Does the WTO Suffer from a Free-Riding Problem?*

Mostafa Beshkar
Indiana University

Ryan Lee
University of La Verne

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Abstract

The nondiscrimination/MFN clause in multilateral trade arrangements, which requires each member to treat all other members equally, is often suspected of creating a free-riding problem that leads to inefficiency in trade agreements. Concerns over free riding in cooperative arrangements has prompted several countries to pursue preferential and plurilateral deals to the detriment of multilateralism. This paper argues that the pattern of negotiated tariffs under the WTO show significant deviations from efficiency. Nevertheless, these inefficiencies cannot be attributed to an MFN-driven free-riding problem in negotiations. Instead, the observed patterns support the prediction of a political-economy model in which governments value the flexibility to adjust their trade policies in response to unverifiable political-economy shocks.

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1 Introduction

The Most-Favored Nation clause (MFN) is one of the key governing principles of the world trading system with far-reaching implications. This clause—which requires that any concession granted in a bilateral negotiation be extended *unconditionally* to the other members—is credited for fostering multilateral negotiations in different ways.[1] Notwithstanding its positive role in the multilateral trade cooperation, the MFN clause is often suspected of creating a free-riding problem. In particular, an unconditional extension of bilateral concessions to all the member countries enables a country that does not make any trade concessions, to profit, nonetheless, from tariff cuts and concessions made by other countries. As a result, the participation of interested exporting countries in tariff cut negotiations may be incomplete, leading to a suboptimal level of trade liberalization.

If the free-riding problem is perceived to be insurmountable, governments may even abandon multilateralism in favor of *exclusive plurilateralism*, which creates a club of countries with exclusive access to extra concessions made among them. To mitigate the apparent shortcomings of the WTO's multilateral approach in the past two decades, many plurilateral agreements have been proposed to rekindle the process of trade liberalization.[2]

Our objective in this paper is to determine whether the MFN-driven free-riding problem has affected the exchange of concessions among the members of the World Trade Organization in a significant way. Our finding, in a nutshell, is that the pattern of negotiated tariffs under the WTO show significant deviations from efficiency. Nevertheless, these inefficiencies cannot be attributed to a MFN-driven free-riding problem in negotiations. Instead, the observed patterns of negotiated tariffs support the prediction of a political-economy model in which governments value the flexibility to adjust their trade policies in response to unverifiable political-economy shocks.

[1]Without an MFN clause in a multilateral arrangement, the parties may hesitate to engage in early bilateral tariff cut negotiations out of the fear that the concessions they receive through early negotiations may be eroded subsequently if their bilateral partner offers lower tariffs to a third party. An MFN requirement, therefore, could foster liberalization by preventing the erosion of benefits from early agreements. Another important role for the MFN clause is identified by Bagwell and Staiger (1999), who show that along with the principle of Reciprocity, the MFN is a necessary rule to ensure efficiency of negotiated tariffs in a multilateral setting.

[2]Government Procurement Agreement and Information Technology Agreement are examples of plurilateral agreements under the WTO. Outside the WTO, various preferential trade agreements are effectively exclusive plurilateral agreements, which do not conform to the MFN clause.

A careful empirical analysis of this matter requires a conceptual model that predicts the pattern of tariff commitments with and without the MFN-driven free-riding problem. Our strategy, therefore, is to develop a hypothesis based on the free-riding theory and test it against alternative hypotheses regarding the variation of negotiated tariffs across countries and sectors.[3]

We base our analysis on the premise that the role of trade agreements is to internalize the Terms-of-Trade (ToT) externality of unilateral trade policies, but various obstacles in the negotiation process—such as the free-riding incentives—may prevent the parties from fully internalizing these externalities. Within this framework, import tariffs could improve a country's ToT at the expense of foreign countries by dampening the world price of its imports. Assuming efficient negotiations, a standard ToT analysis implies that any variation in negotiated tariffs should solely reflect the political-economy preferences of the governments across products—i.e., negotiated tariffs must be *independent* of the import market power of the importing country (Bagwell and Staiger 1999, 2002 and Grossman and Helpman 1995). In contrast, in the absence of a trade agreement, unilaterally chosen tariffs will be increasing in the level of the country's import market power in the respective sectors.

Ludema and Mayda (2013), henceforth LM, argue that because of the MFN-driven free-riding problem, the WTO members were unable to completely internalize the externalities of import tariffs. To elaborate, consider a case where multiple countries export a particular good to a specific importing country. Interested exporting countries could participate in formal negotiations with the importing country through which they would offer individual concessions to the importing country in exchange for tariff cuts. Because of the MFN clause, the tariff cuts will be applied to the imports from all WTO members regardless of whether they participated in the negotiations.

In deciding whether to participate in tariff cut negotiations with the importing country, an exporting country faces a tradeoff: By participating in the negotiations, an exporting country gives more incentive to the importing country to undertake a deeper tariff cut but it will also have to offer concessions of its own. Therefore, an exporting country will join the negotiations if and only if it has a sufficiently large stake in it, namely, iff it supplies a sufficiently large fraction of the importing

[3] The importance of considering alternative hypotheses in empirical analyses is well-known. However, Leamer's (1984, p. 46) critic that "the trade theories have usually been examined empirically without a clear statement of any alternative" continues to be relevant today.

country's demand.

Because the participation of the interested exporting countries in tariff-cut negotiations is incomplete, the negotiated tariffs will not fully internalize the terms of trade effect of tariffs. As a result, the negotiated tariffs will be still increasing in the import market power of the importing countries, especially in products where the free-riding problem is more severe.

The delegation theory of tariffs offers a starkly different hypothesis regarding the pattern of tariff commitments under the WTO. Based on a delegation theory of tariffs (Bagwell and Staiger 2005 and Amador and Bagwell 2013), Beshkar, Bond, and Rho (2015), henceforth BBR, argue that if governments care about flexibility in setting their trade policy (due to uncertain political-economy preferences, for example), the optimally-negotiated tariffs must depend *negatively* on the importing country's import market power. This negative relationship arises from the tradeoff between flexibility and externality: A higher negotiated tariff offers more flexibility while at the same time opens the door for greater negative externality from tariffs. Therefore, it is jointly optimal for the governments to put a stricter bound on tariffs in sectors that generate greater international externalities, i.e., sectors in which the importing country has a stronger import market power.

We evaluate, both theoretically and empirically, the potential roles that the MFN-driven free-riding and the flexibility-externality tradeoff play in the design of trade agreements. To this end, we extend the analyses of LM and BBR by proposing a hybrid model that incorporates the potential role of free riding in the tradeoff between flexibility and externality. Our model, therefore, provides a framework to compare the empirical relevance of the opposing patterns predicted by the flexibility-externality tradeoff and the free-riding problem.

A novel theoretical result—different from that of LM and BBR—arises under our hybrid model: In the presence of the MFN-driven free-riding problem, the effect of the Import Market Power (IMP) on the negotiated tariff caps is *non-monotonic* (see the solid graph in Figure 1.) In particular, there is a threshold of IMP below (above) which the negotiated tariff cap is decreasing (increasing) in IMP.[4] Coincidently, for values of IMP below this threshold, the negotiated tariff caps are *weakly binding*, meaning that under some states of the world, the importing country finds

[4] This finding modifies the results of both LM and BBR who claimed, respectively, that negotiated caps are increasing and non-increasing in IMP.

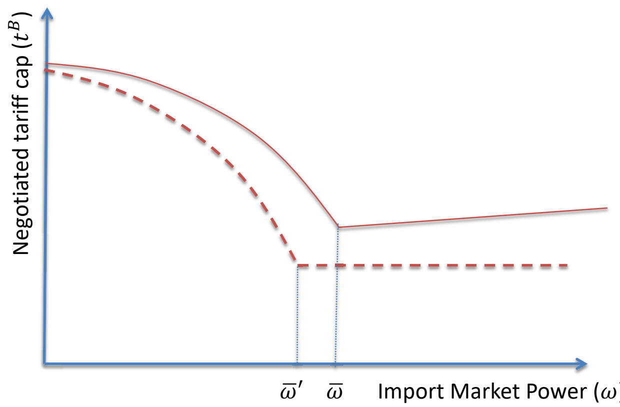

Figure 1: *Negotiated tariff caps as a function import market power. The solid (dashed) graph is related to a case with (without) an MFN-Driven Free-Riding Problem. See Proposition 1 for details.*

it optimal to choose a tariff below the cap, thereby generating a *tariff overhang*.[5] For values of IMP above this threshold, however, the negotiated caps are *strongly binding*, namely, the importing country will find the negotiated cap restrictive under all states of the world and, hence, no tariff overhang is ever observed.

Among the weakly-bound products, i.e., products in which governments retain some unilateral flexibility, the negotiated tariff caps are decreasing in IMP. The negative impact of IMP on the optimal tariff cap is due to the trade-off between flexibility and externality: Since the efficiency cost of providing flexibility increases with the level of IMP, it is optimal to provide less trade policy flexibility to the governments in products with greater IMP. Moreover, for products in which the free-riding problem is more severe, this negative relationship will be weaker, reflecting the inefficiency caused by free-riding in the negotiations.

In strongly-bound products, the binding rates are increasing in IMP *if and only if the free-riding problem exists*. Moreover, as the severity of free-riding problem increases, the relationship between negotiated tariffs and IMP becomes *more positive.* Without a free-riding problem, this model reduces to that of BBR, who predict no relationship between negotiated tariffs and IMP among strongly-bound products.[6]

It is impractical to empirically determine the critical threshold of IMP because it depends on various product-specific parameters that are unobservable to us. How-

[5]This phenomenon is sometimes referred to as water in tariff.
[6]Note the horizontal segment of the dashed-graph in Figure 1.

ever, the availability of applied tariff data for more than two decades enables us to designate the binding status of each product as strong or weak, depending on whether a tariff overhang has ever been observed in a given import product of a country. This categorization of tariff caps into weak and strong, which approximates the binding status that is defined in our theory, allows us to test the non-monotonic prediction of the model.

We test and compare the hypotheses of the above theories using the tariff binding data from the WTO, trade volumes, and various proxies for countries' import market power in an industry. Our strategy to uncover the effect of the MFN-driven free-riding problem is to identify any causal relationship between a country's tariff commitment in an industry and a measure of free-riding problem among the exporting countries. As articulated by LM, the extent of the free-riding problem is expected to be more severe in industries in which imports are originated from a larger number of foreign countries. In particular, LM propose an index of exporter concentration as a measure of free-riding problem among the exporters of a particular product to a particular importing country.

Our empirical findings strongly point to the tradeoff between flexibility and externality in negotiated tariff caps: Generally, negotiated tariffs are negatively related to the country's import market power in the concerned products. On the other hand, the predictions of the MFN-driven free riding theory are generally inconsistent with the observed variation in the data.

The difference between our empirical results and those generated in LM are primarily due to the use of different proxies for IMP and negotiated tariffs. As their main measure of IMP, LM use the degree of *product differentiation,* while we use the estimated inverse of the foreign export-supply elasticity.[7] Moreover, as their main measure of negotiated tariffs, LM use applied tariffs, which are different from negotiated tariffs in a substantial fraction of the tariff lines. An important advantage of our framework is that it specifically accounts for the difference between negotiated caps and applied tariffs, which is a prevalent feature of the observed tariffs in the WTO.

We argue that LM's finding that tariffs are increasing in the degree of product differentiation reveals the role of *Ramsey Taxation*, rather than ToT effects, in trade agreements. To see this, note that the degree of product differentiation is a

[7]For robustness check, we also use world import shares and import volumes as alternative measures of import market power.

direct measure of *demand elasticity* such that products with a lower degree of differentiation have a higher demand elasticity. Moreover, as we know from political-economy models such as Grossman and Helpman (1995), politically optimal tariffs are lower in products with more elastic demand. This result reflects a simple Ramsey Taxation argument in political-economy trade models: As also pointed out by Goldberg and Maggi (1999), in products with a higher demand elasticity, it is more costly for the government to transfer welfare to producers by means of taxing imports. Therefore, politically optimal import tariffs must be higher in products with a greater degree of product differentiation.[8]

Related Literature Our empirical findings confirms Bagwell and Staiger's (2011) observation that WTO negotiators, in effect, negotiated to limit the adverse ToT effects of unilateral trade policy. The additional insight from this paper is that in products with a lower degree of ToT externality, trade negotiations left room for unilateral flexibility and, hence, did not eliminate the ToT effects completely. Importantly, we also find that the failure to eliminate ToT effects does not seem to be driven by the free-riding problem.

In addition to limiting the ToT externality of unilateral trade policy, tariff-cut negotiations could also limit the ability of governments to use trade policy to *"delocate"* production from foreign countries to home.[9] As elaborated by Ossa (2011), the GATT/WTO negotiations, and especially the principle of reciprocity used in the negotiations, could be interpreted as an attempt to eliminate inefficient policies that are aimed at replacing imports with domestic production. In practice, the ability of the governments to delocate production is likely to be correlated with their ability to manipulate their ToT. Therefore, it would be difficult to empirically disentangle the ToT and delocation effects. Nevertheless, to the degree that ToT and delocation effects are correlated, our empirical results may also indicate the tradeoff between flexibility and *delocation* externality in tariff binding negotiations.

This paper highlights the existence of *unilateral* flexibility, i.e., tariff overhang, in the WTO and its implication for the variation of tariff commitments across products and countries.[10] There are, however, various other *contingent* flexibility mea-

[8]Also note that Product Differentiation Index does not vary across countries and it suppresses any determinants of import market power that emanate from the size of imports.

[9]For an in-depth discussion of various goals that trade agreements may achieve, see Maggi (2014), Grossman (2016) and Bagwell et al. (2016).

[10]Several studies, including Estevadeordal et al. (2008) and Bown (2014), confirm that countries

sures–such as that have likely affected the structure of tariff commitments under the WTO. Moreover, there is potentially a substitutability between tariff overhang and contingent protection measures. For example, Beshkar and Bond (2017) show that, theoretically, the availability of an escape clause leads to lower tariff binding commitments in products with greater import market power. Various empirical works provide evidence for the substitutability of alternative flexibility measures: Prusa and Li (2009) show that the use of antidumping measures are inversely related to the existence of tariff overhang. Similarly, Kuenzel (2017) show that a WTO dispute is more likely to arise in products with lower tariff overhangs. Finally, the empirical analysis of Bown and Crowley (2013) suggest that the ToT effects may influence the decision to adopt contingent protection measures.

After laying out our basic economic environment in Section 2, we introduce our model of negotiated tariffs in Section 3. In Section 4 we describe the data and proxies that we use. In section 5, we present our empirical methodology and findings. Section 6 provides concluding remarks.

2 The Basic Environment

In this section, we introduce a model of trade agreement under political uncertainty and the free-riding problem caused by the GATT/WTO's nondiscrimination clause, also known as Most-Favored Nation (MFN) Clause. We first briefly discuss the existing terms of trade models of tariff negotiations that emphasize the role of uncertainty and free-riding problem, respectively. We then offer a hybrid model that incorporates both of these issues.

Trade agreements are often viewed as a solution to the inefficiencies arising from noncooperative policymaking. An import tariff improves a country's terms of trade by depressing the world price of the imports, while generating a negative externality on the exporting countries. As argued by Bagwell and Staiger (1999), remedying the ToT externality is the sole benefit of trade agreements within a wide range of neoclassical trade models.

Consider an importing country, henceforth Home, with the following political welfare function in for a given product:

$$V(t;\theta) \equiv S(p(t)) + (1+\theta)\Pi(p(t)) + tp^*(t)m(p(t)), \tag{1}$$

use the policy flexibility provided by tariff overhang to adjust their applied tariffs unilaterally.

and an exporting country with the following welfare function in product k:

$$V^{*}(t) \equiv S^{*}\left(p^{*}(t)\right)+\Pi^{*}\left(p^{*}(t)\right), \tag{2}$$

where, $S(p)$, $\Pi(p)$, and $m(p)$ are the consumer surplus, the producer surplus, and the import demand function, respectively, and and $*$ indicates the corresponding variables for the exporting country. Moreover, the political parameter, θ, is the extra weight that the government assigns to the producer surplus compared to tariff revenues and consumer surplus.

Optimal noncooperative tariff of Home solves $t^{N}(\theta)=\arg\max_{t} V(t;\theta)$, which is implicitly given by

$$t^{N}=\omega+\theta\left(\frac{1+t^{N}}{\eta}\right), \tag{3}$$

where, $\omega=\left(p^{*}\frac{m^{*\prime}}{m^{*}}\right)^{-1}$ is the inverse of the Foreign export supply elasticity, and $\eta=-\frac{pm'}{y}$ is the product of the home import demand elasticity and the import penetration ratio. The noncooperative tariff, therefore, is increasing in the importing country's IMP, ω.[11]

The import demand elasticity of a product affects the level of the noncooperative tariff if and only if the government values the welfare of produces and consumers differently, i.e., iff $\theta \neq 0$. In particular, if $\theta > 0$, the noncooperative tariff is decreasing in the product's elasticity of demand. This relationship is akin to the Ramsey taxation idea: transferring welfare from consumers to producers is more costly the more elastic is the demand for that product. Therefore, the optimal tariff is decreasing in import demand elasticity.

The jointly efficient tariffs, i.e., the tariff rate that maximizes the joint welfare of the importing and the exporting countries, is the solution to $t^{E}(\theta)=\arg\max V(t;\theta)+V^{*}(t)$. Solving this problem yields the efficient tariff

$$t^{E}(\theta)=\frac{\theta}{\eta-\theta},$$

[11] Our analysis is conducted under a partial equilibrium model and we abstract from the presence of intermediate goods. Recent papers have shown that taking into account the general equilibrium linkages across products as well as the global input-output linkages generate intriguing results that are absent from our model (Beshkar and Lashkaripour, 2019, 2020). Nevertheless, the basic observation of our partial-equilibrium model remains true under those more general settings, namely, when countries have import market power at the level of products or industries, optimal tariffs will be inversely related to the foreign country's export supply function.

which is independent of the importing IMP, ω. Therefore, under an efficient trade agreement, any variation in negotiated tariffs should be independent of the variation in IMP and must solely reflect the preferences of the governments for income distribution and the cost of transfers as determined by demand elasticity and import penetration embodied in η.

The theoretical finding that efficiently-negotiated tariffs are independent of countries' IMP hinges on two key assumptions: *1) negotiations are perfectly efficient;* and *2) there is no uncertainty about the trade policy preferences of the governments.* In the next section, we relax both of these assumptions and show how ToT effects will affect the level of negotiated tariffs.

3 Multilateral Tariff Cap Negotiations

We propose a model of tariff negotiations that incorporates two main elements. First, multilateral negotiations may be affected by a free-riding problem. Second, the negotiators try to strike a balance between a desire for flexibility in tariff commitments and a desire for preventing beggar-thy-neighbor behavior in setting tariffs.

To model the desire for policy flexibility, we follow Amador and Bagwell (2013) and Beshkar, Bond, and Rho (2015) (henceforth, BBR), by assuming that tariff commitments are in the form of caps on the applied tariffs and that the political parameter θ is drawn from a probability distribution, $f(\theta)$. To capture the potential role of free-riding in negotiations, we extend these models to a multi-country setting by making two additional assumptions. First, applied tariffs must satisfy the MFN rule. Second, the negotiated tariff bindings maximize the joint welfare of the importing country and the exporting countries that *participate in negotiations*.

Free Riding The basic premise of the MFN-induced free-riding model is as follows. Some exporting countries may prefer to stay out of negotiations since the MFN rule allows them to receive the benefit of tariff cuts negotiated by other countries without having to offer any concessions in return. We let P and $\phi(P)$, respectively, denote the set of countries that participate in the negotiations and the fraction of the importing country's imports in this product that come from these countries. Due to the free-riding problem $\phi(P) < 1$. Moreover, the more severe the free riding problem is the lower is $\phi(P)$. For brevity, we henceforth use ϕ instead of $\phi(P)$.

As demonstrated by LM, the severity of the free-riding problem depends on the distribution of the export volumes from different countries: the more dispersed is the volume of exports the greater is the free-riding problem since most countries benefit little from negotiations. In contrast, if most of the export is originated from a small number of countries, the importing country will face more aggressive demands for liberalization and, thus, the negotiated tariffs will be lower. Therefore, we follow LM's finding and assume that $\phi(P)$ is decreasing in the degree of exporter concentration.

The Tariff Cap Mechanism As in Amador and Bagwell (2013) and Beshkar, Bond, and Rho (2015), we assume that tariff commitments are in the form of caps on applied tariffs and that the political parameter θ is drawn from a probability distribution, $f(\theta)$. If the tariff cap is sufficiently high, the importing country may find it optimal to apply a tariff below the binding, which generates a tariff overhang. In particular, letting t_B denote the tariff cap for a particular importing country-product pair, the tariff cap is binding if and only if

$$t_N(\theta) > t_B.$$

Therefore, since the unilaterally-optimal tariff, $t_N(\theta)$, is increasing in the political parameter, θ, there is a threshold of the political parameter, given by $\theta_B \equiv t_N^{-1}(t_B)$, below which the importing country finds it optimal to set a tariff below the tariff cap. In particular, given the tariff cap, t_B, the applied tariff is given by

$$t_A(\theta) = \begin{cases} t_N(\theta) & \text{if } \theta < \theta_B \\ t_B & \text{if } \theta \geq \theta_B \end{cases}$$

The Objective of Negotiations To reflect the inefficiency caused by the free-riding problem, we follow LM and assume that the negotiators ignore the effect of the chosen tariff cap on the payoffs of the exporting countries that do not participate in negotiations. More precisely, the objective of the negotiators is to choose a tariff cap that maximizes the expected joint welfare of the importing country and the exporting countries that *participate in negotiations*, P. Therefore, the optimal tariff cap, denoted by $t_B(P)$, is the solution to the following expected joint welfare maximization problem:

$$t_B(P) = \arg\max_{t_B} \int_{\underline{\theta}}^{\theta_B} \left[V(t_N(\theta);\theta) + \sum_{j\in P} V_j^*(t_N(\theta)) \right] f(\theta)d\theta + \int_{\theta_B}^{\bar{\theta}} \left[V(t_B;\theta) + \sum_{j\in P} V_j^*(t_B) \right] f(\theta)d\theta, \tag{4}$$

where V_j^* is the welfare of the exporting country j in this product, and θ_B is implicitly defined by $t_B \equiv t_N(\theta_B)$.

The first integral in (4) is the expected joint welfare of the participating countries when the unilaterally optimal tariff is lower than the binding, $t_N(\theta) < t_B$. Therefore, in this region, where, $\theta < \theta_B$, the importing country imposes its unilaterally optimal tariff, and there will be a positive tariff overhang. The second integral is the expected joint welfare of the countries for $\theta > \theta_B$, in which case the applied tariff is equal to the tariff cap.

Letting $\sum_{j\in P} V_j^*(t) \equiv \phi V^*(t)$, where $\phi \equiv \phi(P)$ is the share of trade originating from the participating countries, the FOC of the optimization problem 4 will be given by:

$$\int_{\theta_B}^{\bar{\theta}} \left[\frac{dV(t_B,\theta)}{dt} + \phi \frac{dV^*(t_B)}{dt} \right] f(\theta)\, d\theta = 0,$$

Noting that $V(t,\theta) = V(t,0) + \theta\Pi(p(t))$, the FOC may be rewritten as

$$\int_{\theta_B}^{\bar{\theta}} \left[\frac{dV(t_B,0)}{dt} + \phi \frac{dV^*(t_B)}{dt} + \theta \frac{d\Pi(t_B)}{dt} \right] f(\theta)\, d\theta = 0,$$

or

$$\left(\frac{dV(t_B,0)}{dt} + \phi \frac{dV^*(t_B)}{dt} \right) \int_{\theta_B}^{\bar{\theta}} f(\theta)\, d\theta + \frac{d\Pi(p)}{dp}\frac{dp}{dt} \int_{\theta_B}^{\bar{\theta}} \theta f(\theta)\, d\theta = 0.$$

Moreover, because $\frac{\int_{\theta_B}^{\bar{\theta}} \theta f(\theta) d\theta}{\int_{\theta_B}^{\bar{\theta}} f(\theta) d\theta} = E[\theta|\theta > \theta_B]$, this FOC may be written in the following form

$$\frac{\frac{dV(t_B,0)}{dt} + \phi \frac{dV^*(t_B)}{dt}}{\frac{d\Pi(p)}{dp}\frac{dp}{dt}} = E[\theta|\theta > \theta_B].$$

Using the properties of the welfare functions, the first-order condition (FOC) for

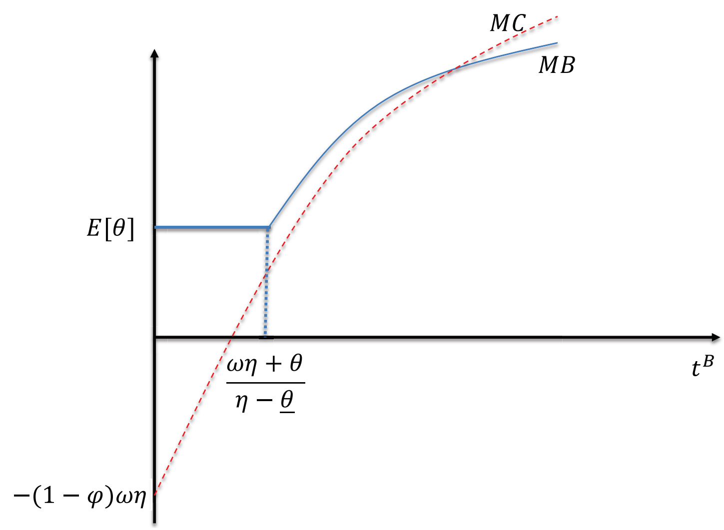

Figure 2: *Marginal benefits (Solid Line) vs. marginal costs (dashed line) of raising a tariff cap*

optimality may be written as

$$(t-(1-\phi)\,\omega)\,\frac{\eta}{1+t}=E[\theta|\theta>(t-\omega)\,\frac{\eta}{1+t}], \tag{5}$$

where, $\omega \equiv \frac{1}{\epsilon^*}$ is the inverse of foreign country's export supply elasticity, $\eta \equiv \epsilon z$, $\epsilon \equiv -p\frac{m'(p)}{m}$ is import demand elasticity, and $z = \frac{m}{s}$ is the import penetration ratio.

Equation (5) incorporates the two special cases of interest, i.e., BBR and LM. In particular, $\phi = 1$ represents a case in which the free riding problem is nonexistent, in which case Equation (5) will be identical to that of BBR. The other extreme is the case where there is no uncertainty or fluctuation in the value of the political economy parameter, θ. In this case, the negotiated tariff varies with the degree of the free-riding problem, ϕ, and the inverse of the foreign country's export supply elasticity, ω, namely,

$$t=\frac{\theta}{\eta-\theta}+\frac{1-\phi}{1-\theta/\eta}\omega.$$

Moreover, in this latter case, there will no tariff overhang, namely, the applied tariffs will be always equal to the negotiated bindings.

Figure 2 illustrates the FOC (5) graphically. The left-hand side of equation (5)—depicted by the dashed line in the figure—is the Marginal Costs (MC) of tariff for the joint welfare of the importing country and the participating exporters, which is increasing in t. Moreover, MC is increasing in the fraction of the total imports that comes from the participating exporters, ϕ, and decreasing in ω, if $\phi < 1$. The right-hand side of the FOC (5)—depicted by the solid line in the figure—is the Marginal Benefit (MB) of an increase in tariff, which is increasing in (independent of) t if $t > (\leq) \frac{\omega\eta+\underline{\theta}}{\eta-\underline{\theta}}$. Note that for sufficiently low tariff binding, MB becomes invariant to the level of tariffs (depicted as the flat part on the MB curve). The second-order condition for maximization is satisfied if the MC curve crosses the MB curve from below, as depicted in Figure 2.

The maximization problem yields a corner solution if MC crosses MB at its flat part (see Figure 2). Since the corner of the flat part is $t = \frac{\omega\eta+\underline{\theta}}{\eta-\underline{\theta}}$, this requires

$$\left(\frac{\omega\eta+\underline{\theta}}{\eta-\underline{\theta}} - (1-\phi)\,\omega\right)\frac{z\epsilon}{1+\frac{\omega\eta+\underline{\theta}}{\eta-\underline{\theta}}} > E[\theta],$$

or, equivalently,

$$\left(1+\frac{1}{\omega}\right)\frac{1}{\phi} < \frac{\eta-\underline{\theta}}{E[\theta]-\underline{\theta}}.$$

This condition indicates that a corner solution arises if the interaction of IMP and the share of trade by participating exporters is sufficiently large. At a corner solution, the optimal binding is increasing in IMP, but this increase is slower the higher is ϕ. At a corner solution, the applied tariffs will always be equal to negotiated tariffs and, hence, there is no tariff overhang under any states of the world. We refer to such negotiated tariffs as *strong binding*.

At an interior solution, the negotiated tariff is higher than unilaterally optimal tariffs under some states of the world, thereby generating tariff overhang. We refer to such negotiated tariff caps as *weak bindings* as they afford the importing country some flexibility in choosing its tariffs. At an interior solution an increase in ω shifts down both MC and MB curves. A downward shift in the MB tends to reduce the optimal binding, while a downward shift in the MC tends to increase the optimal binding. The rate of the shift in MB is slower the larger is ϕ. In particular, when $\phi = 1$, MB becomes invariant to ω. Therefore, there must exist a threshold value of ϕ above which the net effect of an increase in ω on optimal binding is negative.

The following proposition summarises the above findings on the effect of IMP and free-riding measure on negotiated tariffs:

Proposition 1. *(i)If $\left(1+\frac{1}{\omega}\right)\frac{1}{\phi} > \frac{\eta-\underline{\theta}}{E[\theta]-\underline{\theta}}$, there exists a local optimum under which tariff overhang is positive for some states of the world, θ. Moreover, for a sufficiently large $\phi < 1$,* *the optimal tariff binding is decreasing in ω and this correlation strengthens as ϕ increases.*

(ii) If $\left(1+\frac{1}{\omega}\right)\frac{1}{\phi} < \frac{\eta-\underline{\theta}}{E[\theta]-\underline{\theta}}$, there will be no tariff overhang under the optimal tariff binding, which is given by $t_B = \frac{E[\theta]+\eta(1-\phi)\omega}{\eta-E[\theta]}$. Moreover, if $\phi < 1$, the optimal tariff binding will be increasing in ω and this correlation diminishes as ϕ increases.

The first part of this Proposition states that when IMP (measured by the inverse of foreign export supply elasticity, ω) is relatively low, the relationship between the optimal tariff binding and IMP depends on exporter's participation rate in negotiations, measured by ϕ. In particular, for a sufficiently high rate of participation, optimal tariff binding is *declining* in IMP. This negative association is depicted by the declining segment of the solid graph (i.e., where $\omega < \bar{\omega}$) in Figure 1. For sufficiently low ϕ, this relationship is ambiguous. Nevertheless, for all values of ϕ, the relationship between the optimal binding and IMP will be *more negative* the higher is ϕ.

The second part of this Proposition states that when IMP is sufficiently large, the optimal binding is *strong*, i.e., no positive tariff overhang arises under any state of the world. Moreover, it states that among strongly bound products, the negotiated binding is increasing in the importing country's IMP. This positive association is depicted by the increasing part of the solid graph in Figure 1, where $\omega > \bar{\omega}$. The positive association between negotiated tariffs and IMP in this range is a consequence of the free-riding problem under which the negotiated tariffs do not fully internalize the ToT externality of tariffs. If no free-riding problem is present, i.e., if $\phi = 1$, the relationship between the negotiated binding and IMP is given by the dashed graph in this Figure. Note, specially, that in this case for $\omega > \bar{\omega}'$, the curve is flat and the negotiated tariffs are independent of IMP.

4 Data

We use the World Integrated Trade Solution (WITS) for data on MFN tariff binding and applied tariff rates. A natural choice of data for negotiated tariffs is the MFN binding rates that were negotiated in the Uruguay Round. Since the inception of the WTO in 1995, the MFN binding rates for original members have remained virtually unchanged.[12] For those countries that joined the WTO after 1995, we use

[12] As their main measure of negotiated tariffs, LM use applied tariffs. However, a central message of this paper is that due to the existence of tariff overhangs that vary substantially across products, using applied tariff rates to proxy for negotiated tariffs could be misleading.

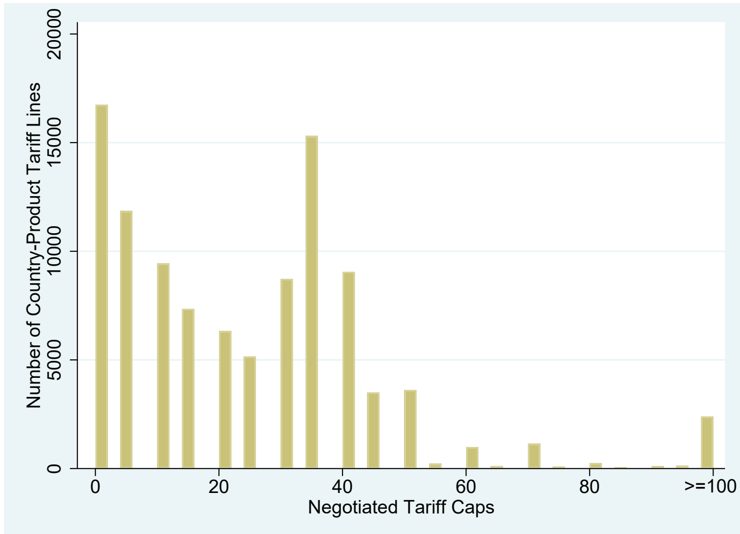

Figure 3: *Distribution of tariff cap rates (rounded down to the closest multiple of 5)*

the tariff caps that these countries were supposed to implement after a phase-in period. Figure 3 depicts the distribution of the tariff cap commitments.

The WITS provides tariff data that is aggregated at the six-digit level of HS codes. This data provides simple and weighted averages as well as the minimum and maximum of tariff rates under each six-digit industry. For robustness check, we test our hypotheses using each of these variables. We also use categorical variables for tariff caps by rounding down tariff caps to the closest multiple of 5.[13]

To calculate overhang status of each country-product, we use the MFN applied tariff rates from 1995 to 2007.[14] We label a tariff line as *strong binding* if there is no positive tariff overhang in any year between 1995 and 2007. Unbound products, i.e., products for which no tariff caps were negotiated, are dropped from the sample.[15] The remaining products, are labeled as weak binding. Only about 24% of product-country pairs in our sample have strongly binding tariff caps, 57% of which are bound at zero.

[13]Since our tariff data is constructed from an average of more detailed tariff rates, using this categorical variable could reduce the potential effect of measurement errors arising from averaging of tariffs.

[14]We confirmed that less restrictive definitions of weak binding generate similar results.

[15]Theoretically, unbound products could be considered as products for which an arbitrarily high tariff binding is negotiated. Including unbound products in our regressions slightly increases the significance of our results.

Measures of Import Market Power

The main explanatory variable in our analysis is Import Market Power (IMP). One of the empirical challenges in testing theories of tariff choices is to find a measure of IMP. Several measures of IMP have been suggested and used in the literature including the inverse of the foreign export elasticity (IFEE), import volume, share of the world imports, and product differentiation. These alternative measures are significantly correlated in our data.

We use the estimates of IFEE for six-digit HS products provided by Nicita, Olarreaga, and Silva (2018). As pointed out by Broda et al. (2008) and Nicita et al. (2018), elasticity measures are usually imprecisely estimated. Moreover, these elasticities are potentially affected by the existing tariffs and, thus, any regression of negotiated tariffs on IFEE may suffer from an endogeneity problem.[16]

To address the endogeneity of IFEE, we follow Nicita et al. by using two instrumental variables, namely, the weighted-sum of import demand elasticities in the rest-of-the-world.[17] While correlated with IFEE estimates, these instruments are unlikely to be affected by the trade policy of a given importing country. To mitigate the problem of imprecisely estimated IFEE measures, we follow the previous literature (Broda et al. 2008, Ludema and Mayda 2013, and Nicita et al. 2018) by using a categorical variable that is equal to 1 for high values of IFEE and zero otherwise.

As alternative measures of IMP, we use import volume (as in Bagwell and Staiger 2011) and the share of a country in that product's world trade (as in BBR and Beshkar and Bond 2017). In our regressions, we use log of these variables as well as a categorical variable that indicates high vs. low import volumes or shares.

To address the endogeneity of trade volumes as a measure of IMP, we use log of GDP and the interaction of log of GDP per Capita and Product Differentiation Index as instrumental variables. GDP would naturally affect the volume of imports in a product without being significantly affected by tariffs in those products. Moreover, the interaction of GDP per Capita and Product Differentiation Index captures, in a rough way, the fact that richer countries tend to import relatively more in highly differentiated products.

[16] Soderbery (2015) also points out that these elasticity measures might overestimate the true level of export supply elasticity. Though it may be important for calculating gains from trade, overestimated elasticities do not introduce a major problem for our analysis as we rely on the ranking–rather than the size– of export supply elasticities.

[17] Estimates of import demand elasticity are obtained from Kee et al. (2008)

Compared to IFEE, a drawback of import volume (and the corresponding world shares) as a measure of IMP is that it suppresses the information about variation of supply elasticity across products. Nevertheless, in comparison to IFEE, it better captures the variation of IMP across countries in the same product category.[18] Therefore, the IMP measures based on trade volumes should provide a useful robustness check for our results.

Exporter Concentration Index (ECI)

LM suggest that a measure of exporter concentration for each product-country pair could be used to proxy for the degree of free-riding problem in tariff cut negotiations. Following LM, we calculate an Exporter Concentration Index akin to the Herfindahl-Hirschman Index for each HS six-digit product k imported to country i, namely,

$$ECI_{ik} = \frac{\sum_{j \in WTO_i} M_{jik}^2}{(\sum_{j \in MFN_i} M_{jik})^2}, \tag{6}$$

where, $M_{ji,k}$ is the volume of exports from country j to country i in product k, WTO_i is the set of all WTO members excluding i's FTA partners, and MFN_i is the set of all trading partners of importer i with and MFN status excluding i's FTA partners. In other words, WTO_i is the set of all countries that would have been able to enter negotiation with i for MFN tariff cuts, and MFN_i is the set of all countries that would benefit from MFN tariff cuts of country i. [19]

It is appropriate to add a caveat in regard to interpreting ECI_{ik} as capturing the role of the principal-supplier rule and the free-riding problem in negotiations: The

[18]The estimates of IFEE do not accurately capture the variation of IMP across countries. For example, in the estimates provided by Broda et al. (2008), the median IFEE for China is lower than that of Paraguay and Algeria, and in par with that of Bolivia and Ukraine. This comparison is very counterintuitive given that China is a much larger economy. Therefore, IFEE estimates seem to capture more accurately the variation of IMP across products within each country.

[19]FTA members are defined as any country pair with an Economic Integration Agreement (EIA) classification number between 3 and 6, as calculated by Baier, Bergstrand, and Feng (2014). A value of 3 corresponds to an FTA, with higher values corresponding to a customs union, a common market, and an economic union. Following LM, we drop intra-Custom Union trade, e.g., trade between European Union members is dropped. As a robustness check FTA is amended to include PTAs, values of 1 or 2 in the EIA database. Here PTAs are either two-way agreements where tariffs are not fully eliminated, or a one-way preferential agreement, such as those involving GSP preferences. Trade data is from UN Comtrade at the six-digit level for 1994, with trade data from 1995, 1996, 2000, 2006, and 2007 supplementing missing importer-product observations from 1994, as well as providing data that more accurately reflects the behavior of new WTO members.

calculated Exporter Concentration Index is negatively and highly correlated with all measures of Import Market Power. The high correlation should be expected as larger markets could naturally accommodate a greater number of firms and varieties. However, due to its high correlation with IMP, ECI may confound the ToT and the free-riding effects.

Other Explanatory Variables

Product Differentiation Index Product differentiation Index—a binary variable provided by Rauch (1999)—is used by LM as their main measure of IMP. This choice is based on the argument that, other things equal, the residual supply of the foreign country is more elastic the more elastic is the foreign country's demand for the product. By construction, this measure does not vary across countries and does not capture the effect of import size or the elasticity of foreign supply on IMP. A major problem with using product differentiation as a measure of IMP is that this measure affects the optimal level of tariff directly through a channel that is distinct from IMP.

In models with politically motivated governments (as in Grossman and Helpman 1995), the optimal non-cooperative and cooperative tariffs are both decreasing in demand elasticity. This is essentially a Ramsey taxation argument: the consumption loss associated with an income transfer to the interest groups is higher in products with more elastic demand. Since higher product differentiation is associated with lower demand elasticity, the Ramsey taxation argument implies that the optimal tariff should be higher for differentiated products. Therefore, it is not justifiable to attribute the positive association between negotiated tariffs and product differentiation to the effect of ToT on trade agreements.

Political Stability We use the World Bank Governance Index, specifically the Political Stability and Absence of Violence measure, to control for country-specific political factors that may affect governments' preference for flexibility. The Governance Index is calculated by aggregating data on governments from a variety of sources including consumer and firm surveys and expert opinions. The construction of the index makes use of 35 data sources from 32 organizations. Our results are robust to various political stability measures provided by the World Bank and the Economist Intelligence Unit.

Table 1: *All Products – No IVs*

	OLS			Tobit		
	Full Sample (1)	LM Countries (2)	Original WTO (3)	Full Sample (4)	LM Countries (5)	Original WTO (6)
IMP (β_1)	-6.535***	-4.153***	-6.428***	-8.417***	-5.595**	-8.402***
	(1.781)	(1.458)	(1.907)	(2.461)	(2.219)	(2.713)
IMP x ECI (β_2)	2.461	0.311	1.892	3.366	0.714	2.775
	(1.575)	(1.418)	(1.728)	(2.076)	(1.847)	(2.312)
ECI	5.469**	7.123**	5.429**	5.313**	7.129**	5.206**
	(2.200)	(3.058)	(2.294)	(2.461)	(3.479)	(2.562)
FTAShare/Mu	0.0181	0.0658*	0.0179	0.0224	0.576**	0.0220
	(0.0130)	(0.0381)	(0.0122)	(0.0185)	(0.259)	(0.0174)
Prod Diff Index (PDI)	2.123***	1.975***	2.344***	2.883***	2.916***	3.235***
	(0.498)	(0.518)	(0.522)	(0.634)	(0.722)	(0.683)
Pol Stability	-9.075***	-12.74***	-10.61***	-12.13***	-15.93***	-13.82***
	(1.785)	(1.373)	(1.721)	(2.392)	(2.206)	(2.423)
Constant	26.82***	28.29***	29.64***	24.06***	25.54***	26.86***
	(4.085)	(5.878)	(4.382)	(4.605)	(6.650)	(4.952)
Observations	102,441	59,622	91,608	102,441	59,622	91,608

[1] SEs clustered at Country level
[2] *** p<0.01, ** p<0.05, * p<0.1
[3] HS2 dummies included in all estimations.

5 Evidence

To test the role of import market power and the free-riding problem in tariff cap negotiations, we estimate the following equation that is suggested by LM:

$$t_{ik}^{B} = \alpha + \beta_1 IMP_{ik} + \beta_2 IMP_{ik} * ECI_{ik} + \Gamma_{ik} + \Phi_i + \Psi_k + \epsilon_{ik}. \quad (7)$$

In this equation, i and k are importer and product indexes, respectively, t_{ik}^{B} is the tariff binding rate, IMP_i is a measure of import market power, and ECI_{ik} is the exporter concentration index. Other product and country-level variables are included in Γ_{ik}, Φ_i, and Ψ_k. In all regressions, we include a two-digit industry dummy and either a country dummy or a country-level index of Political Stability. We also control for the effect of including ECI_{ik} and the ratio of within-FTA trade to import demand elasticity ($FTAShare_{ik}/\mu_{ik}$, as suggested by LM), and the Product Differentiation Index (PDI). Finally, we also run our regressions on various subsamples of countries including the original WTO members and the countries included in LM.[20]

Proposition 1 states that the MFN-driven free-riding concerns and the flexibility-externality tradeoff have opposing effects on the relationship between import market power and negotiated tariffs. In particular, other things equal, the free-riding problem predicts a positive estimate for β_1, while the flexibility-externality tradeoff generally predicts a negative relationship. More precisely, the

[20] The list of countries in our study is provided in Table 8.

Table 2: *All Products – IV OLS*

	Full Sample				LM Countries		Original WTO
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IMP (β_1)	-27.37***	-27.20***	-24.96***	-55.98***	-31.39**	-32.33***	-29.03***
	(8.026)	(8.383)	(7.709)	(8.554)	(13.21)	(12.06)	(9.087)
IMP x ECI (β_2)	35.09***	35.15***	32.04***	48.77***	43.11**	43.14**	36.22***
	(12.16)	(13.03)	(12.13)	(16.58)	(18.80)	(17.67)	(13.94)
ECI	-22.77***	-22.85***	-20.82***	-28.69***	-29.50**	-29.59**	-24.00***
	(7.944)	(8.574)	(7.916)	(10.92)	(13.01)	(12.03)	(9.119)
FTAShare/Mu		0.00335	0.00192	0.0128	0.0132	0.00123	0.00147
		(0.00299)	(0.00175)	(0.0112)	(0.0100)	(0.00712)	(0.00179)
Prod Diff Index (PDI)			1.590***	2.962***		1.885***	1.770***
			(0.468)	(0.568)		(0.522)	(0.516)
Pol Stability				-7.799***			
				(1.683)			
Constant	33.02***	33.00***	29.99***	61.81***	57.30***	55.74***	33.18***
	(6.740)	(7.031)	(6.499)	(7.961)	(11.45)	(10.50)	(7.515)
Observations	128,830	126,037	102,637	102,441	73,189	59,818	91,804
Weak Instrument F-Stat	46.56	53.64	52.37	13.85	28.93	30.53	51.12
Underid p	0	0	0	0	0	0	0

[1] SEs clustered at Country level
[2] *** p<0.01, ** p<0.05, * p<0.1
[3] HS2 dummies included in all estimations.
[4] Country dummies included in all estimations where Pol Stability is not included.
[5] IMP is instrumented with ROW Import Demand Elasticity.

flexibility-externality tradeoff predicts that for *weakly-bound* products, the negotiated tariffs must be decreasing in IMP, while for *strongly-bound* products no relationship between market power and tariff levels is expected. It is, therefore, an empirical question whether free-riding concerns or the flexibility-externality tradeoffs dominate in practice.

A first look at the data reveals a strongly negative effect of import market power (IMP_{ik}) on negotiated tariff caps—i.e., $\beta_1 < 0$. In Tables 1, 2, and 3, we present the estimates of Equation 7, with and without instrumental variables on the entire sample of tariff lines that are bound by a negotiated tariff cap. Recall that while a pure free-riding model predicts a positive estimate for β_1, a pure flexibility-externality model predicts a negative relationship. The negative estimates of β_1 imply that even if free-riding has affected the negotiated caps, its effect is dominated by the flexibility-externality tradeoff.

To dig further for evidence of free-riding, we can evaluate the estimates of β_2, i.e., the coefficient of the IMP-ECI interaction. That is because, as pointed out in Proposition 1, the free-riding problem is expected to be more severe for products in which exporters are spread across more countries. According to the free-riding

***Table 3:** All Products – IV Tobit*

	Full Sample				LM Countries		Original WTO
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IMP (β_1)	-32.82***	-31.67***	-28.09***	-76.95***	-38.80**	-38.02***	-33.41***
	(9.048)	(9.767)	(9.123)	(10.61)	(15.75)	(14.40)	(10.80)
IMP x ECI (β_2)	36.49***	35.29**	31.20**	61.70***	49.08**	47.70**	36.83**
	(13.96)	(15.14)	(14.26)	(18.35)	(21.94)	(20.61)	(16.50)
ECI	-24.39***	-23.56**	-20.79**	-38.52***	-34.68**	-33.57**	-25.02**
	(9.072)	(9.923)	(9.293)	(12.17)	(15.16)	(14.08)	(10.77)
FTAShare/Mu		0.00364	0.00244	0.0144	0.0359***	0.0650	0.00192
		(0.00422)	(0.00306)	(0.0157)	(0.0119)	(0.0463)	(0.00313)
Prod Diff Index (PDI)			2.231***	4.194***		2.820***	2.549***
			(0.572)	(0.782)		(0.705)	(0.634)
Pol Stability				-10.23***			
				(2.090)			
Constant	36.02***	35.24***	31.05***	72.49***	62.09***	58.87***	35.03***
	(7.793)	(8.316)	(7.770)	(9.405)	(13.73)	(12.57)	(9.059)
Observations	128,830	126,037	102,637	102,441	73,189	59,818	91,804
Wald Exogeniety p-value	0	0	0	0	0.013	0.005	0.001

[1] SEs clustered at Country level
[2] *** p<0.01, ** p<0.05, * p<0.1
[3] HS2 dummies included in all estimations.
[4] Country dummies included in all estimations where Pol Stability is not included.
[5] IMP is instrumented with ROW Import Demand Elasticity.

theory, therefore, we must observe a negative β_2. The estimates of β_2, however, are generally non-negative and in some cases positive and statistically significant.

The estimate of Product Differentiation Index (PDI) is positive and significant, providing support of the Ramsey Taxation argument: Other things equal, politically optimal tariffs are lower in products with more elastic demand (Grossman and Helpman, 1995). This positive relationship is also found by LM, although they attribute this relationship to the terms of trade effects. That is because, as we mentioned in the Introduction, LM use PDI as their main proxy for IMP.

5.1 Weak monotonicity in the relationship between market power and negotiated tariffs

So far, we have estimated Equation (7) on the entire sample of products. Our theory, however, suggests that the relationship between market power and negotiated tariffs will be non-monotonic if free riding problem is significant. Our theory, therefore, provides another chance to obtain corroborating evidence for the effect of free-riding problem in tariff cut negotiations. In particular, in the presence of an MFN-driven free riding problem, tariff caps must be increasing in IMP for the subsample of industries in which the negotiated tariff caps are strongly binding.

The flexibility-externality tradeoff predicts a weakly-monotonic relationship

***Table 4:** Weak Binding Products – IV OLS*

	Full Sample				LM Countries		Original WTO
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IMP (β_1)	-37.65***	-38.32***	-33.32***	-45.62***	-50.56***	-48.63***	-39.06***
	(9.839)	(10.38)	(9.871)	(12.44)	(15.67)	(13.85)	(11.21)
IMP x ECI (β_2)	57.67***	60.02***	53.46***	53.07***	77.37***	74.61***	60.61***
	(15.58)	(16.86)	(16.70)	(19.71)	(22.80)	(20.34)	(18.55)
ECI	-35.67***	-37.28***	-33.34***	-28.38**	-50.27***	-48.61***	-38.30***
	(9.898)	(10.77)	(10.54)	(12.41)	(15.48)	(13.50)	(11.74)
FTAShare/Mu		0.00540	0.00352	0.0146	0.0523***	0.0785	0.00323
		(0.00479)	(0.00278)	(0.0121)	(0.0149)	(0.0586)	(0.00298)
Prod Diff Index (PDI)			1.462**	2.416***		2.085***	1.660***
			(0.582)	(0.666)		(0.674)	(0.611)
Pol Stability				-6.248***			
				(1.907)			
Constant	40.96***	41.56***	36.50***	61.64***	72.46***	68.46***	41.01***
	(8.182)	(8.535)	(8.029)	(10.44)	(13.45)	(12.02)	(9.010)
Observations	97,072	95,269	77,502	77,307	53,090	43,315	70,850
Weak Instrument F-Stat	46	48.48	48.24	47.73	13.66	15.43	42.67
Underid p	0	0	0	0	0	0	0

[1] SEs clustered at Country level
[2] *** p<0.01, ** p<0.05, * p<0.1
[3] HS2 dummies included in all estimations.
[4] Country dummies included in all estimations where Pol Stability is not included.
[5] IMP is instrumented with ROW Import Demand Elasticity.

between market power and negotiated tariffs. In particular, the negotiated tariff caps are predicted to be decreasing in IMP only up to the point where the caps become strongly binding, that is, when no tariff overhang will be observed. For strongly-bound products, the theory predicts no relationship between import market power and negotiated tariff caps. Therefore, as suggested by Proposition 1, in order to address the *non-monotonic* relationship between IMP and negotiated tariffs, we now estimate Equation 7 on two separate subsamples, namely, the subsamples of weakly- and strongly-bound products.

As reported in Table 3, the estimation of Equation 7 on the sample of weakly-bound products indicate that $\beta_1 < 0$, i.e., the effect of import market power (IMP_{ik}) on negotiated tariffs is negative and significant. The negative relationship between negotiated tariffs and import market power once again lends support to the theoretical finding that under an optimal agreement *products with a greater* ToT *externality will be given a smaller degree of trade policy flexibility.* To interpret the negative sign of β_1 on the sample of the weakly-bound products, note that there are two opposite forces that determine the sign and size of β_1 : The MFN-driven free-riding theory that predicts a positive β_1, and the flexibility-commitment theory predicts a posi-

Table 5: *Strong Binding Products – Tobit*

	Full Sample			LM Countries			Original WTO
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IMP (β_1)	-1.122	-1.264	-1.078	-1.024	-0.980	-0.523	-1.789
	(1.314)	(1.355)	(1.338)	(1.175)	(1.179)	(1.353)	(1.421)
IMP x ECI (β_2)	-1.913	-1.881	-2.009	0.590	0.458	-0.782	-2.135
	(1.451)	(1.556)	(1.665)	(2.012)	(2.034)	(2.353)	(1.746)
ECI	5.271*	5.431*	5.142*	-1.047	-0.963	0.000562	5.532*
	(2.841)	(2.914)	(2.704)	(2.392)	(2.435)	(2.724)	(3.229)
FTAShare/Mu		0.115	0.113		-0.0104	-0.00552	0.159
		(0.162)	(0.169)		(0.0113)	(0.0125)	(0.213)
Prod Diff Index (PDI)			3.034***			1.779***	3.674***
			(0.784)			(0.656)	(1.071)
Pol Stability	-10.75***	-10.87***	-10.81***				-12.74***
	(1.684)	(1.732)	(1.621)				(1.989)
Constant	-5.294	-5.736	-5.323	5.786	1.854	2.726	-5.546
	(4.955)	(5.413)	(5.766)	(7.326)	(7.951)	(8.372)	(7.815)
Observations	31,723	30,615	25,001	20,775	20,090	16,494	20,820

[1] SEs clustered at Country level
[2] *** p<0.01, ** p<0.05, * p<0.1
[3] HS2 dummies included in all estimations.
[4] Country dummies included in all estimations where Pol Stability is not included.

tive β_1 for weakly-bound products and $\beta_1 = 0$ for strongly-bound products. The negative sign of β_1 suggests that the flexibility-commitment trade off dominates the free-riding effects for weakly-bound products.

Tables 5 and 6 provide Tobit estimation results (with and without IVs) on the sample of strongly-bound products.[21] If free-riding effects are present, they must manifest themselves in the subsample of strongly-bound products. The estimates of β_1, however, are not different from zero for this subsample, which supports the prediction of the flexibility-externality tradeoff theory.

The MFN-driven free-riding theory further predicts that β_2 must be negative, implying a milder free-riding problem in products where exporters are concentrated in fewer countries, i.e., a higher ECI_{ik}. However, the estimated β_2 are generally non-negative.

In summary, our key empirical finding is that the flexibility-externality tradeoff could explain a substantial part of the variation in negotiated tariffs, while the free-riding problem does not have a noticeable effect on the pattern of negotiated tariffs.

[21] A Tobit regression is the appropriate specification to use here since the subsample of strongly-bound products include products with a zero tariff binding.

Table 6: *Strong Binding Products – IV Tobit*

	Full Sample			LM Countries			Original WTO
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IMP (β_1)	-6.200	-3.957	-12.71	-12.06	-12.15	-18.54	-17.97
	(12.26)	(12.69)	(12.38)	(12.34)	(12.59)	(11.58)	(17.08)
IMP x ECI (β_2)	4.188	0.0827	15.04	15.04	15.97	23.37**	30.98
	(17.45)	(17.29)	(17.88)	(9.296)	(10.67)	(11.07)	(24.58)
ECI	0.229	3.595	-8.418	-13.14	-13.92	-20.22**	-19.90
	(14.34)	(14.50)	(14.28)	(8.293)	(9.236)	(9.530)	(19.70)
FTAShare/Mu		0.113	0.109		-0.0111	-0.00708	0.159
		(0.161)	(0.166)		(0.0114)	(0.0127)	(0.211)
Prod Diff Index (PDI)			3.084***			1.962***	3.474***
			(0.764)			(0.613)	(1.063)
Pol Stability	-10.59***	-10.74***	-10.59***				-12.91***
	(1.845)	(1.922)	(1.799)				(2.270)
Constant	-1.104	-3.598	4.311	9.866	9.392	14.84	8.530
	(11.00)	(11.50)	(11.41)	(9.274)	(10.06)	(10.32)	(15.40)
Observations	31,605	30,615	25,001	20,702	20,090	16,494	20,820
Wald Exogeniety p-value	0.916	0.971	0.595	0.260	0.338	0.0723	0.330

[1] SEs clustered at Country level
[2] *** p<0.01, ** p<0.05, * p<0.1
[3] HS2 dummies included in all estimations.
[4] Country dummies included in all estimations where Pol Stability is not included.
[5] IMP is instrumented with ROW Import Demand Elasticity.

6 Conclusion

This paper aims to reconcile conflicting results in the literature concerning how ToT effects matter for tariff negotiations. As articulated by Bagwell and Staiger (1999) and Grossman and Helpman (1995), the first-best trade agreements eliminate the ToT effects. Various empirical studies, including Ludema and Mayda (2013), Beshkar et al. (2015); Beshkar and Bond (2017), and Nicita et al. (2018), show that the real-world trade agreements deviate from this predicted first-best. However, these papers generate conflicting views about why the first-best is not achieved in negotiations and how ToT effects shaped the existing trade agreements.

In this paper we design and test a model that takes into account the uncertainty about future political-economy preferences and the MFN-driven free-riding problem in tariff negotiations. We predict that if there is significant uncertainty about future political-economy preferences, the governments tend to negotiate lower tariffs in products with larger ToT effects. Conversely, if the free-riding problem is a major factor in trade negotiations, tariffs tend to be larger in products with a greater ToT effect.

Testing this model using the WTO negotiated tariffs, we find overwhelming support for the view that uncertainty about future political-economy preferences have shaped the WTO agreement on tariffs. In particular, we find that negotiated tariffs are inversely related to the degree of the ToT effects in a product. This relationship reflects an important tradeoff that the negotiators face: A more stringent tariff binding reduces the negative ToT externality but at the same time it reduces the governments' ability to respond to uncertain political-economy shocks. Therefore, the weaker are the ToT effects, the greater is the value of providing flexibility to the governments through higher negotiated tariffs. The observed pattern of tariff commitments, however, are inconsistent with the prediction of a model featuring MFN-driven free-riding problems.

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Table 7: *Data Sources*

Data Source	Variable Name(s)	Description
UN Comtrade		Database of official international trade statistics
	Importer (iso3_d)	Importing Country
	Exporter (iso3_o)	Exporting Country
	Year (period)	Year of Trade
	Product (SixDigitHS)	6-digit HS 88/92 (Revision 0) Product Code
	Trade Volume (tradevalue)	CIF value in US Dollars of Imports; used to create ECI, FTA Share
Economic Integration Agreements		
	EIA	Denotes Level of Economic Integration
Rauch Product Classification		
	Product (sitc4)	4-digit SITC Revision 2 Product Code
	Liberal Classification (lib)	=n if differentiated good, =w if homogenous good; liberal aggregation
	Conservative Classification (con)	=n if differentiated good, =w if homogenous good; conservative aggregation
World Bank Open Data		
	NY.GDP.MKTP.CD	GDP Current USD
	NY.GDP.PCAP.CD	GDP per Capita Current USD
World Bank Governance Index		Governance indicators for over 200 countries
	Political StabilityNoViolence	Political Stability and Absense of Violence
	GovernmentEffectiveness	Government Effectiveness
	ControlofCorruption	Control of Corruption
	RegulatoryQuality	Regulatory Quality
Nicita et al		Data from "Cooperation in WTOâs Tariff Waters?"
	Market Power	Inverse Foreign Export Supply Elasticity
	ROW Import Demand Elas	Rest of World Import Demand Elasticity
	Imp Demand Elas	Import Demand Elasticity
World Bank WITS - TRAINS		Database of official tariffs
	Tariff Binding (BND)	WTO-negotiated tariff cap (both simple and weighted averages)
	Applied Tariff (MFN)	Applied WTO MFN tariff (both simple and weighted averages)

Table 8: *The List of Countries Included in the Study*

Argentina*	El Salvador	Mauritius*	Thailand*
Australia*	European Union*	Mexico*	Togo
Belize*	Gabon*	Morocco*	Trinidad and Tobago
Bolivia*	Grenada*	New Zealand*	Tunisia*
Brazil*	Guatemala*	Nicaragua*	Turkey
Brunei Darussalam	Honduras	Norway*	Uganda
Burundi	Hong Kong	Paraguay	United States*
Canada*	Iceland*	Peru*	Uruguay
Central African Republic	India*	Singapore	Venezuela
Chile*	Indonesia*	South Korea*	
Colombia*	Japan*	Sri Lanka*	
Congo, Rep.	Macao	St. Lucia	
Costa Rica	Madagascar*	St. Vincent & the Grenadines*	
Dominica*	Malawi	Suriname	
Egypt	Malaysia*	Switzerland	

* Countries studied by LM.