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ABSTRACT

The Clash of Liberalizations: Preferential vs. Multilateral Trade Liberalization in the European Union*

There has been an explosion in the number of preferential trade agreements (PTAs) in the last decade. PTAs are characterized by liberalization with respect to only a few partners and thus, they can potentially clash with and retard multilateral trade liberalization (MTL). Despite this important concern with PTAs, there is almost no systematic evidence on whether they actually affect MTL or not. We model the effect of PTAs on MTL and show that PTAs slow down MTL unless they have a common external tariff and allow for internal transfers. Next, we use detailed data on product-level tariffs negotiated by the European Union in the last two multilateral trade rounds to structurally estimate our model. We confirm the main prediction – the European Union's PTAs have clashed with its MTL – and find that the effect is quantitatively significant. Moreover, we also confirm several auxiliary predictions of the model and provide new evidence on the political economy determinants of MTL in the European Union.

JEL Classification: D78, F13, F14 and F15
Keywords: MFN tariff concessions, multilateral trade negotiations and preferential trade agreements

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1 Introduction

Over 130 preferential trade agreements (PTAs) were formed in the last ten years–more than in the previous 50 years combined. Nearly all countries are currently members of at least one PTA and nearly a third of world trade is carried out under such agreements. Although most economists favor multilateral trade liberalization (MTL), there is no such consensus on the desirability of preferential liberalization. The original concern with PTAs was their ambiguous effect on welfare: positive if the preferential partner is more efficient than the rest of the world but negative otherwise (Viner [1950]). During the late 1980s and early 1990s, MTL was stalled while the United States and the European Union pursued PTAs, generating much debate on whether PTAs are a "building block" or a "stumbling block" towards MTL (Bhagwati [1991]). This issue is also prominent in the current multilateral round since several developing countries fear that MTL will erode the preferences provided to them.[1]

An important source of concern with PTAs is that they can hurt non-members. One direct channel by which this occurs is if the PTA members divert their import demand away from the non-members and this effect is large enough to reduce non-members' export prices. There is evidence of trade diversion and also some direct evidence that PTAs do lower export prices for non-members.[2] This and other costs to the non-members due to discrimination disappear if the preference is fully eroded by MTL. Thus, it is crucial to determine if PTAs hold back MTL and entrench these costs, particularly given that two thirds of world trade is still not covered by any preferences. After much debate there is still no theoretical consensus about and scant empirical evidence of a "clash of liberalizations". We provide evidence of such a clash during the last multilateral trade round by using product-level protection data to estimate a model of the interaction of preferential and multilateral liberalization.

Most of the early theory analyzing the effects of PTAs on MTL assumed that MTL implied free trade. Therefore, the research focused on how PTAs affect the binary choice between free trade and no MTL and it effectively asked whether PTAs made a multilateral trade round more or less likely.[3] Assuming that a round leads to free trade and focusing on its probability simplifies the analysis but generates predictions that are nearly impossible to test because these rounds are so infrequent. Moreover, countries can choose to conclude a multilateral round with considerable liberalization or one with nearly none. Thus, the focus should be on whether PTAs affect the change in multilateral tariffs and not simply the probability of a round.[4]

The model we develop, which builds on Limão (2002), captures key features of the multilateral system and of recent PTAs and generates several specific predictions that we test. The main one is that multilateral tariffs are higher on products that a country imports duty-free from preferential partners than on an otherwise similar good. The basic intuition for this result is the following. Suppose the European Union (EU) offers a preferential duty-free access in a set of products to a certain country. The

[1] The latest round was launched in 2001 and according to a recent article in the leaders section of the *Economist* magazine, a key factor that may lead to its collapse is that "Poor countries with preferential access to rich world markets want to make sure that freer trade will not reduce these preferences" ("Talking the Talk", July 17th 2004, p.14). However, the *possibility* that these preferences would reduce MTL is not new: it was a concern raised when the generalized system of preferences to developing countries was originally proposed (Johnson [1967], p. 166).

[2] Chang and Winters (2002) find that Mercosur caused lower export prices for non-members. Romalis (2004) provides evidence of trade diversion for the North American Free Trade Area and its predecessor between the US and Canada.

[3] Krishna (1998) argues that PTAs reduce the likelihood of a multilateral round because the export rents generated by PTAs disappear when countries liberalize multilaterally and so the producers that benefit from those rents will oppose MTL. Levy (1997) shows that the median voter may reject multilateral free trade after voting for a PTA, even though she would have accepted it, if no PTA had been available.

[4] Bagwell and Staiger (1998b) analyze two opposing effects of PTAs on the equilibrium multilateral tariff *level* in a self-enforcing model. They show that PTAs are a stumbling block if countries are very patient and a building block otherwise. Another approach to the PTA vs. MTL issue is due to Krugman (1991) who analyzes the welfare path for exogenously expanding trading blocs, which Bond and Syropoulos (1996) also analyze. Winters (1999) surveys this literature. Several articles in the July 1998 issue of the *Economic Journal* address various aspects of the regionalism vs. multilateralism issue. See, for example, Bagwell and Staiger (1998a).

latter benefit from facing a lower tariff than their competitors and the fact that the EU signs the PTA indicates that its member governments value it at given multilateral tariffs. If the EU eliminated its multilateral tariff on that same set of products, it would effectively eliminate the PTA that it valued. We show that this additional cost of MTL is only present for the subset of PTA goods and affects multilateral tariff levels only when the preferential tariff is already zero since otherwise, the preferential tariff can be reduced to maintain the preferential margin. The model also predicts that, if there is a common external tariff and the ability for direct cash transfers–generally present when there is a common tariff–then no stumbling block effect appears. This occurs because the EU can now offset any reduction in preferential margins due to MTL through a direct transfer to the preferential partner.

We estimate the model's structural equation for the equilibrium trade policy using detailed data, at the level used in the negotiation, for thousands of products imported by the EU. There are several compelling reasons for focusing on the EU to analyze whether there is a clash of liberalizations. First, a key concern with PTAs is their potential to harm non-members. Given that the EU is the world's largest trader, its trade policy surely affects non-members. Second, as we discuss below, the EU's preferential agreements are quite diverse, which allows us to theoretically derive and test a rich set of predictions. Finally, although the EU accounts for a fifth of world trade, there is hardly any empirical evidence on the formation of the EU's trade policy in general and none that analyzes how its PTAs affect its MTL.[5]

We find that the EU's PTAs generated a stumbling block for MTL in the last trade round. More specifically, the EU reduced its multilateral tariffs on goods not imported under PTAs by almost twice as much as on its PTA goods, as predicted by the model. We ensure that the results are robust to reverse causation and other possible sources of endogeneity by employing an IV-GMM estimator and testing for the exogeneity of different variables and the validity of their instruments. The stumbling block effect we estimate is stronger for goods that were exported by all of the EU's PTA partners. Moreover, the effect is not present for goods with a positive preferential tariff nor in agreements with a common external tariff and transfers, which are two important auxiliary predictions from our model. Various robustness tests provide further support for the baseline estimates.

The results are also economically significant. The estimates imply that the average price effect due to the EU's multilateral tariff changes was only about half for PTA goods relative to other goods. Moreover, according to the theoretical model, our estimate represents not only the current wedge in the tariffs between PTA and non-PTA goods but also what the actual tariff wedge for this set of PTA goods would be relative to the counterfactual where the EU has no preferences for that *same* set of goods. That wedge is about 1.5 percentage points whereas the current average tariff for PTA goods in our sample is 4.7 percent. This evidence along with the stumbling block effect estimated for the US in Limão (2005) suggest that we should be concerned about a "clash of liberalizations".[6]

Reciprocity is a key feature not only of our model but also of the leading economic theory of the GATT (Bagwell and Staiger [1999]). Although reciprocity is supposed to be an important principle in multilateral negotiations, some economists question whether it is followed in practice (Finger, Reincke, and Castro [1999]). We empirically model the multilateral negotiation process and address the endogeneity

[5] Constantopoulos (1974) and Riedel (1977) examine determinants of industry level protection of individual members before accession to the EU. Tavares (2001) analyzes the determinants of the EU's common external tariff, also at the industry level. We are not aware of any paper that either estimates the determinants of protection for the EU at the product level or does so structurally.

[6] It is possible that, in other countries, PTAs lead to lower protection against non-members. Foroutan (1998) finds lower average MFN tariffs for Latin American countries with PTAs after the Uruguay Round. She agrees that no causality can be drawn from such a correlation because those countries were moving away from import substitution during the 90's, which implied considerable unilateral liberalization independently of any effects from PTAs. This issue of causation is partially addressed by Bohara, Gawande and Sanguinetti (2004) who estimate that the Argentine unilateral tariffs were lower in *industries* where the value of imports from Mercosur to value added in Argentina was highest. Neither paper models MTL in the context of a trade round so, even if we set causation issues aside, there is no systematic evidence that PTAs lead to more MTL. Even if such evidence is found for Latin American and some other countries, it will be difficult to overturn the concern that PTAs slow down MTL because the current evidence supports this conclusion for two of the largest traders, the EU and the US, which have generally been the focus of the controversy.

issue associated with reciprocal tariff reductions. Our estimates indicate that reciprocity was followed: the EU's tariff reductions were largest for products exported by countries that provided greater increases in market access. Finally, we model and provide novel evidence of the EU's internal political economy determinants of trade policy. The EU places some, but not much, additional weight on producer than consumer welfare. In this respect our findings are similar to structural estimates of the Grossman-Helpman (1994) model that also find small values for the US.[7]

The paper is organized as follows. We start with a brief description of the EU's trade policy formation that guides the theoretical and empirical modelling. In section 3 we model the interaction between PTAs and MTL and derive the main results. In section 4 we first discuss the predictions and our strategy for empirical identification and then analyze and quantify the estimation results. In the final section we summarize the main results and discuss their implications. All proofs as well as data sources and construction details are in the appendix.

2 The European Union's trade policy

Before the expansion in 2004, the EU's membership was composed of 15 countries that accounted for one third of the world output and more than 20 percent of world trade. The EU succeeded the European Communities that started in the 1950s as a customs union. Currently, its members form a single market with free movement of goods, services, capital, and labor. There is also a very strong element of cooperation in non-trade policies, particularly in issues with regional spillovers such as immigration, environment, development of poorer regions, foreign policy and judicial matters.

The key actors in the formation of EU trade policy are the European Commission and the Council. The Commission proposes, negotiates and enforces trade policy on behalf of the members. The Council, where each member's government is represented, is the decision maker with the power to approve or reject the Commission's proposals for trade policy negotiations and their eventual outcome. That is, the Council is decisive in approving the common external tariff that the Commission negotiates in multilateral trade rounds as well as any preferential treatment it negotiates with non-EU members.[8]

The EU's expansion of preferential trade treatment has occurred both through increased membership—initially 6 and currently 25 countries–and through numerous PTAs with non-members. In the appendix, we provide some details about the latter (including their abbreviations)–here we note only a few key points. First, several of the EU's PTAs do not require the partner to lower their tariffs. Second, many of these PTAs, e.g. preferences to developing countries through GSP and ACP, seek, and at times explicitly require, cooperation in non-trade issues such as labor standards, human rights, migration control, and combat against drugs. The PTAs with the Mediterranean countries are also similar in nature and historically established ties aimed at addressing issues with regional externalities, such as immigration, matter.[9] These features are explicitly captured by our model. Several of the countries that benefit from preferential treatment fear that MTL on the part of the EU will erode these preferences. Thus, they have at times opposed to MTL but the EU itself has used the same argument to avoid liberalizing, which is central to our model.[10]

[7] See Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000).

[8] After 1987 the Commission gained greater control and the veto power of individual countries in the Council was replaced with qualified majority voting. Consequently, some interest groups have also started lobbying the Commission directly. However, even after 1987, industry associations continued to favor lobbying their own government as opposed to the Commission (Hayes [1993]). Thus, our assumption in section 3.1 that lobbying works through governments is a reasonable one. The European Parliament is regularly informed on trade policy by the Commission and is also involved by giving "assent" on major treaty ratifications that cover more than trade For details see <http://europa.eu.int/comm/trade/index_en.htm>

[9] According to Jackson (1997, p.160) "during the last twenty-five years or so the experience of the GSP in the GATT system has been that ... the industrialized countries often succumb to the temptation to use the preference systems as part of 'bargaining chips' of *diplomacy*." The conditionality of EU's concessions in exchange for cooperation has further been documented for instance in Grilli (1997).

[10] For example, in 2000 the European Commission argued that a cut in the price support of about 25 percent in EU sugar

In the estimation we also consider the remaining preferences the EU had in place before the Uruguay Round (UR): to EFTA members that did not eventually join the EU and to some Central and East European economies. These did involve reciprocal trade preferences. However, the East European countries had to comply with several side conditions, e.g. environmental regulations. For the EU the benefits of these side conditions along with the political integration in Western Europe, likely outweighed the preferential treatment provided to EU exports.[11] A similar argument applies to the accession of Greece, Spain and Portugal to the EU. So our model will focus on this exchange of preferences on the part of the EU for cooperation in non-trade issues, appropriately modified in the cases of accessions where a common external tariff is applied.

3 Theory

In this section we show how PTAs can induce higher MFN tariffs and derive the structural equations that we estimate. The model captures key features of the EU's PTAs previously described by extending Limão (2002) along several important dimensions. First, we model a political economy motive for the use of tariffs, which is an important determinant of the cross-sectional tariff structure. Second, we allow for a more general trading pattern and, more importantly, for different types of PTAs. The PTAs we consider differ on whether they involve a common external tariff and allow for direct cash transfers across members, which enables us to test alternative important hypotheses relevant for the different types of agreements signed by the EU.

3.1 Model

Each of the two symmetric regional blocs we model is composed of two economies, L and S. We normalize labor units such that each of the H individuals in each country is endowed with one unit of labor–the only factor of production. The numeraire good is produced with labor according to a constant returns to scale production process. We normalize the price of the numeraire to one, which is identical in all countries.

In L, some individuals are endowed with X_i units of at most one of the non-numeraire goods indexed by i. Thus, there are $2I+1$ types of individuals indexed by their endowment where the "extra" individual type is not endowed with any good, just labor. An individual's income sources are the wage, the value of the endowment and net taxes. The population is sufficiently large so that the numeraire good is always produced in equilibrium, which fixes the wage at unity–labor's marginal revenue productivity in the numeraire sector.

We label the goods in increasing order of L's endowment–from $i = 1$ to $2I$. Denoting the variables for the other regional bloc with an "*", the "mirror" symmetry assumption implies that the endowment of L^* is biggest for $i = 1$. Thus, L imports $i \in [1, I]$ from L^* and exports $i \in [I + 1, 2I]$. We assume that all H individuals in S are identical and that S is endowed with X_i^s of $i \in [1, s]$ where $s \leq I$.[12] Aggregate demand in S is $D_i^s < X_i^s$ for $i \in [1, s]$, and it is fixed and positive up to some price level $\bar{p}_i$ and zero otherwise. Hence S exports $i \in [1, s]$ in exchange for the numeraire.[13] To simplify exposition we focus on the case where net exports from S are price inelastic and thus the main effect of the preference is an income transfer from L to S in the form of higher export prices. However, the qualitative results are

was not tenable because it would cause an income loss of 250 million euros to ACP countries, some of whom export sugar to the EU under preferential treatment. European Commission (2000), "Commission Proposes Overhaul of Sugar Market," Brussels, October 4th 2000, IP/00/1109.

[11] See Winters (1993) for details on the EU's Eastern European programs.

[12] One possible justification for employing a representative agent and not modeling a motivation for S to impose tariffs is that the trade policy of the countries that we consider as PTA partners for the EU often has a negligible effect on the issue that we will address.

[13] Symmetrically, S^* exports $i \in [2I - s, 2I]$.

similar if we relax this elasticity assumption, as we show in Karacaovali and Limão (2005).[14]

Country L sets specific tariffs τ_i on the imports from L^* and a preferential tariff $\pi_i \leq \tau_i$ on S. The equilibrium domestic price in L for its imports, p_i, is then derived from the market clearing condition:

$$M_i(p_i) + M_i^*(p_i - \tau_i) + M_i^s = 0 \quad \text{for } i \in [1, I] \tag{1}$$

where $M_i(.) \equiv D(p_i) - X_i$, $M_i^*(.) \equiv D^*(p_i - \tau_i) - X_i^*$ and $M_i^s \equiv D_i^s - X_i^s$ are the import demand functions for L, L^* and S respectively ($i \in [1, s]$ for S).[15] A similar condition holds for goods $i \in [I+1, 2I]$ imported by L^*. These conditions implicitly define the domestic prices in L and L^* as functions of the tariffs–$p_i(\tau_i)$ for $i \in [1, I]$ and $p_i^*(\tau_i^*)$ for $i \in [I+1, 2I]$. Note that because the net export supply of small countries are price inelastic, the equilibrium prices p_i and p_i^* are not directly affected by preferential tariffs. It is then simple to show that an increase in τ_i raises p_i, whereas an increase in τ_i^* lowers the price for L's exporters.[16]

In the absence of export subsidies the only trade taxes set by L^* that affect L are its tariffs and we can think of the import sectors in each country as the only ones potentially "favored" by the governments. Since we also assume that any individual endowed with a non-numeraire good represents a negligible share of the population, it is reasonable to focus on a case where those individuals lobby their respective governments only for policies in their own sector.[17] Therefore, the government in L sets the trade policy to maximize the following political support function

$$G(\boldsymbol{\tau}, \boldsymbol{\pi}, \boldsymbol{\tau}^*, e, e^s) \equiv H\left(1 - e + \Psi(e, e^s) \ + \sum_{i=1}^{I} \upsilon_i(p_i(\tau_i)) + \sum_{i=I+1}^{2I} \upsilon_i(p_i(\tau_i^*))\right) \tag{2}$$
$$+ TR(\boldsymbol{\tau}, \boldsymbol{\pi}) + \sum_{i=I+1}^{2I} p_i(\tau_i^*) X_i + \sum_{i=1}^{I} \omega_i p_i(\tau_i) X_i$$

where $1 - e$ represents the wage income net of the per capita tax used to finance the provision of a public good in L, which is valued according to a subutility $\Psi(.)$. This function is concave in both the local provision and the provision by S, captured by e^s. The consumer surplus is $\upsilon_i(.)$ and $TR(.)$ represents the tariff revenue, which we specify in the appendix.[18] The last two terms represent a weighted value of endowments, where $\omega_i \geq 1$. If $\omega_i = 1$ for all i, the objective reduces to a standard social welfare function. Therefore, $(\omega_i - 1)$ represents the additional weight the government places on individuals endowed with an import good.[19]

An important issue that arises when we apply the model to the EU is whether (2) represents the objective of an individual government or a joint objective, as maximized by an EU-wide institution. In Karacaovali and Limão (2005) we show that (2) can be obtained as the objective for the EU that arises from bargaining between independent EU-member governments–a fair representation of the EU's trade

[14] For some of the agreements that we analyze, assuming that the changes in trade flows between L and S do not drive L's trade policy is not only analytically convenient but also plausible, since the additional exports from a small partner to the EU are unlikely to amount to a large share of the EU's total imports. In our data those values for 1994 were 13% for the GSP, 5% for EFTX, 2.7% for MED, and 1.4 % for CEC. GSPL and ACP account for less than 0.5 %.

[15] Since export subsidies are generally not permitted by the WTO, we abstract from them. So the domestic price in L^* of a good it exports is simply the price in L net of the tariff, $p_i - \tau_i$.

[16] By implicitly differentiating (1), we find that $\partial p_i(\tau_i)/\partial \tau_i \in (0, 1)$ and $\partial p_i(\tau_i^*)/\partial \tau_i^* \in (-1, 0)$. The balance of payments condition is satisfied through movements of the numeraire good.

[17] Individuals have a quasilinear utility function, $U \equiv c_0 + \sum_{i=1}^{2I} u(c_i) + \Psi(e, e^s)$ and hence $d(p_i) = u'(p_i)^{-1}$. Throughout we focus on a quadratic form of the subutility, $u = (ac - c^2/2)/b$, which gives rise to linear demand curves and implies that $\upsilon = (a - bp)^2/2b$. Aggregate demand is simply $D = Hd(.)$.

[18] 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 L separable.

[19] This is a reduced form that can be obtained as a special case from a model where lobbying is given micro-foundations, such as in Grossman and Helpman (1994), provided that in that model the ownership of the specific factors is concentrated.

policy formation, as we describe in section 2. The weight in (2) can then be interpreted as an average of individual member weights, $\omega_i = \sum_k \omega_i^k \xi_i^k$, where ξ_i^k is the production share of the EU member k in i. This point will also be important in the empirical section because it will provide us with the correct way of aggregating the data for the member countries.[20]

3.2 Preferential vs. multilateral trade liberalization

3.2.1 MFN tariffs in the absence of preferences

We first derive the MFN tariff rate that results when PTAs are not allowed.[21] This benchmark tariff plays an important role in the empirical estimation because, as we show, it is also the equilibrium rate for the subset of products in which S either does not export or receive any preferences even when PTAs are already pursued. This subset of goods will be our control group in the estimation.

Following Bagwell and Staiger (1999), we model the main motive for reciprocal trade liberalization in the WTO as a cooperative outcome between countries that gain from overcoming a terms-of-trade externality. Accordingly, most of the negotiations occur between large countries and follow what is known as the principal supplier rule: if, for a given product, country L is the largest exporter to L^*, then L^* proposes a tariff reduction to L on that product in exchange for L's tariff reduction on L^*'s exports to L. The MFN rule then requires this reduction to be extended to all other WTO exporters of similar goods. Given that both the EU and the rest of the world are several times larger than most of the EU's individual PTA partners we take L and L^* as the principal suppliers. In the estimation section we relax this assumption.

In the absence of PTAs, L and L^* choose their multilateral tariffs to maximize their joint objective. Given the symmetry between them, it is sufficient to focus on one and, since the problem is stationary, we can concentrate on maximizing L's objective within each period. Thus, after imposing the symmetry condition that tariffs in the respective import sectors are equal, $\boldsymbol{\tau}^* = \boldsymbol{\tau}$, the equilibrium multilateral tariffs in the absence of a PTA are given by[22]

$$\boldsymbol{\tau}^m \equiv \arg\max_{\boldsymbol{\tau}} \{G(\boldsymbol{\tau}^* = \boldsymbol{\tau}, \boldsymbol{\pi}, e^s = 0, .) : \boldsymbol{\pi} = \boldsymbol{\tau}\} \tag{3}$$

where the constraint precludes preferential tariffs, i.e. $\boldsymbol{\pi} = \boldsymbol{\tau}$. For simplicity, throughout our analysis we abstract from potential enforcement problems between L and L^* in setting multilateral tariffs by assuming they are sufficiently patient such that their incentive compatibility constraints for MTL do not bind.[23] Given the additive separability of the effect of different goods on the objective function in (2) and the symmetry across regional blocs, the tariff for good i is independent of L's MFN tariffs in other goods. Therefore, the expression for the MFN tariff below–derived in the appendix–applies to any good that is not subject to a preference, i.e. whenever $\tau_i = \pi_i$, and whether PTAs are allowed or not.[24] We derive the advalorem equivalent of tariffs as they are the focus of our empirical work, i.e. $t_i^m = \tau_i^m / p_i^*$,

[20] To obtain (2) as the EU objective we assume: (1) identical preferences across union members; (2) no trading costs within the union so the same prices hold for all; (3) different populations and endowments are allowed provided that the set of import sectors (broadly defined) is identical and so import taxes are chosen on similar industries; (4) the Council chooses EU trade policies and e to maximize total surplus $\Sigma_c G^c(.)$ and then bargains over any bilateral transfers; (5) numeraire transfers are possible across members and subject to bargaining; (6) the regional good financed by the EU is valued by each individual in its totality. Note that there is an interesting question of which is the optimal country in the union to decide on the common tariff (Syropoulos [2002]), which we do not address because in the EU this decision is better captured by assumption 4 above.

[21] This will also be the equilibrium rate if L does not want to pursue a PTA, e.g. if it did not value the regional public good.

[22] The tariff vectors are respectively $\boldsymbol{\tau}^* = (\tau_{2I}^*, \tau_{2I-1}^*, ..., \tau_{I+1}^*)$ and $\boldsymbol{\tau} = (\tau_1, \tau_2, ..., \tau_I)$.

[23] The incentive compatibility problem arises because countries have market power in trade and thus an incentive to cheat and increase their tariffs. For a detailed analysis of the issues that arise when these constraints do bind, see Limão (2002).

[24] Symmetry across countries allows us to focus on reciprocity across pairs of symmetric goods. In general, reciprocity occurs across sets of goods, which we will take into account in the estimation.

which, according to the FOC of the program above, is equal to

$$t_i^m = (\omega_i - 1)\frac{X_i/M_i}{\varepsilon_i} + \frac{M_i^s}{M_i^* + M_i^s}\frac{1}{\varepsilon_i^*} \tag{4}$$

The import demand elasticity for L is denoted by ε, whereas the foreign export supply elasticity it faces is ε^*.[25] If good i is not exported by the regional partner, i.e. if $M_i^s = 0$, this expression is similar to several political economy models (Helpman [1997]). The tariff is increasing on the political economy weight, ω, and the inverse of the import penetration ratio, X/M. This value is weighted by the import demand elasticity for standard Ramsey taxation reasons. The last term represents an MFN externality effect and leads to higher tariffs. It arises if S does not participate in MTL directly, because the MFN clause requires L and L^* to lower their tariffs on imports from all partners even if some did not reciprocally lower their own tariffs. This effect disappears either if L has no market power in good i, $1/\varepsilon_i^* = 0$, or the share of S in L's total imports of i is negligible.

3.2.2 MFN tariffs in the presence of preferences

We first model how the preferential tariff is chosen and then determine its effect on multilateral tariffs. The PTA between L and S is characterized by a bargaining solution where L grants a preferential tariff, $\boldsymbol{\pi} \leq \boldsymbol{\tau}$, in exchange for an increase in S's provision of the regional public good. To capture the asymmetry in size and bargaining power between the EU and its PTA partners we allow L to make a take-it-or-leave-it offer to S. In a one-shot interaction both countries have an incentive to cheat but cooperation can be sustained through repeated interaction. This implies that L's offer extracts as much of the bargaining surplus as possible up to the point where S's incentive compatibility constraint is just binding.

Since we did not model a trade policy motivation for S, the "political support" function it maximizes is identical to its total welfare: labor income net of taxes, endowment value and consumer surplus.

$$G^s(\boldsymbol{\pi}, \boldsymbol{\tau}, e^s) \equiv H(1 - e^s) + \sum_{i=1}^{s \leq I} [(p_i(\tau_i) - \pi_i)X_i^s + (\bar{p}_i - p_i^{sd})D_i^s] \tag{5}$$

where $p_i^{sd} = p_i(\tau_i) - \tau_i$ is the consumption price in S and, for simplicity, we focus on the extreme case where it places no weight on the activity that is valued by L, so it simply enters as a cost, He^s.

The incentive compatible level of e^s is obtained by requiring the current gain to S from deviating, i.e. setting $e^s = 0$, not to exceed the foregone gains from cooperation due to the PTA. Assuming for simplicity that S exports only good 1, the equilibrium condition for e^s under a PTA with no CET is obtained from $G^s(\boldsymbol{\pi}, \boldsymbol{\tau}, e^s = 0) - G^s(\boldsymbol{\pi}, \boldsymbol{\tau}, e^s) \leq [\delta/(1-\delta)] \times [G^s(\boldsymbol{\pi}, \boldsymbol{\tau}, e^s) - G^s(\boldsymbol{\pi} = \boldsymbol{\tau}, \boldsymbol{\tau}, e^s = 0)]$, where $\delta \in (0, 1)$ represents S's discount factor and we use the fact that τ will be the threat level of the tariff used by L if S stops cooperating.[26] When S is a WTO member, the highest credible threat tariff that L can use is to revert to the MFN tariff, τ, as required by WTO rules. Then, using (5), we obtain the equilibrium bargaining level of e^s for a given preferential margin, $\tau_1 - \pi_1$, as

$$e^b = \delta(\tau_1 - \pi_1)X_1^s/H \tag{6}$$

[25] Both of these are evaluated at the equilibrium tariff. Their definitions are $\varepsilon \equiv -M'p^*/M$ and $\varepsilon^* \equiv [\partial(M^* + M^s)/\partial p^*] \times [p^*/(M^* + M^s)]$. Note that import demand elasticities are typically estimated with respect to the domestic price but we define it slightly differently for the purpose of the model discussion and derivations. However, our empirical implementation will take this into account explicitly. See section A.2 for details.

[26] The MFN tariffs are set on the assumption that S accepts a PTA and will not deviate. Moreover, if it does, L removes the preference and sets its tariff equal to τ, the multilateral tariff originally agreed upon with L^*. That is we assume that after a deviation by S, L and L^* do not renegotiate their MFN tariffs. An alternative is to assume that after a deviation by S the MFN tariff implemented is changed to τ^m. This introduces some changes but similar qualitative results can be obtained regarding the stumbling block effect. In practice, we think our assumption is more realistic since there are costs to re-adjusting MFN tariffs between rounds which may lead governments not to do so.

The amount of tax that S collects to supply the regional public good is proportional to the revenue transfer from L due to the preference. Given the additive separability of the objective function in (2), the tariffs for goods other than $i = 1$ are specified by (4). The MFN constraint is now relaxed, $\pi \leq \tau$, and the preferential tariff is optimally chosen taking into account the fact that it will affect e^b. Hence, the equilibrium MFN and preferential tariffs are given by

$$\{\tau^{mp}, \pi^p\} \equiv \arg\max_{\tau,\pi}\{G(\boldsymbol{\tau}^* = \boldsymbol{\tau}, \boldsymbol{\pi}, e^s, .) : \pi \leq \tau; e^s = e^b\} \tag{7}$$

which we use to derive the equilibrium advalorem MFN tariff rate, $t_i^{mp} = \tau_i^{mp}/p_i^*$.[27]

$$t_i^{mp} = (\delta G_{e^s}/H - 1)\frac{X_i^s}{M_i p_i'}\frac{1}{\varepsilon_i} + (\omega_i - 1)\frac{X_i/M_i}{\varepsilon_i} + \frac{M_i^s}{M_i^* + M_i^s}\frac{1}{\varepsilon_i^*} \tag{8}$$

To compare this with the tariff if PTAs were forbidden, t_i^m, we take their difference and evaluate at t_i^m. This yields a non-negative term that captures the potential for a stumbling block effect of a PTA:

$$t_i^{mp} - t_i^m = [(\delta G_{e^s}/H - 1)\frac{X_i^s}{M_i p_i'}\frac{1}{\varepsilon_i}]_{t_i = t_i^m} \geq 0 \tag{9}$$

To interpret and sign this term, we first note that $1/M_i p_i' \varepsilon_i$ is positive, so the sign depends on $(\delta G_{e^s}/H - 1)X_i^s$. From (6) we obtain $\partial e^b/\partial \tau_i = -\partial e^b/\partial \pi_i = \delta X_i^s/H$ and from (2) we have $G_\pi = X_i^s$. Therefore, $(\delta G_{e^s}/H - 1)X_i^s = -(G_\pi + G_{e^s}\partial e^b/\partial \pi)$. The last expression is simply the first order condition for π_i, which is positive if the optimal preferential tariff rate, π_i^p, is zero at τ_i^m. That is, if we are at a corner solution in the PTA, where L would like an increase in e^s but cannot lower π further because it is already at zero. In this case L has an incentive to increase the MFN tariff above τ_i^m.[28]

The intuition for the stumbling block effect is straightforward. When the marginal benefit of S increasing e^s is higher for L than the cost in terms of the foregone tariff revenue, L would prefer to increase the preferential margin given to S and it initially does this by reducing the preferential tariff. However, once the preferential tariff is at zero, the preferential margin can only be increased by raising the MFN tariff.[29]

3.2.3 Common external tariff and direct transfers for cooperation

Most results on PTAs depend on whether they have a CET.[30] Given that between the Tokyo and Uruguay Rounds–the period we analyze in the empirical work–the EU expanded to include new members that share its CET, we analyze the effect of such accessions on MTL.

The use of a CET raises the practical issue of how the tariff revenue is to be distributed over the different countries, e.g. if all goods enter the EU via one port, does that country receive all the revenue? This requires PTAs with a CET to agree to revenue transfer mechanisms. Therefore, one key difference relative to other PTAs is the existence of a mechanism for transfers, which L can use to "purchase" the

[27] See the appendix for this derivation.

[28] A sufficient condition for a corner solution in the PTA is for L to place sufficient weight on S's provision of the regional good.

[29] The observed preferential tariffs in the real world are everywhere bound at zero, which explains why we model them in this way. However, there is no *conceptual* motive why they can't be negative, i.e. subsidies. Limão and Olarreaga (2005) estimate that switching to import subsidies would generate considerable welfare gains by allowing additional MTL on the part of the EU, US and Japan. They also discuss solutions to potential implementation problems that may explain why these subsidies have not yet been used.

[30] Cadot et al. (1999) argue that "deepening integration is likely to work toward *reinforcing* protectionist pressures against nonmembers" (p. 651) when there is a CET but not necessarily if the PTA has no CET in place. Bagwell and Staiger (1998b) indicate that in the absence of a CET, PTAs would undermine reciprocity and non-discrimination, the main pillars of the multilateral trading system. However, they also show that PTAs with a CET could still be efficient in terms of reciprocity as long as external tariffs are non-discriminatory.

supply of the regional good. We note that the willingness to implement such transfer schemes is often limited, which along with the need to agree on a CET, explains why customs unions are rare relative to PTAs with no CET. The implicit costs in the use of direct transfers explain why we ruled them out in deriving the stumbling block effect in the absence of a CET.[31] However, those countries that can agree to a CET clearly do not face prohibitive costs of direct transfers since they use them to redistribute revenue. So the PTA solution must now explicitly allow transfers.

As we show in the appendix, the stumbling block effect disappears under this case. However, despite the ability to use transfers, a preferential rate may still be used because, for given multilateral tariffs, L is indifferent between a transfer *and* preferential tariff reductions. At a given MFN tariff, the cost for L of a reduction in π is simply the lost tariff revenue, which is no more costly than transferring an equivalent amount in the numeraire good. The difference relative to the PTA without a CET is that now if, at $\pi = 0$, S is still not providing "enough" e^s, the optimal solution is for L to increase the transfer rather than the MFN tariff, since the latter distorts the prices. Thus, in equilibrium we have $\tau^{mcu} = \tau^m$.

4 Estimation

4.1 Predictions and identification

We now derive the model's estimating equation, point out its main predictions and analyze how it is identified. Combining the expression for the MFN tariff rate in a good with, (8), and in one without preferences, (4), we obtain the following:

$$t_i = (\delta G_{e^s}/H - 1)(\frac{X_i^s}{M_i p_i'}\frac{1}{\varepsilon_i})I_i + (\omega_i - 1)\frac{X_i/M_i}{\varepsilon_i} + \frac{M_i^s}{M_i^* + M_i^s}\frac{1}{\varepsilon_i^*} \tag{10}$$

where I_i is an indicator for whether good i is imported from a preferential partner and receives a zero preferential rate. Simplifying the notation by using x_i for $\frac{X_i/M_i}{\varepsilon_i}$ and m_i for $\frac{M_i^s}{M_i^*+M_i^s}\frac{1}{\varepsilon_i^*}$ and dropping the product subscript, we have the econometric model in error form

$$t = \phi I + \beta x + m + u \tag{11}$$

where $E(u|x, m, I) = 0$, $\phi = (\delta G_{e^s}/H - 1)E(\frac{X_i^s}{M_i p_i'}\frac{1}{\varepsilon_i}|x, m, I)$ and $\beta = E((\omega_i - 1)|x, m, I)$. Note that if any good is imported from a preferential partner, then $E(\frac{X_i^s}{M_i p_i'}\frac{1}{\varepsilon_i}|x, m, I) > 0$ and so ϕ is positive if and only if $\delta G_{e^s}/H > 1$, which we showed is the condition for a stumbling block effect. Therefore, the key prediction is that ϕ is positive for goods imported at a duty-free preferential rate from a PTA partner. We also test two other important predictions that, because they are specific to this model, may lend it support. The first one is that $\phi = 0$ for products with a positive preferential tariff. The second one is that the MFN tariff should be equal between non-PTA goods and goods exported by countries that recently entered the EU and have access to transfers.

The theoretical model captures key features of trade policy determination. However, it is parsimonious and possibly not fully specified, e.g. tariffs tend to be highly persistent, which may be due to an unobserved product effect. Such an effect may also influence whether a good receives a preference and generate an omitted variable bias. We address this by estimating the model in changes rather than levels.[32] However, this still allows us to estimate the level of the stumbling block effect, as will become

[31] Using direct transfers may also not be the most efficient way to transfer resources to other countries, as the aid vs. trade literature highlights, or to reward cooperation since the direct transfer may end up in the pockets of a politician without providing the best incentives for cooperation. For example, one of the stated aims of the U.S. in providing preferences to the Andean countries is to raise the relative price to activities other than drug production. Political economy constraints that reduce the effectiveness of direct transfers relative to preferences are present in practice, otherwise we would not observe several of the current preference schemes.

[32] Considering changes over two multilateral rounds in the empirical work is not inconsistent with the theoretical model.

clear. Since the model focuses on MFN tariffs, which the EU changes very infrequently, we take the change as the difference between the MFN tariffs negotiated in the UR and those in place before it, which were largely set during the Tokyo Round.[33] Then, the change for a good i that was not imported under a zero preferential tariff before the Tokyo Round but became so by the time the Uruguay Round was negotiated is

$$\Delta t = \phi I + \beta \Delta x + \Delta m + \Delta u \tag{12}$$

Note that we assume the weights, ω_i, are time-invariant.[34] We also use the fact that for a good i that was not imported under a zero preferential tariff before the Tokyo Round we have $I_{it-1} = 0$ and if it became a PTA good before the conclusion of the UR, then $I_{it} = 1$. Therefore β and ϕ have the same interpretation as in (11). Figure 1 illustrates how this approach identifies the level of the stumbling block effect in the model and thus provides an estimate for what the tariff in the PTA goods would have been in the absence of a PTA. The tariff increase up to the dashed line indicates the stumbling block effect predicted by the model if the preference is duty-free (i.e. $t^{mp} - t^m$). We plot the tariffs for two goods that are similar except that one becomes a PTA good between the Tokyo Round and UR. The EU may choose not to change the bound tariff immediately because this would impose a renegotiation cost (as well as the costs from higher tariffs on EU products that other countries would be allowed to set) but, when the new round occurs, the difference in the reduction in the two products reflects the stumbling block effect[35] (once we condition on the other variables).[36]

One important determinant that is not explicitly reflected in (12) is reciprocity–the extent to which the EU lowered its tariffs in response to other countries' reductions in the UR. Reciprocity is an important principle in WTO negotiations and a basic feature of our theoretical model; it is not fully reflected in (12) because we assumed symmetry across the regional blocs and then solved for the equilibrium tariff expression. By relaxing this assumption and controlling explicitly for reciprocity we minimize the possibility for omitted variable bias and can be more confident that the estimated PTA effect, ϕ, captures the structural effect predicted by the model.[37] We follow Limão (2005) who constructs a measure of market access "concessions" that is consistent with the practice in multilateral tariff negotiations. The variable is defined at the product level as $R_i = \sum_k s_{it}^k [\sum_j w_j^k \Delta t_j^k / t_{jt}^k]$ where $\Delta t_j^k / t_{jt}^k$ is the percentage tariff reduction by a non-EU country k in good j and w_{jt}^k is the import share of good j in total imports of k. Therefore the term in brackets captures country k's average market access concession, which is multiplied by s_{it}^k–the export share of a principal supplier k to the EU as a share of total exports from all

Even though the theoretical model features no *expected* changes in protection after MTL occurs and PTAs are agreed, it does allow for unexpected changes. That is if in a period the production to import ratio or political weights fall, then the equilibrium MFN tariff also falls according to the model. Moreover, although we abstracted from them, once we allow the incentive compatibility constraints of the countries negotiating MTL to bind, then shocks to their discount factors would also change the equilibrium level of MFN tariffs.

[33] Although in theory the EU could have renegotiated specific tariff lines between rounds, the WTO shows no record of such renegotiation between the Tokyo and Uruguay Round.

[34] In Karacaovali and Limão (2005) we relax this assumption, test it and find that it is reasonable.

[35] Note that $t^m - t^{m'}$ is the change in MFN tariffs for a non-PTA good between the two periods; whereas $t^m - t^{mp'}$ is the change for a "new" PTA good. The difference between these two differences gives us the stumbling block effect, i.e. $(t^m - t^{m'}) - (t^m - t^{mp'}) = t^{mp'} - t^{m'} = \phi$.

[36] An alternative explanation for the EU waiting until the UR before changing the MFN tariff is that the initial, higher, MFN tariff may generate a sufficiently large preferential margin so that a zero preferential tariff is not used. This was true of several of the EU's programs before the UR. The reduction of MFN tariffs in the UR however reduces the preferential margin, thus generating the stumbling block effect. In fact the EU did reduce many of its preferential tariffs after the UR precisely for this reason. This can also explain why the stumbling block effect interpretation in (12) applies even to products that were already imported under a preference during the Tokyo Round since if the preferential tariff was positive then $I_{it-1} = 0$. For instance, the preferences have been expanded through a number of revisions for MED, ACP, GSP, EFTX, which are the agreements that initially took effect before the Tokyo Round. These revisions also included new requirements on cooperation relating to human rights and democracy from all recipients (Brown [2002], Raya [1999]). In addition to that, the European Economic Area with EFTA in 1992 provided a much deeper economic integration between partners.

[37] One concern if we did not account for reciprocity is that products exported by PTA partners tend to have fewer non-PTA members trying to extract tariff reductions from the EU. Although this could reasonably be described as an indirect

of the EU's principal suppliers. The prediction is that if k offers relatively larger concessions, then the EU reciprocates through larger MFN tariff reductions in the products it imports from k.

The final issue in deriving the estimating equation is data availability. We do not have a bilateral record of which countries negotiated with the EU on each specific 8-digit product during the trade rounds and therefore cannot construct the exact MFN-externality variable, Δm. However, we proxy for it by using information on the share of small exporters by product, i.e. the share of those countries that are not one of the top-5 exporters in product i to the EU. Increases in this share between the rounds imply that the probability of an MFN-externality increases, since the EU would have to negotiate with more exporters each of whom now has a higher incentive to free-ride. We consider the change in this share between 1994 and 1989, the earliest year when the 8-digit harmonized standard data is reported. If the change in this period is sufficiently large, then it will be positively correlated with the change over the full period between rounds. We attempt to capture this by constructing an indicator variable, P, for whether the change in this share for good i is above the median change.[38] The model then predicts a positive coefficient on this variable.

Introducing the proxy for Δm and augmenting (12) to explicitly account for reciprocity yields our basic estimating equation:

$$\Delta t = c + \phi I + \beta \Delta x + \rho R + \mu P + v \tag{13}$$

where we include a constant term, c, which does not have a structural interpretation.[39] We also modify the error to explicitly allow for any measurement error due to the proxy and reciprocity variables. Even if we were to rely strictly on the orthogonality conditions imposed by the theory, we would have to address new components in the error. Since we are interested in establishing causality, we now discuss how we address potential endogeneity issues in estimating (13).

The preference may depend on MFN tariff changes, e.g. if a PTA partner expects a small MFN reduction in a product, it is more likely to request a preference in it than in a product where it expects a large MFN reduction. To tackle this source of reverse causation, and also the potential bias from using a proxy for the MFN externality variable, we employ instrumental variables. The main instrument for I is another indicator, which is equal to one when a product is imported by the EU from the PTA partner in 1994 regardless of whether it receives a preference or not. This instrument is correlated with I, that is whether a product both receives a preference *and* is imported duty-free from the preferential partner but we expect it to be uncorrelated with the error term since the changes in the MFN tariff we use as a dependent variable are implemented starting only in 1995. The second main instrument for I_i is whether the good was subject to a non-tariff barrier (NTB) set by the EU in 1993 on all countries. A country is more likely to seek a preference in a good if it expects that otherwise it would certainly be subject to an NTB. This effect would be magnified if the country already exports this product, hence we interact this variable with the export indicator as well. Moreover, we will be able to test and verify the exogeneity of the export indicator and NTB variables as instruments because we employ a GMM approach. The set of over-identifying restrictions that allows us to perform these tests arise from including other instruments, such as world price changes between 1992 and 1994, that help to predict if a good was exported in 1994 but are unlikely to depend on the changes in MFN tariffs that take place in subsequent years.

The variable that captures the political economy effect, Δx, is likely to depend on the MFN tariffs since it involves the production/import ratio weighted by the import demand elasticity, all of which are functions of the EU's domestic prices and hence its MFN tariffs. Therefore, we employ the levels of these variables before the MFN tariff is implemented, e.g. 1978 for x_{t-1} and 1992 for x_t. We find some evidence

stumbling block effect, in the sense that it works through reciprocity, it is not the direct effect that we are trying to estimate. By controlling for reciprocity separately, this indirect effect is not reflected in the estimated ϕ.

[38] Although our approach here is mainly driven by the lack of data, we note that focusing on the changes in the years leading up to the round has the advantage that they are likely driven by factors other than the EU's subsequent MTL. The estimation results do not change when we employ 75^{th} or 90^{th} percentiles instead.

[39] If we extended the model to either provide a unilateral motive for the EU's tariff reduction or explicitly analyze the role of increased patience in its MTL incentive constraints, we could provide a structural interpretation for the common term.

of endogeneity and therefore instrument Δx with a measure of scale economies (Value added/number of firms) and its interaction with the average world price change in the industry between 1992 and 1994, which are tested for orthogonality to the error term.

Finally, the reciprocity variable is another potential source of endogeneity due to reverse causation since the total tariff reduction by other WTO members in the UR partially depends on EU reductions. We instrument for reciprocity by using the unilateral portion of the total tariff reductions that are 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 round was itself in doubt until 1992. However, when the final multilateral cuts were negotiated, between 1992 and 1994, the unilateral reductions undertaken from 1986 to 1992 were explicitly reciprocated because they had taken place after the official start date of the round (Finger et al. [1999]). Therefore, we employ the unilateral liberalization by WTO members between 1986 and 1992 as an instrument for what eventually was used as a basis for their reciprocal liberalization–the amount between 1986 and 1995.

4.2 Data

In the appendix we provide detailed data definitions, sources and summary statistics (table 5). Here we note some of its salient characteristics. We employ the advalorem MFN tariffs from the WTO schedules of concessions[40], and the preferential tariffs from UNCTAD, both at the 8-digit HS level.[41] To construct the reciprocity variable we employ the data in Finger et al. (1999). They use the available tariff reductions for each WTO member during the UR, and aggregate it from the product level into country-averages. We take these average country concessions and construct a product specific measure of reciprocity by using those countries' export shares (from Eurostat) to the EU by 8-digit product.

We use data on production and other industry-level variables for constructing x and its instruments. This data is available for individual EU members and we aggregate it exactly as suggested by the theoretical model.[42] UNIDO's industrial database provides the most comprehensive source covering all EU members and dating back to 1978. It is collected at the industry level and hence more aggregated than the trade and tariff data. We use clustering at the industry level to correct the standard errors for the fact that it is more aggregated than tariffs and trade.[43] Since UNIDO does not provide production data for agriculture, we exclude those products, but processed agricultural products are included.[44]

[40] These refer to bound rates but we find that the applied and bound rates are equal for about 99% of the products for the EU in our sample, hence we do not expect this to bias our results.

[41] The model requires using preferences for the post-UR period, hence we employ the preferential rates reported for 1996 for all PTAs except for EFTA, which was only reported in 1993. Moreover, we exclude products with a zero MFN tariff before the Uruguay Round for two reasons. First, when the MFN tariff is zero there is often more noise in the data about whether a preference exists or not, since it is in effect irrelevant. Second, 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 would bias the estimates if the proportion of zero tariffs is different for PTA goods relative to the rest of the goods.

[42] In terms of production, this entails simply adding it up over the EU members. The interpretation of the political economy weight estimated in this case is $(\omega_i - 1) = \sum_c (\omega_i^c - 1)\xi_i^c$ where ω_i^c is the individual member weight for a given producer and ξ_i^c is the production share in the EU.

[43] In calculating the variable $(X_I/M_I)/\varepsilon_I$ the remaining variables that we employ are at the same level of aggregation as the production data and compute the EU-wide import demand elasticities using estimates from Kee, Nicita and Olarreaga (2004) as explained in the appendix. The fact that this data is more aggregated could potentially introduce some measurement error. Although we can not rule out this possibility, we note that it may not be such an important concern for the following reason. If the EU negotiators use the data at the most disaggregated level available for most of its members, as we do, then our measure is actually the relevant one. The interpretation of β is now as the average EU-wide extra weight taken over the different industries rather than products. We are comfortable with this interpretation, since producers tend to organize at the industry level to lobby for protection. This is particularly true in the EU, where there is more variation in protection across industries than within them. Therefore, to the extent that the extra weight reflects a political economy motive, the best way to identify it is at the industry level.

[44] Given the prevalence of non-tariff barriers and EU subsidies in agriculture, we don't believe this is a drawback since an analysis that focuses on tariffs without taking these other forms of protection into account could be inappropriate for

Table 1 presents the tariff levels and their changes for our sample. Although our analysis is conducted at the product level, we provide some statistics here aggregated by industry. The highest tariff rates before and after the UR appear in the tobacco sector (SIC-314): an average of 42 and 25 percent respectively. The lowest pre-UR tariffs are in the miscellaneous petroleum and coal products sector (SIC-354) with 3.9 percent, whereas the iron and steel industry (SIC-371) become the least protected in terms of tariffs after the UR, 0.4 percent. The footwear sector (SIC-324) experienced the least liberalization, 0.8 percentage points, and tobacco the highest, 17. Note also that there is a considerable amount of variation in tariff changes both within industries, with coefficients of variation between 0.28 and 1.5, and across industries, with a coefficient of variation of 0.44.

4.3 Estimation results

The unconditional mean reduction in MFN tariffs by the EU was 4.4 percentage points for non-PTA products but only 2.9 for PTA products during the UR. A simple t-test confirms that the difference of 1.5 percentage points, with a standard error of 0.1, is statistically significant. This difference may be due to other factors that are correlated with the PTA variable. Therefore, in table 2 we present the estimates of the parameters in (13). In order to address the endogeneity issues discussed above, we employ an instrumental variables technique. More specifically, we use the two-step efficient generalized method of moments estimator, which is robust to heteroskedasticity with an undetermined form and cluster at the industry level, for the motive we describe above. In section 4.5 we discuss formal tests of endogeneity and heteroskedasticity that justify this procedure and compare the results to those obtained using OLS.

4.3.1 Stumbling block estimates

The indicator variable I^{any0} in table 2 is one if the EU imports the good from *any* partner at a duty-free preferential rate. It excludes countries that acceded after the Tokyo Round, which we estimate separately as suggested by the theory. The coefficient for I^{any0} provides an estimate of ϕ and we find that it is positive and significant at the 1 percent level under all specifications. This provides evidence of a smaller reduction in the EU's MFN tariffs for its PTA products (with a zero preferential tariff) relative to its non-PTA products as predicted by the model. Before quantifying the importance of this stumbling block effect, we test other predictions.[45]

The model also predicts that the stumbling block effect is only present for products with a zero preferential tariff. We test this in column 3 where the variable I^{any} takes the value of one for goods imported by the EU at a preferential tariff rate–either zero or positive–whereas I^{pos} is one for the subset of goods with a positive preferential tariff, which account for about 1.5 percent of the observations in the sample. The total effect of a good with a positive preferential tariff is obtained by summing the two coefficients; doing so we cannot reject the hypothesis that the tariff reduction for such goods is identical to non-PTA products. This prediction is fairly specific to the model and thus its confirmation provides it strong support.

According to the model, MFN tariff changes for products imported from countries that joined the EU between the last two trade rounds should be identical to those of other products if transfers are offered as part of the accession to the EU. The data supports this prediction. In column 4, I^{afs} and I^{spg} are indicator variables for products exported by Austria, Finland, and Sweden and Portugal, Spain, and Greece respectively, which are statistically insignificant. The stumbling block effect generated by the PTAs that do not share a common external tariff with the EU remains unchanged both in magnitude and significance.

agriculture.

[45] A potential cost of using data that is finely disaggregated is that it is more likely to suffer from product misclassification when a shipment is recorded. We try to minimize this problem by classifying a good as being exported by a PTA to the EU only if the value registered in that year is above a certain low threshold. In table 2 we employ the 5th percentile of the value of a given PTA's exports in that year as the threshold. We test and find that this does not affect our results in section 4.5.

The model also predicts a stronger stumbling block effect in products that are important exports for a PTA partner as we can see from the fact that in (10), the stumbling block effect is multiplied by the level of exports by the PTA partner, X_{it}^s. We test this by introducing an additional variable, $I^{hi\,\exp}$–the interaction of I^{any0} with $D^{hi\,\exp}$, where $D^{hi\,\exp}$ is one if the share of a PTA partner's exports in good i relative to its total exports to the EU is above a certain threshold. In column 5 we estimate that such an extra effect is present and significant.[46]

Although we did not explicitly model simultaneous PTAs we expect that in such an extension if a product is exported by several preferential partners, then a given increase in the margin of preference benefits more than one of these partners and generates a stronger stumbling block effect. We test this in column 2 of table 2 by including an additional variable, I^{evy0}, which is an indicator for whether the EU imports the product at a tariff of zero from *every* preferential partner. We find that the stumbling block effect for this subset of products is indeed larger.

The estimates presented so far refer to an average effect of all of the EU's PTAs, which is arguably closer to our theory that features a single PTA. However, it is useful to quantify whether the effect is driven by any given PTA in particular, e.g. such estimates are an important input for determining the welfare effects of eliminating specific PTAs, as in Limão and Olarreaga (2005). Although there is a positive correlation among the variables for the different programs, we do identify a stumbling block effect originating from each in column 6. All individual effects are significant with the exception of the one for the ACP, which is nonetheless significant when tested jointly with the GSP, a program with preferences highly correlated with those of ACP.

In table 3, we present first stage regressions for some of the main specifications, which indicate that the instruments are jointly significant in all of our specifications. Moreover, the row at the bottom of table 2 labeled as "Hansen's J" shows that the excluded instruments pass the orthogonality tests as a group. When the set of instruments is large this test may have low power. Therefore, we also test the subset of instruments that are a priori more likely to be endogenous, such as the export dummy and NTB variables. The results are found in the row "C-Stat" and indicate that we cannot reject the orthogonality of the smaller subsets either.

4.3.2 Reciprocity and political economy determinants of EU tariffs

Tariff changes are notoriously hard to predict and in fact most empirical studies that employ a structural approach focus on explaining the cross-section. Nonetheless, given how sparse the evidence is for the EU's trade policy determination, we think that it is interesting to ask whether the remaining variables of our parsimonious model have any explanatory power.

The coefficient on Δx provides an estimate of $(\omega - 1)$, which can be interpreted as the production weighted average of the extra importance attached to producer surplus relative to social welfare of the EU members, as we discuss in section 3.1. We find it to be positive ranging from 0.0025 (column 6) to 0.0039 (column 3). To our knowledge there are no such estimates for the EU but for the US, Goldberg and Maggi (1999) estimate this extra weight to be approximately 0.014, whereas Gawande and Bandyopadhyay (2000) estimate a much lower value of 0.0003.[47] Thus our estimate for the EU lies in between these. In Karacaovali and Limão (2005), we relax the contraint of constant weights across sectors and show that industries with higher share of employment and higher regional concentration receive higher tariff protection, however we also find that the restriction of constant weights (over industries and time) is a reasonable one for the EU.

[46] The level of exports is the appropriate variable even if we estimate the equation in changes provided that $I_{it-1} = 0$. We do not use a continuous measure of the level of exports because it is more likely to be determined by the preferential tariff rates whereas the indicator is more likely to capture exporter motives for specialization in some products. Table 2 presents the case where the threshold is set at the twenty-fifth percentile but the results are qualitatively similar if different levels such as the median or 75^{th} percentile are used.

[47] Goldberg and Maggi (1999) actually report $1/\omega = 0.986$ (p.1145), whereas Gawande and Bandyopadhyay (2000) report $1/(\omega - 1)$ (p.147).

As we point out in the introduction, reciprocity is a key variable in the theory behind MTL but there is some disagreement about its use in practice. We find that the EU reduced its tariffs by more in products exported by trading partners that reduced their own tariffs by a greater amount. Note that, reciprocity may magnify the stumbling block effect, because smaller reductions in the EU will be reciprocated by smaller reductions in the trading partners. Since Limão (2005) also finds reciprocity to be a significant factor in the US multilateral tariff reductions during the UR, we expect that the stumbling block effect of the EU and the US had an indirect effect at least in the reciprocal tariff reductions between the two of them.

Our proxy for the change in MFN externality term, Δm, has the expected positive sign (except for the specification in column 6) but it is insignificant under all specifications. One explanation for this is that the reciprocity variable already accounts for this effect. Since those countries that free-ride will have small average tariff reductions, the EU will "reciprocate" with smaller tariff reductions of its own as well.[48]

4.4 Quantification and interpretation

The simplest interpretation of the coefficient on the PTA variable is that it represents how much the MFN tariff for PTA products increased relative to the non-PTA products. Its value is 1.6 percentage points for products exported under any PTA and about 2.2 for every PTA. Since the reduction for non-PTA goods was 3.4 percentage points, the magnitude of the stumbling block effect is not trivial.

We can quantify the tariff effect in terms of price changes to assess its economic importance. In the context of the average price effects generated by tariff changes during the UR, the stumbling block effect is not negligible. This is clearest from employing the ratio of the relative domestic price growth effects $\Delta \ln p^d_{mp}/\Delta \ln p^d_m = \Delta \ln(1+t^{mp})/\Delta \ln(1+t^m) \approx \Delta t^{mp}/\Delta t^m = 1+\phi/c$, where c is the estimated average tariff change for non-PTA products.[49] Note that, this statistic can also be used to measure the relative world price effects for goods where there is imperfect pass-through, that is $\Delta \ln p^w_{mp}/\Delta \ln p^w_m \approx 1+\phi/c$ provided the pass-through rate for PTA goods is similar to other goods.[50] This is important because one key concern with PTAs is that they have an impact on other countries by affecting the prices received by excluded countries, for example by causing higher MFN tariffs, as our model shows.[51] Moreover, there is considerable evidence of imperfect pass-through both from exchange rate changes but also from tariff changes.[52] Therefore, the closer $1+\phi/c$ is to zero the stronger the stumbling block effect. For example, a value of 0.5 indicates that a non-PTA country received only half of the export price increase from EU's MFN tariff changes in the UR by exporting a PTA good relative to a similar non-PTA good. An

[48] It is also possible that our proxy is an imperfect one or that the MFN externality effect is simply negligible. Finger (1974) provides some direct evidence that countries can target concessions to minimize the MFN externality. He reports that in the Dillon Round (1960-61), where negotiations were bilateral and item-by-item as in the Uruguay Round, 70% of US imports of items that it agreed to reduce its tariffs in were exported by countries with whom the concession was directly negotiated.

[49] This equality applies to a "benchmark" good with no changes in market access, nor in the elasticity adjusted production/import ratio. If the stumbling block effect completely offsets the average price effect, then $1+\phi/c=0$ and if the price effect for the PTA products were identical to the non-PTA products, the statistic would be equal to 1. The approximation $\Delta \ln(1+t^{mp}) \approx \Delta t^{mp}$ is valid in our sample since $\Delta \ln(1+t^i_t) - \Delta t^i_t$ for all types of products takes a value between 0 and 0.005 for 90 percent of the sample and between 0 and 0.011 for 99 percent of the sample.

[50] To be more precise, since we can write the domestic price as $\ln p^d_t = \ln(1+t^{prog}_t) + \ln p^w_t$ then $\zeta \equiv \Delta \ln p^d_i/\Delta \ln(1+t^i) = 1+\Delta \ln p^w_i/\Delta \ln(1+t^i)$, for $i=mp,\, m$. We can then write the ratio of world price effects for PTA to non-PTA products as $\Delta \ln p^w_{mp}/\Delta \ln p^w_m = [\Delta \ln(1+t^{mp})/\Delta \ln(1+t^m)](\zeta^{mp}-1)/(\zeta^m-1) \approx 1+\phi/c$ if $\zeta^{mp} \approx \zeta^m < 1$.

[51] This concern is confirmed by Chang and Winters (2002) who find that the formation of Mercosur lowered the prices for non-Mercosur producers exporting to them. Olarreaga et al. (1999) show that terms-of-trade effects pose a relatively important motive in explaining Mercosur's external tariff structure.

[52] Finger (1976) estimates that less than one third of the tariff reductions by the U.S., Japan and European Community were passed on to their respective consumers during the Kennedy Round. Goldberg and Knetter (1997) survey the extensive evidence on imperfect pass-through from exchange rates. Feenstra (1989) shows that the effects of the exchange rate pass-through is symmetric to the effects of tariff changes in the US.

alternative interpretation in light of the theoretical model is that the export price for the PTA goods was half of what it would have been in the absence of EU PTAs.

At the bottom of table 2 the row labeled $1 + \phi/c$ provides the estimates of the price effects as well as their confidence intervals. The effect of any PTA is about 0.53 (column 1) and it is not very sensitive to controlling for a positive preferential tariff (column 3) or for the exports of AFS or SGP (column 4). The effect for goods exported by every PTA is stronger: 0.38 (column 2).[53]

An interesting question is whether our estimates carry any information about the unobserved counterfactual of what the average EU tariff would have been in the absence of any PTAs. A strict interpretation of our estimates according to the theoretical model is that MFN tariffs are 1.6 percentage points higher for PTA products as compared to their absence and since PTA products represent a large share of our sample, *all products* are up by 1.5 percentage points. However, there has also been a considerable amount of debate on whether the PTAs pursued by the US and the EU increased or decreased the probability of completion of the Uruguay Round. Since multilateral trade rounds are too infrequent, whether PTAs increase or decrease the probability of a round cannot be answered econometrically but we can provide some bounds for our results. For instance, suppose that in the absence of PTAs the UR would not have been completed, and the mere existence of PTAs assured its completion. In this case the *total* stumbling block effect can be shown to be equal to 1.2 percentage points.[54] Thus, even under this extreme assumption, PTAs are a stumbling block and would have been so unless the average reduction in tariffs by other countries had been almost six times larger than what we actually observed. If, on the other hand, the probability of completing the round without PTAs were nearly one and with PTAs became nearly zero, then the total stumbling block effect would be at least 1.5 percentage points.

Finally, examining the importance of the PTA variable differently, we see that the explained amount of variation in the tariffs across goods which can be attributed to it is significantly higher than the rest of the variables. For instance, changes in both the political economy variable and MFN-externality proxy contribute to about a 5 percent average predicted reduction in tariffs, whereas reciprocity contributes to only a 0.4 percent change relative to a situation where all of them remain unchanged.

4.5 Robustness analysis

We now show whether the results in table 2 are robust to measurement error in the PTA variable, the inclusion of initial tariffs as an explanatory variable and the estimation method. We summarize the results in table 4, where the column labeled "IV-GMM" repeats the basic information from table 2 for ease of comparison. The first row simply gives the coefficient on the PTA variable and the third row, labelled $1 + \phi/c$, provides the quantification discussed in the previous section, both of which refer to specification (1) in table 2. The remaining rows provide the test statistics for whether products with a positive preferential tariff or from countries with a CET generate a stumbling block; they refer to the specifications in columns (3) and (4) in table 2, respectively.

In defining whether a PTA partner exported a particular product to the EU, we employed a low positive value as a threshold to minimize classification errors in recording the product code for low value shipments.[45] Although we expect this threshold to ameliorate any measurement error from misclassification, it also increases the control group of non-PTA goods and, if no classification error were present, this procedure could itself generate a measurement error. Therefore, we repeat our estimations without applying any threshold, e.g. setting I^{any0} equal to 1 if *any* value of a good from any of the PTA partners entered the EU under a preferential tariff rate and find that the coefficients in table 2 are robust to this in terms of their sign and significance without major changes in the magnitudes of coefficients and the stumbling block effect (table 4, column 2).

[53] The effect of the significant individual programs range from 0.88 (GSP) to 0.93 (EFTA, CEC) and the combined effect of all individual programs is 0.54, smaller than the 0.38 estimated in column (2) but not statistically so.

[54] See Karacaovali and Limão (2005) for more details on this calculation.

We do not expect our estimates to be biased because of omitted variables because, as we argue above, even if they are correlated with the included regressors, we instrument, test, and confirm the orthogonality of the excluded instruments relative to the error term. Nevertheless, we want to explicitly address the effect of including the initial tariff rate in the estimation. The average MFN tariff for PTA products in our sample is 7.6 percent, whereas it is 12.8 percent for the non-PTA products. Although in the UR no explicit formula was followed such that higher tariffs would be cut by more than the lower ones, it is certainly a possible outcome and may lead us to find bigger cuts in the non-PTA products. When we add the initial tariff level as a regressor, we find that its coefficient is typically negative, so products with higher initial tariffs had slightly bigger cuts, but it is not always statistically significant. Moreover, the initial tariff does not affect the sign, magnitude or significance of the basic stumbling block effect. As shown in column 3 of table 4, the relative growth effect evaluated at the average initial tariff is at least as large as the ones found in table 2. Since the main results are not sensitive to the inclusion of the initial tariff and, according to the Schwarz criterion, the specification without it is preferred, we choose to focus on the latter, which also follows our theoretical model more closely.

The food products industry, SIC 311, contains approximately half of all the products in our sample that do not enter the EU duty-free through preferential agreements. Although this category does not include primary agricultural products (it includes processing of food related products), it does share one important characteristic with agriculture: high protection. To the extent that this feature is time-invariant, then it is immediately addressed by the fact that we estimate the equations in differences. Moreover, the initial tariff, which is on average higher for 311 than other industries, does not seem to be biasing the results, because, as we have seen, its inclusion does not affect the results significantly. To investigate whether the stumbling block effect is merely driven by a cross-industry difference in the average tariff cut between SIC 311 and other industries, we re-estimate the model by dropping the observations in 311. In column 4 we see that the estimates are qualitatively similar to those in table 2 in terms of the signs and significance of the coefficients.[55,56]

As we argue in section 4.1, there are good reasons to expect the main regressors to be subject to endogeneity, either through reverse causation or correlation with omitted variables. Thus, we report the IV results and, to test if endogeneity is present, we calculate the Hausman statistic. The probability values to reject the null of consistency of the OLS estimates range from 0.04 to 0.52 across different specifications.[57] Given that overall the tests were inconclusive and we wanted to maintain comparability across different specifications, we have focused on the IV estimates, which may be inefficient but consistent over all regressions. However, we also calculated the OLS counterpart to each specification and found that the results were qualitatively similar to the IV estimates. Table 4, column 5 provides the summary statistics from the OLS estimation that confirm the main prediction of the model as well as one of the two auxiliary predictions.[58]Pagan and Hall's heteroskedasticity tests reject the error terms to be homoskedastic, hence the GMM approach is further justified.

[55] The point estimates of the relative growth effect in the basic specification are different when we exclude products in 311 but the 95 percent confidence intervals overlap with those of the corresponding specification in table 2.

[56] Separately, we also tested dropping the observations for petroleum refineries (sic 353) and miscellaneous petroleum and coal products (sic 354) since production data for these sensitive sectors tends to be inaccurate and in some cases missing. They account for less than 0.8 percent of all products in the sample, so dropping them does not affect the results.

[57] More specifically, we calculate the Durbin-Wu-Hausman statistic–reported in table 2 in the row labeled "Endogeneity p-val". The value of 0.04 applies to the equivalent of specification (4) from table 2 when the initial tariffs are added as a regressor.

[58] More specifically we estimate Cragg's "heteroskedastic OLS", which is more efficient than OLS in the presence of heteroskedasticity of unknown form because it uses the orthogonality conditions of the excluded instruments. The excluded instruments are the same we use for the IV estimates.

5 Conclusion

We analyze the effects of PTAs on multilateral trade liberalization–a controversial issue where the evidence has been scarce. The model we develop captures key features of the current trading system and provides a rich set of predictions regarding the impact of PTAs on MTL. We derive and estimate the structural equations of protection using detailed tariff data for the EU during the last two multilateral rounds and find evidence that its PTAs slowed down MTL. As the model predicts, this occurred only in products with a zero preferential tariff and was not present in agreements with a common external tariff and transfers. Our model also incorporates domestic political economy motives for tariffs and we find a negative relation between import penetration and tariff levels working through the extra weight that governments place on producer surplus. We also find evidence of reciprocity in the EU's MTL.

In the absence of its PTAs, the EU would have lowered its MFN tariff on PTA products by an additional 1.6 percentage points. Since the average reduction for non-PTA products was almost twice as high, the average price effect due to the EU's multilateral tariff changes was 50-60 percent for PTA goods relative to other goods. We also discussed how this wedge between PTA and non-PTA products provides an estimate of the effect of PTAs on the expected average reductions in *all* products relative to a situation where the EU has no PTAs and showed that the effect was at least 1.2 percentage points.

The evidence for the US and the EU suggest that we should be concerned about a "clash of liberalizations". Similar work is required for other countries. However, even if the EU and the US turn out to be the exception, this concern would still have to be addressed because their share of world trade implies that their PTAs have a potentially large impact on non-members. These estimates suggest that the stumbling block effect may be even worse for the Doha round, which is currently under negotiation. The motive is simple; after the UR, preferences for existing and new PTAs were greatly expanded, partly as a way to counter the preference erosion generated by the lower MFN tariffs. The inevitable final question is what, if anything, can be done to minimize this clash. The current enthusiasm for PTAs means that prohibiting them is not feasible and we have not shown that doing so would necessarily be optimal either. However, there may be ways to grant preferential treatment that do not slow down MTL. Recall that, according to the model, the effect of PTAs on MTL only occurs when the preferential tariff is zero and cannot be lowered further. From this perspective, the answer is simple: remove the non-negativity constraint on preferential tariffs and allow import subsidies. Limão and Olarreaga (2005) estimate that the additional MTL thus permitted generates a Pareto improvement for the three groups of countries: non-members, preference granting and receiving countries. This or other proposals that target the source of the problem and take into account the effects on these three groups of countries are the most likely to be accepted by them and minimize any further "clash of liberalizations".

References

Bagwell, K. and R. Staiger. 1998a. "Will Preferential Agreements Undermine the Multilateral Trading System?" *Economic Journal*, 108: 1162-82.

—. 1998b. "Regionalism and Multilateral Tariff Cooperation," in J. Piggott and A. Woodland (eds.), *International Trade Policy and the Pacific Rim*, London: MacMillan Press.

—. 1999. "An Economic Theory of GATT," *American Economic Review*, 89(1): 215-248.

Bhagwati, J. 1991. *The World Trading System at Risk*, Princeton, NJ: Princeton University Press.

Bohara, A. K., K. Gawande and P. Sanguinetti. 2004. "Trade Diversion and Declining Tariffs: Evidence from Mercosur," *Journal of International Economics,* 64(1): 65-88.

Bond, E. W. and C. Syropoulos. 1996. "The Size of Trading Blocs-Market Power and World Welfare Effects," *Journal of International Economics*, 40(3-4): 411-37.

Brown, W. 2002. *The European Union and Africa*, London: I.B. Tauris Publishers.

Cadot, O., J. De Melo, and M. Olarreaga. 1999. "Regional Integration and Lobbying for Tariffs against Nonmembers," *International Economic Review*, 40(3): 635-657.

Chang, W. and A. Winters. 2002. "How Regional Blocs Affect Excluded Countries: The Price Effects of Mercosur," *American Economic Review*, 92(4): 889-904.

Constantopoulos, M. 1974. "Labour Protection in Western Europe," *European Economic Review*, 5(4): 313-328.

Feenstra, R. C. 1989. "Symmetric Pass-Through of Tariffs and Exchange Rates under Imperfect Competition: An Empirical Test," *Journal of International Economics*, 27(1-2): 25-45.

Finger, M. 1974. "GATT Tariff Concessions and the Exports of Developing Countries-United States Concessions at the Dillon Round," *Economic Journal*, 84: 566-75.

—. 1976. "Effects of the Kennedy Round Tariff Concessions on the Exports of Developing Countries," *Economic Journal*, 86: 87-95.

Finger, M., U. Reincke and A. Castro. 1999. "Market Access Bargaining in the Uruguay Round: Rigid or Relaxed Reciprocity?" Policy Research Working Paper No. 2258, Washington DC: World Bank.

Foroutan, F. 1998. "Does Membership in a Regional Preferential Trade Arrangement Make a Country More or Less Protectionist?" *The World Economy*, 21(3): 305-336.

Gawande, K. and U. Bandyopadhyay. 2000. "Is Protection for Sale? Evidence on the Grossman-Helpman Theory of Endogenous Protection," *Review of Economics and Statistics*, 82(1): 139-152.

Goldberg, P. K. and M. M. Knetter. 1997. "Goods Prices and Exchange Rates: What Have We Learned?" *Journal of Economic Literature*, 35(3): 1243-1272.

Goldberg, P. K. and G. Maggi. 1999. "Protection for Sale: An Empirical Investigation," *American Economic Review*, 89(5): 1135-1155.

Grilli, E. 1997. "EU Trade and Aid Policies towards the LDCs and the CEECs," in Ali M. El-Agra (ed.), *Economic Integration Worldwide*, p. 135-174, London: MacMillan Press.

Grossman, G. and E. Helpman. 1994. "Protection for Sale," *American Economic Review*, 84(4): 833-850.

Hayes, J. P. 1993. *Making Trade Policy in the European Community*, London: MacMillan Press.

Helpman, E. 1997. "Politics and Trade Policy," in D. M. Kreps and K. F. Wallis (eds.), *Advances in Economics and Econometrics: Theory and Applications*, New York: Cambridge University Press.

Jackson, J. 1997. *The World Trading System: Law and Policy of International Economic Relations*, 2nd edition, Cambridge, MA: MIT Press.

Johnson, H. G. 1967. *Economic Policies Toward Less Developed Countries*, Washington DC: Brookings Institution.

Karacaovali, B. and N. Limão. 2005. "The Clash of Liberalizations: Preferential vs. Multilateral Trade

Liberalization in the European Union," Policy Research Working Paper No. 3493, Washington DC: World Bank. <http://econ.worldbank.org/files/41126_wps3493.pdf>

Kee, H. L., A. Nicita and M. Olarreaga. 2004. "Estimating Import Demand and Export Supply Elasticities," mimeo, World Bank.

Krishna, P. 1998. "Regionalism and Multilateralism: A Political Economy Approach," *Quarterly Journal of Economics*, 113(1): 227-251.

Krugman, P. 1991. "Is Bilateralism Bad?" in E. Helpman and A. Razin (eds.), *International Trade and Trade Policy*, Cambridge, MA: MIT Press.

Levy, P. 1997. "A Political-Economic Analysis of Free-Trade Agreements," *American Economic Review*, 87(4): 506-519.

Limão, N. 2002. "Are Preferential Trade Agreements with Non-Trade Objectives a Stumbling Block for Multilateral Liberalization?" Center for International Economics Working Paper 02-02, University of Maryland.

—. 2005. "Preferential Trade Agreements as Stumbling Blocks for Multilateral Trade Liberalization: Evidence for the U.S.," CEPR DP no. 4884.

Limão, N. and M. Olarreaga. 2005. "Trade Preferences to Small Developing Countries and the Welfare Costs of Lost Multilateral Liberalization," Policy Research Working Paper No. , Washington DC: World Bank.

Olarreaga, M., I. Soloaga and A. Winters. 1999. "What's behind Mercosur's Common External Tariff?" Policy Research Working Paper No. 2231, Washington DC: World Bank.

Raya, F. J. 1999. "A Review of the Barcelona Conference and a Summary of EU Policy Objectives," in C. Cosgrove-Sacks and G. Scappucci (eds.), *The European Union and Developing Countries*, p.193-205, London: MacMillan Press.

Riedel J. 1977. "Tariff Concessions in the Kennedy Round and the Structure of Protection in West Germany: An Econometric Assessment," *Journal of International Economics*, 7: 133-143.

Romalis, J. 2004. "NAFTA's and CUSFTA's Impact on International Trade," mimeo, Chicago GSB.

Syropoulos, C. 2002. "On Tariff Preferences and Delegation Decisions in Customs Unions: A Heckscher-Ohlin Approach," *Economic Journal*, 112: 625-48.

Tavares, S. C. 2001. "The Political Economy of Tariff Determination in the European Union," mimeo, University of Florida.

Viner, J. 1950. *The Customs Union Issue*, New York: Carnegie Endowment for International Peace.

Winters, A. 1993. "Expanding EC Membership and Association Accords," in K. Anderson and R. Blackhurst (eds.), *Regional Integration and the World Trading System*, p. 104-125, London: Harvester Wheatsheaf.

—. 1999. "Regionalism vs. Multilateralism," in R. Baldwin, D. Cohen, A. Sapir and T. Venables (eds.) *Market Integration, Regionalism and the Global Economy*, Cambridge, UK: CEPR.

A Appendix

A.1 Tariff expressions

A.1.1 No common external tariff

Equation (4)
The tariff revenue expression in (2) depends on whether there is a PTA and it involves a CET.

$$TR(\boldsymbol{\tau},\boldsymbol{\pi}) = \begin{cases} -\sum_{i=1}^{I} \tau_i M_i^*(p_i(\tau_i)-\tau_i) + \sum_{i=1}^{s\leq I} \pi_i[X_i^s - D_i^s] - \sum_{i=1}^{s\leq I}(\tau_i-\pi_i)D_i^s & \text{No CET} \\ -\sum_{i=1}^{I} \tau_i M_i^*(p_i(\tau_i)-\tau_i) + \sum_{i=1}^{s\leq I} \pi_i[X_i^s - D_i^s] & \text{CET} \end{cases} \tag{14}$$

The first line applies if there is a PTA without a CET, the second if there exists a PTA with a CET or there is no PTA. They differ because in the absence of a CET the consumers in S purchase from the lowest cost supplier, L^*, so an amount D_i^s–previously exported by L^* to L–on which τ_i was levied is now exported by S to L and only π_i is collected.
Consider good $i = I$, which is imported by L from L^* and its symmetric counterpart $i = I+1$, exported to L^*. Using (2) and the first line in (14), we simplify the FOC for an interior solution to (3) and obtain

$$\begin{aligned} G_{\tau_I} + G_{\tau^*_{I+1}} + G_{\pi_I} &= -[M_I^s + M_I^* + H\tau_I(p_I'-1)d_I^{*\prime}] - p_I' M_I - (p_{I+1}'^{*}-1)M_{I+1} + (\omega_I - 1)p_I' X_I \\ &= -[H\tau_I(p_I'-1)d_I^{*\prime}] - (p_I'-1)M_I - (p_{I+1}'^{*}-1)M_{I+1} + (\omega_I-1)p_I' X_I \end{aligned} \tag{15}$$

where $p' \equiv \partial p/\partial\tau$, $d^{*\prime} \equiv \partial d^*/\partial p^*$ and we use the market clearing condition in (1) for I. Equating to zero, solving for τ_I and using $M_I^{*\prime} = D_I^{*\prime}$ (fixed supply) we obtain

$$\tau_I^m = \frac{(\omega_I-1)p_I' X_I - (p_I'-1)M_I - (p_{I+1}'^{*}-1)M_{I+1}}{(p_I'-1)M_I^{*\prime}} \tag{16}$$

By employing the symmetry, we have $p_I' = p_{I+1}'^{*}$. The symmetry also implies that $M_I = M_{I+1}^*$ and $M_I^s = M_{I+1}^{s^*}$, which, along with (1) implies $M_{I+1}^* + M_{I+1}^{s^*} = -M_{I+1}$, so $M_{I+1} = -(M_I + M_I^s)$. Finally, to obtain (4), we divide (16) by p_I^*, use $p' = M^{*\prime}/[M^{*\prime} + M']$ (from implicit differentiation of (1) and $M_I'^s = 0$) and employ the following elasticity definitions $\varepsilon \equiv -M'p^*/M$ and $\varepsilon^* \equiv [\partial(M^* + M^s)/\partial p^*] \times [p^*/(M^* + M^s)] = [\partial M^*/\partial p^*] \times [p^*/(M^* + M^s)]$.

Equation (8)
The FOC to obtain τ^{mp} uses (2) and the first line in (14) to yield

$$\begin{aligned} G_{e^s}\frac{\partial e^b}{\partial \tau_I} + G_{\tau_I} + G_{\tau^*_{I+1}} &= [G_{e^s}\frac{\partial e^b}{\partial \tau_I} - D_I^s - M_I^* - H\tau_I(p_I'-1)d_I^{*\prime}] - p_I'(D(p_I(\tau_I)-\tau_I) - X_I) \\ &\quad -(p_{I+1}'^{*}-1)(D_{I+1} - X_{I+1}) + (\omega_I - 1)p_I' X_I \\ &= [G_{e^s}\frac{\partial e^b}{\partial \tau_I} - X_I^s - H\tau_I(p_I'-1)d_I^{*\prime}] \\ &\quad -(p_I'-1)M_I - (p_{I+1}'^{*}-1)M_{I+1} + (\omega_I-1)p_I' X_I \end{aligned} \tag{17}$$

where we use $M_I^s \equiv D_I^s - X_I^s$ and (1). Equating to zero, solving for τ_I and using $M_I^{*\prime} = D_I^{*\prime}$ (fixed supply) we obtain

$$\tau_I^{mp} = \frac{(\omega_I-1)p_I' X_I - (p_I'-1)M_I - (p_{I+1}'^{*}-1)M_{I+1} + [G_{e^s}\frac{\partial e^b}{\partial \tau_I} - X_I^s]}{(p_I'-1)M_I^{*\prime}} \tag{18}$$

To obtain (8), we apply the symmetry conditions described in the previous derivation, divide (18) by p_I^*, employ the same elasticity definitions and use $\partial e^b/\partial \tau_I = \delta X_I^s/H$ from (6).

A.1.2 Common external tariff and direct transfers

Allowing a transfer T from L to S when cooperation starts, the equilibrium level of e^s for a given preference, $\tau_1 - \pi_1$, and transfer, T is[59]

$$e^{bcu} = \delta(T + (\tau_1 - \pi_1)(X_1^s - D_1^s))/H \tag{19}$$

L and L^* maximize their joint objective net of transfers made to the regional partner.

$$\{\tau^{mcu}, \pi^{pcu}, T^{cu}\} \equiv \arg\max_{\tau,\pi,T}\{G(\boldsymbol{\tau}^* = \boldsymbol{\tau}, \boldsymbol{\pi}, e^s, .) - T : \pi \leq \tau; e^s = e^{bcu}\} \tag{20}$$

The FOCs for a good obtaining a preference under this program of CET with transfers are

$$G_\tau + G_{\tau^*} + G_{e^s}\frac{\partial e^b}{\partial \tau} \leq 0; \qquad G_\pi + G_{e^s}\frac{\partial e^b}{\partial \pi} \leq 0\ ; \qquad G_T + G_{e^s}\frac{\partial e^b}{\partial T} \leq 0 \tag{21}$$

where we recall that $G(.)$ is defined by (2) with the tariff revenue term given by the second line in (14). Evaluating the FOC of the MFN tariff in the absence of preferences, i.e. (15), at the level of the MFN tariff under the CU in (21) we obtain

$$\begin{aligned}\Big[G_{\tau_I} + G_{\tau^*_{I+1}} + G_{\pi_I}\Big]_{G_\tau + G_{\tau^*} + G_{e^s}\frac{\partial e^b}{\partial \tau}=0} &= G_{\pi_I} - G_{e^s}\frac{\partial e^b}{\partial \tau_I} \\ &= G_{\pi_I} + G_{e^s}\frac{\partial e^b}{\partial \pi_I} = 0\end{aligned} \tag{22}$$

where the second line uses (19). In order to establish the last equality in (22), we must show that the FOC for π in (21) is zero. Suppose it is not, such that $G_\pi + G_{e^s}(\partial e^b/\partial \pi) = -M^s + (\delta M^s/H)G_{e^s} = (-1 + \delta G_{e^s}/H)M^s < 0$ when evaluated at $\tau^{mcu} = \tau^m$. This implies that L would gain by further lowering π but it can only do so until it is zero. However, $G_T + G_{e^s}(\partial e^b/\partial T) = -1 + \delta G_{e^s}/H$, which is positive if $G_\pi + G_{e^s}(\partial e^b/\partial \pi) < 0$. Thus $\tau^{mcu} = \tau^m, T = 0$ and $\pi = 0$ is not a solution. T must be increased until $-1 + \delta G_{e^s}/H = 0$, which implies that $G_\pi + G_{e^s}(\partial e^b/\partial \pi) = 0$. Therefore, we obtain $\tau^{mcu} = \tau^m$, $T^{cu} > 0$ and $\pi = \pi^{pcu} < \tau^{mcu}$.

A.2 Data sources and definitions

- Δt: Change in the bound advalorem MFN tariffs between the pre-Uruguay Round and post-UR periods for the HS 8-digit product i. Source: WTO.
- I^{any0} [I^{evy0}]: Indicator variable equal to 1, if good i is imported at a duty-free preferential rate by EU under any [all] of its PTAs in 1994. It excludes PTAs involving a common external tariff. Sources: Eurostat's COMEXT (trade flows) and UNCTAD's TRAINS (preferential tariff rates).
- I^{any} [I^{pos}]: Indicator equal to 1, if good i is imported by the EU under any of its PTAs at either a duty-free or positive preferential tariff rate [a positive preferential rate only] in 1994. Sources: COMEXT, TRAINS.

[59] The incentive compatibility constraint for S is now $[G^s(\boldsymbol{\pi}, \boldsymbol{\tau}, e^s = 0) + T] - [G^s(\boldsymbol{\pi}, \boldsymbol{\tau}, e^s) + T] \leq [\delta/(1-\delta)] \times [G^s(\boldsymbol{\pi}, \boldsymbol{\tau}, e^s) + T - G^s(\boldsymbol{\pi} = \boldsymbol{\tau}, \boldsymbol{\tau}, e^s = 0)]$ where G^s is still defined by (5) but the consumption price in S is now $p_i^{sd} = p_i(\tau_i) - \pi_i$, since if it were to import from L^* it would need to pay the CET.

- I^{afs} [I^{spg}]: Indicator equal to 1 if i is imported by the EU from the "recent" members Austria, Finland, or Sweden [Spain, Portugal, or Greece] in 1994. Source: COMEXT.

- $I^{hi\,\exp}$: Indicator equal to 1 if the exports of any of the PTA partners (excluding the ones with CET) to the EU in i is greater than the 25th percentile of the exporters' total exports to the EU and it is exported under the respective preferential program. Sources: COMEXT, TRAINS.

- $R \equiv \sum_k s_i^k (\sum_j w_j^k \Delta t_j^k / t_{jt}^k)$: Reciprocity variable measuring changes in market access provided by the major exporters of i to the EU during the UR; where $\Delta t_j^k / t_{jt}^k$ is the percentage tariff reduction by country $k \notin$EU in good j between 1986 and 1995, w_j^k is the 1992 import share of good j in total imports of k, and s_i^k is the exports of a principal supplier k to the EU in i as a share of total exports of i from all of EU's principal suppliers. Sources: Finger et al. (1999) and authors' calculations from COMEXT.

- R^{uni}: Reciprocity variable computed only for the unilateral liberalization (between 1986 and 1992) by the major exporters to EU. The computation is otherwise similar to that of R. Sources: Finger et al. (1999), COMEXT and authors' calculations.

- Δx: The EU-wide change in the elasticity adjusted inverse import penetration ratio between 1978 (pre-Tokyo Round) and 1992 (pre-UR), where $x_{It} \equiv X_{It}/M_{It}\varepsilon_{It}$ for each 3-digit SIC industry I. Computed using the members of the EU in 1978–Belgium, Denmark, France, Germany, Ireland, Italy, Luxembourg, Netherlands, and the United Kingdom. We employ the production value measured in domestic prices, $p_{It}X_{It}$, whereas import values are measured at world prices, $p_{It}^* M_{It}$. The elasticity measure that we use is also evaluated at the domestic prices, hence we calculate the measure required by the model: $x_{It} = X_{It}/M_{It}(M'_{It}/M_{It})p_{It}^* = p_{It}X_{It}/p_{It}^* M_{It}(M'_{It}p_{It}/M_{It})$. The import demand elasticity we calculate,$M'_{It}p_{It}/M_{It}$, is for the EU as a whole, as required by the model. Following Kee et al. (2004) we compute it as $a_{II}/s_I + s_I - 1$, where a_{II} is an estimated structural price parameter in the GDP function and s_I is the EU's import to GDP ratio in I. Sources: Kee et al. (2004) (a_{II}); UNIDO ($p_{It}X_{It}$), COMTRADE and Penn World Tables (s_I).

- P: Proxy for the change in MFN externality effect, Δm. Computed as a dummy equal to one if the change in the share of the non-top-5 exporters in total exports to the EU between 1989 and 1994 is above the median for an hs-8 good i. Source: COMEXT.

- I^{pta_name}: Indicator equal to 1, if good i is imported at a duty-free preferential rate by EU under the "pta_name" program, which includes GSP, GSPL, ACP, MED, CEC, and EFTX. Sources: COMEXT and TRAINS.

- $D^{any\,\exp}$ [$D^{evy\,\exp}$]: Indicator equal to 1, if the good i is imported by EU from any [all] of its PTA partners in 1994 (regardless of whether they receive a preference or not). Source: COMEXT.

- D^{ntb} [D^{ntball}]: Indicator equal to 1 if i is subject to a non-tariff barrier that applies to at least one exporter [all exporters] of i to the EU. Source: TRAINS.

- Δp_{9294}, $(\Delta p_{9294})^2$, $(\Delta p_{9294})^3$: The change in the world price of good i (computed using unit values) between 1992 and 1994 averaged over all of its exporters. Source: COMEXT.

- $\Delta scale$: The change in the EU-wide value added/number of firms between 1978 and 1992. Sources: UNIDO, and COMTRADE.

- $(\Delta p_{9294})^{avg} x \Delta scale$: Interaction of Δp_{9294} averaged over sector i and $\Delta scale$. Sources: UNIDO, and COMTRADE.

A.3 Details on the EU's PTAs

Name of Program	Recipients	Start Date	Type of Preference	Import share 1994	Share in '94 PTA imports	Notes / Non-trade Issues
ACP (African, Caribbean, and Pacific)	Over 70 countries, mostly former colonies of EU members	1976	Unilateral PTA	0.5%	1.9%	Colonial ties major motivation. Financial and political cooperation; human rights play a role.
CEC (Central and East European)	Slovak Republic, Czech Republic, Poland, and Hungary	1992	Bilateral FTA	1.4%	6%	Serves as a transition to full membership. Recipients committed to pass laws such as in intellectual property rights to conform with EU.
EFTX	Switzerland, Norway, Iceland, Liechtenstein.	1973-1974	Bilateral FTA	5.2%	22.3%	EFTA members excluding AFS. Mainly industrial goods, excludes most agricultural products.
GSP (Generalized System of Preferences)	More than 100 developing countries	1971	Unilateral PTA	13%	57%	Widest program, includes non-duty-free rates. Preferential rates vary according to competitiveness of the recipient countries.
GSPL (GSP for least developed)	About 50 of the poorest nations in the world	1971	Unilateral PTA	0.3%	1.2%	Objective: Improving access to global markets for agricultural and industrial goods and services
MED (Mediterra-nean countries	Algeria, Israel Morocco, Tunisia, Egypt, Jordan, Syria	Early 70s	Unilateral PTA	2.7%	11.3%	Cooperation in social affairs, migration, human rights, and democracy. Preferences on industrial goods only, with strict rules of origin.
AFS and SPG	EU members joined between Tokyo and Uruguay rounds	See note	Bilateral CU	n/a	n/a	AFS: Austria (1995), Finland (1995), Sweden (1995). SPG: Spain (1986), Portugal (1986), Greece (1981). Accession years in brackets.

TABLE 1: Tariffs in the EU by Industry

SIC Code	Sector	Before UR Mean	Before UR St.D.	AfterUR Mean	AfterUR St.D.	Change Mean	Change St.D.	Coef. Var.
311	Food products	0.161	0.087	0.114	0.073	0.047	0.026	0.55
313	Beverages	0.108	0.038	0.073	0.021	0.035	0.018	0.51
314	Tobacco	0.422	0.195	0.252	0.118	0.170	0.089	0.52
321	Textiles	0.096	0.030	0.069	0.023	0.026	0.020	0.77
322	Wearing apparel except footwear	0.126	0.026	0.109	0.025	0.017	0.008	0.47
323	Leather products	0.051	0.023	0.034	0.023	0.016	0.009	0.56
324	Footwear except rubber or plastic	0.095	0.048	0.087	0.040	0.008	0.012	1.50
331	Wood products except furniture	0.056	0.022	0.020	0.025	0.036	0.011	0.31
332	Furniture except metal	0.058	0.007	0.012	0.017	0.046	0.013	0.28
341	Paper and products	0.088	0.020	0.044	0.018	0.044	0.017	0.39
342	Printing and publishing	0.093	0.032	0.047	0.024	0.047	0.017	0.36
351	Industrial chemicals	0.080	0.029	0.055	0.015	0.025	0.027	1.08
352	Other chemicals	0.067	0.018	0.031	0.030	0.036	0.029	0.81
353	Petroleum refineries	0.046	0.020	0.030	0.018	0.015	0.008	0.53
354	Miscellaneous petroleum and coal products	0.039	0.023	0.026	0.034	0.013	0.011	0.85
355	Rubber products	0.053	0.023	0.034	0.023	0.019	0.010	0.53
356	Plastic products	0.111	0.048	0.084	0.046	0.027	0.017	0.63
361	Pottery china earthenware	0.078	0.027	0.060	0.025	0.019	0.011	0.58
362	Glass and products	0.074	0.029	0.048	0.031	0.026	0.012	0.46
369	Other non-metallic mineral products	0.045	0.021	0.021	0.017	0.024	0.009	0.38
371	Iron and steel	0.057	0.018	0.004	0.012	0.054	0.021	0.39
372	Non-ferrous metals	0.061	0.024	0.041	0.027	0.021	0.014	0.67
381	Fabricated metal products	0.057	0.019	0.031	0.016	0.026	0.013	0.50
382	Machinery except electrical	0.045	0.013	0.020	0.014	0.025	0.012	0.48
383	Machinery electric	0.063	0.025	0.034	0.021	0.029	0.016	0.55
384	Transport equipment	0.077	0.047	0.053	0.050	0.024	0.018	0.75
385	Professional and scientific equipment	0.062	0.014	0.028	0.016	0.034	0.014	0.41
390	Other manufactured products	0.063	0.017	0.029	0.015	0.034	0.017	0.50
	Total	0.09	0.03	0.05	0.02	0.03	0.01	0.44

Advalorem tariff rates are reported. The number of observations in our sample is equal to 6294. Note that products with initial zero tariff rate are excluded from the sample as explained in the text.

TABLE 2: Stumbling Block Estimates

	(1)	(2)	(3)	(4)	(5)	(6)
I^{any0}	0.015***	0.015***		0.015***	0.011***	
($\phi^{any0}>0$)	(0.003)	(0.003)		(0.003)	(0.002)	
I^{evy0}		0.007***				
($\phi^{evy0}>0$)		(0.002)				
I^{any}			0.013***			
($\phi^{any}>0$)			(0.003)			
I^{pos}			-0.026			
($\phi^{pos}+\phi^{any}=0$)			(0.032)			
I^{afs} ‡				0.002		
($\phi^{afs}=0$)				(0.002)		
I^{spg} ‡				-0.001		
($\phi^{spg}=0$)				(0.001)		
I^{hiexp}					0.005***	
($\phi^{hiexp}>0$)					(0.002)	
I^{gsp} †						0.003***
($\phi^{gsp}>0$)						(0.001)
I^{gspl} †						0.003***
($\phi^{gspl}>0$)						(0.001)
I^{acp}						0.000
($\phi^{acp}>0$)						(0.001)
I^{eftx} †						0.002***
($\phi^{eftx}>0$)						(0.001)
I^{med}						0.002***
($\phi^{med}>0$)						(0.001)
I^{cec} †						0.002***
($\phi^{cec}>0$)						(0.001)
Δx	0.004*	0.003**	0.004*	0.003**	0.003**	0.003**
($\beta>0$)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
R	0.006*	0.005*	0.008*	0.006*	0.006**	0.008***
($\rho>0$)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)
P	0.001	0.000	0.001	0.001	0.001	-0.000
($\mu>0$)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)
Constant	-0.034***	-0.034***	-0.030***	-0.035***	-0.036***	-0.028***
(c)	(0.005)	(0.004)	(0.005)	(0.004)	(0.003)	(0.003)
Observations	6294	6294	6294	6294	6294	6294
Schwarz Criterion	-7.58	-7.60	-7.56	-7.60	-7.61	-7.64
Hansen's J p-val [a]	0.506	0.567	0.559	0.495	0.569	0.159
C-stat p-val [b]	0.729	0.562	0.446	0.722	0.553[e]	0.114
Endogeneity p-val [c]	0.517	0.248	0.399	0.525	0.270	0.210
Heterosked. p-val [d]	0.000	0.000	0.000	0.000	0.000	0.000
$1+\phi/c$ [h]	0.55	0.58	0.57	0.57	0.69	n/a
	(.41,.68)	(.47,.69)	(.42,.72)	(.47,.66)	(.56,.81)	
$1+(\phi+\phi^{all,hi})/c$ [h]	n/a	0.39	n/a	n/a	0.56 [f]	0.53 [g]
		(.21,.56)			(.44, .68)	(.37, .69)
$\phi^{pos}+\phi^{any}=0$ p-val	n/a	n/a	0.68 (accept)	n/a	n/a	n/a

Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Clustering at the 3-digit SIC level. The predicted signs for the coefficients of the variables are indicated in brackets below them.

†: the following coefficient restrictions in place, $\phi^{gsp}=\phi^{gspl}$, $\phi^{eftx}=\phi^{cec}$, based on a test failing to reject their equality.

(a) Hansen-Sargan test of overidentifying restrictions. Probability value for H_0: Excluded instruments are uncorrelated with the error term, and correctly excluded from the estimated equation. (b) Difference-in Sargan (C) statistic. Probability value for H_0: The subset of variables/instruments marked with "‡" in tables 2 and 3 are exogenous. (c) Endogeneity test based on the C statistic for the main regressors. Probability value for H_0: No endogeneity among regressors. (d) Pagan-Hall heteroskedasticity test. Probability value for H_0: Disturbance is homoskedastic. (e) The following extra instruments are tested for this specification: D^{hiexp}, $D^{ntball}xD^{hiexp}$ for which the first stage regression results are similar to those in table 3 but not reported. (f) The value for the combined effect of I^{any0} and I^{hiexp}. (g) Calculated for a product exported under every program. The other values, with confidence intervals in brackets, are GSP and GSPL: 0.88 (.82, .94), ACP: 0.99 (.93, 1.06), MED: 0.92 (.87, .97), EFTX and CEC: 0.93 (.88, .97). (h) Confidence intervals calculated using the delta method.

TABLE 3: First Stage Regressions
(Any and Every PTA Specifications)

	Table 2(1)			Table 2(2)			
	I^{any0}	Δx	R	I^{any0}	I^{evy0}	Δx	R
D^{anyexp} ‡	0.936***	-0.866***	0.021***	0.933***	-0.003	-0.774***	0.020***
	(0.023)	(0.217)	(0.007)	(0.023)	(0.020)	(0.215)	(0.007)
D^{evyexp} ‡				0.035***	0.801***	-0.755***	0.013***
				(0.007)	(0.006)	(0.063)	(0.002)
D^{ntball} ‡	0.008	-0.888**	-0.010	0.013	-0.014	-0.974**	-0.009
	(0.041)	(0.388)	(0.012)	(0.041)	(0.036)	(0.383)	(0.012)
D^{ntball}xD^{anyexp} ‡	-0.229***	0.506	0.010	-0.251***	0.000	0.319	0.009
	(0.042)	(0.392)	(0.012)	(0.041)	(0.036)	(0.389)	(0.012)
D^{ntball}xD^{evyexp} ‡				0.190***	-0.109***	1.497***	0.012*
				(0.026)	(0.022)	(0.240)	(0.007)
Δp_{9294}	-0.003	0.051	-0.004**	-0.002	-0.001	0.035	-0.004**
	(0.006)	(0.059)	(0.002)	(0.006)	(0.005)	(0.059)	(0.002)
$(\Delta p_{9294})^2$	-0.009***	-0.005	0.000	-0.007***	0.000	-0.024	0.001
	(0.003)	(0.028)	(0.001)	(0.003)	(0.003)	(0.027)	(0.001)
$(\Delta p_{9294})^3$	0.002*	-0.007	0.000	0.002*	0.000	-0.004	0.000
	(0.001)	(0.009)	(0.000)	(0.001)	(0.001)	(0.009)	(0.000)
D^{ntb} ‡	0.051***	1.014***	0.025***	0.049***	0.020***	1.072***	0.024***
	(0.006)	(0.060)	(0.002)	(0.006)	(0.006)	(0.059)	(0.002)
$\Delta scale$	0.189***	-0.497***	-0.032***	0.190***	0.003	-0.550***	-0.031***
	(0.009)	(0.082)	(0.002)	(0.009)	(0.008)	(0.081)	(0.002)
$(\Delta p_{9294})^{avg}$x$\Delta scale$ ‡	-0.362***	-0.917	0.102***	-0.285***	-0.017	-1.465*	0.119***
	(0.085)	(0.803)	(0.024)	(0.085)	(0.074)	(0.797)	(0.024)
R^{uni}	0.041**	-0.075	0.754***	0.042**	0.024	-0.058	0.754***
	(0.017)	(0.163)	(0.005)	(0.017)	(0.015)	(0.161)	(0.005)
P	0.039***	-0.274***	-0.004***	0.036***	0.003	-0.252***	-0.005***
	(0.005)	(0.046)	(0.001)	(0.005)	(0.004)	(0.045)	(0.001)
Constant	-0.039*	-1.129***	-0.275***	-0.042*	0.003	-1.084***	-0.275***
	(0.024)	(0.222)	(0.007)	(0.023)	(0.020)	(0.219)	(0.007)
Observations	6294	6294	6294	6294	6294	6294	6294
R-squared	0.379	0.079	0.792	0.390	0.767	0.102	0.794
Adj. R^2	0.378	0.078	0.792	0.389	0.767	0.100	0.794
F-test p-val [a]	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Clustering at the 3-digit SIC level.

‡: the subset of instruments further tested for exogeneity. The probability value for the difference-in Sargan (C) statistics for these instruments are reported on the row labeled C-stat p-val. in table 2.

(a) Probability value for the F–test of H_0: The instruments are jointly insignificant.

TABLE 4: Robustness and Specification Analysis

	IV-GMM	IV-GMM (No threshold)	IV-GMM (Initial tariff)	IV-GMM (No 311)	HOLS
[1] ϕ^{any0}	0.015	0.022	0.018	0.005	0.013
(s.e.)	(0.003)	(0.003)	(0.004) [b]	(0.002)	(0.001)
[1] $1+\phi/c$ [a]	0.55	0.47	0.36	0.79	0.66
(95% CI)	(.41,.68)	(.30, .64)	(-.03, .70) [c]	(.66,.92)	(.60, .71)
[3] H_0: $\phi^{pos}+\phi^{any}=0$	Can't reject	Can't reject	Can't reject [b]	Can't reject	Reject [d]
(p-val)	(0.68)	(0.78)	(0.99)	(0.42)	(0.00)
[4] [e] ϕ^{afs} (s.e)	0.002 (0.002)	0.002 (0.002)	0.003 (0.002) [b]	-0.001 (0.001)	0.000 (0.001)
ϕ^{spg} (s.e)	-0.001 (0.001)	0.001 (0.001)	0.000 (0.001)	-0.000 (0.001)	-0.001 (0.001)
[1] Schwarz Criterion	-7.58	-7.60	-7.45	-7.68	-7.68
Observations	6294	6294	6294	5875	6294

The numbers in square brackets in the first cell of each row refer to the specification numbers from Table 2.

a. Measures the relative growth of world prices due to PTAs for imperfect pass-through (such that $\zeta^{mp} \approx \zeta^{m}<1$). Confidence intervals calculated using the delta method.

b. The coefficient on the initial tariff variable (t_{t-1}) for the three different specifications with the standard errors in brackets are [1]: -0.195 (0.111), [3]: -0.151 (0.119), and [4]: -0.170 (0.115).

c. Refers to the relative growth at the mean initial tariff i.e. $1+\phi/(c+ 0.0789*\phi^{ini})$. When we account for the different average initial tariffs (0.0757 when $I^{any0}=1$ and 0.128 otherwise), that is calculate $(c+ 0.0757*\phi^{ini}+\phi)/(c+ 0.128*\phi^{ini})$, we obtain 0.26 (-.09, .61).

d. The 95% confidence interval for $I^{pos} + I^{any}$ is [-0.0161, -0.0047] .

e. The test of the combined effect $\phi^{afs}+\phi^{spg}=0$ yields the following p-values for columns from IV-GMM to HOLS respectively: 0.84, 0.28, 0.29, 0.58, 0.44.

TABLE 5: Summary Statistics

Variable Name	Mean	Std. Dev.	Min	Max
Δt	-0.030	0.022	-0.268	0.000
I^{any0}	0.939	0.239	0	1
I^{evy0}	0.133	0.339	0	1
I^{any}	0.954	0.210	0	1
I^{pos}	0.015	0.121	0	1
I^{afs}	0.902	0.297	0	1
I^{spg}	0.875	0.330	0	1
I^{hiexp}	0.891	0.311	0	1
I^{gsp}	0.646	0.478	0	1
I^{gspl}	0.190	0.392	0	1
I^{acp}	0.291	0.454	0	1
I^{eftx}	0.870	0.337	0	1
I^{med}	0.508	0.500	0	1
I^{cec}	0.671	0.470	0	1
Δx	-2.004	1.853	-13.884	5.466
R	-0.460	0.118	-0.960	0.000
D^{anyexp}	0.984	0.126	0	1
D^{evyexp}	0.167	0.373	0	1
D^{gsp}	0.899	0.302	0	1
D^{gspl}	0.224	0.417	0	1
D^{acp}	0.333	0.471	0	1
D^{eftx}	0.904	0.294	0	1
D^{med}	0.594	0.491	0	1
D^{cec}	0.852	0.355	0	1
D^{hiexp}	0.948	0.221	0	1
R^{uni}	-0.267	0.139	-0.922	0
D^{ntb}	0.288	0.453	0	1
D^{ntball}	0.096	0.295	0	1
D^{ntball}xD^{anyexp}	0.091	0.288	0	1
D^{ntball}xD^{evyexp}	0.010	0.101	0	1
D^{ntball}xD^{gsp}	0.069	0.253	0	1
Δp_{9294}	0.001	0.461	-3.912	4.874
$\Delta scale$	0.307	0.322	-0.351	1.047
$(\Delta p_{9294})^{avg}$x$\Delta scale$	0.005	0.032	-0.053	0.126
P	0.502	0.500	0	1
t_{t-1}	0.079	0.046	0.005	0.65

The number of observations in our sample (n) is 6294. There are 8688 non-missing values for Δt (the dependent variable), which is reduced to 7784 when we omit the lines with zero initial tariffs. Missing import and market access variables to construct the reciprocity variable reduce the sample to 6837, and missing price data to 6721. Production related data causes the remaining missing values and leaves us with n=6294.

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Figure 1
Identification of the stumbling block effect through MFN tariff changes