BARGAINING DELAY IN MULTILATERAL TRADE NEGOTIATIONS

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(Preliminary and Incomplete)

ABSTRACT. This paper theoretically and empirically explores bargaining delay in tariff negotiations. By imposing a bargaining structure in an equilibrium trade framework, I derive many testable predictions of delay. I then take my model to the newly compiled GATT (Torquay) tariff negotiation data, which includes detailed (product-level) information of the timing and contents of countries’ (back-and-forth) proposals to each other. My empirical exercise broadly supports the theoretical predictions – delay is positively correlated with bargaining externality, as measured (inversely) by the export market concentration.

1. Introduction

Delay in reaching agreements is not uncommon in international trade negotiations. For example, the most recent Doha round of WTO negotiation is effectively in suspension, having been in process for about sixteen years. While there are many anecdotes regarding such delays in various media, a rigorous theoretical and empirical investigation of delays in international trade negotiations is, to my knowledge, missing. In this paper I attempt to fill this gap.

I focus on understanding delay in the context of multilateral rounds of tariff bargaining such as those undertaken in the GATT/WTO; and in particular I explore the possible contribution of bargaining externalities as a cause of delay in negotiations. GATT tariff negotiations provide an interesting laboratory within which to explore

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this possibility, for several reasons. First, GATT tariff negotiations are often car-
ried out in the form of simultaneous bilateral bargains across many bilateral pairs of
countries, with all tariff bargaining outcomes multilateralized to all member countries
through the non-discrimination (most-favored-nation or MFN) principle of GATT:
this means that GATT tariff bargains are typically settings of bilateral bargains with
externalities. Second, the nature of the bargaining externality in this context is in
principle quantifiable, as the externality travels through “world” prices and is hence
subject to measurement. And third, the WTO has begun to declassify the detailed
bargaining records of the earlier GATT rounds, providing an opportunity to explore
the bargaining strategies implied by these real-world high-stakes bargaining records.

Bagwell, Staiger and Yurukoglu (2017) provide the exploration of the bargaining
records from the GATT Torquay (1950-51) Round, and identify a set of stylized facts
emerging from the bargaining records. As they observe, a number of these stylized
facts point to a surprising lack of strategic behavior in GATT tariff bargains, a fea-
ture that has been noted by various commentators and GATT practitioners. Bagwell,
Staiger and Yurukoglu argue that this feature can be interpreted as emerging from
a tariff bargaining environment built around two pillars of the GATT architecture,
namely, MFN (the requirement that a county’s import tariff on a given product must
not vary by exporter source) and reciprocity, which in the GATT/WTO context is
met when negotiated tariff changes lead to changes in a country’s import volumes
which are matched by changes in its export volumes, an argument that is formalized
in Bagwell and Staiger (2017). As these authors describe, reciprocity plays two roles
in GATT: it is a norm for tariff negotiations aimed at achieving lower tariffs, and it
defines a backup rule for tariff renegotiations that are aimed at raising tariffs from
previously bound levels. As Bagwell and Staiger (2017) formally demonstrate, when
joined with MFN and imposed as strict constraints, the resulting bargaining forum
acts like a posted-price mechanism under which countries have dominant strategies
to make tariff cut offers that reveal their true preferences. Bagwell, Staiger and Yu-
rukoglu (2017) suggest that the GATT Torquay bargaining records can be interpreted
through the lens of these findings.

In this paper, I follow Bagwell, Staiger and Yurukoglu (2017) in focusing on the
bargaining records from the GATT Torquay Round. But I depart from their paper
in two important ways. First, empirically, I explore the possibility that strategic
dimensions of Torquay Round bargaining may be found in evidence on delayed offers,
a dimension that Bagwell, Staiger and Yurukoglu do not study. And second, to guide
my empirical exploration of delay in tariff negotiations, from a theoretical perspective
I depart from this prior work as well. Specifically, I maintain the GATT institutional
focus on MFN and reciprocity in tariff negotiations, but I relax the strict insistence on
reciprocity in renegotiations that Bagwell, Staiger and Yurukoglu (2017), and Bagwell
and Staiger (2017) maintain. As I demonstrate below, MFN plus reciprocity in tariff
negotiations, but not in tariff renegotiations, leads to a bargaining environment where
the terms-of-exchange (the “price”) is fixed but the tariff cut depth (the volume of
exchange) is negotiable. In this institutional environment, with the terms of exchange

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2As Hoda (2001, pp. 83-87) details, reciprocity in (GATT Article XXVIII) renegotiation, as em-
bodyed in the right of a country to modify or withdraw a previous tariff concession subject to
the reciprocal right of its principally affected negotiating partners to then withdraw reciprocal or
“substantially equivalent” concessions, was present from the beginning of GATT in 1947, but (with
certain exceptions described by Hoda) was available only 3 years (in the so-called “open season”) af-
after the initial negotiations had concluded. On the other hand, as Bagwell, Staiger and Yurukoglu
(2017, footnote 27) note, the same reciprocity principle applies for temporary modifications of tariffs
under GATT Article XIX, and there is no limitation on when such temporary modifications can
be triggered. Reflecting these complexities, Bagwell, Staiger and Yurukoglu view their modeling
of strict reciprocity in renegotiation as an approximation of a setting where such renegotiations
could occur immediately upon conclusion of any negotiation. And viewed from this perspective, my
relaxation of the reciprocity constraint in renegotiation can be viewed as an approximation to the
alternative extreme where such renegotiations are not possible.

3It is when reciprocity is also imposed for renegotiations, as in Bagwell, Staiger and Yurukoglu (2017)
and Bagwell and Staiger (2017), that a further “respect for voluntary exchange” constraint is added
which effectively fixes the volume of exchange as well and leads to the dominant strategy result estab-
lished in Bagwell and Staiger (2017). Another justification for my exclusion of reciprocity in
renegotiation beyond that described in footnote 2 is that GATT did not formalize the reciprocity
rule regarding renegotiation until later rounds (GATT document G/MA/W/23/Rev.7).
fixed but the volume of exchange not fixed and hence negotiable, a conflict can result when the desires of the negotiating countries are not compatible, and strategic delay may arise.

To highlight the possible contribution of bargaining externalities as a cause of delay in negotiations, I consider within this institutional environment the offer of an MFN tariff cut from an importing country to two competing exporting countries who are privately informed about the political pressures they face and who must collectively reciprocate the importing country’s tariff-cut offer with tariff-cut offers of their own in order for the tariff bargain to succeed. I show that in such a setting bargaining delay may result, and that the length of delay will vary systematically with the strength of the bargaining externality across exporters, as measured by their exporter market concentration in the importing country’s market. Intuitively, this follows because, aside from their political pressure, countries’ bargaining strength crucially depends on their export share. In particular, according to the terms-of-trade theory, the gains from tariff bargaining derives from the elimination of distortions in domestic prices associated with the non-cooperative Nash equilibrium where countries exert their market power over the international price (terms of trade). However, under reciprocity in negotiation, the terms of trade is fixed regardless of the bargaining outcome, so a country with larger market power over the terms of trade (thus larger distortion in its domestic price) has more to gain from an agreement. As a result, countries with little market power, which directly translates to small market share, have a lot of bargaining strength in my model. And bargaining delay becomes shorter when countries have smaller market share (higher bargaining strength).

Broadly speaking, bargaining delay has attracted enormous interest among bargaining theorists, at least since Rubinstein’s seminal work on “splitting the pie”, which however predicts an immediate agreement between two players. Starting from this basic setting, the literature on bargaining delay can be divided into two categories:
bargaining delay due to informational frictions (incomplete information or/and imperfect information) or bargaining delay due to various bargaining externalities. In the strand of literature on bargaining with private information, players have private evaluations of the underlying good in the bargaining game. In this literature, (costly) delay is a possible way to truthfully reveal their evaluation: in general, the longer a player is willing to delay an agreement, the stronger its bargaining strength will be (e.g. Admati and Perry 1987).

Compared with the vast literature on bargaining with incomplete information, the literature on bargaining with externalities is relatively sparse. This strand of the literature usually assumes that the underlying object has the property of being a “public good”. Jehiel and Moldovanu (1995a) examine a finite-horizon framework, where a seller bargains with many potential buyers, and the (abstract and exogenous) non-pecuniary externality leads to delay as every buyer has an incentive to wait for others to bear the cost of the good. Yet the delay result crucially depends on the matching friction where the seller can only be randomly matched to a buyer in each given round. An extension to infinite horizon is considered in Jehiel and Moldovanu (1995b), where “cyclical delay” emerges, although a complete characterization of equilibria is missing, given the complexity. There is also a line of literature that focuses on coalitional bargaining with externalities that can result in delay. Gomes (2005) analyzes an abstract coalitional game where multiple players are deciding the membership of the coalition. In this setting, delay is possible because of players’ randomization. Thus, while delay can be generated in these settings, the prediction is usually not sharp, as typically there are multiple equilibria.

\[4\text{The cost of delay could come from discounting or the increased possibility of bargaining failure. In the GATT setting, discounting could be interpreted as being related to the probability of an exogenous end to the round in any period, so the risk of delay is that countries might not reach agreement before the exogenous end.}\]
A paper that takes an approach closely related to mine is Harstad (2007). In Harstad’s setting, both informational frictions and externalities are incorporated. In particular, in Harstad’s model the presence of private information is key to the existence of delay, while the magnitude of externality determines the length of delay. However, delay is simply an intermediate instrument in Harstad’s model that serves to evaluate the effects of equalization and side payments on countries’ ex ante welfare.\footnote{As pointed out by Harstad (2007), the evaluation could be otherwise done without the use of delay.} As a result, Harstad does not focus on analyzing delay as I do.

There are important features of both private information and externalities in the GATT/WTO trade bargaining setting, but the existing bargaining models don’t reflect well the way these features arise in the trade bargaining setting - and usually they are too abstract to be taken to the data. In the GATT/WTO tariff bargaining setting, a given importer with a (nondiscriminatory) tariff cut to offer often negotiates with several foreign exporters who in a successful bargain must then each make tariff offers back to the importer that together reciprocate the trade liberalization offered by the importer. While the analogue to the underlying object that players bargain over in the typical bargaining model (e.g. the seller-buyer bargaining games, Rubinstein’s pie-splitting game) is the amount of trade liberalization that is needed to reciprocate the importer’s trade liberalization offer, a key difference between the typical bargaining model and the tariff bargaining setting just described is clear: in the typical bargaining model, the “bliss point” for each player is either the whole object or none of the object, but in the tariff bargaining setting the bliss point for each foreign exporter is the ideal tariff cut the exporter would like to offer if it knew that its offer together with the offers of other exporters would reciprocate the tariff cut offer made by the importing country. Moreover, in the tariff bargaining setting this bliss point will typically be “interior” (i.e., it will not typically correspond to
either a fully reciprocating tariff cut – “the whole pie” – or no tariff cut – “none of the pie”) and will depend on the political preferences of the exporting country, which may be private information to the exporting government and therefore unknown to the other exporting governments involved in the bargain. This feature complicates the translation of the typical bargaining setting into the GATT/WTO tariff bargaining setting. In particular, countries may compete for making concessions whether they are collectively competing for more liberalization or less liberalization.

Another way in which the tariff bargaining setting departs from the standard bargaining models in the literature is that, while externalities are introduced with an *exogenous* reduced-form assumption in the typical bargaining models and are therefore interpreted in an abstract fashion, in the GATT/WTO tariff bargaining setting that I analyze here the bargaining externality is *endogenous*, being an intrinsic feature of the economic environment and institutional rules. This departure from standard bargaining settings has two important implications.

A first implication is that a more detailed modeling of the externality is required in the tariff bargaining setting. Specifically, the MFN restriction of nondiscrimination requires GATT/WTO members to apply uniform tariffs to all other members on a given product, and this ensures that all exporters, whether or not they engage in tariff bargaining, will face the same conditions of access into a given import market as summarized by a common-across-exporters world price. Hence, when there are multiple countries exporting to a given import market, each exporting country has an incentive to free ride on the bargaining efforts of the other exporting countries, and the observable export bilateral volumes serve as a natural candidate for measuring the strength of the externalities in the trade bargaining: at the extreme, if only one country exports to a given import destination, then no free-riding externality problem should exist in bargaining over that import tariff. The reciprocity restriction, when coupled with MFN, further shapes this externality problem and reduces it to the
aforementioned bliss point issue: each exporter into a given import market would like the competing exporters into that market to be the “residual claimants” on any tariff liberalization needed to reciprocate the tariff cut on offer; that is, each exporter would like the other competing exporters to agree to tariff cuts which move them away from their bliss points in order to reciprocate the importer tariff cut on offer, so that it can achieve its own bliss point. This implies that each country could be either competing with other exporting countries to cut its tariff more than is jointly compatible with the reciprocation of the importer tariff cut on offer, or competing to cut its tariff less than is jointly compatible with reciprocation of the importer tariff cut on offer.

A second implication of this departure from standard bargaining settings is that, rather than taking an exogenous and abstract form, the externality in the GATT/WTO tariff bargaining setting is readily interpretable in terms of model primitives. This has the advantage that the externality in the tariff bargaining setting is measurable, and its relation to bargaining delay can in principle be examined in the data.

There are also a number of additional interesting features that distinguish the trade bargaining from those in classical theories. (i) While this traditional line of literature generally focuses on linear structures (e.g. buyer/seller splitting the residual from trade via prices), the trade bargaining usually involves the consideration of each country’s bliss point (thus a non-linear structure), which may or may not be compatible with each other. That said, as I noted above, countries may compete to make concessions, but they also compete to avoid making concessions. (ii) The source of incomplete information can take many forms, and come from many fundamental parameters that are not observable by others. (iii) In an ideal framework, trade bargaining involves many players and many goods.

6By “compatible with each other”, I mean that the bliss points would allow both exporters to achieve their respective bliss points while exactly reciprocating together the tariff cut on the offer from the importer.
As a first contribution, I present a formal analysis of bargaining delay in tariff negotiations in this paper, where delay is identified as a strategic device for countries to reveal their domestic political pressure. In this simple framework, two foreign countries export a common good to the importing home country.\footnote{Thus, this is an exporter-competing framework introduced by Bagwell and Staiger (2001)} I assume that the two foreign countries have to bargain with each other on how to collectively reciprocate the home country’s tariff concession in a game with alternating offers.\footnote{In particular, I assume the home country makes a take-it-or-leave-it offer (on the basis of multilateral reciprocity) on its own tariff. This assumption is similar to the assumption of exogenous amount of retaliation, i.e. the amount of auctionable rights, imposed in Bagwell and Staiger (2007), although that amount is determined by home country’s politically optimal tariff in my framework.} I assume the two foreign countries have privately observed political-economy shocks that partly determines their desired tariff/subsidy and their valuation of any agreement. As a result, each foreign country tries to free ride on the other in the sense that each of them would like to obtain their desired level of policy, leaving the other country to reciprocate the home country for the implied residual. By employing this framework, I am able to show that bargaining delay is positively related to a natural measure of externality, namely, the (inverse of) exporter concentration in the import market.

A second contribution of my model is its ability to analyze the GATT Principal Supplier rule, which generally advises countries to focus their negotiation on a given product with principal (largest) supplier(s) of that product. Since the discussion of this feature requires some fundamental asymmetry in the model, from an \textit{ex ante} perspective, a framework with \textit{ex ante} symmetry between players (e.g., Harstad, 2007) does not offer an appropriate way to evaluate this kind of rule. Based on a setup with a more developed economic structure, for example, one with an explicit demand/supply system, my setting not only provides a way to evaluate the asymmetry, but also make it naturally interpretable. In particular, under certain plausible conditions, I am able to show that this rule will shorten the amount of bargaining delay in the model. Thus,
from this aspect, the theory lends some support to the Principal Supplier rule also embodied in GATT articles.

A third contribution is that I actually analyze real bargaining data for delay and explore the issue of delay with this data. Moreover, I take one step further to link the magnitude of delay to an easily measurable index of Free Riding, namely the exporter concentration characterized by the Herfindahl-Hirschman index, which enables me to directly take my theoretical predictions into the data. Depending on my measure of delay, I do find evidence that a larger externality, measured by lower exporter concentration in particular, results in longer delay.

The remainder of the paper is organized as follows. An overview of the theory is provided in Section 2 based on a general equilibrium setting, to illustrate the motives of countries to bargain at all. In Section 3, a formal model is introduced, containing the key structure of the theory. I conduct the equilibrium analysis in Section 4. Section 5 takes the model to the data to test various theoretical predictions. Section 6 concludes.9

2. Theory: Overview

To illustrate the bargaining problem, I start my analysis within general equilibrium frameworks, by considering two countries first to show the basics of tariff bargaining under reciprocity. And I then consider three countries to exhibit the bargaining under both reciprocity and MFN.

2.1. Bargaining under Reciprocity. To illustrate at a general level the basic features of tariff bargaining under reciprocity that are at the heart of the theoretical and empirical analysis to follow, I start by considering just two countries, and in particular begin with a standard two country - two good general equilibrium model. I refer to the two countries as the home country (whose variables are without a

9Unless otherwise noted, all proofs are provided in the Appendix.
superscript ⋆), and the foreign country (whose variables are with a superscript ⋆), respectively. In this setting, the home country is a natural importer of good x, with the foreign country being a natural importer of y, and given the (import) tariffs (τ*, τ) of the countries, the equilibrium world relative price can be written as $p^w(τ*, τ)$. Furthermore, the local relative prices in the home and the foreign markets are $p ≡ p^u(1 + τ)$ and $p^⋆ ≡ p^u(1 + τ^*)$, respectively. Given countries’ (general) welfare functions $W(τ, τ^⋆)$ and $W^⋆(τ^⋆, τ)$, the Nash equilibrium $(τ^*_N, τ_N)$ implies a world price $p^w_N(τ^*_N, τ_N)$. As established in Bagwell and Staiger (1999), the welfare functions can be alternatively represented as $W(p(τ, p^w), p^w(τ^*, τ))$ and $W^⋆(p(τ^*, p^w), p^w(τ^*, τ))$, and reciprocity implies that the world price should be unchanged, whatever the agreement would be. In particular, under this constraint, if the existing tariffs are Nash, then any agreement, in the $(τ^*, τ)$ domain, must lie on the iso-world-price locus $\{(τ^*, τ)| p^w(τ^*, τ) = p^w_N(τ^*_N, τ_N)\}$. Then, the question becomes which portion along this locus constitutes the bargaining frontier. And, as I will argue later, this characterization of the bargaining frontier is the key that distinguishes my work from Bagwell, Staiger and Yurukoglu (2017).

Consider the ideal tariff (and hence the ideal local price) that each country would want, while the $p^w(τ^*, τ)$ was maintained at $\overline{p^w}$ by the needed change from its trading partner. Formally, for the home country, its desired tariff pair is the $(τ, τ^⋆)$ that solves $W_p ≡ \tilde{W}_p(p(τ, \overline{p^w}), \overline{p^w}) = 0$ and $p^w(τ^*, τ) = \overline{p^w}$; for the foreign country, it is the $(τ, τ^*)$

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10 As pointed out in Bagwell and Staiger (1999,2002), a general payoff function can be used to nest many popular models of trade policies, whether countries are politically motivated or not. For example, $W_j(p^j, p^w)$ may be the sum of consumer surplus and producer surplus, where a politically motivated government might put higher weights on the producer surplus. Thus, any tariff change made by country $j$ will affect its payoff through its effects on the local price $p^j$ and the world price $p^w$, where the latter is often regarded as the ‘terms-of-trade externality’ in the literature.

11 As Bagwell and Staiger (1999) show, this follows from trade balance as long as reciprocity is defined as changes in tariffs that lead to changes in the volume of each country’s imports that are of equal value to the changes in the volume of its exports.
that solves $W^*_p \equiv \widehat{W}^*_p (p^*(\tau^*, \overline{p^w}), \overline{p^w}) = 0$ and and $p^w(\tau^*, \tau) = \overline{p^w}$. Thus, the only relevant portion for bargaining is the interval, contained by $\{(\tau^*, \tau)|p^w(\tau^*, \tau) = \overline{p^w}\}$, with two endpoints being the ideal tariff pairs of the two countries. That is, the bargaining frontier is the part of the iso-world-price locus above the lowest of these pairs and below the highest of these pairs.

Figure 2.1, borrowed from Bagwell, Staiger and Yurukoglu (2017), can be used to illustrate this setup. In this figure, all the indifference curves and iso-world-price locus are represented in the $(\tau^*, \tau)$ domain. Depending on the setting, the initial Nash equilibrium could be denoted by $N(A)$, $N(B)$ or $N(C)$, and reciprocity in negotiation means countries’ bargaining outcome has to lie on the iso-world-price $p^w_N (\cdot)$ lines going through them, where the terms of exchange is fixed by the reciprocity restriction. In particular, this can lead to three cases: (1) If the existing Nash equilibrium is $N(A)$, then countries have to bargain along the $p^w_N (A)$ line, where the bargaining frontier is characterized by the segment $A'A''$. In this case, the home country is long, in the sense that it wants more liberalization ($A''$) than the foreign country wants ($A'$). (2) If the existing Nash equilibrium is $N(B)$, then countries have to bargain along the $p^w_N (B)$ line, where the bargaining frontier is characterized by the segment $B'B''$. In this case, the home country is short, in the sense that it wants less liberalization ($B'$) than the foreign country wants ($B''$). (3) If the existing Nash equilibrium is $N(C)$, then countries have to bargain along the $p^w_N (C)$ line which is equal to the world price under political optimum - the bargaining frontier simply reduces to a single point $PO$, which is also the political optimum. In this case, the desires of the two countries are exactly matched. I just denote this as the case where the home country is equal.

As a comparison, Bagwell, Staiger and Yurukoglu (2017) impose the additional restriction of reciprocity in renegotiation under which no country could be forced to

\footnote{These tariffs (the own-tariff component of the ideal tariff pair for each country) are what Bagwell and Staiger (1999) define as the \textit{politically optimal} reaction curve tariffs.}
import more than they want. As a result of this “respect for voluntary exchange” constraint, countries’ bargaining frontiers in their model are necessarily subsets of the frontiers in mine. In particular, reciprocity in renegotiation prescribes that any agreement must also lie on $W^*_p = 0$ or $W_p = 0$, whichever yields smaller trade volume. Thus, together with reciprocity in negotiation, this additional restriction pins down a unique negotiation outcome, that is its intersection with the iso-world-price locus: the bargaining frontier in Bagwell, Staiger and Yurukoglu is therefore a single point. In particular, in the three cases described previously and in terms of Figure 2.1, the bargaining frontiers in their setting are $A'$, $B'$ and $PO$ respectively. Thus, countries effectively do not need to bargain at all, as Bagwell, Staiger and Yurukoglu observe.

While the bargaining frontier is the same single point in the knife-edge case where the existing world price coincides with the world price under political optimum, however, without reciprocity in renegotiation, reciprocity in negotiation alone requires countries to determine a point on the line segment $A'A''$, $B'B''$ in more general cases. Thus, bargaining over the trade volume (though not the terms of trade) arises, which is exactly my starting point.

2.2. Bargaining under Reciprocity and MFN. The two-country setting above is useful for illustrating the basic features of reciprocity in negotiation and in renegotiation, and how each impacts the bargaining frontier. But to consider the possibility of bargaining externalities and the impact of the MFN rule together with reciprocity in shaping these externalities, I must move to a many-country framework. A simplest but natural framework to analyze MFN and Reciprocity involves three countries. Again I work within a simple general equilibrium setting to illustrate the key idea behind my analysis. Here I follow the setup described in Bagwell and Staiger (1999, 2002). In particular, I assume that there are two goods, $x$ and $y$, in this setting. Also, among the three countries, there is one home country (whose variables are without a
superscript) that is a natural importer of good \( x \) from two foreign countries, denoted by \( \star j \), with \( j \in \{1, 2\} \), which are natural importers of good \( y \) from the home country. I denote the local relative price in the home country as \( p \equiv \frac{p_x}{p_y} \), and the local relative price in the foreign country as \( p^\star j \equiv \frac{p^\star j_x}{p^\star j_y} \) for \( j \in \{1, 2\} \). Assuming all countries use non-prohibitive ad valorem import taxes, with the home country’s (foreign countries’) MFN import tariff denoted by \( \tau \ (\tau^\star j) \), then the world relative price can be written as \( p^w \equiv \frac{p_x^w}{p_y^w} \), where \( p^w_x \equiv p^{\star 1}_x = p^{\star 2}_x \) and local prices are such that \( p(\tau, p^w) = p^w \cdot (1 + \tau) \) and \( p^\star j(\tau^\star j, p^w) = p^w/(1 + \tau^\star j) \).\(^{13}\)

I denote the home country’s domestic demand of good \( i \) as \( D_i(p, TR) \) and the foreign country’s demand as \( D^\star j_i(p^\star j, TR^\star j) \), \( i \in \{x, y\} \), where \( TR \) and \( TR^\star j \) respectively represents the tariff revenue of the home country and the foreign countries.

\(^{13}\)Under discriminatory tariffs, there will be a world relative price for each foreign country. However, the MFN restriction, together with law of one price, requires the world relative prices are the same across the home country’s two trading partners.
which I assume is a lump-sum transfer to its own domestic consumers. Also, letting the home country’s domestic supply be \( Q_i(p) \) and the foreign country’s supply be \( Q^*_i(p^*_i) \), then the net import of good \( x \) by the home country, and that of \( y \) by \( *j \) is respectively \( M_x(p, TR) \equiv D_x(p, TR) - Q_x(p) \) and \( M^*_y(p^*_j, TR^*_j) \equiv D^*_y(p^*_j, TR^*_j) - Q^*_y(p^*_j) \). Similarly, the net export of good \( y \) by the home country, and that of \( x \) by \( *j \) is respectively \( E_y(p, TR) \equiv Q_y(p) - D_y(p, TR) \) and \( E^*_x(p^*_j, TR^*_j) \equiv Q^*_x(p^*_j) - D^*_x(p^*_j, TR^*_j) \). Thus \( TR \) and \( TR^*_j \), measured in units of each country’s export good, is implicitly given by \( TR = \tau \cdot p^w M_x(p, TR) = (p - p^w)M_x(p, TR) \) and \( TR^*_j = \tau^*_j \cdot \frac{1}{p^w} M^*_y(p^*_j, TR^*_j) = (\frac{1}{p^w} - \frac{1}{p^{*_j}}) \cdot M^*_y(p^*_j, TR^*_j) \), which yields \( TR = TR(p(\tau, p^w), p^w) \) and \( TR^*_j = TR^*_j(p^*_j(\tau^*_j, p^w), p^w) \). Thus, given the set of local prices: \( p(\tau, p^w), p^1(\tau^*_1, p^w), p^2(\tau^*_2, p^w) \), consumption, production and import/export in each country will be entirely pinned down. And countries’ tariff choice \((\tau, \tau^*_1, \tau^*_2)\) determines such prices in equilibrium.\(^{14}\)

The equilibrium world relative price, denoted by \( p^w_{eq} \), is given by the market clearing condition in the \( x \) market:\(^{15}\)

\[
M_x(p(\tau, p^w_{eq}), TR(p(\tau, p^w_{eq}), p^w_{eq})) = E_x^1(p^1(\tau^*_1, p^w_{eq}), TR^1(p^1(\tau^*_1, p^w_{eq}), p^w_{eq})) + E_x^2(p^2(\tau^*_2, p^w_{eq}), TR^2(p^2(\tau^*_2, p^w_{eq}), p^w_{eq}))
\]

Thus, \( p^w_{eq} \) can be written as \( p^w_{eq}(\tau, \tau^*_1, \tau^*_2) \). Furthermore, I assume that the Lerner paradox is ruled out, such that \( \frac{\partial p^w_{eq}(\tau, \tau^*_1, \tau^*_2)}{\partial \tau^h} < 0 < \frac{\partial p^w_{eq}(\tau, \tau^*_1, \tau^*_2)}{\partial \tau^*_j} \). That is, the world price is now decreasing in the home tariff and increasing in each of the foreign tariffs. And, because of this condition, given an initial \( p^w_{eq}(\tau_0, \tau^*_0^1, \tau^*_0^2) \), to reciprocate any tariff cut \((\tau_0 - \tau > 0)\) offered by the home country, some combination of tariff cuts

\(^{14}\)Presumably, countries may impose both export and import policies. However, I have to restrict the policy choice in a general equilibrium setting, because Lerner Symmetry would imply that there will be indeterminacy in the equilibrium if both export taxes and import taxes are allowed, that is, there are many combinations of them that yield the same outcome.

\(^{15}\)Market clearing for good \( y \) is redundant, when \( x \) good market is cleared and budget constraints are satisfied - ensured by balanced trade.
\( (\tau_0^* - \tau^1 > 0, \tau_0^* - \tau^2 > 0) \) have to be granted by the two foreign countries such that \( p_{eq}(\tau, \tau^*, \tau^*) = p_{eq}(\tau_0, \tau_0^*, \tau_0^*) \).

Again, this leads to the possibilities of home long, home short and home equal (knife-edge) as I discussed in the previous two-country setting. To illustrate this in a three country setting, I assume countries’ payoff can be represented by \( W_j(p^j, p^w) \) for \( j \in \{\text{none}, \star 1, \star 2\} \) where “none” means no superscript. Because of my focus on the three country model from now on, I will explicitly express the determination of countries’ reaction curves. First, the standard terms-of-trade effect can be written as:

\[
\frac{dW_j(p^j, p^w)}{d\tau^j} = \frac{\partial W_j(p^j, p^w)}{\partial p^j} \frac{dp^j(\tau^j, p^w_{eq})}{d\tau^j} + \frac{\partial W_j(p^j, p^w)}{\partial p^w} \frac{dp^w_{eq}}{d\tau^j}
\]

Thus, other things equal, if the government values its terms-of-trade improvement, that is \( \frac{\partial W(p, p^w)}{\partial p^w} < 0 \) and \( \frac{\partial W_j(p^j, p^w)}{\partial p^w} > 0 \) for \( j \in \{\star 1, \star 2\} \), and if it wants to use its trade policy to achieve a desired local price, then it has the incentive to set its import tariff and shift the cost associated with this tariff to its trading partners. Moreover, each country’s reaction curve can be characterized by \( \frac{dW_j(p^j, p^w)}{d\tau^j} = 0 \). In a Nash Equilibrium, each country stays on its reaction curve, leading to an inefficient outcome in general.

Under the rule of reciprocity (i.e. \( dp^w_{eq} = 0 \)), \( \frac{dW_j(p^j, p^w)}{d\tau^j} = 0 \) is equivalent to \( \frac{\partial W_j(p^j, p^w)}{\partial p^j} = 0 \). Thus, each country’s desired tariff is again characterized by \( W_j(p^j) = 0 \), under the condition that the world relative price will be maintained. And, for notational convenience, I will denote any variable that maximizes a country’s payoff under fixed world price with a subscript “po” throughout the paper. In particular, the home country desires \( \tau_{po} \), pinned down by \( W_p = 0 \), given that it will be reciprocated by some \( (\tau_r^1, \tau_r^2) \) such that \( p_{eq}(\tau_{po}, \tau_r^1, \tau_r^2) = p_{eq}(\tau_{0}, \tau_{0}^1, \tau_{0}^2) \). Foreign country \( \star 1 \) desires \( \tau_{po}^* \), pinned down by \( W_{p^1} = 0 \), given that it will be reciprocated by some \( (\tau_r, \tau_r^2) \) such that \( p_{eq}(\tau_r, \tau_{po}^*, \tau_r^2) = p_{eq}(\tau_0, \tau_0^1, \tau_0^2) \). And, foreign country \( \star 2 \) desires
\(\tau_{po}^2\), pinned down by \(W_{p^2}^2 = 0\), given that it will be reciprocated by some \((\tau_r, \tau_r^*)\) such that \(p_{eq}^w(\tau_r, \tau_r^*, \tau_{po}^*) = p_{eq}^w(\tau_0, \tau_0^1, \tau_0^2)\). In general, each of these defines a locus on the iso-world-price surface in the \((\tau, \tau^1, \tau^2)\) domain, which do not necessarily intersect each other at the same point - and if they do, which occurs when the political optimum world price coincides with the existing world price, I am in the knife-edge case where countries’ desires are perfectly aligned. However, any deviation from this case implies that the home country is either on the long side or on the short side. And if the home country is either long or short, an externality arises under which each country would like to get its own desired local price, while leaving all other requirements in an agreement to be fulfilled by other countries.

To describe the three cases in line with the previous section, note that the two foreign countries’ desired tariffs together imply a unique value for the home tariff, which I denote by \(\tau_{ipo}\) satisfying \(p_{eq}^w(\tau_{ipo}, \tau_{po}^1, \tau_{po}^2) = p_{eq}^w(\tau_0, \tau_0^1, \tau_0^2)\). Thus, I again obtain the following cases: (1) If \(\tau_{ipo} > \tau_{po}\), then home country is long: it desires more liberalization than the foreign exporters jointly want. (2) If \(\tau_{ipo} < \tau_{po}\), then home country is short: it desires less liberalization than the foreign exporters jointly want. (3) If \(\tau_{ipo} = \tau_{po}\), then home country is equal.

Whenever countries find themselves in either case (1) or (2), they have to bargain with each other over the allocation of concessions. Depending on the economic environment, relative to the home country’s desire, together the exporters may desire too much concession (for example, when they have relatively larger market power), or too little concession (for example, when they have relatively smaller market power). In order to maintain tractability while exploring this idea in a formal bargaining model, I will make some simplifying assumptions from now on, which will allow me to illuminate the interaction between institutions and bargaining outcome. This will also enable me to link the model with data in a more direct way. In particular, I will next move to a partial equilibrium representation of the three-country general equilibrium.
model I have just described. While this achieves the desired simplification, it also raises some conceptual issues which warrant discussion before proceeding further.

In theory, by relying on a partial equilibrium model, I lose a key feature of import tariffs that is exhibited in the general equilibrium model, namely, that due to Lerner Symmetry there is no formal distinction between an import tariff and an export tax/subsidy in terms of impacts on economic variables. Hence, in the general equilibrium model, reciprocity can be understood as a reciprocal exchange of tariff cuts by the negotiating countries, as I have previously described. And alternatively, in the general equilibrium model and due to Lerner Symmetry, reciprocity could be equivalently understood as a reciprocal exchange of, say, a home import tariff cut for foreign export tax cuts/export subsidy increases. With this in mind, note that Lerner Symmetry, however, does not apply in a partial equilibrium model. Consequently, in order to replicate the world-price-preserving impacts of reciprocity in a partial equilibrium model, I must have the exporters reciprocating the importer tariff cut with export policy changes of their own: exchange of import tariff cuts simply cannot keep the world price fixed in a partial equilibrium setting.

In practice, exchange of tariff cuts for export tax cuts/export subsidy increases is counterfactual to GATT/WTO market access negotiations. However, this form of exchange should not be taken and interpreted literally, but should rather be seen as a simple way for a partial equilibrium model, simplifying but with more tractability, to reflect the Lerner-Symmetry-like features of the general equilibrium model previously sketched, while maintaining the key world-price-preserving feature of reciprocity that arises in a general equilibrium model, under the forms of reciprocal exchanges of tariff concessions that characterize the GATT/WTO market access negotiations. This treatment seems reasonable given that in GATT negotiations many tariffs are being negotiated and general equilibrium forces such as Lerner Symmetry are likely to be quite relevant in capturing the impacts of the round: that is, these negotiations
are not restricted to a single narrow industry, where a focus on partial equilibrium forces would probably suffice, instead they cover many industries and represent broad changes in a country’s tariff structure.

3. The model

I now describe the 3-country partial equilibrium trade model within which I analyze the tariff bargaining problem. I first introduce a static environment, which translates into a dynamic setting once bargaining is included.\(^\text{16}\) There are three countries and one good in this world, where a home country (with no superscript) is a natural importer of that good and two foreign (\(\star 1\) and \(\star 2\)) countries are exporters of that same good. Regarding the protection instruments, the home country imposes import tax denoted as \(\tau\), and the foreign country \(\star j\) \((j = 1, 2)\) imposes export subsidy denoted as \(\tau^{\star j}\). Furthermore, the demand/supply system is denoted as \(D(p), Q(p)\) for the home country; \(D^{\star j}(p^{\star j}), Q^{\star j}(p^{\star j})\) for foreign country \(\star j\), where \(p\) is the domestic price of home country, \(p^{\star j}\) is the local prices of foreign country \(j\), and \(p^w\) is the world price. Throughout my analysis, I adopt the particular parameterization: \(Q = 0, Q^{\star 1} = \omega, Q^{\star 2} = 1 - \omega, D = 1 - \alpha p, D^{\star 1} = \beta - p^{\star 1}, D^{\star 2} = \beta - p^{\star 2}\), that is, a 3-country endowment-economy model with linear demands.\(^\text{17}\) Also, I define the home country’s import demand as \(M(p) \equiv D(p) - Q(p)\), and \(\star j\)’s export supply as \(E^{\star j}(p^{\star j}) \equiv Q^{\star j}(p^{\star j}) - D^{\star j}(p^{\star j})\).

The prices are linked by the conditions \(p(\tau, p^w) = p^w + \tau, p^{\star j}(\tau^{\star j}, p^w) = p^w + \tau^{\star j}\). Thus the market clearing condition \(M(p(\tau, p^w)) = \sum_{j=1,2} E^{\star j}(p^{\star j}(\tau^{\star j}, p^w))\) yields

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\(^{16}\)My model is similar to Bagwell and Staiger (2001)’s competing-exporter model. In terms of parametrization, it is also similar to Bagwell, Mavroidis and Staiger (2007) where a competing-importer, rather than competing-exporter, setup is used.

\(^{17}\)This system enables me to consider the market power of the home country while keeping reciprocity in a simple form. And, in terms of normalization, I am assuming the following conditions: foreign countries have identical demand function, the slope of which is equal to the intercept of the home country’s demand function, and both of them are equal to the total supply. Under these conditions, the functions in my model can be interpreted as having been normalized by the total supply.
the equilibrium world price $p^w = p^w(\tau, \tau^{*1}, \tau^{*2})$, given a tariff/subsidy combination $(\tau, \tau^{*1}, \tau^{*2})$. Following the literature on models with political economy, I assume each country’s welfare function is a weighed sum of consumer surplus, producer surplus and tariff revenue (or subsidy cost). In particular, a politically motivated government will put higher weights on its producer surplus. I denote the set of political weights as $(\gamma, \gamma^{*1}, \gamma^{*2})$. Then the (static or stage) payoff functions in my partial equilibrium setting, with an extra political weight on producer surplus, can be written as:

$$W^k(\tau^k, \tau^{-k}) \equiv W^k(p^k, p^w) = \int_{p^k}^{\beta} D^k(p)dp + \gamma^k \int_{0}^{p^k} Q^k(p)dp + (p^k - p^w)[D^k(p^k) - Q^k(p^k)]$$

where $k \in \{\text{none}, *1, *2\}$. To avoid the (uninteresting) technical issue that countries may subsidize the exporter in a lump-sum fashion in my endowment-economy model, I assume that countries are restricted by the upper bound of local price $\bar{p}^{*j} \equiv \beta$, that is, a policy that makes local price above $\bar{p}^{*j}$, and hence eliminates any consumption distortion from further increases in the tariff, is not permitted.\(^{18}\)

Having described the trade framework, I now introduce the bargaining procedure.\(^{19}\) The game consists of two periods.\(^{20}\) Actions in the first period are trivial in the sense that countries set their (static) Nash policy choices. And, I assume countries are

\(^{18}\)Technically, this assumption ensures concavity in the payoff functions. In a sense, this is a restriction similar to Ossa (2011) where an (exogenous) upper bound on Nash policy is imposed. However, under more general demand/supply system, this restriction is not necessary.

\(^{19}\)While it seems that a timing game such as war of attrition, or (repeated) game of chicken, which is presumably simpler than a bargaining setting, is appropriate for modeling delay, I note several features that make a bargaining setting more appropriate in my tariff negotiation: (1) my actual tariff negotiation procedure takes the form of offers and counteroffers, which a timing game may not capture well. (2) Besides the conflict, reciprocity requires the countries to cooperate in some sense, instead of being 'winner takes all', i.e. stay-exit - it involves compromises between the players, thus the possible outcome is continuous, rather than binary. (3) Actual tariff negotiation involves variations in the time between offers and counteroffers, which I argue justifies the use of a framework with strategic delay.

\(^{20}\)Essentially, they are characterized by the two different steady states. What countries are doing is, starting from an initial steady state, bargaining towards a new steady state, which they may have difficulties to determine in the “shadow” of potential political pressures. The period here can be interpreted as “round” in the GATT/WTO framework.
bound (restricted) in a way such that either they negotiate a new agreement under reciprocity, or they stick to their existing policies if they fail to negotiate a new one, which I interpret as an institutional constraint in my bargaining game reflecting the constraint imposed by previous GATT tariff bindings. Thus the policy profile in the first period will serve as the status quo in the second (bargaining) period. In order to determine the home country’s strategy in a simple way, I assume that the home country makes a take-it-or-leave-it offer in the beginning of the second period. Then the foreign countries bargain with each other on how to make (reciprocal) concessions to the home country, given the home country’s offer.\textsuperscript{21} Also, in the beginning of the second period, there are possibilities that the foreign exporting countries may face their own (private) political shocks,\textsuperscript{22} which they expect to last for indefinite amount of time. Throughout the analysis, the institutional constraints I impose are the Reciprocity and MFN constraints. Under these two conditions, the world price should be kept at its existing level.\textsuperscript{23} Thus the home country’s offer on its (MFN) tariff $\tau^h$ has to be reciprocated by foreign countries’ policy choices ($\tau^*1$, $\tau^*2$) in any agreement. Formally, I define the reciprocity constraint as follows.

**Definition 1.** Given an existing (MFN) policy profile $(\tau_0, \tau^*_0, \tau^*_0)$, a negotiated (MFN) profile of tariff/subsidy $(\tau, \tau^*_1, \tau^*_2)$ is said to satisfy *Reciprocity* if and only if $p^w(\tau, \tau^*_1, \tau^*_2) = p^w(\tau_0, \tau^*_0, \tau^*_0)$.

\textsuperscript{21}Note that this assumption is not as restrictive as it seems, since there isn’t much intensive margin adjustment in the offers, as documented in Bagwell, Staiger and Yurukoglu (2016, 2017). Moreover, while this is a simplifying assumption, one justification (outside the current model) would be that the home country can switch partners costlessly. Then the home country might be thought as having the ability to make take-it-or-leave-it offers, as suggested by Fudenberg, Levine and Tirole (1987).\textsuperscript{22}While introducing the possibility of a political shock to the home country may conceptually make the model more complete, it will not contribute much to my analysis, as I assume that the home country only makes a take-it-or-leave-it offer. Moreover, in my later parametric setting, it does not matter whether the home country has political pressure or not, as I assume, for simplicity, that it does not have any domestic endowment in that setting.\textsuperscript{23}See Bagwell and Staiger (2002) for a full review of this result.
To characterize the outcome when the countries fail to reach an agreement, I assume that the existing tariffs (status quo) are determined from the Nash equilibrium in the initial period, under the political pressure during that period. As the round gets under way, there is a new draw of political pressures in foreign countries.\footnote{In a sense, Jensen and Thursby (1990) analyzed a similar game where a new shock is generated in the second stage. While the shocks are correlated in their setting, I assume independence instead, so as to simplify my analysis such that existing tariff does not convey information about the countries’ current political pressure.}

For notational consistency, throughout the paper, I denote any existing variable, determined in the first period, with a subscript “0”. In particular, recall that these variables are determined by the (static) Nash equilibrium in the first period.

I now proceed to the discussion of the bargaining instruments under reciprocity. Generally speaking, countries would have to decide on \((\tau, \tau^1, \tau^2)\) in any agreement. However, since I endow the home country with the bargaining power to make a take-it-or-leave-it offer, \(\tau\) will be simply fixed in any agreement, that is, the home country faces a static decision problem. Thus the policy profile \((\tau, \tau^1, \tau^2)\) reduces to \((\tau^1, \tau^2)\). Moreover, the reciprocity condition \(p^u(\tau, \tau^1, \tau^2) = p^u(\tau_0, \tau^1_0, \tau^2_0)\) enables me to rewrite \((\tau^1, \tau^2)\) as \((\tau^1, \tau^2(\tau^1))\). Based on this observation, an agreement could be simply characterized by a scalar, which I define, without loss of generality, as \(g \equiv \tau^2 - \tau^1\). Then any agreement \((\tau^1, \tau^2)\) can be equivalently characterized by \(g\) given that they sum to a constant prescribed by the reciprocity. Thus I could simply assume that countries are bargaining on scalar \(g\), which can be interpreted as the difference or \textit{gap} between the two foreign countries’ tariff/subsidy.\footnote{While Harstad (2007) links this scalar to \textit{harmonization} of policies in an \textit{ex ante} symmetric environment, the representation here is just for notational convenience in my setting.} Alternatively, since \(\tau^i = p^i - p^u\) and \(\tau^u\) is fixed at \(\tau^u_0\) under reciprocity, I could equivalently characterize an agreement by \((p^1, p^2)\), and assume countries are directly bargaining on their local prices, wherein the scalar could be well written as \(g = p^1 - p^2\). Thus, under this interpretation, countries are effectively bargaining on the difference or \textit{gap}
between the two foreign countries’ local prices. In sum, given the home country’s offer, an agreement/offer can be equivalently characterized by \((\tau^*_1, \tau^*_2), (p^*_1, p^*_2)\) or \(g\). That said, I will just rewrite countries’ welfare in terms of \(g\) in the analysis of bargaining, and assume that countries are bargaining on \(g\) whenever it is convenient to do so, while keeping the above interpretation in the background.

After observing the initial take-it-or-leave-it offer from the home country, \(\star_1\) and \(\star_2\) will start the negotiation on how to coordinate/allocate their policy choices implied by reciprocity. This negotiation builds on the standard form of an alternating-offer bargaining. In this framework, \(\star_1\) will propose first, then \(\star_2\) will decide whether to accept the offer. If \(\star_2\) accepts, then the game ends. Otherwise, it will be \(\star_2\)’s turn to make proposals and \(\star_1\) responds. Moreover, I assume that each country can wait for as long as they want before making an offer or responding to an offer. Furthermore, each country’s political parameter is private information. Thus, delay is a strategic device to communicate countries’ types. And I impose the following assumptions and notations:\(^{26}\)

\[
(A1) \quad \gamma^{*j} \in \{l, h\}, \quad p \equiv Pr(\gamma^{*j} = h) = \frac{1}{2}, \text{ where } \gamma^{*j} \text{ is private information and } h > l = 1.\(^{27}\)
\]

Thus, I assume that as a result of the shock, in the second period (and forever thereafter) each foreign country is either a national income maximizer, and so its politically optimal reaction curve tariff corresponds to free trade, or it has some political pressure.\(^{28}\)

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\(^{26}\)My assumptions are similar to those adopted in Admati and Perry (1987) and Harstad (2007).

\(^{27}\)In the literature on bargaining with private information, the space of types are usually limited. With a continuum of types, it is generally known that a great many of equilibria exist, undermining the model’s predictive power. Cramton (1992) considers such a framework. And I could alternatively interpret the political shock as the possibility of a new draw, which seems more natural in this setting.

\(^{28}\)This may yield a policy (choice) set similar to Maggi and Staiger (2011) in equilibrium, which consists of Free Trade and Protection. However, my restriction is directly on the possible set of parameters characterizing political pressure.
A common discount factor $\delta = e^{-\rho}$ for the two foreign countries, where $\rho > 0$ is an instantaneous discount rate, and the length of the unit time between offers is arbitrarily small.\(^{29}\)

I denote $\star 1$'s and $\star 2$'s instantaneous welfare function simply as $W^{\star 1}(g, \gamma^{\star 1})$ and $W^{\star 2}(g, \gamma^{\star 2})$ respectively, for an agreement $g$,\(^{30}\) and their inside option (status quo) as $W_0^{\star 1}(\gamma^{\star 1})$ and $W_0^{\star 2}(\gamma^{\star 2})$. Thus the total (discounted) welfare that a foreign country obtains from an agreement $g$, reached at time $t_A$ is:

$$
\int_0^{t_A} \delta^s W_0^{\star j} (\gamma^{\star j}) ds + \int_{t_A}^{\infty} \delta^s W^{\star j}(g, \gamma^{\star j}) ds = \frac{1}{\ln(\delta - 1)} \{ \delta^{t_A} [W^{\star j}(g, \gamma^{\star j}) - W_0^{\star j}(\gamma^{\star j})] + W_0^{\star j}(\gamma^{\star j}) \}
$$

In the special case with no delay, i.e. $t = 0$, this welfare becomes $\frac{1}{\ln(\delta - 1)} W^{\star j}(g, \gamma^{\star j})$.

With delay, i.e. $t_A > 0$, the welfare will diminish according to the $\frac{1}{\ln(\delta - 1)} \delta^{t_A}$ term. To allow for both of the case when home is short and the case when home is long, and to preserve the trade pattern in the initial equilibrium, namely (1) positive export volume by $\star 1$ and $\star 2$, (2) positive domestic consumption in $\star 1$ and $\star 2$ and (3) positive endowment, I impose the following restrictions on the model parameters:

\[ (A3) \quad \beta \in \left[ \frac{1}{2}, \frac{3}{2} \right], \quad (2\beta - 1)\alpha \leq 2 \quad \text{and} \quad \omega \in \Omega(\alpha, \beta). \] \(^{31}\)

To formally establish the bargaining setting, I introduce the following notation for this bargaining game under incomplete information. A history $H^n$ after $n$ offers, consisting of the series of offers and counteroffers, is recursively defined as $H^0 \equiv \{(\emptyset, 0)\}$ and $H^n \equiv H^{n-1} \cup \{(g^n, t^n)\}$ for $n \geq 1$, where $g^n$ is the offer made at $t^n$. Note that whenever an offer is accepted, the game ends. The action space is defined as $A^n = A \equiv \{\text{accept}\} \cup (G, \mathbb{R}^+)$ for $n \geq 1$ and $A^0 \equiv (G, \mathbb{R}^+)$, where $G$ is the possible range of agreements. A pure strategy for a country $\star j$, when it is its turn

\(^{29}\)Note that I do not restrict the discount factor of the home country.

\(^{30}\)Recall that I have previously established the scalar representation of an agreement.

\(^{31}\)See the Appendix for the definition of $\Omega(\alpha, \beta)$, and the formal rationale and derivation underlying these restrictions. For example, as an application in the next section where it is assumed that $\alpha = 1$ and $\beta = \frac{1}{2}$, I will need to restrict $\omega \in \Omega(\alpha, \beta) = \left[ \frac{1}{6}, \frac{5}{6} \right]$. 
to propose/respond, is defined as a mapping from the set of history to the action space. In particular, I assume when \( n \) is even, it is \( *1 \)'s turn to propose/respond, thus \( *1 \)'s strategy can be written as \( \{s_{1k}^2\}_{k \geq 0} \), with \( s_{1k}^2 : H_{2k}^2 \mapsto A \) for \( k \geq 1 \) and \( s_1^0 : H^0 \mapsto A^0 \). Otherwise it is \( *2 \)'s turn to take actions, thus \( *2 \)'s strategy can be written as \( \{s_{2k+1}^2\}_{k \geq 0} \) with \( s_{2k+1}^2 : H_{2k+1}^2 \mapsto A \).\(^{32}\) Thus, when responding to an offer \( g^n \) made at \( t^n \), a country can accept it, or respond with a counter offer \( g^{n+1} \) at \( t^{n+1} \geq t^n \). Moreover, define \( \mathcal{H} \equiv \{H^n\}_{n \geq 0} \). Let \( \mu^j : \mathcal{H} \mapsto [0, 1] \) be \( *j \)'s belief on the probability of \( *-j \) being of high political pressure, i.e. \( \gamma^{*-j} = h \). In particular, I assume \( \mu^1(H^0) = \mu^2(H^0) = p \equiv \frac{1}{2} \).

Due to presence of private information in this game, I will focus on its sequential equilibrium, which requires the strategy profile \( \{(s_{1k}^2, s_{2k+1}^2)\}_{k \geq 0} \) to be optimal after every history, given the beliefs \( (\mu^1, \mu^2) \), and the beliefs have to be consistent with the strategy profile in the sense of Bayesian updating. Moreover, to ensure uniqueness of the equilibrium, I impose the intuitive criterion as my refinement on the off-equilibrium beliefs.

4. Analysis

As a benchmark set of trade policies, the Nash Equilibrium (countries choosing their optimal tariff/subsidy) can be characterized by the best response equations

\[
\left\{ \frac{\partial W_k^{(x, r, e)}}{\partial \tau_k} = 0 \right\}_{k \in \{\text{none}, *1, *2\}}:
\]

\[
\{- (1 - \gamma^k) Q^k(p^k) + (p^k - p^w) [D^k(p^k) - Q^k(p^k)] \} \cdot \left( 1 + \frac{\partial p^w}{\partial \tau_k} \right) - [D^k(p^k) - Q^k(p^k)] \frac{\partial p^w}{\partial \tau_k} = 0
\]

Thus, under Nash Equilibrium, countries are not only motivated by their local prices, which represents their political pressure, but also concerned with the terms-of-trade effect, characterized by \( \frac{\partial p^w}{\partial \tau_k} \). As a result, countries have the incentive to manipulate

\(^{32}\)As will be seen later, the proposing order matters, in the sense that it will affect the expected delay of the game, as the countries in my model is \textit{ex ante} asymmetric.
their terms-of-trade by shifting the associated cost to others, as long as they have some market power, i.e. as long as they are not “small” in international markets. In particular, as shown in the Appendix, I have $E_0^1 > E_0^2 \iff \omega > \frac{1}{2}$ in the equilibrium of the first period. In other words, the country with a larger endowment will be the principal supplier, referring to the foreign country that is the largest export supplier to the home country of the good under consideration. As will be seen in the analysis of the bargaining equilibrium, this allows me to examine the effect of another institutional rule in GATT/WTO, in addition to MFN and reciprocity in negotiations, namely the Principal Supplier rule which leads countries to negotiate concessions with a principal supplier on a given product. In my bargaining model, I will capture this institutional feature by allowing the principal supplier to make the first offer, and I will compare the delay under this rule to the alternative in which the smaller supplier makes the first offer.

As discussed in the context of my general equilibrium trade models, the politically optimal reaction curve tariff is the optimal tariff when a government does not value the terms-of-trade effect when making its policy choice, which solves $W_p = 0$ for any arbitrarily given $p_w$. Also recall that the motive of each country to achieve this tariff through tariff bargaining is the source of the externality across the competing exporters in my model. Throughout the paper, I will simply refer to each country’s politically optimal reaction curve tariff as its “bliss point tariff”, or simply its “bliss point”. Alternatively, I can interpret the bliss point tariffs as those that emerge when countries behave as if they were small countries and set their tariff/subsidy to

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33The politically optimal reaction curve tariff is originally defined in Bagwell and Staiger (1999, 2002). Note that when all countries are on their politically optimal reaction curves, the $p_w$ is in fact the one that would be implied by all the politically optimal reaction curve tariffs simultaneously, which Bagwell and Staiger define as political optimum.
attain the desired local prices.\textsuperscript{34} Concretely, this set of bliss points can be formally characterized by \( \{ \frac{\partial W^{(k,p^w)}}{\partial p^k} = 0 \} \): 

\[-(1 - \gamma^k)Q^k(p^k) + (p^k - p^w)[D^k(p^k) - Q^k(p^k)] = 0\]

In particular, the bliss points in my model are \( \bar{\tau}_{po}^{*1} = (\gamma^{*1} - 1)\omega \), \( \bar{\tau}_{po}^{*2} = (\gamma^{*2} - 1)(1 - \omega) \), \( \tau_{po} = 0 \), \( p_{po}^w = \frac{2\beta + (1 - \gamma^{*1})\omega + (1 - \gamma^{*2})(1 - \omega)}{2 + \alpha} \). Given the restriction \( p^{*j} \leq \bar{p}^{*j} \) which implies \( \tau^{*j} \leq \bar{\tau}^{*} \equiv \frac{(2\beta + 1)\alpha - 1}{2 + 4\alpha} \), there is a technical issue in the current setting, namely, the above bliss points may not be attainable if \( \bar{\tau}_{po}^{*j} > \bar{\tau}^{*} \).\textsuperscript{35} To handle this problem, I now define the (constrained) bliss point policies as \( \tau_{po}^{*1} \equiv \min(\bar{\tau}^{*}, \bar{\tau}_{po}^{*1}) \), \( \tau_{po}^{*2} \equiv \min(\bar{\tau}^{*}, \bar{\tau}_{po}^{*2}) \), which specifies that the bliss point \( \tau_{po}^{*j} \) will be set to \( \bar{\tau}^{*} \) whenever \( \bar{\tau}_{po}^{*j} > \bar{\tau}^{*} \). And, unless explicitly expressed, I will refer to \( (\tau_{po}^{*1}, \tau_{po}^{*2}) \) as bliss points from now on.

The constraint of reciprocity requires that \( p^w = p_0^w \) in any new agreement, implying \( \tau^{*1} + \tau^{*2} = \frac{-(2\beta - 1)\alpha - 2(1 - \alpha)}{2 + 4\alpha} - \alpha \tau \equiv \pi \). Thus, the concession jointly desired by \( \star1 \) and \( \star2 \), \( \tau_{po}^{*1} + \tau_{po}^{*2} \) can be less than, equal to or larger than \( \pi \). As a result, again, there are generally three possibilities for a given pair of political pressure.\textsuperscript{36} Moreover, in the Appendix, I show that the home country will make the offer \( \tau = 0 \) provided that it is sufficiently patient and the parameter restriction \( \alpha \leq \min(\frac{\sqrt{7\beta - 1}}{2}, \frac{2}{2\beta - 1}) \) holds. In order to avoid the complication associated with the home country’s strategy, I henceforth assume that the home country is also sufficiently patient, \( \frac{2}{2\beta - 1} > \frac{\sqrt{7\beta - 1}}{2} \) and \( \alpha \leq \frac{\sqrt{7\beta - 1}}{2} \), which ensures that the home country’s offer is simply \( \tau = 0 \). Next I formally discuss the cases in terms of the home country’s “position” (short, long or equal). Note that \( \pi = \frac{-(2\beta - 1)\alpha - 2(1 - \alpha)}{2 + 4\alpha} \) under \( \tau = 0 \). Since \( (2\beta - 1)\alpha < 2 \), I can

\textsuperscript{34}While each of these two interpretations is appropriate under perfect competition, they may not be equivalent under imperfect competition. See Bagwell and Staiger (2012) for an example.

\textsuperscript{35}Specifically, countries’ payoff functions will be linear when the local price exceeds the choke price above which domestic demand is driven to zero, creating a kink in the payoff function. Thus the (interior) bliss point previously characterized by a first order condition becomes invalid whenever it results in a local price larger than the choke price. However, this issue will not be present under a more general demand/supply system.

\textsuperscript{36}Bagwell and Staiger (2017) also analyzes a framework with these possibilities.
discuss the following possibilities regarding the size of the reciprocal concession asked by the home country, based on the parameters:

(1) (home short) If $\alpha < 1$, that is the home country has less market power, then there is too little concession ($\pi < 0$) to be jointly made by $\star 1$ and $\star 2$ in order to reciprocate the home country. Thus $\star 1$ and $\star 2$ will compete to make more concessions. In other words, the home country’s offer requires at least one of the two foreign countries to levy export tax in an agreement, although neither of them desires to do so.

(2) (home long) If $\alpha > 1$, that is the home country has more market power, then a $l$-type $\star 1$ and a $l$-type $\star 2$ will jointly desire less concession than that asked by the home country ($\pi > 0$), implying that they will compete to make less concession. And, as can be seen from Lemma 4 in the Appendix, if the size of $h$-type’s political pressure is small enough, then they compete to make less concession in the entire game. In other words, when the home country asks for too much liberalization, $\star 1$ and $\star 2$ has to allocate the extra (costly) liberalization relative to their bliss points. However, for given $(\alpha, \beta, \omega)$, if the size of $h$-type’s political pressure, $h$, is large enough, then they will compete to make more concessions.

(3) (home equal) If $\alpha = 1$, the concession asked by the home country is just enough ($\pi = 0$) for a $l$-type $\star 1$ and a $l$-type $\star 2$, that is, free trade will be the best for every country. However, if either of the two countries has any political pressure, that is, being a $h$-type, then they will compete to make more concessions. Thus, in this case, $\star 1$ and $\star 2$ weakly compete to make more concessions.

Also recall that the parameter restrictions that I have imposed so far is $\beta \in \left[\frac{1}{2}, \frac{\sqrt{17} + 5}{8}\right)$, $\alpha \leq \frac{\sqrt{17} - 1}{2}$ and $\omega \in \Omega(\alpha, \beta)$. In particular, for $\alpha \leq 1$, the home country will be on the
short side, that is, foreign countries compete for making (weakly) more concessions. I analyze a simple version of this case next. I leave the case where \( 1 < \alpha < \frac{\sqrt{17} - 1}{2} \) to be worked out in the Appendix [TBA], but as I noted for that case above, provided the \( h \)-type’s political pressure is high enough both exporters will be competing to make more concessions as in the case I analyze below, and so I expect the results for the two cases to be qualitatively similar provided the \( h \)-type’s political pressure is sufficiently high.

For simplicity, I impose \( \alpha = 1 \) and \( \beta = \frac{1}{2} \) in this subsection to capture the case of \( \text{home short} \). In line with assumption (A3), I focus on \( \omega \in \Omega(1, \frac{1}{2}) = (\frac{1}{6}, \frac{5}{6}) \). For convenience, I denote \( g_{01}^* \) and \( g_{02}^* \) as the two foreign countries’ status quo policy, respectively. Then, \( \star_1 \)’s welfare function and \( \star_2 \)’s welfare function can be conveniently represented in terms of \( g \) as

\[
W_{\star 1}(g, \gamma^*) = \frac{1}{8} + p_0^w(\omega - \frac{1}{2}) + [(\gamma^* - 1)\omega + p_0^w](p_0^w - \frac{g}{2}) - \frac{1}{2}(p_0^w - \frac{g}{2})^2
\]

\[
W_{\star 2}(g, \gamma^*) = \frac{1}{8} + p_0^w(\frac{1}{2} - \omega) + [(\gamma^* - 1)(1 - \omega) + p_0^w](p_0^w + \frac{g}{2}) - \frac{1}{2}(p_0^w + \frac{g}{2})^2
\]

And their payoffs from existing policies are \( W_{\star 1}^*(\gamma^*) = W_{\star 1}(g_{01}^*, \gamma^*) \) and \( W_{\star 2}^*(\gamma^*) = W_{\star 2}(g_{02}^*, \gamma^*) \) respectively. Starting from their existing trade policies, each country would like higher local prices, until their bliss points are reached, that is, \( \frac{\partial W_{\star 1}}{\partial g} |_{g=g_{01}^*} < 0 \) and \( \frac{\partial W_{\star 2}}{\partial g} |_{g=g_{02}^*} > 0 \). Also, I can write the bliss point of a type-\( i \) foreign country \( k \) as \( g_{po}^k(i) \equiv \text{argmax}_g[W_{\star k}(g, i) - W_{\star k}^0(i)] \). As is presented in the Appendix, it can be shown that \( g_{ij} \in (g_{po}^1(i), g_{po}^2(j)) \), that is, the agreement has to lie in between the two foreign countries’ bliss points. Moreover, the possible range for any offer \( g \) is \( G \equiv [g_{02}^*, g_{01}^*], \) as any offer outside of this range will be certainly rejected by one or both of the foreign countries.
Recall that, although in reality each exporter is negotiating bilaterally with the importer, I am formally looking at this equivalently as the two exporters making offers to each other rather than to the importer about how they are going to jointly reciprocate the importer’s tariff cut offer. In the case of home short, whenever a country makes an offer that is attractive to a country of \( l \) type but unattractive to a country of \( h \)-type, then the other country will believe it is of \( l \) type. In particular, countries have the incentive to mimic a certain type, according to their own advantage. Specifically, when the home country is short as is analyzed in my current setting, being a type \( h \) is relatively advantageous (\( l \) may pretend to be \( h \), but \( h \) never pretends to be \( l \)), as foreign countries compete to make concessions.\(^{37}\) Let \( t_{ij} \) be the equilibrium amount of delay, or time to agreement, when \( \star_1 \) is of type \( i \) and \( \star_2 \) is of type \( j \), where \( i, j \in \{ h, l \} \). In particular, when both countries are of high type, then \( \star_1 \) delays its offer until \( t_{hl} \), and \( \star_2 \) delays further by \( t_{hh} - t_{hl} \), making its counteroffer at \( t_{hh} \). Thus a bargaining outcome can be represented as \((g_{ij}, t_{ij})\), which specifies the agreement \((g_{ij})\) and the time to agreement, that is, delay \((t_{ij})\). As I will show later on, the equilibrium agreement \((g_{ij})\) is one that coincides with the complete information version of this game. Thus, I summarize the outcome in the following table, where the row labels represent the first proposer (\( \star_1 \))’s political pressure, while the column labels represent the second proposer (\( \star_2 \))’s political pressure.

<table>
<thead>
<tr>
<th>type</th>
<th>( h )</th>
<th>( l )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( h )</td>
<td>((g_{hh}, t_{hh}))</td>
<td>((g_{hl}, t_{hl}))</td>
</tr>
<tr>
<td>( l )</td>
<td>((g_{lh}, t_{lh}))</td>
<td>((g_{ll}, t_{ll}))</td>
</tr>
</tbody>
</table>

In a separating equilibrium, a type \( h \) may need to use delay as a (costly) device to truthfully reveal its type, to convince the other country that it is not of \( l \) type. While a type \( l \) does not need to signal its type by delay. Thus the incentive compatibility

\(^{37}\)This is because a high pressure country will always desire larger “share” of concession in the range of feasible agreements. Technically, it is because \( g_{lt} < g_{lh} < g_{po_1}^* (h) \) and \( g_{lt} < g_{lh} < g_{po_2}^* (h) \).
conditions only need to be binding so as to prevent \( l \) from mimicking \( h \). The intuitive criterion ensuring that the delay will be just enough to signal the types, which pins down the unique equilibrium in terms of final agreement \((g, t)\). Formally, I have the following lemma establishing the equilibrium.

**Lemma 1.** The equilibrium agreement \( g \) coincides with that of its complete information counterpart, and the associated bargaining delay is characterized by the following components: 

\[
\delta_{th} = 0, \quad \delta_{hl} = 0, \quad \delta_{tll} - \delta_{thl} = \min\left\{ \frac{5}{18} - \frac{1}{3} \omega - \frac{s}{12}, 1 \right\}
\]

\[
\delta_{tlh} = \min\left\{ \frac{1}{3} \omega - \frac{2}{18} - \frac{g_{lh}}{2}, 1 \right\}
\]

Now I proceed to the equilibrium analysis for the remainder of this section and discuss several properties of the equilibrium that are relevant for the GATT/WTO institution. Moreover, these properties will also guide my empirical work later on.

**Corollary 1.** Under the given parametric setting, whenever the first proposer has no political pressure, i.e. a national income maximizer, there is no delay in reaching an agreement.

In other words, a necessary condition for the existence of delay is that the first proposer has some political pressure.\(^{38}\) As the relationship between delay and the market shares of the two exporters depends not only directly on \( \omega \), but also indirectly on \( g_{ij}(\omega) \), the overall effect of \( \omega \) on delay is not obvious. On the one hand, when \( \omega \) changes, countries’ payoffs are altered even for a fixed agreement. On the other hand, the agreement itself responds to \( \omega \), thus creating a second type of effect. I begin with the analysis of how \( g_{ij}(\omega) \), which coincides with the Nash bargaining solution, depends on the market share.

\(^{38}\)In a sense, with a risk of digression, a thought experiment would be if the home country was facing a constraint to sequence the negotiations between different country pairs and was able to somehow estimate the political pressure of each country, it probably should begin with those that have relatively low political pressure. Note that I do not model whether there is any private information facing the home country.
Lemma 2. As the first proposer’s market share increases, its equilibrium local price increases, that is, export subsidy (export tax) strictly increases (decreases), whenever at least one of the two foreign countries are of high political pressure: \( \frac{\partial g}{\partial \omega} > 0 \), \( \frac{\partial g_{hl}}{\partial \omega} > 0 \), \( \frac{\partial g_{hh}}{\partial \omega} > 0 \). Moreover, the country with higher political pressure always ends up with an export subsidy in equilibrium, while the country with lower political pressure ends up with an export tax, that is, \( g_{hl} < 0 \), \( g_{lh} > 0 \). When both of the countries are of high political pressure, the smaller (larger) exporter imposes an export subsidy (export tax), that is, \( \text{sign}(g_{hh}) = \text{sign}(\omega - \frac{1}{2}) \).

When both of the countries are of high type, then the big supplier ends up with an export tax, while the small supplier ends up with an export subsidy, which seems to suggest the small supplier being a “winner”. However, note that the sign of \( g \)’s depends not only on their bliss points but also their status quo. While the big supplier takes home with an export tax, it does so from the status quo with relatively large export tax, which is very bad when the political shock comes. Thus in this regard, the small supplier need not to be a “winner”.

I now proceed to the analysis of the relationship between delay and the export market characteristics. First, I focus on \( t_{hh} - t_{hl} \) given in Lemma 1, that is, the delay by which \( \star 2 \) responds to \( \star 1 \)’s initial offer, as this is not only analytically easier, but also an important component of \( t_{hh} \). Note that if \( \omega = \frac{1}{2} \) that is, symmetric suppliers, then I must have \( t_{hh} - t_{hl} > 0 \), because \( -g_{hl} > g_{hh} = 0 \). In words, this component of delay is strictly positive at least when countries’ market shares are similar. And, starting from \( \omega = \frac{1}{2} \), \( t_{hh} - t_{hl} \) decreases with respect to \( \omega \) to the point where \( -g_{hl}(\omega) = g_{hh}(\omega) \) such that \( t_{hh} - t_{hl} = 0 \). I denote this \( \omega \)-cutoff as \( \omega^* \). And for \( \omega \in \left[ \frac{1}{2}, \omega^* \right) \), that is, \( t_{hh} - t_{hl} > 0 \), the expression for \( \frac{d(t_{hh} - t_{hl})}{d\omega} \) is:
On the one hand, for fixed proposals \((g_{hl} \text{ and } g_{hh})\), as \(\omega\) increases,\(^{39}\) the direct effect, captured by \(\ominus\), is that a \(l\)-type \(*2\)'s gain from the agreement, whether mimicking or not, decreases since it becomes a smaller supplier, that is, it benefits less for having smaller market share: in the limit when \(\omega = \frac{5}{6}\), \(*2\) is simply driven to autarky under the initial Nash equilibrium - in this case, its existing (Nash) policy, which is free trade, coincides with its bliss point, which means that a \(l\)-type \(*2\) cannot gain anything from an agreement with \(*1\). That said, whether \(*2\) mimics or not, its payoff decreases with a larger \(\omega\). However, this reduction in benefit for \(*2\), being a smaller supplier, is asymmetric between mimicking and non-mimicking. Concretely, the reduction when mimicking a \(h\)-type (thus getting an agreement \(g_{hh}\)) is smaller than that of sticking to its true type (thus an agreement \(g_{hl}\)). As a result, it provides more incentive for a \(l\)-type to mimic a \(h\)-type, which implies longer delay is needed to signal a \(h\)-type. In other words, when \(\omega\) increases, the difference between mimicking and non-mimicking becomes larger. On the other hand, as \(\omega\) increases, the indirect effect, captured by \(\oplus\), through \((g_{hl}, g_{hh})\) is such that \(g_{hl}\) becomes more attractive to a \(l\)-type, while \(g_{hh}\) becomes less attractive. This provides less incentive for a \(l\)-type to mimic a \(h\)-type, which implies that shorter delay is needed to signal a \(h\)-type. Given these two competing forces, it is helpful to highlight them by a graph.

I use Figure 4.1 to illustrate the effect of \(\omega\) on delay. In this figure, I focus on the delay after \(*1\) has been revealed to be of type \(h\), with an outstanding offer \(g_{hl}\) on the

\(^{39}\)As previously noted, there is a one-to-one mapping between \(\omega\) and export volume.
table. Given this proposal, \(*2\) strategically delays its counteroffer, if any, to signal its type. In particular, a \(l\)-type \(*2\) accepts \(g_{hl}\) without delay, while a \(h\)-type makes an counteroffer \(g_{hh}\) after delaying sufficiently long. Concretely, I plot the proposal \((g)\) on the vertical axis against delay \((t)\) along the horizontal axis, where the three colored loci represent \(l\)-type \(*2\)'s indifference curves, facing the tradeoff between cost of delay and gain from a better deal. As is standard in signaling games, the amount of delay (equilibrium under intuitive criterion) is pinned down when the \(l\) type becomes indifferent between accepting \(g_{hl}\) with no delay, and accepting \(g_{hh}\) with the equilibrium delay. This figure shows how \(\omega\) affects the equilibrium outcome, where I decompose the transition from an initial equilibrium point A (it depicts the equilibrium when \(\omega = 0.5\), which is where \(l\)-type \(*2\)'s indifference curve, passing \(g_{hl}\), intersects the \(g_{hh}\) line.) to a new equilibrium point D after \(\omega\) increases. I can decompose this transition, denoted as \(\overrightarrow{AD}\), to several components as follows. First, when \(\omega\) increases, for a fixed proposal \(g_{hl}\), the indifference curve shifts to the right, causing delay to increase to point B, and I label this 'direct effect' as \(\overrightarrow{AB}\). Intuitively, this is due to the fact that as \(\omega\) increases, delay becomes less costly for \(l\)-type \(*2\) since it gains less from any given agreement, which I summarizes in the following lemma.

**Lemma 3.** When \(\omega\) increases, the difference between the small supplier (\(*2\)’s existing Nash policy and its desired policy a \(l\)-type becomes smaller, and vanishes in the limit. As a result, it tends to become indifferent between its existing policy and an agreement under reciprocity.

In particular, as it becomes a smaller supplier, \(*2\) cares less about agreement as its existing policy converges to its bliss point, willing to endure more delay for a given increase in its local price toward its bliss price. Second, larger \(\omega\) leads to an increase in \(g_{hl}\), which shifts the indifference curve from point B to point C, and I may name this 'indirect effect' as \(\overrightarrow{BC}\), causing the reduction of delay. This is due to that
\( \star 2 \)'s bargaining power increases as it becomes smaller, resulting in a better proposal offered by \( \star 1 \), thus shifting \( \star 2 \)'s indifference curve inward. Finally, another indirect effect (denoted as \( \overrightarrow{CD} \)) is that larger \( \omega \) shifts up the \( g_{hh} \) line, whose intersection with \( \star 2 \)'s indifference curve determines the equilibrium outcome. The direction of this effect is similar to that of the \( \overrightarrow{BC} \) effect, due to that the peak of indifference curve is at \( g = 0 \) for a national income maximizer.

Based on the argument above, I could write the total effect \( \overrightarrow{AD} = \overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CD} \).

That said, whether delay increases or decreases with respect to \( \omega \) depends which of the three effects dominate the others. A general pattern is that the direct effect (\( \overrightarrow{AB} \)) increases delay, while the indirect effects (\( \overrightarrow{BC} \) and \( \overrightarrow{CD} \)) reduces delay. As established in Proposition 1, the indirect effects dominate the direct effect.40

**Proposition 1.** For \( \omega \in [\frac{1}{2}, \omega^*] \), when both of the countries are of high political pressure, then the delay from the first offer to the second (final) offer is decreasing with respect to \( \omega \). For \( \omega \in [\omega^*, \frac{5}{6}) \), there is no delay from the first offer to the second offer, where the agreement itself serves as a signaling device.

This result links the delay (conditional on both countries are of high political pressure) to the export market shares, or the export market concentration. In general, the more concentrated the export market is, the shorter the delay from the first offer to the second offer is. Concretely, if I introduce the Herfindahl-Hirschman Index (HHI), defined as the sum of squared market shares, as a measure of the export market concentration in my model, that is, \( HHI(\omega) \equiv \left( \frac{E_{\omega 1}^1}{E_0^1 + E_0^2} \right)^2 + \left( \frac{E_{\omega 2}^2}{E_0^1 + E_0^2} \right)^2 = \frac{9}{2} (\omega - \frac{1}{2})^2 + \frac{1}{2} \), then the market concentration is monotonically increasing in \( \omega \in [\frac{1}{2}, \frac{5}{6}) \). Thus the

40 However, if the assumption \( l = 1 \) is relaxed, then as long as \( l \) becomes sufficiently large (thus \( h > l \) should be large too), the direct effect dominates the indirect effects, which causes a positive association between \( \omega \) and delay. Intuitively, when both \( l \) and \( h \) types have very high pressure, being a high type or low type does not matter much for the bargaining in the sense that all proposals tend to converge to a constant \( g = \frac{3}{4} \omega - \frac{1}{4} \). This implies that there is infinitely small difference among \( g_{ll} \), \( g_{lh} \), \( g_{hl} \) and \( g_{hh} \), rendering tiny indirect effects.
The proposition above predicts a negative relationship between this particular delay and HHI.

Finally, I analyze the property of $t_{hl}$. Starting from $\omega = \frac{1}{2}$, $t_{hl}$ stays at 0 until $\omega^{**}$ where $(\frac{1}{2}\omega^{**} - \frac{1}{18})^2 - (\frac{dh}{2})^2 = \delta^{hh} - t_{hl}(\frac{1}{3}\omega^{**} - \frac{1}{18})^2 - (\frac{dh}{2})^2 - (\frac{dh}{2})^2$.

**Proposition 2.** If the first proposer is of high political pressure, then for $\omega \in [\frac{1}{2}, \omega^{**}]$ there is no delay from the beginning to the first offer. For $\omega \in (\omega^{**}, \frac{5}{6})$, there exists delay from the beginning to the first offer, which is increasing then decreasing in $\omega$ (HHI).

I summarize the findings in the following corollary.

**Corollary 2.** (a) For $\omega \in [\frac{1}{2}, \omega^{**}]$, there exists positive bargaining delay iff both of the countries are of high political pressure, which is the time elapsed from the first offer, made in the beginning, to the second offer. (b) For $\omega \in [\omega^{**}, \omega^*]$, there exists positive
bargaining delay iff the first proposer is of high political pressure, which is the time elapsed from the beginning to the first offer plus that from the first offer to the second offer. (c) For $\omega \in [\omega^*, \frac{5}{6}]$, there exists positive bargaining delay iff the first proposer is of high political pressure, which is the time elapsed from the beginning to the first offer, where the second offer is made and accepted immediately.

While the above proposition depicts the big picture of the bargaining delay, that is, the presence of different forms of delay, I now specifically link the length of total delay to the bargaining externality in my framework, which will serve as the basis for our empirical exploration.

**Proposition 3.** There exists $\tilde{\omega}_1, \tilde{\omega}_2 \in \left(\frac{1}{2}, \frac{5}{6}\right)$ such that (1) For $\omega \in \left[\frac{1}{2}, \tilde{\omega}_1\right) \cup \left[\tilde{\omega}_2, \frac{5}{6}\right)$, the expected (total) delay is decreasing with respect to market concentration, as measured by the Herfindahl-Hirschman index. (2) For $\omega \in (\tilde{\omega}_1, \tilde{\omega}_2)$, the expected (total) delay is increasing with respect to market concentration.

**Principal Supplier.** The Principal Supplier rule prescribes that countries should focus on negotiating with their major suppliers. In particular, I interpret the rule as one to determine which (foreign) country makes its offer first. Thus, in our bargaining context, the principal supplier rule simply means the principal supplier propose first. The asymmetry in my setting allows me to explore the role of this rule in the current bargaining context.

**Proposition 4.** Under the given parametric setting, letting a Principal Supplier propose the initial offer makes the total (expected) delay shorter.

This proposition provides a mechanism, different from Ludema and Mayda (2009, 2013), which lends additional support to the Principal Supplier rule embedded in the GATT/WTO institution.
Numerical Examples. As an illustrative example, I plot the numerical solutions for $h = 2$ and $h = 3$ respectively in the Figure 4.2, where the horizontal axis denotes the endowment of $\star 1$, and vertical axis is the amount of delay. In particular, the top 3 rows of panels represent the three components of the expected delay, plotted in the bottom row of panels. Moreover, I plot the outcome as red curves when $\star 1$ is the first proposer, and the outcome as blue curves when $\star 2$ is the first proposer.

The role of the principal supplier rule can be seen by viewing the bottom panel of the figure above: for $\omega > \frac{1}{2}$, that is $\star 1$ is the principal supplier, letting $\star 1$ proposes first (red curve) makes the expected shorter than letting $\star 2$ (smaller supplier) proposes first (blue curve).

While it is hard to directly measure externality in typical bargaining models, there is a popular candidate for it in trade settings. In general, the more concentrated the export market is, the smaller the scope for free riding (externality) is: in the extreme of only one supplying country, no free riding is present.\(^{41}\) As can be seen from the numerical example presented in the bottom panels of the figure, delay is in general downward sloping with a kink, that is, the higher the market concentration is, the shorter the expected delay is.

Testable Predictions. While the model predicts many testable predictions (Proposition 1, 2 and 3), the first and preliminary one that I will take to the data is that given the Principal Supplier rule, the delay (from the initial offer to the final offer) will be maximized at $\omega = \frac{1}{2}$ (Proposition 1). Thus I expect that the delay will be decreasing with respect to the export concentration, that is, the more concentrated the export suppliers are, the shorter bargaining delay will be. Although Proposition 2 and Proposition 3 does not provide a clear monotone relationship between the exporter

\(^{41}\)Admittedly, I ignore the adjustment of countries’ export pattern, as a lower tariff on a given good may induce a previously non-exporting country to become an exporter of that good.
concentration and total delay, I also empirically explore the implications associated with it.

5. **Empirical Results**

5.1. **Data.**
Bargaining Data. I use the Torquay round data that is compiled and described by Bagwell, Staiger and Yurukoglu (2017). In particular, this dataset provides me detailed records of both the contents and the timing of offers, counteroffers and final agreements/failures between those negotiating countries. This round of tariff conference took place in Torquay, United Kingdom, on September 28, 1950, and lasted until the end of March 1951, where countries mainly focused on exchange of tariff concessions. Thus, in a sense, I do not need to deal with negotiations involving non-tariff measures that are typical in later rounds, for example, intellectual property rights. As a general bargaining procedure, countries bargain with each other in a bilateral manner, and they may do so concurrently with many partners. Prior to the arrival at Torquay, countries are advised to submit lists of products to other members on which they would like a partner to make concessions, that is, it is the list of concessions that they request for their exports into a partner’s market. Once the round starts, countries begin exchanging their offers at whatever time that best suits them, and these intermediate offers are not observed by other third-party members, until they reach a final agreement.

Trade Data. The trade data in my analysis is the import data of United States in 1948, compiled and described by Bagwell, Staiger and Yurukoglu (2016).

Other Data. Another source of data for my covariates such as GDP, Common language, Border, Distance, comes from CEPII. And the market power measure comes from Broda Limao and Weinstein (2008).

5.2. Empirical Strategy. In total, there are 292 (undirected) dyads negotiating over thousands of products. The empirical specifications can be examined at the (directed or undirected) dyad level, although the relatively small number of observations in the dyad level limits the scope of the results. Alternatively, I can focus on the HS product level in two forms: (a) how long it takes to arrive at an agreement on the
given HS product, regardless of the destination (thus HS as the unit of observation). (b) how long it takes to arrive at an agreement on the given HS product with a particular importer/destination (thus HS-importer as the unit of observation). This second approach, in particular (b), not only greatly expands the number of observations, but also more naturally accords with the single-importer-multiple-exporter framework in the theory. However, there are some issues with these approaches which will be discussed in what follows.

A first question arises whether the procedure in the model is relevant to the actual negotiation, which affects how I can reasonably map the variables in the model to the data. In this regard, I argue the data can be interpreted in a way that is compatible with the theory. Specifically, I interpret the home country as the importer in the data, and the foreign countries (exporters) as those that the importer makes offers to. Then the home country announces its offer in the beginning to everyone (or, alternatively, its offer is perfectly predicted by others). Given the offer, the home country behaves passively (that is, it does not behave strategically in terms of delaying), and officially submits its offer to any other country whenever the latter bids for the offer with its own concession, guided by (multilateral) reciprocity. Consequently, given this interpretation, the exporters behave strategically by delaying their “bid”, so as to signal their bargaining strength among themselves.

A second potential issue with linking the model to the data is the number of players, or countries. In my model, there are two exporters participating in the bargaining, while in the data, there are 36 negotiating parties. However, one feature of my data is that the majority (97%), as documented in Bagwell Staiger and Yurukoglu (2017), of product-level offers are made to no more than two countries.

42 Recall from footnote 21 that this assumption is not as restrictive as it seems, since there isn’t much intensive margin adjustment in the offers, as documented in Bagwell, Staiger and Yurukoglu (2016, 2017).

43 Some countries/regions were negotiating as a single party such as Benelux.
made to less than two countries. Given this observation, although introducing a more general setting with multiple countries might alleviate the discrepancy, it is beyond the scope of this paper and my focus on a two-exporter setting does not result in loss of generality in terms of the pattern observed in my data.

While the theory can be taken to the data in a way that makes the bargaining procedure sensible, delay in the actual negotiation can takes various forms, as there are several stages in the bargaining process: Request (R), Modification of Request (RM), Offer (O), Modification of Offer (OM), Final Agreement (A) and Modification of Final Agreement (AM), together with Termination/Withdrawn (W). Specifically, ignoring the modifications, there are three measures of delay that could serve as a potential focus of the empirical analysis. The three measures of delay are the following: (a) the time elapsed from September 28, 1950, the official starting date of the Torquay round, to final offer, that is, the conclusion of an agreement $i$, which will be denoted as $T_A^i$; (b) the time elapsed from September 28, 1950, the official starting date of the Torquay round, to initial offer, which will be denoted as $T_O^i$; (c) the time elapsed from initial offer to initial final agreement, which will be denoted as $T_O^{O-A}$.

My main focus will be on (c) for the following reasons: (1) although the Torquay round was officially scheduled to start on September 28, 1950, it may not be a good measure of when the actual negotiation starts for each dyad: it may well be that some countries are not fully ready, exogenously; and (2) the theory only predicts a (simple) monotone relationship for (c). While I focus on the initial offer and initial final offer, missing the modifications of offers in between, the average number of back and forth of offers is close to two, as documented in Bagwell, Staiger and Yurukoglu (2017). In particular, a majority of bilateral bargainings only involves 2 rounds of offers, that is,

---

44 The missing data problem in the request stage is significant, as many countries do not report the date of request - at least not in a way that I can observe.

45 While I do see sign changing in different specifications related to $T_A^i$ and $T_O^i$ in my analysis, a more extensive examination of the non-monotonicity in (a) and (b) is left for future work.
countries started the initial exchange of offers (O), then finalized the offers (A) at a later time - the elapsed time can be interpreted as observations of \( t_{hl} \), consisting of \( t_{hl} \) (elapsed time from beginning of round to O) and \( t_{hh} - t_{hl} \) (elapsed time from O to A), in my theoretical model. Then the second most frequent number of rounds of offers is 1, which consists of two scenarios: (i) countries start their exchange of offers (O), then nothing occurred. (ii) countries reach an agreement (A) without initial exchange of offers. For case (i), I can treat them as censored observations where the delay is censored at the end of round.\(^{46}\) For case (ii), the elapsed time from the beginning to (A) can be mapped to \( t_{hl} \) in my theoretical model. In total, these forms account for around 75% of the bilateral bargainings in the Torquay round.

As the variable of key interest, the bargaining externality can be proxied indirectly using the number of exporters involved in each bargain with an importer. However, this measure could be endogenous to the bargaining setting (as in Ludema and Mayda, 2013), and beyond this the use of such a proxy might lead to a model that is hard to distinguish from a mechanical one, say, a random proposing model where the more players there are, the earlier the initial (earliest) offer will be made and the later the initial (earliest) final agreement will occur, which mechanically maps larger externality (more players) to longer delay. While the latter should not concern the current setting, as there is only one importer making offers, another (better) approach is to measure the externality directly. One such measure would be the product concentration in a given country/importer, where the common HHI can be applied. The potential problem with this approach is how to measure the concentration. Specifically, I have to determine whether all exporters, or only those that participate in the negotiation, should be included in the measure. In this regard, my theoretical framework provides a remedy. In particular, as I impose reciprocity (going-down), together with MFN,

\(^{46}\)Note that it is evident that bargaining failure is part of the dataset, which, admittedly, my model cannot explain per se. As a result, I have to exclude the bargaining pairs that failed in my sample, although this portion of data is relatively small.
according to the model there should be no free rider issue related to countries that do not come to the bargaining table (i.e. those non-participants would not benefit from any agreement). Thus, guided by this observation, I should focus on the HHI among those actual negotiators for a given HS.

At first glance, my delay framework seems similar to the analysis of strike duration in labor economics, where hazard rate/survival model is usually applied. However, this modeling strategy is not necessarily applicable in my setting. In hazard modeling, the hazard rate is typically assumed to be constant, which can be rationalized by mixed strategies - thus, in a sense, this type of model embodies the feature of war of attrition, which my theoretical model does not have as I focus on pure strategy.

In particular, length of delay in my theoretical framework is itself a strategic device that can be directly linked to other variables, as opposed to a setting where delay is a by-product of hazard rate. As a result, I will focus on other specifications such as simple OLS and Tobit.

My initial specification will be taking Proposition 1 to the data, that is, to examine whether delay is related to externality. As shown in the empirical evidence that follows, the signs are in general consistent with this proposition in all tables, that is, the larger the externality is, the longer delay (from initial offer to final offer) will be. Also, the theory (Proposition 2 and Proposition 3) does not predict a monotone pattern with respect to the relationship between bargaining delay (from beginning to initial offer, or from beginning to final agreement) and externality, and I do see some switching of coefficient signs in different specifications. In particular, my basic

---

47 See Kennan (1985), Tracy (1987) and Gu and Kuhn (1998), among others, for this line of modeling. Moser and Rose (2012) employ survival analysis to examine delay in trade negotiations across different regional trade agreements.

48 And indeed, the hazard model itself is rejected by my data.

49 Neary (2004) fits an OLS relationship between the duration of negotiation and the number of participating countries, across different GATT rounds, and uses his estimates to form a prediction of the duration of Doha round.
Table 1. Descriptive Statistics: Dyad Level

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time from 9/28/1950 to Initial Offer</td>
<td>324</td>
<td>56.06</td>
<td>54.43</td>
<td>-20</td>
<td>184</td>
</tr>
<tr>
<td>Time from Initial Offer to Final Offer</td>
<td>260</td>
<td>80.86</td>
<td>59.82</td>
<td>0</td>
<td>199</td>
</tr>
<tr>
<td>Time from 9/28/1950 to Final Offer</td>
<td>260</td>
<td>134.4</td>
<td>50.33</td>
<td>11</td>
<td>184</td>
</tr>
</tbody>
</table>

Table 2. Descriptive Statistics: HS Level (US Import)

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time from 9/28/1950 to Initial Offer</td>
<td>1,760</td>
<td>35.68</td>
<td>41.21</td>
<td>4</td>
<td>184</td>
</tr>
<tr>
<td>Time from Initial Offer to Final Offer</td>
<td>1,267</td>
<td>142.6</td>
<td>43.32</td>
<td>0</td>
<td>179</td>
</tr>
<tr>
<td>Time from 9/28/1950 to Final Offer</td>
<td>1,267</td>
<td>172.3</td>
<td>15.28</td>
<td>77</td>
<td>184</td>
</tr>
<tr>
<td>US Import HHI</td>
<td>1,760</td>
<td>0.761</td>
<td>0.372</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

regression equation is:

\[ T_i = \alpha + \beta E^{EXT}_i + X_i'\gamma + \epsilon_i \]

where \( T_i \) is my measure of delay - in particular, the delay from an initial offer to final agreement, \( E^{EXT}_i \) is the measure of externality and \( X_i \) is the vector of control variables. Based on my theoretical results in Proposition 1, one would expect \( \beta > 0 \).

5.3. Summary of Data. I summarize my data in Table 1 and Table 2:

[TBA Explain] I present the results in two sets for different samples in what follows.

5.4. Results: Sample of US bilateral bargaining. Given that only the US import data is currently available, I start with the sample involving US as the seller (importer - the home country), that is, the offers are made by US on its tariff. As previously discussed, the key variables that I have to measure, or define, are \( T_i \) and \( E^{EXT}_i \). Thus I proceed according to various definitions of \( E^{EXT}_i \), and present the results for different \( T_i \), given the definition of \( E^{EXT}_i \). Moreover, the unit of observation \( i \), could be either in the product level, or it can be based on the dyad level where a bundle of products are under negotiation. Thus I divide my results into two groups based on how I define the unit of observation.

Unit of Observation: HS
I consider two measures of externality. The first one is simply based on whether a good is negotiated with multiple countries, which does not require knowledge of the import trade volume. And the second makes use of the trade data and relates externality to the export market concentration, which is a direct result of theory.

A simplest measure of $EXT_i$ can be based on the number of partners that are negotiating on US’s tariff concession, as my theory, although trivially, predicts there should be no delay when there is only one partner on a given product, while delay starts to emerge as more partners are involved. In other words, if I define $\mathbf{C}^{US} \equiv \cup C^{US}_i$, where $C^{US}_i \equiv \{ \text{countries that had received offers on product } i \text{ from US} \}$ and $EXT_i \equiv 1(|C^{US}_i| > 1)$, then a positive $\beta$ would be expected. The results are presented in Table 3. The signs of the externality coefficient in specification (1) and (2) are what the theory would predict, that is, larger externality leads to longer delay.

Trade data definitely served as the basis for the tariff negotiations in Torquay and was arguably the most important information that countries possessed. Since the US import data is complete (with others being in progress), I focus on the sub-sample where the US was a seller (importer) in the negotiations. In particular, I relate the externality to the HHI of a given HS among negotiating exporters in the US market, characterizing how concentrated the export market is for a given HS product. Concretely, $EXT_i \equiv 1 - HHI_i$ with $HHI_i \equiv \sum_{c \in J^{US}_i} s_{ci}^2$, where $s_{ci}$ is country $c$’s existing share in the export market of product $i$ to US. Regression (3) and (4) presents the results using this direct measure of externality. While a complete set of Torquay data is desirable, focusing on US can serve as my initial examination of the externality issue in a direct way. In particular, they seem to be consistent with

\footnote{The GATT advised countries to exchange their lists of products under consideration, together with trade statistics.}
\footnote{In the data, there are offers made to countries on goods that none of them exports. I simply exclude them as exogenous data error.}
Table 3. Larger externality leads to longer delay.

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>Single vs Multiple</th>
<th>HHI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>OLS</td>
<td>Tobit</td>
</tr>
<tr>
<td></td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>OLS</td>
<td>Tobit</td>
</tr>
<tr>
<td>EXT</td>
<td>21.78***</td>
<td>16.24***</td>
</tr>
<tr>
<td></td>
<td>(2.471)</td>
<td>(2.501)</td>
</tr>
<tr>
<td>Constant</td>
<td>130.2***</td>
<td>136.0***</td>
</tr>
<tr>
<td></td>
<td>(1.878)</td>
<td>(1.893)</td>
</tr>
<tr>
<td>Observations</td>
<td>1,267</td>
<td>1,328</td>
</tr>
<tr>
<td>(Pseudo) R-squared</td>
<td>0.032</td>
<td>0.002</td>
</tr>
<tr>
<td>Standard errors (robust) in parentheses</td>
<td>0.005</td>
<td>0.000</td>
</tr>
</tbody>
</table>

*** p<0.01, ** p<0.05, * p<0.1

Proposition 1: the smaller the exporter concentration is (thus larger externality), the longer the delay is.

Unit of Observation: Dyad

As an alternative to the product level negotiation, I can measure the delay at the dyad level, that is, how long it takes a dyad to conclude their negotiation, if any, since the timing of negotiation of a dyad is formally based on the list of products that are under negotiation.

In principle, the importance, and difficulty, of a bargaining or an agreement depends what is at stake. Intuitively, it would be ambiguous to compare the difficulty facing a high-concentration good with large trade volume to the difficulty facing a low-concentration good with little trade volume. In particular, when countries exchange their list of offers, goods on the same list might not be of equal importance in terms of their respective trade volume. Thus, I relate the externality for a dyad to the average HHI across the products under their negotiation, weighted by their import share. In particular, denoting the negotiation list of dyad $i$ as $J_i$ and product $j$’s import share as $w_j$, I define $\text{EXT}_i \equiv 1 - \sum_{j \in J_i} w_j HHI_j$. Table 4 presents the results. And I do see patterns in this table that suggest a correct sign of the externality coefficient,
<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tobit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXT</td>
<td>345.5*</td>
<td>398.9**</td>
</tr>
<tr>
<td></td>
<td>(162.9)</td>
<td>(181.0)</td>
</tr>
<tr>
<td>Constant</td>
<td>-199.4</td>
<td>-224.7</td>
</tr>
<tr>
<td></td>
<td>(155.8)</td>
<td>(172.7)</td>
</tr>
<tr>
<td>Observations</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>(Pseudo) R-squared</td>
<td>0.249</td>
<td>0.018</td>
</tr>
</tbody>
</table>

### Table 4. Externality measured by concentration of the export market: averaging.

although several of them are not very significant. In particular, both regression (1) and (2) now exhibit a positive association between externality and the bargaining delay.

### 5.5. Results: Full Sample of Torquay negotiation.

In this subsection, I use the complete Torquay bargaining data, which extends the US sample that I used in Section 5.4 to all Torquay bilateral bargaining. In this larger sample, every country is considered as the home country when considering its own tariff concession, and also treated as a foreign country when considering the tariff concession offered by any of its partners.

**Unit of Observation: HS-destination**

A product is defined as a “HS-destination” pair, which is the unit of observation I hereby focus on (e.g. I distinguish between a product imported by US and the same product imported by Canada). And the delay is measured as how long it takes to reach an agreement, if any, on a given product. Since the import data is the process of being compiled, externality is, again, measured by considering whether a given HS-destination is negotiated with a single buyer or multiple buyers. Table 5 presents the preliminary results. Although the coefficients of interest are not significant, the signs
TABLE 5. Externality measured by whether the product is negotiated with a single buyer or multiple buyers.

<table>
<thead>
<tr>
<th></th>
<th>Single vs Multiple</th>
</tr>
</thead>
<tbody>
<tr>
<td>VARIABLES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OLS</td>
</tr>
<tr>
<td>EXT</td>
<td>0.427</td>
</tr>
<tr>
<td></td>
<td>(1.029)</td>
</tr>
<tr>
<td>Constant</td>
<td>125.0***</td>
</tr>
<tr>
<td></td>
<td>(0.449)</td>
</tr>
<tr>
<td>Observations</td>
<td>13,561</td>
</tr>
<tr>
<td>(Pseudo) R-squared</td>
<td>0.000</td>
</tr>
<tr>
<td>Standard errors in parentheses</td>
<td></td>
</tr>
<tr>
<td>*** p&lt;0.01, ** p&lt;0.05, * p&lt;0.1</td>
<td></td>
</tr>
</tbody>
</table>

seem to be consistent what one would expect, that is larger externality leads to longer bargaining delay. Moreover, comparing the results to Section 5.4, it also suggests that there might be some heterogeneity across different countries (importers), which I will examine when conducting robustness check.

Unit of Observation: Dyad

Although I currently cannot rely on the import data for the full sample, an analysis that might be interesting on its own is how delay is related to the number of negotiating partners, that has been examined in other literature such as Moser and Rose (2012) and Neary (2004). In particular, for a dyad $ij$, with $i$ being the seller and $j$ being the buyer, I examine the relationship between delay and (a) the number of buyers facing seller $i$; (b) the number of sellers facing buyer $j$. Table 6 presents the result. First, by focusing on variations of delay within a round, I see similar evidence to those examined in Moser and Rose (2012) and Neary (2004), which instead are based on variations of delay across agreements/rounds. Namely, larger number of participants is associated with longer bargaining delay. Second, this set of evidence

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52Admittedly, my two-exporter framework has little to say about the relationship between delay and the number of exporters.
Table 6. Externality measured by concentration of the export market.

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>Number of Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
</tr>
<tr>
<td>OLS</td>
<td>3.132*** (0.768)</td>
</tr>
<tr>
<td>Tobit</td>
<td>2.357*** (0.661)</td>
</tr>
<tr>
<td>#Buyers</td>
<td>1.893 (20.67)</td>
</tr>
<tr>
<td>#Sellers</td>
<td>(Pseudo) R-squared</td>
</tr>
<tr>
<td>Constant</td>
<td>(Standard errors in parentheses)</td>
</tr>
</tbody>
</table>

Table 6. Externality measured by concentration of the export market.

is, in a sense, consistent with the idea regarding externality and bargaining delay. In particular, when there are more countries involved in the negotiation, the bargaining delay will be longer.

5.6. Robustness and Sensitivity. As an initial check, I introduce the country-fixed effects into the specifications introduced in the previous section, to account for unobservable country difference that might affect the bargaining delay. In particular, Table 7 adds the country-fixed effects into Table 3. The results are qualitatively similar.

Also, another potential concern is the unobservable levels of political pressure,\textsuperscript{53} which might cause confounding effects to our specifications. I control this by using the HS2 and HS4 fixed effects (with and without the country fixed effects). The results presented in Table 8 - Table 11 are, again, quite similar.

\textsuperscript{53}In principle, I could make use of political contribution to proxy for the pressure, which Goldberg and Maggi (1999) use to identify an organized industry. Not without its own issue as discussed in Goldberg and Maggi (1999) and Gawande and Krishna (2004), this approach would require a much larger dataset of political contribution from multiple countries. Moreover, this data has to be near the time of Torquay conference. Gawande, Krishna and Olarreaga (2015) estimate the political weights in a cross-country manner based on data over the 1988-2000 period, which seems too far from the 1950-1951.
6. Conclusion

This paper studies bargaining delay in the environment of multilateral trade negotiations. A simple bargaining structure is incorporated into an equilibrium trade framework (Section 2), which is used to establish the relationship between delay in reaching agreements and bargaining externality (Section 3 and Section 4). It is shown that the delay does vary systematically with the degree of export market concentration. And along this dimension, it is also argued that the Principal Supplier rule

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>Single vs Multiple</th>
<th>HHI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>OLS</td>
<td>Tobit</td>
</tr>
<tr>
<td>EXT</td>
<td>21.18***</td>
<td>20.51***</td>
</tr>
<tr>
<td></td>
<td>(6.817)</td>
<td>(6.999)</td>
</tr>
<tr>
<td>Constant</td>
<td>126.5***</td>
<td>136.0***</td>
</tr>
<tr>
<td></td>
<td>(5.416)</td>
<td>(5.584)</td>
</tr>
<tr>
<td>Observations</td>
<td>1,267</td>
<td>1,328</td>
</tr>
<tr>
<td>(Pseudo) R-squared</td>
<td>0.322</td>
<td>0.034</td>
</tr>
<tr>
<td>Country FE</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

Standard errors (robust) in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7. Larger externality leads to longer delay.

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>Single vs Multiple</th>
<th>HHI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>OLS</td>
<td>Tobit</td>
</tr>
<tr>
<td>EXT</td>
<td>19.28***</td>
<td>12.41***</td>
</tr>
<tr>
<td></td>
<td>(2.939)</td>
<td>(2.895)</td>
</tr>
<tr>
<td>Constant</td>
<td>153.2***</td>
<td>170.7***</td>
</tr>
<tr>
<td></td>
<td>(6.211)</td>
<td>(11.79)</td>
</tr>
<tr>
<td>Observations</td>
<td>1,267</td>
<td>1,328</td>
</tr>
<tr>
<td>(Pseudo) R-squared</td>
<td>0.305</td>
<td>0.031</td>
</tr>
<tr>
<td>HS2 FE</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

Standard errors (robust) in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8. Larger externality leads to longer delay.
helps to reduce bargaining delay. Moreover, It is found that the empirical evidence based on the bargaining data from the GATT (Torquay round), due to its recent availability, lends support to the theory (Section 5).

The analysis has made only an initial attempt at understanding the phenomenon of delay in reaching agreements plaguing most trade negotiations, which not only leads to potentially significant welfare loss, but also may hinder the momentum of trade
Table 11. Larger externality leads to longer delay.

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>Single vs Multiple</th>
<th>HHI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>EXT</td>
<td>OLS</td>
<td>Tobit</td>
</tr>
<tr>
<td></td>
<td>24.54***</td>
<td>18.40</td>
</tr>
<tr>
<td></td>
<td>(8.507)</td>
<td>(19.09)</td>
</tr>
<tr>
<td>Constant</td>
<td>161.3***</td>
<td>166.3</td>
</tr>
<tr>
<td></td>
<td>(8.917)</td>
<td>(8.686)</td>
</tr>
<tr>
<td>Observations</td>
<td>1,267</td>
<td>1,328</td>
</tr>
<tr>
<td>(Pseudo) R-squared</td>
<td>0.866</td>
<td>0.189</td>
</tr>
<tr>
<td>Country FE</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>HS4 FE</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>
| Standard errors (robust) in parentheses

*** p<0.01, ** p<0.05, * p<0.1

liberalization, making the existing trade institution in danger. Many issues remain to be explored. First, most trade negotiations – especially within the context of the GATT/WTO, whether the simple bargaining structure imposed in the paper captures sufficiently well the key aspects of the actual bargaining process is not examined, as any (bilateral or not) bargaining is, in fact, part of a much broader network of players. Second, equally, if not more, important is the multiplicity of products/issues under consideration, where one would conjecture that bargaining on one good may be interdependent with another. Finally, the institutional rules such as MFN and Reciprocity are taken as given in the paper, an interesting and important question is how these rules, individually or jointly, affect the bargaining delay.
Appendix

A. Parameter restriction. Since $Q_h = 0$, $Q^{*1} = \omega$, $Q^{*2} = 1 - \omega$. $D_h = 1 - \alpha p^h$, $D^{*1} = \beta - p^{*1}$, $D^{*2} = \beta - p^{*2}$. the only ex ante asymmetry comes from the different endowments in the foreign countries. For any given set of trade policies $(\tau^h, \tau^{*1}, \tau^{*2})$, the home country’s import demand function is

$$M^h(p^h(\tau^h, p^w)) = 1 - \alpha p^h = 1 - \alpha(p^w + \tau^h)$$

and the (total) export supply is given by

$$\sum_{j=1,2} E^{*j}(p^{*j}(\tau^{*j}, p^w)) = 1 - (2\beta - p^{*1} - p^{*2}) = 1 - 2\beta + 2p^w + \tau^{*1} + \tau^{*2}$$

Thus, market clearing implies $p^w = \frac{2\beta - \alpha p^h - \tau^{*1} - \tau^{*2}}{2 + \alpha}$. \(^{54}\)

In the initial period, countries impose their Nash tariffs. In particular, the Nash Equilibrium can be written as

$$\tau^h_0 = \frac{1 - \alpha p^w_0}{2 + \alpha}$$

$$\tau^{*1}_0 = \frac{(1 + \alpha)(\gamma^{*1}_0 - 1)\omega + \beta - p^w_0 - \omega}{2 + \alpha}$$

$$\tau^{*2}_0 = \frac{(1 + \alpha)(\gamma^{*2}_0 - 1)(1 - \omega) + \beta - p^w_0 - (1 - \omega)}{2 + \alpha}$$

implying

$$p^w_0 = \frac{2\beta + 1 + (2\beta - 1)\alpha + (1 + \alpha)(1 - \gamma^{*1}_0)\omega + (1 + \alpha)(1 - \gamma^{*2}_0)(1 - \omega)}{2 + 4\alpha}$$

\(^{54}\)In an endowment economy with specific export subsidies, presence of any political pressure will effectively make an export subsidy almost equivalent to a transfer to the (politically weighted) export sector. I will not obtain this corner solution in frameworks with more general supply system or those with ad valorem export subsidies. Also, in frameworks with import policies rather than export policies, for example, Grossman and Helpman (1995), the import tax makes the interior Nash equilibrium possible, regardless of whether an endowment economy is used. Thus I will impose the condition that all countries are national income maximizers, that is $\gamma^k_0 = 1$, in the initial period, which will ensure an (interior) existing trade policies in Nash equilibrium or bliss point.
Since I assume they are initially all national income maximizers \((\gamma_0^{*1} = \gamma_0^{*2} = 1)\), I must have

\[
p_0^w = \frac{2\beta + 1 + (2\beta - 1)\alpha}{2 + 4\alpha}
\]

\[
\tau_0^h = \frac{2 - (2\beta - 1)\alpha}{(2 + 4\alpha)(2 + \alpha)}
\]

\[
\tau_0^{*1} = \frac{(2\beta + 1)\alpha - 1 - (2 + 4\alpha)\omega}{(2 + 4\alpha)(2 + \alpha)}
\]

\[
\tau_0^{*2} = \frac{(2\beta + 1)\alpha - 1 - (2 + 4\alpha)(1 - \omega)}{(2 + 4\alpha)(2 + \alpha)}
\]

implying

\[
p_0^h = \frac{(2\beta + 1)(1 + \alpha) + 1}{(1 + 2\alpha)(2 + \alpha)}
\]

\[
p_0^{*1} = \frac{(2\beta - 1)\alpha^2 + 8\alpha\beta + 4\beta + 1 - (2 + 4\alpha)\omega}{(2 + 4\alpha)(2 + \alpha)}
\]

\[
p_0^{*2} = \frac{(2\beta - 1)\alpha^2 + 8\alpha\beta + 4\beta + 1 - (2 + 4\alpha)(1 - \omega)}{(2 + 4\alpha)(2 + \alpha)}
\]

Also, the equilibrium (initial) import/export volume is

\[
M_0^h = 2\tau_0^h = \frac{2 - (2\beta - 1)\alpha}{(1 + 2\alpha)(2 + \alpha)}
\]

\[
E_0^{*1} = -(1 + \alpha)\tau_0^{*1} = -(1 + \alpha)\frac{(2\beta + 1)\alpha - 1 - (2 + 4\alpha)\omega}{(2 + 4\alpha)(2 + \alpha)}
\]

\[
E_0^{*2} = -(1 + \alpha)\tau_0^{*2} = -(1 + \alpha)\frac{(2\beta + 1)\alpha - 1 - (2 + 4\alpha)(1 - \omega)}{(2 + 4\alpha)(2 + \alpha)}
\]

implying \(E_0^{*1} > E_0^{*2} \Leftrightarrow \omega > \frac{1}{2}\). In other words, the country with a larger endowment will be the principal supplier, referring to the foreign country that is the largest export supplier to the home country of the good under consideration. As will be seen in my bargaining outcome, this parametrization allows me to examine the effect of another institutional rule in GATT/WTO, in addition to MFN and reciprocity in negotiations, namely the Principal Supplier rule which leads countries to negotiate concessions with a principal supplier on a given product. In my bargaining model, I
will capture this institutional feature by allowing the principal supplier to make the first offer, and I will compare the delay under this rule to the alternative in which the smaller supplier makes the first offer. Also, in order to preserve the trade pattern in the initial equilibrium, namely (1) positive export volume by \( \star1 \) and \( \star2 \), (2) positive domestic consumption in \( \star1 \) and \( \star2 \), I will restrict myself to \( \omega \in \Omega(\alpha, \beta) \), where \( \Omega(\alpha, \beta) \) is defined as:

\[
\left[ \frac{(2\beta + 1)\alpha - 1}{2 + 4\alpha}, 1 - \frac{(2\beta + 1)\alpha - 1}{2 + 4\alpha} \right] \cap \left[ (1 + \alpha) \frac{1 - (2\beta + 1)\alpha}{2 + 4\alpha}, 1 - (1 + \alpha) \frac{1 - (2\beta + 1)\alpha}{2 + 4\alpha} \right]
\]

which reduces to

\[
\left[ \max\left\{ \frac{(2\beta + 1)\alpha - 1}{2 + 4\alpha}, (1 + \alpha) \frac{1 - (2\beta + 1)\alpha}{2 + 4\alpha} \right\}, 1 - \max\left\{ \frac{(2\beta + 1)\alpha - 1}{2 + 4\alpha}, (1 + \alpha) \frac{1 - (2\beta + 1)\alpha}{2 + 4\alpha} \right\} \right]
\]

To ensure \( \Omega(\alpha, \beta) \neq \emptyset \), I must have \((2\beta - 1)\alpha \leq 2\). In addition, to ensure a positive world price \( p^w_0 \), I also require \((2\beta - 1)\alpha > -(2\beta + 1)\). However, on the one hand, if \(2\beta < 1\), these two conditions imply \( \alpha > \frac{1 + 2\beta}{1 - 2\beta} > 1\), excluding the interesting case when \( \alpha \leq 1\), which, as I will discuss later, is the case when home is short. On the other hand, if \(2\beta > 1\), these two conditions imply \( \alpha \leq \frac{2}{2\beta - 1}\), which excludes the case \( \alpha > 1\) for large \( \beta\). To allow for both of the two possibilities, namely, \( \alpha \leq 1\) and \( \alpha > 1\), I restrict myself to \( \beta \in \left[ \frac{1}{2}, \frac{3}{2} \right) \). \(^{56}\)

The bliss points can now be characterized as \( \bar{\tau}_{\star1}^* = (\gamma_{\star1}^* - 1)\omega, \bar{\tau}_{\star2}^* = (\gamma_{\star2}^* - 1)(1 - \omega) \), \( \tau_{\star1}^{h} = 0, \ p_{\star1}^\omega = \frac{2\beta + (1 - \gamma_{\star1})\omega + (1 - \gamma_{\star2})(1 - \omega)}{2 + \alpha} \). Given the restriction \( p^{*j} \leq \bar{p}^{*j} \) which implies \( \tau^{*j} \leq \bar{\tau}^* \equiv \frac{(2\beta + 1)\alpha - 1}{2 + 4\alpha} \), there is a technical issue in the current setting, namely, the above bliss points may not be attainable if \( \frac{\tau_{\star1}^{po}}{\tau_{\star2}^{po}} > \bar{\tau}^* \). \(^{57}\) To handle this problem, I now

\(^{55}\)To save notation, the natural restriction \( \omega \in [0, 1] \) is suppressed throughout.

\(^{56}\)Note that \( \beta = \frac{1}{2} \) will result in unrestricted \( \alpha \in (0, \infty) \).

\(^{57}\)Specifically, countries’ payoff functions will be linear when the local price exceeds the choke price above which domestic demand is driven to zero, creating a kink in the payoff function. Thus the (interior) bliss point previously characterized by a first order condition becomes invalid whenever it
define the (constrained) bliss point policies as
\[ \tau_{p_0}^{*1} \equiv \min(\tau^{*}, \tau_{p_0}^{*1}), \quad \tau_{p_0}^{*2} \equiv \min(\tau^{*}, \tau_{p_0}^{*2}), \]
which specifies that the bliss point \( \tau_{p_0}^{*j} \) will be set to \( \tau^{*} \) whenever \( \tau_{p_0}^{*j} > \tau^{*} \). And, unless explicitly expressed, I will refer to \((\tau_{p_0}^{*1}, \tau_{p_0}^{*2})\) as bliss points from now on.

The constraint of reciprocity requires that
\[ p_w(w) \equiv \frac{2\beta-\alpha \tau h - \tau^{*1} - \tau^{*2}}{2+\alpha} = p_w^0 \equiv \frac{2\beta+1+(2\beta-1)\alpha}{2+4\alpha}, \]
implying \( \tau^{*1} + \tau^{*2} = \frac{-(2\beta-1)\alpha - 2(\alpha-1) - \alpha \tau h}{2+4\alpha} \). Thus, the concession jointly desired by \*1 and \*2, \( \tau_{p_0}^{*1} + \tau_{p_0}^{*2} \) can be less than, equal to or larger than \( \pi^h \).

### B. Home country’s offer.

**Lemma 4.** Assume, without loss of generality, \*1 is the principal supplier, that is \( \omega > \frac{1}{2} \), then there exists \( 0 < \alpha_0 < \alpha_1 < \alpha_2 < \alpha_3 \) such that, conditional on \( \alpha_i \leq \frac{2}{2\beta-1} \), \( i \in \{0, 1, 2, 3\} \), (1) for any \( \alpha \in (0, \alpha_0) \), \( \tau^h = 0 \) (home country’s bliss point) is accepted by the foreign countries of all types. (2) for any \( \alpha \in (\alpha_0, \alpha_1) \), \( \tau^h = 0 \) is accepted only if at least one of the foreign exporters is of high type. (3) for any \( \alpha \in (\alpha_1, \alpha_2) \), \( \tau^h = 0 \) is accepted only if the principal supplier is of high type. (4) for any \( \alpha \in (\alpha_2, \alpha_3) \), \( \tau^h = 0 \) is accepted only if both of the foreign exporters are of high type. (5) for any \( \alpha > \alpha_3 \), \( \tau^h = 0 \) is rejected by the foreign countries of any types.

**Proof.** The home country’s maximization problem can be written as:
\[
\max_{\tau^h} \Pr(\pi^h) \cdot W^h(p^h, p_w^0) + (1 - \Pr(\pi^h)) \cdot W^h(p_0^h, p_0^w)
\]
\[
s.t. \tau^{*1} + \tau^{*2} = \pi^h, \quad \Pr(\pi^h) = \text{1(} W^{*j}(p^{*j}, p_w^0) \geq W^{*j}(p_0^{*j}, p_0^w) \text{, } j \in \{1, 2\} \) \]

Given \*1 and \*2’s existing policy \( (\tau_{0}^{*1}, \tau_{0}^{*2}) \), the sum of them is
\[
\pi_0 = \frac{(2\beta + 1)\alpha - 1 - (2 + 4\alpha)\omega}{(2 + 4\alpha)(2 + \alpha)} + \frac{(2\beta + 1)\alpha - 1 - (2 + 4\alpha)(1 - \omega)}{(2 + 4\alpha)(2 + \alpha)} = \frac{(2\beta - 1)\alpha - 2}{(1 + 2\alpha)(2 + \alpha)}
\]
results in a local price larger than the choke price. However, this issue will not be present under a more general demand/supply system.

\[58\] Bagwell and Staiger (2017) also analyze a framework with these possibilities.
Note that \( \tau^h = 0 \) will be accepted whenever \( \bar{\tau}^* \leq 0 \), that is, whenever \( \alpha \leq \frac{1}{23+1} \).

Thus I focus on the cases where \( \alpha > \frac{1}{23+1} \). For convenience, I use \(( \gamma^1, \gamma^2)\) to denote that \( *j \) is of type \( \gamma^*j \) with \( \gamma^*j \in \{ l, h \} \) and \( j = 1, 2 \). Once the foreign countries start to negotiate, they will agree to reciprocate the home country, as long as \( \tau^{*1} + \tau^{*2} \geq \pi_0 \) and \( \tau^{*1} + \tau^{*2} \leq \min(\bar{\tau}^*, 2\bar{\tau}^{*1} - \tau_0^{*1}) + \min(\bar{\tau}^*, 2\bar{\tau}^{*2} - \tau_0^{*2}) \), that is, if there exists any gain from trade/negotiation. Since \( \tau^{*1} + \tau^{*2} = \pi^h \) under reciprocity, \( \pi^h \) is accepted if and only if (1) \( \pi^h \geq \pi_0 \) and (2) \( \pi^h \leq \min(\bar{\tau}^*, 2\bar{\tau}^{*1} - \tau_0^{*1}) + \min(\bar{\tau}^*, 2\bar{\tau}^{*2} - \tau_0^{*2}) \). Note that (1) is automatically satisfied as \( \pi^h - \pi_0 = \frac{-(2\beta - 1)\alpha^2}{(2+4\alpha)(2+\alpha)} - \alpha \bar{\tau}^h > 0 \iff \tau^h < \tau_0^h \), that is, any agreement entails liberalization. While (1) implies an agreement of liberalization is in the direction of potential welfare improvement for the two foreign countries, (2) requires that, while liberalization is good, there can not be too much.

In particular, (2) is satisfied if and only if all the following conditions hold: (2a) \( \pi^h - 2\bar{\tau}^* = -\alpha p_0^w - \alpha \bar{\tau}^h = -\alpha p_0^h < 0 \). (2b) \( \pi^h \leq \bar{\tau}^* + 2\bar{\tau}^{*j} - \tau_0^{*j} \), for \( j \in \{1, 2\} \). (2c) \( \pi^h \leq \bar{\tau}^{*1} + \bar{\tau}^{*2} - \pi_0 \). Note that (2a) automatically holds. For (2b), it suffices to show that \( \pi^h \leq \bar{\tau}^* - \tau_0^2 \) for \( \omega = 1 - \frac{2(\beta + 1)\alpha^2}{2+4\alpha} \). In particular, it can be shown that \( \pi^h - \bar{\tau}^* + \tau_0^2 = \frac{-(2\beta - 1)\alpha^2}{2+4\alpha} < 0 \). Thus, (2) is satisfied if and only if (2c) holds.

As the unconstrained optimum for the home country is \( \tau^h = 0 \), I discuss the conditions under which this optimum can be supported.

(a) \( \tau^h = 0 \) will be accepted by \((l, l)\) iff \( \pi^h + \pi_0 = \frac{-(2\beta - 1)\alpha^2}{(2+4\alpha)(2+\alpha)} \leq 2(\bar{\tau}^{*1} + \bar{\tau}^{*2}) = 0 \). In particular, iff \( \alpha \leq \alpha_0 = \frac{\sqrt{17} - 1}{2} \), then \( \tau^h = 0 \) will be accepted regardless of \(*1’s and *2’s political pressure. (b) \( \tau^h = 0 \) will be accepted by \((l, h)\) iff \( \pi^h + \pi_0 = \frac{-(2\beta - 1)\alpha^2}{(2+4\alpha)(2+\alpha)} \leq 2(h - 1)(1 - \omega) \), which pins down the cutoff \( \alpha_1 \). (c) \( \tau^h = 0 \) will be accepted by \((h, l)\) iff \( \pi^h + \pi_0 = \frac{-(2\beta - 1)\alpha^2}{(2+4\alpha)(2+\alpha)} \leq 2(h - 1)\omega \), which pins down the cutoff \( \alpha_2 \). (d) \( \tau^h = 0 \) will be accepted by \((h, h)\) iff \( \pi^h + \pi_0 = \frac{-(2\beta - 1)\alpha^2}{(2+4\alpha)(2+\alpha)} \leq 2(h - 1) \), which pins down the cutoff \( \alpha_3 \). Because the function \( \frac{-(2\beta - 1)\alpha^2}{(2+4\alpha)(2+\alpha)} \) is increasing in \( \alpha > 0 \), I must have \( 0 < \alpha_0 < \alpha_1 < \alpha_2 < \alpha_3 \). □
Corollary 3. Suppose the home country does not care about delay, that is it has a discount factor of 1, which can make a take-it-or-leave-it offer, then in any agreement \((\tau^h, \tau^{*1}, \tau^{*2})\) under MFN and Reciprocity, a sufficient condition for \(\tau^h = 0\) is \(\alpha \leq \min\left(\frac{\sqrt{17} - 1}{2}, \frac{2}{2\beta - 1}\right)\).

C. Proofs in Section 4.

Lemma 1.

*Proof.* As is standard, the complete information equilibrium will be the basis for my incomplete information game. In the complete information case, it is a Rubinstein model in the sense that countries will either compete to make concessions or they will compete to avoid concession.\(^59\) Since the time between offers can be arbitrarily small, the complete information bargaining is equivalent to a Nash bargaining.\(^60\) In particular, I denote \(g_{ij}\), which characterizes the gap between the foreign countries’ local prices \((p^{*2} - p^{*1})\),\(^61\) as the complete information equilibrium outcome when \(\star 1\) is of type \(i\) and \(\star 2\) is of type \(j\), where \(i, j \in \{h, l\}\). Then \(g_{ij}\) can be characterized by the following Nash program:

\[
g_{ij} = \arg \max_g \left\{ \left[ W^{*1}(g, i) - W^{*1}_0(i) \right] \cdot \left[ W^{*2}(g, j) - W^{*2}_0(j) \right] \right\}
\]

\[
\text{s.t. } W^{*1}(g, i) - W^{*1}_0(i) \geq 0 \text{ and } W^{*2}(g, j) - W^{*2}_0(j) \geq 0
\]

that is, \(g_{ij}\) characterizes the best outcome that a country could get in a separating equilibrium, which I will focus on, as anything better than \(g_{ij}\) will be rejected by the other country once their political pressures are revealed.

My proof is similar to that in Harstad (2007). I consider \(\star 2\)’s strategy first.\(^62\)

---

\(^59\)However, with private information on the political pressure, whether countries compete to make or avoid concession might be uncertain to either or both of the countries.

\(^60\)See Binmore, Rubinstein and Wolinsky (1987) for this result.

\(^61\)Or equivalently, under reciprocity, it is the gap between their export policy \((\tau^{*2} - \tau^{*1})\).

\(^62\)If \(\star 2\) proposes first, then I can change subscript \(ij\) to \(ji\), and superscript \(\star i\) to \(\star j\) in the \(d\) functions and \(t\) functions.
(a) Suppose $\star 1$ is revealed to be of type $h$ by making an offer at $t_h$. On the one hand, as a $l$-type $\star 2$ will not be able to convince $\star 1$ that it is of $h$-type, a $l$-type $\star 2$ will accept any $g \geq g_{hl}$, and reject any $g < g_{hl}$ and counteroffer $g = g_{hl}$ immediately. Thus, the timing, $t_h$, of a $h$-type $\star 1$’s offer is effectively the time of acceptance by a $l$-type $\star 2$, which can be simply rewritten as $t_{hl}$. On the other hand, if a $h$-type $\star 2$ convinces $\star 1$ that it is of type $h$, then $\star 1$ will accept any offer $g \leq g_{hh}$. Thus $\star 2$ will maximize its payoff under the incentive compatibility constraint by which it could truthfully signal its high political pressure:

$$
\max_{d, t_h} \frac{1}{\ln(\delta - 1)} \{ \delta^{lh} [W^*2(g, h) - W^*2(h)] + W^*2(h) \}
$$

s.t. $\delta^{hl} [W^*2(g_{hl}, l) - W^*2(l)] \geq \delta^{lh} [W^*2(g, l) - W^*2(l)]$

$g \leq g_{hh}$

This yields $g^* = g_{hh}$ and

$$
\delta^{t_{hh} - t_{hl}} = \min\{ \frac{W^*2(g_{hl}, l) - W^*2(l)}{W^*2(g_{hh}, l) - W^*2(l)}, 1 \}
$$

Note that if $g^*_{po}(l) - g_{hl} \leq |g^*_{po}(l) - g_{hh}|$, where $g^*_{po}(l) = 2(l - 1)(1 - \omega) = 0$, then $t_{hh} - t_{hl} = 0$, that is, the counteroffer $g_{hh}$ itself is sufficient to signal $\star 2$’s type.

(b) Suppose $\star 1$ is revealed to be of type $l$ by making an offer at $t_l$. Then similar to my argument in (a), a $l$-type $\star 2$ will only accept $g = g_{ll}$, reject anything different from $g_{ll}$ and counteroffer $g_{ll}$ immediately, where $t_l$ can be rewritten as $t_{ll}$. And a type-$h$ $\star 2$ will maximize:

$$
\max_{d, t_h} \frac{1}{\ln(\delta - 1)} \{ \delta^{lh} [W^*2(g, h) - W^*2(h)] + W^*2(h) \}
$$

s.t. $\delta^{ll} [W^*2(g_{ll}, l) - W^*2(l)] \geq \delta^{lh} [W^*2(g, l) - W^*2(l)]$

$g \leq g_{hh}$

---

$^{63}$Because $h$ will not mimic $l$, the intuitive criterion implies the $l$ will respond immediately.
This yields $g^* = g_{lh}$ and

$$\delta^t_{lh} - t_{lh} = \min \{ W^*_{lh}(g_{lh}, l) - W^*_{lh}(l), 1 \}$$

Since $g_{ll} = 0$, a $\star 2$ of type $l$ will not mimic a type $h$ whatsoever. Thus $t_{lh} - t_{ll} = 0$. This feature is due to the existence of bliss points in the range of feasible agreements when countries are of low type, which results in the slackness of the incentive compatibility condition.

I turn to $\star 1$’s strategy next.

(c) If $\star 1$ is of type $l$, it will not be able to convince $\star 2$ that it is of type $h$ in a separating equilibrium. As a result, it will make an offer that is acceptable to a $\star 2$ of type $l$, that is, $g = g_{ll}$ at $t_{ll} = 0$. Thus $\star 1$’s expected payoff will be

$$\bar{W}^*_{l1} \equiv (1 - p) \frac{1}{\ln(\delta - 1)} W^*_{l1}(g_{ll}, l) + p \frac{1}{\ln(\delta - 1)} \{ \delta^t_{lh}[W^*_{lh}(g_{lh}, l) - W^*_{lh}(l)] + W^*_{lh}(l) \}$$

(d) If $\star 1$ is of type $h$, it will maximize its expected payoff subject to the incentive compatibility constraint that the offer should be unattractive to a $\star 1$ of type $l$, but acceptable for a $\star 2$ of type $l$:

$$\max_{g_{hl}} \left\{ \frac{1}{\ln(\delta - 1)} \{ \delta^t_{hh}[W^*_{hh}(g_{hh}, h) - W^*_{hh}(h)] + W^*_{hh}(h) \} \right\}$$

$$+ (1 - p) \frac{1}{\ln(\delta - 1)} \{ \delta^t_{hl}[W^*_{hl}(g, h) - W^*_{hl}(h)] + W^*_{hl}(h) \}$$

s.t. $\bar{W}^*_{h1} \geq (1 - p) \frac{1}{\ln(\delta - 1)} \{ \delta^t_{hh}[W^*_{hh}(g_{hh}, l) - W^*_{hh}(l)] + W^*_{hh}(l) \}$

$$+ (1 - p) \frac{1}{\ln(\delta - 1)} \{ \delta^t_{hl}[W^*_{hl}(g, l) - W^*_{hl}(l)] + W^*_{hl}(l) \}$$

$$g \geq g_{hl}$$

This yields

$^{64}$ $g = 0$ is also the best offer for a country of type $l$. This will not be true in cases where $l > 1$.

$^{65}$ In my setting, $\star 1$ can not make a pooling offer by choosing either $g_{lh}$ or $g_{ll}$, as both of them can screen $\star 2$ perfectly.
\[ \delta^{t_{hl}} = \min \{ \frac{p\delta^{t_{lh}}[W^s_0(g_{lh}, l)] - W^s_0(l)}{p\delta^{t_{hh}-t_{hl}}[W^s_0(g_{hh}, l)] - W^s_0(l)} + (1 - p)[W^s_1(g_{lh}, l)] - W^s_1(l), 1 \} \]

Substituting the expressions for \( W^s_j(l) \) and \( W^s_j(g_{lh}, l) \) into the above expressions for \( t \)'s, I have:

\[ \delta^{t_{hh}-t_{hl}} = \min \{ \frac{\frac{5}{18} - \frac{1}{3} \omega + \frac{2h_l}{2}(-\frac{2h_l}{4} + \frac{5}{36} - \frac{1}{6} \omega)}{\frac{5}{18} - \frac{1}{3} \omega + \frac{2h_h}{2}(-\frac{2h_h}{4} + \frac{5}{36} - \frac{1}{6} \omega)}, 1 \} \]

\[ \delta^{t_{lh}} = \min \{ \frac{\frac{5}{18} - \frac{1}{3} \omega + \frac{qu}{2}(-\frac{qu}{4} + \frac{5}{36} - \frac{1}{6} \omega)}{\frac{5}{18} - \frac{1}{3} \omega + \frac{qu}{2}(-\frac{qu}{4} + \frac{5}{36} - \frac{1}{6} \omega)}, 1 \} \equiv 1 \]

\[ \delta^{t_{hh}} = \min \{ \frac{\omega - \frac{1}{18} - \frac{g_{lh}}{2}(-\frac{g_{lh}}{4} + \frac{5}{36} - \frac{1}{6} \omega)}{\frac{1}{3} \omega - \frac{1}{18} - \frac{g_{hh}}{2}(-\frac{g_{hh}}{4} + \frac{5}{36} - \frac{1}{6} \omega)}, 1 \} \]

\[ \frac{1}{16} g^3 + \frac{3}{16}[(\gamma^s_1 - 1) \omega - (\gamma^s_2 - 1)(1 - \omega)]g^2 \]

\[ + \frac{1}{36}[-(\omega^2 - \omega + \frac{13}{36}) - (3\omega - \frac{1}{2})(\gamma^s_1 - 1)\omega - (\frac{5}{2} - 3\omega)(\gamma^s_2 - 1)(1 - \omega)] \]

\[ - 18(\gamma^s_1 - 1)\omega(\gamma^s_2 - 1)(1 - \omega)]g + \frac{1}{36}[-6(\gamma^s_1 - 1)\omega(\gamma^s_2 - 1)(1 - \omega)(1 - 2\omega) - \]

\[ (\gamma^s_1 - 1)\omega(\frac{5}{6} - \omega)^2 + (\gamma^s_2 - 1)(1 - \omega)(\omega - \frac{1}{6})^2] = 0 \]

In particular, it is straightforward to show \( g_{lh} = 0 \), and \( g_{hh} \) solves

\[ 66 \text{Together with the second order condition, this polynomial yields a unique solution.} \]
These equations, together with second order conditions, yield the analytical solutions for \( \{ g_{ij} \} \), which fully characterize other variables of interest, in particular the delay. For example, letting \( h \to \infty \), I have:

\[
\begin{align*}
\frac{1}{16}g^3 &+ \frac{3}{16}(h-1)(2\omega-1)g^2 + \frac{1}{36}[-(\omega^2 - \omega + \frac{13}{36})] \\
-(h-1)(6\omega^2 - 6\omega + \frac{5}{2}) - 18(h-1)^2\omega(1-\omega)g \\
+ \frac{1}{36}[-6(h-1)^2\omega(1-\omega)(1-2\omega) - (h-1)\omega(\frac{5}{6} - \omega)^2 + (h-1)(1-\omega)(\omega - \frac{1}{6})^2] &= 0
\end{align*}
\]

\( g_{hl} \) solves

\[
\begin{align*}
\frac{1}{16}g^3 &+ \frac{3}{16}(h-1)\omega g^2 + \frac{1}{36}[-(\omega^2 - \omega + \frac{13}{36}) - (3\omega - \frac{1}{2})(h-1)\omega]g + \frac{1}{36}[-(h-1)\omega(\frac{5}{6} - \omega)^2] = 0
\end{align*}
\]

\( g_{th} \) solves

\[
\begin{align*}
\frac{1}{16}g^3 &- \frac{3}{16}(h-1)(1-\omega)g^2 + \frac{1}{36}[-(\omega^2 - \omega + \frac{13}{36}) - (\frac{5}{2} - 3\omega)(h-1)(1-\omega)]g \\
+ \frac{1}{36}[(h-1)(1-\omega)(\omega - \frac{1}{6})^2] &= 0
\end{align*}
\]

But I currently have to rely on the numerical grids as the closed form solutions are themselves algebraically complicated, exemplified by the above example. In particular, I have three parameters in the model, namely \( h, \omega \) and \( \delta \) where only \( h \) and \( \omega \) plays an role in the bargaining delay patterns of interest. Thus I resort to the grid method
that searches all possible values in the domain of parameters, where the propositions and lemmas are established in the way similar to the following.

Proposition 1.

Proof. In this parametric setting, the only parameters/variables governing the sign of the derivative \( \frac{d(t_{hh} - t_{hl})}{d\omega} \) is \( \omega \) and \( g(h, \omega) \). In other words, this sign is fully characterized by the two parameters \( h \) and \( \omega \). Thus I could numerically calculate the derivatives, exhausting the space \( (h, \omega) \in (1, \bar{h}) \times [\frac{1}{6}, \frac{5}{6}] \) by taking sufficiently fine grids.\(^{67}\)

\(^{67}\)While this derivative has a closed form solution, making a strict analytical proof more desirable, I don’t gain much economic insight other than the algebraic complexities.
REFERENCES


