Are global trade negotiations behind a fragmented world of "gated globalization"?

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Abstract

In a simple model where global trade negotiations precede sequential Free Trade Agreement (FTA) formation, we show global tariff negotiations can prevent global free trade: FTA formation can yield global free trade in the absence of global tariff negotiations, but global free trade never emerges when global tariff negotitaions precede FTA formation. Intuitively, global tariff negotiations can prevent global free trade precisely because they are successful in eliciting concessions from negotiating countries. Moreover, global tariff negotiations can produce a fragmented world of "gated globalization" where some countries form FTAs eliminating tariff barriers among themselves while outsiders continue facing higher tariffs.

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1 Introduction

Since the successful completion of the Uruguay round in 1994, there has been little progress in global tariff negotiations. The "current" Doha round of negotiations, stretching over fifteen years, is essentially dead. Nevertheless, the post-Uruguay round period has been marked by a proliferation of Free Trade Agreements (FTAs) among blocks of countries. These FTAs are negotiated and formed under the rules set by the World Trade Organization (WTO) that

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essentially mandate free trade among FTA members. In principle, if all nations of the world were eventually connected to each other through such agreements, global free trade would obtain despite the lack of progress in global tariff negotiations. However, current trends suggest the vast majority of nations are unlikely to be connected to each other through FTAs in the foreseeable future with substantial trade barriers between members (insiders) and non-members (outsiders) of FTAs only constrained by the globally negotiated tariff caps of the 1994 Uruguay round. *The Economist* recently referred to this fragmented world of trade barriers co-existing with blocks of free trade amongst FTA members as "gated globalization".[1]

Despite the limited success of global tariff negotiations, it is important to investigate the economic mechanisms that could prevent the recent spread of FTAs as an alternative pathway to global free. This paper focuses on one important mechanism - that between the global tariff negotiations that preceded the recent spate of FTA formation and the eventual outcome of the FTA formation process itself. Is it at all possible that the global negotiations are in fact responsible for the fragmented world of gated globalization that resulted from subsequent FTA negotiations? Could the global tariff negotiations have precipitated some FTA formation yet deterred global expansion of FTAs and thereby prevented global free trade? What could be a plausible mechanism for such an effect? How would such a mechanism have affected global trade negotiations among forward looking nations in the first place? These are the questions addressed in this paper and to the best of our knowledge, this is the first paper in the literature to do so.

We consider a world of three symmetric countries. For our underlying trade model, we adapt the competing exporters framework of Bagwell and Staiger (1999b) to include an import competing sector and politically motivated governments. More precisely, there are three goods and each country exports two comparative advantage goods and imports one comparative disadvantage good. And each government's payoff differs from national welfare by an additional weight placed on profits generated by the import competing sector.

To analyze the effect of global tariff negotiations (multilateralism) on FTA formation (regionalism), we compare the outcomes of two extensive form games: one where global tariff negotiations over tariff bindings are followed (with some exogenous probability) by FTA negotiations and a second game where there is no global tariff negotiation preceding FTA negotiations.[2] Following global tariff negotiations and FTA negotiations, countries

[1] *The Economist,* Special Report, October 2013. http://www.economist.com/news/special-report/21587384-forward-march-globalisation-has-paused-financial-crisis-giving-way

[2] In practice, global tariff negotiations are negotiations over upper bounds on tariffs, known as tariff bindings, rather than the actual tariffs that countries will set, known as applied tariffs. Thus, we model global tariff negotiations in this way.

choose their tariffs that, in turn, generates a pattern of consumption and trade. Our protocol for FTA negotiations is one of sequential bilateral FTA formation according to a randomly chosen order; the protocol ensures that after any FTA is formed, all pairs of countries that have not yet formed an FTA have the option to do so. To be clear, governments are forward looking: when undertaking global tariff negotiations they anticipate the possibility of FTA formation even though they do not yet know the precise sequential order in which country pairs will engage in FTA formation.

Apart from the presence or absence of an initial round of multilateral tariff negotiation, there is no difference between the two extensive form games that we compare. Indeed, the tariffs set by governments are assumed bound by WTO rules whether or not global tariff negotiations have occurred. In particular, FTA members set zero tariffs on each other while their tariffs on the outsider, and the outsider's tariffs on the insiders, are bound by globally negotiated tariff bindings and the non-discriminatory MFN (most favored nation) principle.[3] Thus, if all pairs of countries form FTAs, global free trade is attained. We wish to emphasize that our objective is not to isolate the role of the WTO but rather the role that global tariff negotiations have played, *within current WTO rules*, in generating the fragmented world where FTAs exist but fall far short of global free trade.

Our main result is that, when political economy motivations are not too strong, multilateralism prevents global free trade. In particular, a fragmented world of gated globalization with tariff barriers between outsiders and insiders emerges when FTA negotiations are preceded by global tariff negotiations; however, in the *absence* of global tariff negotiations, FTA formation continues until global free trade is attained.

At first glance, our result that global free trade does not emerge in the presence of global tariff negotiations may seem trivial. And this would be true in the absence of FTAs since politically motivated governments would negotiate non-zero "politically efficient" tariffs that maximize their joint payoff (Bagwell and Staiger (1999a)). However such politically efficient tariffs do not necessarily eliminate incentives for FTA formation. In general, FTA formation creates a world of discrimination between FTA members (insiders) and non-members (outsider) which, all else equal, reduces world welfare. Moreover, FTA formation weakens the domestic import competing sector of member countries which mitigates political economy motivations of their governments. Thus, it is possible that politically minded governments, who care somewhat about global welfare, may prefer global free trade over an FTA induced world of discrimination that results from global tariff negotiations.

What actually drives our main result is the different levels of tariff concessions given by the eventual outsider in the presence and absence of global tariff negotiations. In the absence

[3] Thus, even in the absence of global trade negotiations, we assume that GATT Article XXIV holds.

of global tariff negotiations, the outsider has not pre-committed to any tariff concessions, and this creates incentives for the insiders to engage in subsequent FTA formation with the outsider in order to gain tariff concessions from the outsider. As such, sequential FTA formation leads to global free trade. However, if global tariff negotiations occur, then all countries, including the eventual outsider, pre-commit to significant tariff concessions before the FTA negotiations begin. Indeed, these tariff concessions obtained through multilateral negotiations are deep enough that the insiders then have no incentive to engage in subsequent FTA formation with the outsider and global free trade does not emerge. In this sense, the success of multilateralism in lowering tariffs drives our result that multilateralism prevents global free trade.

Indeed, in our framework, the globally negotiated tariff depends on the (exogenous) likelihood that subsequent FTA negotiations will take place and is lower when the likelihood of subsequent FTA negotiations is higher.[4] The driving force behind this result is that FTA formation weakens the domestic import competing sector in FTA member countries and thus mitigates the political economy concerns of member governments. Thus, governments' anticipation of weaker future political economy motivations allows them to negotiate lower tariffs.

The dependence of multilaterally negotiated tariffs on the likelihood of subsequent FTA negotiations has practical implications for binding overhang (the difference between the tariff binding and applied tariff), tariff changes upon FTA formation and the interpretation of trade flow changes upon FTA formation. When the likelihood of FTA negotiations lowers the globally negotiated tariff below what would arise if governments ignored such considerations, i.e. below the "politically efficient tariff", we find that binding overhang never arises. However, we find that binding overhang would arise if governments instead set the politically efficient tariff. Thus, our modeling of global tariff negotiations as farsighted and depending on subsequent FTA negotiations can help explain why essentially zero binding overhang is observed in central countries involved in the 1994 Uruguay Round such as the US, the EU and Japan. Second, in this zero binding overhang case, our model predicts FTA members do not lower their tariff on non-members; that is, there is no tariff complementarity upon FTA formation.[5] The reason is that farsighted global tariff negotiations already incorporate any tariff complementarity effect into applied tariffs prior to FTA negotiations taking place. Third, this logic implies the interpretation of changes in trade flows upon FTA formation is complicated because the effect that FTAs have on multilateral tariffs is already embedded

[4] While we do not impose that governments negotiate a common tariff, the symmetry of the model leads to a common tariff.

[5] The phenomenon of tariff complementarity is well known in the literature (see, for example, Richardson (1993), Bagwell and Staiger (1999b) and Ornelas (2005b)).

in the multilateral tariffs negotiated prior to FTA formation taking place. This is especially important given, as emphasized by Bergstrand et al. (2014, p.3), policy makers actually rely on observed trade flow changes upon FTA formation to infer welfare effects of FTAs.

There is a large extant literature on international trade agreements that investigates how the presence of FTAs has affected the ability to successfully lower global tariffs involving non-members (either via global negotiations or via voluntary tariff concessions by FTA members) and is often couched in the terminology of how "regionalism" has affected "multilateralism" or whether FTAs are "building blocs" or "stumbling blocs" (Bhagwati (1991, 1993)) en route to global free trade.[6] Our approach however is closer to a strand of the literature beginning with Riezman (1999) that investigates the effect of FTA formation on the attainment of global free trade in a world where the only prevailing mechanism for trade liberalization is global tariff negotiation.[7] The question addressed in our paper is, in a sense, the converse of that posed in this literature: we ask whether multilateralism is a building bloc or stumbling bloc to global free trade in the presence of regionalism. We isolate the effects of multilateralism by comparing the outcome of a world where multilateralism and regionalism exist side by side with a world where only regionalism exists.

In a comprehensive review of the regionalism literature, Freund and Ornelas (2010, p.156) document the "... scarcity of analyses on how multilateralism affects regionalism". Freund (2000) represents one of these scarcities and shows how exogenously lower global tariffs can make an FTA between two arbitrarily chosen countries self-enforcing when it is not otherwise self-enforcing.[8] This points to one reason why regionalism may follow from the success of multilateralism.[9] However, Freund (2000) does not consider what would happen in the absence of multilateralism which is crucial in assessing the underlying role played by multilateralism. Indeed, in our model, multilateralism is never necessary for FTA formation. To the contrary, we find that the success of multilateralism is actually the reason it prevents sequential FTA formation from expanding to global free trade.

While not an analysis of how multilateralism affects regionalism, our paper is closely related to Ornelas (2008) who models multilateral negotiations both before and after an

[6] Prominent examples include Levy (1997), Krishna (1998) and Ornelas (2005a). See Freund and Ornelas (2010) for a recent extensive review.

[7] Subsequent examples taking this perspective include Aghion et al. (2007), Saggi and Yildiz (2010) and Lake (2014).

[8] Agreements are self-enforcing in Freund (2000) in the sense of the repeated game notion popularized by Bagwell and Staiger (1997a,b).

[9] Similarly, Ethier (1998) argues regionalism is a benign consequence emerging from the success of multilateralism. He argues that regionalism allows small countries, who do not participate in early rounds of multilateral negotiations, to form FTAs with large countries and gain an advantage over other small countries in terms of attracting foreign direct investment (FDI). Moreover, since FDI is more attractive for for foreign source countries when tariffs are low, regionalism takes hold when multilateralism is successful.

arbitrary bilateral trade agreement. He shows that world welfare rises upon FTA formation because of tariff complementarity but an FTA does not emerge in equilibrium. In contrast, we find FTA formation emerges in equilibrium yet may not be accompanied by tariff complementarity. We expand upon the mechanisms underlying these differences in Section 4.

Our paper also links with some other important papers in the broader trade agreements literature. Maggi (1999) emphasizes that multilateralism can play a positive role in the global trade system via monitoring. Within an infinitely repeated prisoners dilemma game, he shows that the presence of power imbalances makes multilateral monitoring superior to bilateral monitoring because the power to punish defecting countries can be shared between all non-defecting countries including the powerful countries outside of the bilateral trading relationship where the defection occurred. In contrast, our model presents a mechanism where the presence of multilateral cooperation prior to bilateral cooperation results in a loss of world welfare.

Limão (2007) argues that an important rationale underlying "north-south" trade agreements is that the north (i.e. developed countries) uses these agreements to pursue non-economic objectives with the south (i.e. developing countries). Our main result says the extent of FTA formation is limited among countries who participate in global tariff negotiations prior to FTA formation. Since developed countries, and not developing countries, were the key participants in the Uruguay round, this logic suggests that some additional mechanism is needed to explain why there are so many FTAs involving developed countries. The non-economic motivations suggested by Limão (2007) could fill such a void.

The remainder of the paper proceeds as follows. Section 2 presents our modified version of the Bagwell and Staiger (1999b) competing exporters model. Section 2.2 describes our game theoretic approach to modeling multilateralism and regionalism. Section 3 establishes that global tariff negotiations prevent global free trade. Section 4 establishes that global tariff negotiations can produce a fragmented world of gated globalization and characterizes the tariffs that result from global tariff negotiations. Finally, Section 5 concludes. Proofs are collected in the appendix.

2 Model

2.1 Basic trade model

We consider a modified version of the competing exporters model due to Bagwell and Staiger (1999b). There are three symmetric countries denoted by $i = a, b, c$ and three non-numeraire

goods denoted by $Z = A, B, C$. Each country i has an endowment of $e_i^Z = e$ for goods $Z \neq I$ and an endowment of $e_i^Z = d < e$ for good $Z = I$. Below, we will see that country i is a natural exporter of goods $Z \neq I$ and a natural importer of good $Z = I$. Thus, countries j and k are competing exporters in serving country i's market. Moreover, good I can be viewed as country i's "comparative disadvantage" good and goods $Z \neq I$ can be viewed as country i's "comparative advantage" goods. In the results later, the hybrid parameter

$$\varphi \equiv \frac{e-d}{d}$$

plays a frequent role which can be interpreted as the "strength of comparative advantage".

Demand for good Z in country i is given by $q\left(p_i^Z\right) = \alpha - p_i^Z$ where p_i^Z denotes the price of good Z in country i. In turn, no arbitrage conditions link the prices of goods across countries. Given non-prohibitive tariffs t_{ij} and t_{ik} applied by country i on countries j and k, $p_i^I = p_j^I + t_{ij} = p_k^I + t_{ik}$. Closed form solutions for prices of domestic goods can be derived from international market clearing conditions. Letting $x_i^Z = e_i^Z - q\left(p_i^Z\right)$ denote country i's *net* exports of good Z, market clearing for good Z requires $\sum_i x_i^Z = 0$.The equilibrium domestic price of good I in country i is then

$$p_i^I\left(t_i, e, d\right) = \alpha - \frac{1}{3}\left(d + 2e\right) + \left(t_{ij} + t_{ik}\right)$$

where $t_i \equiv \left(t_{ij}, t_{ik}\right)$ denotes country i's tariffs. The equilibrium domestic price of good $Z \neq I$ in country i is

$$p_i^Z\left(t_z, e, d\right) = \alpha - \frac{1}{3}\left(d + 2e\right) + \frac{1}{3}\left(t_{zk} - 2t_{zi}\right) \text{ for } k \neq i, z.$$

Given the equilibrium domestic prices, the net exports of each good and each country are easily calculated. Country i's net exports of good $Z \neq I$ to country $z \neq i$ are

$$x_{iz}^J\left(t_z, e, d\right) = \frac{1}{3}\left(e - d\right) + \frac{1}{3}\left(t_{zj} - 2t_{zi}\right).$$

Thus, country i is a natural exporter of goods $Z \neq I$ because $e > d$ implies $x_{iz}\left(t_z, e, d\right) > 0$ when $t_{zi} = t_{zj} = 0$. Conversely, country i's net imports (i.e. negative net exports) of good I from other countries are

$$m_i^I\left(t_i, e, d\right) = \sum\nolimits_{z \neq i} x_{zi}^I\left(t_i, e, d\right) = \frac{2}{3}\left(e - d\right) - \frac{1}{3}\left(t_{ij} + t_{ik}\right).$$

Thus, country i is a natural importer of good I because $e > d$ implies $m_i^I\left(t_i\right) > 0$ when

$t_{ij} = t_{ik} = 0$. Moreover, when country k faces no tariff in country j, i.e. $t_{jk} = 0$, then country i has positive net exports of good Z to country z if and only if $t_{zi} < t_{PRO}$ where

$$t_{PRO} \equiv \frac{1}{2}(e - d) \tag{1}$$

is the "prohibitive tariff" below which the competing exporters structure of the model is preserved.

It is well known that the effective partial equilibrium nature of the model implies country i's national welfare can simply be represented as

$$W_i(\tau, e, d) = \sum_Z CS_i^Z(\mathbf{t}, e, d) + \sum_Z PS_i^Z(\mathbf{t}, e, d) + TR_i(t_i, e, d)$$

where $\mathbf{t} \equiv (t_i, t_j, t_k)$ is the global tariff vector, CS_i^Z and PS_i^Z denote country i's consumer surplus and producer surplus associated with good Z and TR_i denotes country i's tariff revenue. Appendix A contains algebraic expressions for the individual components of $W_i(\cdot)$. In addition to national welfare, the government's objective function in each country includes a political economy consideration based on the political influence emanating from the import competing sector. In particular, the payoff of country i's government is given by

$$G_i(\mathbf{t}, \theta) = \sum_Z CS_i^Z(\mathbf{t}, e, d) + \sum_{Z \neq I} PS_i^Z(\mathbf{t}, e, d) + (1 + b) PS_i^I(t_i, e, d) + TR_i(t_i, e, d) \tag{2}$$

where $\theta \equiv (b, e, d)$ and $b > 0$ denotes the additional weight placed by the government on the producers surplus of the import competing sector reflecting the extent to which the government is politically motivated. Note that the actual wedge between national welfare $W_i(\cdot)$ and the government's payoff $G_i(\cdot)$ is given by bPS_i^I. Thus, the strength of the government's political economy motivation is partly endogenous as it depends on the producer surplus of the import competing sector.

2.2 Global tariff negotiations and FTA negotiations

We adopt a simple, but flexible, protocol that governs how global tariff negotiations and FTA negotiations proceed. We isolate the role that global tariff negotiations play by comparing the equilibrium outcomes of FTA negotiations that take place in the absence of global tariff negotiations and those that take place after global tariff negotiations. Apart from the presence or absence of an initial round of global tariff negotiations, the FTA formation games compared are identical.

Reflecting the global tariff negotiations that have actually taken place (e.g. Uruguay round, Tokyo round etc.), we model such negotiations as negotiations over the upper bound on tariffs, i.e. tariff bindings, rather than actual tariffs, i.e. applied tariffs. As such, it is possible in our model that countries set applied tariffs below the tariff binding once FTA negotiations have concluded. That is, "binding overhang" can arise in our model. In the version of the model where global tariff negotiations take place at the initial stage, we assume that governments anticipate how the negotiated tariff bindings will affect the equilibrium outcome of subsequent FTA negotiations and set these tariff bindings cooperatively so to maximize their joint expected payoff.

The FTA formation game has three main stages: a move of nature (Stage 0), FTA negotiations (Stage 1) and tariff setting (Stage 2).

Stage 0: Nature chooses whether or not FTA negotiations occur and if so, the sequential order in which pairs of countries have the opportunity to form FTAs. The probability that FTA negotiations occur is exogenously fixed at $p \in (0, 1]$; with probability $1 - p$ there are no FTA negotiations, and thus no FTAs, and we move directly to the tariff setting stage (Stage 2). As for the sequential order in which countries negotiate to form FTAs, all of the six possible orderings are equally likely to be chosen.

Stage 1: The next stage of the game (which is reached only with probability p) is one of actual FTA formation. When a pair of countries has the opportunity to form an FTA, the pair is referred to as the "active pair" and the government of each country in the active pair simultaneously chooses whether or not to join an FTA with the other country in the active pair. An FTA forms if and only if both governments in the active pair choose to join an FTA. Stage 1 consists of three sub-stages:

- Stage 1(a): Following the order previously chosen by nature, the three pairs of countries engage in sequential FTA negotiations with the outcome of each pair's FTA formation decision observed by all countries. However, as soon as the first FTA forms, the game moves to Stage 1(b). If all three pairs fail to form an FTA, FTA formation concludes and the game moves directly to tariff setting (Stage 2).

- Stage 1(b): Following the ordering chosen by nature, the two pairs who have not formed an FTA sequentially decide whether or not to form an FTA (even if they had a chance and failed to form an FTA in Stage 1(a)). However, as soon as either pair forms an FTA, the game moves to Stage 1(c). If both pairs fail to form an FTA, the game moves directly to tariff setting (Stage 2).

- Stage 1(c): The final pair of countries that has not yet formed an FTA has the opportunity to do so. Regardless of the outcome, the game moves to tariff setting (Stage

2).

This protocol has the desirable feature that every pair of countries who chooses to not form an FTA in a given sub-stage gets a chance to reconsider their decision in a later sub-stage if some other pair forms an FTA; FTA negotiations cease if and only if there is no pair of countries that wants to form an additional FTA.[10] This feature makes the protocol more flexible than that in Aghion et al. (2007) where a single "leader" country can make sequential FTA proposals to two "follower" countries and the follower countries never have the opportunity to form their own FTA. In the proofs, we let $a_i \in \{J, NJ\}$ denote whether country i, as a member of an active pair, chooses to join (J) or not join (NJ) an FTA with the other country in the active pair.

Stage 2: Governments of all countries choose their applied tariffs subject to zero tariffs between FTA members and prior globally negotiated tariff bindings (if any).[11]

After the applied tariffs are set, the payoffs of the countries are determined according to the production, trade and consumption generated by these tariffs.

Using backward induction, we solve for a pure strategy subgame perfect equilibrium of the FTA formation game. In doing so, we restrict attention to subgame perfect equilibria where FTA negotiations are efficient in the sense that when any pair of countries has an opportunity to form an FTA, they always choose to do so whenever the formation of the FTA is gainful for both governments; this rules out equilibria where FTA formation fails to arise because of coordination failure.

We will compare the equilibrium outcome of the FTA formation game when global tariff negotiations take place prior to the FTA formation game with the equilibrium outcome of the FTA formation game when there are no global tariff negotiations. In particular, when global tariff negotiations precede the FTA formation game, the tariffs that countries set in Stage 2 of the FTA formation game are constrained by the globally negotiated tariff bindings. However, in the absence of global tariff negotiations, the tariffs countries set in Stage 2 of the FTA formation game are not bound by pre-existing tariff bindings since countries have not committed to any such bindings. Otherwise, the two FTA formation games are identical.

Before moving on to examine optimal tariffs, we present a lemma that will be used frequently in later sections. The lemma deals with the incentive of countries to form an FTA when they are the only pair of countries who have not yet formed an FTA (i.e. Stage 1(c)

[10] Note the maximum number of FTA formation opportunities in Stage 1 is six. Stage 1(a) has a maximum of three FTA formation opportunities, Stage 1(b) has a maximum of two and Stage 1(c) has only a single opportunity.

[11] Zero tariffs between FTA members are consistent with the theoretical literature's interpretation of GATT Article XXIV. While we do not formally impose the MFN principle, symmetry of the model ensures the MFN principle is respected.

of the FTA formation game).

Lemma 1 *Suppose two FTAs have already formed and a pair of countries has the opportunity to form the third FTA. Assuming non-prohibitive tariffs, they form the FTA and, in turn, global free trade is obtained.*

2.3 Optimal tariffs

2.3.1 Optimal non-cooperative tariffs

In this section, we describe the non-cooperative optimal tariffs that countries set if they are unconstrained by tariff bindings. They are all easily derived given the welfare expressions in Appendix A.[12] Obviously, these tariffs will play an important role in determining the equilibrium structure of FTAs in the game where global tariff negotiations do not take place. However, they will also play a role in the game where global tariff negotiations do take place because, in general, the globally negotiated tariff bindings may exceed the non-cooperative optimal tariff of a country and, in this case, the country will set an applied tariff below the tariff binding.

We denote an arbitrary network of FTAs by g. In the absence of any FTAs, denoted by $g = \varnothing$, country i's tariffs on countries j and k, i.e. $t_{ij}(\varnothing)$ and $t_{ik}(\varnothing)$, are chosen to maximize the payoff of country i's government as given in (2). Because of the model's symmetry, country i chooses to impose a non-discriminatory tariff:

$$t_{ij}(\varnothing) = t_{ik}(\varnothing) = t_{Nash} \equiv \frac{1}{4}(e - d) + \frac{3}{4}bd.$$

Country i's optimal tariff consists of two terms. The first term is the standard terms of trade consideration based solely on national welfare of country i. However, unlike the traditional competing exporters model, we have non-zero endowments of comparative disadvantage goods. Thus, larger domestic import competing sectors (i.e. higher d) reduce the volume of exports on the world market and thus mitigate an importing country's incentive to raise tariffs because of terms of trade considerations. The second term arises in our model because of government political economy motivations. This political economy effect rises both with the extra weight placed on the import competing sector's producer surplus, b, and the size of the domestic import competing sector, d. We confine attention to the range of parameters for which the Nash tariffs are below the prohibitive level t_{PRO}, defined in (1),

[12] In the special case of $b = d = 0$, the optimal non-cooperative tariffs reduce to those found in Saggi and Yildiz (2010).

which reduces to the following restriction:

$$b \leq \bar{b}_{PRO}(\varphi) \equiv \frac{1}{3}\varphi. \tag{3}$$

We will assume that (3) holds throughout the paper (hereafter, we suppress the dependence of $\bar{b}_{PRO}(\varphi)$ on φ).

We now describe how FTA formation affects countries' optimal tariffs. As is well known, the competing exporters model delivers the result that FTA formation between countries i and j (insiders) leaves the optimal tariff of country k (outsider) unchanged. Letting g_{ij} denote the insider-outsider network where a single FTA exists between countries i and j, we have :

$$t_{ki}(g_{ij}) \equiv t_{OUT} = t_{Nash} = \frac{1}{4}(e-d) + \frac{3}{4}bd \equiv t^*_{OUT}. \tag{4}$$

Underlying this result is the complete lack of interdependence across goods markets which means the incentive for k to manipulate the price of its imported good is independent of the tariffs in other markets and it is indeed the tariffs on these other goods that are affected by an FTA between i and j. Moreover, in our model, the outsider government's political economy motivations are based exclusively on the market of its imported good and thus are again unaffected by the tariffs in the markets for other goods.

Unlike non-members, FTA formation affects the optimal tariffs of FTA members in the competing exporters model. In particular, FTA formation induces FTA members (insiders) to lower their tariff on the non-member (outsider) which is a phenomena known as tariff complementarity. An insider country, say i, has an optimal tariff on the outsider country k of

$$t_{ik}(g_{ij}) \equiv t_{IN} = \frac{1}{11}(e-d) + \frac{3}{11}bd \equiv t^*_{IN} \tag{5}$$

and tariff complementarity is evident because $t^*_{IN} < t_{Nash}$. As above, terms of trade considerations and political economy motivations drive an insider's tariff on the outsider. However, each of these forces are now weaker. The terms of trade consideration is weaker because upon giving tariff free access to one importer, and losing the associated tariff revenue, it is more attractive to lower the tariff on the other exporter to mitigate the loss of tariff revenue. As in Ornelas (2005b), the political economy consideration is weaker because the surplus received by the domestic import competing sector falls when exporters of the FTA partner are granted tariff free access to the domestic market.

When, an insider country, say i, and an outsider country, say k, form an FTA then the hub-spoke network g_i^H emerges where i is the hub while j and k are spokes. As above, this leaves the tariff of the non-member, country j, unaffected: $t_{jk}\left(g_i^H\right) = t_{jk}(g_{ij})$. However, as

above, the outsider country k lowers its tariff on the non-member country j so that:[13]

$$t_{kj}\left(g_i^H\right) = \frac{1}{11}\left(e-d\right) + \frac{3}{11}bd = t_{IN}^*. \tag{6}$$

2.3.2 Optimal globally negotiated tariff bindings

Having described the optimal tariffs of individual countries across the various FTA network structures, we now describe the optimal tariff bindings that governments negotiate jointly prior to FTA formation. Notation wise, τ denotes a vector of tariffs where, for any i and j, country i's tariff on country j is given by t_{ij} and $\tau\left(t\right)$ denotes a vector of common tariffs where $t_{ij} = t$ for all i, j. Further, τ_{-ij} denotes the vector of tariffs τ *except that* countries i and j set zero tariffs on each other and, similarly, $\tau_{-ij}\left(t\right)$ denotes that each country imposes a common tariff t on each other except that countries i and j impose a zero tariff on each other.

We begin by considering what would be the globally negotiated tariff binding *ignoring* the possibility of subsequent FTA formation and *ignoring* the possibility that the applied tariff could differ from the tariff binding. In this case, governments would maximize their joint payoff by solving:

$$\max\ G_a\left(\varnothing;\tau\right) + G_b\left(\varnothing;\tau\right) + G_c\left(\varnothing;\tau\right). \tag{7}$$

The solution to this problem is that all tariff bindings would be set equal to the "politically efficient" tariff

$$bd \equiv t^{pe} \tag{8}$$

which yields the tariff vector $\tau\left(t^{pe}\right)$. Indeed, since $t^{pe} < t_{Nash}$, the politically efficient tariff would actually bind governments' applied tariffs in the absence of FTAs if set as the tariff binding. Thus, t^{pe} is both the tariff binding and the applied tariff in the absence of any FTAs. Importantly, $t^{pe} > 0$ implies that, even though governments could set any subset of tariffs to zero, the first best outcome from the joint perspective of governments is jointly committing to a common non-discriminatory tariff. As such, we refer to it as politically efficient. Naturally, $t^{pe} \to 0$ as political motivations vanish which happens as $b \to 0$ or $d \to 0$.

Now we consider the tariff bindings that governments will negotiate *anticipating* the possibility of subsequent FTA formation but still *ignoring* the possibility that applied tariffs could differ from the globally negotiated tariff bindings (except, of course, that FTA members levy zero tariffs on each other). Given the equilibrium structure that will obtain in the

[13] Of course, since the hub country has FTAs with both of the other countries it practices free trade.

following sections, we restrict our attention here to the hypothetical situation where governments negotiate tariff bindings knowing for certain that a single FTA will emerge upon FTA negotiations taking place. Then, global negotiations would solve the following maximization problem:

$$\max_{\tau} \quad \sum_{ij\in\{ab,ac,bc\}} \tfrac{1}{3}\left[p\cdot G\left(g_{ij};\tau_{-ij}\right)+(1-p)\,G\left(\varnothing;\tau\right)\right]\ . \tag{9}$$

The solution to this optimization problem is that all tariff bindings would be given by

$$bd\left(1-\frac{p}{3}\right)=t^{pe}\left(1-\frac{p}{3}\right). \tag{10}$$

This yields the global tariff vector $\tau\left(t^{pe}\left(1-\frac{p}{3}\right)\right)$ in the absence of FTAs and $\tau_{-ij}\left(t^{pe}\left(1-\frac{p}{3}\right)\right)$ in the presence of a single FTA between countries i and j. An important result emerging from our model is that globally negotiated tariff bindings, and applied tariffs, depend on the likelihood of subsequent FTA negotiations. This possibility can be seen in (10) and we discuss this result in Section 4 after characterizing when equilibrium applied tariffs are indeed given by (10).

As noted above, the maximization problem in (9) assumes the tariff binding binds countries applied tariffs both in the presence and the absence of FTA negotiations taking place. Given our discussion of the non-cooperative optimal tariffs in the previous section, this is true if and only if $t^{pe}\left(1-\frac{p}{3}\right)\leq\min\left\{t_{IN}^{*},t_{OUT}^{*},t_{Nash}\right\}=t_{IN}^{*}$ which reduces to

$$b\leq\bar{b}_{TC}\left(p,\varphi\right)\equiv\frac{3}{24-11p}\varphi. \tag{11}$$

It is intuitive that global tariff negotiations bind governments' applied tariffs when political economy concerns are not too high. Low political economy concerns produce low globally negotiated tariffs that approach zero as political economy concerns vanish yet, even in the absence of political economy concerns, terms of trade considerations motivate individual governments to impose tariffs on each other.

As an alternative to the situation of setting a tariff binding that binds insiders and the outsider, governments' could set a tariff binding that only binds the outsider upon FTA formation.[14] It is well known that goods markets are completely independent of each other in the competing exporters model. Thus, the optimal tariff binding that only binds the outsider is merely:

$$bd=t^{pe}. \tag{12}$$

[14]Since tariff complementarity implies $t_{OUT}^{*}>t_{IN}^{*}$, it is not possible to set a tariff binding that only binds insiders. Moreover, in the proof of Lemma 2, we show that setting a tariff binding that does not bind any country's applied tariff is not optimal.

Note, t^{pe} does not bind an insider's applied tariff if and only if $b \geq \frac{1}{8}\varphi$ but always binds the applied tariff of the outsider given (3). Of course, the natural question that now arises is whether it is optimal to bind the applied tariffs of insiders and the outsider or whether it is optimal to only bind the applied tariff of the outsider? We can establish the existence of threshold $\bar{b}_{BND}$ where governments are indifferent between these two options. Thus, the following lemma characterizes the optimal tariff binding which we refer to as the "farsighted MFN tariff" t^{fs}_{MFN}.

Lemma 2 *Suppose that, exogenously, a single FTA emerges conditional on FTA negotiations taking place. Then, there exists a threshold* $\bar{b}_{BND} \in \left[\frac{1}{8}\varphi, \bar{b}_{TC}\right]$ *(see (11)) such that the optimal tariff binding is given by*

$$t^{fs}_{MFN} \equiv \begin{cases} t^{pe}\left(1-\frac{p}{3}\right) & \text{if } b \leq \bar{b}_{BND} \\ t^{pe} & \text{if } b \geq \bar{b}_{BND} \end{cases}.$$

Apart from FTA member tariffs on each other (which are zero), all applied tariffs are t^{fs}_{MFN} *with the exception that the applied tariff of an insider is given by* $t_{ik}\left(g_{ij}\right) = t^{*}_{IN}$ *when* $b \geq \bar{b}_{BND}$.

The existence of a critical value $\bar{b}_{BND}$ captures a tension underlying governments choice about whether to bind the applied tariffs of insiders and the outsider or only bind the outsider's applied tariffs. Given (12), binding the outsider's applied tariffs below t^{pe} is costly. However, FTA formation weakens the import competing sector in member countries and thus weakens the political economy motivations of insiders relative to the outsider. Thus, bringing t_{IN} below t^{pe} constitutes a benefit because. When b is small, t^{*}_{IN} far exceeds t^{pe} which creates a large benefit of pushing t_{IN} below t^{pe}. That is, insiders act very opportunistically relative to what governments would like prior to FTA negotiations when b is low. At the same time, a low b means t^{pe} is low so that constraining the outsider to set $t_{OUT} < t^{pe}$ is not very costly. Hence $t^{fs}_{MFN} = t^{pe}\left(1-\frac{p}{3}\right)$ constrains both the insider and outsider when b is small.[15] However, given the outsider's stronger political economy motivations relative to insiders, t^{pe} rises faster than t^{*}_{IN} as b rises. Thus, in addition to the rising cost of constraining $t_{OUT} < t^{pe}$, the benefit of pushing t_{IN} below t^{pe} falls since $t^{*}_{IN} - t^{pe}$ falls as b rises. As such, $t^{fs}_{MFN} = t^{pe}$ when b is high and only binds the outsider.[16]

Complementary to this intuition is that binding the applied tariffs of both the insiders and the outsider is more helpful in smoothing the payoffs of insiders and the outsider when b

[15] Note $\bar{b}_{BND} \leq \bar{b}_{TC}$ implies t^{fs}_{MFN} binds the applied tariffs of insiders and the outsider when $b \leq \bar{b}_{BND}$.

[16] In the proof of Lemma 2, we establish that $b \geq \bar{b}_{BND}$ implies $t^{*}_{IN} > t^{m}_{MFN}$ so that, indeed, t^{fs}_{MFN} does not bind the applied tariffs of insiders when $b \geq \bar{b}_{BND}$.

is low since t^*_{IN} far exceeds t^{pe} in this case. Smoothing these payoffs is attractive for countries given their uncertainty about whether they will be an insider or an outsider at the stage of global tariff negotiations.

3 Global tariff negotiations and global free trade

We begin by stating an important result of the FTA formation game when global tariff negotiations precede FTA negotiations.

Proposition 1 *Global free trade never emerges when global tariff negotiations take place prior to FTA negotiations.*

The proof of Proposition 2 in the Appendix relies on results we establish later in Proposition 3. However, here we present an independent intuition that explains why global tariff negotiations prevent global free trade.

If there is no possibility of FTA formation after global tariff negotiations, or governments are purely myopic, the political economy concerns held by governments imply they maximize their joint payoff by imposing a positive tariff binding. This positive tariff binding t is the politically efficient tariff t^{pe} defined by (8). Thus, in the absence of any FTA formation, Proposition 1 would be somewhat trivial. However, allowing the possibility of FTA formation after global negotiations introduces complications. First, even if global negotiations do not eliminate trade barriers and result in positive tariff bindings, such as t^{pe}, FTA negotiations may lead to a de facto world of global free trade via each pair of countries having an FTA. Second, having negotiated t^{pe} as the global tariff binding, FTA formation leads to a fragmented world of discrimination between insiders and outsiders where insiders drop tariffs on each other from t^{pe} to zero. In this case, governments may decide that, despite their political economy considerations, it is better to rid the world of discrimination by reducing the initially globally negotiated tariff bindings to zero across the board. We show that neither of these happen in equilibrium and, in turn, global free trade will not emerge following global tariff negotiations.

The key argument here is that governments can guarantee themselves a strictly higher joint payoff than derived under global free trade by setting the globally negotiated tariff binding t equal to the politically efficient tariff t^{pe} prior to FTA negotiations taking place. While t^{pe} may not be the globally negotiated tariff binding on the equilibrium path, it dominates any tariff binding that produces global free trade (either directly or, eventually, via sequential FTA formation). Thus, governments can always set a globally negotiated

tariff binding that does not lead to free trade and yields a higher joint payoff than global free trade.

But, why does setting a global negotiated tariff binding equal to the politically efficient level yield governments a higher joint payoff than under global free trade? This is obvious if no FTA emerges in equilibrium because t^{pe} would bind governments applied tariffs (i.e. $t^{pe} < t_{Nash}$) and, by definition, maximize their joint payoff. But, it is also true if a single FTA emerges. In this case, the marginal welfare loss stemming from non-zero applied tariffs is proportional to the tariff level yet the marginal political benefit of non-zero applied tariffs is constant. Thus, given t^{pe} significantly restrains the applied tariff of the outsider (and potentially the insider as well), the political benefit of protection outweighs the welfare loss. Hence, relative to global free trade, governments prefer setting t^{pe} as the globally negotiated tariff binding if either no FTAs or a single FTA emerges in equilibrium.

Indeed, when $t = t^{pe}$, the only possible outcomes of the FTA formation game are no FTAs or a single FTA. This follows from the observation in Lemma 1 that, when given the opportunity, two spoke countries always form the last FTA that takes the world from the hub-spoke network to global free trade. Foreseeing this, an insider is only willing to engage in formation of a second FTA with the outsider if its eventual payoff under global free trade exceeds that as an insider. The main advantage to an insider of moving to global free trade is eliminating the tariff barrier it faces when exporting to the outsider. However, this incentive is relatively low given the globally negotiated tariff binding t^{pe} significantly restrains the tariff imposed by the outsider. Moreover, the insider's own political economy motivations further reduce the incentive to engage in subsequent FTA formation and to the extent that the insider chooses not to form a second FTA and therefore blocks further FTA expansion. Thus, at most a single FTA emerges in equilibrium when the globally negotiated tariff binding is t^{pe} and, in any case, governments prefer this outcome over global free trade.

While global free trade never emerges in the presence of global tariff negotiations, establishing the role played by global tariff negotiations in the attainment of global free trade depends on whether global free trade would be attained in the absence of such negotiations. To establish the equilibrium in the absence of global tariff negotiations, we consider the FTA formation game in the absence of global negotiations. In the absence of any globally negotiated tariff bindings, the only constraint on government tariff setting is that FTA members eliminate tariffs on each other.

We begin by observing that unless political economy considerations are very strong, at least one FTA must form. In a world without FTAs, all applied tariffs would be the non-cooperative Nash tariffs. As such, FTA formation would bring significant welfare gains to members that outweigh the political cost to each member government. Further, Lemma

1 established a hub-spoke network cannot emerge in equilibrium because the two spoke countries are better off deviating and forming their own FTA that takes the world to global free trade. Thus, the equilibrium outcome in the absence of global tariff negotiations must be either a single FTA or global free trade.

This brings us to the important issue of why the absence of global tariff negotiations can lead to global free trade as the equilibrium outcome rather than a fragmented world with only a single FTA. Both insiders and the outsider recognize formation of a second FTA will eventually lead to global free trade. However, the relative attractiveness of global free trade differs for the insiders and the outsider. For all countries, global tariff elimination brings additional market access for exporters and reduced protection for the domestic import competing sector with the latter becoming more costly as political economy motivations strengthen. But the outsider reaps an additional gain because it no longer faces discrimination in the FTA member markets. Thus, if $t_{IN} = t_{OUT}$, this "discrimination effect" implies that the outsider has a weaker incentive than the insider to block global free trade.

However, as discussed in Section 2.3, tariff complementarity induces members to lower their tariff on the non-member so that $t^*_{IN} < t^*_{OUT}$. As a result, the insider's import competing sector now loses less and the outsider's exporting sector now gains less upon expansion to global free trade. Indeed, these "tariff complementarity effects" outweigh the "discrimination effect" so that the outsider has a stronger incentive to block global free trade. Put slightly differently, the absence of tariff concessions given by the outsider motivate each insider's desire to engage in subsequent FTA formation with the outsider even though it eventually yields global free trade. When interpreting our main results, this observation will be very important.

While the outsider has a stronger incentive to block global free trade, whether it does so depends on the strength of political economy motivations. In particular, an outsider refuses to participate in subsequent FTA formation, thereby blocking global free trade, when $G_i(g_{jk}) \geq G_i\left(g^{FT}\right)$. Unsurprisingly, given the optimal tariffs of insiders and outsiders discussed in Section 2.3, an outsider blocks global free trade when political economy motivations exceed a threshold:

$$b \geq \bar{b}_{OUT}(\varphi) \equiv \frac{13}{137}\varphi. \tag{13}$$

Thus, an outsider does not block global free trade, and thus global free trade emerges in the absence of global tariff negotiations, when $b < \bar{b}_{OUT}(\varphi)$ (hereafter, we suppress the dependence of $\bar{b}_{OUT}(\varphi)$ on φ). In this case, FTA formation represents the only, albeit blunt, mechanism whereby insiders can extract tariff concessions from the outsider. Proposition 2 now presents our main result.

Proposition 2 *Global tariff negotiations prevent global free trade when* $b < \bar{b}_{OUT}$ *(see (13)).*

Global tariff negotiations prevent global free trade because global free trade never emerges in the presence of global tariff negotiations (Proposition 1) yet emerges in the absence of global tariff negotiations when $b < \bar{b}_{OUT}$. In other words, global tariff negotiations are actually the cause of a world stuck short of global free trade when political economy motivations are "not too large". Notice that, given our parameter space is restricted to $b < \bar{b}_{PRO} = \frac{1}{3}\varphi$, the striking result of Proposition 2 holds for nearly one-third of the parameter space. Moreover, given the parameter φ can be arbitrarily large as d approaches 0, the result in Proposition 2 may hold even when political economy motivations are very strong.

Gaining a better understanding of how global tariff negotiations prevent global free trade requires understanding how the presence of global negotiations changes the incentives of the outsider or the insiders such that one of them now refuses to participate in FTA expansion that would ultimately yield global free trade. As noted above, the insider opted against blocking global free trade in the absence of global tariff negotiations because it had not extracted any tariff concessions from the outsider. But, the presence of global tariff negotiations leads to a relatively low tariff binding and, as such, extracts significant applied tariff concessions from the eventual outsider. Indeed, these tariff concessions received by the eventual insider are large enough that an insider now refuses to participate in FTA expansion and, thus, blocks expansion to global free trade. Therefore, the role of tariff concessions given by the eventual outsider in global tariff negotiations drive the result that global tariff negotiations can prevent global free trade. More broadly, the success of global tariff negotiations in lowering tariff bindings and applied tariffs across all participating countries underlies why global tariff negotiations prevent global free trade.

4 A fragmented world of gated globalization

In the previous section, we established that global tariff negotiations prevent global free trade primarily because the tariff concessions generated by such negotiations eliminate the FTA expansion incentives necessary for global free trade to emerge via FTA formation. But what is the equilibrium network of FTAs that emerge when global tariff negotiations take place? And what tariffs will result from global tariff negotiations?

We now turn to these two questions with Proposition 3 showing the answers depend on two critical values of the political economy parameter b. The first critical value is $\bar{b}_{\varnothing}$ that will be defined later in this section (see (14)). The second critical value is $\bar{b}_{BND}$ that was defined in Lemma 2 and is the critical value that determines whether the farsighted MFN tariff is given by $t^{fs}_{MFN} = t^{pe}\left(1 - \frac{p}{3}\right)$ or $t^{fs}_{MFN} = t^{pe}$.

Proposition 3 *Global tariff negotiation leads to a fragmented world with a single FTA if, and only if, $b < \bar{b}_{\varnothing}$. The globally negotiated tariff binding is*

$$t^{fs}_{MFN} = \begin{cases} t^{pe}\left(1 - \frac{p}{3}\right) & \text{if } b < \min\left\{\bar{b}_{BND}, \bar{b}_{\varnothing}\right\} \\ t^{pe} & \text{if } b \in \left[\bar{b}_{BND}, \bar{b}_{\varnothing}\right) \end{cases}.$$

The tariff binding is also the applied tariff of all countries regardless of whether FTA negotiations take place except when $b \in \left[\bar{b}_{BND}, \bar{b}_{\varnothing}\right)$ in which case the insiders impose an applied tariff of $t^{*}_{IN} \leq t^{fs}_{MFN}$ on the outsider.

In what follows, we outline the broad arguments underlying Proposition 3.

To begin, note that Lemma 2 already established that, conditional on the emergence of a single FTA in equilibrium, the optimal tariff binding is given by t^{fs}_{MFN}. Further, Lemma 2 also implies that t^{fs}_{MFN} binds the applied tariffs of all countries except for the case where $b \in \left[\bar{b}_{BND}, \bar{b}_{\varnothing}\right)$ when $t^{fs}_{MFN} = t^{pe}$ because then insiders set an applied tariff of $t^{*}_{IN} < t^{pe}$ on the outsider.

However, not only is t^{fs}_{MFN} the optimal tariff binding conditional on a single FTA emerging in equilibrium but it is also true that a single FTA emerges in equilibrium conditional on t^{fs}_{MFN} being the globally negotiated tariff binding. The emergence of FTA formation is not surprising given that $b < \bar{b}_{\varnothing}$ implies b is not too large. When FTA members engage in reciprocal elimination of *any* tariff that lies below the prohibitive tariff, their welfare rises given part of the market access that each member gains in its partner's market comes at the expense of the non-member country. Thus, given b lies below the threshold $\bar{b}_{\varnothing}$, governments' political motivations are not strong enough to make FTA formation unattractive. However, why do FTA negotiations yield only a single FTA? The answer is that, as we discussed in the previous section, global tariff negotiations yield tariff concessions from all countries including the eventual outsider. In turn, insiders have no incentive to use subsequent FTA formation as a means to extract tariff concessions from the outsider. Thus, a single FTA emerges after global negotiations because the success of global tariff negotiations prevent insiders from engaging in subsequent FTA expansion.

Given a single FTA emerges in equilibrium when the globally negotiated tariff binding is t^{fs}_{MFN} and t^{fs}_{MFN} is indeed the optimal tariff binding in such cases, is it possible that something other than a single FTA could emerge in equilibrium? Given Lemma 1 rules out the possibility of a hub-spoke network in equilibrium, the only other possibilities are global free trade or no FTAs. However, by construction, the farsighted MFN tariff not only maximizes the expected payoff for a government conditional on a single FTA emerging but

it also yields a higher expected government payoff than global free trade.[17] Thus, the only possible equilibrium outcome apart from a single FTA is that no FTAs emerge.

Whether a tariff binding t prevents FTA formation depends on a trade-off between the welfare gains of FTA formation and a government's desire to protect its import competing sector. In particular, governments must have sufficiently strong political economy motivations if they forego FTA formation opportunities. Importantly, a governments' political economy motivations depend on the wedge between its payoff and national welfare which, as seen in (2), is $b \cdot PS_i^{IM}$. Thus, preventing FTA formation requires that b exceed a threshold; specifically, we can show that it requires $b \geq \frac{1}{8}\varphi$. Moreover, preventing FTA formation requires a sufficiently strong import competing sector as given by the magnitude of its producer surplus. Thus, given higher tariffs strengthen the import competing sector, the tariff binding must exceed a threshold denoted by $\underline{t}(b)$ even once $b \geq \frac{1}{8}\varphi$ (equation (17) in the appendix gives the closed form expression of $\underline{t}(b)$). Only once the political economy parameter b and the tariff binding t exceed their respective thresholds of $\frac{1}{8}\varphi$ and $\underline{t}(b)$ can government political economy motivations prevent FTA formation. Lemma 3 summarizes this discussion.

Lemma 3 *For $b < \frac{1}{8}\varphi$, there are no global tariff bindings $\tau(t)$ that prevent FTA formation. For $b \geq \frac{1}{8}\varphi$, the global tariff bindings $\tau(t)$ prevent FTA formation only if $t \geq \underline{t}(b)$ (see (17)).*

Even if governments can set a tariff binding that prevents FTA formation, doing so may come at a cost. As we have already established, governments set the tariff binding t equal to the farsighted MFN tariff when they anticipate a single FTA will emerge in equilibrium. In this case, the global tariff vector upon FTA formation will differ from that where all tariffs are the politically efficient tariff (perhaps only because FTA members set zero tariffs on each other). Thus, governments are prepared to sacrifice some political efficiency in order to prevent FTA formation. We can show that governments are not prepared to raise the tariff binding t above the politically efficient tariff by no more than an amount $x(b)$ (see equation (19) in the appendix). That is, governments will choose not to prevent FTA formation if the minimum required tariff binding $\underline{t}(b)$ exceeds $t^{pe} + x(b)$ because the associated sacrifice in political efficiency is too large. On the other hand, governments will prevent FTA formation by setting the tariff binding $t = \min\{\underline{t}(b), t^{pe}\}$ if $\underline{t}(b) < t^{pe} + x(b)$ because the associated sacrifice in political efficiency is small enough. Indeed, we can solve for a threshold value of the political economy parameter $\bar{b}_{\varnothing}$ such that governments are indifferent between preventing

[17] To be clear, by construction, the expected joint payoff of governments when setting t_{MFN}^{fs} exceeds their joint payoff under global free trade. But, symmetry implies this is not only true for the joint payoff but also true for each country individually.

and not preventing FTA formation:

$$t^{pe} + x(b) = \underline{t}\,(b) \text{ if and only if } b = \bar{b}_{\varnothing}. \tag{14}$$

The equilibrium characterization presented in Proposition 3 now follows easily and can be seen graphically from Figure 1.

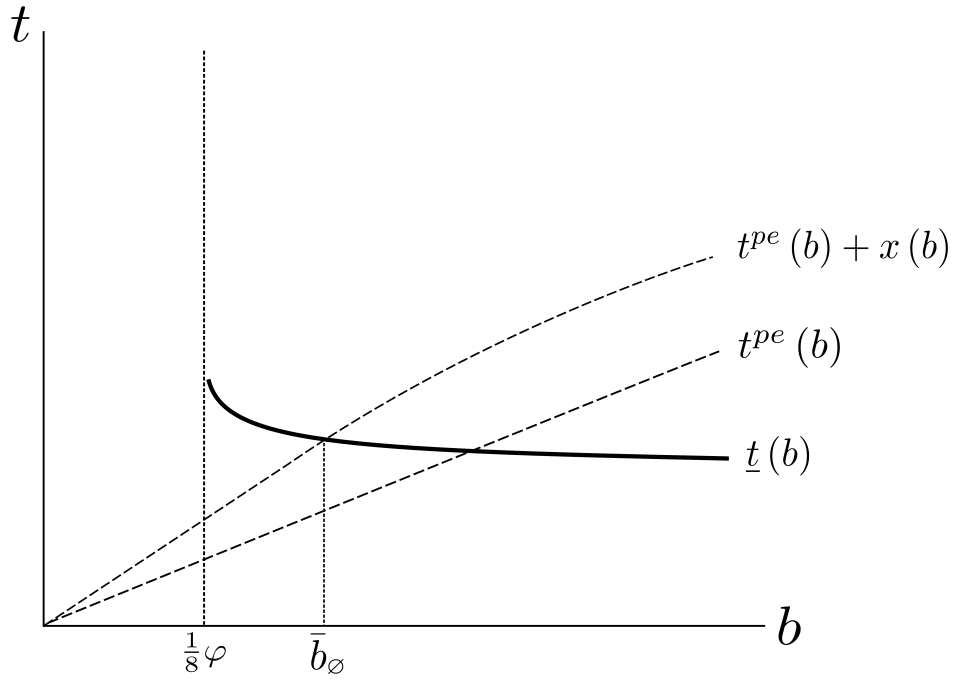

Figure 1: When does a single FTA arise in equilibrium?

Conditional on FTA negotiations taking place, a single FTA emerges in equilibrium if and only if the political economy parameter b falls below $\bar{b}_{\varnothing}$. When $b < \bar{b}_{\varnothing}$, the sacrifice of political efficiency needed to prevent FTA formation is too large. In turn, governments set the tariff binding equal to the farsighted MFN tariff t^{fs}_{MFN} and a single FTA emerges with probability p. Further, the tariff binding will bind the applied tariffs of all countries except when $b \geq \bar{b}_{BND}$ in which case the tariff binding is $t^{fs}_{MFN} = t^{pe}$ and insiders lower their applied tariff on the outsider from t^{pe} to $t^{*}_{IN} < t^{pe}$ upon FTA formation.[18] However, governments prevent FTA formation once $b \geq \bar{b}_{\varnothing}$ by setting the tariff binding equal to $\underline{t}\,(b)$ or, once b is sufficiently high, t^{pe}. In these cases, the sacrifice in political efficiency is small enough that governments set the tariff binding away from the politically efficient tariff to prevent FTA formation.[19]

[18] Of course, in addition, FTA members set zero tariffs on each other.

[19] Using Figure 1, we can see that governments set the tariff binding equal to t^{pe} once b exceeds the value where the $\underline{t}\,(b)$ and $t^{pe}(b)$ curves intersect. In this case, governments prevent FTA formation without sacrificing any political efficiency.

Our gated globalization result in Proposition 3, i.e. the emergence of a single FTA in equilibrium, differs qualitatively from Ornelas (2008) who finds that FTA formation does not arise in equilibrium when governments bargain during global tariff negotiations knowing which countries would be insiders and which country would be the outsider upon formation of an FTA.[20] Crucially for Ornelas (2008), the outsider gains more than an insider from an FTA in the absence of global tariff negotiations (due to tariff complementarity upon FTA formation). This difference in the outside option distorts the distribution of gains in the bargaining outcome of global tariff negotiations and renders FTAs politically infeasible in the presence of global tariff negotiations. However, in our model, the possibility of FTA formation affects global tariff negotiations prior to FTAs actually taking place and prior to the realization of which countries will actually form an FTA. Thus, unlike Ornelas (2008), governments in our model engage in global negotiations under a veil of ignorance and this allows the emergence of FTAs after global negotiations take place.

Proposition 3 also indicates that the globally negotiated tariff binding is the farsighted MFN tariff t^{fs}_{MFN}. Moreover, t^{fs}_{MFN} depends on the likelihood that FTA negotiations will subsequently take place when $b < \bar{b}_{BND}$ but, per Lemma 2, jumps from $t^{fs}_{MFN} = t^{pe}\left(1 - \frac{p}{3}\right)$ to $t^{fs}_{MFN} = t^{pe}$ once $b > \bar{b}_{BND}$. A number of implications follow from this result.

The first implication is that lower tariffs result from global tariff negotiations when FTA negotiations are more likely in the future. In other words, global tariff negotiations lead to relatively large reductions in tariff barriers when governments anticipate subsequent FTA negotiations and consider them highly likely. The shadow of future regionalism has a positive effect on the success of multilateral negotiations.

To understand this result, it is important to note that clarify that, in our endowment economy framework, welfare is unchanged upon formation of an FTA if the non-member's tariffs and the members' external tariffs are unchanged.[21] Therefore, the dependence of the farsighted MFN tariff on the likelihood of FTA negotiations is not related to any welfare loss due to FTA induced tariff discrimination. Rather, it arises solely from the political economy motivation of governments. As we have explained earlier, the payoff received by a government because of political economy motivations is $b \cdot PS^{IM}_i$. Thus, viewing this product as the strength of political economy motivations, such motivations are endogenous. In particular, when a country engages in FTA formation, extending tariff free access to

[20] Indeed, using our endowment economy trade model within the framework of Ornelas (2008) would produce identical tariffs to what we obtain here when FTA negotiations take place with certainty (i.e. $p = 1$).

[21] This is in contrast to Ornelas (2008) who analyzes a production economy with rising marginal cost and shows that FTA induced discrimination lowers world welfare when, as we have here, FTA formation leaves the non-member's tariffs and the members' external tariffs unchanged. See Proposition 1(ii) of Ornelas (2008).

its partner weakens its own import competing sector (i.e. lowers its producer surplus). Thus, when negotiating global tariff bindings, a government anticipates it is likely to have weaker political economy motivations in the future. As such, governments negotiate a tariff binding $t < t^{pe}$ and an even lower t as the likelihood of FTA negotiations rise. Put simply, anticipation of weaker import competing sectors in the future after FTA formation takes place allows politically motivated governments to negotiate lower global tariffs prior to FTA formation taking place.

The second implication concerns binding overhang (i.e. the difference between the tariff binding and the applied tariff) and tariff complementarity. When $b < \min\left\{\bar{b}_{BND}, \bar{b}_{\varnothing}\right\}$, global tariff negotiations in the shadow of FTA formation yield significant tariff concessions in the form of relatively low tariff bindings and to the extent that, in equilibrium, there is no binding overhang nor any tariff complementarity upon FTA formation. It is important to note that, for $\frac{1}{8}\varphi < b < \min\left\{\bar{b}_{\varnothing}, \bar{b}_{BND}\right\}$, the lack of binding overhang derives purely from the farsighted nature of globally negotiated tariff bindings given $t^*_{IN} < t^{pe}$ once $b > \frac{1}{8}\varphi$. To this extent, the farsightedness of countries engaging in global tariff negotiations that take place in the shadow of subsequent FTA negotiations can help explain the lack of binding overhang in countries who were central figures in the 1994 Uruguay round of negotiations.

More broadly, this result says that a lack of binding overhang and a lack of tariff complementarity should characterize countries with relatively low political economy motivations who engage in global negotiations yielding deep tariff concessions. This accords strongly with anecdotal and empirical evidence. As noted by Nicita et al. (2013), the EU, US and Japan played leading roles in negotiating global tariffs in the 1994 Uruguay round. Indeed, these countries have essentially no binding overhang; Beshkar et al. (2014) document that in 2007 these countries had no binding overhang on 95-99% of HS 6-digit tariff lines. Moreover, given these countries have formed many FTAs, these countries have not lowered their external tariffs on non-members upon entering FTAs and, thus, FTAs involving these countries have been characterized by a lack of tariff complementarity. Additionally, recent cross-country empirical evidence from Gawande et al. (2012) shows the EU, US and Japan have some of the lowest values of b in the world.

Conversely, when $b \in \left[\bar{b}_{BND}, \bar{b}_{\varnothing}\right)$ then global tariff negotiations yield relatively low tariff concessions in the form of relatively high tariff bindings and, as such, tariff complementarity emerges upon FTA formation. More broadly, countries with strong political economy motivations who only loosely participate in global tariff negotiations are the countries likely to be characterized by tariff complementarity and, thus, binding overhang. Again, this accords strongly with anecdotal and empirical evidence. Nicita et al. (2013) document that many developing countries were not active participants in negotiating tariff bindings in the 1994

Uruguay Round and Beshkar et al. (2014) document that, for example, many Latin American countries had binding overhang in more than 99% of their HS6 tariff lines in 2007. Moreover, Estevadeordal et al. (2008) provide empirical evidence for tariff complementarity in Latin American countries. Additionally, the cross-country empirics in Gawande et al. (2012) show that Latin American countries tend to have much higher political economy motivations relative to the EU, US and Japan.

The third implication concerns the effect of FTAs on trade flows. As discussed by Bergstrand et al. (2014, p.3), changes in trade flows following FTAs are often used to infer the welfare effects of FTAs. Given our result regarding the absence of tariff complementarity, using FTA induced trade flow changes would seem to suggest that the non-member suffers from FTA formation. Similarly, given Ornelas (2008) finds world welfare rises upon FTA formation if and only if there is tariff complementarity, FTA formation would appear to harm world welfare. However, this emphasizes the important point that, even though tariff complementarity does not arise upon FTA formation, the effect of tariff complementarity is embedded into the global tariffs *prior* to FTA formation actually taking place. As such, our results suggest any effect of increased trade flows upon FTA formation due to tariff complementarity will already be embedded in the trade flows prior to the FTA taking place. Thus, our results suggest that, via the farsighted nature of global tariff negotiations, the effect of an FTA on trade flows consists not only of the effect after the FTA comes into existence but also the effect that the possibility of such an FTA taking place has on applied tariffs *prior to* FTA formation.

5 Conclusion

Multilateralism can foster regionalism in many ways. An important channel is via the effect that globally negotiated tariff bindings have on the incentives for countries to engage in subsequent FTA formation. We have shown that, when political economy concerns are not too strong, global tariff negotiations lead to a world of gated globalization fragmented by FTAs and falling short of global free trade even though, in the absence of any prior global tariff negotiations, FTA formation expands to global free trade. In other words, global tariff negotiations can prevent global free trade. This striking result obtains precisely because global tariff negotiations are successful in extracting concessions from all participating countries. Thus, upon FTA formation, FTA members have already extracted significant tariff concessions from non-members and FTA members block subsequent FTA expansion to global free trade. However, in the absence of global tariff negotiations, FTA members face relatively high tariffs when exporting to non-member markets. Thus, the absence of tariff concessions

gained from non-members causes FTA members to favor FTA expansion resulting in global free trade.

Another important insight of our paper is that the outcome of global tariff negotiations depends on the likelihood of subsequent FTA negotiations. In particular, global tariffs are lower when subsequent FTA formation is more likely. FTA formation weakens the import-competing sector of FTA members and thus weakens the political economy motive to protect the import competing sector. As such, the anticipation of subsequent FTA formation allows negotiating governments to set lower tariffs because they anticipate their import competing sectors will be weaker in the future.

Our results can explain the observed absence of binding overhang by countries who were major participants in global tariff negotiations (e.g. the EU, US and Japan). It also suggests that tariff complementarity may not be observed upon FTA formation because the globally negotiated tariff bindings build in the effect of tariff complementarity prior to FTA negotiations taking place. The common practice of using observations regrading tariff complementarity or changes in trade flows upon FTA formation for inferring changes in global welfare may therefore require re-examination.

Appendix

A Welfare expressions

The individual components of welfare can be expressed for an arbitrary vector of global tariffs $\mathbf{t}$: $CS_i = \frac{1}{18}\left(2e + d - \sum_{j\neq i} t_{ij}\right)^2 + \frac{1}{18}\sum_{j\neq i,k\neq i,j}\left(2e + d + 2t_{ji} - t_{jk}\right)^2$, $PS_i^I = \frac{1}{3}d\left[3\alpha - (2e+d) + \sum_{j\neq i} t_{ji}\right]$, $PS_i^Z = \frac{1}{3}\sum_{j\neq i,k\neq i,j}\left[3\alpha - (2e+d) + t_{jk} - 2t_{ji}\right]\left[4e + 2d + \sum_{j\neq i,k\neq i,j}\left(2t_{ji} - t_{jk}\right)\right]$ for $Z \neq I$ and $TR_i = \frac{1}{3}\sum_{j\neq i,k\neq i,j} t_{ij}\left(e - d + t_{ik} - 2t_{ij}\right)$.

B Proofs

We first present three lemmas that will be used in the proposition proofs.

Lemma 4 *Global free trade emerges in the equilibrium of the FTA formation game if i)* $G_i\left(g^{FT}\right) > \max\left\{G_i\left(g_{jk}\right), G_i\left(g_{ij}\right)\right\}$ *and ii)* $G_i\left(g_{ij}\right) > G_i\left(\varnothing\right)$.

Proof. First, consider stage 1(c). By definition, $g = g_i^H$ for some country i at the beginning of stage 1(c). Lemma 1 implies $a_j = a_k = J$ and thus g^{FT} emerges in stage 1(c).

Second, consider stage 1(b). By definition, $g = g_{ij}$ for some countries i and j at the beginning of stage 1(b). Given symmetry, $G_i\left(g^{FT}\right) > \max\left\{G_i\left(g_{jk}\right), G_i\left(g_{ij}\right)\right\}$ implies $a_l = J$ for each country l in the last active pair. Thus, an FTA forms in stage 1(b).

Finally, consider stage 1(a). By definition, $g = \varnothing$ at the beginning of stage 1(a). Given stages 1(b) and 1(c), FTA formation in stage 1(a) yields g^{FT} as the outcome of the FTA formation game. Thus, symmetry and $G_i\left(g^{FT}\right) > G_i\left(g_{ij}\right) > G_i\left(\varnothing\right)$ implies $a_l = J$ for each country l in the last active pair. Hence, an FTA forms in stage 1(a) and global free trade emerges as the equilibrium outcome of the FTA formation game. ■

Lemma 5 *A single FTA emerges in the equilibrium of the FTA formation game if i)* $G_i\left(g^{FT}\right) < \max\left\{G_i\left(g_{jk}\right), G_i\left(g_{ij}\right)\right\}$ *and ii)* $G_i\left(g_{ij}\right) > G_i\left(\varnothing\right)$. *The single FTA is between the first active pair if* $G_i\left(g_{ij}\right) > G_i\left(g_{jk}\right)$ *but between the last active pair if* $G_i\left(g_{ij}\right) < G_i\left(g_{jk}\right)$.

Proof. First, consider stage 1(c). By definition $g = g_i^H$ for some country i at the beginning of stage 1(c). Given Lemma 1, $a_j = a_k = J$ and g^{FT} emerges in stage 1(c).

Second, consider stage 1(b). By definition, $g = g_{ij}$ for some countries i and j at the beginning of stage 1(b). But, using symmetry, $G_i\left(g^{FT}\right) < \max\left\{G_i\left(g_{jk}\right), G_i\left(g_{ij}\right)\right\}$ implies $a_l = NJ$ for some country l in each active pair. Thus, g_{ij} remains in place and stage 1(c) is never attained.

Finally, consider stage 1(a). By definition, $g = \varnothing$ at the beginning of stage 1(a). Given $G_i\left(g_{ij}\right) > G_i\left(\varnothing\right)$ and symmetry, $a_l = J$ for each country l in the last active pair. If $G_i\left(g_{ij}\right) < G_i\left(g_{jk}\right)$, then $a_l = NJ$ for each country l in the first two active pairs. Thus, the last active pair form an FTA and, given the outcome in stage 1(b), this FTA is the equilibrium outcome of the FTA formation game. Conversely, if $G_i\left(g_{ij}\right) > G_i\left(g_{jk}\right)$ then $a_l = J$ for each country l in the second active pair and, in turn, for each country in the first active pair. Thus, in this case, the first active pair form an FTA and, given the outcome in stage 1(b), this FTA is the equilibrium outcome of the FTA formation game. ■

Lemma 6 *No FTAs emerges in the equilibrium of the FTA formation game if i)* $G\left(\varnothing\right) > G\left(g^{FT}\right)$ *and* $G_i\left(\varnothing\right) > G_i\left(g_{ij}\right)$.

Proof. Lemma 1 says a hub-spoke network cannot emerge in equilibrium. Moreover, given symmetry, $G\left(\varnothing\right) > G\left(g^{FT}\right)$ implies $G_i\left(\varnothing\right) > \max\left\{G_i\left(g^{FT}\right), G_i\left(g_{ij}\right)\right\}$. Thus, choosing $a_i = NJ$ in stage 1(a) of the FTA formation game maximizes player i's payoff. ■

We now move on to proofs of propositions and lemmas from the main text.

Proof of Lemma 1

Let $G_i\left(g\right)$ denote country i's payoff given a network of trade agreements g. g^{FT} denotes global free trade and g_j^H denotes the hub-spoke network (i.e. two FTAs have formed) where

country j is the "hub" meaning it is a member of both FTAs and the other countries are "spokes". In stage 1(c) of the FTA formation game, we have $G_i\left(g^{FT}\right) > G_i\left(g_j^H\right)$ iff $b < \frac{1}{3}\varphi + \frac{7}{6}\frac{t_K}{d}$. This must hold given (1) defines the non-prohibitive tariff and (3) (see Section 2.3.1) says that non-prohibitive tariffs require $b < \bar{b}_{PRO} = \frac{1}{3}\varphi$.

Proof of Lemma 2

Assume a single FTA emerges conditional on FTA negotiations taking place. First, suppose the tariff bindings τ bind the applied tariffs of insiders' and, given $t_{IN}^* < t_{OUT}^*$, the outsider. Then, (9) and (10) say the optimal tariff bindings are given by $\tau\left(t^{pe}\left(1-\frac{p}{3}\right)\right)$ which bind the applied tariffs iff $b \leq \bar{b}_{TC}$.

Second, suppose the tariff bindings τ do not bind insiders' applied tariffs. That is, consider the maximization problem in (9) augmented by the constraint $t_{hk}\left(g_{ij}\right) = t_{IN}^*$ for $h = i, j$. This solution, which mayor may not entail a common tariff binding, is given by (12) which says the optimal tariff bindings are given by $\tau\left(t^{pe}\right)$. These tariff bindings bind the applied tariffs of the outsider but not the insiders, i.e. $t_{IN}^* < t^{pe} < t_{OUT}^*$, iff $b > \frac{1}{8}\varphi$.

The optimal tariff binding is now determined by comparing governments' joint expected payoff under these two case. Note that

$$\begin{aligned} & \left[pG\left(g_{ij};\tau_{-ij}\left(t^{pe}\left(1-\frac{p}{3}\right)\right)\right)+(1-p)\,G\left(\varnothing;\tau_{-ij}\left(t^{pe}\left(1-\frac{p}{3}\right)\right)\right)\right] \\ & -\left[pG\left(g_{ij};\tau_{-ij}^{TC}\left(t^{pe}\right)\right)+(1-p)\,G\left(\varnothing;\tau_{-ij}^{TC}\left(t^{pe}\right)\right)\right] \\ = \; & \frac{1}{1089}p\left[b^2d^2\left(144-121p\right)-30bd\left(e-d\right)+6\left(e-d\right)^2\right] \end{aligned} \tag{15}$$

with (15) positive if and only if $b > \frac{11\sqrt{9-6p}-15}{144-121p}\varphi \equiv \bar{b}_{BND}$ where $\bar{b}_{BND} \in \left[\frac{1}{8}\varphi, \bar{b}_{TC}\right]$. Note, $\bar{b}_{BND} \leq \bar{b}_{TC}$ follows from two observations: i) $\bar{b}_{BND}\left(\theta,p\right) = \bar{b}_{TC}\left(\theta,p\right)$ for $p = 0$ and ii) $\frac{\partial \bar{b}_{TC}(\theta,p)}{\partial p} - \frac{\partial \bar{b}_{BND}(\theta,p)}{\partial p}$ reduces to $z\left(p\right)$ where $z\left(0\right) = 0$ and one can easily verify numerically that $\frac{\partial z(p)}{\partial p} > 0$. Thus, given $\bar{b}_{BND} \leq \bar{b}_{TC}$ and $t_{OUT}^* > t^{pe}$ for all $b < \bar{b}_{PRO}$, the optimal tariff bindings are given by $\tau\left(t_{MFN}^{fs}\right)$ as described in the lemma. Further, $\bar{b}_{BND} \leq \bar{b}_{TC}$ implies applied tariffs are given by t_{MFN}^{fs} with two exceptions: i) $t_{ij}\left(g_{ij}\right) = 0$ (i.e. FTA members set zero tariffs on each other) and ii) $t_{ik}\left(g_{ij}\right) = t_{IN}^*$ for an insider i when $b \geq \bar{b}_{BND}$. ■

Proof of Proposition 1

Suppose global tariff negotiations take place. Then, Proposition 3 states that a single FTA emerges in equilibrium when $b < \bar{b}_{\varnothing}$. Moreover, the proof of Proposition 3 establishes that no FTAs emerge in equilibrium when $b \geq \bar{b}_{\varnothing}$.■

Proof of Proposition 2

In the presence of global tariff negotiations, Proposition 1 implies global free trade does not emerge as an equilibrium outcome of the FTA formation game. However in the absence of

global tariff negotiations, Lemma 4, introduced at the beginning of Appendix B, holds. To see this, let $G_i(g)$ denote country i's payoff given the network of trade agreements g (see Section 2.3). Then, in the absence of global tariff negotiations, we have: i) $G_i\left(g^{FT}\right) - G_i(g_{ij}) > 0$ iff $b < \bar{b}_{IN} \equiv \frac{101}{313}\varphi$ and ii) $G_i(g_{ij}) - G_i(\varnothing) > 0$ iff $b < \bar{b}_{FTA} \equiv \frac{47}{299}\varphi$. Thus, $b < \bar{b}_{OUT}$ implies $b < \bar{b}_{OUT} < \bar{b}_{FTA} < \bar{b}_{IN}$.■

Proof of Lemma 3

Lemmas 4 and 5 imply $G_i(g_{ij}) > G_i(\varnothing)$ is a sufficient condition for FTA formation. Thus, $G_i(\varnothing) \geq G_i(g_{ij})$ is a necessary condition for preventing FTA formation. Let $\tau_{-ij}^{FTA}(t)$ denote the tariff vector where i) i and j set zero tariffs on each other, ii) $t_{IN} = \min\{t_{IN}^*, t\}$ and iii) $t_{OUT} = \min\{t, t_{OUT}^*\}$. Then, given tariff bindings $\tau(t)$, $G_i(g_{ij}) - G_i(\varnothing)$ can be written as

$$f(t_{IN}^*, t_{OUT}^*, t) = G_i\left(g_{ij}; \tau_{-ij}^{FTA}(t)\right) - G_i\left(\varnothing; \tau\left(\min\{t, t_{Nash}\}\right)\right). \tag{16}$$

By considering two cases, we now show that a necessary condition for $f(\cdot) \leq 0$ is that t exceed a threshold $\underline{t}(b)$. First, suppose $t < t_{IN}^*$. Then, $t_{IN} = t_{OUT} = t$ and, using (16), $f(\cdot) \leq 0$ reduces to $t \geq \frac{2}{3}(e-d) - 2bd \equiv \underline{t}_1(b)$. Second, suppose $t \in [t_{IN}^*, t_{OUT}^*]$. Then, $t_{IN} = t_{IN}^*$ and $t_{OUT} = t$. Using (16), $f(\cdot) \leq 0$ reduces to $t \in [\underline{t}_2(b), \bar{t}_2(b)]$ where $\underline{t}_2(b) \equiv \hat{t}(b) - v(\theta)$ and $\bar{t}_2(b) \equiv \hat{t}(b) + v(\theta)$ and where $\hat{t}(b) \equiv \frac{e-d}{7} + \frac{6}{7}bd$ and $v(\theta) \equiv \frac{3}{77}\left[bd(400bd + 54(e-d)) - 13(e-d)^2\right]^{1/2}$. Thus, a necessary condition for $f(\cdot) \leq 0$ is $t \geq \underline{t}(b)$ where

$$\underline{t}(b) = \begin{cases} \underline{t}_1(b) = \frac{2}{3}(e-d) - 2bd & \text{if } t < t_{IN}^* \\ \underline{t}_2(b) = \frac{e-d}{7} + \frac{6}{7}bd + \frac{3}{77}\left[bd(400bd + 54(e-d)) - 13(e-d)^2\right]^{1/2} & \text{if } t \geq t_{IN}^* \end{cases}. \tag{17}$$

We now show that $f(\cdot) > 0$ when $b < \frac{1}{8}\varphi$. Let $t < t_{IN}^*$. Then, $\underline{t}_1(b) > t_{IN}^*$ reduces to $b < \frac{19}{75}\varphi$ which holds for any $b < \frac{1}{8}\varphi$. Thus, $f(\cdot) > 0$ if $b < \frac{1}{8}\varphi$. Now let $t \in [t_{IN}^*, t_{OUT}^*]$. Then, $f(\cdot)$ is quadratic in t and minimized at $\hat{t}(b)$. In turn, the interval $[\underline{t}_2(b), \bar{t}_2(b)]$ is non-empty iff $v(\theta) \geq 0$ which reduces to $b \geq \frac{1}{8}\varphi$. Thus, $f(\cdot) > 0$ if $b < \frac{1}{8}\varphi$. Now let $t \geq t_{OUT}^*$. Then, $f(\cdot) > 0$ reduces to $b < \bar{b}_{FTA}$ where the proof of Proposition 2 gives $\bar{b}_{FTA} \equiv \frac{47}{299}\varphi$. Thus, $\frac{1}{8}\varphi < \bar{b}_{FTA}$ and, in turn, $f(\cdot) > 0$ if $b < \frac{1}{8}\varphi$.■

Proof of Proposition 3

To begin, note that we use the notation $\tau_{-ij}^{FTA}(t)$ in various parts of the proof to denote the tariff vector where i) i and j set zero tariffs on each other, ii) $t_{IN} = \min\{t_{IN}^*, t\}$ and iii) $t_{OUT} = \min\{t, t_{OUT}^*\}$. We will also use the expressions $\underline{t}_1(b)$, $\underline{t}_2(b)$ and $\underline{t}(b)$ from the proof of Lemma 3.

Given the definition of $\underline{t}(b)$ in the proof of Lemma 3, define b^* such that $t^{pe}(b) \geq \underline{t}(b)$ iff $b \geq b^*$. This yields $b^* \approx .177\varphi$ and, in turn, $b^* > \frac{1}{8}\varphi$. By definition of t^{pe}, we have $G(\varnothing; \tau(t^{pe})) > G(g; \tau)$ for any network of FTAs g and any tariff bindings τ. When $b \geq b^*$, Lemma 6 implies no FTAs emerge if the tariff bindings are $\tau(t^{pe})$. In turn, $\tau(t^{pe})$ are the optimal tariff bindings when $b \geq b^*$. Therefore, we restrict attention to $b < b^*$ for the remainder of the proof.

By verifying the two conditions needed for Lemma 5, we now establish that a single FTA emerges in equilibrium when the tariff bindings are given by $\tau\left(t^{fs}_{MFN}\right)$. First, $G_i(g_{ij}) > G_i\left(g^{FT}\right)$ because i) $G_i\left(g_{ij}; \tau_{-ij}\left(t^{fs}_{MFN}\right)\right) - G_i\left(g^{FT}\right) = \frac{1}{9}b^2d^2(1+p)(3-p) > 0$ for any b and ii) $G_i\left(g_{ij}; \tau^{FTA}_{-ij}\left(t^{fs}_{MFN}\right)\right) - G_i\left(g^{FT}\right) > 0$ iff $b \gtrsim .08\varphi$ when $t^{fs}_{MFN} = t^{pe}$. Note, $b \gtrsim .08\varphi$ when $t^{fs}_{MFN} = t^{pe}$ must hold because Lemma 2 established $t^{fs}_{MFN} = t^{pe}$ only if $b \geq \bar{b}_{BND}$ and that $\bar{b}_{BND} \geq \frac{1}{8}\varphi$. Second, $G_i(g_{ij}) > G_i(\varnothing)$ because i) $t^{fs}_{MFN} \leq t^{pe} < \underline{t}_2(b)$ when $t^{fs}_{MFN} \in [t^*_{IN}, t^*_{OUT}]$, ii) $t^{fs}_{MFN} \leq t^*_{IN} < \underline{t}_1(b)$ when $b < \frac{19}{75}\varphi$ and $t^{fs}_{MFN} < t^*_{IN}$, and iii) $t^{fs}_{MFN} \leq t^{pe} < t^*_{OUT}$ for any $b < \bar{b}_{PRO}$.

By construction, $\tau\left(t^{fs}_{MFN}\right)$ maximizes the expected joint government payoff conditional on a single FTA; in particular, governments achieve a higher joint expected payoff than by choosing $\tau(0)$ which corresponds with global free trade. Further, Lemma 1 rules out a hub-spoke network in equilibrium. Thus, the only possible equilibrium outcome apart from a single FTA is an outcome with no FTAs.

Lemmas 4 and 5 imply $G_i(\varnothing) \geq G_i(g_{ij})$ is a necessary condition for no FTAs in equilibrium. However, the proof of Lemma 3 established that $G_i(g_{ij}) > G_i(\varnothing)$ when i) $b < \frac{1}{8}\varphi$ and ii) $b \geq \frac{1}{8}\varphi$ and the tariff bindings are $\tau(t)$ where $t < t^*_{IN}$. Thus, we hereafter restrict attention to $b \in \left[\frac{1}{8}\varphi, b^*\right)$ and $t \geq t^*_{IN}$. We can now see that a single FTA emerges iff $b < \bar{b}_{\varnothing}$ noting that $x(b)$ emerges from solving

$$G(\varnothing; \tau(t)) - \left[p \cdot G\left(g_{ij}; \tau^{FTA}_{-ij}\right) + (1-p) \cdot G\left(\varnothing; \tau\left(t^{fs}_{MFN}\right)\right)\right] \geq 0. \tag{18}$$

(18) reduces to $t \in [t^{pe} - x(b), t^{pe} + x(b)]$ where

$$x(b) = \begin{cases} \frac{1}{3}bd\left(-p^2+6p\right)^{1/2} > 0 & \text{if } b < \bar{b}_{BND} \\ \frac{6p}{33}\left[bd(97bd - 5(e-d)) + (e-d)^2\right]^{1/2} > 0 & \text{if } b \geq \bar{b}_{BND} \end{cases}. \tag{19}$$

Let $b < \bar{b}_{\varnothing}$. Given $t^{pe} + x(b)$ is increasing in b and $\underline{t}_2(b)$ is decreasing in b, there is no $\tau(t)$ such that $G_i(\varnothing) \geq G_i(g_{ij})$ and (18) holds. Thus, the optimal tariff bindings are given by $\tau\left(t^{fs}_{MFN}\right)$ and a single FTA emerges in equilibrium. Lemma 2 implies $\tau\left(t^{fs}_{MFN}\right)$ binds all applied tariffs except those of insiders when $b \in \left[\bar{b}_{BND}, \bar{b}_{\varnothing}\right)$ in which case $t_{IN} = t^*_{IN} \leq t^{pe}$.

Let $b \geq \bar{b}_{\varnothing}$. Given $t^{pe} + x(b)$ is increasing in b and $\underline{t}_2(b)$ is decreasing in b, the tariff bindings $\tau(t)$ with $t = \underline{t}_2(b) > t^{pe}$ imply that $G_i(\varnothing) \geq G_i(g_{ij})$ and that (18) holds. Further, note that $G(\varnothing; \tau(t))$ is decreasing in t for $t > t^{pe}$ and that (18) implies $G(\varnothing; \tau(t)) > G\left(g^{FT}\right)$. Thus, Lemma 6 implies no FTAs emerge in equilibrium if the tariff bindings are $\tau(\underline{t}_2(b))$. In turn, $\tau(\underline{t}_2(b))$ are the optimal tariff bindings.■

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