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What Do Trade Negotiators Negotiate About? Empirical Evidence from the World Trade Organization

by

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1. Introduction

What do trade negotiators negotiate about? There are effectively two coherent theoretical approaches in the economics literature that offer an answer to this question: the terms-of-trade theory and the commitment theory.[1] The terms-of-trade theory holds that trade agreements are useful to governments as a means of helping them escape from a terms-of-trade-driven Prisoners' Dilemma. The commitment theory holds that trade agreements are useful to governments as a means of helping them make commitments to the private sector. The commitment theory has established a potential role for trade agreements that is distinct from the terms-of-trade theory, but until very recently the commitment theory has not been developed in the existing literature much beyond this basic contribution.[2] Most of the theoretical literature on trade agreements can be seen as adopting the perspective of the terms-of-trade theory.[3]

These theories are not mutually exclusive. However, little empirical evidence exists to shed light on the relevance of either theory, and almost none of it confronts the central predictions of theory directly with the data. For example, in a series of recent papers Rose (2004 a,b,c) has suggested that membership in the World Trade Organization (WTO) may have no impact at all on either trade volumes or trade policies, and his papers have inspired a growing literature that further explores these issues (e.g., Subramanian and Wei, 2006, Tomz, Goldstein and Rivers, 2004, Evenett, Gage and Kennett, 2004). However, neither Rose's papers nor those inspired by his findings formulate empirical questions in a way that is closely informed by the theory of trade agreements.[4]

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[1]A description of each is provided in Bagwell and Staiger (2002, Ch. 2).

[2] Recent contributions that make significant further strides in developing the commitment theory include Conconi and Perroni (2003) and Maggi and Rodriguez-Clare (2005).

[3]There is also the commonly held view, expressed most fully by Krugman (1997), that the motives and behaviors of trade negotiators cannot be understood in terms of economics.

[4]Rose's (2004, a,b,c) conclusion of no GATT/WTO impact follows from an examination of the impacts of GATT/WTO membership without direct information on the changes in trade policies that derived from membership, and therefore without controlling for what each country does with its membership and when it does it, with whom it negotiates, and which products the negotiation covers. Tomz, Goldstein and Rivers (2004) argue that careful attention to the subtleties of GATT membership overturn Rose's conclusion. Evenett, Gage and Kennett (2004) employ disaggregated trade flow and trade barrier data to assess the trade effects of WTO accession for Bulgaria and Ecuador, and also find significant effects contrary to Rose's conclusion. Subramanian and Wei (2006) allow for asymmetric

There are a small number of empirical studies that present findings that are more connected to the theory. For example, Staiger and Tabellini (1999) report evidence supporting the view that the General Agreement on Tariffs and Trade (GATT, the WTO's predecessor) may have helped the U.S. make commitments to its private sector. And a number of papers provide empirical evidence on various features and predictions of the terms-of-trade theory. For example, quantification of the terms-of-trade effects associated with trade policy is provided by Kreinin (1961), Winters and Chang (2000, 2002), Anderson and vanWincoop (2001) and Bown and Crowley (2006). And more direct evidence regarding several predictions of the terms-of-trade theory can be found in Bown (2002, 2004a,b,c), who utilizes data on trade disputes within the GATT/WTO, and Limao (2006) and Shirono (2004), who utilize data on the outcomes of multilateral trade negotiations. Most recently, Broda, Limao and Weinstein (2006) report evidence that supports a crucial tenet of the terms-of-trade theory, namely, that the non-cooperative tariff choices of governments actually reflect their abilities to manipulate their terms of trade. These papers provide important evidence, but there has not yet been an attempt to investigate empirically the central prediction of the terms-of-trade theory of trade agreements, namely, that governments use trade agreements to escape from a terms-of-trade driven Prisoners' Dilemma. The purpose of this paper is to attempt such an investigation.

From the perspective of the terms-of-trade theory, the international inefficiencies that are exhibited by unilateral (non-cooperative) trade policy choices stem from the international cost-shifting that occurs when foreign exporters pay part of the cost of tariff hikes by accepting lower exporter ("world") prices. The purpose of negotiated trade agreements is then to give foreign exporters (or their governments) a "voice" in the trade policy choices of their trading partners, so that the "market access" that each country affords its trading partners can be expanded to internationally efficient levels.[5] According to the terms-of-trade theory, the internationally efficient

membership effects that would be expected given the asymmetries across industrial and developing country members in terms of negotiating activity within the GATT/WTO, and find that the trade effects of GATT/WTO membership are large for those countries that utilize membership to negotiate significant trade liberalization (i.e., mainly for industrialized country members). None of these studies attempt to assess whether the pattern of liberalization observed in the GATT/WTO is consistent with theory.

[5]The link between the terms-of-trade theory of trade agreements and the emphasis on market access found in GATT/WTO discussions is identified and formalized in Bagwell and Staiger (2002, Chapter 2).

levels of market access are delivered under multilateral free trade if all governments seek to maximize national income with their trade policy choices, but when governments have broader (e.g. political/distributional) goals international efficiency will generally *not* correspond to free trade. Nevertheless, according to the terms-of-trade theory, the purpose of a trade agreement remains the same independent of government objectives and hence independent of the position of the international efficiency frontier. This feature provides a basis for hope that the underlying structure of the cost-shifting problem central to the terms-of-trade theory will yield empirical regularities in the predicted outcomes of negotiation despite the potential for great diversity across the objectives of member governments in actual trade agreements. It is this feature that we exploit below.

We begin our formal investigation in section 2. There we derive a basic relationship implied by the terms-of-trade theory of trade agreements: the magnitude of the negotiated tariff reductions that would bring a country's pre-negotiation (non-cooperative) tariffs into conformity with international efficiency will be larger (i) the larger is the country's ability to alter foreign exporter prices and hence its terms of trade with its tariff choices, (ii) the larger is the country's pre-negotiation import volume, and (iii) the smaller is the rate at which the costs of the domestic distortions associated with protection rise as tariffs rise. This basic relationship holds under a wide variety of government objectives, and it underlies our approach for assessing the empirical relevance of the theory. According to this approach, the terms-of-trade theory can be used to predict negotiated tariff commitments across countries and products on the basis of observed pre-negotiation tariffs and import levels, and these predictions can then be confronted with data on the actual tariff commitments negotiated by GATT/WTO members.

In section 3 we introduce additional structure in order to derive an estimating equation with which we can implement this approach. We impose linearity on the underlying demand and supply relationship, and we permit domestic political economy forces and foreign export supply responses to vary across countries and industries but not across goods within industries. With this additional structure, the prediction that we take to the data is simple: the tariff to which a country negotiates should, all else equal, be further below its non-cooperative tariff the larger is the level of its non-cooperative import volume. Intuitively, according to the terms-of-trade theory the purpose of trade agreements is to address international cost-shifting; but a bigger non-cooperative import volume implies bigger cost-shifting for a given tariff-induced terms-of-trade movement; and so, all else equal, big non-cooperative import levels predict big negotiated tariff reductions. We also extend our basic estimating equation to allow for the possibility that a commitment role is played by trade agreements. Modeling in a simple way the potential commitment problem that a government may face with regard to producers, we show that the commitment role for trade agreements augments our estimating equation in a straightforward fashion, and in a manner that leaves the central prediction of the terms-of-trade theory intact whether or not there is a commitment role for trade agreements.

A discussion of our empirical strategy and the data we use is contained in section 4. In order to confront the extended, gradual 50-plus-year process of trade liberalization under the GATT/WTO with our basic (essentially static) predictions, we focus on the negotiated tariff bindings of non-GATT-member countries who joined the WTO in separate accession negotiations occurring after the Uruguay Round. A reasonable interpretation is that, at the time of these accession negotiations, existing GATT/WTO members had largely completed the process of negotiating their tariffs to efficient levels, and new members were asked to agree to commitments that moved their tariffs from unbound levels to globally efficient levels.[6] Hence, for these countries, it is reasonable to expect that our central predictions should apply. Our sample of countries is composed of 16 of the 21 countries that joined the WTO between its inception on January 1, 1995, and November of 2005. We collect data on each country's bound ad valorem tariff levels at the 6-digit Harmonized System (HS) level, as well as data on each country's pre-WTO-accession (unbound) ad valorem tariffs and import levels at the 6-digit HS level for an available time-period prior to WTO accession.

Section 5 presents our main empirical findings. Without more comprehensive measures of pre-WTO-accession levels of protection (which we explore in the extension section), we cannot identify the key parameter relevant for the commitment theory, but as noted above the central prediction of the terms-of-trade theory remains intact whether or not there is a commitment role for

[6] In adopting this view, we abstract from potentially important enforcement issues, which could prevent GATT/WTO members from achieving the efficiency frontier. We discuss this and other caveats more fully later in the paper.

trade agreements, and our data do allow this prediction to be evaluated. In this regard, our estimation results indicate a broad level of support for the central prediction of the terms-of-trade theory. The data exhibit a strong positive relationship between the magnitude of negotiated concessions and the pre-negotiation volume of imports. This relationship does not disappear when appropriate controls are introduced: especially when viewed across countries within a given industry but to some degree as well across industries within a given country, we find strong evidence that a country's bound tariff will be further below its unbound tariff the greater is its pre-negotiation import volume. And the effects we identify appear to be most pronounced where we would expect to find them, namely, where the importing country is "large" by any measure and where import volume is supplied by current WTO members (as opposed to exporters who are not WTO members and hence not involved in the negotiations). Finally, we argue that our results appear to correspond in a sensible way to a number of particular features of the WTO accession process.

In section 6 we show that our basic findings are robust to a number of sensitivity checks. Of particular interest are our estimation results using a more comprehensive measure of each country's level of protection prior to its accession to the WTO. We augment our ad valorem pre-WTO-accession tariff measure with the ad valorem equivalent NTB measures reported in Kee, Nicita and Olarreaga (2006). In addition to showing that our main empirical findings are robust to the use of this extended measure, an added advantage is that the key parameter for identifying a commitment role for trade agreements can be estimated under the (strong) assumption that this extended measure is the true measure of pre-WTO-accession levels of protection. Under this assumption, we find evidence that the WTO may play a commitment role for many of the governments and industries in our sample as well.

Our concluding discussion is contained in section 7. Here we place our results in the context of a number of limitations of our analysis, and suggest directions for further work. A Theoretical Appendix provides derivations not included in the text, while a Data Appendix provides a detailed description of our data sources and data cleaning procedures.

2. Theory

In this section we develop the theoretical model that guides our empirical investigation. We begin by describing in general terms the essence of the terms-of-trade theory of trade agreements, and the three elements that are featured in our subsequent analysis.

2.1 The basic idea

Any theory of trade agreements must identify a means by which the negotiating governments can gain from the agreement. The terms-of-trade theory of trade agreements posits that governments can gain from negotiations by correcting the international inefficiencies that arise under unilateral trade policy choices as a result of international cost shifting. This cost shifting occurs whenever the government of an importing country raises its import barriers and the prices received by foreign exporters fall as a result, thereby improving the importing country's terms of trade. Because a portion of the cost of each government's import protection is borne by foreigners in this way, the unilateral best-response import-protection choices of each government are overly restrictive from the perspective of international efficiency, and starting from its best-response (reaction curve) tariffs each government can then gain by negotiating reciprocal liberalization with its trading partners. In this environment, internationally efficient policies can be achieved if each government agrees to adopt the policies it would have chosen had it "ignored" its ability to shift costs on to foreigners.

If international cost-shifting is the source of the inefficiency that international trade agreements exist to correct, then we may identify three basic elements that combine to determine the degree to which a country's unilateral best-response tariffs are set inefficiently high, and therefore that combine to determine the magnitude of the negotiated tariff reductions that would bring that country's tariffs into conformity with international efficiency. The first two elements can be seen once it is observed that, starting from its tariff reaction curve and all else equal, the best-response level of a country's tariffs will be farther from the efficient level when the magnitude of the cost-shifting that would be associated with a small increase in the country's tariffs is large. But when a country raises a tariff, the magnitude of the cost-shifting that occurs is simply the income effect of the terms-of-trade change induced by the higher tariff, and this in turn can be decomposed into the product of two terms: the impact of the increased protection on the country's terms of trade;

and the income effect of the induced terms-of-trade movement, which is given simply by the country's import volume. All else equal then, we may conclude that the efficient level of a country's tariffs will be further below its best-response level: (i) the larger the country's ability to alter foreign exporter prices and hence its terms of trade with its tariff choices; and/or (ii) the larger the country's import volume, where each is measured with the country positioned on its tariff reaction curve.

The third element that helps to determine the degree to which a country's best-response tariffs are set inefficiently high is then the extent to which the government is willing to distort its tariff choices to exploit its ability to shift the costs of this protection on to foreigners. In effect, this third element reflects the rate at which the costs of the domestic distortions associated with protection rise as tariffs rise. All else equal then, we may conclude that the efficient level of a country's tariffs will be further below its best-response level: (iii) the smaller the rate at which the costs of the domestic distortions associated with protection rise as tariffs rise.

In effect, elements (i), (ii) and (iii) provide a decomposition of the way in which international cost-shifting drives unilateral tariff choices above their internationally efficient levels.[7] Having described in general terms these three elements, we next turn to develop the theoretical model that will guide our empirical investigation. Once we have developed the basic features of the model, we will use the model to make precise the three elements we have featured above.

2.2 The model

We work within a simple partial equilibrium perfectly competitive model of trade in many goods among many countries. We develop the equations of the model focusing on a single good i that is imported by H "home" countries and exported by F "foreign" countries. Foreign magnitudes are labeled with a '*'. Demand for good i in home country j is given by $D^{ij}(p^{ij})$ where D^{ij} is a

[7]For the setting in which all countries choose tariffs to maximize national income, so that multilateral free trade is globally efficient, the distance between each country's best-response tariff level and its globally efficient level (free trade) is given by the well-known inverse-foreign-export-supply-elasticity formula, adjusted for the many-importer world considered in this paper to reflect the foreign export supply elasticity "faced by importing country j." As we show below, the decomposition we describe here applies in that setting, as well as in the more complicated setting in which governments pursue political economy objectives with their tariff choices.

decreasing and continuous function and p^{ij} is the price of good i in home country j. $D^{*ij}(p^{*ij})$ is similarly defined for foreign country j. Supply of good i in home country j is given by $S^{ij}(p^{ij})$ where S^{ij} is an increasing and continuous function. $S^{*ij}(p^{*ij})$ is similarly defined for foreign country j.

Denote by τ^{ij} the non-discriminatory import tax/subsidy (expressed in specific terms) imposed by home country j on good i, with $\tau^{ij}>0$ $(\tau^{ij}<0)$ if home country j taxes (subsidizes) imports of good i.[8] Similarly, denote by τ^{*ij} the non-discriminatory export tax/subsidy imposed by foreign country j on good i, with $\tau^{*ij}>0$ $(\tau^{*ij}<0)$ if foreign country j subsidizes (taxes) trade in good i. Maintaining our focus here and throughout on non-prohibitive trade taxes, we have the following pricing relationships: $p^{ij}=p^{wi}+\tau^{ij}$ and $p^{*ij}=p^{wi}+\tau^{*ij}$, where p^{wi} is the "world" (untaxed) price of good i.

The world market-clearing condition for good i determines the equilibrium level of the world price for good i, which we denote by $\tilde{p}^{wi}$, as a function of world-wide intervention in the good-i market. Letting $M^{ij}(p^{ij})\equiv D^{ij}(p^{ij})-S^{ij}(p^{ij})$ denote the imports of good i by home country j and letting $E^{*ij}(p^{*ij})\equiv S^{*ij}(p^{*ij})-D^{*ij}(p^{*ij})$ denote the exports of good i by foreign country j, the world market clearing condition for good i is given by:

$$(1)\qquad M^{ij}(p^{wi}+\tau^{ij}) + \sum_{h\in H\backslash j} M^{ih}(p^{wi}+\tau^{ih}) = \sum_{f\in F} E^{*if}(p^{wi}+\tau^{*if}).$$

For future reference, we may derive using (1) that

$$((2)\qquad \frac{\partial\tilde{p}^{wi}(\boldsymbol{\tau}^{i})}{\partial\tau^{ij}} = \frac{\partial M^{ij}/\partial p^{ij}}{[\sum_{f\in F}\partial E^{*if}/\partial p^{*if}-\sum_{h\in H}\partial M^{ih}/\partial p^{ih}]},$$

[8]Because we are interested in characterizing the tariff liberalization negotiated within the GATT/WTO, where negotiated bindings constitute most-favored-nation (MFN) obligations, we restrict attention here to MFN (non-discriminatory) tariffs. This focus abstracts from any effect that important exceptions to the MFN principle (such as the Article XXIV exceptions allowing for the formation of free-trade agreements and customs unions) may have on negotiated MFN liberalization. Recent work by Karacaovali and Limao (2005), Limao (2006) and Estevadeordal, Freund and Ornelas (2006) suggests that these effects could be empirically significant. We leave a systematic empirical investigation of this question for future work.

where $\boldsymbol{\tau^i}$ is the vector of world-wide trade taxes/subsidies applied to good *i*. Expression (2) gives the impact of home country *j*'s good-*i* tariff on country *j*'s "terms of trade" in good *i* (i.e., the foreign exporter price of good *i* $\tilde{p}^{wi}$). We observe that (2) implies $dp^{ij}/d\tau^{ij} = [1 + \partial\tilde{p}^{wi}/\partial\tau^{ij}] > 0 > \partial\tilde{p}^{wi}/\partial\tau^{ij}$, ruling out the Metzler and Lerner paradoxes.

We next introduce government objectives. In our partial equilibrium setting, the objectives of each government are separable across goods. Because our empirical work focuses on the import-tariff reductions negotiated in the WTO, we discuss in detail only the objective of home (importing) government *j* for good *i*, but we assume that the objectives of each (importing and exporting) government can be written in an analogous way. We follow Baldwin (1987) and represent the government objectives as a weighted sum of producer surplus, consumer surplus and tariff revenue, with the weight on producer surplus (possibly greater than one) representing the state of political economy forces in that industry. Following Bagwell and Staiger (1999, 2001), we write the government objective as a function of local and world prices:

(3) $$W^{ij}(p^{ij}(\tau^{ij},\tilde{p}^{wi}),\tilde{p}^{wi}) = \delta^{ij} PS^{ij}(p^{ij}) + CS^{ij}(p^{ij}) + TR^{ij}(p^{ij},\tilde{p}^{wi}),$$

where PS^{ij} is producer surplus, CS^{ij} is consumer surplus, and $TR^{ij} \equiv (p^{ij} - \tilde{p}^{wi})M^{ij}(p^{ij})$ is tariff revenue in country *j* for good *i*. As Baldwin describes, the parameter δ^{ij} can be interpreted as a reduced-form representation of many political economy models of trade policy determination, with $\delta^{ij} > 1$ $(\delta^{ij} = 1)$ reflecting the presence of (absence of) producer-interest political economy forces affecting the government's tariff choices in the industry.

The best-response good-*i* tariff choice for the government of home country *j*, which we denote by τ^{ijR}, is defined by the first order-condition of (3) with respect to τ^{ij}, which we write as

(4) $$W^{ij}_{p^{ij}} + \theta^{ij} \times W^{ij}_{\tilde{p}^{wi}} = 0,$$

where $\theta^{ij} \equiv \partial\tilde{p}^{wi}/\partial\tau^{ij}/[1 + \partial\tilde{p}^{wi}/\partial\tau^{ij}] < 0$ is guaranteed with the absence of the Lerner and Metzler paradoxes, and where subscripts denote partial derivatives. Using (3), it may be seen that

(5) $$W^{ij}_{\tilde{p}^{wi}} = -M^{ij},$$

and hence, using (5), expression (4) may be rewritten as

(6) $$W^{ij}_{p^{ij}} - \theta^{ij} \times M^{ijR} = 0,$$

where we denote by M^{ijR} the level of country j's imports of good i when country j is on its good-i tariff reaction curve. We assume that $W^{ij}(p^{ij}(\tau^{ij},\tilde{p}^{wi}),\tilde{p}^{wi}(\boldsymbol{\tau}^{i}))$ is globally concave over non-prohibitive τ^{ij}, so that the solution to (4) is unique. This concavity condition amounts to

(7) $$W^{ij}_{\tau^{ij}\tau^{ij}} = W^{ij}_{p^{ij}p^{ij}}[1+\frac{\partial p^{wi}}{\partial \tau^{ij}}]^2 - [2\frac{dM^{ij}}{dp^{ij}}\frac{dp^{ij}}{d\tau^{ij}}]\frac{\partial \tilde{p}^{wi}}{\partial \tau^{ij}} + [(\delta^{ij}-1)S^{ij}-M^{ij}+\tau^{ij}\frac{dM^{ij}}{dp^{ij}}]\frac{\partial^2 \tilde{p}^{wi}}{\partial \tau^{ij^2}} < 0.$$

If (7) is to hold regardless of how "small" country j happens to be in the world market of good i (i.e., regardless of how little effect j's tariff has on world prices for good i), then the following condition must hold globally:

(A1) $$W^{ij}_{p^{ij}p^{ij}} < 0.$$

We maintain (A1) throughout our discussion.

To predict the magnitude of negotiated tariff reductions that would bring a country's tariffs into conformity with international efficiency according to the terms-of-trade theory, we next consider efficient tariff levels, where the international efficiency frontier is defined with respect to the government objectives $W^{ij}(p^{ij},\tilde{p}^{wi})$. There are many efficient combinations of tariffs, but as we have argued in Bagwell and Staiger (1999, 2001, 2002, 2005a) a particular set of efficient tariffs that GATT/WTO rules seem well-equipped to deliver is the set of *politically optimal tariffs*.[9] The vector of politically optimal trade taxes on good i, $\boldsymbol{\tau}^{iPO}$, is defined by the vector $\boldsymbol{\tau}^{i}$ that satisfies

[9]Briefly, politically optimal tariffs define a point on the international efficiency frontier which GATT/WTO rules seem well-equipped in theory to deliver because this efficient point: (i) is the only efficient point that can be implemented under the renegotiation and reciprocity rules of the GATT/WTO; (ii) is particularly impervious to bilateral opportunism; and (iii) can be interpreted as a "rules-based" negotiating outcome.

(8) $W^{ij}_{p^{ij}} = 0$

for each (importing and exporting) country, where in writing (8) we have used the fact that $dp^{ij}/d\tau^{ij}>0$. Defining the politically optimal world price of good i by $\tilde{p}^{wi}(\tau^{iPO})\equiv p^{wiPO}$, and comparing (8) to (4), it may be seen that when governments set politically optimal import tariffs on good i, it is as if they select their preferred tariff taking the world price of i as fixed at its politically optimal level p^{wiPO}, thereby "ignoring" the ability to shift costs on to foreigners (and acting "as if" $\theta^{ij}\equiv 0$). Hence, $\boldsymbol{\tau}^{iPO}$ may be equivalently defined by the vector of trade taxes $\boldsymbol{\tau}^{i}$ satisfying

(9) $W^{ij}_{p^{ij}}(p^{ij}(\tau^{ij},p^{wiPO}),p^{wiPO}) = 0.$

For now we adopt as our operating assumption that governments negotiate to the (efficient) politically optimal tariffs defined by (9), and that they find other means (e.g., international transfers) to distribute the negotiating surplus between them. We will revisit this latter assumption in section 3 when we consider in further detail the GATT/WTO negotiating environment.[10]

As we have argued in Bagwell and Staiger (1999, 2001), negotiations that conform to the GATT/WTO norm of *reciprocity* can be interpreted as leaving the terms of trade $\tilde{p}^{wi}$ unaltered.[11] Suppose, then, that with the government of country j on its reaction curve defined by (6), $\tilde{p}^{wi}$ has already been positioned at its politically optimal level p^{wiPO} (possibly as a result of negotiated tariff commitments made by other governments).[12] Suppose further that, from this starting point, the government of country j contemplates a negotiated tariff reduction for good i which would move it

[10]We also maintain the assumption that enforcement is not an issue in achieving the politically optimal tariffs. We discuss this further in section 3 and note 21.

[11]Shirono (2004) provides comprehensive evidence consistent with the view that the tariff commitments negotiated in the Uruguay Round conformed to reciprocity, while Karacaovali and Limao (2005) provide similar evidence for the European Union commitments negotiated in the Uruguay Round.

[12]Our assumption that the world price has been positioned at its politically optimal level prior to negotiations with country *j* ensures that the efficient political optimum can be achieved through negotiations which also satisfy reciprocity, but the basic empirical prediction we take to the data is preserved for any world price, provided negotiations satisfy reciprocity and deliver country *j* to its politically optimal tariff choice (i.e., the tariff choice that satisfies (8) for country *j*, regardless of the particular tariff choices of other countries).

from its best-response tariff to its politically optimal tariff defined by (9) in exchange for reciprocal (i.e., terms-of-trade preserving) tariff reductions from its trading partners, hence bringing its tariff into conformity with international efficiency. Using (6) evaluated at $\tilde{p}^{wi}=p^{wiPO}$ and also (9), we may then define implicitly the magnitude of country *j's* negotiated tariff reduction for good *i* by

$$(10) \qquad W^{ij}_{p^{ij}}(p^{ij}(\tau^{ijPO},p^{wiPO}),p^{wiPO}) - W^{ij}_{p^{ij}}(p^{ij}(\tau^{ijR},\tilde{p}^{wi}=p^{wiPO}),\tilde{p}^{wi}=p^{wiPO}) = -\theta^{ij}\times M^{ijR}.$$

With the two terms on the left-hand-side of (10) evaluated at the same world price, the difference between them reflects only the impact of the local price effects for country *j* in moving from τ^{ijR} to τ^{ijPO}. Using this observation, (10) can be rewritten as

$$(11) \qquad \int_{\tau^{ijPO}}^{\tau^{ijR}} [-W^{ij}_{p^{ij}p^{ij}}]d\tau^{ij} = -\theta^{ij}\times M^{ijR},$$

where we have used the fact that $dp^{ij}(\tau^{ij},p^{wiPO})/d\tau^{ij} = \partial p^{ij}(\tau^{ij},p^{wiPO})/\partial\tau^{ij} = 1$. We note that the second-order condition associated with (8) implies that $W^{ij}_{p^{ij}p^{ij}}<0$ for $\tau^{ij}=\tau^{ijPO}$. Moreover, $W^{ij}_{p^{ij}p^{ij}}<0$ for $\tau^{ij}\in[\tau^{ijPO},\tau^{ijR}]$ under our maintained assumption (A1).

Expression (11) describes an equilibrium relationship between country *j*'s best-response tariff on good *i*, τ^{ijR}, and the tariff on good *i*, τ^{ijPO}, that would bring country *j* into conformity with international efficiency according to the terms-of-trade theory of trade agreements. To interpret, we first observe that τ^{ijR} and τ^{ijPO} appear as limits of integration on the left-hand-side of (11), and that the integrand $[-W^{ij}_{p^{ij}p^{ij}}]$ is positive over the entire range of integration by (A1). We next observe that the two terms on the right-hand-side of (11) are evaluated with country *j* positioned on its good-*i* tariff reaction curve, i.e., with $\tau^{ij}=\tau^{ijR}$. Hence, when the product of these two terms is large and therefore the right-hand-side of (11) is large, it follows that (i) the left-hand-side integrand $[-W^{ij}_{p^{ij}p^{ij}}]$ is large and/or (ii) the left-hand-side limits of integration τ^{ijR} and τ^{ijPO} are far apart.

Figure 1 illustrates the implications of (11). We plot in Figure 1 the left-hand-side of (6), $W^{ij}_{p^{ij}} - \theta^{ij} M^{ij}$, as a function of τ^{ij} with τ^{i-j} fixed. This function is negatively sloped according to the second order condition, and it crosses the x-axis at τ^{ijR}. Observe that the first term of this function takes on the value $W^{ij}_{p^{ij}}(p^{ij}(\tau^{ijR}, \tilde{p}^{wi} = p^{wiPO}), \tilde{p}^{wi} = p^{wiPO})$ at $\tau^{ij} = \tau^{ijR}$, owing to our assumption that τ^{i-j} is fixed such that $\tilde{p}^{wi} = p^{wiPO}$ when country *j* is on its reaction curve. We also plot in Figure 1 the left-hand-side of (9), $W^{ij}_{p^{ij}}(p^{ij}(\tau^{ij}, p^{wiPO}), p^{wiPO})$, as a function of τ^{ij}. The slope of this function, $W^{ij}_{p^{ij}p^{ij}}$, is negative according to (A1), and the function crosses the x-axis at τ^{ijPO}. In addition, we observe that this function takes on the value $W^{ij}_{p^{ij}}(p^{ij}(\tau^{ijR}, p^{wiPO}), p^{wiPO})$ at $\tau^{ij} = \tau^{ijR}$. Hence, as the

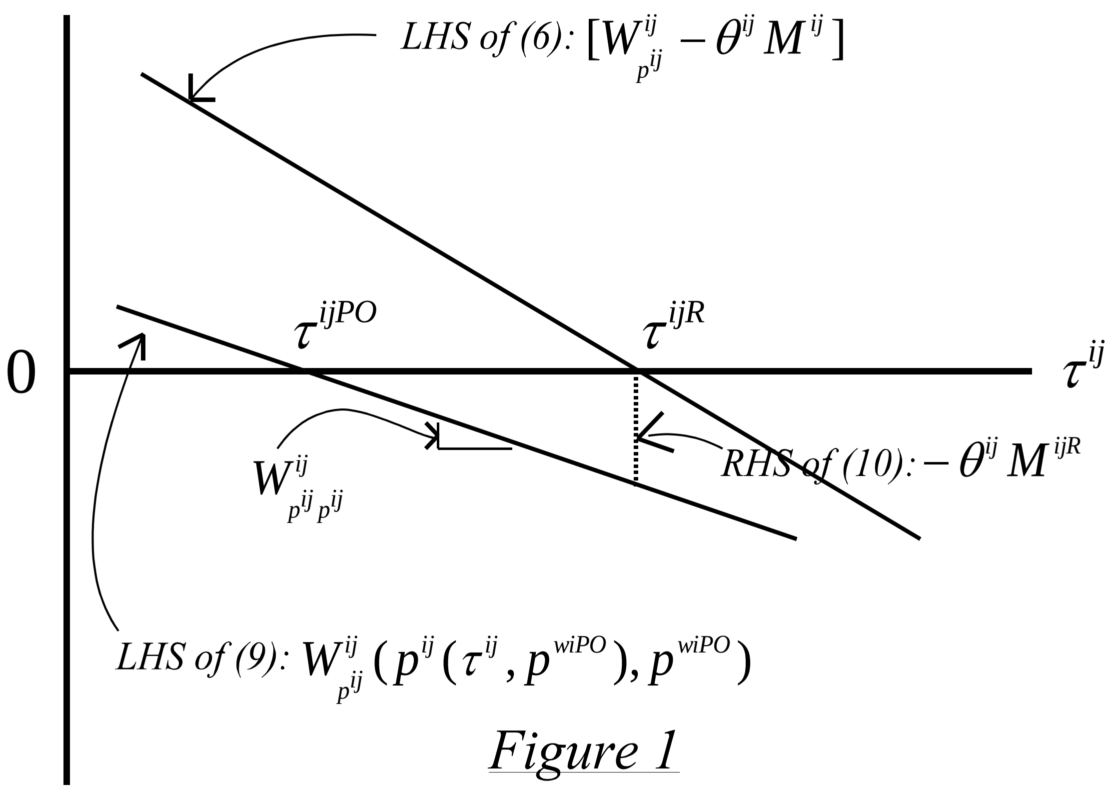

Figure 1

right-hand-side of (10) implies, the vertical distance between these two curves at τ^{ijR} is given in Figure 1 by the magnitude $-\theta^{ij} M^{ijR}$. Finally, as (11) confirms, Figure 1 implies that integrating

$[-W^{ij}_{p^{ij}p^{ij}}]$ from τ^{ijPO} to τ^{ijR} yields the vertical distance $-\theta^{ij}M^{ijR}$.

Returning now to our general discussion in section 2.1, expression (11) and Figure 1 can be seen to provide a formal confirmation of the centrality of the three elements featured in that discussion which combine to determine the magnitude of the negotiated tariff reductions that would bring a country's tariffs into conformity with international efficiency according to the terms-of-trade theory of trade agreements. As expression (11) and Figure 1 suggest, the magnitude of the negotiated tariff reductions that would bring a country's tariffs into conformity with international efficiency (τ^{ijR}- τ^{ijPO}) will be larger: (i) the larger is the magnitude of $\partial\tilde{p}^{wi}/\partial\tau^{ij}$ and therefore θ^{ij}, the country's ability to alter foreign exporter prices and hence its terms of trade with its tariff choices, and (ii) the larger is M^{ijR}, the country's import volume, where each of the magnitudes in (i) and (ii) is measured with the country positioned on its tariff reaction curve; and (iii) the smaller is $[-W^{ij}_{p^{ij}p^{ij}}]$, the rate at which the costs of the domestic distortions associated with protection rise as tariffs rise.

Figure 1 is suggestive of a possible approach for assessing the empirical relevance of the terms-of-trade theory of trade agreements: according to this approach, the terms-of-trade theory can be used to predict negotiated tariff commitments across countries and products on the basis of observed pre-negotiation tariffs and import levels, and then these predictions can be confronted with data on the actual tariff commitments negotiated by WTO members. More specifically, according to the terms-of-trade theory and as (11) and Figure 1 suggest, observations on τ^{ijR} and M^{ijR} can be used to predict τ^{ijPO}, once θ^{ij} and $W^{ij}_{p^{ij}p^{ij}}$ are known. In the next section, we introduce additional structure in order to derive an estimating equation with which we can implement this approach.

3. The Basic Estimating Equation

In this section we impose additional structure that allows expression (11) to be simplified into a form more amenable to estimation. The unit of observation for our empirical work is a (country, 6-digit HS product) pair. With j indexing countries and i indexing 6-digit HS products ("goods"), we suppose that goods can be associated with "industries," and in the remainder of this section we develop our estimating equation for a given industry, suppressing industry superscripts for notational simplicity. This means that the restrictiveness of the "within industry" across-product structure that we impose below varies with the degree of industry aggregation. For this reason, in the empirical sections that follow, we discuss results at varying degrees of industry aggregation. In particular, throughout the empirical sections we present our results for 1-industry economies, and for 10-industry economies (corresponding to 1-digit HS chapters), and at various points in these sections we discuss as well results for 22-industry economies (corresponding to HS "sections"), and 99-industry economies (corresponding to 2-digit HS chapters).

For the industry under consideration, we assume that home country j has N_D^j consumers indexed by z, each with linear demand for product i of $c^{zij}=a^{zij}-B^j p^{ij}$, so that demand for good i in country j is then

$$D^{ij}\equiv\sum_z c^{zij}=a^{ij}-b^j p^{ij}, \tag{12}$$

where $a^{ij}=\sum_z a^{zij}$ and $b^j\equiv N_D^j B^j$. We assume as well that home country j has N_S^j plants/firms indexed by z in the industry under consideration, each with linear supply of product i of $s^{zij}=k^{zij}+L^j p^{ij}$, so that supply of good i in country j is then

$$S^{ij}\equiv\sum_z s^{zij}=k^{ij}+l^j p^{ij}, \tag{13}$$

where $k^{ij}=\sum_z k^{zij}$ and $l^j\equiv N_S^j L^j$. With analogous assumptions for each foreign country, we then have that $\partial M^{ij}/\partial p^{ij}=-[b^j+l^j]$ and $\partial E^{*ij}/\partial p^{*ij}=[l^{*j}+b^{*j}]$, which implies by (2) that

$$\frac{\partial \tilde{p}^{wi}(\boldsymbol{\tau}^i)}{\partial \tau^{ij}} = \frac{-[b^j+l^j]}{\{\sum_{h\in H}[b^h+l^h]\} + \sum_{f\in F}[b^{*f}+l^{*f}]}, \tag{14}$$

and therefore that

(15) $$\theta^{ij} = \frac{-[b^{j}+l^{j}]}{\{\sum_{h\in H\backslash j}[b^{h}+l^{h}] + \sum_{f\in F}[b^{*f}+l^{*f}]\}} \equiv \theta^{j}.$$

We observe from (14) that $dp^{ij}/d\tau^{ij}=[1+\partial\tilde{p}^{wi}/\partial\tau^{ij}] > 0 > \partial\tilde{p}^{wi}/\partial\tau^{ij}$, consistent with the absence of the Metzler and Lerner paradoxes, and therefore by (15) that $\theta^{j}<0$.

Finally, we assume that the weight on producer surplus in the objective of home country government *j* for good *i* is common across import-competing goods *i* in the industry under consideration, so that $\delta^{ij}=\delta^{j}$ for all *i*.[13] With this and our linearity assumptions, it then follows that

(16) $$[-W^{ij}_{p^{ij}p^{ij}}] = [b^{j}+l^{j}-(\delta^{j}-1)l^{j}],$$

which must be positive under our maintained assumption that countries adopt non-prohibitive best-response tariffs, and which therefore satisfies (A1). Using (15) and (16), we may then rewrite (11) in ad-valorem form as

(17) $$t^{ijR}-t^{ijPO} = [\frac{-\theta^{j}}{b^{j}+l^{j}-(\delta^{j}-1)l^{j}}]\times[\frac{1}{p^{wiPO}}]\times[M^{ijR}],$$

where t represents an ad-valorem tariff.[14]

According to expression (17), the difference between a country's best-response tariff and its politically optimal tariff is proportional to its import volume when on its tariff reaction curve, with the factor of proportionality given by the product of a country-specific (*j*) and a good-specific (*i*) term, both positive. The country-specific term reflects the ratio of (a) the country's ability to alter foreign exporter prices and hence its terms of trade in the industry under consideration with its tariff

[13]This assumption is analogous to that made by Gawande and Li (2005), and can be justified, for example, by appealing to a Grossman-Helpman (1994) setup in which all import-competing goods within an industry are either organized, or all are not organized.

[14]It is often observed that developing countries value tariffs for the particular purpose of raising revenue, an observation that is especially relevant for the sample of countries that we examine in our empirical work. In terms of our model, this can be captured by moving the weighting term in (3) from producer surplus to tariff revenue. With these government preferences, the analogue to (17) becomes $t^{ijR}-t^{ijPO} = [\frac{-\theta^{j}}{\delta^{j}(b^{j}+l^{j})}]\times[\frac{1}{p^{wiPO}}]\times[M^{ijR}]$.

choices, $-\theta^j$, to (b) the rate at which the costs of the domestic distortions associated with protection in the country rise in this industry as tariffs rise, $[b^j+l^j-(\delta^j-1)l^j]$; and the country-specific term is larger if (a) is larger and/or if (b) is smaller. The good-specific term reflects the conversion of specific tariffs to ad-valorem tariffs with (the inverse of) p^{wiPO}.

It may at this point be helpful to pause and consider the relationship between (17) and the traditional Johnson (1953-54) "optimal tariff" formula. When $\delta^j=1$, which is to say when the government of country *j* is a national income maximizer, it is direct to show that $t^{ijPO}=0$.[15] As a consequence, when $\delta^j=1$ the left-hand-side of (17) is simply country *j*'s best-response tariff on imports of good *i*, t^{ijR}, and a tariff cut of this magnitude is then required to bring country *j*'s tariff on good *i* into conformity with international efficiency (i.e., set the tariff equal to $t^{ijPO}=0$). But when $\delta^j=1$, the right-hand-side of (17) simplifies as well, and (17) can be written as

$$(17') \qquad t^{ijR} = [\frac{1}{[\sum_{h\in H\setminus j}(b^h+l^h)+\sum_{f\in F}(b^{*f}+l^{*f})]}]\times[\frac{M^{ijR}}{p^{wiPO}}].$$

It can be confirmed that the expression on the right-hand-side of (17') is the elasticity of foreign export supply for good *i* "faced by country *j*," corresponding to Johnson's traditional optimal tariff formula expressed here in a many-importer setting.[16] More generally, for $\delta^j>1$, which is to say when the government of country *j* is "politically motivated" and values redistributing surplus to import-competing producers of good *i*, (17) is no longer an expression for the traditional optimal tariff in a multiple-importer setting, but (17) does continue to express the magnitude of the tariff cut required to bring country *j*'s tariff on good *i* into conformity with international efficiency.

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[15]This follows from the definition of t^{ijPO} given in (9) and the fact that, when $\delta^j=1$, $W^{ij}_{p^{ij}}=\tau^{ij}\times\partial M^{ij}/\partial p^{ij}$.

[16]In the case of a single importer (where *j* is the only country in the set *H* and where market clearing then ensures that $M^{ijR}=E^{*iR}$ with E^{*iR} denoting the equilibrium volume of foreign exports of good *i* when country *j* is on its good-*i* tariff reaction curve), (17') collapses immediately to $t^{ijR} = E^{*iR}/[\sum_{f\in F}(b^{*f}+l^{*f})\times p^{wiPO}]$, which is the inverse export-supply elasticity formula familiar from the single-importer setting and expressed in our linear environment.

A further point illuminated by (17') is that our assumptions imply the property that the slope of the foreign export supply curve faced by country *j* is common across all goods *i* in the industry under consideration (and equal to $[\sum_{h\in H\backslash j}(b^{h}+l^{h})+\sum_{f\in F}(b^{*f}+l^{*f})]$). Evidently, the restrictiveness of this property depends on the level of industry aggregation assumed. For example, as we describe more fully below, we can estimate equations based on (17) by country under the strong assumption of a single aggregate industry, using within-country across-product variation. Together with the property noted above, this assumption of course carries with it the strong implication that the slope of the foreign export supply curve faced by country *j* is common across all goods in the economy. But we emphasize that estimation by disaggregated industry, based on within-industry across-product-and-across-country variation, mitigates the restrictiveness of this property. We will return to this point in later sections when we discuss our by-industry and by-country estimation results.

We next observe that the right-hand-side of (17) involves either model parameters or economic magnitudes that are determined when country *j* is on its non-cooperative tariff reaction curve, but the right-hand-side of (17) does not include economic magnitudes that are determined when country *j* adopts its politically optimal tariff for good *i*.[17] We now highlight this feature by rewriting (17) in the form:

$$(18) \qquad t^{ijPO} = t^{ijR} + [\frac{\theta^{j}}{b^{j}+l^{j}-(\delta^{j}-1)l^{j}}]\times[\frac{1}{p^{wiPO}}]\times[M^{ijR}].$$

According to (18), the efficient tariff on product *i* to which country *j* should negotiate can be predicted as a function of underlying model parameters with knowledge of its non-cooperative best-response tariff and import volume. In effect, as (18) indicates and recalling that $\theta^{j}<0$, the tariff to which country *j* negotiates should, all else equal, be further below its non-cooperative tariff the larger is the level of its non-cooperative import volume.

[17]Recall from our discussion of reciprocity in section 2.2 that we assume that the world price has been positioned at its politically optimal level p^{wiPO} prior to the negotiations with country *j*, and that the world price is then not altered as country *j* negotiates from its reaction curve level t^{ijR} to t^{ijPO}.

For example, suppose we observe two products m and n for which $p^{wmPO}=p^{wnPO}$ and for which country k's non-cooperative tariff choices are the same, so that $t^{mkR}=t^{nkR}$. Suppose, though, that country k's non-cooperative import volume of product m is greater than product n, so that $M^{mkR}>M^{nkR}$. Then (18) implies that we should observe $t^{mkPO}<t^{nkPO}$.[18] Similarly, suppose we observe two countries k and l for which $\theta^k/[b^k+l^k-(\delta^k-1)l^k]=\theta^l/[b^l+l^l-(\delta^l-1)l^l]$, and who happen to make the same non-cooperative tariff choice on product m, so that $t^{mkR}=t^{mlR}$. And suppose that country k's non-cooperative import volume for product m is greater than country l's, so that $M^{mkR}>M^{mlR}$. Then (18) implies that we should observe $t^{mkPO}<t^{mlPO}$. In this way, (18) serves as the basis for predicting t^{ijPO} both across goods for a given country and across countries for a given good with knowledge of non-cooperative tariffs and import volumes.

Equation (18) describes a relationship that is predicted by the terms-of-trade theory of trade agreements. But as we discussed in the Introduction, an alternative and possibly complementary role for trade agreements has been articulated by the commitment theory. We next introduce a possible commitment role for trade agreements in our model, and show that (18) is augmented in a simple and intuitive fashion. As we demonstrate, this permits in principle an empirical evaluation of the dual roles that trade agreements may play.

We introduce a potential commitment problem into the model in a very simple and stylized way. We assume that, when it is unconstrained by a trade agreement, the government of country k sets its tariff levels simultaneously with the supply decisions of a fraction d^k of the plants/firms operating in each country in the industry under consideration, and prior to the remaining fraction $(1-d^k)$ of producers (as well as all consumers). Hence, when $d^k=0$ the government of country k sets its tariff levels before the supply decisions of all firms, and therefore takes full account of the equilibrium supply responsiveness as summarized by l^j in each country j. As a consequence, when $d^k=0$

[18] Within the model, this particular comparison can be generated for example with $\delta^k>1$ by varying the levels of demand shifters (a^{mk} and a^{nk}) and supply shifters (k^{mk} and k^{nk}) across the two sets of model parameters.

the government of country *k* does not face a commitment problem with regard to producers, and the model with which we derived (18) still applies.

At the other extreme, consider now the case in which $d^k = 1$. In this case, the government of country *k* sets its tariff levels simultaneously with the supply decisions of all firms in the industry under consideration, and therefore takes these supply decisions as bygones when it makes its tariff choice, ignoring the effects of its tariff choice on supply. Of course, in equilibrium producers are not surprised by the government's tariff choices, and so those choices do impact fully the supply decisions according to the supply responsiveness parameter l^j in each country *j*; but due to the discretion that the government of country *k* wields in its tariff choices when $d^k = 1$, the government cannot by itself make commitments to producers, and is caught in an inefficient "time-consistent" equilibrium. As a consequence, when $d^k = 1$ the government of country *k does* face a commitment problem with regard to producers, and according to the commitment theory of trade agreements it may then look to a trade agreement to help it solve this problem (in addition to helping it escape from a terms-of-trade driven Prisoners' Dilemma if it faces that problem as well). Finally, in the intermediate case where $d^k \in (0,1)$, the government of country *k* takes into account the supply responsiveness $(1-d^k) \times l^j$ in each country *j* as it makes its unilateral tariff choices, which is a fraction $(1-d^k)$ of the true supply responsiveness l^j.

The commitment problem associated with $d^k > 0$ alters the unilateral best-response tariff choices of the government of country *k*, but it does not alter the politically optimal choices, which must now correct for two sources of inefficiency associated with unilateral best-response tariff choices: the terms-of-trade driven Prisoners' Dilemma, and the commitment problem. Using this fact, beginning again from (10), and exploiting the additional linear structure imposed in this section, we show in the Theoretical Appendix that the generalization of (18) to an environment in which governments face a potential commitment problem is given by:

$$(19)\qquad t^{ijPO} = [1 - \frac{d^j \times l^j}{b^j + l^j - (\delta^j - 1)l^j}]\times[t^{ijR}] + [\frac{\bar{\theta}^j}{b^j + l^j - (\delta^j - 1)l^j}]\times[\frac{1}{p^{wiPO}}]\times[M^{ijR}],$$

where

$$\bar{\theta}^j = \frac{-[b^j + (1-d^j)l^j]}{\{\sum_{h\in Hj}[b^h + (1-d^j)l^h] + \sum_{f\in F}[b^{*f} + (1-d^j)l^{*f}]\}}.$$

According to (19), there are now two potential reasons why t^{ijPO} might lie below t^{ijR}, and therefore why trade negotiations might result in the government of country *j* committing to reduce its tariff on good *i*. In particular, as (19) indicates, even if country *j* perceives itself as small in world markets, so that $\bar{\theta}^j = 0$, its best-response tariff will remain above its politically optimal tariff provided that (i) $\delta^j > 1$ so that $t^{ijR} > 0$ and (ii) $d^j > 0$, which is to say provided that the government of country *j* places extra weight on producer interests and suffers from a commitment problem with regard to producers when choosing its unilateral best-response tariffs.[19] More generally, when $\bar{\theta}^j < 0$, so that $t^{ijR} > 0$ is assured, a commitment problem in country *j* ($d^j > 0$) will be reflected in a coefficient on t^{ijR} in (19) that is less than one. And whether or not the government of country *j* suffers from a commitment problem, if country *j* perceives itself as large in world markets, so that $\bar{\theta}^j < 0$, then its best-response tariff will remain above its politically optimal tariff for the terms-of-trade reasons familiar from (18).[20]

Our focus thus far has been on the set of politically optimal tariffs t^{ijPO} as bargaining outcomes in the GATT/WTO. But as we noted in section 2.2 above, this focus reflects two assumptions: first, that among the efficient tariff possibilities, GATT/WTO rules are especially well-equipped to deliver the set of politically optimal tariffs; and second, that when governments

[19]If $\bar{\theta}^j = 0$ and $\delta^j = 1$, so that country *j* is small in world markets and its government is a national income maximizer, then it faces no commitment problem regardless of the value of d^j, and it follows that $t^{ijR} = 0 = t^{ijPO}$. We also show in the Theoretical Appendix that the coefficient on t^{ijR} in (19) is strictly positive under our maintained assumption that the best-response tariff is non-prohibitive.

[20]We note that, while $\bar{\theta}^j < 0$ for $d^j \in [0,1]$, the impact of d^j on the magnitude of $\bar{\theta}^j$ is ambiguous.

negotiate to their (efficient) politically optimal tariffs, they find other means (e.g., international transfers) to distribute the negotiating surplus between them. We now revisit this second assumption, and consider its place in the GATT/WTO negotiating environment.

If governments found it easy to make international transfers as part of trade negotiations, then they could separate bargaining over the levels of negotiated tariffs from bargaining over the levels of international transfers, achieving the international efficiency frontier by adopting politically optimal tariffs and then bargaining over the distribution of the negotiating surplus and handling any asymmetries in bargaining power via transfers. On the other hand, if governments lack a separate means of dividing up the surplus from negotiation over tariffs, then asymmetries in bargaining power could prevent governments from negotiating to the politically optimal tariffs. The GATT/WTO reality seems to be positioned somewhere between these two extremes: simple transfers do not appear to be readily available to governments in the context of GATT/WTO negotiations; but being cognizant of this fact, governments do take great care to set up "balanced" negotiating agendas that minimize the bargaining implications of a lack of international transfer instruments. For example, in describing how the GATT/WTO handles the lack of readily available international transfers among its member governments in the context of multilateral trade negotiations (MTNs), Hoekman and Kostecki (1997, p. 77) observe:

> "...The lack of a fungible medium of exchange requires trade negotiations to have an agenda that allows all the traders to trade something and in so doing improve upon the status quo. Setting the agenda is therefore very important. Actual negotiations are usually preceded by an intensive preparation process in participating countries during which possible issues are identified, preferences are established, issues are ranked, initial positions are formulated, and a proposal is made with respect to the contents of the negotiating agenda. The process that led to the establishment of the negotiating agenda of the Uruguay round took over five years, starting with the ministerial meeting held in 1982, during which the United States sought but failed to obtain agreement to launch a new MTN, and ending with the 1986 Ministerial meeting in Punta del Este, Uruguay, where agreement was finally reached on the agenda of what was to be known as the Uruguay round."

As the discussion of Hoekman and Kostecki (1997) suggests, a great deal of effort goes into attempting to set the agenda of GATT/WTO negotiations so that a natural balance exists among negotiating partners, thereby mitigating the role of transfers (or the distortions in negotiated policy commitments in lieu of transfers). Nevertheless, it is plausible that for various reasons (e.g., unexpected features of bargaining power that are unknown to negotiators at the time they set up the negotiating agenda), the negotiating agendas will not completely obviate the role of international transfers, and in lieu of such transfers some deviations from efficient politically optimal tariffs may obtain as a result of the negotiations. We therefore suppose that the observed ad valorem tariff binding on good *i* agreed to by country *j* as a result of a GATT/WTO negotiation, which we denote by t_{wto}^{ij}, may differ from t^{ijPO} as a result of such "agenda errors." In particular, we assume that t_{wto}^{ij} is given by

$$(20) \qquad t_{wto}^{ij} = \alpha_0^i + \alpha_0^j + t^{ijPO} + \epsilon^{ij},$$

where ϵ^{ij} is a random error term. According to (20), $\alpha_0^i < 0$ implies that importing countries of good *i* on average have unexpectedly weak bargaining power as compared to exporting countries, and so tend to accept negotiated tariff commitments which bind their tariffs on good *i* at below the politically optimal level. Similarly, $\alpha_0^j < 0$ implies that importing country *j* has unexpectedly weak bargaining power on average across all the products that it imports, and so tends to accept negotiated tariff commitments which bind its tariffs below their politically optimal levels. Substituting (19) into (20) yields

$$(21) \qquad t_{wto}^{ij} = \alpha_0^i + \alpha_0^j + \kappa^j \times [t^{ijR}] + \gamma^j \times \gamma^i \times [M^{ijR}] + \epsilon^{ij},$$

where $\kappa^j \equiv [1 - \frac{d^j \times l^j}{b^j + l^j - (\delta^j - 1) l^j}] \in (0,1]$, $\gamma^j \equiv \frac{\bar{\theta}^j}{b^j + l^j - (\delta^j - 1) l^j} \leq 0$ and $\gamma^i \equiv 1/p^{wiPO} > 0$.

Critically, we assume that, after controlling for country- and product- fixed effects, the remaining unexpected variation in bargaining power is independent of each country's non-cooperative tariff and import volume (i.e., we assume that ϵ^{ij} is independent of t^{ijR} and M^{ijR}). This assumption reflects the position that, in light of our discussion above, the agenda for the GATT/WTO negotiation under consideration will have been set so as to address expected imbalances that might arise with observable features of the negotiating parties such as asymmetries in non-cooperative tariff levels and import volumes, and so the remaining unexpected variation in bargaining power (ϵ^{ij}) should be uncorrelated with each country's non-cooperative tariff and import volume (t^{ijR} and M^{ijR}).[21]

Finally, we discuss the measurement of country *j*'s non-cooperative best-response tariff on imports of good *i*, t^{ijR}. In principle, t^{ijR} could be measured with observations on country *j*'s tariffs prior to its membership in the GATT/WTO (and ideally, prior to membership in any other international arrangement under which it had bound its tariffs). However, an important dimension of the commitments accepted by a country when it joins the GATT/WTO involves bringing its "trade regime" into conformity with GATT/WTO rules, and this routinely implies giving up a variety of non-tariff forms of trade protection (see, for example, WTO, 2005).[22] The theoretically appropriate measure of t^{ijR} would therefore be the "tariffied" ad valorem rate of a country's tariff and non-tariff measures prior to joining the GATT/WTO. Unfortunately, while it is often possible to obtain data on a country's tariffs prior to GATT/WTO membership, there is little systematic information on a country's *non-tariff* barriers (NTBs) prior to entering the GATT/WTO, and information on the tariffication of an acceding country's non-tariff barriers does not exist at the WTO.[23] Accordingly, we interpret a country's unbound ad valorem tariff rates prior to GATT/WTO accession, which we denote by t^{ij}_{prewto}, as related to the country's non-cooperative best-response

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[21]An additional reason that t^{ij}_{wto} could differ from t^{ijPO} relates to possible enforcement difficulties in the GATT/WTO (see for example Maggi, 1999, and Bagwell and Staiger, 2002, Ch. 6 and 2005b), which would imply that $t^{ij}_{wto}>t^{ijPO}$. To the extent that enforcement issues are a substantial contributor to the error term in (20), the assumption that this error term is independent of t^{ijR} and M^{ijR} may be less compelling, as its validity could depend on details of the enforcement mechanism (e.g., whether or not the enforcement incentive constraints are pooled across goods and/or countries).

[22]In practice, developing countries who joined GATT were largely exempted from these and other commitments through "special and differential treatment" provisions. However, the WTO has in large part moved away from the granting of broad special and differential treatment to developing countries, and so now all but the least developed countries accept a broad array of policy commitments as members of the WTO.

[23]A notable exception is contained in Kee, Nicita and Olarreago (2006), who use NTB coverage and frequency data to estimate the import impacts of NTBs in a factor-endowments setting, and report ad valorem equivalents at the HS six-digit level for 91 countries which include 11 of the 16 countries in our data set. We use their estimates to construct an alternative measure of overall (tariff and non-tariff) pre-WTO-accession protection in our section on sensitivity (see also note 24 below). We also thank Cato Adrian of the WTO Secretariat for helpful guidance on the (lack of) available measures at the WTO.

tariff t^{ijR}, but we allow the two to differ according to the relation[24]

$$(22) \qquad t^{ijR} = \alpha_1^j + \psi^j t_{prewto}^{ij}.$$

Substituting (22) into (21) implies the following estimating equation for the industry under consideration:

$$(23) \qquad t_{wto}^{ij} = \alpha^i + \alpha^j + \beta^j t_{prewto}^{ij} + \gamma^j \gamma^i M^{ijR} + \epsilon^{ij},$$

where $\alpha^i \equiv \alpha_0^i$, $\alpha^j \equiv [\alpha_0^j + \kappa^j \alpha_1^j]$, $\beta^j \equiv \kappa^j \psi^j$, γ^i and γ^j are parameters to be estimated. Notice that, in the absence of better data on t^{ijR} that would allow us to dispense with (22), we cannot independently identify the magnitude of the key parameter κ^j relevant for the commitment theory of trade agreements. In the extension section we appeal to additional measures of NTBs so that we can in principle dispense with (22), and we then attempt to estimate the magnitude of κ^j. Nevertheless, even in the absence of additional measures of NTBs, (23) *does* permit us to shed light on the key prediction of the terms-of-trade theory of trade agreements: according to the terms-of-trade theory, $\gamma^j \gamma^i < 0$, implying that the tariff to which country *j* negotiates should, all else equal, be further below its non-cooperative tariff the larger is the level of its non-cooperative import volume. This is the central prediction that we now take to the data.

4. Empirical Strategy and Data Description

If the outcome of GATT/WTO negotiations could be interpreted as producing a once-for-all movement from non-cooperative Nash tariffs to efficient politically optimal tariffs, then it might be

[24] An alternative approach would be to assume that the pre-GATT/WTO tariff measures the non-cooperative best-response tariff with random error, requiring an instrumental variable approach to estimation. We discuss this possibility further in our concluding section. Finally, in our discussion above we have abstracted from another potentially important issue with regard to measuring a country's unbound tariffs, namely, that in anticipation of upcoming accession negotiations the country might "pad" its tariffs for bargaining purposes, a practice that would be especially problematic for us if the tendency to do so was most pronounced in large-import-volume sectors. However, while this practice once was prevalent (see Wallace, 1933), governments have long seen through it (see Tasca, 1938) and we proceed under the assumption that it is not an empirically important phenomenon in modern tariff bargaining.

possible to appeal to (23) as the basis for predicting the pattern of GATT/WTO tariff concessions across all member countries from data on pre-GATT tariffs and import levels. But GATT/WTO negotiations have occurred in a series of rounds that have spanned more than 50 years, with the Uruguay Round (in which the WTO was created) completed in 1994 and marking the 8th and final GATT round.[25] This feature precludes a straightforward application of (23) for long-time GATT-member countries.

Our empirical strategy is therefore to focus on the negotiated tariff bindings of non-GATT-member countries who joined the WTO in separate accession negotiations occurring after the Uruguay Round. A reasonable interpretation is that, at the time of these accession negotiations, existing GATT/WTO members had largely completed the process of negotiating their tariffs to efficient levels, and new members were asked to agree to commitments that moved their tariffs from unbound levels to globally efficient levels (though this interpretation abstracts from possibly important enforcement issues, as we have noted above). Hence, for these countries, it is reasonable to expect that (23) should apply.

Our sample of countries is composed of 16 of the 21 countries that joined the WTO between its inception on January 1, 1995, and November of 2005.[26] Data on each country's (final) bound ad valorem tariff levels at the 6-digit HS level comes from the TRAINS data set.[27] Data on each country's pre-WTO-accession (unbound) ad valorem tariffs at the 6-digit HS level for an available time-period prior to WTO accession comes from the TRAINS data set. Import data comes from the PCTAS data base (a subset of the COMTRADE data base) and is collected at the 6-digit HS level and averaged over the years 1995-1999. This data is recorded in value terms, and so we will

[25] A first WTO negotiating round, the Doha Round, is currently ongoing.

[26] The five countries that joined the WTO between January 1 1995 and November 2005 that are not included in our sample are Bulgaria, Croatia, Chinese Taipei, Mongolia, and Saudi Arabia. These countries were excluded from our sample because we could not acquire data on imports and/or unbound tariffs for time periods prior to WTO accession.

[27] It is standard practice in GATT/WTO negotiations for governments to agree to initial tariff bindings and final tariff bindings, with an agreed-upon "staging" rule defining the transition path from initial to final bindings. We use the final bindings (as recorded in the TRAINS data set) as our measure of t_{wto}^{ij}.

sometimes utilize unit values calculated from the COMTRADE data base to convert the PCTAS import data from value data to quantity data. A detailed description of all data sources used in the paper and our data cleaning procedures is contained in the Data Appendix.

Table 1 reports the list of countries in our sample, the years over which their import data was averaged, the years over which the pre-WTO-accession (unbound) tariff was measured, and the year of WTO accession. As can be seen from the table, for each country the years of unbound tariff data are measured prior to the year of WTO accession, while the import data is averaged over a period that for most countries in the sample precedes the date of WTO accession as well.[28] While our unit of observation is a (country, 6-digit HS product) pair, we will often present estimates by 1-digit HS chapter, and so Table 2 lists a description of all of the 2-digit HS industries contained within each 1-digit HS chapter.

Table 3a provides summary statistics for six-digit HS imports, pre-WTO unbound tariffs and (final) bound tariffs for the full sample of countries and industries, and also by 1-digit HS chapters. Table 3b provides the same information by country. Several features of the data are noteworthy.[29]

[28]The tariff data for year *n* reflects the tariffs in place on the first day of year *n*, and so even the tariff data for Jordan and Panama reflect pre-WTO-accession levels. Ideally, we would like our measure of imports to precede the implementation of any tariff commitments in our sample of countries (although as Freund and McClaren, 1999, show, even this would not necessarily rule out anticipation effects). Using the average import level over 1995-1999 comes close to achieving this, while allowing us to smooth out year-to-year fluctuations and use the same time-frame when measuring imports for each country. We also experimented with using the (uncleaned) TRAINS import values for the years corresponding to our pre-WTO-accession tariff data, as well as excluding Ecuador, Kyrgyzstan and Panama from our sample, and found broadly similar results.

[29]If each of the 16 countries in our sample reported a bound and an unbound tariff, and an import value, for every 6-digit HS product, we would have 85,920 observations. In fact, after accounting for missing tariff observations and for import values that do not achieve the threshold value for the PCTAS data set (the five-year total import value must exceed $50,000), we are left with 42,716 observations. For the majority (89%) of these missing observations, we have complete tariff data but no import data (imports are below the threshold level). Attempting to incorporate these missing observations into our estimation would require dealing with a number of significant interpretive and econometric issues, and so we simply exclude them in what follows. However, we note that the mean ad valorem tariff concession over these missing-import-value observations (which each have yearly import values below $10,000) is roughly 20% below the mean ad valorem tariff concession over the observations for which we do have import data (which have a mean import value of $4,100,000). This suggests that incorporating these missing observations into our estimation would likely strengthen our basic finding that large non-cooperative import volumes predict large tariff concessions.

First, the final bound tariffs are generally quite far away from free trade, averaging 13.1% across the full sample of products and countries, and ranging across 1-digit HS chapters from an average of 7.6% to 19.4% and across countries from an average of 6.9% to 25.8% . Indeed, only about 11% of the observations on final bound tariffs in the full sample of countries and industries correspond to free trade. Hence, predicting the tariff-negotiating outcomes of the WTO does not amount to a trivial exercise of predicting free trade across the board.

Second, for many of the countries and industries in the sample, the average pre-WTO unbound tariff is *lower* than the average final bound tariff. While there are a number of possible interpretations of this feature of the data that are consistent with the terms-of-trade theory of trade agreements, the interpretation directly implied by our modeling approach here proceeds along the lines described in section 3, and simply reflects the tariffication of existing NTBs that is required of countries when they join the WTO: according to this interpretation, the pre-WTO tariffs may be lower than the final bound tariffs because the former do not include NTBs which through the tariffication process are incorporated into the latter.[30]

And finally, there is an enormous amount of variation in the level of imports across countries and products and, not surprisingly, China is huge, not only in absolute terms but especially in relation to the other countries in our sample. On the one hand, this variation is exactly what we want in order to assess the empirical predictions of the terms-of-trade theory of trade agreements. On the other hand, it does raise the concern that any empirical findings may be driven by China, or by a relatively small number of outlier observations, and it suggests the importance of sensitivity analysis to evaluate whether or not this is the case.

[30]Other interpretations of this feature of the data are provided by Bagwell and Staiger, 2005b, Maggi and Rodriguez-Clare, 2005, and Horn, Maggi and Staiger, 2006. Employing a modified terms-of-trade model in which governments experience privately observed political economy shocks, Bagwell and Staiger show that (even non-cooperative) applied tariffs are sometimes set below the efficient MFN binding. Maggi and Rodriguez-Clare show that politically motivated governments may prefer trade agreements that permit applied tariffs to fall below the bound levels (although they do not provide a reason for why tariffs might be applied below the bound level in equilibrium). And adopting an incomplete contracts perspective, Horn, Maggi and Staiger suggest that the optimal trade agreement in a costly contracting environment may exhibit applied tariffs which are sometimes set below bound levels, as a low-cost way to achieve some (upward) rigidity and some (downward) discretion in the contract.

5. Main Results

As developed in sections 2 and 3, the central empirical prediction of the terms-of-trade theory of trade agreements which we take to the data is straightforward: all else equal, the tariff on product *i* to which country *j* negotiates should be further below its non-cooperative tariff the larger is the level of country *j*'s non-cooperative import volume of product *i*. Restated in the language of the GATT/WTO, the terms-of-trade theory implies that, all else equal, the magnitude of negotiated tariff concessions should be positively related to pre-negotiation import volumes.

We begin our empirical exploration by examining the unconditional relationship between negotiated tariff concessions and pre-negotiation import levels. Figure 1a plots the percent deviation from mean concession by import decile, using the import values from the PCTAS data set. Figure 1b presents the same information but using import volumes rather than import values (calculated with the unit values from the COMTRADE data base). Finally, Figure 1c presents the same information but this time using import volumes divided by price, to reflect the conversion of specific tariffs to ad-valorem tariffs as (17) suggests. The positive relationship displayed by each figure is striking, and seems remarkably robust to the various measures of import that distinguish the three figures (substituting median- for mean-concessions produces broadly similar figures). The picture painted by Figures 1a-1c is that countries agree to smaller-than-average tariff concessions for products with relatively small pre-negotiation import levels, and that the largest import levels tend to be associated with dramatically larger-than-average concessions.

While not including any of the controls that equation (23) suggests would be appropriate, Figures 1a-1c nevertheless provide surprisingly strong confirmation of the basic relationship predicted by the terms-of-trade theory of trade agreements. In fact, this positive relationship seems so striking that it might be tempting to conclude that a more direct observation can explain it: tariff concessions are big where pre-negotiation import levels are big, because these concessions imply the biggest gains for the foreign exporters whose governments are requesting the concessions. However this simple story is too simple, because it ignores the fact that tariff concessions won in a GATT/WTO negotiation do not come for "free," but rather are "purchased" in exchange for reciprocal concessions. Once this is appreciated, it becomes clear that there is no direct reason why concessions implying big gains for foreign exporters (i.e., where pre-negotiation import levels are big) would be particularly large, since these concessions would carry a reciprocally large negotiating "price" for the governments of the foreign exporters who are requesting them.[31] Nevertheless, as we have detailed above, a reason for this relationship *is* provided by the terms of trade theory.

We next turn to estimation based on (23). Rather than attempting to estimate (23) for each industry with the country- and product- specific coefficients indicated in (23), we choose instead to estimate the following two variants of (23) on (i) the full sample of countries and products, (ii) by 1-digit HS chapter, and (iii) by country:

(23a) $t^{ij}_{wto} = \alpha^I + \alpha^j + \beta t^{ij}_{prewto} + \gamma[VM^{ijR}] + \epsilon^{ij}$, and

(23b) $t^{ij}_{wto} = \alpha^I + \alpha^j + \beta t^{ij}_{prewto} + \gamma[M^{ijR}/p^{wI}] + \nu^{ij}$,

where α^I denotes an industry-fixed effect at the 2-digit HS level, α^j denotes a country-fixed effect, the term $[VM^{ijR}]$ in (23a) denotes import value, and finally where the term $[M^{ijR}/p^{wI}]$ in (23b) denotes the conversion of import value ($[VM^{ijR}]$) in (23a) to import quantity ($M^{ijR}=[VM^{ijR}/p^{wI}]$), using world prices calculated at the 2-digit HS level, and then multiplied by the inverse of this world price ($1/p^{wI}$) as in (21).[32] In effect, (23a) imposes the restriction that world prices do not vary across

[31]The need to achieve broad reciprocity between rights and obligations is present both in standard market access negotiations in the GATT/WTO and in accession negotiations. For example, the importance of maintaining the balance implied by reciprocity in the context of China's accession to the WTO was emphasized by the Chinese Delegation: "...a few members have raised some unreasonable requests, either requiring China to undertake obligations exceeding the WTO rules, or insisting that China can not enjoy the rights under the WTO rules. I am deeply concerned with such requests. The balance between rights and obligations is the fundamental principle of China's WTO accession...." (Yongtu, 2000). In the context of accession negotiations, which are in effect a series of bilateral negotiations between each interested member government and the government of the acceding country, each member country is "paying" for the concessions it wins from the acceding country with its obligation to extend its existing concessions to the new-member according to the Most-Favored-Nation principle (and in a sense therefore each member has an amount of "cash" associated with its "pre-constituted" package of concessions which it spends on securing the concessions of its choosing).

[32]We experimented with industry fixed effects at the 3-, 4-, 5- and 6-digit HS level as well, and found that it makes no material difference to our results. Hence, we present our results here and throughout with 2-digit HS level industry fixed effects. In addition, as we discuss below, estimation by industry at a further level of industry disaggregation leaves our basic findings unchanged.

2-digit HS industries (so that the world price term can be picked up in the parameter γ), while (23b) employs unit values calculated from the COMTRADE data base to relax this restriction.[33] The central prediction of the terms-of-trade theory of trade agreements is that the sign of the parameter γ estimated in (23a) and (23b) should be negative unless the importing country/countries in the sample are "small" in international markets with respect to the industry/industries in the sample (in which case γ should be zero). The terms-of-trade theory cannot account for positive estimates of γ.

Tables 4a and 4b present our estimates of β and γ under equations (23a) and (23b), using OLS and TOBIT (as mentioned previously, roughly 11% of the observations on t_{wto}^{ij} in the full sample are zero). Table 4a presents the estimates for the full sample and by industry; Table 4b presents the estimates by country.[34]

The estimates for the full sample are contained in the top row of Table 4a. As can be seen, whether estimated by OLS or TOBIT, and whether based on (23a) or (23b), the value of γ estimated on the full sample is negative and highly significant, providing strong support for the central empirical prediction of the terms-of-trade theory: all else equal, the tariffs to which countries negotiate are further below their non-cooperative tariffs the larger are their levels of non-cooperative import volumes. This conclusion is further supported with the by-industry results reported in the next 10 rows of Table 4a, where all OLS point estimates of γ are negative, and significant at the 5% level for 8 out of the 10 industries. The TOBIT estimates by industry exhibit higher standard errors, but are still broadly supportive: all but one point estimates of γ is negative, and 5 of 10 are significant at the 5% level (the one positive point estimate is statistically zero).[35] As discussed

[33]We calculate "world" prices as the total value of imports divided by the total quantity of imports over the 16 sample countries, for each 2-digit HS product, averaged over the period 1995-1999. We also experimented with world prices calculated a the 3- and 4- digit HS level, with broadly similar results.

[34]We do not report and interpret the estimated fixed effects, because as (23) indicates these fixed effects are mixtures of effects that can not be separately identified.

[35]Further industry-level disaggregation yields broadly similar results, with no evidence of significantly positive values of γ though some diminishment of the proportion of γ estimates that are significantly negative (2/3 when γ is

above, the relationship we posit in (22) between a country's non-cooperative best-response tariff t^{ijR} and its unbound ad valorem tariff rate prior to GATT/WTO accession, t^{ij}_{prewto}, does not permit a prediction on the magnitude or even the sign of the estimated parameter β, and we therefore postpone an evaluation of the magnitude of the key underlying parameter κ^j in this regard until the extension section, when we attempt to address the data limitations underlying (22). Still, as Table 4a indicates, it is interesting that the estimates of β are all highly significant and between zero and one, and therefore at least suggestive of a possible commitment role for the GATT/WTO as well.

The estimates by country are presented in Table 4b. Here our results are somewhat mixed. Four of the 16 OLS and TOBIT point estimates of γ under equation (23a) are positive, and one (Cambodia) is significantly positive.[36] Still, 8 countries produce a significantly negative estimate of γ at the 5% level under OLS, and 7 do so under TOBIT. The estimates of γ under equation (23b) are with three exceptions insignificantly different from zero (but are never significantly positive). Nevertheless, the relatively weak empirical results reported in Table 4b are not entirely unexpected, in light of the fact that these estimates use the variation across all products within each country, and therefore rely heavily on our assumptions implying the strong property that in this 1-aggregate-industry case the slope of the foreign export supply curve is common across all goods in the economy. As we observed previously, the by-industry estimates presented in Table 4a do not require this property (at least across 1-digit HS chapters), and so it is not particularly surprising that we find that our estimation performs better on within-industry across-country variation than on within-country across-industry variation.

It is also interesting to observe that, of the 16 countries in our sample, two qualified for

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estimated for each of the 21 HS "sections," which are designed to correspond to sectors of the economy, and approximately 1/2 when γ is estimated for each of the 99 2-digit HS industries). This suggests that the strong within-industry restrictions we imposed in section 3 are not driving our results.

[36]The estimate of β for Kyrgyzstan is omitted here and throughout, because Kyrgyzstan reports zero pre-WTO tariffs across all products, and so β is incorporated into the fixed effects.

accession to the WTO under the special guidelines provided for Least Developed Countries (LDCs) that were indicated in paragraphs 9 and 42 of the Doha Declaration (see WTO, 2005, p. 31): Cambodia and Nepal. According to these guidelines, existing WTO member governments are to "...give more consideration to the specific needs of acceding LDCs, particularly in the following areas: market access (restraint in seeking concessions and commitments from acceding LDCs); WTO rules (Special and Differential Treatment, transition periods, Plurilateral Trade Agreements); process (streamlined accession procedures); and Technical Assistance (priority attention to acceding LDCs)" (WTO, 2005, p. 32). This may explain in part the somewhat anomalous results displayed in Table 4b by both Cambodia (which is the only country in our sample exhibiting a significantly positive estimated value for γ), and Nepal (which exhibits an estimated value for γ that, while significantly negative, is an order of magnitude bigger than that for any other country).

In Tables 4a and 4b, we have allowed our estimates of γ to vary by industry (Table 4a) and by country (Table 4b). But (23), which motivates our estimating equations (23a) and (23b), suggests that γ may vary across both industries and countries. To some extent, our by-country estimates of (23b) account for this, but only imperfectly (under the assumption of a 1-aggregate-industry economy) and the results are rather weak. Hence, to check that our findings do not change dramatically when variation over countries is permitted for γ estimated within a single disaggregated industry, we present in Table 4c estimates of γ^j for a single 1-digit HS chapter. We choose to report results for HS8, because this 1-digit chapter represents almost a quarter of the observations in our full sample, but estimates from the other 1-digit HS chapters would lead to broadly similar conclusions. For simplicity, we focus on the specification in (23a) with country-specific γ estimates.

As can be seen from Table 4c, permitting country-specific variation of the estimated γ's by disaggregated industry generates a modest improvement in the performance of the terms-of-trade theory relative to that reported in Table 4b: 9 of the 16 country-specific γ estimates under OLS are now negative and significant at the 5% level or higher (with a 10th now significantly negative at the 10% level), and under TOBIT 8 are now negative and significant at the 5% level or higher, while none of the country-specific γ estimates are significantly positive. At the same time, it is somewhat surprising that the results are not even stronger when the country-specific γ's are estimated on a single HS chapter rather than on all industries aggregated into one, since as we noted above the structure that we impose on the slopes of foreign export supply curves is then not so onerous. But in fact, as a comparison across the estimates in Table 4b and 4c confirms, whether this structure is imposed or not does not seem to make much difference with regard to the degree to which the estimated γ's are broadly in line with the terms-of-trade theory.[37]

It is not immediately obvious how best to evaluate the quantitative implications of our estimates of γ, but we can offer a couple of perspectives. On the one hand, our estimated impact of non-cooperative imports on the level of bound tariffs seems quantitatively rather small. For example, evaluated at the sample means and using the OLS estimates of γ reported in the first column of Tables 4a and 4b, a ceteris paribus increase in non-cooperative imports by one standard deviation is predicted to lower bound tariff levels by about 1.7% based on the full sample (which at the mean full-sample binding is less than 1/4 of a percentage point), and never as high as 10% for any industry or country sub-sample. On the other hand, the γ estimate for China implies that a ceteris paribus increase in the non-cooperative imports for China by one standard deviation is predicted to lower China's bound tariff levels by about 5.5% (which at the mean China binding is a little over 1/2 of a percentage point), and this is an effect that is larger than that implied for any other country in our sample. Analogous conclusions follow from our TOBIT estimates of γ. Hence, the quantitative implications of our estimates of γ are sometimes sizeable, and they are biggest where we would expect them to be biggest, namely for countries that are by any metric "large" in world markets.

This conclusion is reinforced from a different perspective. Under the assumption that the political economy weights δ^j are close to one, so that the trade policy objectives of each government in our sample is not too far from national income maximization, the estimated γ's can be used to

[37] A similar conclusion emerges when estimates are performed by 1-digit HS chapter for a single country.

construct an implied ranking over countries of the (perceived) foreign export supply elasticities faced by importers when evaluated at sample means.[38] Using again the OLS estimates of γ reported in the first column of Table 4b, the implied ranking of foreign export supply elasticities across importing countries in our sample puts China second from the bottom of the list (and at the bottom of the list if Nepal is excluded as "anomalous" according to the logic described above), and under the TOBIT estimates of γ reported in the first column of Table 4b China faces the lowest foreign export supply elasticity among all importing countries in our sample. These findings are consistent with the broadly held intuition that international market power is positively related to country size, an intuition that also finds empirical support in the work of Broda, Limao and Weinstein (2006).

Our estimated γ's can also be used to construct an implied ranking over industries of the foreign export supply elasticities faced by importers when evaluated at sample means. Using the OLS estimates of γ reported in the first column of Table 4a, the implied ranking of foreign export supply elasticities across 1-digit HS chapters identifies HS0 and HS1, where animal and vegetable products figure most prominently, as the sectors exhibiting the lowest foreign export supply elasticities. The next lowest foreign export-supply elasticities are found in HS7, HS8 and HS9, which are chapters dominated by manufacturing products. And according to our estimates, the highest foreign export supply elasticity is found in HS2, which is heavily weighted toward mineral products and chemicals.

It is difficult to have strong priors about which industries should exhibit the lowest foreign export supply elasticities, but it seems somewhat surprising (at least to us) that the animal and vegetable product chapters HS0 and HS1 claim this distinction over the manufacturing sectors HS7-9, which are next. Moreover, these results seem at odds with those of Broda, Limao and Weinstein

[38]Specifically, (18) can be rewritten as $t^{ijPO}=t^{ijR}+[\frac{-(b^j+l^j)}{b^j+l^j-(\delta^j-1)l^j}]\times[\frac{1}{\eta^{ij}}]$ where η^{ij} is the foreign export supply elasticity for good *i* faced by importing country *j* (and (19) can be similarly rewritten) . Hence, according to (23a), for δ^j close to one the ranking between η^{ij} and η^{ik} is preserved by the ranking between $1/[-\gamma\times VM^{ijR}]$ and $1/[-\gamma\times VM^{ikR}]$. Beginning with Goldberg and Maggi (1999), empirical evidence points consistently to a value of δ^j which is close to one, though see Imai, Katayama and Krishna (2006) for a recent critique of this literature.

(2006), who report significantly higher foreign export supply elasticity estimates for commodity goods relative to differentiated products. Of course, our estimates derive from a high level of industry aggregation, but the broad pattern that we report above is preserved when we disaggregate somewhat our by-industry estimates to the 21 HS sections that are designed to group together goods produced in the same sector of the economy. According to our by-section estimates (not shown), we find that the lowest-elasticity sections are Section I (Live Animals; Animal Products), Section II (Vegetable Products) and Section III (Animal or Vegetable Fats and Oils and Their Cleavage Products; Prepared Edible Fats; Animal or Vegetable Waxes). The highest elasticity sections are Section V (Mineral Products), Section VI (Products of the Chemical or Allied Industries) and Section VII (Plastics, Rubber, and Articles Thereof). And among the remaining sections, those representing manufacturing sectors exhibit relatively low elasticities while the textile and paper product sectors exhibit relatively high elasticities. At the same time, these estimates are not disaggregated by country, and our theory suggests that they should be. But in fact, when we generate by-industry estimates for each country and perform the calculations above, a similar pattern emerges. So while our results point to manufacturing goods as exhibiting relatively low foreign export supply elasticities and mineral and chemical products as exhibiting relatively high foreign export supply elasticities, they also strongly indicate that animal and vegetable products are among the lowest foreign export supply elasticity sectors.[39]

Thus far, we have proceeded according to the view that the foreign exporters selling M^{ijR} of product *i* into acceding country *j*'s market are all located in countries that are existing WTO members, so that their governments can internalize through accession negotiations the terms-of-trade externality that country *j* imposes. While this view is approximately borne out in our data, there is nevertheless some variation in the fraction of acceding country imports that are supplied by existing WTO members (this fraction is less than one for about 25% of the observations in our full sample).

[39]A possible interpretation of this finding is suggested by the expression for θ^j given by (15), which indicates that, all else equal, the magnitude of θ^j, and hence γ^j, will be larger (implying a smaller η^{ij}) when country *j* is served by fewer numbers of exporting countries and competes with fewer numbers of importing countries of product *i*. Our specification permits these numbers to vary across industries (though not across products within an industry). In this light, our finding could be explained if the markets for animal/vegetable products are more regional in nature (reflecting, perhaps, the perishable nature of these products) as compared to the markets for mineral/chemical/plastic products.

This suggests an opportunity to refine our empirical predictions, by exploring whether the effects we have identified are found only where we would expect to find them. We thus wish to explore the possibility that t_{wto}^{ij} is higher when the fraction of country *j*'s pre-negotiation imports of product *i* supplied by non-WTO members is higher.

To capture this possibility, we first define a "mismatch" variable, denoted by MM^{ijR}, by the level of country *j*'s pre-negotiation imports of product *i* supplied by non-WTO members. We then extend our estimating equations and estimate the following variants of (23a) and (23b) on (i) the full sample of countries and products, (ii) by 1-digit HS chapter, and (iii) by country:

(23c) $t_{wto}^{ij} = \alpha^I + \alpha^j + \beta t_{prewto}^{ij} + \gamma[VM^{ijR}] + \lambda[VMM^{ijR}] + \epsilon^{ij}$, and

(23d) $t_{wto}^{ij} = \alpha^I + \alpha^j + \beta t_{prewto}^{ij} + \gamma[M^{ijR}/p^{wI}] + \lambda[MM^{ijR}/p^{wI}] + \nu^{ij}$,

where the new term $[VMM^{ijR}]$ in (23c) denotes the degree of mismatch measured as import value, and where the term $[MM^{ijR}/p^{wI}]$ in (23d) denotes the conversion of the value measure of mismatch ($[VMM^{ijR}]$) in (23c) to a quantity measure ($MM^{ijR}=[VMM^{ijR}/p^{wI}]$), using world prices calculated at the 2-digit HS level, and then multiplied by the inverse of this world price ($1/p^{wI}$). As before, according to the terms-of-trade theory of trade agreements, we expect the sign of the parameter γ estimated in (23c) and (23d) to be negative unless the importing country/countries in the sample are "small" in international markets with respect to the industry/industries in the sample (in which case γ should be zero), while we now also expect the sign of the parameter λ estimated in (23c) and (23d) to be positive unless the importing country/countries in the sample are "small" in international markets with respect to the industry/industries in the sample (in which case λ should be zero).[40]

[40]The WTO web site also provides a list of countries who requested and received "Initial Negotiating Rights" (INRs) with a country during its accession negotiations, and an alternative to our method of creating a mismatch variable would be to identify all countries who do not have INRs with the acceding country, and to use this set of countries to create a mismatch variable. However, whether or not a country formally requests and receives INRs from an acceding country is apparently not a reliable indicator of that country's degree of involvement in the accession negotiations (we thank Cato Adrian of the WTO Secretariat for helpful guidance on this point), so we did not pursue this method.

Tables 5a and 5b present our estimates of β, γ and λ under equations (23c) and (23d), again using OLS and TOBIT. The estimates under (23c) are contained in Table 5a. The first row presents the estimates for the full sample. As the terms-of-trade theory would predict, greater imports from non-member countries leads to significantly higher bound tariffs (the estimated λ is positive and highly significant), and taking account of this mismatch increases somewhat the estimated magnitude of γ (which is again negative and highly significant). The next 10 rows of Table 5a present the results by industry. Most of the 10 by-industry point estimates of λ are positive, and are significantly positive for 3 industries under OLS and 2 industries under TOBIT (none are significantly negative). The estimates of γ are not much affected, though it is encouraging that now three additional industries under TOBIT yield significantly negative γ estimates at the 10% level.

The by-country estimates in Table 5a are also somewhat encouraging. Most of the by-country point estimates of λ are positive, and are significantly positive for 7 of the 16 countries under both OLS and TOBIT (under OLS, 2 are significantly negative, while none are significantly negative under TOBIT). The by-country estimates of γ are slightly more supportive of the terms of trade theory when the mismatch variable is included, with 10 of the 16 by-country OLS estimates of γ now significantly negative (with one significantly positive) and 9 of the 16 by-country TOBIT estimates of γ now significantly negative (with none significantly positive). Table 5b contains the estimates under (22d). Here the effect of adding the mismatch variable is more mixed. In the full sample, the point estimate of λ is positive but insignificant, and the estimates of the other parameters are essentially unaffected. The by-industry and by-country estimates of λ are often negative, and some times significantly so. The estimates of γ by industry and by country change a little, but paint a roughly unchanged picture with regard to support for the terms-of-trade theory.

A further refinement of our basic estimating equation is suggested by the work of Ludema and Mayda (2005), who report a robust negative cross-sectional relationship between foreign exporter concentration (as measured by the Herfindahl index) and the bound MFN level of U.S. tariffs. They argue that this relationship can be interpreted from the perspective of the free-rider issues that are often thought to be associated with tariff bargaining under MFN, and the impediment to negotiation participation that may occur as a result. According to this interpretation, a negative relationship between the foreign exporter concentration of a particular good and an importing country's bound MFN tariff level on that good can be understood to reflect the mitigating effect that exporter concentration has on the free-rider issue created by MFN, and the greater participation in market access negotiations for that good that results.

The logic described by Ludema and Mayda (2005) seems compelling when the participation decision is made on a good-by-good basis, as is the case in many market access negotiations (and this is how Ludema and Mayda model it). But this logic is less compelling in the context of the accession negotiations that are our concern here, because the participation decision in this case is in practice made on a bilateral country-by-country basis rather than good by good (see, for example, WTO, 2005, pp. 12-30). In particular, the process of accession has each existing WTO member deciding whether or not it wants to open bilateral negotiations with the country who is making a bid for accession; and if an existing WTO member does engage in bilateral negotiations with the acceding country, it typically does so on a broad range of goods.[41] Accordingly, in the case of country *j*'s bid for accession, high foreign exporter concentration may actually *decrease* the chance that a significant exporter of good *i* to country *j* chooses to participate in the accession negotiations with country *j*: this would likely be true, for example, if a foreign country's export status in the markets of country *j* for any single good *i* had an insignificant impact on the probability of that foreign country's participation in bilateral negotiations with country *j*. And if, conditional on participation, the free rider issues associated with MFN are then handled by other means, a *positive* relationship between foreign exporter concentration and the bound tariff levels of the acceding country would then be expected.[42]

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[41]This organizational structure reflects a sensible logic: when a country accedes to the GATT/WTO, the MFN treatment that it secures from existing members reflects the cumulative result of all previous GATT/WTO negotiations over all goods, and so each existing member must decide whether or not it is worthwhile to engage the new member in bilateral accession negotiations so as to extract reciprocal concessions in exchange for its own "pre-constituted" package of concessions.

[42]Suppose, for example, that there are 10 existing WTO members and that each has a 0.5 chance of choosing to engage in bilateral accession negotiations with country *j*, independent of export status with regard to the particular good

In light of this discussion, we introduce into (23c) and (23d) a Herfindahl index of foreign exporter concentration, but as reflected by the terms-of-trade theory we remain agnostic as to the expected sign of the estimated coefficient. If the free-rider logic associated with MFN and outlined by Ludema and Mayda (2005) prevails in the context of accession negotiations, then the estimated coefficient on this variable should be negative: all else equal, the tariff on product *i* to which country *j* negotiates should be further below its non-cooperative tariff the larger is the level of country *j*'s non-cooperative import volume of product *i* exported by WTO members and the more concentrated those exporters are. On the other hand, according to the discussion we have presented above, this logic may not apply in the context of accession negotiations, and if conditional on participation the MFN free-rider issues are handled by other means, then the estimated coefficient on this variable could be positive: all else equal, the tariff on product *i* to which country *j* negotiates should be further below its non-cooperative tariff the larger is the level of country *j*'s non-cooperative import volume of product *i* exported by WTO members and the *less* concentrated those exporters are.

To sort out these possibilities, we first define a Herfindahl index of foreign exporter concentration:

$$HC^{ijR} \equiv \frac{\sum_{k \in WTO} (M^{ijkR})^2}{(M^{ijR} - MM^{ijR})^2},$$

where M^{ijkR} denotes country *j*'s pre-negotiation imports of product *i* from foreign country *k*, and where WTO denotes the set of WTO-member countries.[43] We then extend our estimating equations

i. If each country exports 10% of country *j*'s imports of good *i*, then the probability that no exporter of good *i* engages in a bilateral negotiation with country *j* is $(0.5)^{10}$. By contrast, if all of country *j*'s imports of good *i* come from a single existing WTO member exporter, then the probability that no exporter of good *i* engages in a bilateral negotiation with country *j* is 0.5. More generally, while the free-rider effect of MFN on tariff bargaining is inherently a terms-of-trade issue, the terms-of-trade theory of trade agreements does not imply that it will necessarily create an issue for negotiations. As pointed out by Bagwell and Staiger (2002, 2005a and 2005c), the negotiating norm of reciprocity can in principle mitigate the free-rider issues associated with MFN, and so whether or not free-rider issues present an important impediment to tariff bargaining under MFN then becomes an empirical question.

[43]In instances when $M^{ijR} = MM^{ijR}$, so that all of country *j*'s imports of product *i* come from non-WTO members (which is the case for roughly 6% of the observations in our sample), we define $HC^{ijR} \equiv 0$. Our definition of the Herfindahl index of foreign exporter concentration is slightly different from that adopted by Ludema and Mayda (2005), because they treat non-GATT/WTO members slightly differently than we do.

and estimate the following variants of (23c) and (23d) on (i) the full sample of countries and products, (ii) by 1-digit HS chapter, and (iii) by country:

(23e) $$t^{ij}_{wto} = \alpha^I + \alpha^j + \beta t^{ij}_{prewto} + \gamma[VM^{ijR}] + \lambda[VMM^{ijR}] + \rho[HC^{ijR}] + \epsilon^{ij}, \text{ and}$$

(23f) $$t^{ij}_{wto} = \alpha^I + \alpha^j + \beta t^{ij}_{prewto} + \gamma[M^{ijR}/p^{wI}] + \lambda[MM^{ijR}/p^{wI}] + \rho[HC^{ijR}] + \nu^{ij}.$$

As before, according to the terms-of-trade theory of trade agreements, we expect the sign of the parameter γ (λ) estimated in (23e) and (23f) to be negative (positive) unless the importing country/countries in the sample are "small" in international markets with respect to the industry/industries in the sample (in which case γ and λ should be zero). And as discussed above, we interpret a negative estimated value of the parameter ρ in (23e) and (23f) to be indicative of a significant MFN free-rider problem, while we interpret a positive estimated value of the parameter ρ in (23e) and (23f) as indicating instead that the MFN free-rider problems are insubstantial and the negative impact of exporter concentration on the likelihood of participation described above is dominant (and if the importing country/countries in the sample are "small" in international markets with respect to the industry/industries in the sample, then ρ should be zero).

Tables 5c and 5d present our estimates of β, γ, λ and ρ under equations (23e) and (23f), again using OLS and TOBIT. The estimates under (23e) are contained in Table 5c, and continue to show broad support for the terms-of-trade theory, in that γ continues to be significantly negative and λ significantly positive in the pooled results as well as the results by industry and by country. But contrary to the findings of Ludema and Mayda (2005), the estimated coefficient ρ is almost always positive, and often significantly so. This result deserves further scrutiny in order to assess more clearly the source of our different findings (for instance, the sets of controls differ across the two studies). However, as indicated above, the terms-of-trade theory is itself agnostic on the sign of this coefficient, and the strongly positive relationship that we find between exporter concentration and the bound level of importer tariffs seems consistent with the particulars of the accession negotiations on which we focus. In this light, our findings can be interpreted as suggestive that, at least in the case of accession negotiations, MFN free-rider problems are insubstantial and instead the negative impact of exporter concentration on the likelihood of participation described above is dominant. Table 5d contains the estimates under (23f) and, as before, the results here are weaker, but the basic picture in terms of our broad findings is the same.

Overall, together with Figures 1a-1c, our baseline and extended estimation results presented in Tables 4 and 5 indicate a broad level of support for the central predictions of the terms-of-trade theory. The data exhibit a strong positive relationship between the magnitude of negotiated concessions and the pre-negotiation volume of imports. This relationship does not disappear when appropriate controls are introduced: especially when viewed across countries within a given industry but to some degree as well across industries within a given country, we find strong evidence that a country's bound tariff will be further below its unbound tariff the greater is its pre-negotiation import volume. And the effects we have identified appear to be most pronounced primarily where we would expect to find them, namely, where the importer is "large" by any measure and where import volume is supplied by current WTO members. Finally, our results relating to the impact of exporter concentration on importer bound tariffs differ from earlier findings, but seem at least consistent with the particulars of the accession negotiations on which we focus. In the next section we consider the robustness of our basic findings.

6. Sensitivity

In this section we explore the sensitivity of the central findings reported in the previous section along a number of dimensions. In particular, we present estimates that shed light on the potential importance of outlier observations, of the influence of China, and of alternative approaches to measuring a country's non-cooperative best-response tariff t^{ijR}. We next describe each of these dimensions in more detail and discuss the accompanying results.[44]

[44]Following Moulton (1990), it is increasingly common to provide "cluster-adjusted" standard errors when employing "mixed level" data such as ours, in which the unit of analysis is a country-product pair, and so we also considered reporting various forms of cluster-adjusted standard errors as well. However, we decided not to report these results for three reasons. First, the concern with conventional White standard errors is that observations associated with a given "cluster" – in our case a given country – may not be statistically independent, and cluster-adjusted standard errors are then seen as a potential way to address this issue. But our estimating equations include country-fixed effects, and as

First, as noted in section 4, our data set contains a number of observations with very large import values. To address the possibility that import outliers could be dominating our results, we estimate (23a) in log form on (i) the full sample of countries and products, (ii) by 1-digit HS chapter, and (iii) by country, according to:

$$t_{wto}^{ij} = \alpha^{I} + \alpha^{j} + \beta t_{prewto}^{ij} + \gamma[\ln(VM^{ijR})] + \epsilon^{ij}.$$

Column 1 of Table 6a presents the estimation results for the full sample and by industry, while Table 6b presents the results of estimation by country. As can be seen, the log specification of (23a) if anything provides stronger support for the terms-of-trade theory. The full-sample and by-industry estimates of γ continue to be strongly supportive of the theory (with TOBIT estimates of γ now significantly negative in every industry), and now 11 of the 16 OLS estimates and 12 of the 16 TOBIT estimates of γ by country are significantly negative (and only two OLS point estimates and one TOBIT estimate are positive, and not significantly so).[45]

Second, as noted in section 4, the size of China's imports dwarf many of the imports of the other countries in our sample. This variation is of course very informative for our assessment of the empirical predictions of the terms-of-trade theory of trade agreements, but it does raise the concern that our empirical findings may be driven largely by China. While we have presented estimates of (23a) by country, and while our estimates of (23a) for the full sample and by industry include country-specific fixed effects, it is therefore still important to know whether our results for the full sample and by industry would be markedly altered if China were excluded from our sample. Column 2 of Table 6a contains the results of estimating (23a) with China excluded. The first row presents the results for the full sample. As can be seen, under both OLS and TOBIT, the estimate

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pointed out in Wellford, Pepper and Petrie (2003), this obviates the motivation for reporting cluster-adjusted standard errors as originally conceived by Moulton. Second, the commonly used methods for adjusting standard errors for clusters are only reliable when the number of clusters is large, and our 16 country-"clusters" are unlikely to satisfy this criterion. And third, we find in any event that the adjustments do not have an important impact on our reported results.

[45]As a further check on the robustness of our results with regard to import outliers, we also reran our estimation on a sample that excluded observations with import values below various cutoff levels, on the grounds that low reported import values are often thought to be highly unreliable. We do not report these results because they are essentially the same as the results we do report.

of γ remains negative and highly significant when China is omitted. The next 10 rows present the results of estimation by industry. There are some changes in the individual estimates, especially for the TOBIT results (now the one positive estimate of γ is statistically significant at the 10% level, while 8 of the 9 negative estimates of γ are now statistically significant at the 1% level) but from the perspective of support for the terms-of-trade theory, it makes little if any difference whether or not China is included in the sample.

Finally, we consider an alternative approach to measuring a country's non-cooperative best-response tariff t^{ijR}, utilizing the calculations of Kee, Nicita and Olarreago (2006). They use NTB coverage and frequency data to estimate the import impacts of NTBs in a factor-endowments setting, and report ad valorem equivalents of NTBs at the six-digit HS level for 91 countries which include 11 of the 16 countries in our data set.[46] Their data on NTBs for each of the 11 countries that overlap with our sample comes from years that precede each country's WTO accession with the exception of Ecuador (NTB data from 2001, WTO accession in 1996) and Jordan (NTB data from 2001, WTO accession in 2000). The import data they use to estimate the price impact of NTB's (from which their ad valorem equivalents are calculated) covers the period 2001-2003, raising the issue for us that this import data may reflect the impact of WTO accession for some of our sample countries.

Nevertheless, with these caveats in mind, we use the NTB ad valorem equivalent estimates of Kee, Nicita and Olarreago (2006), which we denote by ntb^{ij}, to construct an alternative measure of overall (tariff and non-tariff) pre-WTO-accession protection for the sub-sample of 11 countries over which our sample overlaps with theirs. Specifically, we define a new measure of overall pre-WTO-accession protection, $\hat{t}^{ijR}$, by

[46]The five countries in our sample that are not included in the Kee, Nicita and Olarreago (2006) sample are Armenia, Cambodia, Georgia, Macedonia and Panama. Kee, Nicita and Olarreago provide ad valorem equivalent estimates for two kinds of NTBs: Core NTBs, which include price control measures, quantity restrictions, monopolistic measures, and technical regulations; and NTBs which take the form of agriculture domestic support. As Kee, Nicita and Olarreago note, their coverage of domestic support is fairly incomplete, and only 158 tariff lines at the 6 digit HS level are affected by domestic support NTBs in at least one WTO member. In fact, none of the countries in our sample exhibit domestic support NTBs according to their measure. As a consequence, we use only the ad valorem equivalents for Core NTBs that they calculate.

(22') $\hat{t}^{ijR} = t^{ij}_{prewto} + ntb^{ij}.$

Under the (admittedly strong) assumption that $t^{ijR}=\hat{t}^{ijR}$,we may substitute (22') into (21), yielding the estimating equation:

(23') $t^{ij}_{wto} = \alpha^{i}_{0} + \alpha^{j}_{0} + \kappa^{j}\hat{t}^{ijR} + \gamma^{j}\gamma^{i}M^{ijR} + \epsilon^{ij},$

where, according to the commitment theory of trade agreements, $\kappa^{j}\in(0,1]$ with $\kappa^{j}<1$ if a commitment role is played by the WTO, and according to the terms-of-trade theory of trade agreements, $\gamma^{j}\gamma^{i}\leq 0$ with $\gamma^{j}\gamma^{i}<0$ if the WTO helps governments escape from a terms-of-trade driven Prisoners' Dilemma. As before, we estimate the following two variants of (23') on (i) the full (sub-)sample of countries and products, (ii) by 1-digit HS chapter, and (iii) by country:

(23'a) $t^{ij}_{wto} = \alpha^{I} + \alpha^{j} + \kappa\hat{t}^{ijR} + \gamma[VM^{ijR}] + \epsilon^{ij}$, and

(23'b) $t^{ij}_{wto} = \alpha^{I} + \alpha^{j} + \kappa\hat{t}^{ijR} + \gamma[M^{ijR}/p^{wI}] + v^{ij},$

where all variables and parameters are defined as before.

Tables 6c and 6d present our estimates of κ and γ under equations (23'a) and (23'b), using OLS and TOBIT. Table 6c presents the estimates for the full sample and by industry; Table 6d presents the estimates by country. A number of points are noteworthy.

First, regarding γ and comparing the results reported in Tables 6c/6d with those in Tables 4a/4b, our earlier findings in support of the terms-of-trade theory continue to hold up under our augmented measure of pre-WTO-accession protection levels, and are if anything somewhat strengthened. Second, regarding κ, and under our assumption that $t^{ijR}=\hat{t}^{ijR}$, the commitment theory receives strong support as well, at least when viewed from the perspective of the pooled and by-industry estimates contained in Table 6c, where the estimated values of κ are all significantly less than one and (with one exception) significantly greater than zero, as the commitment theory would predict. Third, maintaining our focus for the moment on Table 6c, the magnitude of the estimated levels of κ are consistently very close to zero, and always below 0.2. According to (19), this can be interpreted as reflecting some combination of commitment problem ($d>0$) and political economy force ($\delta>1$), with either a high d or a high δ required to place κ close to zero. But beyond this we cannot determine the relative importance of commitment and political economy forces in delivering the low value for κ.[47]

And finally, turning to the by-country estimates of κ contained in Table 6d, a degree of caution is suggested in drawing conclusions about the commitment role of trade agreements from our results, because as Table 6d indicates we find that the requirement that κ is strictly greater than zero fails consistently across our estimating equations for 4 of the 11 countries in the sample. We find a similar pattern when γ and κ are allowed to vary by country for the 1-digit HS chapter HS8, as presented in Table 6e. The only way that this finding can be explained within our framework is to return to our reliance on (22) and thereby relax the assumption that our augmented measure of pre-WTO-accession protection level captures the "true" level. But a reliance on (22) implies that, while we can still draw inferences from our estimates of γ about the terms-of-trade theory, we cannot draw inferences about the commitment role of trade agreements, since we can only estimate $\beta \equiv \kappa\psi$ (and are therefore unable to identify the parameter κ). Hence, we view the results in Tables 6c-6e as indicating that our main empirical findings on the terms-of-trade theory are broadly robust to different measures of pre-WTO-accession levels of protection, and as offering some tentative support as well for the importance of the commitment theory, but with the caveats above limiting the scope of this latter conclusion.

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[47]It is tempting to try to use the estimates of κ and γ to quantify the relative contributions of the commitment and terms-of-trade theories for explaining the negotiated tariff concessions in the WTO. However, (19) does not support such an attempt, because the quantitative effects of the commitment and terms-of-trade forces are intertwined. This can be seen clearly in the case discussed in note 19 where political economy forces are absent ($\delta=1$): in this case, no matter how far κ is below one and therefore no matter how big a "commitment issue" the government faces, its negotiated tariff concession will achieve the internationally efficient politically optimal level if and only if it is induced to behave "as if" it were small ($\bar{\theta}=0$) and thereby escapes from the terms-of-trade Prisoners' Dilemma. For this reason, we do not attempt to quantify the relative contributions of the commitment and terms-of-trade problems, but rather focus only on whether or not there is evidence that each problem is present.

7. Conclusion

In this paper, we have attempted to investigate empirically the central prediction of the terms-of-trade theory of trade agreements, namely, that governments use trade agreements to escape from a terms-of-trade driven Prisoners' Dilemma. To this end, we have derived a simple prediction that can be confronted with the data: the tariff to which a country negotiates should, all else equal, be further below its non-cooperative tariff the larger is the level of its non-cooperative import volume. Our estimation results indicate a broad level of support for this simple prediction, and thereby offer empirical support for the central prediction of the terms-of-trade theory. Along the way we have also offered more tentative evidence consistent with a commitment role for trade agreements, though this evidence is tempered by important measurement issues. We conclude this paper with a brief discussion of several of the most pressing limitations of our study, and suggest in turn several directions for future work.

Our estimation has proceeded under the assumption that both foreign export supply slopes and political economy forces may vary across countries and industries, but not across products within an industry. This has allowed us to proceed without detailed product-specific data on export supply responsiveness or political organization in each country. Clearly, the restrictiveness of this assumption depends on the level of aggregation over which an "industry" is defined. We have attempted to mitigate somewhat the restrictiveness of this assumption by presenting by-industry estimates of the coefficients of interest for varying levels of industry aggregation. Nevertheless, this assumption represents a potentially important limitation of our study, and an important direction for future work is to acquire the additional data that would allow this assumption to be relaxed. Likewise, as we have noted repeatedly above, the measurement of t^{ijR} poses a difficult problem, and limits in particular the ability to draw inferences about the commitment theory of trade agreements within our framework. Moreover, while we have not allowed for general measurement error in our estimation procedures, it is likely that there is serious measurement error associated with t^{ijR}, and that instrumental variables estimation is therefore called for. This raises the difficult issue of finding appropriate instruments, and the search for valid instruments for t^{ijR} is clearly also an important task for future work.

As we have noted at various points in the paper, our approach abstracts from two potentially important features of the WTO. First, we have limited our analysis to the consideration of MFN tariff bargaining. But in fact, in addition to accepting MFN tariff bindings as a result of WTO negotiations, the vast majority of WTO members have also granted discriminatory preferential tariff access to a subset of their trading partners through free trade agreements, customs unions and the generalized system of preferences. Second, we have abstracted from the possibility that enforcement difficulties might prevent WTO negotiations from achieving points on the international efficiency frontier, assuming instead that the discrepancy between WTO negotiating outcomes and free trade can be attributed entirely to the underlying political economy forces of each member government. But there are many reasons to expect that limited enforcement ability could place binding constraints on achievable negotiating outcomes in the WTO. Exploring ways to incorporate each of these features into the empirical analysis of WTO tariff bargaining could lead to important new insights.

Finally, we have limited our empirical work to a focus on new members of the WTO that joined after its creation at the end of the Uruguay Round of GATT negotiations, in order to focus on a set of countries that arguably traversed from their tariff reaction curves to the efficiency frontier in one negotiating round. But it is important to find ways to extend the empirical analysis of WTO tariff bargaining to the entire set of (currently) 149 member governments. It might be argued that many of the developing country members who were also GATT members and/or who joined the WTO at its inception accepted their first meaningful tariff bindings in the Uruguay Round, and so our approach might be extended to include these countries in a straightforward manner. Given that two thirds of WTO members are developing countries, such an extension could significantly broaden country coverage. Finding a way to incorporate the industrial country members into the empirical analysis of WTO tariff bargaining is more difficult in light of the many rounds of negotiation in which they have actively participated, but this is perhaps even more important for the theory.

In light of these and other important limitations of our study, we can only at this point claim to have offered a first, albeit promising, glimpse at the empirical content of the terms-of-trade (and to a lesser extent, the commitment) theory of trade agreements. Providing more conclusive evidence is an important task for future research.

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Theoretical Appendix

In this Appendix we derive (19) from the text, and we establish that the coefficient on t^{ijR} in (19) is strictly positive under our maintained assumption that the best-response tariff is non-prohibitive. First, from (3) we have

$$\text{(C1)} \quad W^{ij}_{p^{ij}} = (\delta^{ij}-1)S^{ij} + (p^{ij}-\tilde{p}^{wi})\frac{\partial M^{ij}}{\partial p^{ij}}$$

Therefore, as a general matter (10) implies

$$\text{(C2)} \quad [(\delta^{ij}-1)S^{ijPO} + (p^{ijPO}-\tilde{p}^{wiPO})\frac{\partial M^{ijPO}}{\partial p^{ij}}] - [(\delta^{ij}-1)S^{ijR} + (p^{ijR}-\tilde{p}^{wiPO})\frac{\partial M^{ijR}}{\partial p^{ij}}] = -\theta^{ijR}M^{ijR},$$

where we utilize θ^{ijR} to represent the perceived value of θ^{ij} when country *j* is on its reaction curve and therefore suffers from a commitment problem when $d^j>0$. Adopting now the linear setting of section 3 with $\delta^{ij}=\delta^j$ for all *i*, and assuming that (a) in the absence of a trade agreement the government of country *j* makes its tariff choices simultaneously with the fraction d^j of producers, while (b) under a trade agreement country *j*'s commitment problem is solved and the political optimum is achieved, we have

$$\text{(C3)} \quad \frac{\partial M^{ijPO}}{\partial p^{ij}} = -[b^j+l^j],$$

$$\text{(C4)} \quad \frac{\partial M^{ijR}}{\partial p^{ij}} = -[b^j+(1-d^j)l^j], \text{ and}$$

$$\text{(C5)} \quad \theta^{ijR} = \bar{\theta}^j \equiv \frac{-[b^j+(1-d^j)l^j]}{\{\sum_{h\in H^j}[b^h+(1-d^j)l^h] + \sum_{f\in F}[b^{*f}+(1-d^j)l^{*f}]\}}.$$

Therefore, substituting (C3)-(C5) into (C2), and noting that the equilibrium (rational expectations) difference between S^{ijPO} and S^{ijR} is given by $[S^{ijPO}-S^{ijR}]=[\tau^{ijPO}-\tau^{ijR}]l^j$, yields the expression

$$t^{ijPO} = [1 - \frac{d^j\times l^j}{b^j+l^j-(\delta^j-1)l^j}]\times[t^{ijR}] + [\frac{\bar{\theta}^j}{b^j+l^j-(\delta^j-1)l^j}]\times[\frac{1}{p^{wiPO}}]\times[M^{ijR}],$$

which is (19) in the text. To show that the coefficient on t^{ijR} in the above expression is strictly positive under our maintained assumption that the best-response tariff is non-prohibitive, we proceed with two cases. First, if $\delta^j=1$, then the claim follows directly from inspection of (19). Second, consider the case where $\delta^j>1$. Here we make use of the fact that a country's best-response tariff is prohibitive if and only if its "politically optimal" best-response tariff (satisfying $W^{ij}_{p^{ij}}=0$) is prohibitive. Using (C1), country *j*'s politically optimal best-response tariff on good *i*, which we denote by τ^{ijR}_{po}, is given by

$$\tau^{ijR}_{po} = \frac{(\delta^j-1)\times[k^{ij}+l^jp^{wiPO}]}{\{[b^j+l^j-(\delta^j-1)l^j] - d^j\times l^j\}},$$

which, if non-prohibitive, implies for $\delta^j>1$ that $[b^j+l^j-(\delta^j-1)l^j]>d^j\times l^j$.

Data Appendix

Import Values

All import data is originally from the PC-TAS database, a subset of the UN-Comtrade database. The PC-TAS database contains bilateral trade flows for 6-digit HS products over the period 1995-1999. The units of trade value are thousands of nominal US$. Bilateral trade flows are included in the database if the value of trade over the period 1995-1999 exceeds $50,000.

Three steps are taken to clean the bilateral trade dataset. First, known data reporting errors are corrected by hand. Second, a "primary" data cleaning algorithm, in the spirit of Feenstra, Lipsey, Deng, Ma, and Mo (2005), is utilized to compare importer and exporter reported trade values. Finally, trade with regional partners is redistributed among countries within each region.

Individual problems

In the first step, known data errors occurring during the period 1995-1999, as identified in Feenstra, Lipsey, Deng, Ma, and Mo (2005), are corrected by hand. Problems are corrected only if they appeared in the PC-TAS data. Since Feenstra et. al. uses a different level of data refinement, not every issue shows up. Below is a list of all problems identified by Feenstra et. al. that also appear in the PC-TAS data.

Country - Product	**HS**	**Comments**
Australia Imports of Television Receivers	852810	Trade with unspecified partners is redistributed to the UK, Japan, and Singapore for the years 1995 and 1996. For 1997-2000, this trade is redistributed to Singapore only. The redistribution is weighted according to export data
Australia Imports of Paper products	480252 480253	Trade with unspecified partners is redistributed to Indonesia and Korea. The redistribution is based on export data
Petroleum Gases to Austria	271121	Unspecified partner trade is allocated to Russia.
Israeli Imports of Diamonds	7102	Unspecified partner trade is allocated to South Africa.
French Imports of Fissile Material	284410	Unspecified trade is redistributed according to difference between reported exports and reported imports, with the remaining value of unspecified trade being attributed to Niger.

Primary Data Cleaning

Ideally, a recorded trade (defined as a positive value of trade between two sovereign countries for a given six-digit product in a given year) should be recorded by both importers and exporters. Often, this is not the case. In fact, this is a major problem in using UN-Comtrade and its derivative datasets. Importers and exporters often report different values for a given trade, and sometimes fail to report each other as trading partners. Thus, to construct a precise account of all bilateral trade flows (and the aggregate values derived thereof), both importer and exporter reported trade must be utilized to ensure that all trading partners are identified, and that within identified trading partners, the value of trade is accurate.

The process we utilize is similar to Feenstra, Lipsey, Deng, Ma, and Mo (2005), and is based on the assumption that importers are more likely to accurately report trade values.[1] However, if importers do not report a given bilateral trade, then exporter reported trade values are recorded. Precisely, for each six-digit product in each year, we utilize the following algorithm as the primary method to record a "cleaned" value of trade.

1. Compile a list of all importers, including those reported by exporters.
2. For each importer, if there is an importer reported trade value, record this as the true trade value.
3. If there is no importer reported value (or if the importer systematically does not report trade values for the given year), record the exporter recorded value.

After this step, we have a single value for each bilateral trade in each year for every product. Notably, for all bilateral trades over the period 1995-1999, exporter reported values are used in at least one year for 33% of all observations.

Redistributing regional trade

Importers occasionally report trade with regional partners, but not countries within each region. We have chosen to redistribute these import values among the known trading partners within each region.

If a country reports importing a product from a regional partner, the value of trade to be redistributed is defined as the value of imports from this regional partner minus the value of trade that is already accounted for using exporter reported values from this region. This method assumes that the reported trade value from regional partners already includes trade value that has been supplemented by exporter reported trade values (via the primary data cleaning algorithm described above). Thus, we only redistribute if the difference between regional imports and exporter supplemented trade is positive.

[1] This assumption is supported by the fact that, due to tariff collection and quota enforcement, importers have a larger incentive to record trade data correctly.

If there is a positive value of trade to redistribute, the following decision rules completes the redistribution process:

1. For a given product-year-importer observation, if the total importer reported value of trade is greater than the total exporter reported value of trade, then we redistribute according to the distribution of reported imports for countries within each region.

2. For a given product, year, importer observation, if the total importer reported value of trade is less than the total exporter reported value of trade, then we redistribute according to the distribution of positive values of (reported exports – reported imports) for countries within each region.

Tariff Data

Most ad-valorem tariff values are obtained from the TRAINS database (available to academic institutions at http://wits.worldbank.org/). Conveniently, the TRAINS database contains data on most-favored nation (MFN) applied tariffs (the unbound measure of trade protection) and the final WTO tariff bindings (the bound measure of trade protection). For the most part, we use the data as-is. Unbound and bound tariffs are constructed as follows:

Unbound Tariff: For each country, the unbound tariff is the mean value of MFN tariffs over the period identified in Table 1.

Bound Tariff: The bound tariff is the final WTO negotiated tariff binding.

The only departure from the TRAINS database is in the case of products with tariff-quotas. For any product with a tariff-quota as a final bound "tariff", the bound tariff takes the value of the within-quota tariff binding. There are a limited number of these observations, and the coverage according to each country is listed below.

Country	Count
China	45
Panama	39
Lithuania	4
Macedonia	1

Tariff quota information is obtained from WTO accession documents (available at http://www.wto.org/english/thewto_e/acc_e/acc_e.htm).

World Price Data

To construct an estimate of the world price, we utilize aggregate trade value and quantity data from UN-Comtrade (the data is freely downloadable from http://unstats.un.org/unsd/comtrade/). The units of trade data are nominal US dollars, and the units of quantity data are kilograms. The trade values are recorded CIF, which account for the cost of the good, insurance costs and freight costs. To construct the world price facing the sixteen countries in our sample, for each two-digit HS product, the total value of trade over the period 1995-1999 is divided by the total quantity of trade over the same period. This is done for all two-digit HS products. Thus, an implication of this calculation is that all six-digit products with the same two-digit industry face the same world price.

Table 1: Countries in the Sample

Country	Years of Import Data	Years of Unbound Tariff Data	Year of WTO Accession
Albania	1995-1999	1997	2000
Armenia	1995-1999	2001	2003
Cambodia	1995-1999	2001-2003	2004
China	1995-1999	1996-2000	2001
Ecuador	1995-1999	1993-1995	1996
Estonia	1995-1999	1995	1999
Georgia	1995-1999	1999	2000
Jordan	1995-1999	2000	2000
Kyrgyzstan	1995-1999	1995	1998
Latvia	1995-1999	1997	1999
Lithuania	1995-1999	1997	2001
Macedonia	1995-1999	2001	2003
Moldova	1995-1999	2000	2001
Nepal	1995-1999	1998-2000,2002	2004
Oman	1995-1999	1997	2000
Panama	1995-1999	1997	1997

1) Unbound tariff data for each country comes from the TRAINS database. Tariffs are MFN ad-valorem, recorded at the HS6 level, and averaged over the sample period.

2) Import data for each country comes from the PC-TAS Database, a subset of the COMTRADE database. Import values are nominal and in millions of US$, and averaged over the sample period.

Table 2: Industry Description by 1-digit HS Chapter

HS	Description
0	Live Animals; Meat and Edible Meat Offal; Fish and Crustaceans, Molluscs and Other Aquatic Invertebrates; Dairy Produce; Birds' Eggs; Natural Honey; Products of Animal Origin, Not Elsewhere Specified or Included; Live Trees and Other Plants; Bulbs, Roots and the Like; Cut Flowers and Ornamental Foliage; Edible Vegetables and Certain Roots and Tubers; Edible Fruit and Nuts; Peel of Citrus Fruit or Melons; Coffee, Tea, Maté and Spices
1	Cereals; Products of the Milling Industry; Malt; Starches; Insulin; Oil Seeds and Oleaginous Fruits; Miscellaneous Grains, Seeds and Fruit; Industrial or Medicinal Plants; Straw and Fodder; Lac; Gums, Resins and Other Vegetable Saps and Extracts; Vegetable Plaiting Materials; Vegetable Products Not Elsewhere Specified or Included; Animal or Vegetable Fats and Oils and Their Cleavage Products; Pastrycooks' Products; Preparations of Meat, of Fish or of Crustaceans, Molluscs or Other Aquatic Invertebrates; Sugars and Sugar Confectionery; Wheat Gluten; Cocoa and Cocoa Preparations; Preparations of Cereals, Flour, Starch or Milk; Prepared Edible Fats; Animal or Vegetable Waxe
2	Preparations of Vegetables, Fruit, Nuts or Other Parts of Plants; Miscellaneous Edible Preparations; Beverages, Spirits and Vinegar; Residues and Waste From the Food Industries; Prepared Animal Fodder; Tobacco and Manufactured Tobacco Substitutes; Salt; Sulphur; Earths and Stone; Plastering Materials, Lime and Cement; Ores, Slag and Ash; Mineral Fuels, Mineral Oils and Products of Their Distillation; Organic or Inorganic Compounds of Precious Metals, of Rare-Earth Metals, of Radioactive Elements or of Isotopes; Organic Chemicals Bituminous Substances; Mineral Waxes; Inorganic Chemicals;
3	Pharmaceutical Products; Fertilisers; Tanning or Dyeing Extracts; Tannins and Their Derivatives; Dyes, Pigments and Other Colouring Matter; Paints and Varnishes; Putty and Other Mastics; Inks; Essential Oils and Resinoids; Perfumery, Cosmetics or Toilet Preparations; Soap, Organic Surface-active Agents, Washing Preparations, Lubricating Preparations, Artificial Waxes, Prepared Waxes, Polishing or Scouring Preparations, Candles and Similar Articles, Modelling Pastes, "Dental Waxes" and Dental Preparations with a Basis of Plaster Albuminoidal Substances; Modified Starches; Glues; Enzymes; Explosives; Pyrotechnic Products; Matches; Pyrophoric Alloys; Certain Combustible Preparations; Photographic or Cinematographic Goods; Miscellaneous Chemical Products; Plastics and Articles Thereof
4	Rubber and Articles Thereof; Raw Hides and Skins (Other Than Furskins) and Leather; Articles of Leather; Travel Goods, Handbags and Similar Containers; Saddlery and Harness; Articles of Animal Gut (Other Than Silk-Worm Gut); Furskins and Artificial Fur; Manufactures Thereof; Wood and Articles of Wood; Wood Charcoal; Cork and Articles of Cork; Manufactures of Straw, of Esparto or of Other Plaiting Materials; Basketware and Wickerwork; Pulp of Wood or of Other Fibrous Cellulosic Material; Waste and Scrap of Paper or Paperboard; Paper and Paperboard; Printed Books, Newspapers, Pictures and Other Products of the Printing Industry; Manuscripts, Typescripts and Plans; Articles of Paper Pulp, of Paper or of Paperboard;
5	Silk; Wool, Fine or Coarse Animal Hair; Horsehair Yarn and Woven Fabric; Cotton; Other Vegetable Textile Fibres; Paper Yarn and Woven Fabrics of Paper Yarn; Man-Made Filaments; Man-Made Staple Fibres; Wadding, Felt and Nonwovens; Special Yarns; Twine; Cordage, Ropes and Cables and Articles Thereof; Carpets and Other Textile Floor Coverings; Carpets and Other Textile Floor Coverings; Special Woven Fabrics; Tufted Textile Fabrics; Lace; Tapestries; Trimmings; Embroidery; Impregnated, Coated, Covered or Laminated Textile Fabrics; Textile Articles of a Kind Suitable For Industrial Use
6	Knitted or Crocheted Fabrics; Articles of Apparel and Clothing Accessories, Knitted or Crocheted; Articles of Apparel and Clothing Accessories, Not Knitted or Crocheted; Other Made Up Textile Articles; Sets; Worn Clothing and Worn Textile Articles; Rags; Footwear, Gaiters and the Like; Parts of Such Articles; Headgear and Parts Thereof; Umbrellas, Sun Umbrellas, Walking-Sticks, Seat-Sticks, Whips, Riding-Crops and Parts Thereof;Prepared Feathers and Down and Articles Made of Feathers or of Down; Artificial Flowers; Articles of Human Hair; Articles of Stone, Plaster, Cement, Asbestos, Mica or Similar Materials; Ceramic Products; Glass and Glassware
7	Glass and Glassware; Natural or Cultured Pearls, Precious or Semi-Precious Stones, Precious Metals, Metals Clad with Precious Metal, and Articles Thereof; Imitation Jewellery; Coin; Iron and Steel; Articles of Iron or Steel; Copper and Articles Thereof; Nickel and Articles Thereof; Aluminum and Articles Thereof; Lead and Articles Thereof; Zinc and Articles Thereof
8	Tin and Articles Thereof; Other Base Metals; Cermets and Articles Thereof; Tools, Implements, Cutlery, Spoons and Forks, of Base Metal; Parts Thereof of Base Metal; Miscellaneous Articles of Base Metal; Nuclear Reactors, Boilers, Machinery and Mechanical Appliances; Parts Thereof; Electrical Machinery and Equipment and Parts Thereof; Sound Recorders and Reproducers, Television Image and Sound Recorders and Reproducers, and Parts and Accessories of Such ArticlesRailway or Tramway Locomotives, Rolling- Stock and Parts Thereof; Railway or Tramway Track Fixtures and Fittings and Parts Thereof; Mechanical (Including Electro-Mechanical) Traffic Signalling Equipment of all Kinds; Vehicles Other Than Railway or Tramway Rolling-Stock, and Parts and Accessories Thereof; Airraft, Spacecraft, and Parts Thereof; Ships, Boats and Floating Structures
9	Optical, Photographic, Cinematographic, Measuring, Checking, Precision, Medical or Surgical Instruments and Apparatus; Parts and Accessories Thereof Clocks and Watches and Parts Thereof; Musical Instruments; Parts and Accessories of Such Articles; Arms and Ammunition; Parts and Accessories Thereof Furniture; Bedding, Mattresses, Mattress Supports, Cushions and Similar Stuffed Furnishings; Lamps and Lighting Fittings, Not Elsewhere Specified or Included; Illuminated Signs, Illuminated Name-Plates and the Like; Prefabricated Buildings; Toys, Games and Sports Requisites; Parts and Accessories Thereof; Miscellaneous Manufactured Articles; Works of Art, Collectors' Pieces and Antiques

Table 3a: Summary Statistics for Imports, Unbound Tariffs, and Bound Tariffs
Full Sample and by Industry

Sample (#Obs)	Variable	Mean	SD	Median	Min	Max	#Obs=0
All	Imports	4.1	50.5	0.18	0.01	5788.1	-
42716	Unbound Tariff	10.3	11.6	5.7	0.0	180.0	10501
	Bound Tariff	13.1	11.3	10.0	0.0	200.0	5578
HS0	Imports	1.3	6.3	0.15	0.01	165.1	-
2024	Unbound Tariff	13.6	13.0	10.0	0.0	60.0	457
	Bound Tariff	19.4	15.1	15.0	0.0	200.0	83
HS1	Imports	4.0	31.9	0.22	0.01	619.6	-
1814	Unbound Tariff	13.8	16.6	10.0	0.0	121.5	415
	Bound Tariff	18.6	14.9	15.0	0.0	144.0	150
HS2	Imports	4.4	64.4	0.15	0.01	3827.0	-
4419	Unbound Tariff	9.1	14.0	5.0	0.0	180.0	1034
	Bound Tariff	11.6	18.1	6.5	0.0	200.0	548
HS3	Imports	4.9	43.9	0.27	0.01	1190.6	-
4030	Unbound Tariff	9.1	10.0	5.0	0.0	60.0	1073
	Bound Tariff	7.6	6.3	6.5	0.0	47.0	529
HS4	Imports	3.7	23.3	0.18	0.01	678.1	-
3265	Unbound Tariff	10.2	10.7	6.7	0.0	50.0	821
	Bound Tariff	11.9	10.6	10.0	0.0	40.0	847
HS5	Imports	3.3	27.2	0.12	0.01	952.1	-
4272	Unbound Tariff	10.9	10.3	7.0	0.0	37.2	866
	Bound Tariff	13.3	8.4	10.0	0.0	50.0	82
HS6	Imports	1.2	11.9	0.13	0.01	464.6	-
4177	Unbound Tariff	17.1	12.2	15.0	0.0	50.0	654
	Bound Tariff	18.1	6.8	15.0	0.0	40.0	1
HS7	Imports	3.0	18.0	0.18	0.01	379.2	-
4292	Unbound Tariff	8.7	9.7	5.0	0.0	52.0	1170
	Bound Tariff	12.2	10.3	10.0	0.0	40.0	1160
HS8	Imports	6.6	81.8	0.25	0.01	5788.1	-
10957	Unbound Tariff	7.7	9.8	5.0	0.0	130.0	3171
	Bound Tariff	12.0	9.2	10.0	0.0	60.0	1426
HS9	Imports	2.1	15.6	0.17	0.01	439.9	-
3466	Unbound Tariff	11.3	11.0	8.3	0.0	50.0	840
	Bound Tariff	13.6	10.5	14.9	0.0	40.0	752

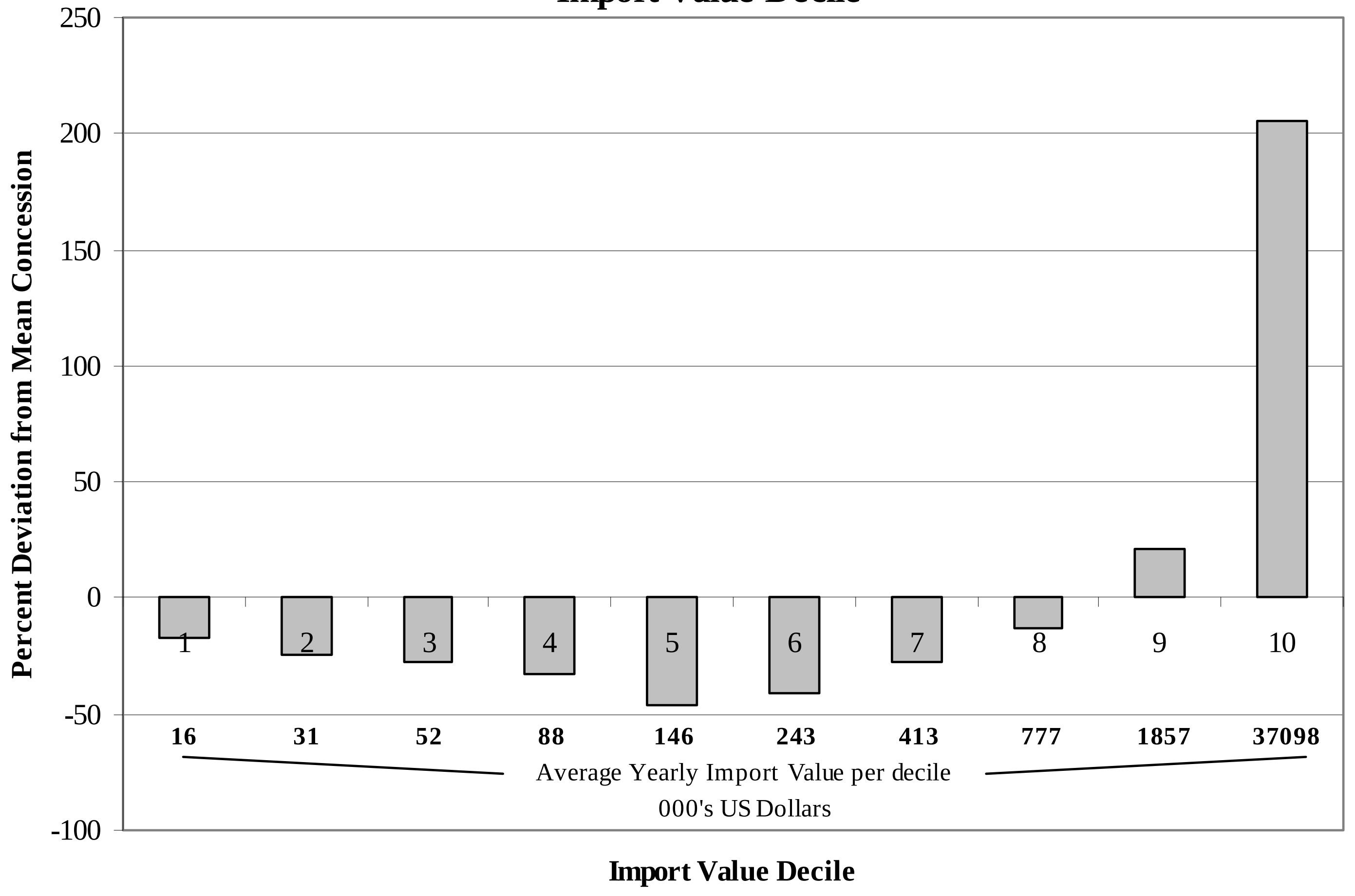
Notes: "Imports" represents the average yearly import value for each six-digit HS product over the period 1995-1999 in milions of US$. "Unbound Tariff" represents the average pre-accession MFN applied tariff over the sample at periods noted in Table 1. "Bound Tariff" represents the final negotiated post-accession tariff binding.

Table 3b: Summary Statistics for Imports, Unbound Tariffs, and Bound Tariffs by Country

Sample (#Obs)	Variable	Mean	SD	Median	Min	Max	#Obs=0
Albania	Imports	0.35	1.4	0.083	0.01	37.2	-
2172	Unbound Tariff	16.7	8.7	20.0	0.0	30.0	6
	Bound Tariff	7.7	6.6	5.0	0.0	20.0	517
Armenia	Imports	0.36	2.1	0.055	0.01	42.4	-
1213	Unbound Tariff	3.0	4.5	0.0	0.0	10.0	843
	Bound Tariff	8.7	6.7	10.0	0.0	15.0	402
Cambodia	Imports	0.62	4.3	0.082	0.01	153.8	-
1632	Unbound Tariff	16.2	12.3	15.0	0.0	96.0	81
	Bound Tariff	19.3	10.2	15.0	0.0	60.0	13
China	Imports	27.9	120.4	3.3	0.01	3827.0	-
4648	Unbound Tariff	18.7	13.0	16.0	0.0	121.5	64
	Bound Tariff	9.8	6.7	8.5	0.0	65.0	250
Ecuador	Imports	1.2	4.6	0.23	0.01	99.4	-
3602	Unbound Tariff	11.6	5.7	12.0	0.0	32.3	14
	Bound Tariff	21.7	7.9	20.0	5.0	85.5	0
Estonia	Imports	1.0	4.5	0.25	0.01	171.7	-
3647	Unbound Tariff	0.1	1.0	0.0	0.0	16.0	3627
	Bound Tariff	8.5	7.6	8.0	0.0	59.0	734
Georgia	Imports	0.36	2.4	0.053	0.01	48.3	-
1388	Unbound Tariff	9.8	3.2	12.0	5.0	12.0	0
	Bound Tariff	6.9	5.5	6.5	0.0	30.0	383
Jordan	Imports	1.1	5.4	0.19	0.01	204.1	-
3334	Unbound Tariff	22.0	14.9	23.3	0.0	180.0	295
	Bound Tariff	16.0	13.9	15.0	0.0	200.0	206
Kyrgyzstan	Imports	0.37	1.7	0.074	0.01	500.9	-
1576	Unbound Tariff	0.0	0.0	0.0	0.0	0.0	1576
	Bound Tariff	7.0	4.6	10.0	0.0	25.0	365
Latvia	Imports	0.83	4.7	0.18	0.01	215.6	-
3254	Unbound Tariff	4.8	8.3	0.5	0.0	75.0	131
	Bound Tariff	12.0	11.8	10.0	0.0	55.0	502
Lithuania	Imports	1.3	9.4	0.26	0.01	449.4	-
3517	Unbound Tariff	3.6	7.4	0.0	0.0	50.0	2613
	Bound Tariff	9.5	8.0	10.0	0.0	100.0	747
Macedonia	Imports	0.52	1.9	0.14	0.01	68.2	-
2643	Unbound Tariff	15.0	11.4	12.0	0.0	60.0	17
	Bound Tariff	7.3	7.7	5.8	0.0	60.0	843
Moldova	Imports	0.34	3.0	0.072	0.01	118.9	-
1872	Unbound Tariff	4.6	5.4	5.0	0.0	16.3	843
	Bound Tariff	6.9	4.6	7.0	0.0	20.0	383
Nepal	Imports	0.41	1.7	0.075	0.01	48.6	-
1517	Unbound Tariff	14.9	14.0	15.0	0.0	130.0	40
	Bound Tariff	25.8	14.0	25.0	0.0	200.0	55
Oman	Imports	2.0	11.6	0.19	0.01	290.8	-
2825	Unbound Tariff	4.7	1.2	5.0	0.0	5.0	177
	Bound Tariff	13.2	15.6	15.0	0.0	200.0	85
Panama	Imports	3.7	101.0	0.25	0.01	5788.1	-
3691	Unbound Tariff	12.1	11.3	9.0	0.0	60.0	122
	Bound Tariff	23.4	10.6	30.0	0.0	144.0	75

Notes: "Imports" represents the average yearly import value for each six-digit HS product over the period 1995-1999 in millions of US$. "Unbound Tariff" represents the average pre-accession MFN applied tariff over the sample at periods noted in Table 1. "Bound Tariff" represents the final negotiated post-accession tariff binding.

Figure 1a: Percent Deviation from Mean Concession by Import Value Decile



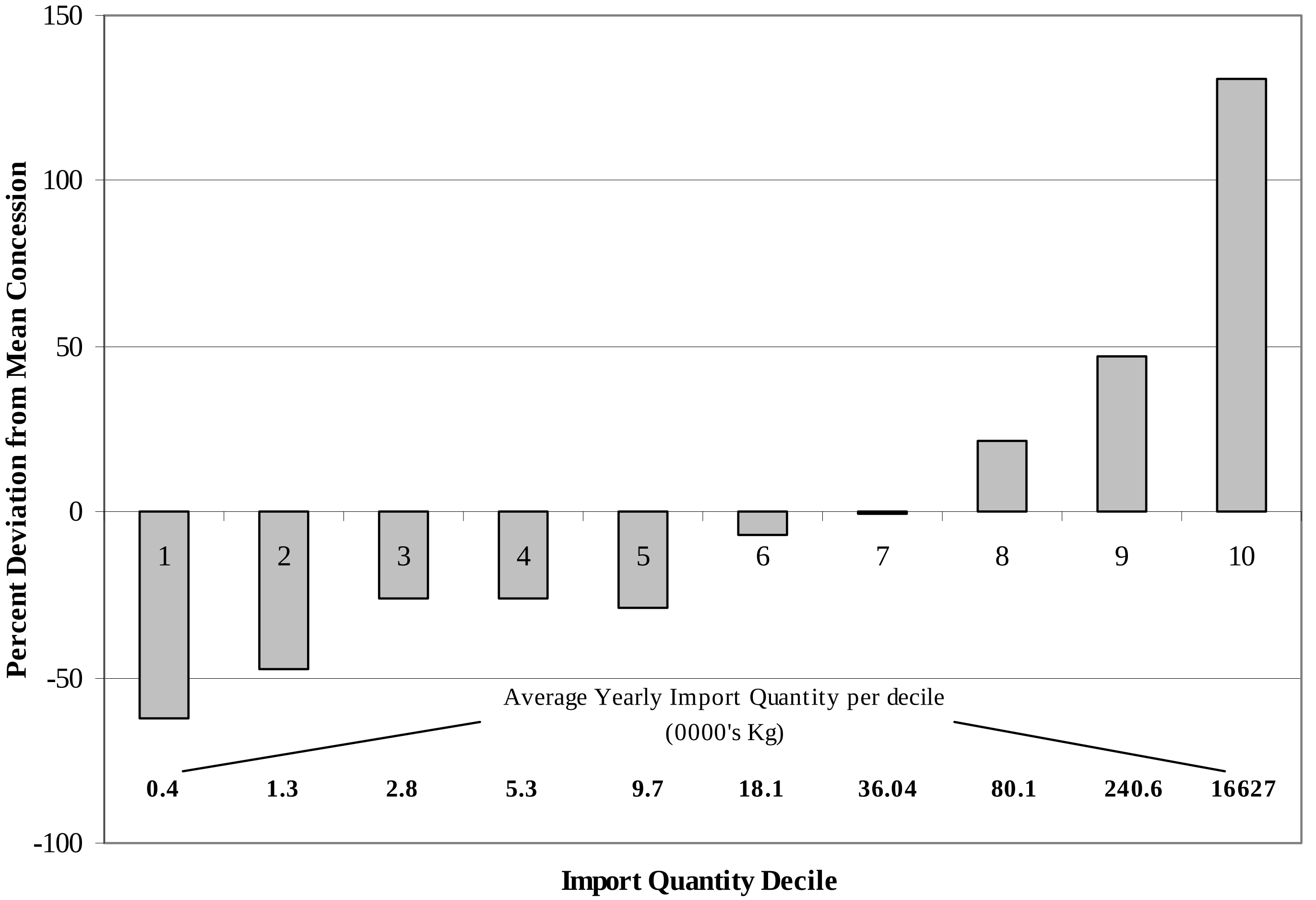
Notes: Percent deviation from mean concession for import decile k calculated as:

$$\left[\frac{\frac{1}{binsize}\sum_{i\in k}(t_{prewto,i}-t_{wto,i})-\frac{1}{10*binsize}\sum_{k\in 10}\sum_{i\in k}(t_{prewto,i}-t_{wto,i})}{\left|\frac{1}{10*binsize}\sum_{k\in 10}\sum_{i\in k}(t_{prewto,i}-t_{wto,i})\right|}\right],$$

where $binsize = 4271$ is the number of observations within each decile.

See Table 1 for the sample periods of Import and Tariff Data

Figure 1b: Percent Deviation from Mean Concession by Import Quantity Decile

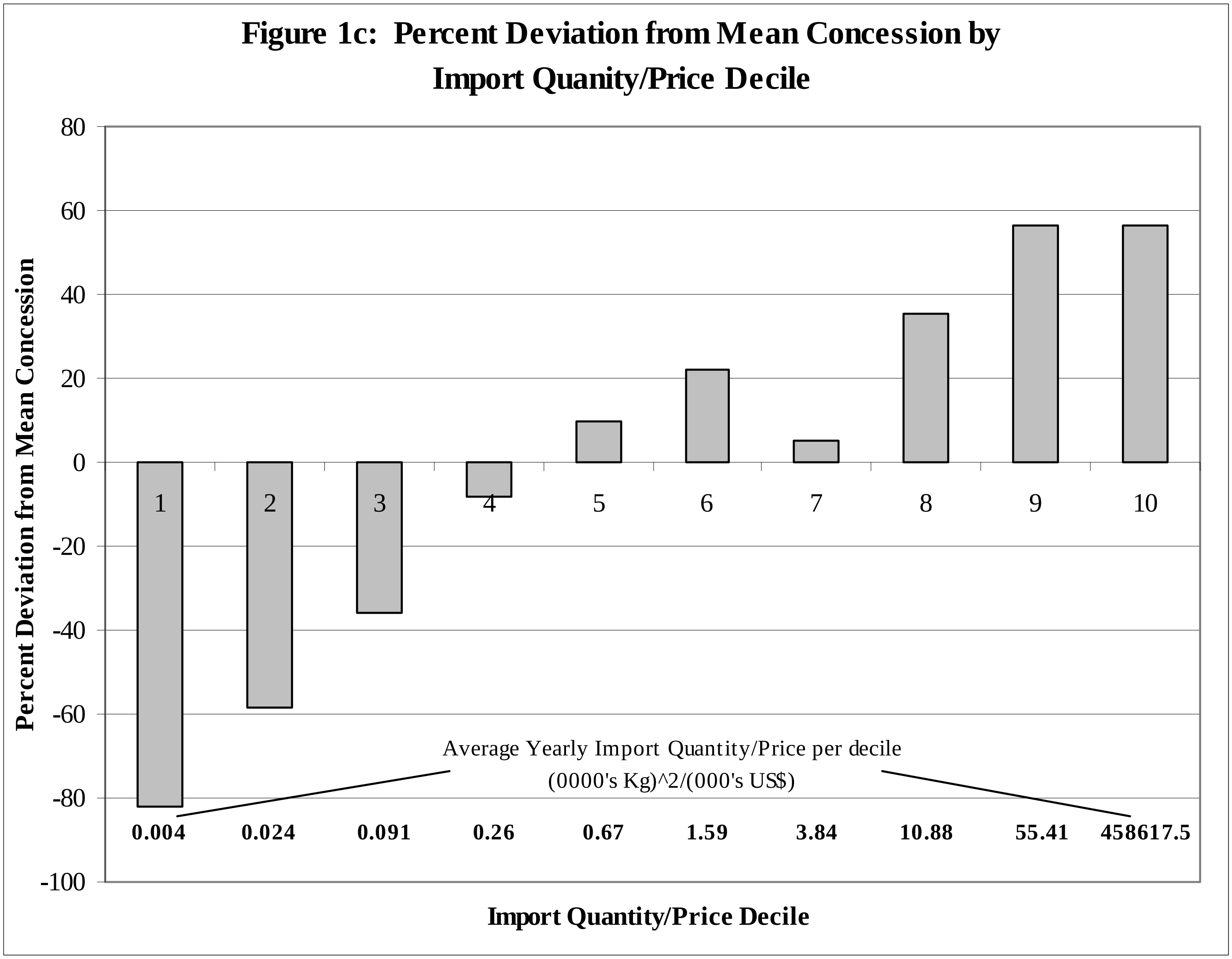


Notes: Percent deviation from mean concession for import decile k calculated as:

$$\left[\frac{\frac{1}{binsize}\sum_{i\in k}(t_{prewto,i}-t_{wto,i})-\frac{1}{10*binsize}\sum_{k\in 10}\sum_{i\in k}(t_{prewto,i}-t_{wto,i})}{\left|\frac{1}{10*binsize}\sum_{k\in 10}\sum_{i\in k}(t_{prewto,i}-t_{wto,i})\right|}\right],$$

where $binsize = 4201$ is the number of observations within each decile.

See Table 1 for the sample periods of Import and Tariff Data



Notes: Percent deviation from mean concession for import decile k calculated as:

$$\left[\frac{\frac{1}{binsize}\sum_{i\in k}(t_{prewto,i}-t_{wto,i})-\frac{1}{10*binsize}\sum_{k\in 10}\sum_{i\in k}(t_{prewto,i}-t_{wto,i})}{\left|\frac{1}{10*binsize}\sum_{k\in 10}\sum_{i\in k}(t_{prewto,i}-t_{wto,i})\right|}\right],$$

where $binsize = 4201$ is the number of observations within each decile.

See Table 1 for the sample periods of Import and Tariff Data

Table 4a: Baseline Results - Full Sample, by Industry

Equation:	$t_{wto}^{ij} = \alpha^I + \alpha^j + \beta t_{prewto}^{ij} + \gamma \left[VM^{ijR}\right] + \epsilon^{ij}$						$t_{wto}^{ij} = \alpha^I + \alpha^j + \beta t_{prewto}^{ij} + \gamma \left[M^{ijR}/p^{wI}\right] + v^{ij}$					
		OLS			**Tobit**			**OLS**[a]			**Tobit**[a]	
Sample	**Obs**	β	γ	R^2	β	γ	**Obs**	β	γ	R^2	β	γ
All	42716	0.3701***	-0.0044***	0.804	0.3899***	-0.0065***	42010	0.3680***	-0.0026***	0.802	0.3871***	-0.0028**
		(0.0174)	(0.0008)		(0.0051)	(0.0010)		(0.0178)	(0.0009)		(0.0052)	(0.0012)
HS0	2024	0.3745***	-0.0735**	0.762	0.3915***	-0.0661	2024	0.3756***	-0.0394**	0.763	0.3924***	-0.0399
		(0.0284)	(0.0339)		(0.0292)	(0.0445)		(0.0284)	(0.0182)		(0.0292)	(0.0335)
HS1	1814	0.2218***	-0.0476***	0.782	0.2368***	-0.0487***	1814	0.2227***	-0.1559***	0.783	0.239***	-0.1645***
		(0.0311)	(0.0104)		(0.0218)	(0.0095)		(0.0308)	(0.0278)		(0.0217)	(0.0296)
HS2	4419	0.6500***	-0.0001	0.651	0.6778***	-0.0053	4379	0.6511***	-0.0273***	0.651	0.6784***	-0.0304*
		(0.0707)	(0.0015)		(0.0210)	(0.0051)		(0.0707)	(0.0095)		(0.0210)	(0.0175)
HS3	4030	0.2679***	-0.0044***	0.867	0.2805***	-0.0047***	4030	0.2680***	-0.0029***	0.867	0.2807***	-0.0029
		(0.0162)	(0.0008)		(0.0098)	(0.0015)		(0.0162)	(0.0011)		(0.0098)	(0.0027)
HS4	3265	0.3285***	-0.0060***	0.918	0.3711***	-0.0062	3265	0.3284***	-0.0102***	0.918	0.3709***	-0.0114
		(0.0142)	(0.0017)		(0.0147)	(0.0048)		(0.0142)	(0.0031)		(0.0147)	(0.0102)
HS5	4272	0.3136***	-0.0056***	0.955	0.3163***	-0.0056***	4272	0.3135***	-0.0167***	0.955	0.3162***	-0.0169***
		(0.0104)	(0.0015)		(0.0083)	(0.0020)		(0.0104)	(0.0044)		(0.0083)	(0.0063)
HS6	4177	0.1343***	-0.0135***	0.973	0.1343***	-0.0135***	4177	0.1337***	-0.0101	0.974	0.1336***	-0.0101***
		(0.0144)	(0.0045)		(0.0089)	(0.0042)		(0.0144)	(0.0065)		(0.0089)	(0.0026)
HS7	4292	0.3704***	-0.0111***	0.905	0.3763***	-0.0088	4060	0.3245***	-0.0018	0.903	0.3225***	0.0057
		(0.0185)	(0.0025)		(0.0153)	(0.0057)		(0.0205)	(0.0032)		(0.0172)	(0.0098)
HS8	10957	0.4013***	-0.0044***	0.872	0.4143***	-0.0057***	10956	0.4015***	-0.0159***	0.872	0.4145***	-0.0191***
		(0.0159)	(0.0006)		(0.0080)	(0.0008)		(0.0159)	(0.0026)		(0.0080)	(0.0029)
HS9	3466	0.3715***	-0.0112*	0.886	0.4123***	-0.0113	3033	0.3783***	-0.0937**	0.887	0.4184***	-0.115***
		(0.0176)	(0.0063)		(0.0179)	(0.0082)		(0.0186)	(0.0381)		(0.0189)	(0.0263)

Notes: Standard errors are in parentheses (OLS are heteroskedasticity-robust). The labels *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Bold indicates a rejection of the terms-of-trade theory. Industry fixed effects, α_I, are at the two-digit HS product level. Country fixed effects are denoted by α_j. Fixed effect estimates are available upon request. The term t_{wto}^{ij} represents the final negotiated post-accession tariff binding. The term t_{prewto}^{ij} represents the average pre-accession MFN applied tariff over the sample at periods noted in Table 1. The term VM^{ijR} is the average yearly import value for each six-digit HS product over the period 1995-1999. The term p^{wI} is the total value of imports divided by the total quantity of imports over all sample countries, for each two-digit HS product, averaged over the period 1995-1999. M^{ijR} is calculated by dividing the VM^{ijR} by p^{wI}, $i \in I$.
a) The variable M^{ijR}/p^{wI} is divided by its mean for each sample.

Table 4b: Baseline Results - by Country

Equation:	$t_{wto}^{ij} = \alpha^I + \alpha^j + \beta t_{prewto}^{ij} + \gamma \left[VM^{ijR}\right] + \epsilon^{ij}$						$t_{wto}^{ij} = \alpha^I + \alpha^j + \beta t_{prewto}^{ij} + \gamma \left[M^{ijR}/p^{wI}\right] + v^{ij}$					
		OLS			**Tobit**			**OLS**^{a}			**Tobit**^{a}	
Sample	**Obs**	β	γ	R^2	β	γ	**Obs**	β	γ	R^2	β	γ
Albania	2172	0.2544***	-0.0085	0.870	0.3194***	-0.0183	2153	0.2464***	-0.0117***	0.869	0.3101***	-0.0114**
		(0.0208)	(0.0512)		(0.0256)	(0.0690)		(0.0208)	(0.0044)		(0.0258)	(0.0051)
Armenia	1213	0.2693***	0.0063	0.877	0.3066***	0.0058	1189	0.2615***	0.0003	0.879	0.2979***	0.0003
		(0.0661)	(0.0666)		(0.0686)	(0.0789)		(0.0689)	(0.0010)		(0.0701)	(0.0072)
Cambodia	1632	**0.4979*** **	**0.0453** **	**0.951**	0.4985***	0.0450	1609	0.5018***	0.0018	0.950	0.5024***	0.0018
		(0.0276)	**(0.0186)**		(0.0136)	(0.0304)		(0.0291)	(0.0011)		(0.0140)	(0.0039)
China	4648	0.2583***	-0.0044***	0.861	0.2661***	-0.0073***	4527	0.2355***	-0.0008	0.861	0.2407***	-0.0008
		(0.0214)	(0.0009)		(0.0079)	(0.0008)		(0.0216)	(0.0031)		(0.0080)	(0.0026)
Ecuador	3602	0.5702***	-0.0610**	0.972	0.5702***	-0.0610***	3543	0.5668***	-0.0007	0.972	0.5668***	-0.0007
		(0.0224)	(0.0246)		(0.0182)	(0.0147)		(0.0229)	(0.0009)		(0.0184)	(0.0016)
Estonia	3647	0.2123**	-0.0899***	0.869	0.2456*	-0.1122***	3591	0.1124	-0.0068	0.868	0.1210	-0.0068*
		(0.1060)	(0.0288)		(0.1408)	(0.0195)		(0.1136)	(0.0044)		(0.1404)	(0.0037)
Georgia	1388	-0.2285**	0.0457	0.900	-0.4986***	0.0441	1369	-0.2284**	-0.0056	0.899	-0.5004***	-0.0056
		(0.0974)	(0.0280)		(0.1598)	(0.0436)		(0.0973)	(0.0063)		(0.1609)	(0.0052)
Jordan	3334	0.6317***	-0.0547**	0.931	0.6504***	-0.0720***	3284	0.6313***	-0.0007	0.931	0.6487***	-0.0006
		(0.0310)	(0.0274)		(0.0096)	(0.0214)		(0.0314)	(0.0007)		(0.0096)	(0.0024)
Kyrgyzstan	1576	-	-0.0784	0.904	-	-0.0903*	1559	-	0.0001	0.903	-	0.0001
		-	(0.0665)		-	(0.0507)		-	(0.0012)		-	(0.0039)
Latvia	3254	0.1198***	-0.0619***	0.856	0.1237***	-0.1275***	3202	0.1163***	-0.0189***	0.855	0.1202***	-0.0187***
		(0.0381)	(0.0186)		(0.0240)	(0.0489)		(0.0382)	(0.0067)		(0.0241)	(0.0048)
Lithuania	3517	0.4989***	-0.0051	0.850	0.5177***	-0.0060	3465	0.4986***	-0.0008	0.850	0.5174***	-0.0008
		(0.0444)	(0.0115)		(0.0223)	(0.0110)		(0.0444)	(0.0010)		(0.0223)	(0.0033)
Macedonia	2643	0.4616***	-0.0188	0.858	0.6044***	-0.0183	2613	0.4620***	-0.0027	0.858	0.6055***	-0.0031
		(0.0174)	(0.0602)		(0.0159)	(0.0544)		(0.0175)	(0.0016)		(0.0160)	(0.0028)
Moldova	1872	0.4161***	0.0009	0.925	0.4755***	0.0254	1848	0.4304***	0.0004	0.927	0.4920***	0.0002
		(0.0329)	(0.0031)		(0.0252)	(0.1512)		(0.0336)	(0.0019)		(0.0254)	(0.0033)
Nepal	1517	0.3516***	-0.3998**	0.940	0.3527***	-0.4073***	1494	0.3494***	0.0032	0.940	0.3504***	0.0032
		(0.0391)	(0.1810)		(0.0183)	(0.1150)		(0.0395)	(0.0024)		(0.0185)	(0.0079)
Oman	2825	-0.4555	-0.0248**	0.764	-0.4662**	-0.0258	2761	-0.4700	-0.0039	0.762	-0.4811**	-0.0039
		(0.5301)	(0.0124)		(0.2351)	(0.0174)		(0.5507)	(0.0040)		(0.2423)	(0.0084)
Panama	3691	0.1277***	-0.0031***	0.924	0.1300***	-0.0032***	3615	0.1250***	-0.0048*	0.925	0.1273***	-0.0048
		(0.0179)	(0.0010)		(0.0132)	(0.0012)		(0.0183)	(0.0028)		(0.0134)	(0.0041)

Notes: Standard errors are in parentheses (OLS are heteroskedasticity-robust). The labels *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Bold indicates a rejection of the terms-of-trade theory. Industry fixed effects, α_I, are at the two-digit HS product level. Country fixed effects are denoted by α_j. Fixed effect estimates are available upon request. The term t_{wto}^{ij} represents the final negotiated post-accession tariff binding. The term t_{prewto}^{ij} represents the average pre-accession MFN applied tariff over the sample at periods noted in Table 1. The term VM^{ijR} is the average yearly import value for each six-digit HS product over the period 1995-1999. The term p^{wI} is the total value of imports divided by the total quantity of imports over all sample countries, for each two-digit HS product, averaged over the period 1995-1999. M^{ijR} is calculated by dividing the VM^{ijR} by p^{wI}, $i \in I$.
a) The variable M^{ijR}/p^{wI} is divided by its mean for each sample.

Table 4c: Baseline Results – Country-Specific γ Estimates – HS8

$t_{wto}^{ij} = \alpha^I + \alpha^j + \beta t_{prewto}^{ij} + \sum_{j \in J} \gamma^j \left[VM^{ijR}\right] + \epsilon^{ij}$		
	OLS	**Tobit**
β	0.407***	0.419***
	(0.016)	(0.008)
$\gamma^{Albania}$	0.363	0.361
	(0.287)	(0.381)
$\gamma^{Armenia}$	-0.919***	-1.514***
	(0.224)	(0.512)
$\gamma^{Cambodia}$	0.010	-0.003
	(0.0657)	(0.110)
γ^{China}	-0.003***	-0.006***
	(0.0007)	(0.001)
$\gamma^{Ecuador}$	-0.0794**	-0.083**
	(0.0395)	(0.033)
$\gamma^{Estonia}$	-0.134***	-0.201***
	(0.0248)	(0.043)
$\gamma^{Georgia}$	-0.538**	-1.358
	(0.267)	(0.86)
γ^{Jordan}	-0.110**	-0.123***
	(0.047)	(0.047)
$\gamma^{Kyrgyzstan}$	-0.534***	-0.765**
	(0.190)	(0.352)
γ^{Latvia}	0.0599	0.053
	(0.086)	(0.084)
$\gamma^{Lithuania}$	-0.0298	-0.029
	(0.019)	(0.033)
$\gamma^{Macedonia}$	-0.172*	-0.163
	(0.103)	(0.135)
$\gamma^{Moldova}$	0.196	0.146
	(0.332)	(0.527)
γ^{Nepal}	-1.216**	-1.277***
	(0.583)	(0.199)
γ^{Oman}	-0.006	-0.007
	(0.007)	(0.012)
γ^{Panama}	-0.005***	-0.006***
	(0.001)	(0.001)
Nobs	10957	10957
R^2	0.873	
Notes	See Tables 4a and 4b	

Table 5a: Extended Results using Import Values

Equation:	$t^{ij}_{wto} = \alpha^I + \alpha^j + \beta t^{ij}_{prewto} + \gamma[VM^{ijR}] + \lambda[VMM^{ijR}] + \epsilon^{ij}$							
		OLS				**Tobit**		
Sample	Obs	β	γ	λ	R^2	β	γ	λ
All	42716	0.3704***	-0.0059***	0.0125***	0.804	0.3901***	-0.0074***	0.0098*
		(0.0174)	(0.0015)	(0.0044)		(0.0051)	(0.0011)	(0.0059)
HS0	2024	0.3734***	-0.1284***	0.1513**	0.763	0.3903***	-0.1200**	0.1486
		(0.0285)	(0.0497)	(0.0631)		(0.0292)	(0.0596)	(0.1092)
HS1	1814	0.2216***	-0.0448***	-0.1846	0.783	0.2366***	-0.0440***	-0.3067
		(0.0311)	(0.0101)	(0.2464)		(0.0218)	(0.0104)	(0.2766)
HS2	4419	0.6501***	0.0028	-0.0090	0.651	0.6778***	-0.0046	-0.0023
		(0.0707)	(0.0070)	(0.0183)		(0.0210)	(0.0089)	(0.0241)
HS3	4030	0.2679***	-0.0038***	-0.0022	0.867	0.2804***	-0.0040*	-0.0026
		(0.0162)	(0.0013)	(0.0037)		(0.0098)	(0.0024)	(0.0070)
HS4	3265	0.3286***	-0.0067**	0.0032	0.918	0.3711***	-0.0052	-0.0042
		(0.0142)	(0.0031)	(0.0089)		(0.0147)	(0.0083)	(0.0286)
HS5	4272	0.3135***	-0.0070***	0.0052	0.955	0.3162***	-0.0067*	0.0041
		(0.0104)	(0.0023)	(0.0076)		(0.0083)	(0.0036)	(0.0114)
HS6	4177	0.1342***	-0.0184*	0.0178	0.973	0.1342***	-0.0184***	0.0178
		(0.0144)	(0.0107)	(0.0219)		(0.0089)	(0.0065)	(0.0181)
HS7	4292	0.3703***	-0.0171***	0.0195***	0.905	0.3761***	-0.0159*	0.0229
		(0.0185)	(0.0041)	(0.0072)		(0.0153)	(0.0089)	(0.0220)
HS8	10957	0.4014***	-0.0045***	0.0012	0.872	0.4134***	-0.0048***	-0.0350**
		(0.0159)	(0.0007)	(0.0079)		(0.0080)	(0.0009)	(0.0160)
HS9	3466	0.3712***	-0.0320***	0.2475***	0.886	0.4117***	-0.0405***	0.3219***
		(0.0176)	(0.0091)	(0.0585)		(0.0178)	(0.0129)	(0.1041)
Albania	2172	0.2544***	-0.0177	0.6182	0.870	0.3194***	-0.0239	0.3823
		(0.0208)	(0.0557)	(0.7473)		(0.0256)	(0.0730)	(1.6148)
Armenia	1213	0.2701***	0.0325	-0.0810	0.877	0.3075***	0.0378	-0.0961
		(0.0661)	(0.0888)	(0.1091)		(0.0686)	(0.0982)	(0.1754)
Cambodia	1632	**0.4978*** **	**0.0449** **	**-2.4031** **	**0.951**	0.4983***	0.0446	-2.3953
		(0.0276)	**(0.0186)**	**(1.2068)**		(0.0136)	(0.0304)	(5.8303)
China	4648	0.2593***	-0.0061***	0.0096**	0.862	0.2668***	-0.0085***	0.0081*
		(0.0212)	(0.0014)	(0.0045)		(0.0079)	(0.0011)	(0.0046)
Ecuador	3602	0.5699***	-0.0624**	0.0323	0.972	0.5699***	-0.0624***	0.0323
		(0.0223)	(0.0281)	(0.2130)		(0.0182)	(0.0161)	(0.1498)
Estonia	3647	0.2428**	-0.1588***	0.1904***	0.870	0.3019**	-0.2254***	0.2865***
		(0.1042)	(0.0312)	(0.0551)		(0.1410)	(0.0315)	(0.0604)
Georgia	1388	-0.2285**	0.0455	0.0026	0.900	-0.4986***	0.0431	0.0114
		(0.0974)	(0.0304)	(0.0488)		(0.1598)	(0.0456)	(0.1516)
Jordan	3334	0.6312***	-0.1143***	0.1128***	0.931	0.6499***	-0.1663***	0.1647***
		(0.0310)	(0.0262)	(0.0270)		(0.0095)	(0.0340)	(0.0454)
Kyrgyzstan	1576	-	-0.6269***	0.6683***	0.905	-	-0.7915***	0.8343***
		-	(0.1386)	(0.1461)		-	(0.1548)	(0.1708)
Latvia	3254	0.1195***	-0.2301***	0.2692***	0.856	0.1232***	-0.3688***	0.3929***
		(0.0379)	(0.0740)	(0.0966)		(0.0240)	(0.0853)	(0.1175)
Lithuania	3517	0.5002***	-0.0681**	0.0776***	0.850	0.5195***	-0.0931***	0.1034***
		(0.0443)	(0.0286)	(0.0294)		(0.0223)	(0.0301)	(0.0332)
Macedonia	2643	0.4617***	-0.0272	0.2825	0.858	0.6044***	-0.0266	0.3435
		(0.0174)	(0.0575)	(0.4633)		(0.0159)	(0.0564)	(0.6144)
Moldova	1872	0.4164***	0.0343	-0.0352	0.925	0.4754***	0.0418	-0.1321
		(0.0329)	(0.0844)	(0.0858)		(0.0252)	(0.1678)	(0.5881)
Nepal	1517	0.3537***	-0.6204***	1.8017**	0.941	0.3548***	-0.6343***	1.8511**
		(0.0391)	(0.2107)	(0.8526)		(0.0183)	(0.1518)	(0.8096)
Oman	2825	-0.4571	-0.0213*	-0.2199*	0.764	-0.4677**	-0.0225	-0.2114
		(0.5303)	(0.0113)	(0.1254)		(0.2351)	(0.0178)	(0.2462)
Panama	3691	0.1278***	-0.0026**	-0.0616	0.924	0.1301***	-0.0026**	-0.0619
		(0.0179)	(0.0011)	(0.0444)		(0.0132)	(0.0013)	(0.0511)
Notes:	See Table 4 notes. The term VMM^{ijR} is the average yearly import value from non-WTO members at the time of accesion for each six-digit HS product over the period 1995-1999.							

Table 5b: Extended Results using Import Quantity/World Price

Equation:	$t^{ij}_{wto} = \alpha^I + \alpha^j + \beta t^{ij}_{prewto} + \gamma[M^{ijR}/p^{wI}] + \lambda[MM^{ijR}/p^{wI}] + v^{ij}$							
		OLS[a]				**Tobit**[a]		
Sample	Obs	β	γ	λ	R^2	β	γ	λ
All	42010	0.3680***	-0.0028**	0.0002	0.802	0.3871***	-0.003**	0.0003
		(0.0178)	(0.0013)	(0.0007)		(0.0052)	(0.0015)	(0.0012)
HS0	2024	0.3756***	-0.033**	-0.0116	0.763	0.3924***	-0.0332	-0.012
		(0.0284)	(0.0164)	(0.0113)		(0.0292)	(0.0361)	(0.0241)
HS1	1814	0.2235***	-0.1497***	-0.0267**	0.783	0.2408***	-0.1544***	-0.0464
		(0.0308)	(0.0256)	(0.0117)		(0.0218)	(0.0302)	(0.0295)
HS2	4379	0.6513***	-0.0209*	-0.0071	0.651	0.6787***	-0.0235	-0.0077
		(0.0707)	(0.0124)	(0.0058)		(0.0210)	(0.0225)	(0.0156)
HS3	4030	0.2680***	-0.0022**	-0.0009	0.867	0.2806***	-0.0023	-0.0008
		(0.0162)	(0.001)	(0.0008)		(0.0098)	(0.0035)	(0.003)
HS4	3265	0.3285***	-0.0109***	0.0008	0.918	0.3711***	-0.0133	0.0022
		(0.0142)	(0.0035)	(0.0025)		(0.0147)	(0.0134)	(0.0097)
HS5	4272	0.3138***	-0.0108	-0.0055	0.955	0.3165***	-0.0105	-0.0060
		(0.0104)	(0.0092)	(0.0077)		(0.0083)	(0.0117)	(0.0091)
HS6	4177	0.1333***	-0.0289	0.0142	0.974	0.1332***	-0.0289***	0.0142**
		(0.0144)	(0.0179)	(0.0092)		(0.0089)	(0.0079)	(0.0057)
HS7	4060	0.3244***	0.0034	-0.0044*	0.903	0.3223***	0.0161	-0.0087
		(0.0205)	(0.0049)	(0.0025)		(0.0172)	(0.0172)	(0.0117)
HS8	10956	0.4012***	-0.0148***	-0.0028	0.872	0.4132***	-0.0139***	-0.0229***
		(0.0160)	(0.0026)	(0.004)		(0.0080)	(0.0032)	(0.0067)
HS9	3033	0.3786***	-0.1268**	0.0237	0.887	0.4189***	-0.1513***	0.0268*
		(0.0186)	(0.0523)	(0.0213)		(0.0189)	(0.034)	(0.0159)
Albania	2153	0.2464***	-0.0117**	-0.0027*	0.869	0.3101***	-0.0114**	-0.0026
		(0.0208)	(0.0047)	(0.0015)		(0.0258)	(0.0051)	(0.0025)
Armenia	1189	0.2655***	-0.0008***	0.003***	0.879	0.3026***	-0.0009	0.0035
		(0.0699)	(0.0002)	(0.0008)		(0.0706)	(0.0076)	(0.0066)
Cambodia	1609	0.5017***	0.0018	-0.0012**	0.950	0.5023***	0.0018	-0.0012
		(0.0291)	(0.0011)	(0.0006)		(0.0140)	(0.0040)	(0.0036)
China	4527	0.2357***	0.0045	-0.0059*	0.861	0.2409***	0.0046	-0.006
		(0.0217)	(0.005)	(0.0035)		(0.0080)	(0.0042)	(0.0037)
Ecuador	3543	0.5667***	-0.0015**	-0.0033	0.972	0.5667***	-0.0015	0.0033
		(0.0229)	(0.0007)	(0.0026)		(0.0184)	(0.0019)	(0.004)
Estonia	3591	0.1124	-0.0077	0.0018	0.868	0.1210	-0.0078*	0.0022
		(0.1136)	(0.0053)	(0.0052)		(0.1404)	(0.0043)	(0.0047)
Georgia	1369	-0.2284**	-0.0043	-0.0036	0.899	-0.5003***	-0.0043	-0.0036
		(0.0974)	(0.0071)	(0.0056)		(0.1608)	(0.0054)	(0.005)
Jordan	3284	0.6312***	-0.0063	0.0063	0.931	0.6487***	-0.0061	0.0062
		(0.0314)	(0.011)	(0.0121)		(0.0096)	(0.0117)	(0.0130)
Kyrgyzstan	1559	**-**	**0.0025***	**-0.0054***	**0.903**	-	0.0025	-0.0054
		-	**(0.0015)**	**(0.0031)**		-	(0.0049)	(0.0068)
Latvia	3202	0.1170***	-0.0159***	-0.0066	0.855	0.1209***	-0.0159***	-0.0064
		(0.0382)	(0.0056)	(0.0057)		(0.0241)	(0.0055)	(0.006)
Lithuania	3465	0.4989***	-0.0027*	0.0036	0.850	0.5176***	-0.0027	0.0037
		(0.0445)	(0.0016)	(0.0026)		(0.0223)	(0.0046)	(0.0059)
Macedonia	2613	0.4622***	-0.0003	-0.0047	0.858	0.6057***	-0.0001	-0.0062
		(0.0175)	(0.0037)	(0.0076)		(0.0160)	(0.0050)	(0.0083)
Moldova	1848	0.4304***	0.0004	0.0001	0.927	0.4920***	0.0002	0.0000
		(0.0336)	(0.0019)	(0.0013)		(0.0254)	(0.0034)	(0.0028)
Nepal	1494	0.3494***	0.0032	0.0008	0.940	0.3504***	0.0032	0.0008
		(0.0396)	(0.0024)	(0.0011)		(0.0185)	(0.0080)	(0.0062)
Oman	2761	-0.47	-0.0106***	0.0062***	0.762	-0.4811**	-0.0106	0.0062
		(0.5508)	(0.0010)	(0.0005)		(0.2423)	(0.0123)	(0.0083)
Panama	3615	0.125***	-0.0017	-0.0071***	0.925	0.1273***	-0.0016	-0.0071
		(0.0183)	(0.0022)	(0.0025)		(0.0134)	(0.0046)	(0.0046)
Notes:	See notes in Tables 4 and 5a. The term MM^{ijR} is calculated by dividing VMM^{ijR} by p^{wI}, $i \in I$.							

Table 5c: Extended Results using Import Values, Herfindahl Index

Equation	$t^{ij}_{wto} = \alpha^I + \alpha^j + \beta t^{ij}_{prewto} + \gamma[VM^{ijR}] + \lambda[VMM^{ijR}] + \rho[HC^{ijR}] + \epsilon^{ij}$									
		OLS					**Tobit**			
Sample	**Obs**	β	γ	λ	ρ	R^2	β	γ	λ	ρ
All	42716	0.37***	-0.0058***	0.0127***	0.8209***	0.8043	0.3897***	-0.0074***	0.0102*	0.9469***
		(0.0174)	(0.0015)	(0.0044)	(0.1150)		(0.0051)	(0.0011)	(0.0059)	(0.1352)
HS0	2024	0.3701***	-0.1098**	0.1387**	2.6979***	0.7643	0.387***	-0.0999*	0.1349	2.917***
		(0.0287)	(0.0458)	(0.0589)	(0.7989)		(0.0292)	(0.0597)	(0.1090)	(0.8937)
HS1	1814	0.221***	-0.0447***	-0.1733	1.0345	0.7832	0.2358***	-0.0439***	-0.295	1.1326
		(0.0311)	(0.0100)	(0.2533)	(0.8346)		(0.0218)	(0.0104)	(0.2768)	(0.9024)
HS2	4419	0.6507***	0.0028	-0.0088	0.6925	0.6513	0.6785***	-0.0045	-0.0019	0.8975
		(0.0706)	(0.0070)	(0.0182)	(0.4995)		(0.0210)	(0.0089)	(0.0241)	(0.6349)
HS3	4030	0.2682***	-0.0038***	-0.0021	0.4364**	0.868	0.2811***	-0.004*	-0.0024	0.541**
		(0.0162)	(0.0013)	(0.0035)	(0.1902)		(0.0098)	(0.0024)	(0.0070)	(0.2167)
HS4	3265	0.329***	-0.0067**	0.0039	0.7272***	0.9187	0.3715***	-0.0052	-0.0033	0.8501**
		(0.0141)	(0.0030)	(0.0088)	(0.2608)		(0.0147)	(0.0082)	(0.0286)	(0.3387)
HS5	4272	0.3134***	-0.0069***	0.0051	-0.3949**	0.9553	0.3162***	-0.0066*	0.004	-0.4103**
		(0.0104)	(0.0023)	(0.0076)	(0.1638)		(0.0083)	(0.0036)	(0.0114)	(0.1692)
HS6	4177	0.1335***	-0.0184*	0.0186	0.5646***	0.9737	0.1335***	-0.0184***	0.0186	0.5661***
		(0.0144)	(0.0106)	(0.0217)	(0.1427)		(0.0089)	(0.0065)	(0.0181)	(0.1568)
HS7	4292	0.3707***	-0.0169***	0.0193***	0.4725**	0.9058	0.3767***	-0.0155*	0.0225	0.9776***
		(0.0186)	(0.0041)	(0.0072)	(0.2292)		(0.0153)	(0.0089)	(0.0220)	(0.3196)
HS8	10957	0.4014***	-0.0045***	0.0014	1.1853***	0.8727	0.4134***	-0.0047***	-0.0342**	1.1759***
		(0.0159)	(0.0007)	(0.0078)	(0.1730)		(0.0080)	(0.0009)	(0.0159)	(0.2003)
HS9	3466	0.3661***	-0.0317***	0.2484***	2.3162***	0.8881	0.4053***	-0.0393***	0.3183***	3.0402***
		(0.0175)	(0.0087)	(0.0580)	(0.3180)		(0.0177)	(0.0126)	(0.1027)	(0.4180)
Albania	2172	0.2557***	-0.0099	0.7367	0.3389	0.8703	0.3227***	-0.0111	0.6065	0.6265*
		(0.0209)	(0.0573)	(0.7630)	(0.2929)		(0.0256)	(0.0733)	(1.6195)	(0.3734)
Armenia	1213	0.2717***	0.0292	-0.097	-0.5459*	0.878	0.3095***	0.0334	-0.1195	-0.8009*
		(0.0666)	(0.0906)	(0.1121)	(0.3084)		(0.0685)	(0.0981)	(0.1756)	(0.4467)
Cambodia	1632	**0.4968*** **	**0.0519*** **	**0.0905**	**1.76*** **	**0.952**	**0.4973*** **	**0.0517***	**0.1188**	**1.7744*** **
		(0.0274)	**(0.0187)**	**(1.4042)**	**(0.4911)**		**(0.0135)**	**(0.0303)**	**(5.8430)**	**(0.4695)**
China	4648	0.2585***	-0.0061***	0.01**	1.2529***	0.8625	0.2659***	-0.0085***	0.0088*	1.3059***
		(0.0211)	(0.0014)	(0.0044)	(0.3632)		(0.0079)	(0.0011)	(0.0046)	(0.3522)
Ecuador	3602	0.5691***	-0.0608**	0.0423	0.264	0.9721	0.5691***	-0.0608***	0.0423	0.264
		(0.0225)	(0.0282)	(0.2140)	(0.2298)		(0.0182)	(0.0162)	(0.1500)	(0.2345)
Estonia	3647	0.2406**	-0.1563***	0.188***	0.383*	0.8704	0.299**	-0.222***	0.2829***	0.4396
		(0.1034)	(0.0311)	(0.0545)	(0.2236)		(0.1410)	(0.0315)	(0.0604)	(0.2780)
Georgia	1388	-0.233**	0.0467	0.0075	0.2364	0.901	-0.502***	0.0446	0.0185	0.3748
		(0.0952)	(0.0310)	(0.0499)	(0.2317)		(0.1598)	(0.0455)	(0.1517)	(0.2943)
Jordan	3334	0.6313***	-0.113***	0.1121***	0.111	0.9311	0.65***	-0.1641***	0.1633***	0.1678
		(0.0310)	(0.0261)	(0.0269)	(0.3190)		(0.0095)	(0.0343)	(0.0455)	(0.3302)
Kyrgyzstan	1576	-	-0.6322***	0.6736***	11.1151*	0.9061	-	-0.801***	0.8438***	0.3793*
		-	(0.1383)	(0.1459)	(0.1651)		-	(0.1551)	(0.1711)	(0.2060)
Latvia	3254	0.1201***	-0.2161***	0.2547***	0.8457***	0.8567	0.1239***	-0.35***	0.3766***	0.8654**
		(0.0379)	(0.0717)	(0.0934)	(0.3277)		(0.0239)	(0.0853)	(0.1176)	(0.4091)
Lithuania	3517	0.5008***	-0.0661**	0.0757***	0.2289	0.8504	0.5198***	-0.0919***	0.1021***	0.1343
		(0.0443)	(0.0278)	(0.0286)	(0.2678)		(0.0223)	(0.0302)	(0.0334)	(0.3371)
Macedonia	2643	0.4618***	-0.025	0.3008	0.1742	0.8588	0.6045***	-0.024	0.3859	0.2546
		(0.0174)	(0.0568)	(0.4684)	(0.2746)		(0.0159)	(0.0565)	(0.6145)	(0.3534)
Moldova	1872	0.4161***	0.0407	-0.0415	0.1023	0.9258	0.4752***	0.0552	-0.087	0.1382
		(0.0329)	(0.0841)	(0.0855)	(0.1452)		(0.0252)	(0.1687)	(0.5911)	(0.1826)
Nepal	1517	0.3562***	-0.5692***	1.6343*	1.782**	0.9413	0.3572***	-0.5849***	1.6897**	1.7247**
		(0.0391)	(0.2080)	(0.8471)	(0.7819)		(0.0183)	(0.1531)	(0.8114)	(0.7766)
Oman	2825	-0.4612	-0.0194*	-0.1918	1.0837*	0.7651	-0.4717**	-0.0206	-0.1834	1.0833*
		(0.5308)	(0.0112)	(0.1261)	(0.6103)		(0.2350)	(0.0179)	(0.2466)	(0.6413)
Panama	3691	0.1299***	-0.0027***	-0.0459	3.1257***	0.9261	0.1323***	-0.0027**	-0.0459	3.1742***
		(0.0179)	(0.0010)	(0.0409)	(0.3989)		(0.0131)	(0.0013)	(0.0508)	(0.4145)
Notes:	See notes in tables 4 and 5a. HC^{ijR} is constucted according to the text using average bilateral trade flows over the period 1995-1999.									

Table 5d: Extended Results using Import Quantity/World Price, Herfindahl Index

Equation	$t^{ij}_{wto} = \alpha^I + \alpha^j + \beta t^{ij}_{prewto} + \gamma[M^{ijR}/p^{wI}] + \lambda[MM^{ijR}/p^{wI}] + \rho[HC^{ijR}] + v^{ij}$									
		OLS					**Tobit**			
Sample	**Obs**	β	γ	λ	ρ	R^2	β	γ	λ	ρ
All	42010	0.3677***	-0.0028**	0.0002	0.8299***	0.8025	0.3867***	-0.003**	0.0003	0.9558***
		(0.0178)	(0.0012)	(0.0006)	(0.1165)		(0.0052)	(0.0015)	(0.0012)	(0.1369)
HS0	2024	0.3719***	-0.0272*	-0.0089	2.7922***	0.764	0.3886***	-0.027	-0.0092	2.9945***
		(0.0286)	(0.0156)	(0.0107)	(0.7994)		(0.0292)	(0.0360)	(0.0241)	(0.8913)
HS1	1814	0.2228***	-0.1494***	-0.0263**	1.1051	0.7837	0.2401***	-0.1541***	-0.0462	1.2188
		(0.0308)	(0.0256)	(0.0125)	(0.8307)		(0.0218)	(0.0302)	(0.0296)	(0.9005)
HS2	4379	0.6518***	-0.0204*	-0.0071	0.6526	0.6515	0.6794***	-0.0229	-0.0076	0.8423
		(0.0707)	(0.0122)	(0.0057)	(0.5056)		(0.0210)	(0.0225)	(0.0156)	(0.6403)
HS3	4030	0.2684***	-0.0024**	-0.0008	0.4468**	0.8677	0.2813***	-0.0025	-0.0006	0.552**
		(0.0162)	(0.0010)	(0.0008)	(0.1903)		(0.0098)	(0.0035)	(0.0030)	(0.2170)
HS4	3265	0.3289***	-0.011***	0.001	0.7316***	0.9187	0.3715***	-0.0135	0.0024	0.8558**
		(0.0141)	(0.0036)	(0.0026)	(0.2608)		(0.0147)	(0.0134)	(0.0097)	(0.3387)
HS5	4272	0.3137***	-0.0107	-0.0056	-0.3969**	0.9553	0.3165***	-0.0103	-0.0061	-0.4123**
		(0.0104)	(0.0092)	(0.0078)	(0.1638)		(0.0083)	(0.0117)	(0.0091)	(0.1692)
HS6	4177	0.1326***	-0.0286	0.014	0.5669***	0.9738	0.1326***	-0.0286***	0.014**	0.5684***
		(0.0144)	(0.0179)	(0.0092)	(0.1424)		(0.0088)	(0.0079)	(0.0057)	(0.1567)
HS7	4060	0.3248***	0.0027	-0.004	0.4991**	0.9035	0.3227***	0.0147	-0.008	1.0264***
		(0.0205)	(0.0049)	(0.0025)	(0.2365)		(0.0172)	(0.0172)	(0.0117)	(0.3339)
HS8	10956	0.4012***	-0.0147***	-0.0028	1.1914***	0.8726	0.4132***	-0.0138***	-0.0229***	1.1865***
		(0.0159)	(0.0026)	(0.0040)	(0.1731)		(0.0080)	(0.0032)	(0.0067)	(0.2003)
HS9	3033	0.3735***	-0.1125**	0.0216	2.3295***	0.8888	0.4122***	-0.1322***	0.0239	3.1225***
		(0.0185)	(0.0493)	(0.0208)	(0.3416)		(0.0188)	(0.0339)	(0.0158)	(0.4518)
Albania	2153	0.2475***	-0.0115**	-0.0028*	0.3017	0.869	0.3133***	-0.011**	-0.0028	0.587
		(0.0209)	(0.0047)	(0.0015)	(0.2895)		(0.0258)	(0.0051)	(0.0025)	(0.3693)
Armenia	1189	0.2679***	-0.001***	0.0029***	-0.5147*	0.8793	0.3056***	-0.0012	0.0033	-0.7473*
		(0.0704)	(0.0003)	(0.0008)	(0.3100)		(0.0705)	(0.0076)	(0.0066)	(0.4433)
Cambodia	1609	**0.5004*** **	**0.002***	**-0.0003**	**1.6676*** **	**0.9508**	0.501***	0.002	-0.0003	1.6823***
		(0.0288)	**(0.0011)**	**(0.0007)**	**(0.4930)**		(0.0139)	(0.0040)	(0.0036)	(0.4718)
China	4527	0.2347***	0.004	-0.0055*	1.3357***	0.8611	0.2399***	0.004	-0.0056	1.4137***
		(0.0215)	(0.0046)	(0.0032)	(0.3701)		(0.0080)	(0.0042)	(0.0037)	(0.3560)
Ecuador	3543	0.5649***	-0.0015**	0.0033	0.4467*	0.9716	0.5649***	-0.0015	0.0033	0.4467*
		(0.0231)	(0.0007)	(0.0025)	(0.2303)		(0.0185)	(0.0019)	(0.0040)	(0.2369)
Estonia	3591	0.1124	-0.0075	0.0018	0.4786**	0.8684	0.1209	-0.0077*	0.0022	0.5709**
		(0.1126)	(0.0052)	(0.0052)	(0.2279)		(0.1403)	(0.0043)	(0.0047)	(0.2829)
Georgia	1369	-0.2324**	-0.0043	-0.0035	0.2061	0.8994	-0.5033***	-0.0043	-0.0034	0.3424
		(0.0954)	(0.0071)	(0.0057)	(0.2334)		(0.1609)	(0.0055)	(0.0050)	(0.2978)
Jordan	3284	0.6314***	-0.0065	0.0066	0.3376	0.9313	0.6489***	-0.0064	0.0066	0.4288
		(0.0314)	(0.0110)	(0.0122)	(0.3187)		(0.0096)	(0.0117)	(0.0130)	(0.3294)
Kyrgyzstan	1559	**-**	**0.0025***	**-0.0052***	**11.1011**	**0.9031**	-	0.0025	-0.0051	0.3479*
		-	**(0.0015)**	**(0.0031)**	**(0.1668)**		-	(0.0049)	(0.0068)	(0.2105)
Latvia	3202	0.1177***	-0.0158***	-0.0065	0.9647***	0.8557	0.1216***	-0.0158***	-0.0062	1.0436**
		(0.0382)	(0.0056)	(0.0056)	(0.3331)		(0.0241)	(0.0055)	(0.0060)	(0.4129)
Lithuania	3465	0.4998***	-0.0026	0.0036	0.3359	0.8496	0.5184***	-0.0027	0.0037	0.2839
		(0.0444)	(0.0016)	(0.0027)	(0.2722)		(0.0223)	(0.0046)	(0.0059)	(0.3393)
Macedonia	2613	0.4623***	-0.0004	-0.0046	0.1553	0.8581	0.6058***	-0.0001	-0.0061	0.2159
		(0.0175)	(0.0037)	(0.0077)	(0.2741)		(0.0160)	(0.0050)	(0.0083)	(0.3548)
Moldova	1848	0.4299***	0.0004	0.0001	0.1331	0.9271	0.4914***	0.0003	0.0001	0.1747
		(0.0336)	(0.0019)	(0.0013)	(0.1456)		(0.0254)	(0.0034)	(0.0028)	(0.1793)
Nepal	1494	**0.3529*** **	**0.0045***	**0.0019***	**2.2052*** **	**0.9406**	0.3538***	0.0045	0.0019	2.1518***
		(0.0395)	**(0.0025)**	**(0.0011)**	**(0.7883)**		(0.0185)	(0.0080)	(0.0062)	(0.7851)
Oman	2761	-0.4766	-0.0101***	0.0062***	1.2159**	0.7626	-0.4876**	-0.0101	0.0062	1.2024*
		(0.5514)	(0.0010)	(0.0005)	(0.6162)		(0.2422)	(0.0123)	(0.0083)	(0.6526)
Panama	3615	0.1272***	-0.0011	-0.0072***	3.1706***	0.926	0.1297***	-0.0011	-0.0072	3.2206***
		(0.0183)	(0.0021)	(0.0025)	(0.4041)		(0.0133)	(0.0045)	(0.0045)	(0.4195)
Notes:	See notes in tables 4 and 5a. HC^{ijR} is constucted according to the text using average bilateral trade flows over the period 1995-1999.									

Table 6a - Sensitivity Analysis - Full Sample, by Industry

Eqn:	$t^{ij}_{wto} = \alpha^I + \alpha^j + \beta t^{ij}_{prewto} + \gamma[\ln(VM^{ijR})] + \epsilon^{ij}$						$t^{ij}_{wto} = \alpha^I + \alpha^j + \beta t^{ij}_{prewto} + \gamma\left[VM^{ijR}\right] + \epsilon^{ij}$, *No China*					
		OLS			**Tobit**			**OLS**			**Tobit**	
Sample	**Obs**	β	γ	R^2	β	γ	**Obs**	β	γ	R^2	β	γ
All	42716	0.3675***	-0.3527***	0.80	0.3869***	-0.3805***	38068	0.4200***	-0.0052***	0.81	0.4470***	-0.0056***
		(0.0174)	(0.0259)		(0.0051)	(0.0259)		(0.0194)	(0.0017)		(0.0059)	(0.0014)
HS0	2024	0.3676***	-0.5394***	0.76	0.3847***	-0.5267***	1741	0.3847***	-0.4641***	0.76	0.4010***	-0.4646***
		(0.0289)	(0.1656)		(0.0293)	(0.1630)		(0.0333)	(0.1170)		(0.0344)	(0.1319)
HS1	1814	0.1919***	-0.7187***	0.78	0.2064***	-0.7817***	1603	0.3437***	-0.1505***	0.79	0.3543***	-0.1928***
		(0.0282)	(0.1473)		(0.0207)	(0.1551)		(0.0385)	(0.0357)		(0.0296)	(0.0599)
HS2	4419	0.6489***	-0.2062	0.65	0.6771***	-0.2402*	3721	0.7235***	0.0356	0.66	**0.7564*** **	**0.0349***
		(0.0707)	(0.1342)		(0.0209)	(0.1241)		(0.0681)	(0.0378)		**(0.0235)**	**(0.0197)**
HS3	4030	0.2679***	-0.1578***	0.87	0.2806***	-0.1869***	3654	0.2577***	-0.0140	0.87	0.2721***	-0.0161
		(0.0161)	(0.0365)		(0.0098)	(0.0400)		(0.0158)	(0.0112)		(0.0105)	(0.0216)
HS4	3265	0.3260***	-0.3264***	0.92	0.3680***	-0.3520***	2917	0.3352***	-0.2717***	0.92	0.3768***	-0.2954***
		(0.0141)	(0.0540)		(0.0146)	(0.0670)		(0.0159)	(0.0655)		(0.0167)	(0.0593)
HS5	4272	0.3135***	-0.0673*	0.96	0.3162***	-0.0664*	3779	0.3313***	-0.0925*	0.96	0.3351***	-0.0988***
		(0.0104)	(0.0387)		(0.0083)	(0.0345)		(0.0125)	(0.0537)		(0.0096)	(0.0298)
HS6	4177	0.1320***	-0.1274***	0.97	0.1320***	-0.1272***	3750	0.1124***	-0.0781	0.98	0.1124***	-0.0781***
		(0.0144)	(0.0367)		(0.0089)	(0.0337)		(0.0157)	(0.0607)		(0.0094)	(0.0187)
HS7	4292	0.3677***	-0.3474***	0.91	0.3728***	-0.3827***	3837	0.3171***	-0.0932**	0.91	0.3221***	-0.1023***
		(0.0184)	(0.0492)		(0.0152)	(0.0642)		(0.0201)	(0.0375)		(0.0178)	(0.0340)
HS8	10957	0.4004***	-0.5604***	0.87	0.4132***	-0.6073***	9972	0.4067***	-0.0057***	0.88	0.4217***	-0.0059***
		(0.0155)	(0.0373)		(0.0079)	(0.0368)		(0.0181)	(0.0015)		(0.0091)	(0.0010)
HS9	3466	0.3608***	-0.8328***	0.89	0.3984***	-1.0174***	3094	0.3551***	-0.7012***	0.90	0.3994***	-0.8213***
		(0.0171)	(0.0709)		(0.0175)	(0.0833)		(0.0183)	(0.1221)		(0.0184)	(0.0865)

Notes: Standard errors are in parentheses (OLS are heteroskedasticity-robust). The labels *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Bold indicates a rejection of the terms-of-trade theory. Industry fixed effects, α_I, are at the two-digit HS product level. Country fixed effects are denoted by α_j. Fixed effect estimates are available upon request. The term t^{ij}_{wto} represents the final negotiated post-accession tariff binding. The term t^{ij}_{prewto} represents the average pre-accession MFN applied tariff over the sample at periods noted in Table 1. The term VM^{ijR} is the average yearly import value for each six-digit HS product over the period 1995-1999.

Table 6b - Sensitivity Analysis, by Country

Eqn:	$t^{ij}_{wto} = \alpha^I + \alpha^j + \beta t^{ij}_{prewto} + \gamma \left[\ln(VM^{ijR})\right] + \epsilon^{ij}$					
		OLS			**Tobit**	
Sample	**Obs**	β	γ	R^2	β	γ
Albania	2172	0.2540***	0.0237	0.87	0.3196***	-0.0051
		(0.0208)	(0.0598)		(0.0256)	(0.0760)
Armenia	1213	0.2687***	-0.0842	0.88	0.3061***	-0.1130
		(0.0662)	(0.1004)		(0.0686)	(0.1265)
Cambodia	1632	0.4960***	-0.1532	0.95	0.4965***	-0.1569*
		(0.0273)	(0.1005)		(0.0136)	(0.0815)
China	4648	0.2575***	-0.5151***	0.87	0.2641***	-0.5438***
		(0.0207)	(0.0426)		(0.0077)	(0.0364)
Ecuador	3602	0.5642***	-0.2207***	0.97	0.5642***	-0.2207***
		(0.0226)	(0.0473)		(0.0182)	(0.0424)
Estonia	3647	0.1408	-0.2759***	0.87	0.1586	-0.3674***
		(0.1045)	(0.0498)		(0.1391)	(0.0553)
Georgia	1388	-0.2306**	-0.0494	0.90	-0.5032***	-0.0865
		(0.0973)	(0.0630)		(0.1599)	(0.0793)
Jordan	3334	0.6315***	-0.2929***	0.93	0.6506***	-0.3447***
		(0.0310)	(0.0665)		(0.0095)	(0.0664)
Kyrgyzstan	1576	-	-0.1344**	0.90	-	-0.1728***
		-	(0.0530)		-	(0.0631)
Latvia	3254	0.1213***	-0.3815***	0.86	0.1254***	-0.4348***
		(0.0377)	(0.0812)		(0.0239)	(0.0895)
Lithuania	3517	0.5043***	-0.2738***	0.85	0.5242***	-0.3351***
		(0.0441)	(0.0584)		(0.0222)	(0.0660)
Macedonia	2643	0.4619***	-0.1677***	0.86	0.6040***	-0.2152***
		(0.0174)	(0.0606)		(0.0158)	(0.0767)
Moldova	1872	0.4163***	0.0069	0.93	0.4752***	0.0010
		(0.0330)	(0.0418)		(0.0251)	(0.0520)
Nepal	1517	0.3571***	-0.7666***	0.94	0.3582***	-0.7764***
		(0.0383)	(0.1545)		(0.0182)	(0.1363)
Oman	2825	-0.4801	-0.3232**	0.77	-0.4911**	-0.3284***
		(0.5322)	(0.1305)		(0.2350)	(0.1121)
Panama	3691	0.1265***	-1.2466***	0.93	0.1289***	-1.2737***
		(0.0179)	(0.0792)		(0.0127)	(0.0729)

Notes: Standard errors are in parentheses (OLS are heteroskedasticity-robust). The labels *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Bold indicates a rejection of the terms-of-trade theory. Industry fixed effects, α_I, are at the two-digit HS product level. Country fixed effects are denoted by α_j. Fixed effect estimates are available upon request. The term t^{ij}_{wto} represents the final negotiated post-accession tariff binding. The term t^{ij}_{prewto} represents the average pre-accession MFN applied tariff over the sample at periods noted in Table 1. The term VM^{ijR} is the average yearly import value for each six-digit HS product over the period 1995-1999.

Table 6c: Sensitivity Analysis - NTB measures, Full Sample and by Industry

Equation	$t_{wto}^{ij} = \alpha^I + \alpha^j + \kappa \widehat{t^{ijR}} + \gamma\left[VM^{ijR}\right] + \epsilon^{ij}$						$t_{wto}^{ij} = \alpha^I + \alpha^j + \kappa \widehat{t^{ijR}} + \gamma\left[M^{ijR}/p^{wI}\right] + v^{ij}$					
		OLS			**Tobit**			**OLS**[a]			**Tobit**[a]	
Sample	**Obs**	κ	γ	R^2	κ	γ	**Obs**	κ	γ	R^2	κ	γ
All	30306	0.0765***	-0.005***	0.7718	0.0789***	-0.008***	29779	0.0754***	-0.0031*	0.7704	0.0774***	-0.0032**
		(0.0056)	(0.0010)		(0.0026)	(0.0015)		(0.0056)	(0.0017)		(0.0027)	(0.0013)
HS0	1456	0.0251	-0.1315**	0.7614	0.0243**	-0.1262**	1456	0.0248	-0.0415*	0.7604	0.024*	-0.0436
		(0.0183)	(0.0632)		(0.0123)	(0.0512)		(0.0184)	(0.0243)		(0.0123)	(0.0419)
HS1	1185	0.0359***	-0.0228***	0.78	0.0365***	-0.022*	1185	0.0362***	-0.0836***	0.7803	0.0373***	-0.0865**
		(0.0130)	(0.0078)		(0.0126)	(0.0113)		(0.0129)	(0.0260)		(0.0125)	(0.0365)
HS2	3064	0.1429***	-0.001	0.5548	0.143***	-0.0059	3040	0.1451***	-0.0377*	0.5552	0.1449***	-0.0404*
		(0.0419)	(0.0084)		(0.0148)	(0.0121)		(0.0423)	(0.0200)		(0.0149)	(0.0230)
HS3	2714	0.0252***	-0.0056***	0.8899	0.0245***	-0.006***	2714	0.0251***	-0.009***	0.8895	0.0244***	-0.0096***
		(0.0052)	(0.0010)		(0.0040)	(0.0014)		(0.0052)	(0.0033)		(0.0040)	(0.0036)
HS4	2194	0.0465***	-0.0132***	0.8892	0.0456***	-0.0138***	2194	0.0444***	-0.0333***	0.8891	0.0434***	-0.0371**
		(0.0093)	(0.0030)		(0.0071)	(0.0051)		(0.0090)	(0.0066)		(0.0070)	(0.0147)
HS5	3076	0.1483***	-0.0168***	0.9457	0.1483***	-0.0168***	3076	0.1505***	-0.0722***	0.9459	0.1506***	-0.0724***
		(0.0172)	(0.0034)		(0.0061)	(0.0024)		(0.0176)	(0.0108)		(0.0062)	(0.0096)
HS6	3036	0.0272***	-0.0113***	0.9793	0.0272***	-0.0113***	3036	0.0271***	-0.0053**	0.9792	0.0271***	-0.0053**
		(0.0046)	(0.0036)		(0.0035)	(0.0036)		(0.0046)	(0.0021)		(0.0035)	(0.0024)
HS7	3006	0.0667***	-0.0204***	0.8763	0.073***	-0.0189***	2836	0.0497***	-0.0019	0.8819	0.0533***	0.0089
		(0.0074)	(0.0039)		(0.0070)	(0.0060)		(0.0067)	(0.0065)		(0.0070)	(0.0133)
HS8	8012	0.0673***	-0.0041***	0.827	0.0684***	-0.007***	8012	0.0674***	-0.0174***	0.827	0.0686***	-0.0287***
		(0.0073)	(0.0010)		(0.0039)	(0.0015)		(0.0074)	(0.0064)		(0.0039)	(0.0064)
HS9	2563	0.0327***	-0.0113**	0.8502	0.0323***	-0.0125	2230	0.0325***	-0.1038**	0.8468	0.0323***	-0.1297***
		(0.0115)	(0.0055)		(0.0098)	(0.0088)		(0.0117)	(0.0429)		(0.0101)	(0.0333)
Notes	See Table 4a											

Table 6d: Sensitivity Analysis - NTB measures, by Country

Equation	$t_{wto}^{ij} = \alpha^I + \alpha^j + \kappa\widehat{t}^{ijR} + \gamma\left[VM^{ijR}\right] + \epsilon^{ij}$						$t_{wto}^{ij} = \alpha^I + \alpha^j + \kappa\widehat{t}^{ijR} + \gamma\left[M^{ijR}/p^{wI}\right] + v^{ij}$					
		OLS			**Tobit**			**OLS**[a]			**Tobit**[a]	
Sample	**Obs**	κ	γ	R^2	κ	γ	**Obs**	κ	γ	R^2	κ	γ
Albania	2084	0.1583***	0.0319	0.8677	0.2716***	0.0258	2066	0.1526***	-0.0113***	0.8665	0.2632***	-0.0109**
		(0.0229)	(0.0869)		(0.0230)	(0.0864)		(0.0225)	(0.0037)		(0.0231)	(0.0047)
China	4436	0.0499***	-0.0052***	0.8337	0.0523***	-0.0072***	4316	0.0435***	-0.001	0.837	0.0449***	-0.0011
		(0.0061)	(0.0009)		(0.0036)	(0.0009)		(0.0059)	(0.0029)		(0.0036)	(0.0029)
Ecuador	3266	0.025***	-0.0829**	0.97	0.025***	-0.0829***	3209	0.0257***	-0.0025***	0.969	0.0257***	-0.0025
		(0.0050)	(0.0371)		(0.0042)	(0.0164)		(0.0050)	(0.0007)		(0.0042)	(0.0016)
Estonia	3324	-0.0195	-0.0942***	0.8847	-0.0272	-0.1302***	3269	-0.0237**	-0.0049*	0.8837	-0.0358**	-0.0049*
		(0.0127)	(0.0244)		(0.0175)	(0.0272)		(0.0112)	(0.0028)		(0.0176)	(0.0029)
Jordan	3198	0.074***	-0.1449***	0.8459	0.0751***	-0.1866***	3148	0.0745***	-0.0059***	0.8466	0.0757***	-0.006
		(0.0102)	(0.0358)		(0.0054)	(0.0487)		(0.0102)	(0.0010)		(0.0054)	(0.0038)
Kyrgyzstan	1437	0.005	-0.1775*	0.9056	0.0062	-0.21***	1421	0.0063	-0.0004	0.9038	0.0078	-0.0004
		(0.0087)	(0.0961)		(0.0166)	(0.0761)		(0.0087)	(0.0008)		(0.0167)	(0.0035)
Latvia	3117	0.0097	-0.1031*	0.857	0.0112	-0.14***	3066	0.0105	-0.0181***	0.856	0.0118	-0.0181***
		(0.0125)	(0.0540)		(0.0075)	(0.0539)		(0.0124)	(0.0057)		(0.0076)	(0.0044)
Lithuania	3371	0.0431***	-0.0351**	0.8245	0.0463***	-0.0432*	3320	0.043***	-0.0026**	0.8237	0.046***	-0.0027
		(0.0094)	(0.0175)		(0.0076)	(0.0234)		(0.0095)	(0.0012)		(0.0076)	(0.0036)
Moldova	1789	0.02***	-0.0026	0.9113	0.0328***	-0.1291	1766	0.023***	0.0011	0.9123	0.0387***	0.0011
		(0.0068)	(0.0046)		(0.0097)	(0.1691)		(0.0074)	(0.0010)		(0.0099)	(0.0032)
Nepal	1462	0.3339***	-0.4009**	0.9429	0.3349***	-0.4082***	1439	0.3317***	0.0034	0.9423	0.3326***	0.0034
		(0.0397)	(0.1804)		(0.0177)	(0.1131)		(0.0400)	(0.0025)		(0.0179)	(0.0082)
Oman	2677	-0.0113	-0.0254**	0.7922	-0.0114	-0.0263*	2613	-0.0112	-0.003	0.7895	-0.0113	-0.003
		(0.0317)	(0.0124)		(0.0137)	(0.0157)		(0.0319)	(0.0036)		(0.0139)	(0.0070)
Notes	See Table 4a											

Table 6e: NTB Results – Country-specific γ and κ Estimates – HS8

$t_{wto}^{ij} = \alpha^I + \alpha^j + \sum_{j \in J} \kappa^j \widehat{t}^{ijR} + \sum_{j \in J} \gamma^j \left[VM^{ijR}\right] + \epsilon^{ij}$				
	OLS		**Tobit**	
Country	κ^j	γ^j	κ^j	γ^j
Albania	0.3094***	0.2502	0.3289***	0.241
	(0.0352)	(0.3080)	(0.0437)	(0.3909)
China	0.105***	-0.0036***	0.1061***	-0.0063***
	(0.0148)	(0.0009)	(0.0075)	(0.0014)
Ecuador	0.0478***	-0.0609	0.0449***	-0.0633*
	(0.0104)	(0.0440)	(0.0128)	(0.0348)
Estonia	0.0603	-0.118***	0.2211	-0.1896***
	(0.0993)	(0.0251)	(0.2261)	(0.0485)
Jordan	0.0463***	-0.0634	0.047***	-0.0714
	(0.0122)	(0.0569)	(0.0058)	(0.0479)
Kyrgyzstan	0.0192	-0.5924***	0.0239	-0.8612**
	(0.0127)	(0.1732)	(0.0280)	(0.3740)
Latvia	0.0275***	-0.0185	0.0333***	-0.0315
	(0.0053)	(0.0762)	(0.0118)	(0.0856)
Lithuania	-0.0199	-0.037*	-0.0231	-0.0357
	(0.0195)	(0.0204)	(0.0245)	(0.0339)
Moldova	-0.0629***	0.2135	-0.0938***	0.1955
	(0.0096)	(0.3382)	(0.0307)	(0.5394)
Nepal	0.2891***	-0.9279**	0.288***	-0.9455***
	(0.0337)	(0.4635)	(0.0173)	(0.2068)
Oman	-0.0063	-0.0122*	-0.0074	-0.0131
	(0.0288)	(0.0071)	(0.0430)	(0.0117)
R^2	0.8351		-	
Nobs	8012		8012	
Notes	See Table 4a			