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# The Clash of Liberalizations: Preferential versus Multilateral Trade Liberalization in the European Union\*

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## Abstract

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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. 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 multilateral liberalization in the European Union.

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## **Non-Technical Summary**

In this paper we analyze the effects of preferential trade agreements (PTAs) on multilateral trade liberalization. First, we develop a model that captures key aspects of the current multilateral trading system and different types of PTAs. Next, we structurally estimate the main predictions obtained from our model using product level tariff data for the European Union (EU) spanning the Tokyo and Uruguay trade rounds. We show that the EU reduced its multilateral tariffs by only about half the amount in the goods imported duty-free under a PTA as compared with similar non-PTA goods, hence the EU's PTAs held back its multilateral liberalization. The results are economically significant and robust to potential endogeneity problems. If its PTAs had not been present, the EU would have reduced its multilateral tariffs on the PTA products by 1.6 percentage points more with an average price effect of 50-60%. The EU's multilateral tariff reductions were largest for products exported by countries that provided greater increases in market access, providing evidence of reciprocity.

Our model also incorporates domestic political economy motives for tariff determination and we find that tariff levels are inversely related to import penetration and import demand elasticity due to the extra weight governments place on producer surplus. Furthermore, these industry weights increase in regional concentration and employment shares.

# 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” toward MTL. (Bhagwati [1991]) This issue is also prominent in the current multilateral round with several developing countries fearing that MTL by the countries that provide them with preferential treatment will erode those preferences.<sup>1</sup>

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 that 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.<sup>2</sup> 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 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 applying product-level protection data to estimate a model of the interaction of preferential and multilateral liberalization.

Most of the early theory analyzing the effect of PTAs on MTL assumed that MTL implied free trade. So the research focused on the effect of PTAs on a binary choice between free trade and no MTL and it effectively asked whether PTAs made a multilateral trade round more or less likely.<sup>3</sup> Assuming that a round leads to free trade and focusing on the probability of a round simplifies the

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<sup>1</sup>The latest round was launched in 2001 and, according to a recent article in the leader section of the Economist, 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.) The *possibility* that these preferences would reduce MTL is not new: it was a concern raised by opponents of the generalized system of preferences when it was originally proposed (Johnson [1967] p. 166).

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

<sup>3</sup>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 he would have accepted it if no PTA had been available.

theoretical analysis but makes the predictions nearly impossible to test because multilateral rounds are so infrequent—eight since GATT was signed in 1947. Moreover, countries can choose to conclude a multilateral round with either considerable or little liberalization. Thus, the focus should be on whether PTAs affect the change in multilateral tariffs and not simply the probability of concluding any given multilateral round.<sup>4</sup>

The model that 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 prediction 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 duty-free access in a set of products to some North African countries. The latter benefit from facing a lower tariff than their competitors; 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, that is generally present when there is a common tariff, then no stumbling block effect is present. 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 product level data for 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.<sup>5</sup>

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<sup>4</sup>Bagwell and Staiger (1998) 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. Winters (1999) surveys this literature and Panagariya (2000) the broader issue of regionalism. Another approach to the PTA vs. MTL issue is due to Krugman (1991) who analyzes the welfare path for exogenously expanding trading blocs.

<sup>5</sup>Constantopoulos (1974) and Riedel (1977) examine determinants of industry level protection of individual members before accession to the EU. Tavares (2001) is an exception in that she 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

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 duty-free PTA goods, as predicted by the model. We ensure that the result is 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 auxiliary predictions from our model. Various sensitivity and specification 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 (2003) suggest that we should be concerned about a “clash of liberalizations”.<sup>6</sup>

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]). Our estimates indicate that it is: the EU’s tariff reductions were largest for products exported by countries that provided greater increases in market access.

Finally, we also 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 for the US (e.g. Goldberg and Maggi [1999] and Gawande and Bandyopadhyay

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protection for the EU at the product level or does so structurally.

<sup>6</sup>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 even 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.

[2000]). Furthermore we estimate that this extra weight depends positively on an industry's share of employment and regional concentration.

The paper is organized as follows. We start by providing background information on the EU's trade policy 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 are in the appendix.

## 2 The European Union's Trade Policy

Until the most recent expansion, 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 the EU members form a single market with free movement of goods, services, capital, and labor and also cooperation on foreign and security policy as well as justice and police matters.

The main actors in the formation of EU trade policy are the Commission, the Council, and the European Parliament. The Commission negotiates and enforces trade policy on behalf of the member states. The Council, where each member state is represented at the ministerial level, is the decision maker. It determines a mandate on the basis of a Commission proposal. The Commission negotiates on the basis of this mandate and the Council must then decide whether to approve the outcome or not. The European Parliament is regularly informed on trade policy by the Commission but it is also involved by giving "assent" on major treaty ratifications that cover more than trade.<sup>7</sup>

The 1966 Luxembourg Compromise required unanimity in decision-making in the Council for crucial issues. As a matter of fact, until 1987 the interest groups predominantly concentrated on lobbying their own governments for protection given this veto power. After the 1987 Single European Act, the Commission gained greater control and the veto power has been replaced by a qualified majority voting and consequently, some interest groups have also started lobbying the Commission in order to be able to affect the trade policy determination process, not only the voting outcome. (Tavares [2001]) However, even after 1987, industry associations continued to favor lobbying their own government as opposed to the Commission (Hayes [1993]).<sup>8</sup> Thus, our assumption in section 4.6

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<sup>7</sup>Based on information from the Directorate General Trade of the European Commission. Accessed on July 30, 2004 at <[http://europa.eu.int/comm/trade/index\\_en.htm](http://europa.eu.int/comm/trade/index_en.htm)>

<sup>8</sup>There are some exceptions, such as the pan-European organization EUROFER that represents the steel sector but,

that lobbying works through governments is a reasonable one.

In the appendix, we provide more details about the PTAs the EU participates in (including their abbreviations)—here we note only a few key points. Several of the EU’s PTAs are non-reciprocal, that is they do not require the partner to lower their tariffs. For example, the GSP, GSPL, and ACP programs are geared towards developing, and least developed countries and, apart from the stated objective of trying to incorporate the recipient countries into the world trade economy, they require cooperation in non-trade issues such as labor standards, human rights, migration control, and combat against drugs.<sup>9</sup> The PTAs with the Mediterranean region countries are also similar in nature and historically established ties partially aimed at addressing regional externalities such as immigration problems. These features are captured by our model below. Several of the countries that benefit from these preferences fear that MTL on the part of the EU will erode the 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. For example, in 2000 the European Commission argued that a cut in the price support of about 25% in EU sugar was not tenable because it would cause an income loss of 250 million Euro to ACP countries, some of whom export sugar to the EU under preferential treatment.<sup>10</sup>

Six countries acceded to the EU between the Tokyo and Uruguay Rounds to the EU, the effects of which are also modeled and tested in the subsequent sections. Furthermore, in the empirical estimation, we also consider the bilateral free trade agreements with the remaining EFTA members that did not join the EU and agreements signed before the UR with some of the Central and East European transition economies. The imports under the GSP program account for 13 percent of the total EU imports from the rest of the world. The other shares are 5 percent for EFTX, 2.7 percent for MED, and 1.4 percent for CEC. GSPL and ACP, on the other hand, account for less than 0.5 percent of EU’s imports.

### 3 Theory

In this section we derive the structural equations that we estimate and show how PTAs can cause an increase in the MFN tariffs. The model builds on Limão (2002) and extends it along several important

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according to Hayes (1993), the strategic decisions are still made by the national governments in the Council even for steel.

<sup>9</sup>For instance, Jackson (1997, p.160) notes that “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 Winters (1993) and Grilli (1997).

<sup>10</sup>European Commission (2000), “Commission proposes overhaul of sugar market,” Brussels, 4 October 2000, IP/00/1109.

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. This allows us to use a single model to nest and test various alternative hypotheses that arise from the various types of trade agreements signed by the EU.

### 3.1 Regional Blocs

Each of the two symmetric regional blocs modeled is composed of two economies, Large and Small. Large has a bigger endowment in the (non-numeraire) traded goods than Small. However, Small must be important in the non-trade dimension to justify Large seeking its cooperation. Thus we assume that both countries have the same population to ensure that Large places a non-negligible weight on those issues proportional to Small's population, e.g. on human and labor rights or immigration and environmental issues. We normalize labor units such that each of the  $H$  individuals in both countries 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 with marginal product equal to unity. We normalize the price of the numeraire to one and assume, as is standard, no taxes on it so that its price is identical in all countries. Some individuals are endowed with a non-numeraire good indexed by  $i$ . For simplicity the ownership of a good  $i$  is exclusive and concentrated. That is, each individual is endowed with an amount  $X_i$  of at most one good, which nobody else in that economy is endowed with. Since the remaining features of the large and small economies differ we describe them separately.

The reference table below describes the notation. Subscript  $i$  indexes goods such that  $i = 0$  for the numeraire and  $i \in [1, 2I]$  for the non-numeraire goods. The superscript  $i$  indexes individuals in Large that are endowed with  $i$ , whereas  $j$  indexes the countries: Large, Small, Large\* and Small\*. Variables for Large\* and Small\* are denoted with a “\*”.



Variable definitions	
$X_i$	Large's endowment of $i$
$X_i/k_i$	Small's endowment of $i$ , $k_i \geq 1$
$D_i$	Total fixed demand of $i$ in Small
$M_i^j$	Import demand by country $j$ in $i$
$y^{iL}$	Income of an individual of type $i$ in Large
$d(p_i)$	Individual demand for $i \in [1, 2I]$ in Large
$w^{iL}$ [ $w^S$ ]	Indirect utility of individual $i$ in Large [Small]
$v(\cdot)$	Individual consumer surplus for non-numeraire goods in Large
$H$	Total population in each country
$TR^j$	Tariff revenue in $j$
$\omega_i - 1$	Additional weight Large places on import sector surplus
$\bar{\Psi}(E^L, E^S)$	Subutility function for the public good in Large
$e^j$	Per-capita tax used to finance public good provision, $E^j$ , in $j$
$\tilde{e}^B$ [ $e^B$ ]	Equilibrium $e^S$ under PTAs without [with] a CET
$p_i^j$	Domestic price of $i$ in $j = L, L^*$
$p_i^S$ [ $p_i^{SC}$ ]	The domestic producer [consumer] price of $i$ in Small
$\tau_i^L$	Large's specific preferential tariff on Small's exports of $i$
$\tau_i^B$	Large's equilibrium specific preferential tariff
$\tau_i^m$	Large's specific MFN tariff
$\tau_i^{Cm}$	Large's equilibrium specific MFN tariff under no preferential tariff in $i$
$\tau_i^{EXm}$ [ $\tau^{EXCUm}$ ]	Large's equilibrium specific MFN tariff with PTAs without [with] a CET
$G^j(\cdot)$ [ $G^j(\cdot)$ ]	Objective of government $j$ in a PTA without [with] a CET

Large is endowed with  $2I$  types of non-numeraire goods and its individuals have the following utility

$$U^L \equiv c_0^L + \sum_{i=1}^{2I} u(c_i^L) + \bar{\Psi}(E^L, E^S) \quad (1)$$

where  $c_0^L$  stands for consumption of the numeraire good and  $u(\cdot)$  is twice continuously differentiable and strictly concave. The subutility function for the public good is defined as

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

There is a regional spillover if  $\alpha$  is positive.<sup>11</sup> We can interpret  $E$  broadly as public expenditures to address environmental problems, enforce human and labor rights, immigration laws, etc.<sup>12</sup>

Indexing individuals by the good they are endowed with, we have  $2I + 1$  types (where the “extra” individual type represents those not endowed with any good, just labor). Then, for given prices and taxes, an individual of type  $i$  chooses the quantities of the private goods she consumes to maximize her utility subject to a budget constraint,  $c_0^{iL} + \sum_i p_i^L c_i^{iL} \leq y^{iL}$ . Given the assumptions on the subutility, the budget constraint is satisfied with equality and all individuals demand the same quantity of each

<sup>11</sup>We also assume that  $\Psi(0) = 0$ ;  $\lim_{E \rightarrow 0} \Psi'(E) = \infty$  and  $\lim_{E \rightarrow \infty} \Psi(E) \leq \bar{\psi}$ . The last boundary assumption ensures that as long as the population of Small is sufficiently large, it is not exhausted in producing  $E$ , hence the wage is fixed at unity.

<sup>12</sup>Limão (2002) shows that the main results extend to the case where the spillovers are global.

of the non-numeraire goods,  $d(p_i) = u'(p_i)^{-1}$ . Thus the indirect utility of an individual of type  $i$  is

$$w^{iL} = y^{iL} + \bar{\Psi}(E^L, E^S) + \sum_{i=1}^{2I} v(p_i^L) \quad (3)$$

where the last term represents consumer surplus.<sup>13</sup> An individual's income sources are the wage, the value of the endowment and net taxes. Net taxes are equal to per capita tariff revenue,  $TR^L/H$ , net of the per capita tax used to finance the public good,  $e^L$ .

The government sets trade policy and supplies the public good in order to maximize a political support function defined below. The public good is produced using  $h_e^L$  units of labor according to  $E^L = b^L h_e^L$ . We assume that 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. Finally, the balanced budget condition implies that the amount of public good produced in equilibrium is  $E^L = Hb^L e^L$ .<sup>14</sup> Therefore income for individual  $i \in [1, 2I]$  in Large is  $y^{iL} = 1 + p_i^L X_i + TR^L/H - e^L$ .

Small is endowed with a fraction  $1/k_i$  of Large's total endowment of each good  $i$  for a subset  $i \in [1, s]$  where  $s \leq I$ . This will also be a subset of the goods imported by Large. We simplify our model by focusing on a representative agent in Small, hence each individual in Small has a similar share  $1/Hk_i$  of  $X_i$ .<sup>15</sup>

In terms of Small's preferences we assume that it places a lower weight on the public good than Large and actually focus on the extreme case where individuals in Small place no weight on it. Second, we assume that up to some price level,  $\bar{p}_i$ , Small demands a total fixed amount  $D_i < X_i/k_i$  and otherwise demands zero. Further, we assume that  $\bar{p}_i$  is very low for  $i \notin [1, s]$ , the goods that Small is not endowed with, so in effect this implies that Small has a positive demand for only  $i \in [1, s]$ . As we will see these assumptions allow us to “model away” trade creation and diversion effects that would otherwise occur because of a preferential agreement. Although some of these effects certainly do occur, we want to emphasize a different channel by which PTAs affect MTL.<sup>16</sup>

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<sup>13</sup>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  $v = (a - bp)^2/2b$ .

<sup>14</sup>The tariff revenue is distributed lump-sum and we assume that none is used to finance the public good, which maintains the two policies within Large separable in the analysis that follows.

<sup>15</sup>One possible justification for employing a representative agent and not modeling a motivation for Small to impose tariffs is that the trade policy of small countries often has a negligible effect on the issue that we address. That is we will mostly focus on unilateral trade preferences and moreover if a country is truly small, then its policies have no effect on world prices and will not have much direct effect on multilateral liberalization negotiations. Although the EU is planning to convert some of its unilateral trade preferences outside of the GSP program into reciprocal ones this is in part driven with compliance issues of the existing schemes in the WTO.

<sup>16</sup>In the appendix, we show how to extend the model to allow for trade effects and show that this does not affect the main results. For some of the agreements that we analyze assuming that the changes in trade flows between Large and

As a result, the indirect utility for an individual in Small is simply the wage income, which is one, net of taxes,  $e^s$ , plus the value of her endowment and consumer surplus. As will be clear below, we must distinguish between the supply and consumption prices, which we denote respectively by  $p_i^S$  and  $p_i^{SC}$ .

$$w^{iS} = 1 - e^s + \frac{1}{H} \sum_{i=1}^{s \leq I} [p_i^S X_i/k_i + (\bar{p}_i - p_i^{SC}) D_i] \quad (4)$$

### 3.2 Trade and Price Effects of PTAs

Differences in the endowments of the large countries determine their trade pattern. We label goods in increasing order of Large's endowment—smallest endowment in good 1 and largest in  $2I$ . The “mirror” symmetry across blocs then implies that the endowment of Large\* is biggest for  $i = 1$ . Thus, Large imports  $i \in [1, I]$  from Large\* and exports  $i \in [I + 1, 2I]$ . Since Small has a demand  $D_i < X_i/k_i$  for all prices, it exports  $i \in [1, s]$ .<sup>17</sup> The balance of payments condition is satisfied through movements of the numeraire good.

Large sets specific tariffs of  $\tau_i^L$  and  $\tau_i^m$  on the imports from Small and Large\* respectively. The equilibrium domestic price in Large for its set of imported goods,  $p_i^L$ , is then derived from the following market clearing condition.

$$M_i^L(p_i^L) + M_i^{L*}(p_i^L - \tau_i^m) + M_i^S = 0 \quad \text{for } i \in [1, I] \quad (5)$$

where import demand is  $M_i^j \equiv Hd(p_i^j) - X_i^j$  for  $j = L, L^*$  and  $i \in [1, I]$ ;  $M_i^S \equiv D_i - X_i/k_i$  for  $i \in [1, s]$  (recall that  $M_i^S$  is zero for other products). Because we assume that countries do not use export subsidies, the domestic price in Large\* of a good it exports is simply the price in Large net of the tariff,  $p_i^L - \tau_i^m$ .<sup>18</sup> A similar condition holds for the goods imported by Large\*,  $i \in [I + 1, 2I]$ . These conditions implicitly define the domestic prices in the large countries as functions of the tariffs— $p_i^L(\tau_i^m)$  for  $i \in [1, I]$  and  $p_i^{L*}(\tau_i^m)$  for  $i \in [I + 1, 2I]$ . Note that because the net export supplies of small countries are perfectly inelastic, the equilibrium prices  $p_i^L$  and  $p_i^{L*}$  are not directly affected by preferential tariffs. It is then simple to show that an increase in  $\tau_i^m$  raises  $p_i^L$ , whereas an increase in  $\tau_i^{m*}$  lowers the price for Large's exporters.<sup>19</sup>

In the equilibrium without PTAs, small countries do not use tariffs since they do not import any

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Small do not drive Large'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 of that good.

<sup>17</sup>Symmetrically, Small\* exports  $i \in [2I - s, 2I]$ .

<sup>18</sup>Since export subsidies are generally not permitted by the WTO and we have no data, we abstract from them.

<sup>19</sup>From implicitly differentiating (5) we find that  $\partial p_i^L(\tau_i^m)/\partial \tau_i^m \in (0, 1)$  and  $\partial p_i^{L*}(\tau_i^{m*})/\partial \tau_i^{m*} \in (-1, 0)$ .

of the non-numeraire goods. Therefore, given that Small has no tariff reductions to offer to Large, a PTA between Large and Small consists of a tariff reduction by Large on Small's exports in exchange for Small's provision of the regional public good. Even if we modeled a motive for Small to employ tariffs, reductions in those tariffs would still be of negligible value to Large given that Small is a price taker. If  $D_i$  were zero in Small, then the PTA would not affect the bilateral trade volume of the non-numeraire goods, but the exporters in Small would receive a higher price and Large would have to forfeit the tariff revenue. It is also straightforward to show that a PTA does not affect Large's *total* imports in the more general case we have, when small has a positive but fixed demand,  $D_i$ . Throughout we assume that there are rules of origin in place, as observed in practice, that prevent Large\* from exporting through Small to Large at the preferential tariff.<sup>20</sup>

In sum, at given MFN tariffs, Large's total imports remain unchanged, that is there is no trade creation whether it is a PTA with a common external tariff (CET) or not. There is also no trade diversion in the traditional sense where a less efficient supplier replaces a more efficient one, because both Large\* and Small are equally efficient. However, with a PTA, Large extracts less tariff revenue on imports from Small. When transfers are feasible, as it is the case between EU members for example, we will allow Large to choose whether a direct transfer or a preference is the optimal instrument to compensate Small for its provision of the regional public good.

### 3.3 Policy Objectives

We can now write the objective functions for the governments in terms of the policy variables. Denote Large's tariff vectors on imports from Large\* and Small respectively by  $\boldsymbol{\tau}^m = (\tau_1^m, \dots, \tau_I^m)$  and  $\boldsymbol{\tau}^L = (\tau_1^L, \dots, \tau_s^L)$ . The only trade taxes set by Large\* that affect Large are its tariffs,  $\boldsymbol{\tau}^{m*} = (\tau_{2I}^{m*}, \dots, \tau_{I+1}^{m*})$ , and, in the absence of export subsidies, 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 only for policies in their own sector. We can then represent

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<sup>20</sup>In the more general case when  $D_i > 0$ , the initial exports from Small to Large are  $X_i/k_i - D_i$  before the preference. The amount of Small's exports to Large after the preference depends on whether there is a common external tariff applied by the regional bloc. If there is, then consumers in Small still buy the same amount  $D_i$  domestically albeit at the higher price  $p_i^L(\tau_i^m) - \tau_i^L > p_i^L(\tau_i^m) - \tau_i^m$ . Thus, trade volume in non-numeraire goods within a block remains unchanged. In the absence of a CET, Small's consumers will buy from the cheapest available source: Large\* at a price of  $p_i^L - \tau_i^m$ . This is because the exporters of Small will charge at least  $p_i^L - \tau_i^L$ —the price they would receive from selling in Large. Thus, for a PTA without a CET, Small exports  $X_i/k_i$  to Large, so its exports increase, but it now imports  $D_i$  from Large\*. This last effect implies a decrease in exports from Large\* to Large that exactly offsets the increase in exports from Small. So *total* imports by Large remain unchanged.

the government in Large as maximizing the following political support function:

$$\begin{aligned}
G^L(\boldsymbol{\tau}^L, e^S, \boldsymbol{\tau}^m, \boldsymbol{\tau}^{m*}, e^L) &\equiv H[1 - e^L + \bar{\Psi}(Hb^L e^L, Hb^S e^S) + \sum_{i=1}^I v_i(p_i^L(\tau_i^m)) + \sum_{i=I+1}^{2I} v_i(p_i^L(\tau_i^{m*}))] \\
&+ TR^L(\boldsymbol{\tau}^L, \boldsymbol{\tau}^m) + \sum_{i=I+1}^{2I} p_i^L(\tau_i^{m*})X_i + \sum_{i=1}^I \omega_i p_i^L(\tau_i^m)X_i
\end{aligned} \tag{6}$$

If  $\omega_i = 1$  for all  $i$ , the objective reduces to a standard social welfare function. Therefore  $\omega_i - 1$  represents the additional weight placed on individuals endowed with an import good. This is a reduced form that can be obtained as a special case from a model where lobbying is given micro-foundations, an issue we will explore in an extension of the empirical section. An important issue that arises when we apply the model to the EU is whether this objective represents individual governments or a joint objective, as maximized by an EU-wide institution. In the appendix we show that (6) can be obtained as the objective for the EU that arises from bargaining between independent EU-member governments, which is a fair representation of the EU's trade policy formation, as we describe in section 2.<sup>21</sup>

As previously mentioned, we simplify by not modeling a motivation for Small to employ trade policy. Therefore, the ‘‘political support’’ function maximized by Small is identical to its total welfare.

$$G^S(\boldsymbol{\tau}^L, e^S, \boldsymbol{\tau}^m) \equiv H[1 - e^S] + \sum_{i=1}^{s \leq I} [(p_i^L(\tau_i^m) - \tau_i^L)X_i/k_i + (\bar{p}_i - p_i^{SC})D_i^S] \tag{7}$$

where  $p_i^{SC} = p_i^L(\tau_i^m) - \tau_i^L$  if there is a PTA with a CET, and  $p_i^L(\tau_i^m) - \tau_i^m$  otherwise.

The tariff revenue expression in (6) depends on whether there is a PTA and it has a CET.

$$TR^L(\boldsymbol{\tau}^L, \boldsymbol{\tau}^m) = \begin{cases} - \sum_{i=1}^I \tau_i^m M_i^{L*} (p_i^L(\tau_i^m) - \tau_i^m) + \sum_{i=1}^{s \leq I} \tau_i^L [X_i/k_i - D_i^S] & \text{CET} \\ - \sum_{i=1}^I \tau_i^m M_i^{L*} (p_i^L(\tau_i^m) - \tau_i^m) + \sum_{i=1}^{s \leq I} \tau_i^L [X_i/k_i - D_i^S] - \sum_{i=1}^{s \leq I} (\tau_i^m - \tau_i^L) D_i^S & \text{No CET} \end{cases}$$

The first expression above applies to a PTA with a CET or when no PTA is present. The second applies to a PTA without a CET. The difference is that in the absence of a CET the consumers in Small purchase from the lowest cost supplier, Large\*, so an amount  $D_i^S$  that was previously exported by Large\* to Large on which  $\tau^m$  was levied is now exported by Small to Large and only  $\tau^L$  is collected. Therefore, at given tariff rates, the objective for Large when it has a PTA with no CET ( $\tilde{G}^L$ ) is the

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<sup>21</sup>This point will also be important in the empirical section because it will provide us with the correct way for aggregating the data of the member countries.

same as with a CET ( $G^L$ ) net of the tariff revenue lost. For Small the opposite is true. That is, given the constant demand modeled, imposing a CET in an existing PTA simply transfers some income from Small to Large. In practice such arrangements will have a rule to redistribute such revenues, which as we discuss below, will be important.

$$\tilde{G}^L(.) = G^L(.) - \sum_{i=1}^{s \leq I} (\tau_i^m - \tau_i^L) D_i^S \quad (8)$$

$$\tilde{G}^S(.) = G^S(.) + \sum_{i=1}^{s \leq I} (\tau_i^m - \tau_i^L) D_i^S \quad (9)$$

### 3.4 Preferential vs. Multilateral Trade Liberalization

#### 3.4.1 MFN Tariffs without Preferences

We first derive the MFN tariff rate that results when PTAs are not allowed. This is the same rate that results if large countries do not want to pursue a PTA, e.g. if Large did not value the regional public good. 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 Small either does not export or does not receive any preferences even when PTAs are already pursued. This subset of goods will be our control group in the estimation. In the next subsection we derive the MFN tariffs for the products with preferences.

Following Bagwell and Staiger (1999), we model the main motive for reciprocal trade liberalization in the WTO as 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 A is the largest exporter to B, then B proposes a tariff reduction to A on that product in exchange for A's tariff reduction on B's exports to A. The MFN rule then requires this reduction to be extended to all other WTO exporters of similar goods.

In the absence of PTAs, the two symmetric large countries choose their multilateral tariffs to maximize their joint objective. Large countries have an individual incentive to cheat and increase their tariffs given their market power in trade. They overcome this problem through repeated interaction in which case the equilibrium MFN tariff rate is subject to an incentive compatibility constraint, denoted by  $IC^C$ , that ensures neither prefers to deviate from the agreement. Given the symmetry between the two large countries it is sufficient to focus on one and, since the problem is stationary, we can focus on maximizing their objective within each period. Thus, after imposing the symmetry

condition,  $\tau^{m*} = \tau^m$ , the equilibrium multilateral tariffs in the absence of a PTA are given by

$$\tau^{Cm} \equiv \arg \max_{\tau^m} \{G^L(\tau^L, e^S = 0, \tau^m, \tau^{m*} = \tau^m, \cdot) : \tau^L = \tau^m; IC^C\} \quad (10)$$

where the constraints require no preferential tariffs,  $\tau^L = \tau^m$ , and incentive compatibility. For simplicity we abstract from potential enforcement problems between large countries in setting their multilateral tariffs by assuming they are sufficiently patient such that the incentive compatibility constraints for MTL do not bind.<sup>22</sup> Given the additive separability of the effect of different goods on the objective and the symmetry across large countries, the tariff for good  $i$  is independent of Large'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  $\tau_i^m = \tau_i^L$ , and whether PTAs are allowed or not.<sup>23</sup> We derive the advalorem equivalent because that is the focus of our empirical work. It is the ratio of the specific tariff to the price before tariff,  $t_i^{Cm} = \tau_i^{Cm}/p_i^{L*}$ , which, according to the FOC for the program above, gives us

$$t_i^{Cm} = (\omega_i - 1) \frac{X_i/M_i}{\varepsilon_i} + \frac{M_i^S}{M_i^* + M_i^S} \frac{1}{\varepsilon_i^*} \quad (11)$$

The import demand elasticity of Large is denoted by  $\varepsilon$  whereas the foreign export supply elasticity it faces is  $\varepsilon^*$ .<sup>24</sup> 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]) If in addition there is no extra weight on the import competing sector the tariff is zero. Otherwise the tariff is increasing on that weight and the value of the endowment relative to imports and decreasing in import demand elasticity for standard Ramsey taxation reasons. The last term represents an MFN externality effect and leads to higher tariffs. It arises because the MFN clause requires Large to lower the tariff on imports from all partners even if some do not reciprocally lower their own tariffs, as is the case for Small. The MFN externality disappears either if Large has no market power in good  $i$ ,  $1/\varepsilon_i^* = 0$ , or if Small's share in Large's total imports is negligible, as we assume in the model.

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<sup>22</sup>For a detailed analysis of the issues that arise when these constraints do bind, see Limão (2002).

<sup>23</sup>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.

<sup>24</sup>Both of these are evaluated at the equilibrium tariff. Their definitions are  $\varepsilon \equiv -M'p^{L*}/M$  and  $\varepsilon^* \equiv \frac{\partial(M^*+M^S)}{\partial p^{L*}} \frac{p^{L*}}{M^*+M^S}$ .

### 3.4.2 MFN Tariffs with Preferences

We first model how the preferential tariff is chosen to then determine its effect on MFN tariffs. Large makes a take-it-or-leave-it (TOL) offer to Small that involves a reduction in the preferential tariff,  $\tau^L$ , below  $\tau^m$  in exchange for an increase in Small's provision of the regional public good. In a one-shot interaction both countries have an incentive to cheat but cooperation can be sustained through repeated interaction. This implies that Large's TOL offer must ensure that Small does not have an incentive to deviate from the agreement and stop supplying the public good. Since we allow Large to make a TOL offer, it will always extract as much of the bargaining surplus as possible so that Small's incentive compatibility constraint is just binding.

The incentive compatible level of  $e^S$  is obtained by requiring the current gain to Small from deviating, i.e. setting  $e^S = 0$ , not to exceed the foregone gains from cooperation due to the PTA. The equilibrium condition for  $e^S$  under a PTA with no CET is as follows.<sup>25</sup>

$$\tilde{G}^S(\tau^L, e^S = 0, \tau^m) - \tilde{G}^S(\tau^L, e^S, \tau^m) \leq \frac{\delta}{1 - \delta} [\tilde{G}^S(\tau^L, e^S, \tau^m) - \tilde{G}^S(\tau^T, e^S = 0, \tau^m)] \quad (12)$$

where  $\delta \in (0, 1)$  represents Small's discount factor and  $\tau^T$  stands for the threat level of the tariff used by Large if Small stops cooperating. When Small is a WTO member the highest credible threat tariff that Large can use is to revert to the MFN tariff,  $\tau^m$ , as required by WTO rules.<sup>26</sup> Then, using the definition of  $\tilde{G}^S$  in (9), we obtain the equilibrium TOL bargaining solution level of  $e^S$  for a given preferential margin,  $\tau^m - \tau^L$ . Assuming for simplicity that Small exports only good 1 we have

$$\tilde{e}^B = \delta(\tau_1^m - \tau_1^L)X_1/Hk_1 \quad (13)$$

Therefore the amount of tax that Small will collect to supply the regional public good is proportional to the revenue transfer from Large due to the preferential treatment. Given the additive separability of the objective function the MFN tariffs for goods other than  $s = 1$  are given by (11). The MFN constraint is now relaxed,  $\tau^L \leq \tau^m$ , and the preferential tariff is optimally chosen taking into account the fact that it will affect  $\tilde{e}^B$ . We continue to assume that large countries are sufficiently patient such

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<sup>25</sup>We assume that the MFN tariffs are set on the assumption that the small countries accept a PTA and will not deviate. Moreover, if Small does deviate, Large removes the preference given to Small and sets its tariff equal to the MFN tariff originally agreed upon with Large\*. That is we assume that after a deviation by the small country in the supply of the public good, the large countries do not renegotiate their MFN tariffs. An alternative is to assume that after a deviation by Small the MFN tariff implemented is changed to  $\tau^{Cm}$ . 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.

<sup>26</sup>The case where Large's incentive compatibility constraint for the PTA also binds is analyzed in Limão (2002).



that their IC, now denoted as  $IC^{EX}$ , do not bind. Substituting in the equilibrium value of  $e^S$  just derived, the equilibrium MFN and preferential tariffs are given by

$$\{\tau^{EXm}, \tau^B\} \equiv \arg \max_{\tau^m, \tau^L} \{\tilde{G}^L(\tau^L, e^S, \tau^m, \tau^{m*} = \tau^m, \cdot) : \tau^L \leq \tau^m; IC^{EX}; e^S = \tilde{e}^B\} \quad (14)$$

From this we obtain the following expression for the equilibrium (advalorem) MFN tariff rate.<sup>27</sup>

$$t_i^{EXm} = (\delta \tilde{G}_{e^S}^L / H - 1) \frac{X_i / k_i}{M_i p_i'^L} \frac{1}{\varepsilon_i} + (\omega_i - 1) \frac{X_i / M_i}{\varepsilon_i} + \frac{M_i^S}{M_i^* + M_i^S} \frac{1}{\varepsilon_i^*} \quad (15)$$

In order to compare the MFN tariff for a given good when PTAs are allowed against the tariff that would emerge if they were forbidden, we can evaluate the right-hand side of (15) using the tariff level that emerges in the absence of PTAs,  $t_i^{Cm}$ . When we do so, we obtain a non-negative term that captures the potential for a stumbling block effect of a PTA:

$$t_i^{EXm} - t_i^{Cm} = [(\delta \tilde{G}_{e^S}^L / H - 1) \frac{X_i / k_i}{M_i p_i'^L} \frac{1}{\varepsilon_i}]_{\tau^m = \tau_i^{Cm}} \geq 0 \quad (16)$$

To interpret and sign this term note first that  $1/M_i p_i'^L \varepsilon_i > 0$ . So the sign depends on the remainder of the expression,  $(\delta \tilde{G}_{e^S}^L / H - 1) X_i / k_i$ . From (13) we obtain  $\frac{\partial e^B}{\partial \tau_i^m} = -\frac{\partial e^B}{\partial \tau_i^L} = \delta X_i / H k_i$  and from (8) we have  $\tilde{G}_{\tau^L}^L = X_i / k_i$ . Therefore,  $(\delta \tilde{G}_{e^S}^L / H - 1) X_i / k_i = -(\tilde{G}_{\tau^L}^L + \tilde{G}_{e^S}^L \frac{\partial e^B}{\partial \tau^L})$ . The last expression is simply what arises from the first order condition for  $\tau^L$ , which is positive if the optimal preferential tariff rate is zero at  $\tau_i^{Cm}$ . That is to say, if we are at a corner solution in the PTA, where Large would like an increase in the supply of  $e^S$  but cannot lower its preferential tariff because it is already at zero. In this case there is an incentive to increase the MFN tariff above  $\tau_i^{Cm}$ . A sufficient condition for a corner solution in the PTA is for  $\alpha$ , the scope of the spillover to be sufficiently large.

The intuition for the stumbling block effect is straightforward. When the marginal benefit to Large from additional supply of the regional public good is higher than the cost in terms of foregone tariff revenue, Large would prefer to increase the preferential margin given to Small and it initially does this by reducing the preferential tariff. However, once the preferential tariff is at zero, then the preferential margin can only be increased by raising the MFN tariff.

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<sup>27</sup>See the appendix for the derivation.

### 3.4.3 Common External Tariff and Cash for Cooperation

There is a long literature on various aspects of PTAs that shows that their effects often depend on the existence of a CET.<sup>28</sup> 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. If all goods enter the EU via one port, does that country receive all the revenue? In order to address this issue, PTAs with a CET specify revenue transfer mechanisms. Therefore, one key difference relative to other PTAs is the existence of a mechanism for transfers, which Large can use to provide an incentive for Small to supply the regional good. In the context of the EU such transfers go well beyond tariff revenue distribution and therefore we now model the effect of a CET in the presence of transfers and show that such transfers will either partially or fully replace the manipulation of MFN tariffs to obtain cooperation from regional partners.

The possibility of transfers also raises the question of whether preferences in this model would be given in the first place, since the motive for Large in using them is to obtain  $e^S$ . Below we show the conditions under which Large will optimally use both transfers *and* preferences. This will show that the model can explain preferential treatment even if Large can also use cash to obtain Small’s cooperation.

If Small can deviate in the provision of the public good then its incentive compatibility constraint is still (12). If we allow a transfer  $T$  from Large to Small when cooperation starts then we have:

$$[G^S(\boldsymbol{\tau}^L, e^S = 0, \boldsymbol{\tau}^m) + T] - [G^S(\boldsymbol{\tau}^L, e^S, \boldsymbol{\tau}^m) + T] \leq \frac{\delta}{1 - \delta} [G^S(\boldsymbol{\tau}^L, e^S, \boldsymbol{\tau}^m) + T - G^S(\boldsymbol{\tau}^T, e^S = 0, \boldsymbol{\tau}^m)]$$

where the left-hand-side represents Small’s gain from deviating and the right-hand-side the discounted value from cooperating. Using the definition of  $G^S$  in (7), we obtain the equilibrium level of  $e^S$  for a

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<sup>28</sup>Cadot et al. (1999) argue that “deepening integration is likely to work toward *reinforcing* protectionist pressures against nonmembers” when there is a CET but not necessarily if the PTA has no CET in place. Bagwell and Staiger (1998) 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 in line with the non-discrimination principle.

given preference,  $\tau_1^m - \tau_1^L$ , and transfer,  $T$ , as<sup>29</sup>

$$e^B = \delta(T + (\tau_1^m - \tau_1^L)(X_1/k_1 - D_1))/H \quad (17)$$

Now the extent of Small's regional good supply depends on the transfer and the additional revenue from the preferential margin on its exports,  $X_1/k_1 - D_1$ .

The large countries maximize their joint objective net of any transfers made to the regional partner. By allowing them to optimally choose the instruments we can answer whether a PTA with a CET will take place and how it affects MFN tariffs.

$$\{\tau^{EXCUm}, \tau^B, T^B\} \equiv \arg \max_{\tau^m, \tau^L, T} \{G^L(\tau^L, e^S, \tau^m, \tau^{m*} = \tau^m, \cdot) - T : \tau^L \leq \tau^m; IC^{CU}; e^S = e^B\} \quad (18)$$

As we show in the appendix solving this problem yields the following relationship between the equilibrium preferential tariff,  $\tau^B$ , the MFN tariff with a CET,  $\tau^{EXCUm}$ , and the MFN tariff in the absence of preferences,  $\tau^{Cm}$ .

$$\tau^{EXCUm} = \tau^{Cm} ; \tau^B \leq \tau^{EXCUm} \quad (19)$$

The stumbling block effect is no longer present under a CET with transfers but, despite the extra ability to use transfers, a preferential rate may still be utilized. Both transfers *and* preferential tariff reductions may be used because Large is indifferent between the two. At a given MFN tariff, the cost of a reduction in  $\tau^L$  is simply the lost tariff revenue for Large and since Small's exports are inelastic this lost revenue is no more costly than simply transferring an equivalent amount in cash/numeraire good. Therefore, a preference may be provided, i.e.  $\tau^B \leq \tau^{EXCUm}$ . The difference relative to the PTA without a CET is that now, if at  $\tau^L = 0$  Small is still not providing "enough" of the public good, the optimal solution is to increase the transfer rather than the MFN tariff. This occurs because a higher MFN tariff is more costly than higher transfers for Large, because it distorts the prices. Since Large is indifferent between using  $\tau^L$  and transfers for all levels of transfers and  $\tau^L$ , it prefers to use  $T$  instead of increasing the MFN tariff. So in equilibrium we have  $\tau^{EXCUm} = \tau^{Cm}$ .

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<sup>29</sup>An alternative case would be to allow Small to simultaneously deviate in its supply of the public good and allow its consumers to import from the rest of the world at a lower price, which would generate an additional motive to deviate. We can then show that  $e^B = (T + (\tau_1^m - \tau_1^L)(\delta X_1/k_1 - D_1))/H$ . The additional incentive to deviate only arises if Small is given a trade preference. This implies that a direct transfer has an added advantage over the preference if we assumed that Small would deviate in this way.

## 4 Estimation

### 4.1 Predictions and Identification

We now derive the main estimating equation, discuss its main predictions and analyze how it is identified. Combining the expression for the MFN tariff rate in a good without preferences,(11), and the one with preferences, (15), we obtain the following.

$$t_i = (\delta\tilde{G}_{eS}^L/H - 1)\frac{X_i/k_i}{M_i p_i^L} \frac{1}{\varepsilon_i} I_i + (\omega_i - 1)\frac{X_i/M_i}{\varepsilon_i} + \frac{M_i^S}{M_i^* + M_i^S} \frac{1}{\varepsilon_i^*} \quad (20)$$

where  $I_i$  is an indicator variable that equals 1 if the good is imported from a preferential partner and receives a zero preferential rate. Simplifying the notation by using  $x_i$  and  $m_i$  for  $\frac{X_i/M_i}{\varepsilon_i}$  and  $\frac{M_i^S}{M_i^* + M_i^S} \frac{1}{\varepsilon_i^*}$  respectively and dropping the product subscript we have the following econometric model.

$$t = \phi I + \beta x + m + u \quad (21)$$

where  $E(u|x, m, I) = 0$ ,  $\phi = (\delta\tilde{G}_{eS}^L/H - 1)E(\frac{X/k}{Mp^L} \frac{1}{\varepsilon}|x, m, I)$  and  $\beta = E((\omega_i - 1)|x, m, I)$ . Note that when a good is imported from a preferential partner, then  $E(\frac{X/k}{Mp^L} \frac{1}{\varepsilon}|x, m, I) > 0$  and therefore the coefficient  $\phi$  is positive if and only if  $\delta\tilde{G}_{eS}^L/H > 1$ , which we showed is the condition for a stumbling block effect to exist. Therefore, from an econometric perspective the key prediction we test is whether  $\phi$  is positive or not. There are also two auxiliary predictions that arise immediately from the theory and that we test. First,  $\phi = 0$  for products with a positive preferential tariff. Second, the MFN tariff on products exported by countries that recently entered the EU and have access to transfers should be no different than the one for non-PTA goods.

The theoretical model captures key features of trade policy determination. However, it is a parsimonious model which might not be fully specified. One important concern is that since tariffs tend to be highly persistent, there may be an unobserved component determining the tariff level for each product. Such an effect may also influence whether a good receives a preference and thus potentially generate an omitted variable bias. We address this issue by estimating the model in changes rather than levels.<sup>30</sup> Since the model focuses on MFN tariffs, most of which the EU changes infrequently, we take the change as the difference between the MFN tariffs negotiated in the UR and those in place

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<sup>30</sup>Considering changes over two multilateral rounds in the empirical work is not inconsistent with the theoretical model. 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, once we allow the incentive compatibility constraints of the large countries to play a role in constraining the level of multilateral liberalization then shocks to their discount factors would also change the equilibrium level of MFN tariffs.

before it, which were largely set during the Tokyo Round. 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

$$\Delta t = \phi I + \beta \Delta x + \Delta m + v \quad (22)$$

where  $E(v|\Delta x, \Delta m, I) = 0$ , and  $\beta$  and  $\phi$  have the same interpretations as in the cross-section equation. Note that we assumed that the weights,  $\omega_i$ , are time-invariant, an assumption that we will test. More importantly, we used 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  $I_{it} = 1$ .<sup>31</sup>

One important determinant that is not explicitly reflected in (22) is reciprocity—the extent to which a country lowers its tariffs in response to another country’s tariff reductions. Reciprocity is an important principle in WTO negotiations and also a basic feature of our theoretical model but it is not fully reflected in the expression above because we assumed that the large countries are symmetric and then solved for the equilibrium tariff. We should point out that an element of reciprocity, or rather lack thereof, is reflected through the MFN externality term,  $m$ . Recall that this term captures how much higher the MFN tariff is because of those small exporters that do not participate in the negotiations, i.e. do not offer reciprocal tariff reductions but receive the MFN tariff.<sup>32</sup>

To relax the symmetry in the model and capture reciprocity in the estimation we follow Limão (2003) who constructs a measure of market access ‘‘concessions’’ that is consistent with how multilateral tariff negotiations take place. The variable is defined at the product level as  $R_i = \sum_c s_{it}^c [\sum_j w_j^c \Delta t_j^c / t_{jt}^c]$  where  $\Delta t_j^c / t_{jt}^c$  is the percentage tariff reduction by country  $c$  in good  $j$  and  $w_j^c$  is the import share of good  $j$  in total imports of  $c$ . Therefore the term in brackets captures country  $c$ ’s average market access concession, which is multiplied by  $s_{it}^c$ —the export share of a principal supplier  $c$  to the EU as a share of total exports from all of the EU’s principal suppliers. The prediction is that in the goods exported by countries that offered relatively larger concessions, the EU will reciprocate by offering

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<sup>31</sup>To confirm that the underlying parameters in the change equation can be interpreted exactly as the ones in the cross-section when  $I_{it-1} = 0$  and  $I_{it} = 1$  note that in terms of the underlying parameters we have  $\Delta t_i = (\delta \tilde{G}_{teS}^L / H_t - 1) \frac{X_{it} / k_{it}}{M_{it} p_{it}^L \frac{1}{\varepsilon_{it}}} I_{it} + (\omega_i - 1) \Delta x_i + \Delta m_i$ . For goods where  $I_{it-1} = I_{it}$  we would have  $\Delta t_i = I_i \Delta [(\delta \tilde{G}_{eS}^L / H - 1) \frac{X_i / k_i}{M_i p_i^L \frac{1}{\varepsilon_i}}] + (\omega_i - 1) \Delta x_i + \Delta m_i$ . Thus, for PTA goods from agreements that were in place before the Tokyo Round, e.g. for certain GSP and ACP goods, the coefficient on  $I_i$  measures any increase in the marginal benefit to the EU from the provision of the regional public good between the two rounds.

<sup>32</sup>In the context of our model, only the small countries entering into the PTAs were assumed not to liberalize reciprocally. However, in practice there are several small countries that have not pursued significant reciprocal tariff reductions. If there was a significant change in  $m$  between the two rounds, this would imply that some countries in the last round offered more reciprocal tariff reductions.

relatively larger MFN tariff reductions of its own. As we discuss below, including reciprocity in the estimation will also help us to address a data problem with the MFN externality effect.

Augmenting (22) to explicitly account for reciprocity the basic estimating equation becomes the following.

$$\Delta t = \phi I + \beta \Delta x + \rho R + \Delta m + v \quad (23)$$

There are no data available to construct the exact MFN externality variable. The main reason for this is that we do not have a bilateral record of which countries did not negotiate with the EU on specific products during the trade rounds. Therefore, in our basic estimation we do not include this variable. This raises the issue of omitted variable bias unless  $E(\Delta m | \Delta x, I, R) = 0$ , but we believe it is mitigated for two reasons. First, reciprocity will act partially as a proxy for the missing variable, since those countries that free-ride will have small average tariff reductions and the EU will “reciprocate” with smaller tariff reductions of its own. Second, we employ an instrumental variables approach based on a GMM estimator that allows us to test the orthogonality of our instruments to the error term. If the omitted variable bias is a serious problem, then the orthogonality tests should fail. Moreover, in the robustness section 4.5 we construct a proxy for the MFN externality effect and find that it does not affect the results.

There are other potential endogeneity problems that we address in estimating (23). First, whether a particular product receives a preference is likely to depend on some unobserved characteristics that are product-specific. This is addressed by estimating in differences. Second, the preference may depend on MFN tariff changes, e.g. if a PTA partner expects a small MFN reduction in a product, it may be more likely to request a preference in it than in a product where it expects a large MFN reduction. In order to address this potential problem we first make sure that the PTAs considered take effect before the multilateral tariff changes are implemented for the UR. However, this does not solve the problem if the tariff change was correctly *anticipated*. To tackle reverse causation, and also the potential bias from omitting the exact MFN externality variable we employ instrumental variables.

The main instrument for the PTA-good variable,  $I$ , is an indicator variable 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. The instrument is correlated with  $I_i$ , that is whether a product both receives a preference and is imported 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 an 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, the decision to export a good prior to the UR may be independent of the subsequent MFN tariff changes so that the instrument is uncorrelated with the error term. Nonetheless, we will be able to test and verify the exogeneity of the export indicator and NTBs as instruments because we employ a GMM approach. The set of overidentifying restrictions that allow us to perform these tests arise from including other instruments such as world price changes between 1992 and 1994 which can 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,  $\Delta x$ , 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 of endogeneity and therefore instrument  $\Delta x$  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. We also test this set of instruments to ensure that they are orthogonal to the error.

Finally, the reciprocity term also poses a potential endogeneity problem in the form of reverse causation since the total tariff reduction by other WTO members in the UR will partially depend on the EU's reductions. We instrument reciprocity by using the unilateral portion of the total tariff reductions that are eventually offered at the UR. More specifically, the reductions between 1986 and 1992 were unilateral because they were undertaken by various countries, outside of GATT negotiations, which did not know if these reductions would be reciprocated at all. In fact it was not clear at the time if the round would even be completed. However, when the final 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, the unilateral liberalization by the other WTO members (between 1986 and 1992) is used as an instrument for their total liberalization (between 1986 and 1995).<sup>33</sup>

## 4.2 Data

In the appendix section A.5 we provide detailed definitions and sources for each of the variables; their summary statistics are presented in table 7. Here we point out some salient characteristics of the

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<sup>33</sup>Limão (2003) provides a detailed argument for the use of this instrument for reciprocity.

data. The advalorem tariff rates for the EU before and after the Uruguay Round (UR) are available through the WTO schedules of concessions at the 8-digit HS level and the 8-digit preferential tariff rates are obtained from UNCTAD.<sup>34</sup> The intra and extra-EU bilateral trade data is available at the same level of disaggregation through Eurostat. In order to construct the reciprocity variable for a given country we employ the data in Finger et al. (1999) who use the available tariff reductions for each WTO member for each product during the UR aggregated by country into averages and then weighted by own imports. They calculate both the tariff reductions from 1986-95 and 1992-95, which tend to differ mainly for the countries that undertook considerable unilateral liberalization between 1986-92. This is an important point in identifying the reciprocity effect as we describe above. From these we construct our own product weighted measures of reciprocity that account for the share of each main exporter to the EU in a particular good.

We also require data on production and other industry variables that we use as instruments for  $x$ . This data is typically available for EU members and we aggregate it in the way that is suggested by the theoretical model.<sup>35</sup> UNIDO's industrial database provides the most comprehensive source covering all EU members and dating back to 1978. UNIDO's data is collected at the industry level and hence it is more aggregated than the trade and tariff data, which 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.<sup>36</sup> Furthermore, we argue that our use of instrumental variables reduces any measurement error problem generated by using industry data for this variable.

Using industry level data for  $x$  does imply that the interpretation of  $\beta$  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

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<sup>34</sup>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.

<sup>35</sup>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  $\omega_i^c$  is the individual member weight for a given producer and  $\xi_i^c$  is the production share in the EU as shown in section A.1 of the appendix.

<sup>36</sup>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. Moreover, the import demand elasticity we calculate is for the EU as a whole, as required by the model. For this we use the structural estimates of the parameter  $a_{nn}$  for each 3-digit product from Kee, Nicita and Olarreaga (2004) along with the EU's imports to GDP ratio in that industry.



best way to identify it is at the industry level.<sup>37</sup>

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%, whereas the iron and steel industry (SIC-371) became the least protected in terms of tariffs after the UR, 0.4%. 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 (23). 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. Furthermore, we allow for the errors to be correlated through clustering within each industry for which the production data is used to ensure the estimation is also robust to arbitrary within-industry correlation.<sup>38</sup>

The variable  $I^{any0}$  in table 2 takes the value one for goods imported at a duty-free preferential rate

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<sup>37</sup>The share of between-industry variation relative to total variation in the MFN tariff rates for EU is twice as high as in the US for instance. This is the case both in levels (0.62-0.69) and in changes (0.34). This might be partly due to the fact that the original CET in 1968 was an average of the tariffs of the founding members. When the averaging is done for each product across countries, the within variation for any given industry falls relative to what it was for any individual country. Thus, the share of the variation between industries after the averaging tends to increase relative to what it was for any given country. Moreover, from a political economy perspective, it is easier to build consensus for tariffs at the industry level (most countries are likely to produce some product in any given industry) rather than at the product level (some countries do not produce some products and would clearly loose when the CET on it is raised). In effect, the consumers are relatively organized in a CU because each government is likely to represent them when the country is a net importer. Producers from different countries that join for EU-wide lobbying on trade policy are more likely to maintain their coalition together if they focus on a level of protection that is similar for all of them, that is a level of protection with little within industry variation. A similar effect arises when ministers from different countries representing a given sector, say agriculture, must agree on an EU-wide policy. Each demand protection for some products and will support protection favored by other countries in other products, if they expect this to increase the probability of protection for their own products of concern, which Winters (1994) describes as the “restaurant bill” effect.

<sup>38</sup>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.

by the EU from any of its preferential partners and is zero otherwise.<sup>39</sup> The variable excludes countries that share a CET with the EU and have acceded after the Tokyo Round: Greece, Portugal, Spain, Austria, Finland and Sweden. We estimate that effect separately as suggested by our theoretical model. The estimates of the coefficient for  $I^{any0}$  are positive and significant at the 1% level under all specifications, which provides evidence that there was 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 of the model.

The model also predicts that the stumbling block effect is only present for products with a zero preferential tariff rate. 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 only about 1.5 % of the observations in the sample. The total effect of a good with a positive preferential tariff is obtained by summing the two coefficients and we can’t reject the hypothesis that the tariff reduction for such goods is the same as that of non-pta products, as predicted.

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, which we confirm to be true in column 4. The variables  $I^{afs}$  and  $I^{spg}$  are indicator variables for products exported by Austria, Finland and Sweden and Spain, Portugal 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.

The model also predicts that the stumbling block effect should be stronger in products that are important exports for a PTA partner, as we can see from the fact that in (20) the stumbling block effect is multiplied by the level of exports by the PTA partner,  $X_{it}/k_{it}$ . 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.<sup>40</sup>

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<sup>39</sup>The finer the level of disaggregation the bigger the potential for product misclassification when a shipment is recorded. We employ data at the 8-digit so we try to minimize this problem by reclassifying 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. The results in table 2 employ the 5th percentile as the threshold for a product defined with respect to the total exports from that PTA to the EU. We test whether this affects our results in section 4.5.

<sup>40</sup>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 75th percentile are used.

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. In order to test whether this creates an increased incentive for the EU to hold back MFN tariffs, we include an additional variable in column 2 of table 2,  $I^{evy0}$ , which is one if the product is imported by the EU at a preferential duty-free rate from all of its preferential partners, and zero otherwise. We estimate that the stumbling block effect for this subset of products is indeed larger.

The EU has several different preferential programs. The estimates we have presented thus far refer to an average effect of all these programs. This average effect is arguably closer to the theory since the model we provided focuses on a single PTA. However, it may be useful to quantify whether the effect is being driven by any given PTA in particular. Moreover, such estimates are an important input for determining the welfare effects of eliminating specific PTAs, as Limão and Olarreaga (2004) do for example. 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 that is highly correlated with it.

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, since smaller reductions in the EU will be reciprocated by smaller reductions in the trading partners. Since Limão (2003) also finds reciprocity to be a significant factor in the US multilateral tariff reductions in 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.

The coefficient on  $\Delta x$  provides an estimate for  $\omega - 1$ . This represents the production weighted average of the extra importance attached to producer surplus relative to social welfare in the EU members, as we show in the appendix. We can't reject that an extra weight is placed on the producer surplus. The estimates range from 0.0024 in column 6 to 0.0042 in column 3. We provide an alternative interpretation of this parameter and a comparison with other studies when we model its determinants in section 4.6.

In Tables 3 and 4, we present the first stage regressions for the main specifications. The regressions indicate that the instruments used 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 can’t reject the orthogonality of the smaller subsets either.

#### 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. The reduction for non-PTA goods was about 3.4 percentage points so 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 products where the EU is a price taker in the world market the growth in the advalorem tariff is fully passed to the price paid by EU consumers. Writing the domestic price as  $\ln p_t^d = \ln(1 + t_t) + \ln p_t^w$  we can immediately see that under full pass-through of tariffs the growth in the domestic price of a PTA good is  $\Delta \ln(1 + t^{PTA})$ , which is approximately equal to  $\Delta t^{PTA}$ .<sup>41</sup> Using this and (23) we can immediately see that the growth in the domestic price of a PTA good relative to that of a similar non-PTA good is  $\Delta t^{PTA} - \Delta t = \phi$ . Therefore the parameter we estimate can be interpreted as the relative domestic price growth between similar PTA and non-PTA goods under full pass-through.

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 the ratio of the growth effects  $\Delta \ln p_{PTA}^d / \Delta \ln p^d = \Delta \ln(1 + t^{PTA}) / \Delta \ln(1 + t) \approx \Delta t^{PTA} / \Delta t = 1 + \phi/c$ , where  $c$  is the estimated average tariff change for non-PTA products. Therefore, the last 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.

It is also possible to provide an interpretation of the results in terms of price effects for goods where there is imperfect pass-through from tariffs to domestic prices, i.e. when the EU is not a price taker. 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.<sup>42</sup> Moreover there is considerable evidence of imperfect pass-through not only from exchange rate changes but also from tariff changes.<sup>43</sup> Provided

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<sup>41</sup>This approximation is valid in our sample since  $\Delta \ln(1 + t_t) - \Delta t_t$  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.

<sup>42</sup>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.

<sup>43</sup>Kreinin (1961) estimated that less than one third of the U.S. tariff reductions were passed on to its consumers

that the pass-through is similar for PTA and non-PTA goods then the relative growth in the prices is also given by the expression above, i.e.  $\Delta \ln p_{PTA}^w / \Delta \ln p^w \approx 1 + \phi/c$  if  $\pi^{PTA} \approx \pi < 1$ .<sup>44</sup> Therefore, the interpretation of a value for  $1 + \phi/c$  of say 0.5 is that a non-PTA country received only half of the export price increase due to the EU MFN tariff changes in the UR by exporting the PTA good relative to what it would have received by exporting a similar non-PTA good.

At the bottom of table 2 the row labeled  $1 + \phi/c$  provides the estimates for the stumbling block price effects as well as their confidence intervals. The effect of any PTA is about 0.53 (column 1) and it does not change much when we control for whether there is 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).<sup>45</sup>

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. We believe that they do. First, comparing the estimation equation (20) and (21) we see that the parameter  $\phi$  that we estimate is the average difference in the tariff rates for a given product under a commitment to MFN, i.e. when no PTAs are allowed, and when they are allowed, as shown in (16). So a strict interpretation of our estimate in light of the theory is that on average the MFN tariffs on *PTA products* are 1.6 percentage points higher than they would have been in the absence PTAs. Since PTA products represent a large share of our sample the average effect for *all products* is about 1.5 percentage points.

One possible concern with the last argument is that the model does not fully take into account all the effects that PTAs have on MTL. For example, there has been considerable debate on whether the PTAs pursued by the US and the EU increased or decreased the probability of completion of the Uruguay Round. However, there is no consensus on this question. Although the question of stumbling blocks arose as the Uruguay Round was delayed, with some blaming it on PTAs, several people have argued that PTAs actually lead partners to the multilateral table. Since multilateral trade rounds are too infrequent, whether PTAs increase or decrease the probability of a round can not be answered econometrically. Given that we cannot estimate this effect on the probability, and the lack of consensus on whether it is even positive or negative, the best we can do is estimate the effects of PTAs on MFN tariffs given that there were PTAs in place in the last round and use the model to interpret these

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during the Kennedy multilateral trade round. Feenstra (1989) showed that the effects of the exchange rate pass-through is symmetric to the effects of tariff changes in the US. Goldberg and Knetter (1997) survey the evidence on imperfect pass-through from exchange rates.

<sup>44</sup>To see this define the pass-through rate from tariffs as  $\pi = \Delta \ln p^d / \Delta \ln(1+t) = 1 + \Delta \ln p^w / \Delta \ln(1+t)$ . We can then write the ratio of world price effects for PTA to non-PTA products as  $\Delta \ln p_{PTA}^w / \Delta \ln p^w = [\Delta \ln(1 + t^{PTA}) / \Delta \ln(1 + t)](\pi^{PTA} - 1) / (\pi - 1) \approx 1 + \phi/c$  if  $\pi^{PTA} \approx \pi < 1$ .

<sup>45</sup>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.

estimates in a way that allows us to get at the counterfactual of what would have happened in the absence of any PTAs.

Although we can't provide exact econometric estimates of the effects of PTAs on the probability of the completion of the round we can provide some bounds for our results that try to incorporate such effects. To do so we first distinguish between a direct and an indirect effect of PTAs on MTL. The direct effect of the EU's PTAs is the one we estimated: the higher tariffs the EU maintained on its PTA goods given how much other countries changed their tariffs. The indirect effect refers to whether the EU's PTAs increased the probability of the last round and, given that round did occur, whether those PTAs made other countries reduce their tariffs by more or less. This effect is indirect in that it works through reciprocity. Thus if PTAs affect the probability of a round they alter the expected value of the EU's tariff changes by changing the expected value of reciprocity. Given this consider the expected difference in the MFN tariffs of the EU in a world with PTAs, denoted by a variable  $z = 1$ , and the unobserved world without them,  $z = 0$ . The main difference between the two is the existence of PTA goods and the extent of reciprocity.

$$E(\Delta t|z = 1, I, R, \Delta x) - E(\Delta t|z = 0, I, R, \Delta x) = \phi E(I) + \rho(p_1 R_1 - p_0 R_0) \quad (24)$$

where we assume that in the presence of PTAs if there is a direct stumbling block effect it will affect the average tariff independently of whether there is a round and that the unilateral motives for changing the tariffs are identical whether there are PTAs or not. When a round is not completed the EU does not reciprocate other countries' tariff changes so  $\rho = 0$  with probability  $1 - p_1$  when there are PTAs and  $1 - p_0$  when there are no PTAs. Therefore, the second term reflects the difference in the expected reciprocity effect on the EU's tariffs depending on the existence of PTAs. The most neutral case to assume is that the existence of PTAs affects neither the probability of a round,  $p_1 = p_0$ , nor the amount of tariff reductions undertaken by other countries *given* that a round is completed,  $R_1 = R_0$ . In this case the reciprocity term in (24) is zero and we obtain the average value of 1.5 percentage points discussed above.<sup>46</sup>

To provide some bounds on the results that account for possible effects of PTAs on the probabilities of MTL suppose that in the absence of PTAs the UR would not have been completed,  $p_0 = 0$ , and the mere existence of PTAs assured its completion,  $p_1 = 1$ . In this case the *total* stumbling block effect is  $1.5 - 0.006 * (-0.46) = 1.2$  percentage points, where  $\rho = 0.006$  from table 2 and  $R_1 = -0.46$  from

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<sup>46</sup>To obtain (24) we use (23) to write  $E(\Delta t|z = 1, I, R, \Delta x) = p_1(\phi I + \beta \Delta x + \rho R_1 + \Delta m + v) + (1 - p_1)(\phi I + \beta \Delta x + \Delta m + v)$  and  $E(\Delta t|z = 0, I, R, \Delta x) = p_0(\beta \Delta x + \rho R_1 + \Delta m + v) + (1 - p_0)(\beta \Delta x + \Delta m + v)$ .

table 7. So even under this extreme assumption PTAs are a stumbling block and would have been so unless the average reduction in tariffs by other countries, as represented by  $R_1$ , had been almost 6 times larger than what we actually observed. If on the other hand  $p_0 = 1$  and the probability of completing the round under that PTAs was nearly 0 then the total stumbling block effect is at least 1.5 percentage points. Although we did not observe the realization of  $R_0$ , we can reasonably expect that it would have entailed some amount of liberalization such that  $R_0 \leq 0$ .<sup>47</sup>

Finally, looking at the importance of the PTA variable from a different perspective, we see that the explained amount of variation in the tariffs across goods which can be attributed to it is significantly higher than the amount explained by either reciprocity or the political economy variable. Changes in the political economy variable contributed to an average reduction of 0.8 percentage points whereas product reciprocity only contributed 0.3 percentage points relative to a situation where neither change.

#### 4.5 Specification and Robustness Analysis

We now analyze how sensitive the results in table 2 are to measurement error in the PTA variable, the exclusion of some variables and the estimation method. We summarize the results in table 5, 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 second row provides the quantification discussed in the previous section, both of which refer to specification (1) in table 2. The third and fourth rows provide the test statistics for whether products with a positive preferential tariff or from countries with a CET generate a stumbling block, which refer to specifications (3) and (4) in table 2, respectively.

In defining whether a PTA exported a particular product to the EU we employed a low positive value as a threshold to minimize classification errors. 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 introduce it. To test whether the results are sensitive to this, we repeat our estimation 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 duty-free rate. The coefficients in table 2 are robust to this in terms of their sign and significance without major

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<sup>47</sup>The estimates above provide not only information on the bounds of the EU’s tariffs but also on the likelihood that PTAs had a negative impact on liberalization through reciprocity. To see this more clearly start by assuming no difference,  $p_1 = p_0$ , and  $R_1 = R_0$ , and then ask whether the total estimated effect contradicts this assumption. Since even with  $p_1 R_1 = p_0 R_0$  we estimate that the EU’s PTAs caused an increase in its average tariff through the direct effect it is then plausible that the observed reciprocal tariff reduction of other countries was smaller than it would have been under no PTAs. This suggests that  $p_1 R_1 > p_0 R_0$ . From this perspective reciprocity effects may have amplified the stumbling block effect of PTAs.

changes in their magnitudes. Therefore, both the main and auxiliary predictions of the model are verified and the magnitude of the stumbling block effect is similar, as noted in table 5.

As discussed in section 4.1, the data to construct an exact measure to capture the MFN externality is not available. Although we don't think this seriously biases our results, as previously discussed, we create a proxy for this effect. For each HS-8-digit product, we calculated the share of the top 5 exporters in total exports to the EU in 1994 and 1989—the earliest year when the 8-digit hs data is reported. If a decrease in this share in a given product reflects a longer term decrease over the period between 1978 and 1994, then we can use it as a proxy. The model hence predicts a negative coefficient on this variable: products where the share increases have bigger decreases in tariffs.<sup>48</sup> When we include our proxy for the (inverse of) MFN externality we find that it has the expected negative sign but it is insignificant. This could either be because the effect is partially captured by the reciprocity variable, because the proxy is an imperfect one or MFN externalities were not significant. More importantly, for our purposes both the main and auxiliary predictions of the model are again confirmed and the growth effect is also statistically identical to the one in the baseline specification.

The theoretical model that guides our empirical estimation is parsimonious and therefore it is possible that we have not accounted for some determinants of the EU's tariff changes. We do not expect that such omitted variables will bias our estimates 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, there is one variable that does not appear in the theoretical model that we want to address explicitly: the initial tariff rate. The average MFN tariff for PTA products in our sample is 7.57%, whereas it is 12.8% 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, 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 table 5 the relative growth effect evaluated at the average initial tariff is at least as large as the ones found in table 2. Therefore, the basic results in table 2 are not driven by differences in initial tariffs across products. Since the main results are not sensitive to the inclusion

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<sup>48</sup>At an extreme the EU is likely to offer larger reductions when it goes from importing a good from 10 different countries to just 1 because when the negotiation is done with one country, and it is the single exporter of the good, then there is no free-rider problem. That is there are no other exporters waiting to receive an MFN tariff reduction negotiated by some other country. The single exporter internalizes all the gains of the MFN reduction and will thus offer bigger tariff reductions to goods exported to the EU.



of the initial tariff and according to the Schwarz criterion the specification without it is preferred, we choose to focus on the latter, which follows our theoretical model more closely as well.<sup>49</sup>

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. If on the other hand the amount of the reduction depends on the initial tariff, which is on average higher for 311 than other industries, this could potentially affect the results because half of the products in 311 are non-PTA products and they represent a large share of all non-PTA products in the sample. However, this last concern should be addressed by including the initial tariff as a regressor, which, as we have just described, does not affect the results significantly.

To study whether the stumbling block effect is merely driven by a cross-industry difference in the average tariff cut, we re-estimate the model by dropping the observations in 311 and obtain estimates that are qualitatively similar to those in table 2 in terms of the signs and significance of the coefficients. The point estimates of the relative growth effect in the basic specification are higher when we exclude products in 311 but the 95% confidence intervals overlap with those of the corresponding specification in table 2.<sup>50</sup>

A final concern that we address is the potential measurement error in the production data for petroleum refineries (sic 353) and miscellaneous petroleum and coal products (sic 354). Given that these are sensitive sectors, the production data for them can be inaccurate and is in some cases missing. To calculate the EU weighted average production variable used in the main specifications, we imputed the missing data for a few countries in 1992 by using information from previous years.<sup>51</sup> However, since these sectors produce outlier values for the political economy variable,  $\Delta x$ , we re-ran the basic specifications by dropping the two industries. They account for less than 0.8% of all products in the sample and so dropping them does not affect the results.

As we argue in section 4.1, there are good reasons to expect the main regressors to be subject

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<sup>49</sup>We treat the initial tariff as an endogenous regressor.

<sup>50</sup>Again, a simple explanation for why the basic estimates are not too sensitive is that, to the extent that the change in tariffs for that industry was not already accounted for by the political economy or reciprocity variables, it indicated the existence of an omitted variable but since we instrument for the preference variable, this omitted variable should not bias the estimates.

<sup>51</sup>For these industries we do not have data in 1992 (or surrounding years) for France (354), Germany and Italy (353, 354). We impute it based on the 1978 values by assuming a similar share in total output. For example if the value of output is available for all sectors 1, 2, and 3 in 1978 but missing for sector 2 in 1992 in country  $c$ . We impute the value for output,  $v_{2c}^{92}$  with  $[v_{2c}^{78}/(v_{1c}^{78} + v_{3c}^{78})] * (v_{1c}^{92} + v_{3c}^{92})$ .

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 0.79 across different specifications.<sup>52</sup> 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 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.<sup>53</sup>

## 4.6 Political Economy Determinants

There is little systematic evidence on the political economy determinants of the EU’s trade policy. In this section we provide an empirical model of the political economy weights that allows us to identify some of their important determinants in the EU. In doing so we can also analyze the validity of our assumptions that these weights were constant over the last two trade rounds and over industries.

Our theoretical model features a general objective function that allows different weights to be placed on the value of the endowment for different products. The interpretation for this becomes clearer if instead of an endowment economy we think of these goods as being produced by a single factor with which each individual is endowed. Then our formulation simply corresponds to allowing an additional weight  $\omega_i - 1$  on producer surplus relative to consumer surplus. An objective function of this form can be obtained from a model where lobbying is given micro-foundations, such as in Grossman and Helpman (1994), provided that the ownership of the specific factors is concentrated.<sup>54</sup> In Grossman-Helpman each industry has the same relative weight in the government’s objective function provided that it is organized into a lobby. In our sample it is reasonable to assume that all industries are organized because the available industry data we use to identify this weight is aggregated. Moreover, in the Grossman-Helpman setting, the extra weight  $\omega - 1$  has a structural interpretation: the marginal rate of substitution between social welfare and contributions in the politician’s objective. Therefore, the estimates of the coefficient on the variable  $\Delta x$ , which represents the extra weight  $\omega - 1$ , are

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<sup>52</sup>More specifically, we calculate the Durbin-Wu-Hausman statistic. They are 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.

<sup>53</sup>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.

<sup>54</sup>Please see Staiger (1995).

comparable to structural estimates of the Grossman-Helpman model. 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. Our estimates in table 2 range from 0.0025 to 0.0042 for the specifications in columns 3 and 6 respectively and are therefore in between the extremes estimated for the US.<sup>55</sup>

The underlying reason why all organized industries have identical weight in the Grossman-Helpman model is that they lobby by providing the same good to politicians in exchange for protection, that is political contributions in the form of cash that may ultimately be used for campaigning. This formulation is likely to apply better to the US than the EU because several EU members have some combination of stricter limits on campaign spending, public financing and mandatory quotas for free advertising on television.<sup>56</sup> Therefore, we now relax the constraint of identical weights.

As we point out in our discussion of the formation of trade policy in the EU, section 2, lobbies still work to a large extent through the member governments. Therefore we model the political economy weights using a first order approximation for each member government,  $c$ . More specifically the extra weight the government in country  $c$  places on industry  $i$  is a function of various variables indexed by  $k$ , such as the employment share of an industry in  $c$ ,  $(\omega_i^c - 1) = \sum_k \gamma_k \pi_{ki}^c$ . Using the result in the appendix section A.1, the appropriate way to aggregate each industry's weights, over the different EU members, is to take a production weighted average, and hence obtain an average EU weight in each industry as

$$\sum_c (\omega_i^c - 1) \xi_i^c = \sum_k \gamma_k \sum_c \pi_{ki}^c \xi_i^c \quad (25)$$

where  $\xi_i^c$  is country  $c$ 's share of EU production in sector  $i$  and the structural parameters,  $\gamma_k$ , are assumed to be identical over EU members. We can substitute out the extra weight in (20), using the expression above, and then proceed to obtain an estimating equation by taking differences, as before. Defining the EU-wide average value of the determinants of the weights  $\pi_{ki}$  as  $\sum_c \pi_{ki}^c \xi_i^c$ , which can vary over time, but assuming that the structural parameters, in (25) are time-invariant we can identify  $\gamma_k$  by estimating the following augmented version of our initial model:

$$\Delta t = \phi I + \sum_k \gamma_k \Delta(\pi_k x) + \rho R + \Delta m + e \quad (26)$$

We construct the weighted variables  $\pi_k$ , interact them with  $x$  and take differences to identify  $\gamma_k$ .

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<sup>55</sup>Goldberg and Maggi actually report  $1/\omega = 0.986$  (p.1145) whereas Gawande and Bandyopadhyay report  $1/(\omega - 1)$  (p.147).

<sup>56</sup>See for example Nassmacher (2003).

We focus on the share of employment of an industry in  $c$ , on the inverse of the wage in the industry and the industry’s regional concentration. Naturally this is not an exhaustive list of all possible determinants of these weights but given the limited amount of *cross-industry* variation and of data that spans the period from 1978 to 1992 for each EU member, we must be parsimonious. There are several plausible explanations for expecting a positive effect of each of these measures on the extra weight that a government places on a sector. First, an industry with a higher share of employment commands more votes and may thus be more likely to be protected (Caves [1976]). Constantopoulos (1974) shows that in 1960s the national tariffs of several current EU members were indeed affected by labor concerns and seemed to favor labor intensive sectors. Second, an industry with production that is concentrated in a specific region is more likely to be organized as proximity of different production units may lower the costs of creating and maintaining a lobby and thus help overcome any free-rider problems in obtaining protection (Olson [1965]).<sup>57</sup> Finally, Magee et al (1989) argue that industries with low wages may be given higher weight since its workers have a lower opportunity cost of lobbying and therefore lobby more intensively.

The estimation results for (26) are presented in table 6. Since the new variables are interacted with an endogenous variable,  $x$ , we also instrument them.<sup>58</sup> The estimates in table 6 show that industries with higher share of employment and higher regional concentration receive higher tariff protection with “beta” effects of 0.23 and 0.34 respectively.<sup>59</sup> Note that industries that are more regionally concentrated are also more likely to form to lobby the EU Commission directly, which may account for its strong effect on trade policy. Industries with lower wages get a slightly higher weight but this effect is never significant. This last finding does not necessarily contradict the evidence that import protection favors sectors with a large share of low-skill, low-wage workers in developed countries but it does suggest that the increased protection in those industries is not because they are given a higher political economy weight.<sup>60</sup>

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<sup>57</sup>Trefler (1993) provides evidence that industries with above average regional concentration tend to receive more protection in the US. His approach is not a structural one and he does not model the effect of regional concentration on the weights but rather its final effect on trade barriers.

<sup>58</sup>We use the interaction of each of the instruments used for  $x$  with each of the new variables and verify that these new instruments are exogenous and valid, hence orthogonal to the error term.

<sup>59</sup>Calculated as the product of the estimated coefficient for the independent variable and the ratio of the standard deviations of the independent and dependent variables.

<sup>60</sup>Further evidence that the effect of low wages on protection in developed countries is not, as suggested by Magee et al (1989), due to lower opportunity cost of lobbying is that in the US unskilled workers demand less, not more, protection than skilled workers (Goldberg and Maggi 1999, p.1152). An alternative explanation for the evidence of higher protection for low-skill and wage industries found by Ray (1981) and Lee and Swagel (1997) is that the government objective exhibits some degree of concern for redistribution as modeled in Limão and Panagariya (2003) for example. The redistribution channel suggests that the effect of low wages on protection should enter directly into the estimation equation and not as a determinant of the political economy weights. The model we use to derive the structural equation in the current paper ignores redistribution concerns. For this reason, and because the focus of this section is to study the determinants of

Our approach provides a novel way to estimate varying weights that can provide interesting information about the ranking of industries in governments' preferences in terms of structural parameters rather than policy outcomes. The coefficients on the share of employment, regional concentration and wage identify the structural parameters,  $\gamma_k$ , and hence allow us to calculate the EU-wide average weights for each of the different industries and at different points in time by using (25). Figure 1 provides the estimates of these weights for 1992 and 1978. Although there is a positive correlation between the weights we estimate and the average level of protection the simple partial correlation for 1992 is fairly low, which further underscores that the ranking based on the underlying parameters can provide additional interesting information. Note for example that the industries with the second and third lowest weights (pottery and textiles) actually are ranked twenty first and twenty second out of 28 in terms of highest average tariffs and those with the highest weights (machinery except electrical and petroleum refineries) are ranked fairly low in terms of average tariffs. In fact the rank correlation for 1992 between average industry tariffs and the estimated weights is only 0.03. Naturally, there are non-tariff barriers that could potentially reflect some of these weights more closely but it is not clear whether taking those into account would change the main point here; that there is a way to estimate the underlying political economy weights and that these can provide a different ranking of industries in the government's objective relative to the one based solely on the outcome of the protection policy.<sup>61</sup>

The estimated weights also provide a robustness test of our previous results and in particular of the assumption of a constant weight over time and industries. In 1992 the extra weights placed on producer surplus of the sectors in the EU are all estimated to be statistically positive and range from 0.0021 (non-metallic mineral products) to 0.0084 (petroleum refineries). The mean is 0.0044, which is slightly above the estimate in column 1 of table 2, but the confidence intervals for the weight in each of the industries overlaps with the earlier estimate. The median is 0.0038—nearly identical to the value of 0.0037, estimated in table 2, column 1. So restricting the weight to be identical across industries should not affect our results significantly.

The range of weight estimates for 1978 is similar to 1992, as are the mean (0.0047) and median (0.0041). In fact we find no significant change in the weight for any given industry between 1978 and 1992; there is considerable overlap in their confidence intervals even though they are quite tightly

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the political economy weights, we do not augment the basic estimation equation to include the effects of redistribution or other potential determinants on protection unless they work through the weight.

<sup>61</sup>The low partial correlations between the weights and tariffs for 1992 is perfectly compatible with the significant estimates for the structural parameters,  $\gamma_k$ , in table 6. First, these parameters were estimated while controlling for other variables and involved interacting the employment, concentration and wage variables with the  $x$  variable, as suggested by the model, whereas the calculated weights do not rely on that interaction, as is clear from (25). Second, the equation is estimated in differences and the correlation between the weights and the average tariffs in 1978 is higher than in 1992.

estimated. Therefore, restricting the weight to be identical over time should also not affect the results substantially. Another implication of the small changes over time in the weights is that they did not contribute significantly to the EU's tariff reduction in the UR.<sup>62</sup>

To conclude, the assumption of constant weights is reasonable in this sample and does not appear to affect our main results significantly. This is further supported by noting that the sign and significance of the main parameters in table 6 are identical to those we found in table 2. The main predictions of the model are still confirmed and the only difference is a small change in the magnitude of the point estimate of the growth effect, but even that is not significantly different from table 2.<sup>63</sup> Nonetheless we did find evidence of significant determinants that generate different political economy weights across industries. This suggests that in general the variation in these weights should be modeled empirically and theoretically.<sup>64</sup>

## 5 Conclusion

We analyze the effects of preferential trade agreements 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 setting trade policy and we find a negative relation between import penetration and tariff levels working through the extra weight that governments place on producer surplus. We estimate that these industry weights are increasing in regional concentration and employment shares. 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

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<sup>62</sup>Even though the individual industry weights we estimate do not differ from the mean, we do find some differences in the weights across industries at the extremes. In particular, bilateral comparisons of each of 353, 354 (petroleum and coal) and 314 (tobacco) with the remaining industries reveal that the lower bound of the 95% confidence intervals of these 3 industries exceed the upper bound of the rest a total of 12 times in 1992 and 51 in 1978.

<sup>63</sup>To compare the specifications across tables 2 and 6 we also calculated a different version that includes an intercept in the weight equation and thus nests our initial specification. In those specifications (not shown) the estimated intercept of the weight equation was zero indicating, as we expected, that the extra weight placed on an industry is zero if its share of employment is zero and it has average concentration.

<sup>64</sup>Such improvements in modeling could potentially help to explain the puzzlingly low political economy weights thus far found, when estimating structural political economy models of trade protection.

as high, the average price effect due to the EU's multilateral tariff changes was 50-60% 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 their PTAs have a potentially large impact on non-members. 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. But, 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 (2004) argue that this 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”.<sup>65</sup>

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<sup>65</sup>Limão and Olarreaga (2004) also calculate that a switch by the EU, US and Japan from their preferences to less developed countries to an import subsidy scheme would generate positive welfare effects for those 3 groups of countries in the current trade round.

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# A Appendix

## A.1 Intra-EU Bargaining Interpretation of the Objective Function

Note that the objective functions  $G^L$  and  $\tilde{G}^L$  in (6) and (8) respectively refer to one “large” country. However, EU policy reflects the interests of several countries that bargain, usually directly through the Council of Ministers, and then direct the executive arm, the Commission, as we discuss in section 2. We now provide a set of sufficient conditions that allow us to interpret the aggregate objective function we use as the outcome of such bargaining between its members.

Assume that: (1) Union members have the same preferences; (2) there are no trading costs within the union so the same prices hold for all members; (3) members may have different populations and endowments provided that the set of import sectors (broadly defined) is identical, which implies they choose to have import taxes on similar industries; (4) the European Council chooses EU trade policies and  $e^L$  to maximize their total surplus, given by  $W^{eu} = \Sigma_c G^{Lc}(\cdot)$ . It then bargains over any bilateral transfers,  $f_c$ , to implement such a bargain; (5) cash/numeraire transfers are possible across members and subject to bargaining where on net  $\Sigma_c f_c = 0$ ; (6) the regional good financed by the EU is valued by each individual in its totality, i.e.  $\bar{\Psi}(E^{Lc}, E^S) \equiv \Psi(\Sigma_c E^{Lc}) + \alpha \Psi(E^S)$ . Members can still supply national public goods but these will not affect the analysis, since by definition they have no regional spillover.

Under these assumptions we can write the EU-wide objective as a function of the individual members’ objectives as

$$\begin{aligned} W^{eu} = & \sum_c H^c [1 - e^L + \bar{\Psi}(Hb^L e^L, Hb^S e^S) + \sum_{i=1}^I v_i(p_i^L(\tau_i^m)) + \sum_{i=I+1}^{2I} v_i(p_i^L(\tau_i^{m*}))] \\ & + \sum_c \left( \sum_{i=I+1}^{2I} p_i^L(\tau_i^{m*}) X_i^c + \sum_{i=1}^I \omega_i^c p_i^L(\tau_i^m) X_i^c \right) + TR^L(\boldsymbol{\tau}^L, \boldsymbol{\tau}^m) + \Sigma_c f_c \end{aligned}$$

where  $TR$  is the total import tariff revenue for the EU. Using our assumptions we then have

$$\begin{aligned} W^{eu} = & H[1 - e^L + \bar{\Psi}(Hb^L e^L, Hb^S e^S) + \sum_{i=1}^I v_i(p_i^L(\tau_i^m)) + \sum_{i=I+1}^{2I} v_i(p_i^L(\tau_i^{m*}))] \tag{27} \\ & + \sum_{i=I+1}^{2I} p_i^L(\tau_i^{m*}) X_i + \sum_{i=1}^I p_i^L(\tau_i^m) X_i + \sum_{i=1}^I p_i^L(\tau_i^m) X_i \sum_c (\omega_i^c - 1) \xi_i^c + TR^L(\boldsymbol{\tau}^L, \boldsymbol{\tau}^m) \end{aligned}$$

This expression is identical to (6) and according to (27), the weight in (6) can be interpreted as an average of individual member weights:  $(\omega_i - 1) = \sum_c (\omega_i^c - 1) \xi_i^c$ , where  $\xi_i^c$  stands for the production share of member  $c$  in EU. To see this note that given assumptions (1), (2) and the quasilinearity of preferences, individuals in all member countries have identical consumer surplus and utility from the public good. Thus, the first set of terms are unchanged in the EU-wide interpretation. Due to assumption (2),  $p_i^{Lc} = p_i^L$ , implying that the value of supplied goods is  $\sum_c \sum_{i=1}^{2I} p_i^L(\cdot) X_i^c = \sum_{i=1}^{2I} p_i^L(\cdot) (\Sigma_c X_i^c)$  so in (6) and in the empirical work we correctly interpret  $X_i$  as the EU’s aggregate production in  $i$ . Finally, aggregate transfers balance according to assumption 5, hence  $\Sigma_c f_c = 0$ .

## A.2 Trade Effects

When we relax the perfectly inelastic demand assumption for Small, its export supply increases from  $X_i/k_i - D_i(p_i^L(\tau_i^{Cm}) - \tau_i^{Cm})$  under MFN commitment to  $X_i/k_i$  under the PTA case without CET. On the other hand, the exports of Large\* to Small increase from zero to  $D_i(p_i^L(\tau_i^{EXm}) - \tau_i^{EXm})$  and its exports to Large will change by  $H[d_i^*(p_i^L(\tau_i^{EXm}) - \tau_i^{EXm}) - d_i^*(p_i^L(\tau_i^{Cm}) - \tau_i^{Cm})] + D_i(p_i^L(\tau_i^{EXm}) - \tau_i^{EXm})$ . The market clearing condition is now given by:

$$M_i^L(p_i^L) + M_i^{L*}(p_i^L - \tau_i^m) + D_i(p_i^L - \tau_i^m) - \frac{X_i}{k_i} = 0 \quad (28)$$

which indicates that the price clearing this market can still be written only as a function of the MFN tariff and it will not depend on the preferential tariff,  $\tau_i^L$ . Thus after solving for each of the tariff expressions as we did in section 3.4 and with some simplification we obtain

$$\tau_i^{EXm} - \tau_i^{Cm} = \frac{\tilde{G}_{e^S}^L \frac{\partial e^B}{\partial \tau_i^m} - X_i/k_i}{(p_i^L(\tau_i^m) - 1)(Hd_i^{*'} + D_i^{S'})} + \frac{D_i^S(p_i^L(\tau_i^{EXm}) - \tau_i^{EXm}) - D_i^S(p_i^L(\tau_i^{Cm}) - \tau_i^{Cm})}{Hd_i^{*'} + D_i^{S'}} \quad (29)$$

where we use the fact that  $p_i^L(\tau_i^{Cm}) = p_i^L(\tau_i^{EXm})$ . This is satisfied because  $p^L = M^*/(M^* + M')$  and these are fixed parameters given that we assume fixed endowments and quadratic utility functions that give rise to demand functions that are linear in prices. The first term on the right-hand-side (RHS) of (29) is greater than zero if and only if  $\tau_i^L = 0$  at  $\tau_i^{Cm}$  as shown for the case with no trade effects (section 3.4.2). The second term in (29) is less than zero if and only if  $\tau_i^{EXm} > \tau_i^{Cm}$ ; it represents a trade effect where the numerator measures the change in the volume of Large's imports under MFN commitment relative to the PTA case. More specifically, Small's exports to Large increase by  $D_i^S(p_i^L(\tau_i^{Cm}) - \tau_i^{Cm})$ , whereas Large\*'s exports to Large decrease by  $D_i^S(p_i^L(\tau_i^{EXm}) - \tau_i^{EXm})$  under the PTA. This decrease in Large's total imports implies a decline in the MFN tariff as an extra channel.

The extra trade term attenuates the stumbling block effect but is not enough to fully offset it. In order to see this, suppose  $\tau_i^{EXm} = \tau_i^{Cm}$  so that the left-hand-side (LHS) of (29) and the second term on the RHS are zero. In this case the equality holds if and only if  $\tau_i^L > 0$  at  $\tau_i^{Cm}$ . However, the equality fails if the equilibrium preferential tariff at  $\tau_i^{Cm}$  is already zero because  $[\tilde{G}_{e^S}^L \frac{\partial e^B}{\partial \tau_i^m} - X_i/k_i]_{\tau^{Cm}} > 0$ . Given the continuity of  $\tau_i^{EXm}$  and  $D_i^S(p_i^L(\tau_i^{EXm}) - \tau_i^{EXm})$  in  $\tau_i^{EXm}$ , we can then increase  $\tau_i^{EXm}$  until the equality holds because when  $\tau_i^{EXm}$  is raised, the LHS becomes positive and the RHS starts to decline since  $(D_i^S(p_i^L(\tau_i^{EXm}) - \tau_i^{EXm}))/ (Hd_i^{*'} + D_i^{S'})$  falls and a higher equilibrium  $e^S$  at the higher preference margin implies a lower marginal benefit,  $\tilde{G}_{e^S}^L$ . On the other hand, if we start at  $\tau_i^{EXm} = \tau_i^{Cm}$  and lower  $\tau_i^{EXm}$ , the LHS becomes negative, whereas the RHS would remain positive and increasing. Therefore, with  $\tau_i^{EXm} < \tau_i^{Cm}$  the equality cannot be re-established, which shows that  $\tau_i^{EXm} \geq \tau_i^{Cm}$ . Furthermore, the inequality holds strictly, if the preferential tariff is zero at  $\tau_i^{Cm}$ .

### A.3 Tariff Expressions

#### A.3.1 No Common External Tariff

##### Equation (11)

Consider good  $i = I$ , which is imported by Large from Large\* and its symmetric counterpart  $i = I + 1$ , which is exported to Large\* in return. Simplifying the expression from the FOC for an interior solution to (10) we obtain

$$\begin{aligned} G_{\tau_I^m}^L + G_{\tau_{I+1}^{m*}}^L + G_{\tau_I^L}^L &= -[M_I^S + M_I^{L*} + H\tau_I^m(p_I^{L*} - 1)d_I^{*'}] \\ &\quad -p_I^{L*}M_I - (p_{I+1}^{L*} - 1)M_{I+1} + (\omega_I - 1)p_I^{L*}X_I \\ &= -[H\tau_I^m(p_I^{L*} - 1)d_I^{*'}] - (p_I^{L*} - 1)M_I - (p_{I+1}^{L*} - 1)M_{I+1} + (\omega_I - 1)p_I^{L*}X_I \end{aligned}$$

where  $p^{L*} \equiv \frac{\partial p^L}{\partial \tau^m}$ ,  $d^{*'} \equiv \frac{\partial d^*}{\partial p^*}$  and we use the market clearing condition (5) for good  $I$ . Equating to zero, solving for  $\tau_I^m$  and noting that  $M_I^{*'} = Hd_I^{*'}$ , because the supply is fixed, we obtain

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

Employing the symmetry, we have  $p_I^{L*} = p_{I+1}^{L*}$ . Moreover, the symmetry also implies that  $M_I = M_{I+1}^{*}$  and  $M_I^S = M_{I+1}^{S*}$ , which along with the market clearing condition gives  $M_{I+1}^{*} + M_{I+1}^{S*} = -M_{I+1}$ , so  $M_{I+1} = -(M_I + M_I^S)$ . Finally, to obtain (11) we divide by  $p_I^{L*}$ , use  $p^{L*} = \frac{M^{*'}}{M^{*'} + M^S}$  (from implicit differentiation of the market clearing condition and  $M_I^S = 0$ ) and employ the standard elasticity definitions  $\varepsilon \equiv -M^S p^{L*} / M$  and  $\varepsilon^* \equiv \frac{\partial(M^{*'} + M^S)}{\partial p^{L*}} \frac{p^{L*}}{M^{*'} + M^S} = \frac{\partial M^{*'}}{\partial p^{L*}} \frac{p^{L*}}{M^{*'} + M^S}$ .

##### Equation (15)

$$\begin{aligned} \tilde{G}_{e^S}^L \frac{\partial e^B}{\partial \tau_I^m} + \tilde{G}_{\tau_I^m}^L + \tilde{G}_{\tau_{I+1}^{m*}}^L &= [\tilde{G}_{e^S}^L \frac{\partial e^B}{\partial \tau_I^m} - D_I^S - M_I^{L*} - H\tau_I^m(p_I^{L*} - 1)d_I^{*'}] \\ &\quad -p_I^{L*}(Hd(p_I^L(\tau_I^m) - \tau_I^m) - X_I) - (p_{I+1}^{L*} - 1)(Hd_{I+1} - X_{I+1}) \\ &\quad + (\omega_I - 1)p_I^{L*}X_I \\ &= [\tilde{G}_{e^S}^L \frac{\partial e^B}{\partial \tau_I^m} - X_I/k_I - H\tau_I^m(p_I^{L*} - 1)d_I^{*'}] \\ &\quad - (p_I^{L*} - 1)M_I - (p_{I+1}^{L*} - 1)M_{I+1} + (\omega_I - 1)p_I^{L*}X_I \end{aligned}$$

where we use  $M_I^S \equiv D_I^S - X_I/k_I$  and the market clearing conditions for goods  $i = I$ . Equating to zero, solving for  $\tau_I^m$  and noting that  $M_I^{*'} = Hd_I^{*'}$  because the supply is fixed, we obtain

$$\tau_I^m = \frac{(\omega_I - 1)p_I^{L*}X_I - (p_I^{L*} - 1)M_I - (p_{I+1}^{L*} - 1)M_{I+1} + [\tilde{G}_{e^S}^L \frac{\partial e^B}{\partial \tau_I^m} - X_I/k_I]}{(p_I^{L*} - 1)M_I^{*'}}$$

To obtain (15) we apply the symmetry conditions described in the previous derivation, divide by  $p_I^{L*}$ , employ the same elasticity definitions and  $\frac{\partial e^B}{\partial \tau^m} = \delta X_I / Hk_I$  from (13).

### A.3.2 Common External Tariff and Transfers

The FOC for the program in (18) for a given good obtaining a preference in the PTA are

$$\begin{aligned} G_{\tau^m}^L + G_{\tau^{m^*}}^L + G_{e^s}^L \frac{\partial e^B}{\partial \tau^m} &\leq 0 \\ G_{\tau^L}^L + G_{e^s}^L \frac{\partial e^B}{\partial \tau^L} &\leq 0 \\ G_T^L + G_{e^s}^L \frac{\partial e^B}{\partial T} &\leq 0 \end{aligned}$$

Evaluating the expression for the FOC for the MFN tariff under commitment,  $G_{\tau^m}^L + G_{\tau_i^{m^*}}^L + G_{\tau_i^L}^L$ , at the FOC for the MFN tariff under the CU we obtain:

$$\begin{aligned} \left[ G_{\tau_I^m}^L + G_{\tau_{I+1}^{m^*}}^L + G_{\tau_I^L}^L \right]_{G_{\tau^m}^L + G_{\tau^{m^*}}^L + G_{e^s}^L \frac{\partial e^B}{\partial \tau^m} = 0} &= G_{\tau_I^L}^L - G_{e^s}^L \frac{\partial e^B}{\partial \tau_I^m} \\ &= G_{\tau_I^L}^L + G_{e^s}^L \frac{\partial e^B}{\partial \tau_I^L} \\ &= 0 \end{aligned}$$

where the second line uses (17). To establish the last inequality we must show that the FOC for  $\tau^L$  is zero in equilibrium. Suppose it is not, such that  $G_{\tau^L}^L + G_{e^s}^L \frac{\partial e^B}{\partial \tau^L} = -M^S + G_{e^s}^L (\delta M^S / H) = (-1 + \delta G_{e^s}^L / H) M^S < 0$  when evaluated at  $\tau^{EXCUm} = \tau^{Cm}$ . This means that Large would gain by further lowering  $\tau^L$  but it can't because it is already at zero. However,  $G_T^L + G_{e^s}^L \frac{\partial e^B}{\partial T} = -1 + \delta G_{e^s}^L / H$ , which is positive if  $G_{\tau^L}^L + G_{e^s}^L \frac{\partial e^B}{\partial \tau^L} < 0$ . Thus  $\tau^{EXCUm} = \tau^{Cm}$ ,  $T = 0$  and  $\tau^L = 0$  is not a solution.  $T$  must be increased until  $-1 + \delta G_{e^s}^L / H = 0$ , which implies that  $G_{\tau^L}^L + G_{e^s}^L \frac{\partial e^B}{\partial \tau^L} = 0$ .

## A.4 Notation

*Subscripts:*  $i$  indexes goods such that  $i = 0$  for the numeraire and  $i \in [1, 2I]$  for the non-numeraire goods. *Superscripts:*  $i$  indexes individuals in Large that are endowed with good  $i$ , whereas  $j$  indexes the countries Large, Small, Large\*, and Small\*. Variables for Large\* and Small\* are denoted with a “\*”.

### Variables in section 3.1

$U^j(\cdot)$ : Individual utility function

$u(c_i^L)$ : Subutility for the non-numeraire goods in Large.

$c_0^j(c_i^j)$ : Consumption of the numeraire (non-numeraire) good(s).

$\bar{\Psi}(E^L, E^S)$ : Subutility function for the public good in Large.

$E^j$ : Expenditure on public good provision in  $j$ .

$\alpha$ : Scope of the regional spillover of the public good.

$y^{iL}$ : Income of an individual of type  $i$  in Large.

$d(p_i)$ : Individual demand for  $i \in [1, 2I]$  in Large.

$w^{iL}$  [ $w^S$ ]: Indirect utility of individual  $i$  in Large [Small].

$X_i$ : Large's endowment of  $i$ .

$X_i/k_i$ : Small's endowment of  $i$ .

$v(p_i^L)$ : Individual consumer surplus for non-numeraire goods in Large.

$TR^j$ : Tariff revenue in  $j$ .

$H$ : Total population in each country.

$h_e^j$ : Number of workers producing  $E$  in  $j$ .

$e^j$ : Per-capita tax used to finance public good provision,  $E^j$ , in  $j$ .

$p_i^j$ : Domestic price of  $i$  in  $j$ .

$D_i$ : Total fixed demand of  $i$  in Small.

$p_i^S$  [ $p_i^{SC}$ ]: The domestic supply [consumption] price  $i$  in Small.

$\bar{p}_i$ : The upper limit for the consumer price of  $i$  up to which there exists a positive demand in Small.

### Variables in section 3.2

$M_i^j$ : Import demand of country  $j$  in good  $i$ .

$\tau_i^L$ : Large's specific preferential tariff on Small's exports of  $i$

$\tau_i^m$ : Large's specific MFN tariff.

### Variables in section 3.3

$\tilde{G}^j(\cdot)$  [ $G^j(\cdot)$ ]: Objective of government  $j$  in a PTA without [with] a CET.

$\omega_i - 1$ : Additional weight Large places on import sector surplus.

### Variables in section 3.4

$IC^C$  [ $IC^{EX}$ ,  $IC^{CU}$ ]: Incentive compatibility constraint for Large to ensure no deviation from the MFN tariffs under no PTAs [PTAs without a CET, PTAs with a CET].

$\tau_i^{Cm}$ : Large's equilibrium MFN tariff under no preferential tariff in  $i$ .

$\tau_i^{EXm}$  [ $\tau_i^{EXCUm}$ ]: Large's equilibrium MFN tariff with PTAs without [with] a CET.

$t_i^{Cm}$  [ $t_i^{EXm}$ ,  $t_i^{EXCUm}$ ]: The advalorem equivalent of the MFN tariff rate adopted by large countries under no PTAs [PTAs without a CET, PTAs with a CET] for  $i$ .

$\tau^B$ : Large's equilibrium preferential tariff.

$\varepsilon_i$ : Import demand elasticity of Large for good  $i$ .

$\varepsilon_i^*$ : Foreign export supply elasticity faced by Large for good  $i$ .

$\delta$ : Small's discount factor of time.

$\tau^T$ : The threat level of the tariff used by Large if Small stops cooperating.

$\tilde{e}^B$  [ $e^B$ ]: Equilibrium  $e^S$  under PTAs without [with] a CET.

$T$ : Total amount of numeraire transfer from Large to Small.

## A.5 Data Sources and Definitions of Variables

$\Delta t$ : Change in the bound advalorem MFN tariff rates 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.

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

$I^{hiexp}$ : 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.

$R \equiv \sum_c s_i^c (\sum_j w_j^c \Delta t_j^c / t_{jt}^c)$ : Reciprocity variable measuring changes in market access provided by the major exporters of  $i$  to the EU during the UR; where  $\Delta t_j^c / t_{jt}^c$  is the percentage tariff reduction by country  $c$  in good  $j$  between 1986 and 1995,  $w_j^c$  is the 1992 import share of good  $j$  in total imports of  $c$ , and  $s_i^c$  is the exports of a principal supplier  $c$  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.

$\Delta x$ : The EU-wide change in the elasticity adjusted inverse import penetration ratio between 1978 (pre-Tokyo Round) and 1992 (pre-UR), that is  $x_{it} = X_{it} / M_{it} \varepsilon_{it}$  for a sector  $i$ . The 1978 members of EU

–Belgium, Denmark, France, Germany, Ireland, Italy, Luxembourg, Netherlands, United Kingdom– are considered only. Note that in our data  $X_{it}$  is the value of production measured at domestic prices whereas  $M_{it}$  is the value of imports measured at world prices. The elasticity measure that we employ is also evaluated at the domestic prices hence we obtain  $x_{it}$  from the following available information:  $p_i^L X_{it}/p_i^{L*} M_{it}(M'_{it}/M_{it})p_i^L$ . Sources: Kee et al. (2004), UNIDO’s Industrial Statistics Database, COMTRADE, and Penn World Tables.

$I^{pta\_name}$ : Indicator equal to 1, if  $i$  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 UNCTAD’s 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.

$R^{uni}$ : 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.

$D^{ntb}$  [ $D^{ntball}$ ]: 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.

$\Delta p_{9294}$ ,  $(\Delta p_{9294})^2$ ,  $(\Delta p_{9294})^3$ : The change in the world price of good  $i$  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’s Industrial Statistics Database, and COMTRADE.

$(\Delta p_{9294})^{avg} x \Delta scale$ : Interaction of  $\Delta p_{9294}$  and  $\Delta scale$ .

$\Delta x\_shemp$ : Computed as  $\Delta \left( \sum_c \pi_{ki}^c \xi_i^c \right) x$ , where  $\xi_i^c$  is the share of EU member  $c$ ’s output in total EU output for sector  $i$ ,  $x$  is defined as above, and  $\pi_{ki}^c$  is the number of workers employed in sector  $i$  divided by the total number of workers employed (in all sectors) in the member country  $c$ . Sources: UNIDO and COMTRADE.

$\Delta x\_rc$ : Computed as  $\Delta \pi_k x$ , where  $\pi_{ki} = Mean_c \left| \frac{valueadded_{ic}}{valueadded_{iEU}} - \frac{workingagepopulation_c}{workingagepopulation_{EU}} \right|$  measures the regional concentration of sector  $i$  within EU. Sources: UNIDO, COMTRADE, for production and trade data, and World Bank Development Indicators CD-ROM for population data.

$\Delta x\_wage$ : Computed as  $\Delta \left( \sum_c \pi_{ki}^c \xi_i^c \right) x$ , where  $\xi_i^c$  is the share of EU member  $c$ ’s output in total EU output for sector  $i$ ,  $x$  is defined as above, and  $\pi_{ki}^c$  is the inverse of the wage rate in sector  $i$  for the member country  $c$ . Sources: UNIDO and COMTRADE.

$\Delta scale\_shemp$ ,  $\Delta scale\_rc$ ,  $\Delta scale\_wage$ ,  $(\Delta p_{9294})^{avg} x \Delta scale\_shemp$ ,  $(\Delta p_{9294})^{avg} x \Delta scale\_rc$ ,  $(\Delta p_{9294})^{avg} x \Delta scale\_wage$ : Instruments for the related variables explained above, where  $\Delta scale$  replaces  $\Delta x$ , and its interactions with average sector price changes. Sources: UNIDO, COMTRADE, and WB Development Indicators.

$P^{MFN-ext}$ : A proxy for the MFN externality effect for each  $i$  which is calculated as the change in the share of the top 5 exporters in total exports to the EU between 1989 and 1994. Source: Eurostat’s COMEXT.

## A.6 Details on the EU’s PTAs

**MED**: includes Algeria, Morocco, Tunisia, Egypt, Jordan, Syria, and Israel. The “Cooperation Agreements” (which are the relevant ones for the UR period, hence our study) between the EU and these countries are predominantly unilateral in nature and date back to 1970s. They comprise preferences on industrial goods only, with strict rules of origin. Since 1998 a total of 15 Mediterranean countries, including the ones we considered, have been in the process of signing (or have already signed) “Association Agreements” to form a Euro-Med area where a WTO-compatible FTA (with reciprocal

liberalization) is to be formed over a transitional period of up to 12 years. These agreements apart from their economic nature involve non-economic objectives, where the EU seeks cooperation in social affairs, migration, human rights, and democracy as outlined in the “Barcelona declaration” of 1995.

**ACP:** stands for African, Caribbean, and Pacific states and covers over 70 countries, which were mostly former colonies of the EU members. The agreements are part of a series of Lomé Convention (its predecessors Yaoundé 1963 and 1969) arrangements which went into effect for the first time in 1976 and provide non-reciprocal trade benefits in 99 percent of the industrial goods and some agricultural products, where political and colonial ties appear as the major motivation. The agreements also administer financial and political cooperation including aid packages and infrastructure development in the recipient states. In the most recent agreements, human rights appear as an essential element of the cooperation.

**GSP:** Generalized System of Preferences, first introduced in 1971, is the widest program that grants unilateral concessions to developing countries and covers more than 100 countries. The preferential rates vary widely according to the competitiveness of the recipient countries and the sensitivity of the products to the EU market.

**GSPL:** Generalized System of Preferences for Least Developed Countries grants duty-free access on most products and some agricultural goods to a set of the poorest nations in the world. In 2001, the EU started the ‘Everything but arms’ initiative granting duty-free access on all products except weapons to these countries. These additional preferences are not reflected in our data.

**CEC:** includes Slovak Republic, Czech Republic, Poland, and Hungary. Series of FTAs which serve as a transition to full membership have been signed with the prospective members. These four countries signed in 1992 (before the UR) so apart from a gradual liberalization they have committed to pass laws such as in intellectual property rights or competition that will conform with the EU. Thus, these countries did not lower their trade barriers substantially relative to the EU at the time the agreements were signed.

**EFTX:** covers Switzerland, Norway, Iceland, and Liechtenstein (i.e. the 1993 EFTA members excluding Austria, Finland, and Sweden.) The preferences considered here refer to the early FTA arrangements signed in 1973 and 1974, which exclude most agricultural products and cover mainly the industrial goods. These FTAs are currently superseded by European Economic Area (EEA) agreement with Norway, Iceland, and Liechtenstein and a separate arrangement with Switzerland, which call for a wider range of preferences. Moreover the EEA covers the free movement of workers, goods, services and capital with these three countries and similarly the agreement with Switzerland includes free movements of workers.

**AFS and SPG:** AFS stands for Austria (1995), Finland (1995), and Sweden (1995) and SPG stands for Spain (1986), Portugal (1986), and Greece (1981), which became members of EU in the years indicated in parentheses. In February 1993, Austria, Finland, and Sweden had already started accession negotiations and signed “Acts of Accession” in June 1994. Thus, we do not include them in computing the reciprocity and the EFTA variables.

The share of imports from each of the PTA groups as part of total EU imports and as part of total preferential EU imports (which are indicated in brackets) are as follows for our sample (that is for the year 1994 and excluding the observations with initial zero MFN tariffs.) MED: 2.7% (11.3%), ACP: 0.5% (1.9%), GSP: 13% (57%), GSPL: 0.3% (1.2%), CEC: 1.4% (6%), EFTX: 5.2% (22.3%).



**TABLE 1: Tariffs in the EU by Industry**

SIC Code	Sector	Before UR		AfterUR		Change		
		Mean	St..D.	Mean	St.D.	Mean	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	0.17	0.089	0.52
321	Textiles	0.096	0.03	0.069	0.023	0.026	0.02	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	0.04	0.008	0.012	1.50
331	Wood products except furniture	0.056	0.022	0.02	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	0.02	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	0.08	0.029	0.055	0.015	0.025	0.027	1.08
352	Other chemicals	0.067	0.018	0.031	0.03	0.036	0.029	0.81
353	Petroleum refineries	0.046	0.02	0.03	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	0.01	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	0.06	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	0.02	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	0.05	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)
$I^{any0}$	0.016***	0.015***		0.015***	0.011***	
(>0)	(0.003)	(0.003)		(0.003)	(0.003)	
$I^{evy0}$		0.007***				
(>0)		(0.002)				
$I^{any}$			0.014***			
(>0)			(0.003)			
$I^{pos}$			-0.026			
( $I^{pos} = -I^{any}$ )			(0.031)			
$I^{afs} ‡$				0.002		
(=0)				(0.002)		
$I^{pg} ‡$				-0.001		
(=0)				(0.001)		
$I^{hiexp}$					0.005***	
(>0)					(0.002)	
$I^{gsp} †$						0.003***
(>0)						(0.001)
$I^{gspl} †$						0.003***
(>0)						(0.001)
$I^{acp}$						0.000
(>0)						(0.001)
$I^{eflx} †$						0.002***
(>0)						(0.001)
$I^{med}$						0.002***
(>0)						(0.001)
$I^{cec} †$						0.002***
(>0)						(0.001)
$\Delta x$	0.004*	0.003**	0.004*	0.003**	0.003**	0.002***
(>0)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
$R$	0.006*	0.005*	0.008**	0.006*	0.006**	0.007***
(>0)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.002)
Constant	-0.034***	-0.035***	-0.030***	-0.035***	-0.036***	-0.028***
	(0.005)	(0.004)	(0.005)	(0.005)	(0.003)	(0.003)
Observations	6294	6294	6294	6294	6294	6294
Schwarz Criterion	-7.58	-7.60	-7.55	-7.60	-7.61	-7.64
Hansen's J p-val <sup>a</sup>	0.515	0.573	0.571	0.497	0.574	0.152
C-stat p-val <sup>b</sup>	0.736	0.546	0.472	0.718	0.561 <sup>c</sup>	0.107
Endogeneity p-val <sup>c</sup>	0.389	0.204	0.309	0.296	0.174	0.794
Heterosked. p-val <sup>d</sup>	0.000	0.000	0.000	0.000	0.000	0.000
$1 + \phi / c$ <sup>h</sup>	0.53	0.57	0.53	0.56	0.68	n/a
	(.37, .69)	(.44, .69)	(.34, .72)	(.46, .66)	(.55, .82)	
$1 + (\phi + \phi^{all,hi}) / c$ <sup>h</sup>	n/a	0.38	n/a	n/a	0.55 <sup>f</sup>	0.54 <sup>g</sup>
		(.18, .57)			(.41, .69)	(.37, .70)
$I^{pos} + I^{any} = 0$ p-val	n/a	n/a	0.69 (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 following coefficient restrictions in place,  $coef(I^{gsp}) = coef(I^{gspl})$ ,  $coef(I^{eflx}) = coef(I^{cec})$ , based on a test failing to reject their equality. The expected signs for the coefficients of the variables are indicated in brackets below them. 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 Table 2, 3, and 4 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 hi-export specification:  $D^{hiexp}$ ,  $D^{nitball}$ ,  $x D^{hiexp}$  for which the first stage regression results are similar 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: 1.0 (.94, 1.06), MED: 0.92 (.87, .97), EFTX and CEC: 0.93 (.88, .98). h. Confidence intervals calculated using the delta method.

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

	Table 2(1)			Table 2(2)			
	$I^{any0}$	$\Delta x$	$R$	$I^{any0}$	$I^{every0}$	$\Delta x$	$R$
$D^{anyexp} \ddagger$	0.951*** (0.023)	-0.970*** (0.217)	0.019*** (0.007)	0.947*** (0.023)	-0.002 (0.020)	-0.868*** (0.214)	0.018*** (0.007)
$D^{everyexp} \ddagger$				0.037*** (0.007)	0.801*** (0.006)	-0.772*** (0.063)	0.012*** (0.002)
$D^{ntball} \ddagger$	0.010 (0.041)	-0.899** (0.389)	-0.010 (0.012)	0.015 (0.041)	-0.014 (0.036)	-0.986*** (0.384)	-0.009 (0.012)
$D^{ntball} \times D^{anyexp} \ddagger$	-0.236*** (0.042)	0.553 (0.393)	0.011 (0.012)	-0.257*** (0.042)	-0.000 (0.036)	0.364 (0.390)	0.010 (0.012)
$D^{ntball} \times D^{everyexp} \ddagger$				0.193*** (0.026)	-0.109*** (0.022)	1.474*** (0.241)	0.012 (0.007)
$\Delta p_{9294}$	-0.004 (0.006)	0.059 (0.059)	-0.004** (0.002)	-0.003 (0.006)	-0.001 (0.005)	0.042 (0.059)	-0.004** (0.002)
$(\Delta p_{9294})^2$	-0.011*** (0.003)	0.010 (0.027)	0.001 (0.001)	-0.009*** (0.003)	0.000 (0.001)	-0.011 (0.027)	0.001 (0.001)
$(\Delta p_{9294})^3$	0.002** (0.001)	-0.008 (0.009)	-0.000 (0.000)	0.002* (0.001)	0.000 (0.001)	-0.005 (0.009)	-0.000* (0.000)
$D^{ntb} \ddagger$	0.051*** (0.006)	1.013*** (0.060)	0.025*** (0.020)	0.049*** (0.006)	0.020*** (0.006)	1.073*** (0.060)	0.024*** (0.002)
$\Delta scale$	0.188*** (0.009)	-0.493*** (0.082)	-0.032*** (0.002)	0.190*** (0.009)	0.003 (0.008)	-0.548*** (0.082)	-0.031*** (0.002)
$(\Delta p_{9294})^{avg} \times \Delta scale \ddagger$	-0.404*** (0.085)	-0.628 (0.804)	0.107*** (0.024)	-0.319*** (0.090)	-0.020 (0.074)	-1.224 (0.798)	0.123*** (0.024)
$R^{uni}$	0.040** (0.017)	-0.066 (0.163)	0.754*** (0.005)	0.041** (0.017)	0.024 (0.015)	-0.050 (0.161)	0.754*** (0.005)
<i>Constant</i>	-0.033 (0.024)	-1.170*** (0.222)	-0.275*** (0.007)	-0.036 (0.023)	0.004 (0.020)	-1.120*** (0.220)	-0.276*** (0.007)
Observations	6294	6294	6294	6294	6294	6294	6294
R-squared	0.373	0.074	0.792	0.384	0.767	0.097	0.794
Adj. R <sup>2</sup>	0.372	0.073	0.792	0.383	0.767	0.095	0.793
F-test p-val <sup>a</sup>	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: First Stage Regressions  
(Individual Programs Specification)**

	Table 2 (6)					
	$I^{gsp} + I^{gspL}$	$I^{acp}$	$I^{efx} + I^{cec}$	$I^{med}$	$\Delta x$	$R$
$D^{gspexp} + D^{gspLexp} \ddagger$	0.881*** (0.016)	-0.000 (0.006)	0.028** (0.012)	0.010 (0.025)	-0.141** (0.056)	0.011*** (0.002)
$D^{acpexp} \ddagger$	0.029* (0.018)	0.878*** (0.007)	-0.005 (0.013)	-0.003 (0.009)	-0.285*** (0.062)	0.004** (0.002)
$D^{efxexp} + D^{cecexp} \ddagger$	0.088*** (0.014)	-0.003 (0.005)	0.909*** (0.011)	0.012 (0.007)	-0.503*** (0.049)	-0.004*** (0.002)
$D^{medexp} \ddagger$	0.019 (0.015)	-0.001 (0.006)	0.037*** (0.012)	0.850*** (0.008)	-0.286*** (0.054)	-0.006*** (0.002)
$D^{ntball} \ddagger$	-0.151*** (0.056)	-0.070*** (0.022)	-0.197*** (0.044)	-0.164*** (0.030)	-1.230*** (0.197)	-0.016*** (0.006)
$D^{ntball} \times D^{gsp+gspLexp} \ddagger$	-0.405*** (0.044)	0.028* (0.017)	0.203*** (0.034)	0.069*** (0.024)	0.311** (0.156)	0.009* (0.005)
$D^{ntball} \times D^{acpexp} \ddagger$	0.166*** (0.061)	-0.138*** (0.024)	-0.031 (0.048)	0.103*** (0.033)	0.923*** (0.215)	-0.001 (0.007)
$D^{ntball} \times D^{efx+cecexp} \ddagger$	0.019 (0.033)	0.017 (0.013)	-0.281*** (0.026)	0.037** (0.018)	-0.198* (0.116)	0.005 (0.004)
$D^{ntball} \times D^{medexp} \ddagger$	0.173*** (0.050)	0.006 (0.020)	0.050 (0.039)	-0.314*** (0.027)	0.792*** (0.176)	0.005 (0.004)
$\Delta p_{9294}$	0.014 (0.017)	-0.003 (0.006)	-0.004 (0.013)	-0.001 (0.009)	-0.005 (0.058)	-0.003* (0.002)
$(\Delta p_{9294})^2$	0.008 (0.008)	-0.001 (0.003)	0.002 (0.006)	-0.002 (0.004)	-0.087*** (0.027)	0.001 (0.001)
$(\Delta p_{9294})^3$	-0.002 (0.003)	0.000 (0.001)	0.002 (0.002)	0.001 (0.001)	0.002 (0.009)	-0.001* (0.000)
$D^{ntb} \ddagger$	0.168*** (0.017)	0.035*** (0.007)	0.164*** (0.013)	0.086*** (0.009)	1.096*** (0.059)	0.025*** (0.002)
$\Delta scale$	0.158*** (0.023)	0.005 (0.009)	0.325*** (0.018)	0.042*** (0.013)	-0.374*** (0.082)	-0.028*** (0.003)
$(\Delta p_{9294})^{avg} \times \Delta scale \ddagger$	-0.254 (0.227)	-0.175** (0.087)	-0.795*** (0.176)	-0.467*** (0.121)	-2.697*** (0.795)	0.119*** (0.025)
$R^{umi}$	0.092** (0.046)	0.001 (0.018)	0.027 (0.036)	0.009 (0.025)	0.217 (0.161)	0.760*** (0.005)
<i>Constant</i>	-0.285*** (0.031)	-0.009 (0.012)	-0.166*** (0.024)	-0.044*** (0.016)	-0.766*** (0.107)	-0.260*** (0.003)
Observations	6294	6294	6294	6294	6294	6294
R-squared	0.494	0.825	0.667	0.721	0.128	0.796
Adj. R <sup>2</sup>	0.493	0.824	0.666	0.721	0.125	0.795
F-test p-val <sup>a</sup>	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 5: Robustness and Specification Analysis**

	IV-GMM	IV-GMM (No threshold)	IV-GMM (MFN-ext.)	IV-GMM (Initial tariff)	IV-GMM (No 311)	HOLS
[1] $I^{any0}$ (s.e.)	0.016 (0.003)	0.023 (0.004)	0.015 <sup>b</sup> (0.003)	0.020 (0.004) <sup>c</sup>	0.005 (0.002)	0.013 (0.001)
[1] $1 + \phi / c$ <sup>a</sup> (95% CI)	0.53 (.37, .69)	0.44 (.24, .63)	0.57 (.43, .72)	0.30 (-.10, .71) <sup>d</sup>	0.78 (.65, .90)	0.65 (.60, .70)
[3] $H_0: I^{pos} + I^{any} = 0$ (p-val)	Can't reject (0.69)	Can't reject (0.60)	Can't reject (0.85) <sup>b</sup>	Can't reject <sup>c</sup> (0.99)	Can't reject (0.45)	Reject <sup>e</sup> (0.00)
[4] <sup>f</sup> $I^{afs}$ (s.e.)	0.002 (0.002)	0.002 (0.002)	0.001 (0.001) <sup>b</sup>	0.003 (0.002) <sup>c</sup>	-0.001 (0.001)	0.001 (0.001)
$I^{spg}$ (s.e.)	-0.001 (0.001)	0.001 (0.001)	-0.002 (0.001)	0.000 (0.001)	-0.000 (0.001)	-0.001 (0.001)
[1] Schwarz Criterion	-7.58	-7.58	-7.64	-7.42	-7.69	-7.68
Observations	6294	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 domestic EU prices due to PTAs (vs non-PTA goods) for full pass-through ( $\pi=1$ ) and the relative growth of world prices due to PTAs for imperfect pass-through (such that  $\pi^{PTA} \approx \pi < 1$ ). Confidence intervals calculated using the delta method.

b. The coefficient on the MFN-externality proxy ( $P^{MFN-ext}$ ) for the three different specifications with the standard errors in brackets are [1]: -0.008 (0.006), [3]: -0.007 (0.006), and [4]: -0.008 (0.006)

c. The coefficient on the initial tariff variable ( $t_{i,t}$ ) for the three different specifications with the standard errors in brackets are [1]: -0.189 (0.108), [3]: -0.146 (0.118), and [4]: -0.172 (0.115).

d. Refers to the relative growth at the mean initial tariff i.e.  $1 + \phi / (c + \phi^{ini} 0.0789)$  and when we account for the different average initial tariffs, i.e.  $(c + \phi^{ini} 0.0789 + \phi) / (c + \phi^{ini} 0.128)$  we obtain 0.21 (-.18, .60)

e. The 95% Confidence Interval for  $I^{pos} + I^{any}$  is [-0.0166, -0.005]

f. The test of the combined effect  $I^{afs} + I^{spg} = 0$  yields the following p-values for columns from IV-GMM to HOLS respectively: 0.73, 0.19, 0.69, 0.21, 0.66, 0.62.

**TABLE 6: Determinants of Political Economy Weights**

	(1)	(2)	(3)	(4)	(5)	(6)
$I^{any0}$	0.010***	0.007***		0.009***	0.006***	
(>0)	(0.002)	(0.002)		(0.003)	(0.002)	
$I^{evy0}$		0.007***				
(>0)		(0.001)				
$I^{any}$			0.006**			
(>0)			(0.003)			
$I^{pos}$			-0.056			
(=0)			(0.058)			
$I^{afs} ‡$				0.001		
(=0)				(0.002)		
$I^{pg} ‡$				-0.001		
(=0)				(0.001)		
$I^{hiexp}$					0.003*	
(>0)					(0.002)	
$I^{gsp} †$						0.003***
(>0)						(0.001)
$I^{gspl} †$						0.003***
(>0)						(0.001)
$I^{acp}$						0.004***
(>0)						(0.001)
$I^{eftx} †$						-0.000
(>0)						(0.001)
$I^{med}$						0.002**
(>0)						(0.001)
$I^{cec} †$						-0.000
(>0)						(0.001)
$\Delta x\_shemp$	0.024**	0.027***	0.024*	0.025**	0.014**	0.028***
(>0)	(0.012)	(0.008)	(0.014)	(0.012)	(0.007)	(0.005)
$\Delta x\_rc$	0.079***	0.084***	0.070***	0.082***	0.069***	0.092***
(>0)	(0.020)	(0.018)	(0.020)	(0.021)	(0.017)	(0.010)
$\Delta x\_wage$	0.003	0.003	0.004	0.002	0.006	0.004
(>0)	(0.009)	(0.009)	(0.009)	(0.009)	(0.008)	(0.007)
$R$	0.006**	0.006*	0.005	0.007**	0.005*	0.007***
(>0)	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.003)
$Constant$	-0.033***	-0.031***	-0.029***	-0.032***	-0.031***	-0.027***
	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.004)
Observations	6294	6294	6294	6294	6294	6294
Schwarz Criterion	-7.68	-7.68	-7.62	-7.68	-7.70	-7.67
Hansen's J p-val	0.4228	0.5055	0.3551	0.4358	0.4342	0.5610
C-stat p-val <sup>a</sup>	0.5901	0.7713	0.5817	0.7560	0.6954	0.4841
Endogeneity p-val	0.1394	0.1268	0.2127	0.1491	0.2104	b
Heterosked. p-val	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$1+ \phi/c$	0.70	0.76	0.78	0.71	0.82	n/a
	(.63, .78)	(.68, .84)	(.65, .91)	(.58, .84)	(.72, .91)	
$1+(\phi + \phi^{all,hi})/c$	n/a	0.53	n/a	n/a	0.72	0.59 <sup>c</sup>
		(.42, .64)			(.64, .81)	(.45, .73)
$I^{pos} + I^{any} = 0$ p-val	n/a	n/a	0.39(accept)	n/a	n/a	n/a

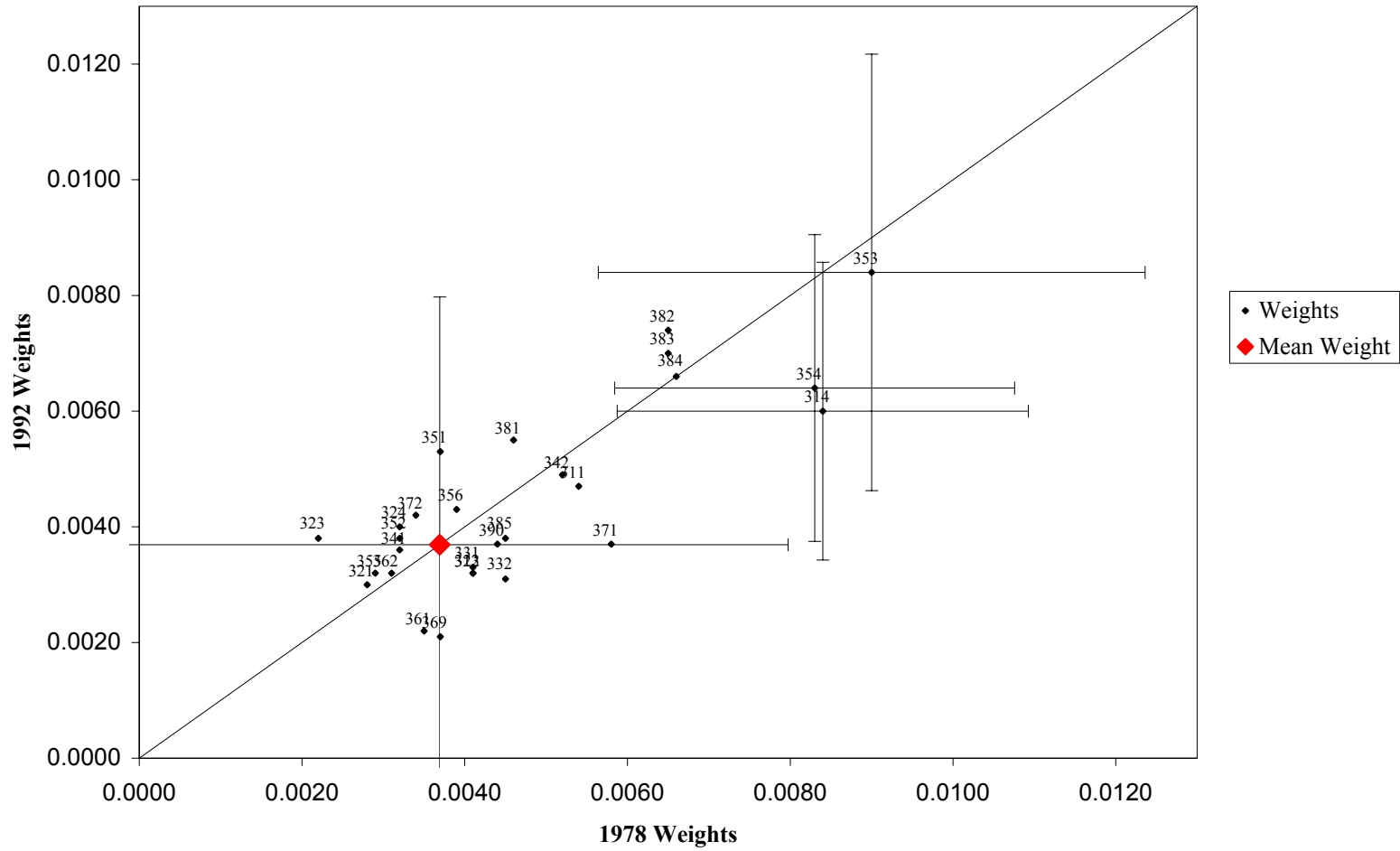
The notes for Table 2 also apply here. a. The subset of the instruments tested for exogeneity include those marked with “†” in Tables 3 and 4 except  $(\Delta p_{9294})^{avg} x \Delta scale$  which is replaced by  $(\Delta p_{9294})^{avg} x \Delta scale\_shemp$ ,  $(\Delta p_{9294})^{avg} x \Delta scale\_rc$ , and  $(\Delta p_{9294})^{avg} x \Delta scale\_wage$  instead. b. Number of clusters were insufficient to calculate optimal weighting matrix, hence C-stat not computed. c. Total effect of individual programs reported. The other values, with confidence intervals in brackets, are GSP and GSPL: 0.89 (.82, .96), ACP: 0.86 (.77, .94), MED: 0.94 (.89, .99), EFTX and CEC: 1.0 (.95, 1.07).

**TABLE 7: Summary Statistics**

Variable Name	Mean	Std. Dev.	Min	Max
$\Delta t$	-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
$I^{eflx}$	0.870	0.337	0	1
$I^{med}$	0.508	0.500	0	1
$I^{cec}$	0.671	0.470	0	1
$\Delta x$	-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
$D^{eflx}$	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
$D^{mb}$	0.288	0.453	0	1
$D^{ntball}$	0.096	0.295	0	1
$D^{ntball} \times D^{anyexp}$	0.091	0.288	0	1
$D^{ntball} \times D^{evyexp}$	0.010	0.101	0	1
$D^{ntball} \times D^{gsp}$	0.069	0.253	0	1
$\Delta p_{9294}$	0.001	0.461	-3.912	4.874
$\Delta scale$	0.307	0.322	-0.351	1.047
$(\Delta p_{9294})^{avg} \times \Delta scale$	0.005	0.032	-0.053	0.126
$\Delta x_{shemp}$	-0.125	0.209	-0.689	0.291
$\Delta x_{rc}$	0.017	0.095	-0.490	0.150
$\Delta x_{wage}$	-0.554	0.295	-2.72	-0.132
$P^{MFN-ext}$	-0.014	0.066	-0.359	0.357
$t_{t-1}$	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  $\Delta t$  (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 accounts for the remaining missing values and leaves us with n=6294.

**Figure 1: EU's Political Economy Weights by Industry in 1992 vs. 1978**



Note: Error bars refer to confidence intervals and are displayed only for the mean weight and those sectors outside the CI of mean weight.