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Oliver Lorz and Susanna Thede

Tariff Overhang and Aid: Theory and Empirics

Coordination: Bernd Hayo • Philipps-University Marburg
School of Business and Economics • Universitätsstraße 24, D-35032 Marburg
Tel: +49-6421-2823091, Fax: +49-6421-2823088, e-mail: hayo@wiwi.uni-marburg.de

Tariff Overhang and Aid:
Theory and Empirics

Oliver Lorz and Susanna Thede[1]

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Abstract

In this paper, we consider aid payments as a possible explanation for tariff overhangs. According to our hypothesis, rich countries may use development aid to pay for tariff concessions. Developing countries, in turn, may anticipate such a policy in the negotiations for tariff bindings. Setting the bound tariff rate at a relatively high level may then serve as a mechanism to incentivize rich countries to carry on with aid payments in the subsequent ``aid for trade'' game. We empirically examine this hypothesis using detailed data (at the 6-digit HS level) on bound and applied tariff rates under the Uruguay agreement. Our results provide strong support for the view that aid recipients are more likely to adopt tariff overhangs, that they implement larger tariff overhangs than non-recipient countries and that recipients of larger aid payments adopt tariff overhangs more frequently. We also find strong support of the theoretical model prediction that larger tariff overhangs are implemented by countries that receive more aid.

Keywords: Tariff binding, tariff overhang, foreign aid.

JEL Classification: F13, O19.

[1] Lorz: RWTH Aachen University, School of Business and Economics, 52056 Aachen, Germany, lorz@rwth-aachen.de. Thede (corresponding author): University of Malta, Institute for European Studies, 2080 Msida, Malta, susanna.thede@um.edu.mt.

1. Introduction

Most of world trade takes place under WTO (and former GATT) regulation: 75 percent of all countries are members of the organization and 11 percent of those that remain are under observation to acquire membership. Almost all tariffs are thereby subject to regulation set in multilateral trade negotiations. The high participation in multilateral agreements reflects the success of the multilateral trade negotiation system in liberalizing world trade. In the light of this, it may appear surprising that many countries, especially in the developing world, have committed to tariff ceilings, so-called "tariff bounds", which exceed applied rates on most products so that much of world imports takes place under non-binding tariff constraints (see, e.g., WTO 2009).

This observation of a positive "tariff overhang" is difficult to reconcile with standard theoretical hypotheses on incentives for governments in trade negotiations. If special interest pressure determines protection, tariff outcomes of trade negotiations reflect the stakes of domestic and foreign industries (Grossman and Helpman, 1995). If tariffs arise from a motivation of manipulating the terms-of-trade to reap unilateral trade gains, trade negotiations can result in an internalization of these terms-of-trade externalities (Bagwell and Staiger, 1999). In both cases, there seems to be no reason to negotiate bound tariffs that substantially exceed applied tariff rates in non-cooperative equilibrium.

The negotiation of tariff ceilings instead of exact tariff rates can be explained, however, if additional factors are taken into account. In a setting in which capital is inter-sectorally mobile and interest group pressure influences domestic tariff policies, governments can opt for tariff bindings to counteract investment distortions (Maggi and Rodríguez-Clare, 2007). Other reasons for negotiating tariff ceilings are that governments prefer contract incompleteness because it reduces contracting costs (Horn et al., 2010) or because they are uncertain about future political pressure by special interest groups (Bagwell and Staiger, 2005). The tariff overhang reflects a trade-off between commitment and flexibility under the agreement and is lower under stronger importer market power because of stronger enforcement to reduce the tariff bound in negotiations and a starker terms-of-trade improvement of applied tariff protection (Beshkar et al., 2015).

In this paper, we examine a supplementary explanation for tariff bindings that hinges on the fact that developing countries, in general, stand for most and the largest tariff overhangs. According to our hypothesis, development aid may serve as an instrument to influence trade policies of developing countries. Actually, rich countries may buy access to the market of developing countries by promising aid payments for tariff concessions. Developing countries, in turn, may anticipate such a policy when negotiating the multilateral trade agreement. Setting the bound rate at a relatively high level may then serve as a mechanism to incentivize rich countries to carry on with aid payments in the subsequent ``aid for trade'' game. We empirically examine this hypothesis using detailed data (at the 6-digit HS level) on bound and applied tariff rates under the Uruguay agreement. The data, which is extracted from the TRAINS database, is complete with respect to GATT members participating in the Uruguay negotiations. We empirically investigate the relationship between product tariff overhang and aid in several ways: First, we estimate a Probit model linking the probability that a country adopts product tariff overhang to political-economy conditions. Our results provide stark support that aid recipients are more prone to adopt product tariff overhangs and that countries that receive more aid adopt product tariff overhangs more frequently. Second, a corresponding linear regression model is estimated using OLS and Heckman methods to investigate whether aid recipients negotiate tariff bounds that allow for larger product tariff overhangs. We find strong evidence of this. Third, we use OLS and Heckman methods to estimate a linear regression model linking the product tariff overhang to political-economy conditions including aid. The results provide strong support for the theoretical model prediction that countries with larger aid receipts implement larger product tariff overhangs.

The rest of this paper is structured as follows: In the next section, a comprised description of related literature is provided to place our contribution in perspective. A theoretical model that illustrates main mechanisms at work is presented in section 3. A detailed overview of the tariff data is given in section 4 and the empirical investigation in its entirety is presented in section 5. The last section concludes.

2. Background

Market power is a central feature of multilateral trade negotiations. A classic argument for tariff protection is that the government of a country with market power can restrict imports to improve its term-of-trade. As this argument holds for the foreign trading partners as well, countries are likely to set tariffs at inefficiently high levels incurring losses in non-cooperative equilibrium. Governments acting on social welfare motives may therefore forge international trade agreements to enforce mutual tariff reductions. Terms-of-trade manipulation is counteracted by two pillars of the multilateral trade negotiation system, the non-discrimination and reciprocity principles (Bagwell and Staiger, 1999). Empirical evidence shows that elasticities of foreign export supply affect tariff implementation that is not subject to WTO regulation (Broda et al, 2008) so that larger tariff cuts are incurred upon WTO membership if importer market power is stronger (Bagwell and Staiger, 2011). The terms-of-trade incentive for protection may not be fully eliminated by participation in the multilateral trade negotiation system, however, due to exceptions from non-discrimination in its regulatory framework (Bagwell and Staiger, 1999) and because exporters with low stakes can free-ride on the most-favoured-nation tariff (Ludema and Mayda, 2013).[2]

That industry-specific interests influence tariff outcomes is well established in the political-economy literature. Tariff outcomes result in politically optimal equilibria if governments take into account political contributions of industry-specific interests in addition to implications for aggregate welfare of their constituency. The tariff rate is higher at a less elastic import demand due to the limited deadweight loss and higher at a larger ratio of domestic output to imports because of larger gains at stake of industry-specific interests and lower welfare costs (Grossman and Helpman, 1994).[3] In large countries, the tariff rate is also higher at a less elastic foreign export supply since there is an incentive to manipulate terms-of-trade (Grossman and Helpman, 1995). While the terms of trade effect can be neutralised by effective negotiation, the uneven political influence of interest groups are certain to filter into the agreement. A higher tariff rate results if industry interests in the importing country exert starker political power on their government compared to corresponding interests in the exporting country.

Governments can opt for negotiating tariff ceilings (weak bindings) instead of exact tariff rates (strong bindings) to ensure that they have the discretion to respond should shocks appear that affect policy-making con-

[2] Recent evidence by Ludema et al. (2015) indicate that the latter effect has been counteracted by the formation of preferential trade agreements, pointing to a building-block effect of preferential trade liberalization.

[3] The empirical relevance of the model has recently been placed under scrutiny by Imai et al. (2009 and 2013), who show that testing the model using quantile regressions overturns its support and uncovers a positive link between protection and import penetration.

straints.[4] Weak bindings enable governments to levy lower tariffs, and incur higher national welfare, in the absence of such events. Contracting costs can be important factors in explaining the negotiation focus on weak tariff bindings under uncertainty about future conditions (Horn et al., 2010). Bagwell and Staiger (2005) and Amador and Bagwell (2014) model the trade-off between allowing governments to react on the political influence of special interests and restricting the ability to manipulate the terms of trade. They show how a tariff ceiling may arise endogenously from this trade-off. A tariff ceiling also preserves the political influence of industry interests, which reduces their net returns of affecting the negotiation outcome. This lowers overinvestment due to expected protectionist support and thereby counteracts inefficiencies arising from a distorted allocation of capital (Maggi and Rodriguez-Claire, 2007).

Tariff overhang reflects flexibility in policy making, which is more valuable under political instability (Bagwell and Staiger, 2005; Beshkar et al., 2015). Policy makers facing prolonged periods of political uncertainty are thereby expected to be more prone to adopt tariff overhangs and to implement on-average larger tariff overhangs over time. The tariff overhang decreases with importer market power as the terms-of-trade externality of protection stimulates negotiation partners to exert more effort to reduce the bound rate and leads a higher applied tariff rate to be implemented under the agreement (Beshkar et al., 2015). Also, the gains from negotiating binding tariff reductions compared to contracting costs are increasing in importer market power (Nicita et al., 2013). Tariff overhangs should therefore be observed more often, and be larger on average, in countries and for products related to low importer market power.

The relationship between foreign aid and trade policies of recipient countries has been analyzed before in the literature. To our knowledge, none of the existing papers deals with its implications for tariff bindings. In Lahiri and Raimondos-Møller (1997) aid raises demand by recipient countries for the goods exported by the donor. Due to this effect, the donor country allocates more aid to a recipient country that has a low tariff rate. Lahiri et al. (2002) extend this analysis allowing the donor country to commit to aid payments that are contingent on subsequently set tariff rates by the recipients. Nanivazo and Lahiri (2011) analyze implications of conditional aid which is given as a prize depending on the tariff policy of recipient countries.

3. The model

Our model characterizes in stylized form international trade agreements between developed and developing countries, incorporating voluntary foreign aid payments. We consider a country in the North *N* facing a continuum of symmetric countries in the South *S* with mass 1. The country in *N* exports a final good q and can pay development aid to each country in *S*. Countries in *S* may raise tariffs on imports from *N* with tariff rate $\tau \geq 0$ and receive the aid payments a from *N*. Welfare of *N* and of its trading partner in *S* can be written in reduced form as $W_N(\tau, a)$ and $W_S(\tau, a)$. The underlying welfare functions are assumed to be twice differentiable and additively separable, i.e., $W_i(\tau, a) = V_i(\tau) + U_i(a)$, with $i = N, S$. We furthermore assume that welfare in *N* declines in the tariff rate τ, whereas welfare of the importing country in S first increases and then declines in τ such that there exists a strictly positive optimum tariff rate from the view of this country. Let the optimum tariff be denoted by $\hat{\tau} > 0$, i.e., $V_S{'}(\hat{\tau}) = 0$. Due to the negative spill-overs of the tariff to the exporting country, the tariff rate which maximizes joint welfare of the exporting country *N* and its importing trading partner from *S*

[4] In a related setting, Busch and Pelc (2014) compare tariff bindings with trade remedies under the WTO.

would be accordingly lower than $\hat{\tau}$. If we employ τ^* to denote this joint welfare maximizing tariff rate, then $0 \leq \tau^* < \hat{\tau}$. For the welfare effects of development aid, we consider a setting in which aid is not merely a lump-sum transfer between two countries but has positive allocative effects in the South. That is, aggregate welfare of both countries is maximized for an aid payment a^* strictly exceeding zero: $U_N'(a^*) + U_S'(a^*) = 0$ at $a^* > 0$. However, from the view of the North alone, the marginal utility from aid payments to the South is negative for all a: $U_N'(a^*) < 0$. Given these assumptions, all countries in S would set the tariff at the optimum rate $\hat{\tau}$ whereas country N would pay no development aid at all in a static non-cooperative setting without international agreements. If countries would negotiate a trade agreement, such an agreement would reduce the tariff in all countries of the South to the welfare maximizing level τ^* and still there would be no tariff overhang.

The outcome may change in a repeated game setting. As is well known, cooperative solutions may be supported by a subgame perfect equilibrium with an infinite time horizon (see, e.g., Dixit 1987, or Bagwell and Staiger, 1990). In our model, tariff concessions by a country in the South can be incentivized by aid payments from the North and vice versa. However, we may think of a number of real world situations in which such self-enforcing contracts may not come into being: For example, it could be that political conflicts prevent aid payments between two countries, or that no appropriate aid projects can be found, or that some governments may be short sighted or regarded as unreliable, etc. To account for this possibility in a tractable and straightforward manner, we assume that self-enforcing mechanisms for trade liberalization and aid can be established only for a subset of countries in the South. The other countries in the South keep the tariff at the bound rate τ^b and receive no aid. Ex ante, during the multilateral negotiations of the trade agreement, it is not known which countries in the South will be able to proceed with further self-enforcing trade liberalization and receive aid payments. Let π denote the share of these countries.

To determine the equilibrium with self-enforcing cooperation, we consider the following setting: First, the North and all countries in the South negotiate the tariff binding τ^b, which holds for all countries.[5] After the tariff binding has been set, a share π of randomly chosen countries in the South and the country in the North decide about their strategies for cooperative tariff and aid levels. For this stage, we assume the following trigger strategies: In period *t*, countries set their choice variables at the cooperative welfare maximizing levels, $a_t = a^*$ and $\tau_t = \tau^*$, but revert to the non-cooperative tariff and aid levels, i.e., $a_t = 0$ and $\tau_t = \tau^b$, for the remainder of the game if they observe a deviation from the cooperative outcome in their bilateral relationship. The tariff rate τ^b can only be binding at this stage if it is set below the optimum tariff $\hat{\tau}$ because otherwise a deviating country in S would prefer this optimum tariff rate. Given the trigger strategies, we can determine the necessary conditions for enforcement of the cooperative outcome. With δ as discount factor ($0 < \delta < 1$) and for a given aid level a, a country in S does not deviate as long as $V_S(\tau^b) + U_S(a) + \sum_{t=1}^{\infty} \delta^t \cdot [V_S(\tau^b) + U_S(0)] \leq \sum_{t=0}^{\infty} \delta^t [V_S(\tau^*) + U_S(a)]$. Rearranging yields

$$\delta \cdot [U_S(a) - U_S(0)] \geq V_S(\tau^b) - V_S(\tau^*) . \qquad \textit{Constraint S} \tag{1}$$

Similarly, country N does not deviate if $V_N(\tau^*) + U_N(0) + \sum_{t=1}^{\infty} \delta^t \cdot [V_N(\tau^b) + U_N(0)] \leq \sum_{t=0}^{\infty} \delta^t \cdot [V_N(\tau^*) + U_N(a)]$, or

[5] As countries in *S* are symmetric ex ante, we only consider symmetric tariff bindings.

$$U_N(0) - U_N(a) \leq \delta \cdot [V_N(\tau^*) - V_N(\tau^b)] . \qquad \textit{Constraint N}$$

(2)

Both constraints would be satisfied for $\tau^b = \tau^*$ and $a = 0$. If there were no aid payments, the tariff binding could be lowered to the joint welfare-maximizing rate. With a strictly positive aid level, constraint *N* requires a tariff overhang ($\tau^b > \tau^*$) to ensure incentive compatibility for country N. Similarly, according to constraint *S*, incentive compatibility for country S requires a positive level of aid if there is a tariff overhang. For both constraints to be satisfied with $a > 0$ and $\tau^b > 0$, the discount factor δ also has to be sufficiently large.

Define $\tau_S^b = \tau_S^b(a, \tau^*)$ as the critical tariff binding at which constraint (1) for the South is just satisfied as an equality. As the r.h.s. of (1) is increasing in the tariff binding, τ_S^b determines an upper limit for τ^b specifying the maximum tariff binding that can be set without inducing a country from *S* from choosing the bound tariff rate instead of the cooperative rate τ^*. Differentiating (1) yields

$$\frac{d\tau_S^b}{d\tau^*} = \frac{V_S'(\tau^*)}{V_S'(\tau^b)} > 0 \quad \text{and} \quad \frac{d\tau_S^b}{da} = \frac{\delta \cdot U_S'(a)}{V_S'(\tau^b)} > 0 .$$

(3)

The critical tariff binding for the South increases in the cooperative tariff rate τ^* as well as in the aid level a. Similarly, we can define a critical τ_N^b that determines a lower limit for country *N*, i.e., the minimum tariff binding that is incentive compatible for country *N*. For a higher tariff binding, country *N* would choose to pay no aid given that country *S* plays the trigger strategy. Differentiating (2), we obtain for country *N*

$$\frac{d\tau_N^b}{d\tau^*} = \frac{V_N'(\tau^*)}{V_N'(\tau^b)} > 0 \quad \text{and} \quad \frac{d\tau_N^b}{da} = \frac{U_N'(a)}{\delta \cdot V_N'(\tau^b)} > 0 .$$

(4)

The critical tariff binding for the North increases in the cooperative tariff rate as well as in the aid level. Since τ_S^b determines an upper limit and τ_N^b specifies a lower limit for the tariff binding, both incentive compatibility constraints can only be satisfied jointly if $\tau_N^b \leq \tau_S^b$. This is a necessary condition for the trigger strategy equilibrium to exist.

In the multilateral negotiations in the first stage of the game, governments set the bound tariff rates such that expected per period welfare of all countries is maximized, which is defined as follows:[6]

$$EW = \pi\, [V_N(\tau^*) + U_N(a^*) + V_S(\tau^*) + U_S(a^*)] + [1 - \pi][V_N(\tau^b) + U_N(0) + V_S(\tau^b) + U_S(0)] .$$

(5)

As *EW* declines in τ^b, the optimal bound rate has to be set as low as possible while still satisfying the incentive compatibility constraints.[7] The negotiated bound tariff in this setting is thus equal to τ_N^b with $a = a^*$.

According to equation (4), the negotiated bound rate could – at least in theory – be lowered if governments could commit to lower aid payments *ex ante*. [8] With a pre-commitment on a ceiling for the aid payment a^c, the opti-

[6] With objective function (5), we implicitly assume that side-payments between countries are allowed in the multilateral negotiation.

[7] In our model, governments have an incentive to keep tariff bindings low as they may determine the actual tariff rates. In a framework which incorporates risk about tariff rates, low bindings may also improve welfare due to stimulating market entry and trade (Sala et al. 2010; Handley, 2014).

[8] Another possible argument for linking trade agreements with foreign aid is analyzed by Maoz et al. (2011) who consider an endogenous growth model in which aid improves the international allocation of capital.

mum combination of a^c and τ^b can be found by maximizing (5) subject to constraint (2). From the first order conditions of this problem, we obtain the following condition:

$$\frac{\pi}{1-\pi}\cdot\frac{U_N'(a^c)\ +U_S'(a^c)}{V_N'(\tau^b)\ +V_S'(\tau^b)}=\frac{U_N'(a^c)}{V_N'(\tau^b)}.$$

(6)

As the r.h.s. of (6) is positive, the equation can only be satisfied if $a^c < a^*$. This would be an argument for linking the trade agreement with foreign aid. Since the level of aid influences the tariff binding, governments can improve welfare by considering both policies jointly in the trade agreement.

To provide a specific illustrative example for the results obtained so far, we analyze a simple partial equilibrium trade model, which is a stripped-down version of the framework employed in Bagwell and Staiger (2005). The model considers import market power as an argument for tariffs. Consumers in each country in *S* demand the import good q according to the linear function $d = 1 - p_S$, domestic producers in *S* supply the good according to $q_S = p_S/2$ and producers from country *N* supply the good according to $q_N = p_N$.[9] The tariff puts a wedge between prices in *S* and in *N*: $p_S = p_N + \tau$. Equilibrium prices and quantities are then given by

$$p_S=\frac{2+2\tau}{5},\quad p_N=\frac{2-3\tau}{5},\quad q_S=\frac{1+\tau}{5}\ ,\ \text{and}\ q_N=\frac{2-3\tau}{10}\quad\text{for}\ \ \tau\leq\frac{2}{3}.$$

(5)

Producer surplus is $\pi_N = (2-3\tau)^2/50$ in *N* and $\pi_S = (1+\tau)^2/25$ in *S*. Consumer surplus and tariff revenues are $\pi_S^d = (3-2\tau)^2/50$ and $T_S = \tau(2-3\tau)/5$. This yields an aggregate welfare derived from this particular trading relationship of

$$V_S(\tau)=\frac{11+12\tau-24\tau^2}{50}\quad\text{and}\ V_N(\tau)=\frac{4-12\tau+9\tau^2}{50}.$$

(6)

According to (6), $V_N(\tau)$ is decreasing in τ for $\tau \leq 2/3$. $V_S(\tau)$ is strictly concave in τ and has its maximum at $\tilde{\tau} = 1/4$, the optimum tariff rate from the view of an individual country in S. From the view of both countries together, $V_S(\tau) + V_N(\tau)$ is strictly concave in τ and has its maximum at the free trade level $\tau^* = 0$.

For the welfare effects of development aid, we choose a simple quadratic specification, i.e., we assume the following functional forms:

$$U_S(a)=\varphi a-\gamma\frac{a^2}{2}\quad\text{and}\ U_N(a)=-a\,.$$

(7)

For an interpretation of (7), suppose development aid is used to finance certain earmarked public goods in S that cannot be supplied otherwise. The parameter $\varphi > 1$ then determines the marginal benefit derived from these public goods whereas the quadratic term accounts for convex costs that limit the optimal level of aid. These costs could result, for example, from rent seeking behavior in the destination country.[10] With this specification, the aid level that maximizes aggregate welfare of both countries is $a^* = (\varphi - 1)/\gamma$.

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[9] For simplicity, there is no demand for the good in country *N*.

[10] To derive equation (7) in a rent seeking setting, consider a continuum of potential rent seekers in country *S*. Each potential rent seeker has to invest fixed costs f as a lottery ticket to win a rent seeking prize with an expected payoff $\mu \cdot a$, with $\mu < 1$. Fixed rent seeking costs f are distributed uniformly between 0 and $\bar{f} > \mu \cdot a$ and the mass of potential rent seekers is

Given the functional specifications of our example, the critical tariff binding derived from the incentive compatibility constraint (1) for a country in *S* is determined by

$$12\tau_S^b \cdot (1 - 2\tau_S^b) = 50\, a\delta \cdot \left(\varphi - \gamma \cdot \frac{a}{2}\right).$$

(1')

Constraint (2) for country *N* can be written as

$$3\,\delta\tau_N^b \cdot (4 - 3\tau_N^b) = 50 \cdot a.$$

(2')

Figure 1 illustrates the two critical tariff bindings τ_N^b and τ_S^b as determined in (1') and (2'), respectively. As described above, parameters have to be such that the necessary condition for existence of the trigger strategy equilibrium $\tau_N^b \le \tau_S^b$ is satisfied. This is the case if the discount factor is sufficiently high and as long as the aid payment does not exceed the first best level.[11]

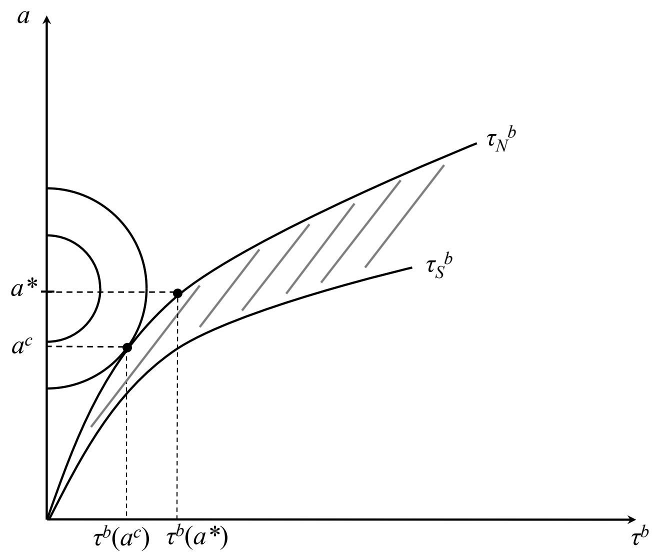

Figure 1

The critical tariff binding τ_N^b can be derived in closed form from equation (2') as

$$\tau_N^b = \frac{2}{3} - \sqrt{\frac{4}{9} - \frac{50\,a}{9\,\delta}}.$$

(9)

According to (9), the tariff binding and therefore the tariff overhang increases in the aid payment a and declines in the discount factor δ.

normalized to 1. In such a setting, all potential rent seekers with fixed costs less or equal to the critical cut-off $\mu \cdot a$ invest in rent seeking, such that aggregate rent seeking costs are $(\mu \cdot a)^2/(2\bar{f})$. If we define $\gamma = \mu^2/\bar{f}$, we obtain (7).

[11] Since $\tau_N^b = \tau_S^b = 0$ at $a = 0$, the condition $\tau_N^b \le \tau_S^b$ is satisfied for all positive a if $d\tau_b^N/da \le d\tau_b^S/da$. Totally differentiating (1') and (2') yields $\frac{d\tau_S^b}{da} = \frac{25\,\delta\cdot(\varphi-\gamma a)}{6\cdot(1-4\tau_S^b)}$ and $\frac{d\tau_N^b}{da} = \frac{25}{3\,\delta\cdot(2-3\tau_N^b)}$. Employing $\varphi - \gamma a^* = 1$ and taking the limit $\delta \to 1$ yields $d\tau_N^b/da < d\tau_S^b/da$ for $\tau_N^b = \tau_S^b > 0$ and $a \le a^*$.

Figure 1 can also be used to illustrate the case in which governments negotiate about an aid ceiling a^c in addition the tariff binding. The half circles around the unconstrained welfare maximizing aid level a^* are iso-welfare lines from the view of both governments. The tangency point between iso-welfare and constraint N determines the optimal combination of aid and tariff binding from the view of both countries.

4. Tariff Data

Our investigation is performed using data on WTO countries' tariff rates under the Uruguay agreement, which was implemented in its entirety in the year 2005.[12] The tariff data covers the 2005-2013 period. It is extracted from the most comprehensive and detailed tariff data set available, the UNCTAD TRAINS data base. Annual tariff reporting of GATT/WTO countries is incomplete in the TRAINS data base. This implies that the tariff data constitutes an uneven panel. The country coverage of the panel is complete with respect to GATT members participating in the Uruguay negotiations and includes 128 of the 135 countries that were WTO members in 2013.[13,14] The European Union, which adopts a supranational trade policy, enters into the sample as one country.

Product tariff overhangs are calculated at the 6-digit level of the combined nomenclature (CN) of the Harmonized System (HS) industry classification,[15] which is the most disaggregated level of common nomenclature adopted by WTO members. The product tariff overhang equals the gap, in percentage points, between the importer's bound and most-favored-nation (MFN) product tariff. This gap can be positive, equal to zero in case of binding MFN rates, or negative (when the applied MFN rate exceeds a set bound). Almost all tariff implementation falls into the first two categories in adherence to WTO regulation, which depicts that a country can only temporarily deviate from negotiated tariff rates (under exceptional circumstances). These categories, which stand for 97.5 percent of the observations, are retained to focus on regular tariff outcomes. The tariff overhangs are sometimes very large, exceeding 100 percentage points for 0.7 percent of the observations.

The histogram in Figure 2a displays the percentage distribution of tariff overhangs suppressing these outlier data points. Almost 40 percent of sample observations report binding MFN tariffs (zero overhang), implying that the majority of product MFN tariff rates are implemented below set bounds in the time period. It is evident that the tariff overhang distribution is incoherent with assumptions underlying standard estimation techniques, and tariff overhangs are transposed into (natural) logarithmic format for this reason (excluding observations with zero overhang). The resulting distribution (including outlier data points) is displayed in Figure 3b.

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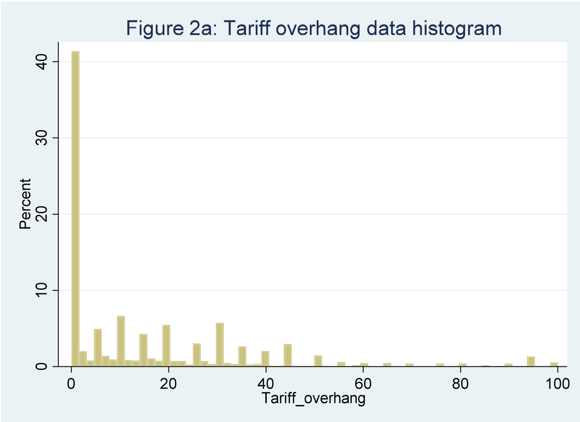
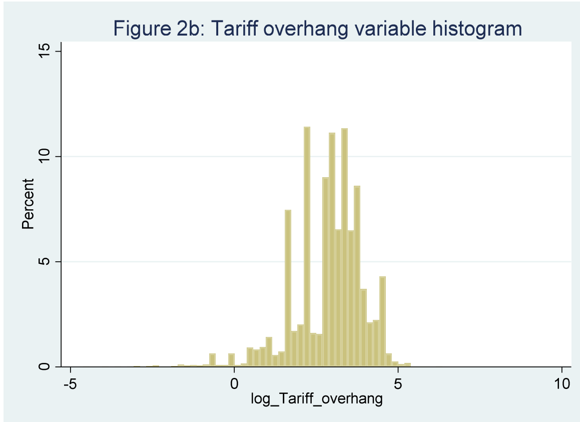
[12] The implementation of the agreement started on the 1st of January 1995 and ended for sensitive agricultural and textile products on the 1st of January 2005.

[13] No data is available for Liechtenstein, which formally entered the GATT in March 1994 (the agreement was signed in April the same year). The country's official stance is that it participated in the negotiations through the Swiss delegation.

[14] Data is lacking for countries that became WTO members in 2012 or 2013: Laos, Montenegro, Russia, Samoa, Tajikistan and Vanuatu.

[15] For example, the 2-digit industry category 'tobacco and tobacco products' (HS24) includes cigarettes, containing tobacco (HS240220) as a 6-digit product category.





In Table 1, we report descriptive statistics for our tariff sample. Product tariff overhangs are often large in relation to MFN rates. The average tariff overhang is 16.7 percentage points, which gives a government substantial leeway to increase its protection without breeching the agreement. Applied at the average MFN rate of 8.7 percent, this implies that the applied tariff rate can be almost tripled without allowing for retaliatory response under WTO regulation. A sample breakdown into developed and developing countries shows that these figures are strongly influenced by the fact that a large share of observations report tariffs of developing countries.[16] For developing countries, the average tariff overhang is 18.3 percentage points and the average bound and MFN tariff rates are 34.2 and 10.2 percent. The share of binding MFN tariffs is 64 percent for developed countries and 53 percent for developing countries, which is coherent with stylized evidence that developing countries are overrepresented in the utilization of tariff overhangs (see, e.g. WTO, 2009). LDCs adopt the largest tariff overhangs, averaging 20.2 percentage points, as well as the largest bound and MFN tariff rates equal to on average 54.5 and 13.2 percent.[17]

Table 1: Tariff data descriptive statistics (country-year means)

	Tariff overhang		Bound rate (%)		MFN rate (%)		
Sample	Average	St. Dev.	Average	St. Dev.	Average	St. Dev.	Nobs
Total	16.7	24.0	29.4	29.9	8.7	13.7	335,465
Developed countries	11.8	23.0	17.4	26.9	4.0	10.5	83,917
Developing countries	18.3	24.1	34.2	29.7	10.2	14.2	251,547
LDCs	20.2	33.0	54.5	37.8	13.2	9.4	59,760

[16] Developing countries are categorized based on the concurrent World Bank classification, including all low- and middle-income countries at the time of observation.
[17] LDCs are categorized by the UN classification. This includes Cape Verde for the years 2005 to 2007 (transition December 2007) and Maldives for the 2005-2010 period (transition January 2011).

5. Empirical approach

5.1 Empirical specification

Our model predictions on the relationship between product tariff overhangs and aid are investigated as follows: First, we examine if governments that are aid recipients are more prone to adopt tariff overhangs and if those governments that have larger aid receipts adopt tariff overhangs more frequently. Second, we investigate if governments that receive aid have larger tariff overhangs. Third, we analyze if larger tariff overhangs are implemented by governments that receive more aid. Political-economy constraints are captured by previously identified determinants and country-industry clustered standard errors are used when applicable to account for factors that could influence the tariff overhang in political equilibrium (Maggi and Rodrigues-Clare, 2007).

To examine if tariff overhangs are adopted more often by governments that are aid recipients, the following Probit model is used:

$$\Pr\left(Adopting\ tariff\ overhang_{ijk}\right) = \Phi(\alpha_j + \beta_1 Negotiating\ bound_{ijk} + \beta_2 Product\ import\ share_{ijk} + \beta_3 Market\ size_k + \beta_4 Political\ stability_k + \beta_5 Aid\ \ recipient_k), \quad (10)$$

where subscripts i, j, and k denote product, industry and country, Φ is the cumulative standard normal distribution function, $Adopting\ tariff\ overhang\ _{ijk}$ is a dummy variable taking the value one if the country has product tariff overhang, α_j is an industry-specific effect, $Negotiating\ bound_{ijk}$ is a dummy variable taking the value one if the country negotiated a bound (instead of applied MFN) product tariff rate in the Uruguay round, $Product\ import\ share_k$ is the country's product import share amongst WTO members capturing product importer market power (Beshkar et al., 2015), $Market\ size_k$ is the country's GDP level capturing country importer market power (Broda et al., 2008), $Political\ stability_k$ is the country's political stability capturing insulation from political shocks (Beshkar et al., 2015), and $Aid\ recipient_k$ is a dummy variable taking the value one if the country is an aid recipient. To investigate if tariff overhangs are used more frequently by governments that receive more aid, we use a Probit model including the same political-economy constraints and a variable measuring the country's aid receipts Aid_k. The Probit estimations are performed using country-industry clustered standard errors.

To examine if larger tariff overhangs are used by governments that receive aid, the following linear regression model is used:

$$Tariff\ overhang_{ijk} = \alpha_j + \beta_1 Product\ import\ share_{ijk} + \beta_2 Market\ size_k + \beta_3 Political\ stability_k \\ \beta_4 Aid\ \ recipient_k + \varepsilon_{ijk}, \quad (11)$$

where $Tariff\ overhang_{ijk}$ is the country's product tariff overhang and ε_{ijk} is an error term. To investigate if larger tariff overhangs are used by governments that receive more aid as predicted in our theoretical model, we use a linear model including the same political-economy constraints and the aid variable. The linear models are estimated using the OLS method with country-industry clustered standard errors. As observations of zero tariff overhang are omitted in these estimations, and the obtained least squares results may be subject to sample selection bias, supplementary estimations are performed using the Heckman method. Specifically, a Probit estimation of the selection equation at the first stage is used to compute the inverse Mills ratio which is added to the outcome equation estimated using the OLS method at the second stage.

The variable measurement is as follows. Continuous variables are averaged over the agreement time period (2005-2013). Products and industries are identified at the 6 and 2-digit level of the HS classification. Product import shares are calculated using WTO member import data from the UNCTAD COMTRADE data base. GDP levels are measured in inflation-adjusted US Dollars using nominal GDP levels and US Consumer Price Indices from the World Bank WDI data base. Political stability is measured using the ICRG political risk index from the PRS group in modified proportional form. This index, which decreases with political risk, is a weighted composite of underlying components measuring bureaucracy quality (4%), corruption (6%), democratic accountability (6%), ethnic tensions (6%), external conflict (12%), government stability (12%), internal conflict (12%), investment profile (12%), law and order (6%), military in politics (6%), religious tensions (6%) and socioeconomic conditions (12%).[18] Aid receipts comprise net official development assistance (given to poorer countries) and official aid (given to other countries), which are supplemented by null observations for donors of this aid.[19] These are measured in inflation-adjusted US Dollars using nominal aid levels and US Consumer Price Indices from the World Bank WDI data base. The GDP and aid levels are taken in natural logarithms due to stark uneven raw data variation.[20]

5.2 Estimation Results

In Table 2, the Probit estimation results of the probability to adopt tariff overhang and corresponding average marginal effects are presented for a benchmark equation including prior determinants in the second and third column, the equation including an aid receipt dummy variable (eq. 10) in the fourth and fifth column and the equation including aid in the sixth and seventh column. The empirical model performances are fine and all parameter estimates receive expected signs confirming that political-economy constraints and aid affect government discipline. As importer market power at product and country level gives less leeway to set high bounds in the negotiations and motivates the use of higher (optimal) protection, the probability of product tariff overhang is reduced on the margin. Better insulation from political shocks reduces the need to attain flexibility, limiting tariff bounds and the probability of resulting tariff overhangs. The political-economy constraints faced by governments mainly work through product importer market power and political stability. Governments that are aid recipients are more prone to adopt tariff overhangs with an effect that increases the probability of observing product tariff overhang by 0.12. Governments that receive more aid adopt tariff overhangs more frequently though this effect is limited.

TABLE 2 ABOUT HERE

In Table 3, the least squares and Heckman estimation results are presented for a benchmark equation in the second and fifth column, for the equation including an aid receipt dummy variable in the third and sixth column (eq.11), and the equation including aid in the fourth and seventh column. The empirical model performances are

[18] More detailed information about the ICRG index and its subcomponents is provided online by the PRS group. See https://www.prsgroup.com/wp-content/uploads/2012/11/icrgmethodology.pdf

[19] These countries are listed in the underlying OECD database from which the World Bank aid data is retrieved.

[20] To avoid data loss in the transformation, zero aid values have been exchanged for 0.001.

fine and the parameter estimates receive expected signs and stark statistical support. The Heckman results reveal that there is sample selection bias as implied by the (highly) significant and negative parameter estimate of the inverse Mills ratio. A comparison with corresponding least squares results suggests that this bias primarily stems from an overestimated restrictive impact of product importer market power. The effects of importer market power at product and country level and political stability are all important. For example, a one percentage change in country importer market power decreases the tariff overhang by 6.8 to 10 percent. Governments that receive aid have larger tariff overhangs with an effect that increases the tariff overhang by 84 percent (using the correction of Halvorsen and Palmquist, 1980). Evaluated at the tariff overhang mean, this corresponds to an increase of 14 percentage points. Governments that receive more aid adopt wider tariff overhangs. A one percent increase in aid receipts increases the tariff overhang by 2.21 percent, which corresponds to a 12.1 percent increase for a country that moves from the second to the third quartile of the aid distribution.

TABLE 3 ABOUT HERE

6. Conclusions

In this paper, we identified and analyzed development aid as a possible explanation for tariff overhangs, i.e., for gaps between negotiated tariff ceilings and actual tariff rates. According to our framework, tariff overhangs can be seen as a collateral to induce aid payments from developed to developing countries. Employing a simple theoretical model that combines voluntary cooperation on trade and aid policies in an infinite horizon framework with negotiations on tariff ceilings, we were able to derive a clear prediction concerning the relationship between aid and tariff bindings: The tariff overhang increases in the level of aid payments to ensure incentive compatibility for developed countries to pay aid. In our model, we could also determine the optimal combination of aid and tariff bindings that maximizes joint welfare if aid and tariffs are linked in an international agreement. In our empirical analysis, we employed three approaches to test for the predicted relationship between aid payments and tariff bindings: First, we set up a Probit-model to determine the factors which influence the probability of a positive tariff overhang. Second, given that a tariff overhang exists, we analyzed whether this overhang is larger for aid recipients and third, we looked at how a country's aid influences the size of the overhang. The results of all three empirical strategies are supportive of our hypothesis.

The incentive mechanism that was at the center of our study may also be present in other settings in which countries make voluntary policy concessions. The most direct application, which does not need to resort on development aid at all, would be mutual tariff reductions, i.e., tariff concessions by rich nations and developed countries. However, also in these settings rich countries may have strong reasons to rely on aid payments to stabilize voluntary tariff reductions: Aid may bring about efficiency gains such that its use can increase aggregate welfare (as in our paper). Developed countries may be reluctant to open their own import markets for developing countries and could thereby use aid as a substitute for granting market access. Finally, aid payments may be more transparent and stable compared to the gains from exporting – in particular for those developing countries that are specialized in export goods with highly volatile prices such as certain raw materials. Then rich countries may be inclined to prefer to pay aid as an incentive mechanism compared to own tariff concessions. Along these lines, a promising avenue for future research would be to compare the use of different policy instruments and their combination as mechanisms to stabilize voluntary tariff reductions.

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Table 2: Adopting tariff overhang results - Probit [a] estimations

Variable/Estimate	Coefficient	Marginal effect	Coefficient	Marginal effect	Coefficient	Marginal effect
Negotiating bound	3.157*** (0.055)	0.574*** (0.007)	3.183*** (0.054)	0.546*** (0.008)	3.202*** (0.055)	0.553*** (0.008)
Product import share	-2.532*** (0.190)	-0.460*** (0.036)	-2.734*** (0.200)	-0.469*** (0.037)	-2.653*** (0.199)	-0.458*** (0.037)
Market size	-0.108*** (0.013)	-0.020*** (0.002)	-0.050*** (0.015)	-0.009*** (0.002)	-0.059*** (0.014)	-0.010*** (0.002)
Political stability	-2.213** (0.234)	-0.402*** (0.040)	-1.490*** (0.270)	-0.256*** (0.045)	-1.516*** (0.277)	-0.262*** (0.047)
Aid recipient			0.685*** (0.075)	0.120*** (0.013)		
Aid receipts					0.023*** (0.003)	0.004*** (0.000)
Industry dummies	X		X		X	
R2/Pseudo R2	0.507		0.532		0.530	
LL	-134,417		-116,222		-116,832	
Nobs	410,676		373,099		373,099	

Notes: [a] Country-industry clustered standard errors reported within parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: Tariff overhang results – least squares[a] and Heckman estimations

Method	OLS	OLS	OLS	Heckman	Heckman	Heckman
Product import share	-2.117*** (0.234)	-1.898*** (0.222)	-1.874*** (0.225)	-1.940*** (0.046)	-1.782*** (0.045)	-1.742*** (0.045)
Market size	-0.105*** (0.008)	-0.064*** (0.008)	-0.069*** (0.008)	-0.100*** (0.001)	-0.063*** (0.001)	-0.068*** (0.001)
Political stability	-3.200*** (0.156)	-3.029*** (0.179)	-2.926*** (0.181)	-3.107*** (0.020)	-2.991*** (0.021)	-2.883*** (0.022)
Aid recipient		0.636*** (0.064)			0.609*** (0.008)	
Aid receipts			0.023*** (0.002)			0.022*** (0.000)
Inv. Mills ratio				-0.111*** (0.007)	-0.072*** (0.008)	-0.083*** (0.008)
Industry dummies	X	X	X	X	X	X
R2/Pseudo R2	0.222	0.276	0.273			
Wald Chi-Square				53,417	59,953	59,678
Nobs	246,208	221,203	221,203	401,675	364,222	364,222

Notes: [a] Country-industry clustered standard errors reported within parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.