. Limão. 2005. "The Clash of Liberalizations: Preferential vs. Multilateral Trade Liberalization in the European Union." World Bank Research WP no. 3493.
- Krishna, P. 1998. "Regionalism and Multilateralism: A Political Economy Approach." *Quarterly Journal of Economics*, 113; 227-51.
- Mattoo, A. and A. Subramanian. 2004. "The WTO and the Poorest Countries: The Stark Reality," IMF WP WP/04/81.
- Levy, P. 1997. "A Political-Economic Analysis of Free-Trade Agreements." *American Economic Review*, 87(4); 506-19.
- Limão, N. 2006. "Preferential Trade Agreements as Stumbling Blocks for Multilateral Trade Liberalization: Evidence for the US." *American Economic Review*, 96(3); 896-914.
- . 2002. "Are Preferential Trade Agreements with Non-trade Objectives a Stumbling Block for Multilateral Liberalization?" University of Maryland Center for International Economics Working Paper 02-02.

- Limão, N. and M. Olarreaga. 2006. "Trade Preferences to Small Developing Countries and the Welfare Costs of Lost Multilateral Liberalization," *World Bank Economic Review*, 20(2); 217-240.
- McCalman, P. 2001. "Reaping what you sow: an empirical analysis of international patent harmonization." *Journal of International Economics*, 55(1); 161-186.
- Perroni, C. and J. Whalley. 2000. "The New Regionalism: Trade Liberalization or Insurance?" *Canadian Journal of Economics*, 33(1); 1-24.
- Schiff, M. and A. Winters. 1998. "Regional Integration as Diplomacy." *World Bank Economic Review*, 12(2); 271-95.
- Srinivasan, T.N. 1999. "Developing Countries in the World Trading System: From GATT, 1947, to the Third Ministerial Meeting of WTO, 1999." *The World Economy*, 22(8); 1047-1064.
- Staiger, R. 1995. "International Rules and Institutions for Trade Policy." in *Handbook of International Economics* Vol. III, Gene Grossman and Kenneth Rogoff (eds.), Elsevier, North-Holland, 1495-1551.
- Syropoulos, C. 2002. "Optimum Tariffs and Retaliation Revisited: How Country Size Matters." *Review of Economic Studies*, 69(3); 707-27.
- Trebilcock, M.J. and Robert Howse. *The regulation of international trade*, 2nd ed. Routledge ; 1999, xii, 599.
- Winters, A. 1993. "Expanding EC Membership and Association Accords" in *Regional Integration and the World Trading System*, K. Anderson and R. Blackhurst (eds.), Harvester Wheatsheaf; 104-125.
- World Bank. 2000. "Regional Integration Agreements." World Bank, Washington D.C.

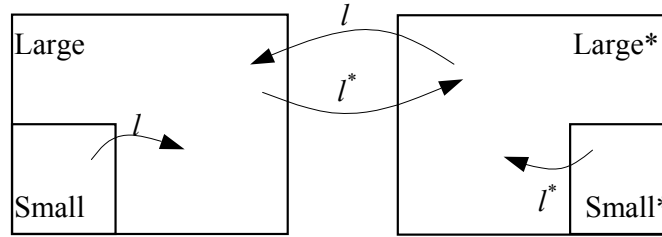


**Figure 1: Timing in each period of the repeated game**



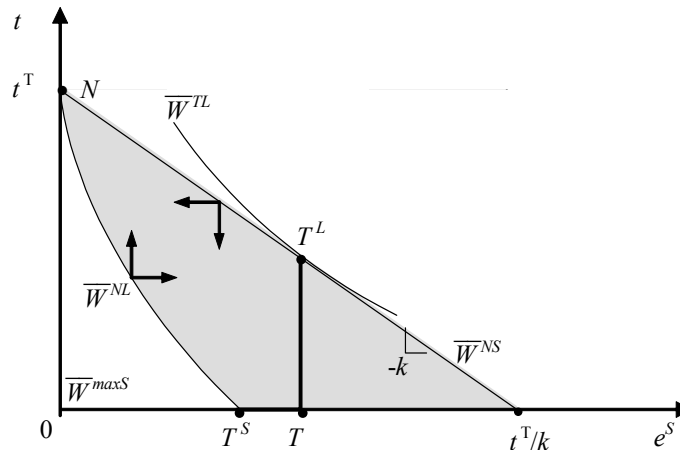
Notes: Large countries first choose a regime (R), where they either commit to MFN (no PTAS allowed) or not: the PTA exception. Given the regime, the large countries choose a level for the MFN tariff ( $\tau^R$ ). This is the maximum credible threat that can be subsequently used to make a take-it-or-leave-it offer (TOL) for a PTA, which Small can accept or reject. The TOL offer in the final stage is simply the vector  $(t^B, e^B)$ , 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.

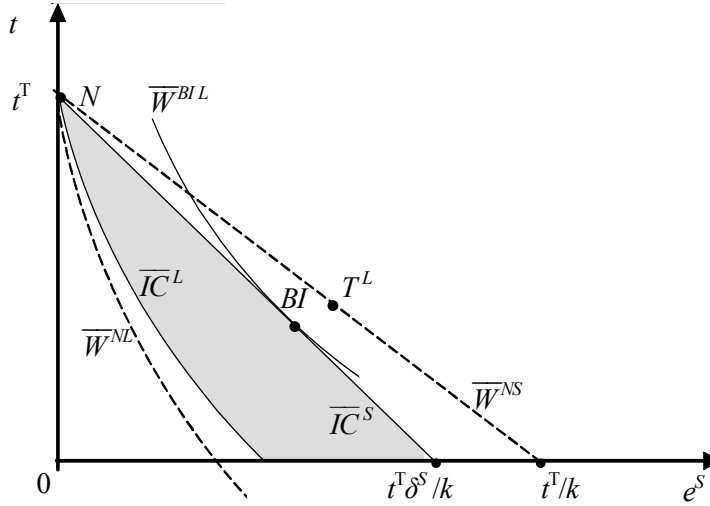
**Figure 3: PTA bargaining solutions**  
(no enforcement constraints)



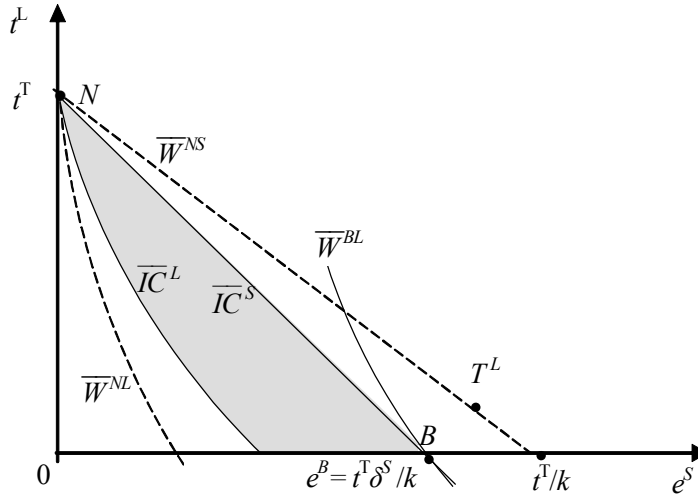
Notes: Point  $N$  denotes the non-cooperative solution to Large's tariff on Small and the latter's e-tax. The shaded area represents potential PTAs which are Pareto improving. The slope of Small's iso-welfare line is  $-k < -1$ , the ratio of Large to Small's endowments. Large's welfare is quasi-linear in  $t$ . The segment  $T^S T T^L$  represents PTAs that are both Pareto improving and Pareto efficient. Any efficient bargaining solution must lie on  $T^S T T^L$ . 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  $T T^L$  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: PTA Self-enforcing solutions**

**4a. Large not sufficiently endowed relative to Small ( $BI$ )**



**4b. Duty-free PTA: Large sufficiently endowed relative to Small ( $B$ )**



Notes:

The shaded areas represent the set of self-enforcing PTAs that improve on the Nash ( $N$ ); it is delimited by each country's incentive frontiers. Point  $BI$  in figure 4a represents the self-enforcing TOL PTA 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 4b point  $B$  represents the self-enforcing TOL PTA solution proposed by Large when it is sufficiently endowed relative to Small, i.e. when  $k$  is sufficiently high.

**Table 1: Summary statistics**

<i>Variables</i>	Mean	St. dev.	Min	Max
$\Delta \tau$	-1.46	2.71	-36.3	0
ATPA_CBI	0.361	0.643	0	2
ATPA	0.165	0.371	0	1
CBI	0.196	0.397	0	1
NAFTA	0.704	0.457	0	1
ISRAEL	0.153	0.36	0	1
GSP	0.369	0.483	0	1
RECIPROCITY	-50.3	12.7	-86.6	-2.26
INITIAL $\tau$	3.24	4.64	0.00428	36.3
<i>Excluded Instruments</i>				
UNILAT_RED	-28.9	19.3	-79.4	-0.355
EXP GROWTH	130	23.3	10.5	164
TRANSP_COST 94	8.51	6.24	0.318	59
$\Delta$ PRICE_90_94	10.9	94.6	-470	736
TCx $\Delta$ PRICE	58.4	825	-3644	9385
EX_ATPA	0.238	0.426	0	1
EX_CBI	0.209	0.407	0	1
EX_ISR	0.168	0.374	0	1
EX_GSP	0.733	0.443	0	1

Notes: All variables, except indicators are in percentages. Number of observations: 929. After excluding the special sections (21 and 22) there exists data for 1331 unique 8-digit tariff lines for which the US set a positive specific tariff before the Uruguay Round. Lines with missing or zero imports from every US partner must be dropped because they are required to construct the transport cost and price variables (n=1011). The sample is reduced to 1000 due to missing preference data. Missing tariff reduction and gdp growth data for some partners used to construct reciprocity and growth variables reduces the sample to 931. Two industries have a single observation in the sub sample of 931 thus reducing the sample to 929, which is used in the main specifications.

**Table 2: Data description and sources**

Variable	Definition/description	Source <sup>a</sup>
$\Delta \tau$	$=\ln[(1+\tau_{it}/p_{it})/(1+\tau_{it-1}/p_{it})]$ ; $\tau_{it,t-1}$ : U.S. Specific bound tariff (t: post-UR, t-1: pre-UR). $p_{it}$ : Average price for HS 8-digit product $i$ over all exporters of $i$ to the U.S. in 94.	WTO, Feenstra et al 2002
INITIAL $\tau$	$=\tau_{it-1}/p_{it}$	" "
PTANAME	=1 if HS-8 good $i$ exported to U.S. under the PTA (1994)	Feenstra et al 2002
ATPA_CBI	= ATPA+CBI	" "
EX_PTA	=1 if HS-8 good $i$ exported to the U.S. by the respective PTA partner whether or not the product received a preference (1994)	" "
$s_{iT}^k$	Partner $k$ 's export share of top 5 exporters of HS-8 good $i$ to U.S. in 1990	" "
RECIPROCITY	$\sum_k s_{iT}^k (\sum_j \Delta \tau_{jt}^k w_j^k)$ ; where $(\sum_j \Delta \tau_{jt}^k w_j^k)$ : Partner $k$ 's aggregate multilateral liberalization; $\Delta \tau_{jt}^k \equiv$ % change 95-86; $w_j^k \equiv$ Share of good $j$ in $k$ 's imports	Finger et al 2002
UNILAT_RED	$\sum_k s_{iT}^k (\sum_j \Delta \tau_{jt}^k w_j^k - \sum_j \Delta \tau_{jt}^{rk} w_j^k)$ where $\Delta \tau_{jt}^{rk} \equiv$ % change 95-92	Finger et al 2002
$\Delta$ PRICE_90_94	Mean price change (90 to 94) for HS-8 good $i$ exported to U.S.	Feenstra et al 2002
TRANSP_COST 94	Mean transport cost for HS-8 good $i$ exported to U.S. in 1994	U.S.ITC
TCx $\Delta$ PRICE	= TC * $\Delta$ PRICE_90_94	
EXP GROWTH	$=\sum_k s_{iT}^k \ln(\text{GDP}_{90}^k / \text{GDP}_{77}^k)$ . Growth in partner $k$ 's GDP.	PWT 6.1

(a) PWT, Penn World Tables; U.S.ITC, United States International Trade Commission; WTO, World Trade Organization.

**Table 3: IV Estimates of stumbling block effect**

Dependent variable: $\Delta\tau$		(1)	(2)	(3)	(4)	(5)	(6)
ATPA_CBI ( $\pi$ ) <sup>†</sup>		0.533 (0.152)	0.552 (0.148)	0.511 (0.152)	0.440 (0.142)	0.329 (0.136)	0.522 (0.167)
RECIPROCITY <sup>†</sup>			0.017 (0.010)	0.018 (0.010)	0.005 (0.011)	0.021 (0.010)	0.018 (0.011)
NAFTA				0.263 (0.237)	0.203 (0.197)	0.072 (0.242)	0.298 (0.270)
ISRAEL <sup>†</sup>				0.089 (0.269)	0.058 (0.227)	0.152 (0.274)	0.159 (0.297)
GSP <sup>†</sup>				-0.171 (0.462)	0.069 (0.397)	-0.843 (0.524)	-0.222 (0.514)
INITIAL $\tau$ <sup>†</sup>					-0.192 (0.107)		
Mean Reduction <sup>a</sup>	{ gross	-1.65	-1.68	-1.80	-2.40	-1.32	-1.89
	{ net	na	-0.82	-0.89	-1.53	-0.26	-0.98
Mean price effect <sup>b</sup>	{ gross	68%	67%	72%	82%	75%	72%
	{ net	na	33%	43%	71%	-25%	47%
No. Obs.		929	929	929	929	919	929
No. parameters		17	18	21	22	62	21
Hansen's J (p) <sup>c</sup>		0.16	0.26	0.22	0.13	0.43	0.24
Exogeneity (p) <sup>d</sup>		0.00	0.00	0.00	0.00	0.00	0.00
Equality (p) <sup>e</sup>		0.78	0.91	0.77	0.10	0.46	0.67

Notes: Heteroskedasticity robust standard errors in parentheses. Section/industry dummies included but not reported. (a) Estimated average tariff factor growth for non-PTA products taken as the average of the industry effects weighted by their share of observations in the sample. The estimates in the rows labeled "gross" include the growth due to the average change in the reciprocity variable in the sample, whereas "net" excludes it. (b) Measure of relative growth of world prices due to CBI and ATPA when there is imperfect pass-through ( $\zeta_{pta} \approx \zeta_{npta} < 1$ ), calculated as  $(\pi+c)/c$  where  $c$  is the mean tariff reduction for non-PTA goods using the measures gross or net of the reciprocity effect. (c) Test of over-identifying restrictions. Probability at which we reject the null hypothesis that the excluded instruments are uncorrelated with the error term, and correctly excluded from the estimated equation. (d) Durbin-Wu-Hausman specification test for the exogeneity of the variables marked with a "†". Probability value at which we reject the consistency of OLS. (e) Wald test of the null hypothesis of equality between the CBI and ATPA parameters in unrestricted versions of each specification.

Specification in column (5) identical to (3) except we use harmonized standard 2-digit industry dummies instead of section dummies. These results require us to drop 10 other industries with a single observation.

Specification in column (6) uses the difference in the advalorem equivalent of the specific tariff as the dependent variable.

**Table 4: First stage regressions for basic and preferred specifications**

Specification Table 3	(1)		(3)		
Dependent variable	ATPA_CBI	ATPA_CBI	RECIPROCITY	GSP	ISRAEL
EX_CBI	0.791 (0.026)	0.798 (0.026)	0.370 (0.513)	-0.045 (0.034)	0.040 (0.010)
EX_ATPA	0.769 (0.027)	0.785 (0.027)	1.081 (0.528)	0.071 (0.035)	-0.002 (0.011)
TRANSP_COST 94	0.006 (0.002)	0.006 (0.002)	-0.012 (0.033)	0.004 (0.002)	0.000 (0.001)
Δ PRICE_90_94	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.004)	-0.000 (0.000)	-0.000 (0.000)
TCxΔPRICE	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
NAFTA		-0.026 (0.023)	1.40 (0.446)	0.038 (0.030)	0.009 (0.009)
EX_GSP		-0.025 (0.024)	0.181 (0.464)	0.476 (0.031)	-0.009 (0.009)
EX_ISR		-0.037 (0.027)	-1.05 (0.535)	0.072 (0.036)	0.908 (0.011)
UNILAT_RED		-0.003 (0.001)	0.688 (0.014)	0.002 (0.001)	-0.001 (0.000)
EXP GROWTH		0.002 (0.001)	-0.188 (0.011)	-0.002 (0.001)	0.000 (0.000)
No. Obs.	929	929	929	929	929
Adjusted R-squared	0.84	0.84	0.99	0.61	0.92
F-test exc. IV (p-val) <sup>a</sup>	0.00	0.00	0.00	0.00	0.00

Notes: Heteroskedasticity robust standard errors in parentheses. Section/industry dummies included but not reported.  
(a) Probability value for the F-test of the null hypothesis that the excluded instruments are jointly insignificant.

# A Appendix

## A.1 Proofs of Propositions in Text

**Proposition 1:** *Self-enforcing PTA bargaining solutions*

In the text we define that **Large is sufficiently endowed relative to Small** if  $k \geq \max(k_1, k_2)$ , where  $k_1$  is defined by  $\{\frac{W_{e^S}^L(k_1)}{W_t^L} = \frac{W_{e^S}^S}{W_t^S} \frac{1}{\delta^S}\}_{t=0, e^S = \frac{t^T \delta^S}{k_1}}$ . Rewriting the *IC* in (16) and (15) as  $\Omega^j \leq \frac{\delta^j}{1-\delta^j} \omega^j$  then  $k_2$  is defined by  $\{\Omega^L(t, e^S, k_2) = \frac{\delta^L}{1-\delta^L} \omega^L(t, e^S, k_2)\}_{t=0, e^S = \frac{t^T \delta^S}{k_2}}$ . Using (5),(6) and (16) our conditions reduce to  $\{\alpha^L \lambda^L \delta^S H b^S \Psi'(b^S H e^S)\}_{e^S = t^T \delta^S / k_1} = 1$  for  $k_1$  and  $\{\alpha^L \lambda^L \delta^L \Psi(b^S H e^S)\}_{e^S = t^T \delta^S / k_2} = t^T / k_2$  for  $k_2$ . Forming the Lagrangian with  $\mu^j$  and  $\phi^g$  as the multipliers for the incentive and non-negativity constraints respectively we have the following necessary conditions for  $j = L, S$  and  $g = t, e^S$ :

$$\begin{aligned} \partial W^L / \partial g - \sum_j \mu^j (\partial \Omega^j / \partial g - \frac{\delta^j}{1-\delta^j} \partial \omega^j / \partial g) + \phi^g &= 0 \\ \mu^j (\Omega^j - \frac{\delta^j}{1-\delta^j} \omega^j) &= 0; \phi^g g = 0; \mu^j \geq 0; \phi^g \geq 0 \end{aligned}$$

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  $\Omega^S = \frac{\delta^S}{1-\delta^S} \omega^S \Leftrightarrow e^B = \frac{\delta^S}{k} (t^T - t^B)$ , using the definitions in (5) and (15).

If  $k = k_2$  then, by definition,  $\Omega^L = \frac{\delta^L}{1-\delta^L} \omega^L$  at  $t^B = 0$ ,  $e^B = \frac{\delta^S t^T}{k}$ , thus in figure 4  $\overline{IC}^L$  and  $\overline{IC}^S$  would intersect at  $t = 0$ . An increase in  $k$  relaxes  $IC^L$  at any given  $t^T$  since it reduces  $\Omega^L = \frac{H}{k} (t^T - t)$  and increases  $\omega^L = \frac{\delta}{1-\delta} (-\frac{H}{k} (t^T - t) + H \alpha^L \lambda^L \Psi(b^S H e^S))$ . Thus  $\Omega^L \leq \frac{\delta^L}{1-\delta^L} \omega^L$  at  $t^B = 0$ ,  $e^B = \frac{\delta^S t^T}{k}$  iff  $k \geq k_2$ . The FOC then yield  $W_{e^S}^L / W_t^L \geq W_{e^S}^S / W_t^S \delta^S$ . Now, if  $k > k_2$  then  $IC^L$  does not bind and  $e^B$  is determined by  $W_{e^S}^L / W_t^L = W_{e^S}^S / W_t^S \delta^S$ . A further increase in  $k$  lowers  $t^B$  but not  $e^B$  (because  $W_{e^S}^L / W_t^L = W_{e^S}^S / W_t^S \delta^S$  is independent of  $k$ ). If in addition  $k = k_1 \geq k_2$  then  $W_{e^S}^L / W_t^L = W_{e^S}^S / W_t^S \delta^S$  at  $(t^B = 0, e^B = \delta^S t^T / k)$ . Thus, since we rule out  $t^B < 0$  it must be that, at the given  $t^T$ ,  $e^B = \delta^S t^T / k$  falls and therefore at  $k \geq k_1$  we have  $W_{e^S}^L / W_t^L > W_{e^S}^S / W_t^S \delta^S$ .

If  $k < k_2$  then, by definition,  $\overline{IC}^L$  and  $\overline{IC}^S$  intersect at  $t > 0$  and two cases arise. First, if  $\Omega^L < \frac{\delta^L}{1-\delta^L} \omega^L$  at  $(t^B, e^B)$  then  $e^B$  is determined by  $W_{e^S}^L / W_t^L = W_{e^S}^S / W_t^S \delta^S$  and  $t^B$  by  $e^B = \frac{\delta^S}{k} (t^T - t^B)$ . Second, if  $\Omega^L = \frac{\delta^L}{1-\delta^L} \omega^L$  then  $t^T - t^B = \delta^L k \alpha^L \lambda^L \Psi(b^S H e^B)$  by using (6) and (16). In the second case the FOC require  $W_{e^S}^L / W_t^L \geq W_{e^S}^S / W_t^S \delta^S$ .  $\square$

**Proposition 2:** *PTAs as stumbling blocks,  $\tau^{EX} > \tau^C$*

If large countries are sufficiently patient s.t. neither  $IC^{EX}$  nor  $IC^C$  bind then (19) and (20) are necessary to determine  $\tau^{EX}$  and  $\tau^C$  (they are also and sufficient since the respective second derivatives are negative). Evaluating (20) at  $\tau^{EX}$  we obtain  $\{W_t^L (1 - \frac{\partial t^B}{\partial t^T}) - W_{e^S}^L \frac{\partial e^B}{\partial t^T}\}_{\tau^{EX}}$ . We must consider two cases:

- *Case 1:* PTA is not or is “just” duty-free at  $t^T$  if  $t^B(t^T = \tau^{EX}) \geq 0 \wedge t^B(t^T \rightarrow \tau^{EX+}) > 0$

From implicit differentiation of either  $(t^{BI}, e^B)$  or  $(t^{BII}, e^B)$  in proposition 1 we obtain  $\partial t^B / \partial t^T = 1$  and  $\partial e^B / \partial t^T = 0$ .

$$\therefore \{W_t^L (1 - \frac{\partial t^B}{\partial t^T}) - W_{e^S}^L \frac{\partial e^B}{\partial t^T}\}_{\tau^{EX}} = 0 \Rightarrow \tau^{EX} = \tau^C.$$

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

From implicit differentiation of either  $(t^{BI}, e^B)$  or  $(t^{BII}, e^B)$  in proposition 1 we obtain  $\partial t^B / \partial t^T = 0$  and  $\partial e^B / \partial t^T = \frac{\delta^S}{k}$ . Thus  $\{W_t^L(1 - \frac{\partial t^B}{\partial t^T}) - W_{e^S}^L \frac{\partial e^B}{\partial t^T}\}_{\tau^{EX}} < 0$  because  $\frac{W_{e^S}^L}{W_t^L} > \frac{W_{e^S}^S}{W_t^S} \frac{1}{\delta^S} = \frac{k}{\delta^S}$  (proposition 1).  
 $\therefore \{W_t^L(1 - \frac{\partial t^B}{\partial t^T}) - W_{e^S}^L \frac{\partial e^B}{\partial t^T}\}_{\tau^{EX}} < 0 \Rightarrow \tau^{EX} > \tau^C$ .  $\square$

**Proposition 3:** *Comparative Statics*

We need to consider only the effect of  $\alpha^L$  since  $\lambda^L$  enters  $W^L$  symmetrically.

**A.**  $IC^{EX}$  and  $IC^C$  not binding

First,  $d\tau^C/d\alpha = 0$  since under commitment no PTA occurs. Implicit differentiation of (19) yields:

$$\begin{aligned} \frac{d\tau^{EX}}{d\alpha} &= \frac{\partial(W_t^L \frac{\partial t^B}{\partial t^T} + W_{e^S}^L \frac{\partial e^B}{\partial t^T})/\partial\alpha}{-\partial^2 W^L / \partial(\tau)^2} \\ \text{sign}(\frac{d\tau^{EX}}{d\alpha}) &= \text{sign}(\partial(W_t^L \frac{\partial t^B}{\partial t^T} + W_{e^S}^L \frac{\partial e^B}{\partial t^T})/\partial\alpha) \end{aligned}$$

where the second line follows from the concavity of  $W^L(t = t^B, e^S = e^B, \tau, \tau^* = \tau, \cdot)$  in  $\tau$ . Similarly to proposition 2 we must consider two cases.

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

From proposition 1  $\frac{\partial t^B}{\partial t^T} = 1$ , thus  $\frac{\partial}{\partial\alpha}(\frac{\partial t^B}{\partial t^T}) = 0$ . Moreover,  $\frac{\partial e^B}{\partial\tau} = 0$  and  $\frac{\partial}{\partial\alpha}(W_t^L) = 0$  since  $W_t^L = H/k$ .  
 $\therefore d\tau^{EX}/d\alpha = d\tau^C/d\alpha = 0$ .

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

From proposition 1  $\frac{\partial t^B}{\partial t^T} = 0$  and thus  $\frac{\partial}{\partial\alpha}(\frac{\partial t^B}{\partial t^T}) = 0$ . Moreover,  $\frac{\partial}{\partial\alpha}(\frac{\partial e^B}{\partial\tau}) = 0$ , since  $\frac{\partial e^B}{\partial\tau} = \delta^S/k$ .  $\frac{\partial}{\partial\alpha}(W_t^L) = 0$  since  $W_t^L = H/k$ .

$\therefore \partial(W_t^L \frac{\partial t^B}{\partial t^T} + W_{e^S}^L \frac{\partial e^B}{\partial t^T})/\partial\alpha = (\delta^S/k)\partial(W_{e^S}^L)/\partial\alpha > 0 \Rightarrow d\tau^{EX}/d\alpha > d\tau^C/d\alpha = 0$ .  $\square$

**B.**  $IC^{EX}$  and  $IC^C$  bind: see section A.2.4.

**Proposition 4:** *Welfare ranking of regimes*

*i. a.* When large countries are sufficiently patient the PTA exception regime welfare dominates commitment to MFN for large countries.

To prove this we show that we can rewrite the commitment problem in a form that is identical to the exception problem except it has an additional constraint. Rewriting the problem in (18) by explicitly allowing large countries to *propose* PTAs under commitment the equilibrium solution is still  $\tau = \tau^C = t$  and  $e^S = 0$ . Note that  $e^B(t^T) = \frac{\delta^S}{k}(t^T - t^B(t^T)) = 0$  because the constraint  $t = \tau$  means both that  $t^B(t^T) = \tau$  and  $t^T$  cannot be higher than  $\tau$ .

$$\tau^C \equiv \arg \max_{\tau} \{W^L(t = t^B(t^T), e^S = e^B(t^T), \tau, \tau^* = \tau, \cdot) : IC^C; t = \tau\} \quad (23)$$

When large countries are sufficiently patient their  $IC$  in the MTL do not bind and the only difference between the program for  $\tau^{EX}$  in (17) and the one for  $\tau^C$  in (23) is that in the latter the constraint  $t = \tau$  binds because the PTA is welfare improving at any given multilateral tariff.

$\therefore$  since (23) and (18) are equivalent we have  $W^L(\tau^{EX}, \cdot) > W^L(\tau^C, \cdot)$  for  $\delta^S > 0$ .  $\square$

To prove parts *i.b.* and *ii* of proposition 4 it is useful to restate the proposition in a form that is exactly equivalent to the text:

*When large countries are sufficiently patient and Small is not sufficiently patient it prefers the PTA regime.*

*When large countries are sufficiently patient and Small is sufficiently patient:*

(i) *it prefers the PTA regime if the PTA under  $\tau^{EX}(\delta^S)$  is not duty-free ( $W^{EXS} > W^{CS}$ ).*

(ii) *there exists a  $\delta^S \in (p_\tau, 1)$  s.t. Small prefers the commitment regime if the PTA under  $\tau^{EX}(\delta^S)$  is duty-free ( $W^{EXS} < W^{CS}$ ).*

We show that a necessary and sufficient condition for  $W^{EXS} > W^{CS}$  is:

$$\delta^S < 1 - \frac{(\tau^{EX} - \tau^C)(1 - p_\tau^L)}{\tau^{EX} - t^B(\tau^{EX})} = \begin{cases} 1 & \text{when the PTA at } \tau^{EX} \text{ is not duty-free} \\ p_\tau^L + \frac{\tau^C}{\tau^{EX}}(1 - p_\tau^L) < 1 & \text{when the PTA at } \tau^{EX} \text{ is duty-free} \end{cases}$$

Moreover,  $\delta^S < p_\tau^L$  is a sufficient condition for  $W^{EXS} > W^{CS}$  since  $\min(1 - \frac{(\tau^{EX} - \tau^C)(1 - p_\tau^L)}{\tau^{EX} - t^B(\tau^{EX})}) \geq p_\tau^L$ . Where  $p_\tau^L \equiv \partial p_l^L / \partial \tau$  and all the prices in the expressions immediately above and below correspond to *Large's* import good,  $l$ , so we drop the subscript.

$$\begin{aligned} W^{EXS} - W^{CS} &= \left\{ \frac{H}{k}(p^L(\tau^{EX}) - t^B(\tau^{EX})) - H e^B(\tau^{EX}) \right\} - \frac{H}{k}(p^L(\tau^C) - \tau^C) \\ &= \frac{H}{k}(p^L(\tau^{EX}) - t^B(\tau^{EX}) - (p^L(\tau^C) - \tau^C) - \delta^S(\tau^{EX} - t^B(\tau^{EX}))) \\ &= \frac{H}{k}(p^L(\tau^{EX}) - p^L(\tau^C) - (\tau^{EX} - \tau^C) + (\tau^{EX} - t^B(\tau^{EX}))(1 - \delta^S)) \\ &= \frac{H}{k}((\tau^{EX} - t^B(\tau^{EX}))(1 - \delta^S) - (\tau^{EX} - \tau^C)(1 - p_\tau^L)) \end{aligned}$$

In the first line we use (5); in the second we use  $IC^S$  from the proof of proposition 1 to substitute  $e^B$ ; in the third we add and subtract  $\tau^{EX}$ . The fourth line follows from the linearity of prices in tariffs that implies  $p^L(\tau^{EX}) - p^L(\tau^C) = (\tau^{EX} - \tau^C)p_\tau^L$ . Solving for  $\delta^S$  we obtain  $\delta^S < 1 - \frac{(\tau^{EX} - \tau^C)(1 - p_\tau^L)}{\tau^{EX} - t^B(\tau^{EX})}$ .

$\therefore$  when the PTA is not duty-free at  $\tau^{EX}$  then  $\tau^{EX} = \tau^C$

$\Rightarrow \delta^S < 1$  is necessary and sufficient for  $W^{EXS} > W^{CS}$ .

$\therefore$  when  $t^B(\tau^{EX}) = 0$  then  $\tau^{EX} > \tau^C$

$\Rightarrow \delta^S < 1 - \frac{(\tau^{EX} - \tau^C)(1 - p_\tau^L)}{\tau^{EX}} = \{p_\tau^L + \frac{\tau^C}{\tau^{EX}}(1 - p_\tau^L)\} \in (p_\tau, 1)$  is necessary and sufficient for  $W^{EXS} > W^{CS}$

thus a  $\delta^S \in (p_\tau, 1)$  exist s.t. *Small* prefers the commitment regime.  $\square$