Tariff Cooperation in Free Trade Areas

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Abstract

This paper develops a model of endogenous trade policy formation to study the impact of preferential trade agreements (PTA) on members' external trade policies when members internalize the intra-bloc welfare effects. This model is empirically tested using global trade data covering 170 countries and 177 PTAs established between 1988 and 2011. This paper finds empirical evidence of tariff cooperation between members of FTAs. Using three different measures of political relations (the affinity scores from the UN General Assembly Voting Data, dyad alliances data, and bilateral events and interactions data), we show that members with good political relation cooperate more on external tariff policy after formation of FTAs. On average, an increase in market share of PTA partners' firms by one standard deviation is associated with about 3 percentage points increase in external tariff in industries that matter for intra-bloc members.

1 Introduction

Do members in Free Trade Area (FTA) cooperate on their external tariff policy? This question is centric to policy makers who want to understand the welfare implications of FTA for its members. If FTA members cooperate on the level of their external tariffs, they would behave similarly to those in Customs Union (CU), and become more protectionist against outsiders after the formation of the trade agreement.[1] As a result, trade creation within the trade bloc can be plausibly generated at the cost of trade loss from the outsiders of the bloc. Theoretical literature have shown that FTA leads to further reduction in trade protection among its members but this result is mainly built on the assumption of

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[1]See Syropoulos (2002), Facchini et al. (2013), Kennan and Riezman (1990), Bagwell and Staiger (1997), Ornelas (2005) and Freund and Ornelas (2010).

non-cooperative policy of FTA members. However, empirically there has been very little known on this matter.

In this paper, we attempt the empirical study on this matter. To do so, first we construct a model of endogenous trade policy formation that incorporates some of the channels, identified in previous literature, through which FTA can affect the external tariffs of a FTA member. This base model provides a testable prediction on how tariff complementarity and tariff revenue affact the choice of external tariff policy for FTA members through terms-of-trade effects. Similar results are found in Bond, Riezman, and Syropoulos (2004), Ornelas (2005b), and Estevadeordal, Freund, and Ornelas (2008). These results show that FTA induces acceleration on external tariff liberalization among its members, and this result is consistent to the findings in previous literature about the 'building block' effect of FTA.

Next, we extend this model by introducing a political factor that allows us to capture and differentiate the motive for tariff cooperation between FTA members. FTA members will internalize the effect of their external tariff policy on their partner's welfare if they are concerned about each others. The internalization takes the form of jointly optimization of external tariff by incorporating the partner's welfare function into each other's objective functions. We allow heterogeneity in the degree of internalization which is weighted by this political factor. We use political relation between FTA partners as the measure for this political factor. This political feature of the model shows that FTA members coordinate more on external tariff setting when their political relations are closer. It also implies that when a FTA is formed by close political partners, their external trade policy tends to be more protectionist as what we would expect to find among CU members.

To test for tariff cooperation among FTA members, we formulate our empirical specification based on the predictions of the equilibrium external tariff policy from the structural model. From the theoretical model, we derive two equilibrium policies: (i) equilibrium external tariff policy under *non-cooperative* setup; (ii) equilibrium external tariff policy under *cooperative* setup. We derive the difference in external tariff policy from the equilibrium under these two setups and specify our empirical strategy to test the difference as the effect of tariff cooperation on external tariff.

The data we use for this project come from several sources. Data on tariff cover 170 different countries for the period from 1988 to 2011 at HS 6-digit level. During this time period, a total of 177 free trade agreements have been established. Industrial data in manufacturing sector covering these countries during the periods are at ISIC 3-digit level. To approximate political relations between

countries we employ three measures: (i) the affinity scores from the UN General Assembly Voting Data; (ii) the formal alliance status from the Correlates of War Formal Alliance data; and (iii) bilateral political events and interactions from the Conflict and Peace Data Bank.[2]

We then estimate our empirical specification using the data. Our results provide strong evidence for tariff cooperation among the FTA formed during the period from 1988 to 2011. On average, the external tariffs on the rent-generating industries for FTA partners liberalize 20% slower compared to other industries. The results also show that political relation plays an important role in determining FTA partners' external tariff policy. Comparing to the results *without* the political factor as the benchmark, we find an addition of 8% slower liberalization in external tariffs on the rent-generating industries among the FTA partners who share similar economic and political interests, and an addition of 20% slower liberalization among those who have formal alliance with military defense treaty.

Our work is related to the strand of literature on the impact of regionalism on multilateralism. As in Grossman and Helpman (1994) and Stoyanov (2009), RTA weakens the motivation for tariff protection by creating leakage in this protectionist trade policy so that reduces the incentive for special politically active group lobbying for protection. Levy (1997) shows that bilateral trade agreement may disproportionally benefits the countries' median voters, thus increasing the support against protection liberalization. Krishna (1998) suggests that if RTA creates large gains to some powerful economic groups, reduction is external protection becomes politically infeasible.

Our work is also related to the studies on incentives to alter external tariffs in RTAs. Kennan and Riezman (1990) show that in a three-country general equilibrium endowment economy, equilibrium external tariffs are higher when countries moving from FTA to CU. Richardson (1993) finds that FTA members tend to lower external tariffs to mitigate the negative impact from trade diversion generated by RTA. Bagwell and Staiger (1997), Freund (2000), Bond, Riezman, and Syropoulos (2004), Ornelas (2005a, 2005b), and Saggi and Yildiz (2010) illustrate how FTA induces incentive for multilateral trade through terms-of-trade effect.

Our paper is also related to Limao (2007)'s study. He looks at tariff cooperation of FTA partners in "non-trade" issues. Preferential treatment is offered to RTA partners in exchange for cooperation on, for example, drug trade issues. A reduction on external tariff protection would diminish the benefit the RTA partners from this preferential treatment, so that it could erode the incentive for the partners to maintain their cooperation on non-trade issues. This paper is closely related to Mai and Stoyanov

[2] Detail descriptions of the data can be found in Section 4.

(2015)'s study, which analyses the effect of CUSFTA on Canadian external trade policy. In this study, they categorize Canadian industries in quartiles ranked by the rent generated to US, and they find that the industries which create the least rent to US have exhibited fastest liberalization in external tariffs.

The paper is organized as the follows. In the next section, we present the model of endogenous trade policy formation and derive the equilibrium external tariff policy under tariff cooperation. In Section 3, we present the empirical specification and the interpretations of the key variables. In Section 4, we discuss the data used for this project. In Section 5, we present the empirical results and the discussion of the results. Section 6 concludes.

2 The Theory

In this section, we study the channels through which different degrees of political relation can affect a country's choice on its external tariffs. We present a monopolistic competition model with differentiated products and free market entry, and derive the equilibrium trade policy for a country which faces heterogeneous political affinity to her partners with preferential trade agreements (PTA). The theoritical model will lay foundations for our empirical specifications.

To identify tariff cooperation within a FTA, our strategy is to incorporate a measurement for political relations among FTA partners as the weights for the importance of the partners' national welfares that are taken into consideration into government's decision of the formation of its external trade policy. Then derive and compare the equilibrium trade policy *with* and *without* tariff cooperation.

Consider a model with a Home country, H, trading with R partner countries with PTA and F countries *without* PTA, hereafter indexed by H, f and r respectively. Note that $f = 1, ..., F$ and $r = 1, ..., R$, and country $j \in \{H, f, r\}$. All countries produce and trade $N + 1$ goods, with the first good being a numeraire, traded at no costs and produced by perfectly competitive firms. For all other industry i the number of firms in each country j is fixed and equal to n_{ij}, and each firm produces a distinct variety of a good. All firms in industry i are assumed to be symmetric within country j, therefore they share the same demand function, production technology and charge the same price. There are $(n_{iH} + \sum_{f=1}^{F} n_{if} + \sum_{r=1}^{R} n_{ir})$ varieties in industry i available to consumers in country H for $H \neq f$ and $H \neq r$.

Suppose that the preferences of a representative agent in country j can be denoted by a quasilinear

utility function with a constant elasticity of substitution for varieties in industry i

$$U = X_0 + \sum_{i=1}^{n} \alpha_i \ln X_i, \ \sum_{i=1}^{n} a_i = 1 \tag{1}$$

where α_i is the fraction of total expenditure the agent spends on industry i goods. X_0 is consumption of the numeraire good. X_i is the sub-utility derived from the consumption of differentiated product i produced at home and abroad, and assumed to take the non-symmetric CES form, which can be represented by

$$X_i = \left(n_{iH} d_{iH}^{\frac{1}{\sigma_i}} x_{iH}^{\frac{\sigma_i - 1}{\sigma_i}} + \sum_{r=1}^{R} n_{ir} d_{ir}^{\frac{1}{\sigma_i}} x_{ir}^{\frac{\sigma_i - 1}{\sigma_i}} + \sum_{f=1}^{F} n_{if_j} d_{if}^{\frac{1}{\sigma_i}} x_{if}^{\frac{\sigma_i - 1}{\sigma_i}} \right)^{\frac{\sigma_i}{\sigma_i - 1}} \tag{2}$$

where $\sigma_i > 1$ is the elasticity of substitution among varieties of good i, d_{ij} denotes the taste parameter for i from country j, and x_{ij} is the demand for i produced in country j. Maximizing equation (1) subject to standard budget constraint, we obtain the demand function and aggregate price index for the differentiated product i:

$$x_{ij} = a_i d_{ij} p_{ij}^{-\sigma_i} P_i^{\sigma_i - 1} \ \forall \ j \in \{H, f, r\} \tag{3}$$

$$P_i = \left(n_{iH} d_{iH} p_{iH}^{1-\sigma_i} + \sum_{r=1}^{R} n_{ir} d_{ir} p_{ir}^{1-\sigma_i} + \sum_{f=1}^{F} n_{if} d_{if} p_{if}^{1-\sigma_i} \right)^{\frac{1}{1-\sigma_i}}. \tag{4}$$

Home country government sets two types of ad valorem tariffs - preferential tariff, τ_{ir}, on imports from country r and MFN tariff, τ_{if}, on imports from country f. The profit function facing different firms in Home country can be written as:

$$\pi_{iH} = (p_{iH} - c_{iH})\, q_{iH} \tag{5}$$

$$\pi_{ij} = ((1 - \tau_{ij}) p_{ij} - c_{ij})\, q_{ij} \ \ \forall \ \ j \in \{f, r\}$$

where q_{ij} is the quantity supplied and c_{ij} is the marginal costs of production. Assuming the number of firms is large enough that an individual firm's decision on pricing has no impact on the aggregate price index P_i, each firm takes the price index as given. Knowing the demand function, each firm

maximizes profit by setting its price:

$$p_{iH} = \left(\frac{\sigma_i}{\sigma_i - 1}\right) c_{iH},\ p_{ij} = \frac{\sigma_i}{(\sigma_i - 1)} \frac{1}{(1 - \tau_{ij})} c_{ij} \ \forall \ \ j \in \{f, r\} \tag{6}$$

where τ_{ij} is the ad valorem tariff collected by the Home country government. Each firm sets its price by a mark-up over its marginal cost. Substituting equation (6) into (5), the profit functions can be written in a convenient form:

$$\begin{aligned} \pi_{iH} &= \sigma_i^{-1} p_{iH} x_{iH} \\ \pi_{ij} &= (1 - \tau_{ij}) \sigma_i^{-1} p_{ij} q_{ij} \ \forall \ \ j \in \{f, r\}. \end{aligned} \tag{7}$$

The next step towards deriving the optimal trade policy on external tariff is to set up government's objective function. One issue is that we do not know the form of the objective function. Participation in any trade agreement is afterall a political decision therefore this function can take various forms depending on the objectives of governments.[3] For now, we assume that governments' objectives are socially desirable for their domestic welfare. Let the objective function, G, consist of the sum of consumer surplus from consumption of differentiated goods (CS), tariff revenue (TR), and profits of domestic firms (π_{iH}):

$$G = CS(\tau_{ij}) + TR(\tau_{ij}) + \sum_{i=1}^{n} n_{iH} \pi_{iH}(\tau_{ij}) \tag{8}$$

where

$$CS(\tau_{ij}) = U(X_0, X_i, \tau_{ij}) - \sum_{i=1}^{n} \sum_{j=1}^{H,F,R} p_{ij} n_{ij} x_{ij}, \tag{9}$$

and

$$TR(\tau) = \sum_{i=1}^{n} \sum_{j=1}^{F,R} \tau_{ij} n_{ij} x_{ij}. \tag{10}$$

2.1 Tariff cooperation in FTA

One distinction between members of FTA and CU is that FTA members maintain autonomous external tariff policies while CU members jointly set and share common external tariffs. This subtle difference creates the tendency for members of CUs to coordinate and adopt higher external tariffs than those of

[3] Grossman and Helpman (1994), (1995), Krishna (1998), and Stoyanov (2009) show that special interest groups influence governments' objectives. Limao (2007) shows that RTAs can be used by governments as motives to induce partner country to cooperate in non-trade areas.

FTAs.[4] Tariff coordinations among CUs have been criticized because they could hinder the viability of multilateral free trade. However, it is not yet clear whether tariff coordination exists among FTAs because government can adjust external tariff rates to accommodate the impact from the changes in preferential policy and reassure its objectives.[5]

Next, we look at the case when a government of FTA members is concerned about the welfare of other members of the FTA, it incorporates the welfare of other members into its objective function (8), it becomes:

$$G = CS(\tau_{if}) + TR(\tau_{if}) + \sum_{i=1}^{n} n_{iH}\pi_{iH}(\tau_{if}) + \sum_{r_j=1}^{R} \phi_r W_r, \tag{11}$$

where W_r is the welfare of partner country r and $\phi_r \in [0,1]$ measures the degree of concern country H to W_r. Since the external policy of H will affect the profits of exporting firms of r in H and not affect the consumer surplus and tariff revenue of partner r, we can simplify expression (11) as the following:

$$G = CS(\tau_{if}) + TR(\tau_{if}) + \sum_{i=1}^{n} n_{iH}\pi_{iH}(\tau_{if}) + \sum_{i=1}^{n}\sum_{r=1}^{R} \phi_r n_{ir}\pi_{ir}(\tau_{if}), \tag{12}$$

where $n_{ir}\pi_{ir}$ is the total profits of firms from partner r in industry i in H. Government of H internalizes the profits of firms from partner r (essentially partner's welfare) into consideration when optimizing its objective function, and the larger is ϕ_r the higher degree of internalization takes place for its partner r's welfare in H's objective function. By choosing the level of external tariff rate τ_{if}, H maximizes its object in (12), and after collecting terms, we obtain the following equilibrium external tariff policy:

$$\epsilon_i^f \tau_{if} = \frac{\sigma_i - 1}{\sigma_i} s_{iH} + (\sigma_i - 1)\sum_{r=1}^{R} \tau_{ir} s_{ir} + \frac{\sigma_i - 1}{\sigma_i}\sum_{r=1}^{R} \phi_r \left(1 - \tau_{ir}\right) s_{ir} \tag{13}$$

where $s_{iH} = \frac{n_{ir}p_{ir}x_{ir}}{a_i}$ is the market share of domestic firms in industry i and $s_{ir} = \frac{n_{ir}p_{ir}x_{ir}}{a_i}$ is market share of firms in industry i from partner country r in H. On the left hand side of equation (13) is external tariff rate τ_{if} multiplied by ϵ_i^f, which is the import demand elasticity for goods i imported from outsiders. In (13), s_{iH} and s_{ir} are positively related to external tariff τ_{if}. The positive relation between s_{iH} and τ_{if} suggests that if the market share of domestic firms in industry i is low after the formation of FTA, it is optimal to have a low external tariff rate for i. One explanation for this

[4] See Kennan and Riezman (1990) and Facchini et al. (2013) among others for rationales for higher external tariffs under CUs. Estevadeordal et al. (2008) find tariff complementarity only in FTAs.

[5] See for example of optimal external tariffs settings Kennan and Riezman (1990), Richardson (1993), Yi (1996), Bagwell and Staiger (1999), Cadot et al. (1999), Freund (2000) and more recently Ornelas (2005a, 2005b), (2007), Facchini et al. (2009).

positive relation is the protection leakage effect. If s_{iH} is small in H, protection from high τ_{if} will be an inefficient rent-generator for domestic firms, instead, part of the rents would go to the partners' firms. Because protection for rents to domestic firms becomes less effective when s_{iH} is small, H would be better off to shift some of the rents from FTA partners back to CS by lowering τ_{if}.

The second term in (13) reflects the effect of tariff complementarity such as in Richardson (1993). If preferential tariffs are low - large preferential margins, it is optimal for government to lower the corresponding external tariffs. The complementary effect is stronger with larger market share of partner firms and closer substitude of product i. Intuitively, a drop in intra-bloc tariff induces a shift of imports from outsiders, who have comparative advantage in production of i, to less efficient partner r thanks to preferential tariff treatment. Thus, the trade diversion reduces overall welfare. To mitigate the welfare lost from the distortion of trade pattern, governments can lower external tariffs to redirect some of the imports back to their original sources.[6]

The last term in (13) indicates the effect from tariff cooperation. The positive relation between τ_{if} and s_{ir} suggests that, if H is concerned about partner r's welfare, it is optimal to coordinate with high external tariff for industry i if the market shares of firms from partner r in industry i is large after the formation of FTA. The intensity for tariff cooperation is strong if ϕ_r is high. Reducing the external tariff in i would induce competition coming from external firms and thus reduce the rents of the partner's firms.

For the case when $\phi_r = 0$, it implies no tariff cooperation between FTA members. The welfare function of FTA partner W_r in (11) does not enter the objective function of H government. In such case, the external tariff policy in equlibrium becomes

$$\epsilon_{iROW}\tau_{iROW} = \frac{\sigma_i - 1}{\sigma_i} s_{iH} + (\sigma_i - 1) \sum_{r=1}^{R} \tau_{ir} s_{ir}. \tag{14}$$

3 Empirical specification

Policy response often may not be instantaneous. To allow for policy response delays, we introduce time dimension to both (13) and (14). Next, we move to estimate tariff cooperation among FTA partners. First, suppose H and r form a trade agreement at time t. If H coordinates its external tariff for r into

[6] Other researchers also provide different explanations for tariff complementarity, for example Bagwell and Staiger (1999) in terms of trade motivations; Grossman and Helpman (1994) and Ornelas (2005a) in political economy factors; Saggi and Yildiz (2010) in endowment models with endogenous trade agreements.

period $t+1$, from (13), we have

$$\epsilon_i^f \tau_{if,t+1} = \frac{\sigma_i - 1}{\sigma_i} s_{iH,t+1} + (\sigma_i - 1) \sum_{r=1}^{R} \tau_{ir,t+1} s_{ir,t+1} + \frac{\sigma_i - 1}{\sigma_i} \sum_{r=1}^{R} \phi_r \left(1 - \tau_{ir,t+1}\right) s_{ir,t+1}. \tag{15}$$

Comparing (15) to the equilibrium external tariff policy represent by (14) in period t, and time differencing gives us the following:

$$\epsilon_i^f \Delta_1 \tau_{i,t}^f = \frac{\sigma_i - 1}{\sigma_i} \Delta_1 s_{iH,t} + (\sigma_i - 1) \sum_{r=1}^{R} \Delta_1 \tau_{ir,t} s_{ir,t} + \frac{\sigma_i - 1}{\sigma_i} \sum_{r=1}^{R} \phi_r \left(1 - \tau_{ir,t}\right) s_{ir,t} \tag{16}$$

where Δ_1 represent time difference by 1 period. Note that the last term on the right hand side of (16) is the market share from r in level, for which, one interpretation can be that it captures the importance of industry i to partner r.

Equation (16) outlines the two forces driving external tariffs in opposite directions - tariff complementarity and tariff coordination. With our main goal focused on testing tariff coordination among FTAs, and motivated by (16), our empirical framework is the following:

$$\frac{\sigma_i}{\sigma_i - 1} \epsilon_i^f \Delta_1 \tau_{i,t}^f = \beta_0 + \beta_1 \Delta_1 s_{iH,t} + \beta_2 \sum_{r=1}^{R} \Delta_1 \tau_{ir,t} s_{ir,t} + \beta_3 \sum_{r=1}^{R} \phi_{r,t} \left(1 - \tau_{ir,t}\right) s_{ir,t} + \epsilon_{i,t} \tag{17}$$

where $s_{ir,t}$ is measured by the value of imports of good i from partner r over the total domestic spending on i at time t and $s_{iH,t}$ is the domestic output over the total domestic spending on i at t. Equation (17) assembles the relationship between external tariff and the key explanatory variables from the model into an econometric form. Note that for the FTAs where $\tau_{ir,t}$ immediately reduce to zero, for following years $\Delta\tau_{ir,t}$ become zero. In such case, the term $\sum_{r_j=1}^{R} \Delta\tau_{ir_j,t} s_{ir_j,t}$ disappears and $\sum_{r_j=1}^{R} \phi_{r_{j,t}} \left(1 - \tau_{ir_j,t}\right) s_{ir_j,t}$ becomes $\sum_{r_j=1}^{R} \phi_{r_{j,t}} s_{ir_j,t}$. In previous literature, the role of political affinity is often overlooked when investigating the relationships between preferential tariff and MFN tariff for industries traded with FTA partners and outsiders.[7] The effects of preferential tariff from different FTA partners on MFN tariff are treated homogeneously. However, relations of countries are heterogeneous and thus there is a strong reason to believe the effect of tariff cooperation on external tariff must be different by country if political relationship between partner countries matters when a country sets up its external policies. One novelty of this study is that we estimate the effect

[7] For example, Limao's (2006) approach is to assign a dummy variable that equals one for industries US imports from its PTA partner and compare the change in MFN tariffs in these industries to those that do not import from PTA partners post- and pre- Uruguay Round.

of preferential tariff on external tariffs under a political economic perspective by differentiating the importance of FTA partners' welfare to government H so that the impact on its external policy is weighted differently by how close the political relations are its partners. In equation (17), ϕ_r is a partner country specific political parameter that weights the importance of the market shares from r in H. The idea is that, if partner country r is politically close to H, ϕ_r is high and share of partner firms $s_{ir,t}$ matters more in the relation to $\Delta\tau^f_{i,t}$ ceteris paribus, we would expect a more significant of β_3 in the estimation of (17).

To test whether or not political relation ϕ_r matters for tariff cooperation, we estimate two sets of results on (17) - one treating all r homogeneously (e.g. $\phi_r = 1$ for all r), and another allowing ϕ_r to vary. Consider four scenarios - a pair FTA partners can have high or low ϕ_r pre- or post- FTA formation. Figure 1 illustrates the level of MFN tariff of H for non-members before and after the formation of FTA. External tariff, $\tau^f_{i,t}$, on country f is at $\tau^f_{i,t_0}(\phi^L_{r_{j,t_0}}, \phi^H_{r_{j,t_0}})$ from time t_0. Suppose H and r forms a FTA at time t_1, the external tariff on f can either go up or down or remain unchanged.[8] The average MFN tariff rate is 9.6% for the period from 1988 to 2011, and have decreased by 0.35% per year. Figure 1 shows this general downward trend of global MFN tariffs. The idea is that if Home and country r_j are close political partners, Home is concerned about r_j's welfare and adopts a more protective external policy after the formation of FTA. In such case, τ_f is higher than it would otherwise be in post PTA period t_1. For the country pair, political affinity set $(\phi^H_{r_{j,t_0}}, \phi^H_{r_{j,t_1}})$ and $(\phi^L_{r_{j,t_0}}, \phi^H_{r_{j,t1}})$, $\tau^f_{i,t+1}$ will be at $\tau^{f_{High}}_{i,t_1}$. External tariff is lower at $\tau^{f_{Low}}_{i,t_1}$ for $(\phi^H_{r_{j,t_0}}, \phi^L_{rj,t_1})$ and $(\phi^L_{r_{j,t_0}}, \phi^L_{rj,t_1})$. The difference between $\tau^{f_{High}}_{i,t_1}$ and $\tau^{f_{Low}}_{i,t_1}$ is the stumbling effect on external liberalization coming from tariff cooperation based on their level of political affinity $\phi_{r_{j,t}}$. More importantly, a statistically significant $\phi_{r_{j,t}}$ would provide a possible answer to the puzzle why some find stumbling block effect in FTAs while others find building block effect.

If tariff cooperation exists, we would be more likely to find it in industries that import under PTA. We expect there is no tariff cooperation for industries that have no imports from PTA partners because the higher external tariff rate does not increase the profits of partner countries' firms, and it is not in the interest of the Home government too. We expect the effect of cooperation will be stronger if the size of market share of partners' firms in i is large.[9] The the effect of PTA on external tariff would

[8] WTO member conutries have legally bound commitments on tariff rates, which act as the ceilings on tariffs. Governments can adjust tariff rates upward only if the applied rates are lower than the bound rates.

[9] Using import share of PTA partner firms in Home may not be the best way to measure the importance of industry i to partner country as some suggest the importance of industry i in Home for PTA partner country should be measured by the export share of i in partner country to Home. However, we argue this is a reasonable measure for capturing tariff cooperation because if Home is concerned about welfare of partner country, it cares the most for large industries in the

probably be undermined because the dummy variable forgoes the size effect.

The key variable of interest is $\sum_{r=1}^{R} \phi_{r,t} (1 - \tau_{ir,t}) s_{ir,t}$ because we are interested to know how $\tau_{i,t}^{f}$ responds in industries that are beneficial to r. For capturing the potential further delays in policy responds, we include 6 more lag periods of $\sum_{r=1}^{R} \phi_{r,t} (1 - \tau_{ir,t}) s_{ir,t}$ in (17). Changes in preferential policy will force partners' firms to adjust their production and management, and the process likely take time. Any changes in Home's market conditions coming from the impact of partners' firms' adjustments are more likely to emerge in later periods. We expect government's response through external policy to any market condition changes will not happen simultaneously so we lag all explanatory variables to one period time. After implementing the lag periods, the estimation equation becomes

$$Y_{i,t} = \beta_0 + \beta_1 X_{i,t-1}^{1} + \beta_2 X_{i,t-1}^{2} + \beta_3 X_{i,t-1}^{3} + \beta_4 X_{i,t-2}^{3} + ... + \beta_8 X_{i,t-6}^{3} + \epsilon_{i,t} \tag{18}$$

where $Y_{i,t} = \frac{\sigma_i}{\sigma_i - 1} \epsilon_i^f \Delta_1 \tau_{i,t}^{f}$, $X_{i,t-1}^{1} = \Delta_1 s_{iH,t} = s_{iH,t} - s_{iH,t-1}$, $X_{i,t-1}^{2} = \sum_{r=1}^{R} \tau_{ir,t} s_{ir,t} - \sum_{r=1}^{R} \tau_{ir,t-1} s_{ir,t-1}$, $X_{i,t-1}^{3} = \sum_{r=1}^{R} \phi_{r,t-1} (1 - \tau_{ir,t-1}) s_{ir,t-1}$ and $X_{i,t-2}^{3} = \sum_{r=1}^{R} \phi_{r,t-2} (1 - \tau_{ir,t-2}) s_{ir,t-2}$. Also note that time difference in equation (18) can also help remove any country-industry fixed effects.

3.1 Estimation issues

Endogeneity is a serious concern when estimating the effect of market share on external tariff policy because the level of external tariff can reversely affect the market shares of both domestic and foreign firms. Since we are interested in establishing the causal relationship, a good instrument for the market shares of PTA partners in Home becomes very important. To do this we construct an instrument variable for traded goods from PTA partners following the methodology detailed in Frankel and Romer (1999). We predict trade flows between countries using geographic characteristics from gravity equation. This is a valid approach because trade flows between countries are highly correlated to their geographical characteristics, which are unlikely correlated to any trade policies. We regress the values of imports in log for every industry i on dyadic gravity variables. We perform the following:

$$\begin{aligned} \ln(M_{ij}) \quad = \quad & a_0 + a_1 \ln D_{ij} + a_2 \ln N_i + a_3 \ln N_j + a_4 \ln A_i + a_5 \ln A_j \\ & + a_6 (L_i + L_j) + a_7 B + a_8 B \ln D_{ij} + a_9 B \ln A_i + a_{10} B \ln A_j \\ & + a_{11} B \ln N_i + a_{12} B \ln N_j + a_{14} B (L_i + L_j) . \end{aligned} \tag{19}$$

Home market.

In equation (19), D_{ij} is the distance between country i and j, N_i and A_i are the population and area in country i repectively, and L_i indicates whether country i is landlocked. The fitted values of equation (19) are used as our instrument variable (IV) for imports of Home i from partner r_j, denoted by $import\_iv1$ in Table 1. We construct three additional IV to ensure results will be not sensitive to the way we construct the IV. For the second IV, we extend equation (19) to include controling for high dimensional country-year fixed effects for country i and j following the estimation procedure in Martyn et al. (2006). The fitted values are denoted by $import\_iv2$ in Table 1. The third IV and the fourth IV, include controls for industry-year fixed effects and country-industry-year fixed effects respectively and are denoted by $import\_iv3$ and $import\_iv4$.

4 Data

This paper uses data from several different sources. Tariff data comes from UN Comtrade Database, covering 177 free trade agreements involved 170 different countries for the time period from 1988 to 2011, available at the 6-digit HS classification level. Tariff rates are aggregated to ISIC 3-digit level based on Product Concordance from World Integrated Trade Solution (WITS). The data on output, imports, exports and import demand elasticities ϵ_i^f are obtained from Nicita, and Olarreaga (2006). Domestic share, $s_{iH,t}$, is constructed by the value of domestic output in industry i over the total domestic spending on i. Similarly, the share of PTA partner, $s_{ir_j,t}$, is the ratio of the value of imports from partner r_j to domestic spending in i. The missing values in output data is imputed with the fitted value from regressing output data to industry index. The data on elasticity of substitution, σ_i, is obtained from Broda and Weinstein (2006) at ISIC 3-digit level. The data on geographical characteristics is from Mayer and Zignago (2011). Gravity equation variables come from Head and Mayer (2013).

We employ several approaches to measure bilateral political relation $\phi_{r_{j,t}}$. For our first measure, we use the affinity score index constructed by Voeten (2013) based on the United Nations General Assembly Voting Data (UNGAVD). The data records voting information on General Assembly resolutions for each UN member country. UN members can approve, abstain, or disapprove of each resolution. Based on the voting data, the dyadic affinity scores is constructed as the share of similar votes between country i and country j over the total of country i's votes. The affinity score index is often used to measure the degree of similarity in the economic and geopolitical interests of a pair of countries (Alesina and Dollar, 2000). For example, the average magnitude of the affinity score index

for US and its major political allies (Canada, France, Israel, UK, and Australia) ranges from 0.58 to 0.86 for the period between 2000 and 2012, and the score ranges from 0.17 to 0.21 for countries such as Iraq, Afghanistan, Cuba, Indonesia, and China during these periods.

Common political interests between countries is an important indicator of good international relations, yet not a perfect one. As Voeten (2013) points out, some countries may have share similar voting patterns in the UN on global matters but have poor political relations (e.g. India and Pakistan). Therefore, it is necessary to have additional political relation proxies to complement UN affinity scores.

Our second measure of political relations is the formal alliance status between two countries. We retrieve alliances data from the Correlates of War Formal Alliance (COWFA) v4.1 data set first constructed by Small and Singer (1969) and maintained by Gibler and Press (2009). This dataset covers the periods from 1835 to 2012. The COWFA divides country i's alliances into 3 categories - defense pact, neutrality (non-aggression) treaty, and entente agreement. We use an indicator variable to classify countries are in good political relation if there is defense pact, which is the highest level of military commitment among these three classes and it requires intense political cooperation.

For the third measure of political relations, we use the frequencies of bilateral events and interactions from the Conflict and Peace Data Bank (COPDAB), which records actions of approximately 135 countries toward one another on a daily basis. The majority of the international events that involve countries are related to political relations (37.6%), economoic relations (27.5%), military and strategic relations (14.9%), and cultural and scientific relations (10%). The bilateral interactions are categorized as cooperative, neutural or uncooperative. The events are recorded for the period from 1948 to 1978, a bit over 20 years prior to the first year of our data set, and the relevance of these events for the current political relations is certainly a concern. However, we argue that the international relations between countries have remained relatively stable since the end of the Second World War and the frequency of diplomatic interactions from 1950s to 1970s can still be informative of the current international relations.[10]

In order to isolate the role of political relations from other influences to the frequency of bilateral events, such as the relative size of two countries, we first regress the number of diplomatic cooperative interactions on the log of population, GDP, geographic area, and the log of distance from one another using the full sample of country-pairs.[11] Because the dependent variable is a count variable with a

[10] This may not be the case for relationship with countries from the former Soviet Block, so we excluded them from this analysis.

[11] These variables are retrieved from Research and Expertise on the World Economy (CEPII).

large dispersion, the model is estimated by negative binomial regression with country-year fixed effects. We use the residuals from the regression as our measure of political relations, which is essentially the frequency of bilateral events purged from the scale effect. Figure 2 plots political interactions index against the affinity scores for US and other countries in our sample. It reveals that the frequency of diplomatic interactions is positively correlated with affinity scores, suggesting that the two measures capture similar aspects of political relations.

Table 1 summarizes the variables of interests in this study. The average MFN tariff in our sample is 7.3% during the period from 1988 to 2011. The average reduction of MFN tariff is about 0.4% each year during this period. The shares of domestic output over domestic consumptions are just over 60% and shrinks at about 1% per year on average for countries in our sample. The political relation proxies from UN affinity scores, defense pack, political interactions are summarized in ϕ_{UN}, $\phi_{Defense}$, and $\phi_{Interaction}$ respectively.

5 Results

In this section, we will provide results from estimating specification (18) and discuss their economic implications.

First, we want to learn whether in general countries are concerned with the welfare of their PTA partners. One way is to test if countries offer protectionist trade policy to umbrella the industries that are important to their PTA partners. We begin with estimating specification (18) without including any political relation proxy. This estimation shows how external tariff of each country H responds in the industries which have presence from their PTA partners' firms. If there is tariff coordination between PTA members, we would expect external tariffs to be relatively higher in these industries or they are liberalized slower than they would otherwise be. Linear regression results are provided in Table 2. Column (1) reports the result on how changes in external tariff respond in industries with market presence of partners' firms for lagged 6 periods. Results in column (2) and column (3) are adjusted by elasticity of substitution and import demand elasticity respectively. Results in column (4) are adjusted by both types of elasticity. All these results are controlled for country-industry fixed effects. Results in Table 2 show that there are positive associations between changes in external tariffs and market presence of PTA partner countries' firms. The effects are stronger in the 2^{nd} and the 3^{rd} lagged periods with coefficients statistically significant at 0.01. The results suggest that an increase in market share of PTA partners' firms by one standard deviation is associated with about 3 percentage

points increase in external tariff in industry i for the 3^{rd} period after formation of PTA.

We report the panel structure regression results from estimating specification (18) with different political relation proxies in Table 3. Column (1) provides the results unweight by any political relation measures as the benchmark. For estimation results in Column (2) to (4), the market share from PTA partners' firms are weighted by political relation proxies. For example, when $s_{ir_j,t}$ is weighted by defense treaty $\phi_{Defense,r}$ (in Column 3), it estimates the effect of those industries imports from country H's political alliances. The estimation results relaxing the elasticity are reported in column (5) - (8). If close political relation between countries induces higher co-operation on external trade policy, we would expect the effect of weighted $s_{ir_j,t}$ on changes in external tariff to be stronger. Comparing to the benchmark results in Column (1), we find results weighted by political relation proxies are stronger especially for the 2^{nd} and 3^{rd} periods into PTA. For example, results in Column (2) suggests that those industries with firms from PTA partner countries which share similar geopolitical and economic interests enjoy about 50% more tariff protection at 3^{rd} year into PTA. We find similar effects when $s_{ir_j,t}$ is weighted by $\phi_{Defense,r}$ and $\phi_{Interaction,r}$.

Next, we report the IV estimation results for Imports from PTA partners. First, we estimate the benchmark model using unweight $s_{ir_j,t}$ and which is instrumented by four different IVs which discussed in the previous section. Results are reported inTable 4 Column (1) - (4). Column (5) - (8) report the estimation results excluding the elasticity. In Table 5, we show the IV estimation results for specification (18) using three political relation proxies. The results from IV estimators are robust and consistent to the previous findings.

6 Conclusion

In this paper, we develop an endogenous trade policy formation model in a monopolistic competition framework with differentiated products and free market entry. We derive the equilibrium trade policy that incorporates a political factor to captures tariff cooperation between FTA member countries. Using this model, we show that multilateral liberalization is slower if FTA partners are concerned about the welfare of other members when setting their external trade policy.

We test this the prediction of the model using comprehensive trade and industry data, and find evidence that supports the tariff cooperative hypothesis. In addition, we find that the closer are the two FTA partners in political relations the more likely these two members coordinate their external trade policy to benefit the national welfare of the other.

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7 Appendix

Some of the derivations:

The response of price and quantity to change in the tariff rate:

$$\frac{\partial x_{iH}}{\partial \tau_{if}} = (\sigma_i - 1)\frac{x_{iH}}{P_i}\frac{\partial P_i}{\partial \tau_{if}}$$

$$\frac{\partial x_{ir_j}}{\partial \tau_{if}} = (\sigma_i - 1)\frac{x_{ir_j}}{P_i}\frac{\partial P_i}{\partial \tau_{if}}$$

$$\frac{\partial x_{if_j}}{\partial \tau_{if}} = -\sigma_i\frac{x_{if_j}}{1-\tau_{if}} + (\sigma_i - 1)\frac{x_{if_j}}{P_i}\frac{\partial P_i}{\partial \tau_{if}}$$

$$\frac{\partial P_i}{\partial \tau_{if}} = \frac{P_i}{1-\tau_{if}}\sum_{f_j=1}^{F} n_{if_j} d_{if_j}\left(\frac{p_{if_j}}{P_i}\right)^{1-\sigma_i} = \frac{P_i}{1-\tau_{if}}\sum_{f_j=1}^{F} s_{if_j}$$

Response of consumer surplus to changes in external tariff:

Consumer surplus is

$$CS(\tau) = V(Y, P_i) - Y = -\sum_{i=1}^{n} a_i + \sum_{i=1}^{n} a_i \ln\left(\frac{a_i}{P_i}\right) = \sum_{i=1}^{n} a_i\left(\ln a_i - 1 - \ln P_i\right)$$

$$\frac{\partial CS(\tau)}{\partial \tau_{if}} = -\frac{a_i}{P_i}\frac{\partial P_i}{\partial \tau_{if}} = -X_i\frac{\partial P_i}{\partial \tau_{if}} = -X_i\frac{P_i}{1-\tau_{if}}\sum_{f_j=1}^{F} s_{if_j}$$

Response of tariff revenue to change in external tariff:

$$\frac{\partial TR(\tau)}{\partial \tau_{if}} = \frac{\partial \sum_{i=1}^{n}\sum_{j=1}^{F,R}\tau_{ij}p_{ij}n_{ij}x_{ij}}{\partial \tau_{if}}$$

$$= \sum_{f_j=1}^{F}\left[a_i s_{if_j} + \frac{a_i(1-\sigma_i)}{1-\tau_{if}}\tau_{if}s_{if_j} + (\sigma_i - 1)X_i\frac{\partial P_i}{\partial \tau_{if}}\tau_{if}s_{if_j}\right] + \sum_{r_j=1}^{R}(\sigma_i - 1)\frac{\partial P_i}{\partial \tau_{if}}X_i\tau_{ir_j}s_{ir_j}$$

$$= \sum_{f_j=1}^{F} a_i s_{if_j} - \sum_{f_j=1}^{F}\frac{a_i(\sigma_i - 1)}{1-\tau_{if}}\tau_{if}s_{if_j} + \sum_{f_j=1}^{F}(\sigma_i - 1)X_i\frac{\partial P_i}{\partial \tau_{if}}\tau_{if}s_{if_j} + \sum_{r_j=1}^{R}(\sigma_i - 1)\frac{\partial P_i}{\partial \tau_{if}}X_i\tau_{ir_j}s_{ir_j}$$

$$= a_i\sum_{f_j=1}^{F} s_{if_j} - \frac{a_i(\sigma_i - 1)}{1-\tau_{if}}\tau_{if}\sum_{f_j=1}^{F} s_{if_j} + (\sigma_i - 1)X_i\frac{\partial P_i}{\partial \tau_{if}}\tau_{if}\sum_{f_j=1}^{F} s_{if_j} + (\sigma_i - 1)\frac{\partial P_i}{\partial \tau_{if}}X_i\sum_{r_j=1}^{R}\tau_{ir_j}s_{ir_j}$$

$$= \frac{a_i(1-\tau_{if})}{P_i}\frac{\partial P_i}{\partial \tau_{if}} - \frac{a_i(\sigma_i - 1)}{1-\tau_{if}}\tau_{if}\frac{(1-\tau_{if})}{P_i}\frac{\partial P_i}{\partial \tau_{if}} + (\sigma_i - 1)X_i\frac{\partial P_i}{\partial \tau_{if}}\tau_{if}\sum_{f_j=1}^{F} s_{if_j} + (\sigma_i - 1)\frac{\partial P_i}{\partial \tau_{if}}X_i\sum_{r_j=1}^{R}\tau_{ir_j}s_{ir_j}$$

$$= X_i \frac{\partial P_i}{\partial \tau_{if}} \left[1 - \tau_{if} - (\sigma_i - 1)\tau_{if} + (\sigma_i - 1)\tau_{if} \sum_{f_j=1}^{F} s_{if_j} + (\sigma_i - 1) \sum_{r_j=1}^{R} \tau_{ir_j} s_{ir_j} \right]$$

Response of firms' profits to change in external tariff:

$$\frac{\partial \sum_{i=1}^{n} \sum_{r_j=1}^{R} n_{ir_j} \pi_{ir_j}}{\partial \tau_{if}} = \frac{\sigma_i - 1}{\sigma_i} X_i \frac{\partial P_i}{\partial \tau_{if}} \sum_{r_j=1}^{R} (1 - \tau_{ir_j}) s_{ir_j}$$

$$\begin{aligned} \frac{\partial \sum_{i=1}^{n} \sum_{f_i=1}^{F} n_{if_i} \pi_{if_i}}{\partial \tau_{if}} &= X_i \frac{\partial P_i}{\partial \tau_{if}} \left[-\frac{1 - \tau_{if}}{\sigma_i} + \frac{\sigma_i - 1}{\sigma_i}(1 - \tau_{if}) \sum_{f_j=1}^{F} s_{if_j} - \frac{\sigma_i - 1}{\sigma_i}(1 - \tau_{if}) \right] \\ &= X_i \frac{\partial P_i}{\partial \tau_{if}} \left[-\frac{1 - \tau_{if}}{\sigma_i} - \frac{\sigma_i - 1}{\sigma_i}(1 - \tau_{if}) \left(1 - \sum_{f_j=1}^{F} s_{if_j} \right) \right] \end{aligned} \tag{20}$$

Import demand elasticity:

$$\frac{\partial x_{if_j}}{\partial \tau_{if}} \frac{\tau_{if}}{x_{if_j}} = \frac{\tau_{if}}{1 - \tau_{if}} \left[-\sigma_i + (\sigma_i - 1) \sum_{f_j=1}^{F} s_{if_j} \right]$$

$$|\epsilon_{i\tau_F}| = \frac{1 - \tau_{if}}{\tau_{if}} \frac{\partial x_{if_j}}{\partial \tau_{if}} \frac{\tau_{if}}{x_{if_j}} = \sigma_i - (\sigma_i - 1) \sum_{f_j=1}^{F} s_{if_j}$$

$$\begin{aligned} \frac{\partial x_{if_j}}{\partial p_{if_j}} \frac{p_{if_j}}{x_{if_j}} &= \frac{\partial x_{if_j}}{\partial \tau_{if}} \frac{\partial \tau_{if}}{\partial p_{if_j}} \frac{p_{if_j}}{x_{if_j}} \\ &= \left[\frac{-\sigma_i x_{if_j}}{1 - \tau_{if}} + (\sigma_i - 1) \frac{x_{if_j}}{P_i} \frac{P_i}{1 - \tau_{if}} \sum_{f_j=1}^{F} s_{if_j} \right] \frac{(\sigma_i - 1)(1 - \tau_{if})}{\sigma_i c_{if_j}} \frac{p_{if_j}}{x_{if_j}} \\ &= -\sigma_i + (\sigma_i - 1) \sum_{f_j=1}^{F} s_{if_j} \end{aligned}$$

$$|\epsilon_{i\tau_F}| = \left| \frac{\partial x_{if_j}}{\partial p_{if_j}} \frac{p_{if_j}}{x_{if_j}} \right| = \sigma_i - (\sigma_i - 1) \sum_{f_j=1}^{F} s_{if_j}$$

Table 1. Summary statistics of variables of interest.

Variable	Description	Mean	Standard deviation	Min	Max	N
τ^{ROW}	*MFN tariff*	.073	.161	0	25.662	84429
$\Delta_{t-1}\tau^{ROW}$	*Change in MFN tariff*	-.004	.183	-2.586	13.834	77430
τ^{PTA}	*Preferential tariff*	.001	.011	0	1.958	84429
$\Delta_{t-1}\tau^{PTA}$	*Change in preferential tariff*	0	.015	-1.958	1.901	77430
ε_{ij}	*Import demand elasticity*	7.2	40.471	1.042	2944.918	63015
σ_{ij}	*elasticity of substitution*	-1.093	1.066	-38.681	-.003	50835
$S_{iH,t}$	*Home industry share*	.633	.297	0	1	12068
$\Delta_{t-1}S_{iH}$	*Change in Home industry share*	-.007	.093	-.971	.895	10469
$S_{ir,t}$	*Partner industry market share*	.002	.028	0	.973	15458
$\Delta_{t-1}S_{ir,t}$	*Change in partner industry share*	0	.039	-.954	.973	13043
ln(import)	*log of imports*	5.651	3.187	0	18.956	2374356
$ln(import\_IV_1)$	*log of imports (instrument 1)*	5.172	1.748	.002	16.705	1525623
$ln(import\_IV_2)$	*log of imports (instrument 2)*	5.403	2.715	0	22.337	2173609
$ln(import\_IV_3)$	*log of imports (instrument 3)*	5.405	2.714	0	22.345	2173609
$ln(import\_IV_4)$	*log of imports (instrument 4)*	5.43	2.675	0	20.023	1525623
ϕ_{UN}	*UN affinity index*	.834	.151	0	1	387840
$\phi_{Defense}$	*Defense treaty indicator*	.793	.405	0	1	60349
$\phi_{Interaction}$	*Countries interactions index*	-.2	.533	-1	6.06	11151

Note: τ^{ROW} and τ^{PTA} are MFN tariff and preferential tariff respectively, aggregated from 6-digit HS classification to 3-digit ISIC classification. $S_{ir,t}$ is the ratio of output to domestic consumption of i. Imports are recorded at 6-digit HS classification. The correlations between imports and its instrument variables $import\_IV_1$ - $import\_IV_4$ are 0.505, 0.829, 0.83, and 0.832 respectively. ϕ_{UN} is UN affinity score. $\phi_{Defense=1}$ when two countries is with defense pack. $\phi_{Interaction}$ is the measure of political and economic interactions between countries purged from scale effects.

Table 2. Linear regression results of the effects of political relation on external tariffs.

	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta S_{iH,t}$	0	0	0	0	0	0
	(0.250)	(0.212)	(0.328)	(0.335)	(0.416)	(0.567)
$\sum_r (1-\tau_{ir,t-1}) S_{ir,t-1}$	0.096*	0.049*	0.273	0.138	0.048	0.070
	(0.097)	(0.091)	(0.143)	(0.142)	(0.185)	(0.164)
$\sum_r (1-\tau_{ir,t-2}) S_{ir,t-2}$	0.385***	0.201***	0.527**	0.263**	0.198***	0.338***
	(0.000)	(0.000)	(0.026)	(0.021)	(0.003)	(0.000)
$\sum_r (1-\tau_{ir,t-3}) S_{ir,t-3}$	0.298***	0.154***	0.631***	0.322***	0.104***	0.230***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\sum_r (1-\tau_{ir,t-4}) S_{ir,t-4}$	0.042**	0.021**	0.114*	0.056*	0.004	0.020*
	(0.036)	(0.035)	(0.055)	(0.053)	(0.296)	(0.095)
$\sum_r (1-\tau_{ir,t-5}) S_{ir,t-5}$	0.067**	0.034**	0.187**	0.093**	0.003	0.028*
	(0.030)	(0.029)	(0.049)	(0.048)	(0.122)	(0.088)
$\sum_r (1-\tau_{ir,t-6}) S_{ir,t-6}$	0.063*	0.032*	0.179*	0.089*	0.010*	0.021
	(0.066)	(0.065)	(0.085)	(0.083)	(0.067)	(0.198)
Country-industry fixed effects	Yes	Yes	Yes	Yes		Yes
Industry-year fixed effects					Yes	
Year fixed effects		Yes	Yes			Yes
R^2	0.054	0.031	0.116	0.234	0.063	0.095
No. of Obs.	13031	12465	10626	10085	13031	13031
F statistics	17.13	16.75	6.91	8.36	3.31	3.31

The dependent variable is $\Delta\tau_{ij,t}$ in column (1), (5), (6,), and $[\sigma_{ij}/(\sigma_{ij}-1)]\Delta\tau_{ij,t}$ in column (2), and $\varepsilon_{ij}\Delta\tau_{ij,t}$ in column (3), and $\varepsilon_{ij}[\sigma_{ij}/(\sigma_{ij}-1)]\Delta\tau_{ij,t}$ in column (4). $\Delta S_{iH,t}$ is 1-period time difference in the ratio of domestic output to domestic consumption of i. $S_{ir,t}$ is the ratio of import from partner r to domestic consumption of i at time t. Column (1) - (4) include country-industry fixed effect. Column (5) includes industry-year fixed effects. Columne (6) includes country-industry and year fixed effects. p-values, based on standard errors clustered at country-industry level, are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table 3. Estimation results for the effects of political relation on external tariffs in panel structure.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\phi_r=1$	$\phi_{UN,r}$	$\phi_{Defense,r}$	$\phi_{Interaction,r}$	$\phi_r=1$	$\phi_{UN,r}$	$\phi_{Defense,r}$	$\phi_{Interaction,r}$
$\Delta S_{iH,t}$	0	0	0	0	-0.000	-0.000	-0.000	-0.000
	(0.300)	(0.303)	(0.317)	(0.302)	(0.537)	(0.541)	(0.549)	(0.538)
$\sum_r \phi_r (1-\tau_{ir,t-1}) S_{ir,t-1}$	0.137	0.520	0.093***	0.122	0.070	0.297	0.025	0.060
	(0.112)	(0.140)	(0.000)	(0.114)	(0.134)	(0.114)	(0.100)	(0.139)
$\sum_r \phi_r (1-\tau_{ir,t-2}) S_{ir,t-2}$	0.289**	0.274**	0.736***	0.436**	0.338***	0.478***	0.890***	0.427***
	(0.011)	(0.028)	(0.000)	(0.011)	(0.000)	(0.000)	(0.000)	(0.000)
$\sum_r \phi_r (1-\tau_{ir,t-3}) S_{ir,t-3}$	0.331***	0.487***	0.441***	0.420***	0.230***	0.345***	0.221***	0.268***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\sum_r \phi_r (1-\tau_{ir,t-4}) S_{ir,t-4}$	0.056**	0.076**	0.095***	0.051*	0.020*	0.058	0.007	0.016
	(0.037)	(0.046)	(0.000)	(0.067)	(0.072)	(0.102)	(0.464)	(0.110)
$\sum_r \phi_r (1-\tau_{ir,t-5}) S_{ir,t-5}$	0.093**	0.138**	0.157***	0.084*	0.028*	0.068*	0.009	0.022
	(0.033)	(0.043)	(0.000)	(0.061)	(0.066)	(0.060)	(0.528)	(0.117)
$\sum_r \phi_r (1-\tau_{ir,t-6}) S_{ir,t-6}$	0.088*	0.083	0.172***	0.080	0.021	0.023	0.007	0.016
	(0.062)	(0.134)	(0.000)	(0.107)	(0.166)	(0.250)	(0.676)	(0.259)
Country-industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects					Yes	Yes	Yes	Yes
F-statistics	9.73	6.25	17.73	11.42	30.26	26.53	33.61	29.53
Rho	.49	.49	.49	.49	.14	.14	.13	.14
R^2	0.000	0.000	0.000	0.000	0.050	0.051	0.047	0.049
No. of Obs.	10085	10085	10085	10085	13031	13031	13031	13031

The dependent is $\varepsilon_{ij}[\sigma_{ij}/(\sigma_{ij}-1)]\Delta\tau_{ij,t}$ in column (1) - (4) and $\Delta\tau_{ij,t}$ in column (5) - (8). Column (1) and (5) report estimates not weighted by proxy of political relation. $S_{iH,t}$ is 1-period time difference in the ratio of domestic output to domestic consumption of *i*. $S_{ir,t-1}$ is the ratio of import from partner *r* to domestic consumption of *i* at time *t-1*. ϕ_r is the political relation proxy. Estimates in column (2) and (6) are weighted by political affinity scores from UN Assembly Votings. Estimates in column (3) and (7) are weighted by defense treaty dummy. Estimates in column (4) and (8) are weighted by dyad political interactions. p-values, based on standard errors clustered at country-industry level, are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table 4. Estimation results for the effects of on external tariffs using instrument variables.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Iv_1	Iv_2	Iv_3	Iv_4	Iv_1	Iv_2	Iv_3	Iv_4
$\sum_r (1-\tau_{ir,t-1}) S_{ir,t-1}$	1.583***	0.769**	0.645**	0.602**	1.034***	0.465***	0.410**	0.397**
	(0.000)	(0.020)	(0.026)	(0.025)	(0.000)	(0.007)	(0.011)	(0.013)
$\sum_r (1-\tau_{ir,t-2}) S_{ir,t-2}$	0.534***	0.288***	0.258***	0.237***	0.479***	0.474***	0.462***	0.457***
	(0.004)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
$\sum_r (1-\tau_{ir,t-3}) S_{ir,t-3}$	0.520***	0.429***	0.382***	0.372***	0.413***	0.359***	0.331***	0.326***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\sum_r (1-\tau_{ir,t-4}) S_{ir,t-4}$	0.975***	0.381***	0.302***	0.281***	0.669***	0.271***	0.224***	0.213***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\sum_r (1-\tau_{ir,t-5}) S_{ir,t-5}$	1.218***	0.485***	0.396***	0.393***	0.162**	0.287***	0.236***	0.231***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.022)	(0.000)	(0.000)	(0.000)
$\sum_r (1-\tau_{ir,t-6}) S_{ir,t-6}$	0.981***	0.311***	0.248***	0.252***	0.865***	0.202***	0.168***	0.168***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\Delta S_{iH,t}$	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.333)	(0.286)	(0.289)	(0.289)	(0.276)	(0.218)	(0.217)	(0.217)
Country-industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LM statistic	7.50	9.94	4.33	8.12	15.50	8.07	4.46	6.54
Cragg-donald wald	0.62	64.96	111.49	132.47	9.36	87.59	153.67	194.22
Hansen J. statistics	0	0	0	0	0	0	0	0
F-statistics	8.70	9.83	10.2	10.55	16.66	21.67	22.17	20.55
No. of Obs.	9882	9875	9920	9936	12779	12775	12824	12844

The dependent is $\varepsilon_{ij}[\sigma_{ij}/(\sigma_{ij}-1)]\Delta\tau_{ij,t}$ in column (1) - (4) and $\Delta\tau_{ij,t}$ in column (5) - (8). $\Delta S_{iH,t}$ is 1-period time difference in the ratio of domestic output to domestic consumption of i. $S_{ir,t-1}$ is the ratio of import from partner r to domestic consumption of i at time $t-1$. Column (1) and (4) are instrumented with Iv_1. Column (2) and (6) are instrumented with Iv_2. Column (3) and (7) are instrumented with Iv_3. Column (4) and (8) are instrumented with Iv_4. p-values, based on standard errors clustered at country-industry level, are reported in parentheses. LM statistic reports for underidentification test. Wald F. statistic reports for weak identification test. Hansen J statistic is zero for the case of exact identification. * p<0.10, ** p<0.05, *** p<0.01

Table 5. Estimation results for the effects of political relation on external tariffs using instrument variables.

	$\phi_{UN,r}$				$\phi_{Defense,r}$				$\phi_{Interaction,r}$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	IV1	*IV2*	*IV3*	*IV4*	*IV1*	*IV2*	*IV3*	*IV4*	*IV1*	*IV2*	*IV3*	*IV4*
$\sum_r \phi_r (1-\tau_{ir,t-1}) S_{ir,t-1}$	2.719***	2.140***	1.868***	1.599***	0.963***	0.293***	0.203***	0.191***	2.319***	0.779**	0.631**	0.579**
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.003)	(0.009)	(0.005)	(0.000)	(0.033)	(0.046)	(0.045)
$\sum_r \phi_r (1-\tau_{ir,t-2}) S_{ir,t-2}$	0.486***	0.348***	0.320***	0.308***	1.100***	1.104***	1.092***	1.121***	1.105***	0.438***	0.401***	0.357***
	(0.006)	(0.000)	(0.000)	(0.001)	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\sum_r \phi_r (1-\tau_{ir,t-3}) S_{ir,t-3}$	0.752***	0.531***	0.485***	0.483***	2.797**	0.587***	0.497***	0.505***	0.936***	0.524***	0.465***	0.468***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.043)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\sum_r \phi_r (1-\tau_{ir,t-4}) S_{ir,t-4}$	1.039***	0.723***	0.618***	0.531***	0.990***	0.362***	0.237***	0.222***	1.134***	0.398***	0.308***	0.287***
	(0.005)	(0.000)	(0.000)	(0.000)	(0.004)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\sum_r \phi_r (1-\tau_{ir,t-5}) S_{ir,t-5}$	1.391***	0.868***	0.751***	0.726***	1.292***	0.443***	0.291***	0.292***	1.477***	0.500***	0.399***	0.392***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\sum_r \phi_r (1-\tau_{ir,t-6}) S_{ir,t-6}$	1.014***	0.283***	0.247***	0.246***	0.624***	0.385***	0.237***	0.259***	1.241***	0.343***	0.263***	0.269***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\Delta S_{iH,t}$	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.337)	(0.291)	(0.293)	(0.293)	(0.298)	(0.318)	(0.317)	(0.318)	(0.346)	(0.285)	(0.288)	(0.288)
Country-industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LM statistic	20.65	13.28	2.46	12.9	3.81	2.63	2.63	2.68	6.58	7.52	3.25	5.91
Cragg-Donald Wald	1.86	19.51	2.36	29.84	0.56	54.3	1.72	31.9	0.91	25.03	1.81	26.44
No. of Obs.	9882	9875	9920	9936	9882	9875	9920	9936	9882	9875	9920	9936

The dependent variable is $\varepsilon_{ij}[\sigma_{ij}/(\sigma_{ij}-1)]\Delta\tau_{ij,t}$. $\Delta S_{iH,t}$ is 1-period time difference in the ratio of domestic output to domestic consumption of i. $S_{ir,t-1}$ is the ratio of import from partner r to domestic consumption of i at time $t-1$. Estimates in column (1) - (4) are weighted by political affinity scores from UN Assembly Votings. Estimates in column (5) - (8) are weighted by defense treaty dummy. Estimates in column (9) - (12) are weighted by dyad political interactions. p-values, based on standard errors clustered at country-industry level, are reported in parentheses. LM statistic reports for underidentification test. Wald F. statistic reports for weak identification test. Hansen J statistic is zero for the case of exact identification. * p<0.10, ** p<0.05, *** p<0.01

Figure 1. Change in MFN tariff after formation of PTA for high and low political relation.

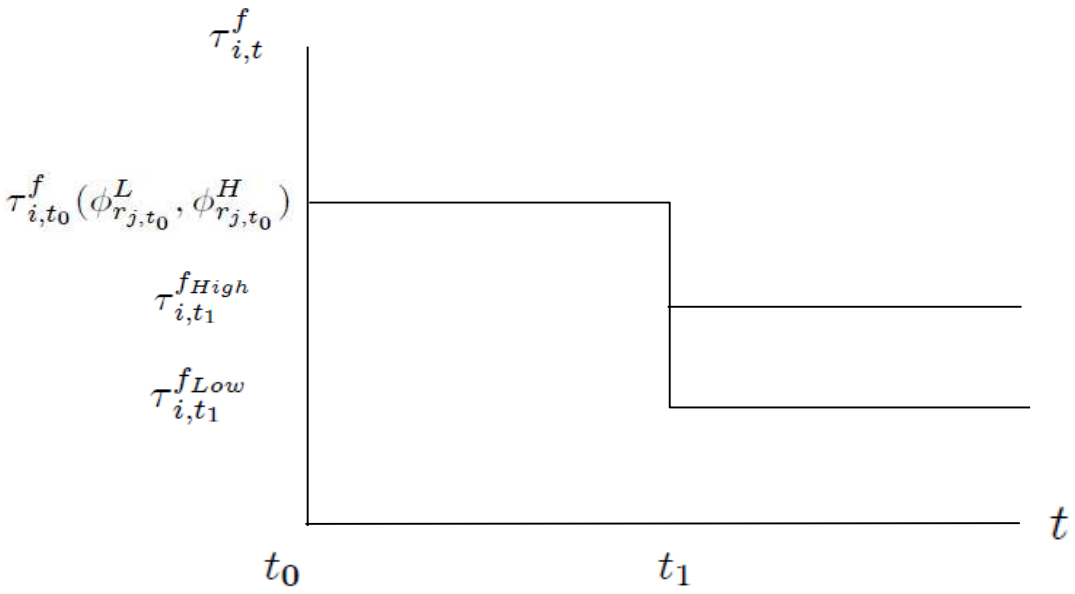

Figure 2. UN voting similarity scores against frequency of diplomatic interactions