Shifting Comparative Advantage and Accession in the WTO

by

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ABSTRACT

Motivated by the structure of WTO negotiations, we analyze a bargaining environment in which negotiations proceed bilaterally and sequentially under the most-favored-nation (MFN) principle. We identify *backward-stealing* and *forward-manipulation* problems that arise when governments bargain under the MFN principle in a sequential fashion. We show that these problems impede governments from achieving the multilateral efficiency frontier unless further rules of negotiation are imposed. We identify the WTO *reciprocity norm* and *renegotiation provisions* as rules that are capable of providing solutions to these problems. In this way, we suggest that WTO rules can facilitate the negotiation of efficient multilateral trade agreements in a world in which the addition of new and economically significant countries to the world trading system is an ongoing process.

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I. Introduction

Under the auspices of the World Trade Organization (WTO) – and GATT, its predecessor organization created in 1947 – governments have met with remarkable success in liberalizing world trade. This success, however, was not immediate, and history suggests that it was not a forgone conclusion. The inter-war years witnessed numerous international conferences, convened to orchestrate a return to the liberal trade policies of the pre-war period. These conferences consisted largely of expressions of support for liberal trading ideals, and invariably they ended in failure (Hudec, 1990, pp. 3-45, and League of Nations, 1942, pp. 101- 155).[1] The creation of GATT marked a fundamental divergence from these earlier efforts. In effect, GATT provided a negotiating forum, wherein the original 23 member-governments could seek to "buy" access rights to the markets of their trading partners and agree in return to undertake obligations to "supply" access to their own markets. This forum has subsequently spawned a more-or-less continuous process of trade negotiations extending over 50 some years and now involving more than 140 countries.

The success of the GATT/WTO is all the more remarkable in light of three prominent features of the GATT/WTO negotiating environment. First, WTO negotiations must abide by the most favored nation (MFN) principle. Under this principle, a WTO-member country must provide all member-countries with the same conditions of access to its markets.[2] Second, WTO negotiations take place overwhelmingly among small numbers of countries.[3] And third, as observed above,

[1]The League of Nations report describes the reasons for this failure: "...trade was consistently regarded as a form of warfare, as a vast game of beggar-my-neighbour, rather than as a co-operative activity from the extension of which all stood to benefit. The latter was the premise on which the post-war conferences based their recommendations – a premise accepted by all in theory but repudiated by almost all in practice. It was repudiated in practice because, as the issue presented itself on one occasion after another, it seemed only too evident that a Government that did not use its bargaining power would always come off second-best." (League of Nations, 1942, p. 120).

[2]The WTO does grant certain exceptions to MFN, for example to allow the formation of free trade agreements and customs unions. We abstract from these exceptions here. We also take as given the MFN clause, and do not offer here an explanation for its usefulness. For formal analyses of the role of the MFN clause in trade agreements, see Bagwell and Staiger (1999a, 1999b, 1999c), Caplin and Krishna (1991), Choi (1995), Ethier (1998), Ludema (1991) and McCalman (1997). For a comprehensive survey, see Horn and Mavroidis (2000).

[3]This feature is noted, for example, by Horn and Mavroidis (2000), who observe: "...In the WTO, negotiations for the most part take place between subsets of Member countries. Sometimes this is 'officially sanctioned,' as in the case of Principal Supplier negotiations. But also in seemingly multilateral negotiations, the 'actual' negotiations occur

GATT/WTO negotiations have extended over half a century, during which time the addition of new and economically significant countries to the world trading system – via either the process of economic development or the act of accession to the GATT/WTO – has occurred on a continuing basis. Each new arrival marks in turn both a potential new buyer of market access and a potential new supplier of market access. As a consequence of these three features, it is routine for a country to engage in market access negotiations on a product with one country, having previously negotiated tariff commitments on that product with another country, all subject to MFN.

In this sequential MFN negotiating environment, a pair of potential impediments to multilateral efficiency may be identified. First, under MFN, any market access concession that a country makes to an early negotiating partner is automatically available to future negotiating partners as well. To reduce the associated potential for "free-riding," a country might then engage in inefficient "foot-dragging," offering little in the way of trade liberalization to early negotiating partners, in order to maintain its bargaining position for later negotiations. A second impediment to multilateral efficiency might arise if later negotiating partners themselves engage in "bilateral opportunism," whereby these negotiating partners seek to alter the market-access implications of earlier negotiations to their own advantage. More broadly, we may associate the first impediment with a *forward-manipulation* problem, in which early agreements are manipulated to alter the outcome of later negotiations, and the second impediment with a *backward-stealing* problem, in which later agreements are structured to take surplus from earlier negotiating partners.

Does the GATT/WTO owe its apparent success to the fact that these potential impediments are simply unimportant? Or can its rules instead be credited with providing governments with assurance that forward-manipulation and backward-stealing problems will not become severe? In this paper, we suggest that the potential impediments to efficiency associated with these problems are indeed severe. And we identify GATT/WTO rules that can help governments overcome these impediments. More specifically, we show that, without further rules governing their negotiations,

between a very limited number of countries..." (Horn and Mavroidis, 2000, p. 34).

governments cannot achieve multilaterally efficient outcomes when they bargain sequentially and abide my MFN. Further, we show that the GATT/WTO *reciprocity norm* can solve the backward-stealing problem while its *renegotiation provisions* can solve the forward-manipulation problem, thereby allowing governments to achieve multilateral efficiency through sequential negotiations.

Our analysis is carried out within a three-country two-good world, in which a home-country government negotiates bilaterally and sequentially with each of two trading partners, subject to the MFN principle. We also permit governments to make direct international transfers as part of their bilateral negotiations. We do this for two reasons. The first reason is to ensure analytical tractability: the feasibility of direct international transfers simplifies our analysis considerably. The second reason is to endow governments with a reasonably flexible portfolio of policy instruments. While actual trade negotiations rarely if ever involve explicit transfers as part of the agreement, these negotiations do often involve more than just tariff reductions.[4] Our assumption that direct international transfers are feasible may be seen as an attempt to capture these additional policy dimensions in a simple model, with "reality" positioned somewhere in between the extremes of negotiations over tariffs only and negotiations over tariffs and direct international transfers.

Within this framework, we develop our analysis in two broad steps. In the first step, we identify problems and propose solutions in their most stripped-down form. To this end, we suppress the details of the economic environment and express government objectives as direct functions of tariffs and transfers. We impose on these objective functions a minimal set of restrictions which are sufficient to sign the cross-negotiation externalities along the multilateral efficiency frontier. After characterizing this frontier, we then explore whether it can be reached in subgame-perfect equilibria of specific bargaining games that entail sequential and bilateral negotiations under MFN.

We show that, in our most-basic sequential MFN bargaining game, the backward-stealing

[4]For example, the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPs) negotiated in the Uruguay Round is often interpreted as a transfer from the developing world to industrialized countries that was granted in exchange for certain market access concessions (such as the phase-out of the Multifiber Arrangement).

problem makes it impossible for governments to reach the multilateral efficiency frontier: beginning from any efficient combination of tariffs and transfers, the home-government and its later negotiating partner can always alter the tariffs and transfers under their control in a way that benefits them at the expense of the (unrepresented) early negotiating partner. When we impose a rule that makes early agreements secure against backward stealing, we find that the forward manipulation problem makes it impossible for governments to reach the efficiency frontier: beginning from any efficient combination of tariffs and transfers, the home-government can engage in inefficient foot-dragging with its early negotiating partner by keeping its tariff high, and both the home government and its early negotiating partner can thereby benefit at the expense of the (unrepresented) later negotiating partner, who is stuck with a less-favorable disagreement point. The first step of our analysis is completed by demonstrating conditions under which either (i) a unanimity rule or (ii) renegotiation opportunities can solve the forward manipulation problem and, in combination with a rule that provides security against backward stealing, can enable governments to achieve the multilateral efficiency frontier through their sequential MFN negotiations.

We then turn to the second broad step of our analysis. In this step, we utilize the three-country two-good general equilibrium environment to impose further structure on the objectives of governments. With this additional economic structure, we proceed to tie our results more closely to WTO rules and practice.

We first confirm that the backward-stealing and forward-manipulation problems arise under very general circumstances in this economic environment, and we interpret those problems in terms of the market access issues which dominate GATT/WTO discussions: each problem reflects the incentives of negotiating partners to position the *balance of market access rights and obligations* in a way that is disadvantageous for unrepresented governments.[5] We next provide economic

[5]The balance of market access rights and obligations is routinely emphasized by GATT/WTO legal scholars and in GATT/WTO legal proceedings. For example, Hudec (1993, p. 7) summarizes his description of the original GATT agreement as follows: "The key value underlying this rather odd legal design was reciprocity. The legal procedures were not there to enforce obligations for the sake of enforcement. They were there to correct imbalances that might arise in the benefits governments were actually receiving from the agreement." The perceived importance of avenues of redress to correct imbalances is routinely reflected in GATT/WTO legal proceedings as well. For

interpretations of the conditions under which a unanimity rule or renegotiation opportunities can solve the forward manipulation problem. Finally, we interpret the GATT/WTO norm of reciprocity, whereby governments negotiate a balanced exchange of market access, as embodying a rule that provides security against backward stealing. In this way, our two-step procedure highlights the essential structure of the impediments to efficiency found generally in sequential MFN trade bargaining environments (step 1), and highlights as well the role played by the underlying economic structure in translating these impediments and their solutions into terms that find representation in GATT/WTO rules and practice (step 2).

Our paper is directly related to earlier work in both Industrial Organization and in International Trade. In the Industrial Organization literature on contracting with externalities, our paper has links to both the common-seller models and the common-buyer models.

In a common-seller model, a single seller offers an input and sequentially contracts with two buyers. The buyers interact directly, through their subsequent product-market conduct. In the formulation that McAfee and Schwartz (1994) present, the seller makes take-it-or-leave-it offers, where an offer is comprised of a wholesale price and a fixed fee.[6] The buyers' product-market choices are non-contractible. Once the first buyer has sunk the fixed fee, the seller has possible incentive to offer the second buyer a lower wholesale price in exchange for a higher fixed fee. The wholesale-price reduction gives the second buyer an advantage in the product market, and the seller and the second buyer are thus tempted to "steal backwards" from the first buyer. McAfee and

example, a recent GATT panel report states: "...the main value of a tariff concession is that it provides an assurance of better market access through improved price competition. Contracting parties negotiate tariff concessions primarily to obtain that advantage. They must therefore be assumed to base their tariff negotiations on the expectation that the price effect of the tariff concessions will not be systematically offset. If no right of redress were given to them in such a case, they would be reluctant to make tariff concessions and the General Agreement would no longer be useful as a legal framework for incorporating the results of trade negotiations." (as quoted in Petersmann, 1997, p. 168). Finally, the importance of this balance in China's accession was emphasized recently by the Chinese Delegation: "...a few members have raised some unreasonable requests, either requiring China to undertake obligations exceeding the WTO rules, or insisting that China can not enjoy the rights under the WTO rules. I am deeply concerned with such requests. The balance between rights and obligations is the fundamental principle of China's WTO accession...." (Yongtu, 2000).

[6] For other important formulations, see Hart and Tirole (1990), O'Brien and Shaffer (1992) and Segal (1999). We describe the findings under sequential contracting, but similar themes also appear under simultaneous contracting.

Schwartz argue that a non-discrimination clause is ineffective in curbing such opportunism, where such a clause ensures that any wholesale-price/fixed-fee pairing that is offered to the second buyer is also offered to the first buyer. Marx and Shaffer (2000a) show, however, that non-discrimination clauses in fact do enable efficient outcomes to be achieved in equilibrium.

We may think of our model as a common-seller model, in which the seller (country A) offers wholesale prices (tariffs) to the buyers (countries B and C) in exchange for fixed fees (transfers), where the buyers also make product-market (tariff) choices. Our model, however, introduces three key differences. First, we do not assume that payoffs are quasi-linear; consequently, efficiency imposes direct restrictions on the selection of transfers. Second, motivated by the trade-policy application, the non-discrimination clause that we consider ensures only that the seller offers a uniform wholesale price to both buyers. The buyers may pay different fixed fees. Third, the buyers' product-market choices are contractible in our model, and in fact the first buyer's product-market choice is fixed when the second negotiation commences. In our model, therefore, the first buyer is especially vulnerable: the non-discrimination clause is incomplete, the seller and second buyer negotiate over a larger range of payoff-relevant variables and the conduct of the first buyer cannot be adjusted in response to the second contract. In fact, we find that the backward-stealing problem is so severe that sequential contracting cannot deliver efficiency, even when the non-discrimination clause is in place.

Our work is also related to the common-buyer model, in which two sellers sequentially contract with the same buyer. In the initial formulation, given by Aghion and Bolton (1987), sellers make take-it-or-leave-it offers, and the buyer seeks only one unit and thus trades with just one seller. The sellers interact only indirectly, through their contracts with the common buyer. The first seller offers a contract that specifies a penalty payment if the buyer transacts with the second. This contract alters the reservation value that the buyer holds when the second seller approaches and thereby serves to manipulate the offer that the second seller makes. Indeed, when information is symmetric, the efficient seller supplies the good, and the buyer and first seller extract all of the surplus. Marx and Shaffer (2000b) generalize the common-buyer model and allow that the buyer may trade with both sellers. The buyer and first seller extract surplus (but not necessarily all surplus) by manipulating the buyer's future disagreement payoff, and their optimal efforts in this regard do not compromise efficiency.[7]

We may think of our model as a generalized common-buyer model, such as Marx and Shaffer (2000b) consider, in which the buyer (country A) offers transfers to the sellers (countries B and C) in exchange for their production (tariffs). But our model introduces several new elements: the buyer makes a further choice (country A's tariff) that directly affects both sellers, the sellers interact directly in that each seller's production affects the payoff of the other seller even when transfers are held fixed, the transfer to the first seller cannot be conditioned upon the production of the second seller, and payoffs are not quasi-linear and so efficiency also impinges on the selection of transfers. Our findings also differ in important respects. First, early negotiators in our trade-policy game manipulate the disagreement payoff of country C (i.e., the second seller). Second, in our model, the pursuit of rents through forward manipulation creates an inefficiency (absent further rules).

In the International Trade literature, we are aware of two papers that are closely related to the present analysis. A first paper is Bagwell and Staiger (1999b). In that paper, we are also concerned with the possibility of inefficient negotiating outcomes when pairs of countries can negotiate bilaterally. But there are two important differences between that paper and the present analysis. First, in our earlier paper we identify rules of negotiation that serve to protect the welfare of governments that are not participating in a bilateral negotiation, and we relate these rules to WTO principles, but we do not ask the central question of the present analysis: Starting from an inefficient (non-cooperative) set of policies, can a simple set of rules be identified which (i) allow governments who engage in sequential bilateral MFN negotiations to arrive at an efficient arrangement, and (ii) have a counterpart in GATT articles? Providing an answer to this question requires a model of the sequential bargaining process, something that our earlier paper does not provide. A second important difference is that we do not permit direct international transfers in our earlier paper. We

[7] For other important extensions of the Aghion-Bolton (1987) model, see Marx and Shaffer (1999, 2001) and Spier and Whinston (1995).

indicate below how the possibility of international transfers affects our earlier results.

A second related paper in the International Trade literature is the independent work of Bond, Ching and Lai (2000). Their paper, which focuses specifically on the process of accession under WTO rules, models this process as one in which existing members first negotiate their MFN tariffs (and transfers) together, and then as a group negotiate with the acceding member over the terms that MFN tariff treatment will be extended to it. Within this negotiating environment, Bond, Ching and Lai study how WTO rules can affect the distribution of payoffs between existing WTO members and new members that are negotiating to join the agreement. But in contrast to the negotiating process we study below, in their bargaining model there is no stage at which a country that had previously negotiated a tariff agreement is absent from the bargaining table. It is this feature of negotiations that gives rise to the potential for bargaining inefficiencies in our model, and it is these inefficiencies and the WTO rules which may be interpreted as preventing them that are our primary concern.

The rest of the paper proceeds as follows. The three-country two-good model is introduced in section 2, where the efficiency frontier is also characterized. Section 3 introduces the basic sequential MFN bargaining game, and identifies the backward-stealing problem, while section 4 identifies the forward-manipulation problem. Sections 5 and 6 establish conditions under which efficiency can be achieved under a rule that provides security against backward stealing combined with either a unanimity rule or a renegotiation provision, respectively. Section 7 exploits the structure of the general equilibrium economic model to link the results more tightly to features of the GATT/WTO. Section 8 concludes. More technical proofs are collected in an Appendix.

2. The Model

We assume that country A exports good *y* to countries B and C in exchange for imports of good *x* from B and C. Country A may levy an MFN import tariff τ^A, while countries B and C may each levy their own import tariff, τ^B and τ^C, respectively.[8] We adopt the convention that τ^j

[8] In this 2-good MFN environment, countries B and C have no basis for trade between them.

represents one plus the ad valorem import tariff of country j, and we let $\boldsymbol{\tau}$ denote the vector of tariffs (τ^A,τ^B,τ^C). Country A may also make direct (consumption) transfers to country B and/or country C. We denote the (positive or negative) transfer from A to B by t^B and from A to C by t^C, measured in units of y. The total net transfers made from A to its trading partners is then $t^A \equiv t^B + t^C$.

The objectives of the government of country $j \in \{A,B,C\}$ are represented by the general reduced-form function $W^j(\boldsymbol{\tau},t^j)$. Hence, we allow each government to be affected by its own tariff and the tariff of each of the other countries. We also allow each government to care about the net transfer it grants or receives, and we assume that $W^A_{t^A}<0$, $W^B_{t^B}>0$ and $W^C_{t^C}>0$.

The efficiency frontier, defined with respect to the governments' own preferences, is defined by the set of solutions to:

$$\max_{(\boldsymbol{\tau},t^B,t^C)} \quad W^A(\boldsymbol{\tau},t^A \equiv t^B+t^C)$$
$$\text{s.t.} \quad W^B(\boldsymbol{\tau},t^B) \geq \overline{W}^{BE}; \quad W^C(\boldsymbol{\tau},t^C) \geq \overline{W}^{CE},$$

where $\overline{W}^{BE}$ and $\overline{W}^{CE}$ denote the welfare of the governments of countries B and C, respectively, evaluated at the efficient policies. The five first-order conditions that characterize the efficient selection of $(\boldsymbol{\tau},t^B,t^C)$, given $\overline{W}^{BE}$ and $\overline{W}^{CE}$, can be written as:[9]

(1) $$\frac{W^A_{\tau^A}}{W^A_{t^A}} - \frac{W^B_{\tau^A}}{W^B_{t^B}} - \frac{W^C_{\tau^A}}{W^C_{t^C}} = 0;$$

(2) $$\frac{W^A_{\tau^B}}{W^A_{t^A}} - \frac{W^B_{\tau^B}}{W^B_{t^B}} - \frac{W^C_{\tau^B}}{W^C_{t^C}} = 0;$$

[9]We assume throughout that global concavity conditions are met.

(3) $$\frac{W^A_{\tau^C}}{W^A_{t^A}} - \frac{W^B_{\tau^C}}{W^B_{t^B}} - \frac{W^C_{\tau^C}}{W^C_{t^C}} = 0;$$

$$W^B(\boldsymbol{\tau},t^B) = \overline{W}^{BE}; \text{ and } W^C(\boldsymbol{\tau},t^C) = \overline{W}^{CE}.$$

Throughout the paper we restrict our focus to the set of points on the efficiency frontier that lie below the reaction curves of each country, and we ask whether such points can be implemented as equilibria of specific bargaining games. This restriction comes with little loss of generality. In each of the games we consider -- as in GATT/WTO negotiations -- governments agree to *bind* their tariffs at specified levels, and these bindings then place *upper limits* on permissible tariff choices. As a consequence, any point on the efficiency frontier that required at least one country to set its tariff above its reaction curve would be unattainable in the bargaining games we consider, provided only that subsequent to the conclusion of negotiations each government were assumed to set its tariff unilaterally subject to the constraint that it did not exceed its negotiated tariff binding. Rather than make these arguments formally throughout the paper, we focus from the beginning on efficient points that lie below the reaction curves of each country. We record this restriction as:

(A1) $dW^j/d\tau^j > 0,\ j \in \{A,B,C\}$.

In addition to (A1), we restrict our focus as well to efficient points that satisfy:

(A2) $sign(dW^B/d\tau^A) = sign(dW^C/d\tau^A)$, and

(A3) $dW^j/d\tau^{\backslash j} > 0$ for $j \in \{B,C\}$,

where $\backslash j$ denotes the element of $\{B,C\}$ that differs from j. Conditions (A2) and (A3) ensure that the incentives of B and C are "aligned" at the efficient point under consideration. That is, at an efficient point satisfying (A2), B and C agree on the direction each would like τ^A to move. Likewise, at an efficient point satisfying (A3) and in light of (A1), B and C agree on the direction each would like τ^B or τ^C to move. In the explicit economic framework we employ in section 7, (A3) is implied by (A1) and (A2). Exploring cases where the incentives of B and C are opposed might also be of interest, but the aligned case seems to be a natural starting point for analyzing tariff bargaining between A and each of its trading partners under MFN.

We treat (A1)-(A3) as maintained assumptions until section 7. The implications of these assumptions are recorded in:

Lemma 1: At any efficient point satisfying (A1)-(A3), the following restrictions apply:

(R1)

$(i)\ dW^{j}/d\tau^{j}>0,\ j\in\{A,B,C\};$

$(ii)\ dW^{j}/d\tau^{A}<0,\ dW^{A}/d\tau^{j}<0,\ j\in\{B,C\};$

$(iii)\ dW^{j}/d\tau^{\backslash j}>0,\ j\in\{B,C\}.$

Proof: (R1)(i) and (iii) simply restate (A1) and (A3). (A1), (A2) and (1) imply $dW^{j}/d\tau^{A}<0$ for $j\in\{B,C\}$, while (A1), (A3), (2) and (3) imply $dW^{A}/d\tau^{j}<0$ for $j\in\{B,C\}$. **QED**

In light of Lemma 1, we may under (A1)-(A3) rewrite conditions (1)-(3) in the equivalent form:

$$\text{(E1).}\quad \frac{W^{A}_{\tau^A}}{W^{A}_{t^A}}\left[\frac{W^{C}_{\tau^B}}{W^{C}_{\tau^A}} - \frac{W^{A}_{\tau^B}}{W^{A}_{\tau^A}}\right] = \frac{W^{B}_{\tau^A}}{W^{B}_{t^B}}\left[\frac{W^{C}_{\tau^B}}{W^{C}_{\tau^A}} - \frac{W^{B}_{\tau^B}}{W^{B}_{\tau^A}}\right];$$

$$\text{(E2).}\quad \frac{W^{A}_{\tau^A}}{W^{A}_{t^A}}\left[\frac{W^{B}_{\tau^C}}{W^{B}_{\tau^A}} - \frac{W^{A}_{\tau^C}}{W^{A}_{\tau^A}}\right] = \frac{W^{C}_{\tau^A}}{W^{C}_{t^C}}\left[\frac{W^{B}_{\tau^C}}{W^{B}_{\tau^A}} - \frac{W^{C}_{\tau^C}}{W^{C}_{\tau^A}}\right];$$

$$\text{(E3).}\quad \left[\frac{W^{A}_{\tau^C}}{W^{A}_{t^A}} - \frac{W^{C}_{\tau^C}}{W^{C}_{t^C}}\right] = \frac{W^{B}_{\tau^C}}{W^{B}_{t^B}}.$$

Conditions (E1)-(E3) can be interpreted as depicting a number of tangency conditions that are required at all points on the efficiency frontier. Figure 1A illustrates the implications of (E1) and (E2). For $j\in\{B,C\}$ and with τ^j on the vertical axis and t^j on the horizontal axis, Figure 1A describes the tangency condition that must be met between the indifference curves of the governments of countries A and *j* when (i) τ^j is altered slightly from its efficient level, (ii) τ^A is adjusted to fix the welfare of the government of country *j* at its efficient level, and (iii) t^j is altered to preserve the welfare of the government of country *j* at its efficient level. Figure 1B illustrates the implications of (E3). In this figure, we place τ^C on the vertical axis and t^A on the horizontal axis. The locus *BC* describes, for each τ^C around the efficient level, the level of t^A implied by the t^B and t^C required to fix W^B and W^C at their efficient levels. According to (E3), this locus must be tangent to the indifference curve of the government of country A at efficient policy choices.

3. Backward Stealing

In this section we begin to explore whether the efficiency frontier can be reached in specific bargaining environments that entail sequential and bilateral negotiations under MFN. As we discussed in the Introduction, the sequential nature of bargaining under MFN is a central property of WTO negotiations. That is, countries routinely enter market access negotiations on a product having previously negotiated bindings on that product with other trading partners, all within the context of MFN.

Before proceeding to define the bargaining environment, we first point out an important feature of the efficiency frontier. According to Lemma 1, any point on the efficiency frontier satisfying (A1)-(A3) must satisfy (R1), and under (R1) efficiency conditions (2) and (3) imply:

$$(4) \qquad -\frac{W^{\backslash j}_{t^j}}{W^{\backslash j}_{\tau^j}} = 0 > -\frac{W^A_{t^j}}{W^A_{\tau^j}} > -\frac{W^j_{t^j}}{W^j_{\tau^j}} \text{ for } j \in \{B,C\}.$$

With τ^j on the vertical axis and t^j on the horizontal axis, Figure 1C depicts the "lens" implied by (4). As Figure 1C illustrates, beginning from any efficient policy combination that satisfies (A1)-(A3), the governments of country A and either of its trading partners can enjoy mutual gains – at the expense of the government of the third country – if A's transfer to this trading partner is increased slightly and the trading partner's tariff is slightly reduced.[10] We summarize this observation with:

Proposition 1: At any point on the efficiency frontier, and for $j \in \{B,C\}$, it is possible to increase t^j and reduce τ^j so as to increase W^A and W^j at the expense of $W^{\backslash j}$.

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[10]Observe that Figures 1A and 1C are not inconsistent, because in Figure 1A country A's tariff is adjusted to fix the welfare of the government of country $\backslash j$ at its efficient level, while in Figure 1C no such adjustment is undertaken.

The lens described in Proposition 1 is significant, because it signals the broad potential for a "backward stealing" problem when governments negotiate bilaterally and sequentially, *even when those negotiations are constrained to abide by MFN*. In the explicit economic framework we introduce in section 7, this problem admits a simple interpretation: in effect, with no change to its own tariff whatsoever, the government of country A can use its transfer policy to "pay" one of its trading partners to liberalize and generate a beneficial improvement in A's terms of trade, all at the expense of the third country. As we next demonstrate, this problem must be avoided if governments are to negotiate to the efficiency frontier.[11]

We now define the *Sequential MFN Game*. In stage 1 of this game, country A makes a take-it-or-leave-it proposal to B concerning *bindings* (i.e., permissible upper bounds) on τ^A and τ^B, as well as a transfer from A to B, t^B. Then, in stage 2, country A makes a take-it-or-leave-it proposal to C concerning bindings on τ^A (with the stage-2 binding on τ^A set no higher than its stage-1 level) and on τ^C, as well as a transfer from A to C, t^C. The *Sequential MFN Game* has the following features:

Stage 1: *A proposes* $(\tilde{\tau}^A, \bar{\tau}^B, \bar{t}^B)$*, which B accepts or rejects.*

Stage 2: *If B accepts, A proposes* $(\bar{\tau}^A, \bar{\tau}^C, \bar{t}^C)$*, where* $\bar{\tau}^A \leq \tilde{\tau}^A$*, which C accepts or rejects.*

Figure 2 illustrates the full extensive form of the Sequential MFN Game. If B and C reject,

[11] Proposition 1 is related to Propositions 5 and 8 of Bagwell and Staiger (1999b). As we mentioned in the Introduction, in that paper we did not allow governments to make bilateral international transfers. Proposition 5 of that paper established in a discriminatory tariff environment that any efficient tariff vector produces a "lens" that can be entered into by A and *j* through mutual reductions in the (discriminatory) tariffs that they apply to one another's imports. Proposition 8 of that paper showed that the MFN restriction can reduce, but cannot eliminate, the possibility of a lens, in the particular sense that the existence of a lens is confined to a subset of points on the efficiency frontier when the MFN restriction is imposed. What Proposition 1 above implies is that even this limited effect of MFN on the existence of a lens is undone when international transfers are possible. This is because the possibility of joining MFN tariffs with bilateral international transfers effectively allows governments to replicate what is achievable with discriminatory tariffs alone. This implication may itself be of some independent interest, because it suggests a possible note of caution regarding the often-stated proposals to make direct international transfers an explicit part of the GATT/WTO system (see Kowalczyk and Sjostrom, 1994, for a particularly forceful statement of this proposal).

no transfers are paid and all countries play their Nash tariffs, yielding Nash payoffs W_N^j for $j \in \{A,B,C\}$. If B accepts and C rejects, then there is no transfer between A and C, and C selects its best-response tariff ($\tau^{CR}(\tilde{\tau}^A, \bar{\tau}^B, t^C \equiv 0)$) to the agreement between A and B. In this case, A's payoff is $\hat{W}^A_{\backslash C}(\tilde{\tau}^A, \bar{\tau}^B, \bar{t}^B) \equiv W^A(\tilde{\tau}^A, \bar{\tau}^B, \tau^{CR}, \bar{t}^B)$, B's payoff is $\hat{W}^B_{\backslash C}(\tilde{\tau}^A, \bar{\tau}^B, \bar{t}^B) \equiv W^B(\tilde{\tau}^A, \bar{\tau}^B, \tau^{CR}, \bar{t}^B)$, and C's payoff is $W_D^C(\tilde{\tau}^A, \bar{\tau}^B) \equiv W^C(\tilde{\tau}^A, \bar{\tau}^B, \tau^{CR}, t^C \equiv 0)$.[12] If B rejects, then there is no transfer between A and B, A proposes (τ^A, τ^C, t^C) to C, and B selects its best-response tariff to the agreement between A and C. In this case, A's proposal to C solves:

$$\max_{(\tau^A, \tau^C, t^C)} \quad W^A(\tau^A, \tau^{BR}(\tau^A, \tau^C, t^B \equiv 0), \tau^C, t^C)$$

$$\text{s.t.} \quad W^C(\tau^A, \tau^{BR}(\tau^A, \tau^C, t^B \equiv 0), \tau^C, t^C) = W_N^C .$$

If $(\tau^A_{\backslash B}, \tau^C_{\backslash B}, t^C_{\backslash B})$ solves this program, and if C accepts, then the payoffs for A, B and C, respectively, are $\hat{W}^A_{\backslash B}(\tau^A_{\backslash B}, \tau^C_{\backslash B}, t^C_{\backslash B}) \equiv W^A(\tau^A_{\backslash B}, \tau^{BR}, \tau^C_{\backslash B}, t^C_{\backslash B})$, $W_D^B(\tau^A_{\backslash B}, \tau^C_{\backslash B}) \equiv W^B(\tau^A_{\backslash B}, \tau^{BR}, \tau^C_{\backslash B}, t^B \equiv 0)$, and W_N^C.

We focus on Subgame Perfect Equilibria (SGPE) of the Sequential MFN Game. The next proposition follows from Proposition 1:

Proposition 2: In any SGPE of the Sequential MFN Game, the outcome is inefficient.

Proof: As illustrated by Figure 1C when j is set to C, A could improve upon any stage-2 proposal $(\bar{\tau}^{AE}, \bar{\tau}^{CE}, \bar{t}^{CE})$ that, in combination with $(\bar{\tau}^{BE}, \bar{t}^{BE})$, attained a point on the efficiency frontier, because with a slight reduction in $\bar{\tau}^C$ below $\bar{\tau}^{CE}$ and a slight increase in $\bar{t}^C$ above $\bar{t}^{CE}$, A could move into the lens depicted in Figure 1C, and C would accept this proposal. In fact, in terms of Figure 1C, A's proposal will achieve a tangency between A's indifference curve and C's indifference curve (the latter associated with W_N^C), and by Proposition 1 this cannot be efficient. **QED**

Within the explicit economic framework described in section 7, this result may be interpreted

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[12]When it is clear from context, we let τ^{jR} for $j \in \{B,C\}$ denote *j's* best-response tariff to the tariffs of A and $\backslash j$ when $t^j \equiv 0$.

as follows. Starting from stage-2 choices that would achieve the efficiency frontier, A and C can do better for themselves if C liberalizes further. C's import liberalization benefits A by increasing the price of A's export good on world markets, and A can compensate C for C's implied welfare loss with a transfer to C while enjoying the gains from higher export prices against B. Hence, efficient outcomes are precluded by the backward-stealing problem identified in Proposition 1.

Finally, we observe that, while we have derived Proposition 2 in a take-it-or-leave-it bargaining context, it is clear from Figure 1C that the proposition holds in more general bargaining environments as well, provided only that the stage-2 bargain between A and C is efficient (i.e., exhausts all feasible gains from cooperation in that stage) and therefore leads to a tangency between the indifference curves of A and C in Figure 1C.

4. Forward Manipulation

Let us suppose that rules of negotiation can be found which solve the backward-stealing problem identified in the previous section. We say that a stage-1 agreement between A and B will be *secure against backward stealing* if and only if, following an agreement between A and B in stage 1, any agreement between A and C satisfies:

$$W^{B}(\overline{\tau}^{A},\overline{\tau}^{B},\overline{\tau}^{C},\overline{t}^{B})=\hat{W}^{B}_{\backslash C}(\tilde{\tau}^{A},\overline{\tau}^{B},\overline{t}^{B}).$$

According to this definition, any stage-2 agreement between A and C which follows a stage-1 agreement between A and B must leave B with the welfare it would attain if its stage-1 agreement with A were implemented and there were no stage-2 agreement between A and C.

Before defining a bargaining environment that is secure against backward stealing, we again pause to highlight an important feature of the efficiency frontier. Beginning from efficient policies, consider any policy adjustments that leave the governments of countries A and j indifferent. Then these adjustments must leave the government of country $\backslash j$ indifferent as well. Otherwise, these policy adjustments could be made in a direction that induced a first-order increase in the welfare of $\backslash j$ while fixing j's welfare, and any (at-most second order) loss to A could be offset by a further adjustment in t^j, thereby orchestrating a Pareto improvement. We record this observation with:

Proposition 3: At any point on the efficiency frontier, any policy adjustments that leave A and j indifferent must leave $\backslash j$ indifferent as well.

The observation contained in Proposition 3 is significant, because it signals the broad potential for a "forward manipulation" problem when MFN tariff negotiations proceed sequentially and bilaterally. If the efficiency frontier is to be reached in this negotiating environment, Proposition 3 then implies that the indifference to small changes in stage-1 choices that A and B achieve as a result of their stage-1negotiations must not be a by-product of implied (first-order) changes in welfare of the government of country C. As we next demonstrate, this problem must be avoided if governments are to negotiate to the efficiency frontier.

We now define the *Secure Sequential MFN Game*. In stage 1 of this game, country A makes a take-it-or-leave-it proposal to B concerning bindings on τ^A and τ^B, as well as a transfer from A to B, t^B. Then, in stage 2, country A makes a take-it-or-leave-it proposal to C concerning bindings on τ^A (with the stage-2 binding on τ^A set no higher than its stage-1 level) and on τ^C, as well as a transfer from A to C, t^C, subject to ensuring that any agreement reached in stage 1 is secure against backward stealing. The *Secure Sequential MFN Game* has the following features:

Stage 1: *A proposes* $(\tilde{\tau}^A, \bar{\tau}^B, \bar{t}^B)$, *which B accepts or rejects.*

Stage 2: *If B accepts, A proposes* $(\bar{\tau}^A, \bar{\tau}^C, \bar{t}^C)$, *where* $W^B(\bar{\tau}^A, \bar{\tau}^B, \bar{\tau}^C, \bar{t}^B) = \hat{W}^B_{\backslash C}(\tilde{\tau}^A, \bar{\tau}^B, \bar{t}^B)$ *and* $\bar{\tau}^A \leq \tilde{\tau}^A$, *which C accepts or rejects.*

The full extensive form of the Secure Sequential MFN Game is the same as that illustrated in Figure 2, with the additional "security" constraint imposed on stage-2 negotiations.

At this point, we introduce a new assumption which requires that, when C is on its reaction curve, its welfare is diminished when τ^A is raised:

(A4) $dW^C_D(\tilde{\tau}^A,\overline{\tau}^B)/d\tilde{\tau}^A < 0$.

We may now state:

Proposition 4: Under (A4), in any SGPE of the Secure Sequential MFN Game, the outcome is inefficient.

Proof: Suppose to the contrary that there existed a SGPE of the Secure Sequential MFN Game in which the efficiency frontier was reached. Then in this SGPE B must accept A's proposal; otherwise, with no agreement reached in stage 1, the proof of Proposition 2 applies, and A's proposal to C must be inefficient. Therefore, whether or not C accepts A's proposal, C must receive $W^C_D(\tilde{\tau}^A,\overline{\tau}^B)$, its disagreement payoff. Moreover, A must be indifferent to small changes in its proposed stage-1 policies that fix B's welfare, and in particular A must be indifferent to changes in $\tilde{\tau}^A$ and $\overline{t}^B$ along B's indifference curve. By Proposition 3, efficiency then requires that these changes in $\tilde{\tau}^A$ and $\overline{t}^B$ leave C indifferent as well, which is to say that they must not alter $W^C_D(\tilde{\tau}^A,\overline{\tau}^B)$ to the first order. But this is contradicted by (A4). **QED**

Hence, under (A4), there can be no SGPE of the Secure Sequential MFN Game that achieves an efficient outcome, and the essential reasoning reflects the forward-manipulation problem described above and captured in Proposition 3: the source of the inefficiency is A's desire to use its stage-1 negotiations with B to position itself favorably for stage-2 negotiations with C. In effect, A can raise $\tilde{\tau}^A$ above the level consistent with efficiency and compensate B with a transfer, and then gain in its dealings with the unrepresented C, because C is stuck with a less-favorable disagreement point.[13] We observe that this logic is also related to a concern about the "foot-dragging" maneuver for handling "free-riders" as this maneuver was described in the Introduction. According to this concern, country A might be induced under MFN to offer "too little" in the way of trade liberalization to its early negotiating partners, in order to maintain its bargaining position for later

[13]Specifically, for any choice of $(\tilde{\tau}^{AE},\overline{\tau}^{BE},\overline{t}^{BE})$ that induces efficient policies, A can gain with an adjustment in $(\tilde{\tau}^A,\overline{t}^B)$ that fixes B's welfare if and only if $\tilde{\tau}^A$ is raised above $\tilde{\tau}^{AE}$, and C's disagreement point is thereby worsened.

negotiations. Proposition 4 can be interpreted as providing a formal justification for this concern.[14]

Finally, we observe that, while we have derived Proposition 4 in a take-it-or-leave-it bargaining context, it is likely to hold as well in more general bargaining environments. In more general bargaining environments, C's welfare will be affected by changes in stage-1 negotiation outcomes through three possible channels: (i) its own stage-2 disagreement payoff; (ii) A's stage-2 disagreement payoff; and (iii) the general shape of the stage-2 bargaining frontier. The take-it-or-leave-it bargaining model we employ here highlights channel (i), and shuts down channels (ii) and (iii). In a general bargaining model, all three channels may be present. However, unless these three channels happen to exactly offset each other, it will still be the case, as in Proposition 4, that the indifference to small changes in stage-1 choices that A and B achieve as a result of their stage-1negotiations is a by-product of implied (first-order) changes in welfare of the government of country C, and therefore by Proposition 3 that efficiency is not achieved.

5. Preventing Forward Manipulation through Unanimity

It is sometimes said in GATT/WTO negotiation rounds that "nothing is agreed until everything is agreed" (e.g., Hoekman and Kostecki, 1996, p. 65) In this section we take an extreme interpretation of this position, and impose a *unanimity requirement* on the Secure Sequential MFN Game considered in the previous section: if *anyone* rejects, all governments receive a fixed disagreement payoff $D \equiv (\bar{W}_D^A, \bar{W}_D^B, \bar{W}_D^C)$. For example, a natural candidate for D would be the Nash payoffs, though other candidates might also be plausible. In any case, the unanimity requirement assures that C's disagreement payoff is independent of $(\tilde{\tau}^A, \bar{\tau}^B, \bar{t}^B)$, and so it prevents the forward-manipulation problem identified in the previous section.

[14] A further question of interpretation arises if negotiations with C are over *accession*, rather than simply market access as we have (implicitly) modeled the negotiations here. If C is not yet a WTO member, then stage-2 disagreement between A and C might reasonably result in the ability of A to impose *discriminatory* tariffs against C, since the MFN obligation of WTO members extends only to other members. In the context of Proposition 4, this would sever the direct link between $\tilde{\tau}^A$ and C's disagreement welfare. Nevertheless, an indirect link still exists between the tariff A negotiates with B and the disagreement welfare of C: as a result of the *tariff complementarity effect* (see Bagwell and Staiger, 1999c), a higher tariff for A against imports from B translates into a higher best-response (discriminatory) tariff for A against imports from C. This link would still give rise to a foot-dragging problem of the kind described above.

We now introduce the *Secure/Unanimity Sequential MFN Game*, which has the following features:

Stage 1: *A proposes* $(\tilde{\tau}^A, \overline{\tau}^B, \overline{t}^B)$, *which B accepts or rejects, where rejection leads to the disagreement point D.*

Stage 2: *If B accepts, A proposes* $(\overline{\tau}^A, \overline{\tau}^C, \overline{t}^C)$, *where* $\mathrm{W}^B(\overline{\tau}^A, \overline{\tau}^B, \overline{\tau}^C, \overline{t}^B) = \hat{W}^B_{\backslash C}(\tilde{\tau}^A, \overline{\tau}^B, \overline{t}^B)$ *and* $\overline{\tau}^A \leq \tilde{\tau}^A$, *which C accepts or rejects, where rejection leads to the disagreement point D.*

The full extensive form of the Secure/Unanimity Sequential MFN Game is illustrated in Figure3.

The Secure/Unanimity Sequential MFN Game does not succumb to the backward-stealing problem, because its rules dictate that the stage-1 agreement between A and B must be secure against backward stealing. And the forward-manipulation problem cannot arise under the unanimity rule either. We next ask whether there exists a SGPE of this game in which efficient policies are implemented. In particular, A can do no better than the policies it would choose if it could simply *commit* at the start of the game to $(\tau^A, \tau^B, \tau^C, t^B, t^C)$. Hence, we ask whether A can implement its commitment solution in the Secure/Unanimity Sequential MFN Game.

A's *commitment program* is

$$\max_{(\tau^A, \tau^B, \tau^C, t^B, t^C)} \quad W^A(\tau^A, \tau^B, \tau^C, t^A \equiv t^B + t^C)$$

$$\text{s.t.} \quad W^B(\tau^A, \tau^B, \tau^C, t^B) = \overline{W}^B_D$$
$$W^C(\tau^A, \tau^B, \tau^C, t^B) = \overline{W}^C_D,$$

where $\overline{W}^B_D$ and $\overline{W}^C_D$ are defined by D. We denote the solution to A's commitment problem as $(\tau^A(D), \tau^B(D), \tau^C(D), t^B(D), t^C(D))$, and note that it is guaranteed to correspond to a point on the efficiency frontier.[15]

For A to be able to implement its commitment solution in the Secure/Unanimity Sequential MFN Game, we require that a new condition is met. This condition is:

(A5) (i) $\tau^{CR}(\tau^A(D),\tau^B(D),t^C\equiv 0)\ \geq\ \tau^C(D)$; (ii) $sign[d\hat{W}^B_{\backslash C}/d\tilde{\tau}^A]\ =\ -sign[dW^B/d\bar{\tau}^C]$.

Condition (A5) requires that A can solve its commitment program while positioning τ^C below C's zero-transfer reaction curve, and that with C positioned on its reaction curve an increase in A's tariff has an impact on B's welfare which is opposite in sign to the impact on B of an increase in C's tariff. The role of this condition is to ensure that A's tariff binding declines monotonically along the implementation path. We may now state:

Proposition 5: In the Secure/Unanimity Sequential MFN Game, if (A5) holds, then there exists a SGPE in which A implements its commitment solution and an efficient outcome is thereby achieved.

Proof: (Contained in the Appendix).

The equilibrium strategies that implement A's commitment solution are for A to propose $(\tilde{\tau}^A,\bar{\tau}^B,\bar{t}^B)=(\tilde{\tau}^A(D),\tau^B(D),t^B(D))$ in stage 1, where $\tilde{\tau}^A(D)$ satisfies $\hat{W}^B_{\backslash C}(\tilde{\tau}^A,\tau^B(D),t^B(D))=\bar{W}^B_D$, and for A to propose $(\bar{\tau}^A,\bar{\tau}^C,\bar{t}^C)=(\tau^A(D),\tau^C(D),t^C(D))$ in stage 2, and for B and C to each accept these proposals in their respective stages. In effect, B and C cannot do better, because by disagreeing each gets the same payoff as when they each agree. And with A unable to steal backward and prevented as well from manipulating forward, A cannot do better than to give each trading partner that trading partner's (fixed) disagreement payoff, to do so efficiently, and to keep all the surplus for itself. However, A must be able to achieve this while honoring its stage-1 binding, and this requires that $\tilde{\tau}^A(D)\geq\tau^A(D)$, which (A5) ensures.

Finally, we observe that the take-it-or-leave-it bargaining structure does play a potentially important role in generating Proposition 5. With a more general bargaining structure in each stage,

[15]There may be many such solutions. Our condition (A5) below need only be met by at least one of these.

where B and/or C have some bargaining power, the unanimity rule of the Secure/Unanimity Sequential MFN Game will continue to stop forward manipulation of the stage-2 disagreement points for A and C. But the *shape* of the stage-2 bargaining frontier can be manipulated by stage-1 choices as well. For example, A's marginal willingness to transfer to C is affected by its earlier transfer to B, if A's welfare is nonlinear in the level of transfers it grants or receives, and so the choice of $\overline{t}^B$ may affect the shape of the stage-2 bargaining frontier. In a general bargaining setting, altering stage-1 choices to manipulate the shape of the stage-two bargaining frontier in this way could influence the stage-2 bargaining solution and hence C's welfare, leading to a forward-manipulation problem of the general kind identified in Proposition 3.

6. Preventing Forward Manipulation through Renegotiation

A unanimity rule can solve the forward-manipulation problem, but such a rule may be difficult to follow in practice. An alternative approach is to introduce *renegotiation* opportunities, and thereby separate C's disagreement payoff from $(\tilde{\tau}^A,\overline{\tau}^B,\overline{t}^B)$. Indeed, the GATT/WTO explicitly allows for renegotiation. This is true both within a multilateral round of negotiation, when agreements reached between negotiating pairs early in the round may be "revisited" if subsequent negotiations with other partners do not go as expected (e.g., Jackson, 1969, p. 220), and it is also true outside of multilateral rounds, where explicit renegotiations of previous agreements are permitted (e.g., Jackson, 1969, pp. 229-238). In this section, we consider whether introducing renegotiation possibilities into the Secure Sequential MFN Game can solve the forward manipulation problem and lead to efficient outcomes.

We first describe the novel features of the *Secure/Renegotiation Sequential MFN Game*:

Stage 1: *A proposes* $(\tilde{\tau}^A,\overline{\tau}^B,\overline{t}^B)$, *which B accepts or rejects.*

Stage 2: *If B accepts, A proposes* $(\overline{\tau}^A,\overline{\tau}^C,\overline{t}^C)$, *where* $W^B(\overline{\tau}^A,\overline{\tau}^B,\overline{\tau}^C,\overline{t}^B)=\hat{W}^B_{\backslash C}(\tilde{\tau}^A,\overline{\tau}^B,\overline{t}^B)$ *and* $\overline{\tau}^A\leq\tilde{\tau}^A$, *which C accepts or rejects.*

Stage 3: *If B accepts in Stage 1 and C rejects in Stage 2, then A proposes* $(\tau_r^A,\tau_r^B,t_r^B)$, *which B accepts or rejects.*

The full extensive form of the Secure/Renegotiation Sequential MFN Game is given in Figure 4.[16]

Renegotiation can play the same role as unanimity in preventing the forward-manipulation problem and permitting efficient outcomes to be achieved, but an additional condition is required to assure that this is the case. To state this condition, we first consider the stage-3 proposal $(\tau_r^A, \tau_r^B, t_r^B)$ that A makes to B if B accepts in stage 1 and C rejects in stage 2. This proposal solves:

$$\begin{array}{lll} \underset{(\tau_r^A, \tau_r^B, t_r^B)}{\text{Max}} & & W^A(\tau_r^A, \tau_r^B, \tau^{CR}(\tau_r^A, \tau_r^B, t^C \equiv 0), t_r^B) \\ & \text{s.t.} & W^B(\tau_r^A, \tau_r^B, \tau^{CR}(\tau_r^A, \tau_r^B, t^C \equiv 0), t_r^B) = W_N^B. \end{array}$$

If $(\tau_{\backslash C}^A, \tau_{\backslash C}^B, t_{\backslash C}^B)$ solves this program, and if B accepts, then the payoffs for A, B, and C, respectively, are $\hat{W}_{\backslash C}^{\ A}(\tau_{\backslash C}^A, \tau_{\backslash C}^B, t_{\backslash C}^B) \equiv W^A(\tau_{\backslash C}^A, \tau_{\backslash C}^B, \tau^{CR}, t_{\backslash C}^B)$, W_N^B, and $W_D^C(\tau_{\backslash C}^A, \tau_{\backslash C}^B) \equiv W^C(\tau_{\backslash C}^A, \tau_{\backslash C}^B, \tau^{CR}, t^C \equiv 0)$.

We now state the additional condition and the proposition that holds in its presence, and then interpret the condition and the problem that can arise in its absence. The additional condition is:

(A6) $\quad W_D^B(\tau_{\backslash B}^A, \tau_{\backslash B}^C) \leq W_N^B; \quad W_D^C(\tau_{\backslash C}^A, \tau_{\backslash C}^B) \leq W_N^C.$

We may now state:

Proposition 6: In the Secure/Renegotiation Sequential MFN Game, if (A5)-(A6) hold, then there exists a SGPE in which A implements its commitment solution for $\overline{W}_D^B = W_D^B(\tau_{\backslash B}^A, \tau_{\backslash B}^C)$ and $\overline{W}_D^C = W_D^C(\tau_{\backslash C}^A, \tau_{\backslash C}^B)$, and an efficient outcome is thereby achieved.

[16]For simplicity, we introduce renegotiation possibilities between A and B only if B accepts A's proposal in stage 1 and C rejects A's proposal in stage 2. But our results also hold in the presence of more extensive renegotiation opportunities. For example, if A and B are extended an opportunity to renegotiate also when B accepts in stage 1 and C *accepts* in stage 2, our results are unaffected (provided that this renegotiation preserves the security of A's earlier agreement with C). More generally, our results would not be altered by the introduction of further stages in which, if country $j \in \{B, C\}$ had accepted in its previous negotiation with A, it had the opportunity to renegotiate with A again after A's negotiation with $\backslash j$.

Proof: (Contained in the Appendix).

The equilibrium strategies that implement A's commitment solution in the Secure/ Renegotiation Sequential MFN Game are the same as those described for the Secure/Unanimity Sequential MFN Game when $D \equiv (\bar{W}^A_D < W^A(\boldsymbol{\tau}(D), t^A(D)),\ \bar{W}^B_D = W^B_D(\tau^A_{\backslash B}, \tau^C_{\backslash B}),\ \bar{W}^C_D = W^C_D(\tau^A_{\backslash C}, \tau^B_{\backslash C}))$. However, in the Secure/Unanimity Sequential MFN Game, only (A5) is needed to ensure the existence of a SGPE that achieves efficiency. In the Secure/Renegotiation Sequential MFN Game, on the other hand, (A6) is needed as well. The new problem that can arise when unanimity is replaced by renegotiation is that, rather than negotiate with each partner sequentially under the disagreement points $W^B_D(\tau^A_{\backslash B}, \tau^C_{\backslash B})$ and $W^C_D(\tau^A_{\backslash C}, \tau^B_{\backslash C})$, respectively, A might wish to *bypass* one of its trading partners to "isolate" the other and negotiate directly with it under that trading partner's Nash disagreement point. This option is not available to A in the unanimity game, where one disagreement stops all negotiations. Intuitively, the "bypass" problem is an extreme form of the free-rider problem associated with MFN, in which A chooses to bypass an early negotiation partner because the combined ability of *each* of A's trading partners to free-ride on A's negotiations with the other makes it undesirable for A to negotiate with both. This problem is avoided under (A6).

Absent renegotiation possibilities, the bypass problem could in some circumstances be avoided by ordering A's negotiation partners by size and negotiating first with the largest partner, because it will not be in A's interest to bypass a sufficiently large trading partner in order to isolate a relatively small one. This procedure essentially describes the "chief-" or "principal-supplier" rule that is sometimes utilized in GATT/WTO negotiations, a rule that has been credited with minimizing free-rider issues associated with MFN.[17] However, the renegotiation opportunities provided in the Secure/Renegotiation Sequential MFN Game make the possibility of bypass symmetric for B and

[17]For example, in describing the operations of the U.S. Reciprocal Trade Agreements Program, which itself served as a model for many of the features of GATT, Beckett observes: "A serious problem is encountered in a program which combines most-favored-nation treatment with a bilateral tariff bargaining procedure. If, for example, we should grant, in agreements with a few important nations, duty concessions upon our leading imports from them and generalize these concessions to other nations, our bargaining power for future agreements would be greatly reduced. To avoid such a situation, the chief supplier principle is used as the guiding rule for granting reductions (or bindings) of duties stipulated in the Tariff Act of 1930." (Beckett, 1941, p. 21).

C, and so the order in which B and C negotiate with A cannot solve the problem.

In a sense the bypass problem can be traced to an issue of bargaining power, and in particular to the possibility that A may have "too much" of it in its bargaining with B and C. After all, in more general bargaining environments A's payoff will be sensitive to both the disagreement payoff of its negotiating partner *and* its own disagreement payoff, and the latter *must* be (weakly) lower when A chooses to bypass than when A chooses to negotiate (since in the event of disagreement in stages 1 or 2 A's subsequent negotiations proceed under a Nash disagreement point). To illustrate starkly that giving B and C sufficient bargaining power can solve the bypass problem, we consider the following alternative game in which B and C each make take-it-or-leave-it offers to A. As A is now the "passive" participant in each of its bilateral negotiations, we call this alternative game the *Passive Secure/Renegotiation Sequential MFN Game*:

Stage 1: *B proposes* $(\tilde{\tau}^A, \bar{\tau}^B, \overline{t}^B)$, *which A accepts or rejects.*

Stage 2: *If A accepts, C proposes* $(\bar{\tau}^A, \bar{\tau}^C, \overline{t}^C)$, *where* $W^B(\bar{\tau}^A, \bar{\tau}^B, \bar{\tau}^C, \overline{t}^B) = \hat{W}^B_{\backslash C}(\tilde{\tau}^A, \bar{\tau}^B, \overline{t}^B)$ *and* $\bar{\tau}^A \leq \tilde{\tau}^A$, *which A accepts or rejects.*

Stage 3: *If A accepts in Stage 1 and A rejects in Stage 2, then B proposes* $(\tau^A_r, \tau^B_r, t^B_r)$, *which A accepts or rejects.*

The extensive form of the Passive Secure/Renegotiation Sequential MFN Game is identical to that of the Secure/Renegotiation Sequential MFN Game illustrated in Figure 4, but now B and C each have all the bargaining power as they negotiate with A.

In analogy with our approach above, let us first consider the stage-3 proposal $(\tau^A_r, \tau^B_r, t^B_r)$ that B makes to A if A accepts in stage 1 and A rejects in stage 2. B's proposal to A solves:

$$\max_{(\tau^A_r, \tau^B_r, t^B_r)} \quad W^B(\tau^A_r, \tau^B_r, \tau^{CR}(\tau^A_r, \tau^B_r, t^C \equiv 0), t^B_r)$$

$$\text{s.t.} \quad W^A(\tau^A_r, \tau^B_r, \tau^{CR}(\tau^A_r, \tau^B_r, t^C \equiv 0), t^B_r) = W^A_N.$$

If $(\bar{\tau}^A_{\backslash C}, \bar{\tau}^B_{\backslash C}, \bar{t}^B_{\backslash C})$ solves this program, and if A accepts, then the payoffs are W^A_N, $\hat{W}^B_{\backslash C}(\bar{\tau}^A_{\backslash C}, \bar{\tau}^B_{\backslash C}, \bar{t}^B_{\backslash C}) \equiv W^B(\bar{\tau}^A_{\backslash C}, \bar{\tau}^B_{\backslash C}, \tau^{CR}, \bar{t}^B_{\backslash C})$, and $W^C_D(\bar{\tau}^A_{\backslash C}, \bar{\tau}^B_{\backslash C}) \equiv W^C(\bar{\tau}^A_{\backslash C}, \bar{\tau}^B_{\backslash C}, \tau^{CR}, t^C \equiv 0)$. We may now state:

Proposition 7: In the Passive Secure/Renegotiation Sequential MFN Game, if (A5) holds, then there exists a SGPE in which B implements its commitment solution for $\bar{W}^A_D = W^A_N$ and $\bar{W}^C_D = W^C_D(\bar{\tau}^A_{\backslash C}, \bar{\tau}^B_{\backslash C})$, and an efficient outcome is thereby achieved.

Proof: (Contained in the Appendix).

As Proposition 7 indicates, if sufficient bargaining power resides with B and C, the bypass problem cannot arise, and (A6) is then not required to ensure efficiency. Finally, we observe that, while each of the games considered in this section adopts an extreme allocation of bargaining power, when the bargaining power lies in between these two extremes additional opportunities for forward manipulation can arise, namely, those associated with the shape of the stage-2 bargaining frontier.

7. The WTO

We now introduce an explicit economic model and use it to place additional structure on government objective functions. With this additional structure, we then proceed to tie the results of the previous sections more closely to WTO rules and practice.

7.1 The Generalized Terms-of-Trade Framework

In this subsection we develop the economic environment in more detail. Provided that country A's (MFN) tariff is non-prohibitive with regard to trade with each of its trading partners B and C, there will be a common exporter price for good *x* in countries B and C, and we denote this price by p_x^*. The export price for good *y* in country A is denoted by p_y^A. We may define the ratio of "world" prices (relative exporter prices) as $p^w \equiv p_x^*/p_y^A$. We refer to p^w as the world price or the *terms of trade* between country A and its trading partners B and C. Similarly, we let $p^j \equiv p_x^j/p_y^j$ denote the price of good *x* relative to the price of good *y* prevailing locally in country $j \in \{A, B, C\}$. We refer to p^j as the ratio of *local prices* in country *j*. With non-prohibitive tariffs, international arbitrage links world and local prices:

$$p^A = \tau^A p^w \equiv p^A(\tau^A, p^w); \; p^j = p^w/\tau^j \equiv p^j(\tau^j, p^w) \text{ for } j \in \{B,C\}.$$

We assume that the international transfers have no secondary burden or blessing (i.e., that they do not affect the equilibrium terms of trade). In each country, the sum of net transfers and tariff revenue is distributed to consumers in a lump-sum fashion.

For any world price, each country's trade must balance in light of its net transfers:

$$\begin{aligned} &p^w M^A(p^A(\tau^A, p^w), p^w, t^A) = E^A(p^A(\tau^A, p^w), p^w, t^A) - t^A, \\ (5) \qquad & \\ &M^j(p^j(\tau^j, p^w), p^w, t^j) - t^j = p^w E^j(p^j(\tau^j, p^w), p^w, t^j), \quad j \in \{B,C\}, \end{aligned}$$

where M^j and E^j for $j \in \{A,B,C\}$ denote, respectively, imports and exports for country *j*. We express imports and exports in the usual way, as functions of local prices and the terms of trade, as well as net transfers. We assume that transfers are never so large as to cause a country to export or import both goods (i.e., we do not allow a country's transfer to be larger than its trade in good *y*). Market clearing determines the equilibrium world price as a function of the vector of tariffs $\boldsymbol{\tau}$. With $\tilde{p}^w(\boldsymbol{\tau})$ denoting the equilibrium terms of trade, the *x*-market clearing condition is given by:

$$(6) \qquad M^A(p^A(\tau^A, \tilde{p}^w), \tilde{p}^w, t^A) = E^B(p^B(\tau^B, \tilde{p}^w), \tilde{p}^w, t^B) + E^C(p^C(\tau^C, \tilde{p}^w), \tilde{p}^w, t^C).$$

The *y*-market is then assured to clear at $\tilde{p}^w(\boldsymbol{\tau})$ by (5). We assume that the Marshall-Lerner stability conditions are met globally (ensuring that $\tilde{p}^w$ is uniquely defined by $\boldsymbol{\tau}$), so that an inward shift of a country's import demand curve improves its terms-of-trade, and that the Lerner and Metzler paradoxes are ruled out, so that $\partial \tilde{p}^w / \partial \tau^A < 0$, $dp^A/d\tau^A > 0$, $\partial \tilde{p}^w / \partial \tau^j > 0$ and $dp^j/d\tau^j < 0$ for $j \in \{B,C\}$.

Finally, we represent the objectives of each government as a general function of its local prices, its terms of trade, and the net transfers it grants or receives. In particular, we represent the welfare of the government of country *j* by $\overline{W}^j(p^j(\tau^j, \tilde{p}^w), \tilde{p}^w, t^j)$ for $j \in \{A,B,C\}$. We place the following basic restrictions on these objective functions. First, we assume that, holding its local prices and its terms of trade fixed, each government would prefer an increase in net transfers toward it: $\overline{W}^A_{t^A} < 0$; $\overline{W}^B_{t^B} > 0$; $\overline{W}^C_{t^C} > 0$. Second, we assume that, holding its local prices and its net transfer fixed, each country would prefer a terms-of-trade improvement: $\overline{W}^A_{\tilde{p}^w} < 0$; $\overline{W}^B_{\tilde{p}^w} > 0$; $\overline{W}^C_{\tilde{p}^w} > 0$. In fact, as these terms-of-trade improvements imply international income transfers of a magnitude related directly to the volume of trade, we impose the further conditions that:[18]

(7a) $\overline{W}^A_{\tilde{p}^w} \equiv M^A(p^A(\tau^A,\tilde{p}^w),\tilde{p}^w,t^A) \times \overline{W}^A_{t^A}$;

(7b) $\overline{W}^B_{\tilde{p}^w} \equiv \dfrac{[M^B(p^B(\tau^B,\tilde{p}^w),\tilde{p}^w,t^B) - t^B]}{\tilde{p}^w} \overline{W}^B_{t^B}$; and

(7c) $\overline{W}^C_{\tilde{p}^w} \equiv \dfrac{[M^C(p^C(\tau^C,\tilde{p}^w),\tilde{p}^w,t^C) - t^C]}{\tilde{p}^w} \overline{W}^C_{t^C}$.

As we have argued extensively elsewhere (see Bagwell and Staiger, 1999a), by leaving government preferences over local prices unspecified, our representation of government objectives is very general and is consistent with national-income-maximizing governments as well as governments that are motivated by various political/distributional concerns.[19]

Defining $W^j(\boldsymbol{\tau},t^j) \equiv \overline{W}^j(p^j(\tau^j,\tilde{p}^w(\boldsymbol{\tau})),\tilde{p}^w(\boldsymbol{\tau}),t^j)$, we now impose (A1) and (A2) and maintain these assumptions throughout this section. We record the following lemma:

Lemma 2: Any point on the efficiency frontier satisfying (A1) and (A2) satisfies (A3) as well.

Proof: Utilizing $W^j(\boldsymbol{\tau},t^j) \equiv \overline{W}^j(p^j(\tau^j,\tilde{p}^w(\boldsymbol{\tau})),\tilde{p}^w(\boldsymbol{\tau}),t^j)$, it follows that (A1), (A2) and (1) imply $dW^j/d\tau^A < 0$ while $sign[dW^j/d\tau^A] = -sign[dW^j/d\tau^{\backslash j}]$ and hence $dW^j/d\tau^{\backslash j} > 0$ for $j \in \{B,C\}$. **QED**

In light of Lemma 2, we may now state:

Lemma 1': At any efficient point satisfying (A1)-(A2), the following restrictions apply:

(*i*) $dW^j/d\tau^j > 0,\ j \in \{A,B,C\}$;

(R1) (*ii*) $dW^A/d\tau^j < 0,\ dW^j/d\tau^A < 0,\ j \in \{B,C\}$;

(*iii*) $dW^j/d\tau^{\backslash j} > 0,\ j \in \{B,C\}$.

[18]Holding local prices fixed, changes in the terms of trade and the transfer each affect government welfare through their impact on government revenue. With this observation, conditions (7a) - (7c) may be derived.

[19]As in earlier sections, we assume that each government's welfare is globally concave in its own tariff.

In analogy with (E1)-(E3), the efficiency frontier is described by the three conditions:

(F1) $$\frac{\tilde{p}^{w}\times\bar{W}^{A}_{p^{A}}}{\bar{W}^{A}_{t^{A}}}\times\frac{\partial\tilde{p}^{w}/\partial\tau^{B}}{\partial\tilde{p}^{w}/\partial\tau^{A}} = \frac{p^{B}\bar{W}^{B}_{p^{B}}}{\tau^{B}\bar{W}^{B}_{t^{B}}};$$

(F2) $$\frac{\tilde{p}^{w}\times\bar{W}^{A}_{p^{A}}}{\bar{W}^{A}_{t^{A}}}\times\frac{\partial\tilde{p}^{w}/\partial\tau^{C}}{\partial\tilde{p}^{w}/\partial\tau^{A}} = \frac{p^{C}\bar{W}^{C}_{p^{C}}}{\tau^{C}\bar{W}^{C}_{t^{C}}}\text{ ; and}$$

(F3) $$\frac{-[\tau^{A}\bar{W}^{A}_{p^{A}} + \bar{W}^{A}_{p^{w}}]}{\bar{W}^{A}_{t^{A}}} = \frac{-[(1/\tau^{B})\bar{W}^{B}_{p^{B}} + \bar{W}^{B}_{p^{w}}]}{\bar{W}^{B}_{t^{B}}} + \frac{-[(1/\lambda^{C})\bar{W}^{C}_{p^{C}} + \bar{W}^{C}_{p^{w}}]}{\bar{W}^{C}_{t^{C}}},$$

where $\lambda^{C}\equiv[\partial\tilde{p}^{w}/\partial\tau^{C}]/[dp^{C}/d\tau^{C}]<0$. These three conditions have analogous interpretations to (E1)-(E3), as described above with reference to Figures 1A and 1B.

We observe that, in light of (5)-(7), a straightforward way to satisfy (F1)-(F3) and so achieve a point on the efficiency frontier for any t^{B} and t^{C} is to set tariffs at their associated *politically optimal* levels (see Bagwell and Staiger, 1999a), as defined by the three conditions $\bar{W}^{j}_{p^{j}}=0$ for $j\in\{A,B,C\}$. Politically optimal tariffs achieve the efficiency frontier, because they are the tariffs that governments would choose unilaterally if they "ignored" their ability to shift the costs of protection on to foreign exporters through terms-of-trade movements, and because this international cost-shifting is the only source of inefficiency in their unilateral tariff choices. For future reference, we let $\boldsymbol{\tau}^{po}$ denote a vector of politically optimal tariffs.

We refer to the framework described here as the *generalized terms-of-trade framework*, because it includes as special cases each of the leading political-economy models of tariff formation as well as the traditional benevolent-government approach (see Bagwell and Staiger, 1999a).

7.2 Confirming Propositions 1-7 in the Generalized Terms-of-Trade Framework

In light of Lemma 1' above, we first observe that Propositions 1-3 apply in the generalized terms-of-trade framework under (A1) and (A2), i.e., the remaining assumption (A3) required for Propositions 1-3 is automatically satisfied in the generalized terms-of-trade framework. We next observe that Proposition 4 requires as well that (A4) hold. But in the generalized terms-of-trade framework, (A4) is automatically satisfied, because with C positioned on its reaction curve the impact on C's welfare of an increase in $\tilde{\tau}^A$ has the same sign as the impact of the increase in $\tilde{\tau}^A$ on the world price, and is therefore strictly negative as (A4) requires.[20] Hence, in the generalized terms-of-trade framework, Proposition 4 also applies under (A1) and (A2). We summarize this with:

Proposition 8: In the generalized terms-of-trade framework, Propositions 1-4 apply under (A1)-(A2).

We next observe that Propositions 5 and 7 require as well assumption (A5). In the generalized terms-of-trade framework, a sufficient condition for (A5) is that the politically optimal tariffs are independent of transfers, and that C's reaction curve is not "too steep." We state this condition as:

(A7) (i) $\overline{W}^j_{p^j t^j}(p^j(\tau^j,\overline{p}^w),\overline{p}^w,t^j) = 0$ for any $\overline{p}^w$ and for $j \in \{A,B,C\}$; (ii) $\dfrac{\partial\tau^{CR}}{\partial\tau^A} < -[\dfrac{\partial\tilde{p}^w/\partial\tau^A}{\partial\tilde{p}^w/\partial\tau^C}]$.

Under (A7)(i), the politically optimal tariff levels for each of the three countries are uniquely defined by the three conditions $\overline{W}^j_{p^j}=0$ for $j \in \{A,B,C\}$, and with tariffs set at their politically optimal levels the transfers may then be chosen to reach any point on the efficiency frontier. Condition (A7)(i) implies that (A5)(i) will be satisfied, because when politically optimal tariffs are independent of transfers these tariffs can always be used to solve A's commitment problem, and politically optimal tariffs are guaranteed to satisfy (A5)(i). Condition (A7)(ii) ensures that (A5)(ii) holds in the generalized terms-of-trade framework, because in this framework B's welfare is affected by changes in the tariffs of A and C only through the induced movement in the world price. (A7)(ii) implies $d\tilde{p}^w(\tau^A,\tau^B,\tau^{CR}(\tau^A,\cdot))/d\tau^A<0$, and with $\partial\tilde{p}^w/\partial\tau^C>0$ it then follows that (A5)(ii) is satisfied.

[20] To see this, note that $d\overline{W}^C/d\tau^A=[\overline{W}^C_{p^C}/\tau^C+\overline{W}^C_{p^w}][\partial\tilde{p}^w/\partial\tau^A]$, while C's reaction curve is defined implicitly by $\overline{W}^C_{p^C}+\lambda^C\overline{W}^C_{p^w}=0$. It follows that, when C is positioned on its reaction curve, $d\overline{W}^C/d\tau^A=[1-\lambda^C\tau^{CR}]\overline{W}^C_{p^w}[\partial\tilde{p}^w/\partial\tau^A]<0$ as required by (A4).

Condition (A7) is satisfied, for example, when all governments maximize national income, and it is satisfied as well for the case of politically determined tariffs in which utility takes a quasi-linear form, as in Baldwin (1987) and Grossman and Helpman (1994, 1995). We may now state:

Proposition 9: In the generalized terms-of-trade framework, Propositions 5 and 7 apply under (A1)-(A2) and (A7).

Consider next Proposition 6. This proposition requires (A5) and (A6). But in the generalized terms-of-trade framework, (A6) must hold if countries are "sufficiently symmetric participants" in the multilateral Nash tariff war. To make this precise, we first provide a definition of symmetry. To this end, let $\tau^{jpo}(\tilde{p}^{wN})$ denote the τ^j that solves $W^j_{p^j}(p^j(\tau^j,\tilde{p}^{wN}),\tilde{p}^{wN}),t^j) = 0$ for $j \in \{A,B,C\}$, and observe that $\tau^{jpo}(\tilde{p}^{wN})$ is independent of t^j by (A7). Let $\hat{p}^w(\tau^A,\tau^j) \equiv \tilde{p}^w(\tau^A,\tau^j,\tau^{\backslash jR}(\tau^A,\tau^j,t^{\backslash j} \equiv 0))$. Then we say that A and j are *symmetric participants in the multilateral Nash tariff war* if and only if $\hat{p}^w(\tau^{Apo}(\tilde{p}^{wN}),\tau^{jpo}(\tilde{p}^{wN})) = \tilde{p}^{wN}$. Accordingly, when A and j are symmetric, their pursuit of inefficient cost-shifting motives leads to a *balanced* reduction in world trade volumes (i.e., with $\backslash j$ positioned on its zero-transfer reaction curve, the movement from $(\tau^{Apo}(\tilde{p}^{wN}),\tau^{jpo}(\tilde{p}^{wN}))$ to the Nash tariffs (τ^{AN},τ^{jN}) does not alter the terms of trade). This definition is a natural 3-country generalization of the traditional notion of symmetric participants in a 2-country tariff war (i.e., neither country succeeds in moving the terms of trade in its favor as a result of their bilateral tariff war).

Armed with this definition, and recalling that $(\tau^A_{\backslash C},\tau^B_{\backslash C})$ and $(\tau^A_{\backslash B},\tau^C_{\backslash B})$ are the tariffs that A proposes to B and to C, respectively, in the environment where the third country sets its best-response tariff, we next observe that, in the generalized terms-of-trade framework, (A6) holds if and only if the implied world price under A's proposal in this environment is no greater than the Nash world price, or:[21]

(8) $\hat{p}^w(\tau^A_{\backslash B},\tau^C_{\backslash B}) \leq \tilde{p}^{wN}$; $\hat{p}^w(\tau^A_{\backslash C},\tau^B_{\backslash C}) \leq \tilde{p}^{wN}$.

But when A is a sufficiently symmetric participant in the multilateral Nash tariff war with each of

[21] See the arguments in note 20.

its trading partners, condition (8) must be met. To see this, consider the case of perfect symmetry, where $\hat{p}^w(\tau^{Apo}(\tilde{p}^{wN}),\tau^{jpo}(\tilde{p}^{wN})) = \tilde{p}^{wN}$. In that case, any proposal that violates (8) could be improved upon by proposing the alternative tariffs $(\tau^{Apo}(\tilde{p}^{wN}),\tau^{jpo}(\tilde{p}^{wN}))$ and a transfer t^j that drives j to its disagreement welfare. This alternative proposal must be better for A, because beginning from an original proposal that violates (8) we may construct a two-step path to this alternative proposal along which A gains at each step: (i) move τ^A, τ^j and $\tau^{\backslash j}$ along the iso-world-price locus implied by the original proposal to the point where A and j each achieve their ideal local price conditional on the world price, and adjust t^j to hold j to its disagreement welfare; and then (ii) adjust $\tau^{\backslash j}$ to reduce the world price from its original level to $\tilde{p}^{wN}$ while continuing to adjust τ^A and τ^j to give A and j their ideal local price conditional on the world price, and adjust t^j to hold j to its disagreement welfare. These two steps describe a path from the original proposal to the alternative proposal, and A gains in both steps (i) and (ii), and so the alterative proposal improves upon any proposal that violates (8). Consequently, condition (8) is satisfied whenever A and each of its trading partners are sufficiently symmetric participants in the multilateral Nash tariff war. We may thus state:

Proposition 10: In the generalized terms-of-trade framework, Proposition 6 applies under (A1)-(A2) and (A7) if governments are sufficiently symmetric participants in the multilateral Nash tariff war.

7.3 A Market-Access Interpretation of the Backward -Stealing and Forward-Manipulation Problems

Within the generalized terms-of-trade framework, each of the results reported above may be given a terms-of-trade interpretation. For example, the backward-stealing problem highlighted in Propositions 1 and 2 may be interpreted from the perspective of the incentive that A and C have to turn the terms of trade against B in their stage-2 negotiations. This interpretation follows from the fact that the reduction in $\bar{\tau}^C$ below its efficient level, which is contemplated in the proof of Proposition 2, reduces $\tilde{p}^w$ and thereby helps A while hurting both B and C, and A can compensate C with an increase in $\bar{t}^C$ while enjoying the improved terms of trade against B. Similarly, the forward manipulation problem highlighted in Propositions 3 and 4 may be interpreted from the perspective of the incentive that A and B have to turn the terms of trade against C. This interpretation follows from the fact that the increase in $\tilde{\tau}^A$ considered in the proof of Proposition 4 reduces $\tilde{p}^w$, and thereby hurts B but helps A in its subsequent negotiations with C (by depressing C's disagreement payoff), and A can compensate B with an increase in $\overline{t}^B$ while enjoying the improved bargaining position against C.

But is there any connection between the problem of terms-of-trade manipulation identified in the generalized terms-of-trade framework and the concerns about the balance of market access commitments that dominate GATT/WTO discussions? In this subsection we answer this question in the affirmative. As we now show, concerns about the security and/or manipulation of the balance of negotiated market access rights and obligations *are* concerns about terms-of-trade manipulation.

To see this, it is necessary to establish a formal link between, on the one hand, the balance of market access rights and obligations that are agreed to in a negotiation, and on the other hand, the terms of trade that are implied by that negotiation. To forge this link, we must define the *market access* that one country affords to a second. We define this by the first country's volume of import demand for the exports of the second country at a given world price. Hence, the market access that countries B and C each afford to A at a given world price $\overline{p}^w$ is defined by their respective import demands at that world price:

$$MA^j(\tau^j,t^j;\overline{p}^w) \equiv M^j(p^j(\tau^j,\overline{p}^w),\overline{p}^w,t^j) \ \ for\ j \in \{B,C\}\,.$$

The market access that country A affords to country *j* is A's *residual* import demand for *j*'s exports – after the other country's export supply to A has been netted out – at a given world price:

$$MA^{Aj}(\tau^A,\tau^{\backslash j},t^B,t^C;\overline{p}^w) \equiv M^A(p^A(\tau^A,\overline{p}^w),\overline{p}^w,t^A(t^B,t^C)) - E^{\backslash j}(p^{\backslash j}(\tau^{\backslash j},\overline{p}^w),\overline{p}^w,t^{\backslash j}) \ \ for\ j \in \{B,C\}\,.$$

With market access defined, we may now consider the link between the balance of market access rights and obligations and the terms of trade.

We define the *balance of market access rights and obligations* between A and *j* that is implied by a vector of negotiated tariffs and transfers at a given world price by

$$B^{Aj}(\boldsymbol{\tau},t^B,t^C;\overline{p}^w) \equiv [MA^j(\tau^j,t^j;\overline{p}^w) - \overline{p}^w \times MA^{Aj}(\tau^A,\tau^{\backslash j},t^B,t^C;\overline{p}^w)] \ \ \text{for } j \in \{B,C\}\,.$$

We may now state:

Lemma 3: $\tilde{p}^w(\boldsymbol{\tau}^{\mathbf{0}})=\tilde{p}^w(\boldsymbol{\tau}^{\mathbf{1}})$ if and only if $B^{Aj}(\boldsymbol{\tau}^{\mathbf{0}},t^B,t^C;\tilde{p}^w(\boldsymbol{\tau}^{\mathbf{0}}))=B^{Aj}(\boldsymbol{\tau}^{\mathbf{1}},t^B,t^C;\tilde{p}^w(\boldsymbol{\tau}^{\mathbf{0}}))$ for some $j\in\{B,C\}$. Further, if $B^{Aj}(\boldsymbol{\tau}^{\mathbf{0}},t^B,t^C;\tilde{p}^w(\boldsymbol{\tau}^{\mathbf{0}}))=B^{Aj}(\boldsymbol{\tau}^{\mathbf{1}},t^B,t^C;\tilde{p}^w(\boldsymbol{\tau}^{\mathbf{0}}))$ holds for some $j\in\{B,C\}$, then it holds for each $j\in\{B,C\}$.

Proof: By (5) and (6), $B^{Aj}(\boldsymbol{\tau}^{\mathbf{0}},t^B,t^C;\tilde{p}^w(\boldsymbol{\tau}^{\mathbf{0}}))=t^j=B^{Aj}(\boldsymbol{\tau}^{\mathbf{1}},t^B,t^C;\tilde{p}^w(\boldsymbol{\tau}^{\mathbf{1}}))$ for each $j\in\{B,C\}$. Hence, if $\tilde{p}^w(\boldsymbol{\tau}^{\mathbf{0}})=\tilde{p}^w(\boldsymbol{\tau}^{\mathbf{1}})$ then $B^{Aj}(\boldsymbol{\tau}^{\mathbf{1}},t^B,t^C;\tilde{p}^w(\boldsymbol{\tau}^{\mathbf{0}}))=t^j$ for each $j\in\{B,C\}$ also. Going the other way, if $B^{Aj}(\boldsymbol{\tau}^{\mathbf{0}},t^B,t^C;\tilde{p}^w(\boldsymbol{\tau}^{\mathbf{0}}))=B^{Aj}(\boldsymbol{\tau}^{\mathbf{1}},t^B,t^C;\tilde{p}^w(\boldsymbol{\tau}^{\mathbf{0}}))$ for some $j\in\{B,C\}$, then (5) and (6) imply $\tilde{p}^w(\boldsymbol{\tau}^{\mathbf{0}})=\tilde{p}^w(\boldsymbol{\tau}^{\mathbf{1}})$, and further $B^{Aj}(\boldsymbol{\tau}^{\mathbf{0}},t^B,t^C;\tilde{p}^w(\boldsymbol{\tau}^{\mathbf{0}}))=B^{Aj}(\boldsymbol{\tau}^{\mathbf{1}},t^B,t^C;\tilde{p}^w(\boldsymbol{\tau}^{\mathbf{0}}))$ for each $j\in\{B,C\}$. **QED**

According to Lemma 3, two vectors of tariffs imply the same balance of market access rights and obligations if and only if they imply the same terms of trade. Hence, the terms-of-trade interpretation of the backward-stealing problem noted above may be equivalently expressed in the language of market access: A and C have an incentive to use their negotiations to upset the balance of market access rights and obligations that were implied by the original negotiations between A and B. Similarly, the terms-of-trade interpretation of the forward-manipulation problem may be equivalently expressed in market-access terms: A and B have an incentive to manipulate the balance of market access rights and obligations implied by their negotiations in order to position A more favorably for its subsequent negotiations with C. We summarize this with:

Proposition 11: In the generalized terms-of-trade framework, the backward-stealing and forward-manipulation problems that can arise when governments negotiate sequentially in an MFN environment reflect incentives of the negotiating parties to position the balance of market access rights and obligations in a way that is disadvantageous for unrepresented governments.

7.4 Reciprocity as a Means to Prevent Backward Stealing

To address the backward-stealing problem, we have imposed in the Secure Sequential MFN Game and each of the games that follow the rule that the stage-1 agreement between A and B must be secure against backward stealing in the specific sense that, following an agreement between A and B in stage 1, any stage-2 agreement between A and C satisfies:

$$(10) \qquad W^B(\bar{\tau}^A,\bar{\tau}^B,\bar{\tau}^C,\bar{t}^B)=\hat{W}^B_{\backslash C}(\tilde{\tau}^A,\bar{\tau}^B,\bar{t}^B).$$

According to this rule, any stage-2 agreement between A and C which follows a stage-1 agreement between A and B must leave B with the welfare it would attain if its stage-1 agreement with A were implemented and there were no stage-2 agreement between A and C. But what is the practical feasibility of such a rule?

We now observe that, in the generalized terms-of-trade framework, this rule has a simple interpretation along the lines of *reciprocity*. To see this, we first need to define reciprocity, and we then need to express (10) in terms of the government objective functions of the generalized terms-of-trade framework. We say that stage-2 negotiations between A and C *conform to reciprocity* if the negotiated tariff changes in stage 2 bring about for A and C equal changes in the level of market access they afford to one another, when these market access levels are measured at the world price implied by stage-1 negotiations (i.e., at $\hat{p}^w(\tilde{\tau}^A,\bar{\tau}^B)$) and with $t^C\equiv 0$:

$$(11) \qquad \begin{aligned}&\hat{p}^w(\tilde{\tau}^A,\bar{\tau}^B)\times[MA^{AC}(\bar{\tau}^A,\bar{\tau}^B,\bar{t}^B,t^C\equiv 0;\hat{p}^w(\tilde{\tau}^A,\bar{\tau}^B)) - MA^{AC}(\tilde{\tau}^A,\bar{\tau}^B,\bar{t}^B,t^C\equiv 0;\hat{p}^w(\tilde{\tau}^A,\bar{\tau}^B))]\\ &= [MA^C(\bar{\tau}^C,t^C\equiv 0;\hat{p}^w(\tilde{\tau}^A,\bar{\tau}^B)) - MA^C(\tau^{CR},t^C\equiv 0;\hat{p}^w(\tilde{\tau}^A,\bar{\tau}^B))]\end{aligned}.$$

But letting $\boldsymbol{\tau}^{\mathbf{0}}\equiv(\tilde{\tau}^A,\bar{\tau}^B,\tau^{CR})$, we observe that $\hat{p}^w(\tilde{\tau}^A,\bar{\tau}^B)=\tilde{p}^w(\boldsymbol{\tau}^{\mathbf{0}})$. Therefore, letting $\boldsymbol{\tau}^{\mathbf{1}}\equiv(\bar{\tau}^A,\bar{\tau}^B,\bar{\tau}^C)$, it follows that tariff changes which satisfy (11) imply $B^{AC}(\boldsymbol{\tau}^{\mathbf{0}},\bar{t}^B,t^C\equiv 0;\tilde{p}^w(\boldsymbol{\tau}^{\mathbf{0}}))=B^{AC}(\boldsymbol{\tau}^{\mathbf{1}},\bar{t}^B,t^C\equiv 0;\tilde{p}^w(\boldsymbol{\tau}^{\mathbf{0}}))$. Hence by Lemma 3 we have:

Lemma 4: Stage-2 negotiations between A and C that conform to reciprocity will preserve the world price implied by stage-1 negotiations between A and B.

We next express (10) in terms of the government objective functions of the generalized terms-of-trade framework:

$$\bar{W}^B(p^B(\bar{\tau}^B,\tilde{p}^w(\bar{\tau}^A,\bar{\tau}^B,\bar{\tau}^C)),\tilde{p}^w(\bar{\tau}^A,\bar{\tau}^B,\bar{\tau}^C),\bar{t}^B) = \bar{W}^B(p^B(\bar{\tau}^B,\hat{p}^w(\tilde{\tau}^A,\bar{\tau}^B)),\hat{p}^w(\tilde{\tau}^A,\bar{\tau}^B),\bar{t}^B).$$

It is now immediate that, in the generalized terms-of-trade framework, the rule embodied in (10) reduces to $\tilde{p}^w(\bar{\tau}^A,\bar{\tau}^B,\bar{\tau}^C) = \hat{p}^w(\tilde{\tau}^A,\bar{\tau}^B)$. Hence, in light of Lemma 4, we may state:

Proposition 12: In the generalized terms-of-trade framework, the backward-stealing problem will not arise if stage-2 negotiations conform to reciprocity.

7.5 Nullification-or-Impairment as a Means to Induce Reciprocity

The GATT/WTO does not in fact *require* negotiated agreements to conform to reciprocity, but it is often observed that governments *seek* reciprocity in their GATT/WTO negotiations, and in this sense reciprocity is a GATT/WTO *norm*. Is there a GATT/WTO rule that might work to *induce* stage-2 negotiations to conform to reciprocity? We next argue that, in the presence of a reciprocity norm, the "non-violation nullification-or-impairment" provisions of the WTO can work to this affect. We begin by describing these provisions.

GATT/WTO Dispute Panels consistently recognize the value of a tariff concession to be the improved market access which it represents (see, for example, the discussion in footnote 5). Accordingly, when a government takes some action that "nullifies or impairs" a previous concession made to some trading partner, that partner has a potentially legitimate basis from which to file a complaint. Nullification complaints are handled under GATT Article XXIII, and they may be lodged even if no violation of WTO rules is alleged. As Petersmann (1997) details, there are three established conditions for a successful "non-violation" complaint of this kind: (i). a reciprocal concession was negotiated between two trading partners; (ii). a subsequent action was taken by one government, which, though consistent with GATT articles, adversely affected the market access afforded to its trading partner; and (iii). this action could not have been reasonably anticipated by this partner at the time of the negotiation of the original tariff concession.

In the context of the our sequential MFN bargaining games, the possibility of a non-violation complaint arises in stage-2, when A and B have already engaged in successful market access negotiations, and where A and C may now engage in negotiations which would deny market access from B. Such an action would satisfy the first two conditions listed above for a successful non-violation complaint on the part of B against A. But to evaluate the circumstances under which the third condition listed above would be met, we need to consider the level of market access that a government could *reasonably anticipate* it had attained in a previous negotiation.

To this end, we first define the market access afforded to country B by country A which is *implied* by the stage-1 negotiations of these two countries. We define this by the market access that A would give to B (at the implied terms of trade) if the results of their stage-1 negotiations were directly implemented: $MA^{AB}(\tilde{\tau}^A, \tau^{CR}, \overline{t}^B, t^C \equiv 0; \hat{p}^w(\tilde{\tau}^A, \overline{\tau}^B))$. With this definition in hand, we are now ready to consider the market access that country B could have *reasonably anticipated* as a result of its stage-1 negotiations with country A. Certainly, as the WTO is a forum for bilateral negotiations, it would be *un*reasonable for B *not* to anticipate that countries A and C might engage in subsequent negotiations. But these subsequent negotiations may be structured in a variety of ways, some of which could potentially have large adverse impacts on B's interests. So we need additional guidance on what could be reasonably anticipated to come out of these negotiations.

With this in mind, we invoke *reciprocity* as a WTO negotiating *norm*, and suppose that it defines what B can reasonably anticipate concerning the outcome of A's subsequent negotiations with C: hence, we assume that B can reasonably anticipate future negotiations between A and C which conform to the WTO norm of reciprocity. But by Lemma 4, negotiations between A and C which conform to reciprocity will preserve the world price implied by stage-1 negotiations between A and B, and by Lemma 3 this implies in turn that MA^{AB} will remain at the level implied by stage-1 negotiations when negotiations in stage 2 conform to reciprocity. Hence, we conclude that the level of market access that country B can *reasonably anticipate* as a result of its stage-1 negotiations with country A is simply that which is *implied* by their stage-1 negotiations.

Notice the difference between the role of reciprocity here and in the previous subsection. In the previous subsection, reciprocity was imposed as an additional restriction on the *outcome* of stage-2 agreements. Here, reciprocity is instead introduced as a negotiating norm: if a bilateral negotiation does not satisfy this norm, then the parties to the negotiation *may* be vulnerable to claims of nullification or impairment by a third party, *if* the third party had previously negotiated a market access agreement with one of them.[22]

We may now observe that, according to Lemma 3 and under our stability assumptions, a decline in B's terms of trade below that implied by stage-1 negotiations (i.e., a fall in $\tilde{p}^{w}$ below $\hat{p}^{w}(\tilde{\tau}^{A},\overline{\tau}^{B})$) would come about as a direct result of the stage-2 negotiations of A and C if and only if these negotiations served to reduce B's access to A's market below the level that B could have reasonably anticipated. When this is the case, we will say that stage-2 negotiations have *nullified* B's rights under its stage-1 agreement with A, and B is then given a right of redress: under the GATT/WTO nullification clause, country B may unilaterally raise its tariff above the binding it negotiated in stage 1, in order to withdraw a reciprocal amount of market access from country A and thereby preserve the balance of its market access rights and obligations (i.e., the terms of trade) at the level implied by stage-1 negotiations. We denote B's maximal permitted tariff response under the nullification clause by $\overline{\tau}^{BNV}(\overline{\tau}^{A},\overline{\tau}^{C};\hat{p}^{w})$, and we observe that $\overline{\tau}^{BNV}$ is defined implicitly by $\tilde{p}^{w}(\overline{\tau}^{A},\tau^{BNV},\overline{\tau}^{C})=\hat{p}^{w}$.

We now describe the *Nullification-or-Impairment/Renegotiation Sequential MFN Game*:

Stage 1: *A proposes* $(\tilde{\tau}^{A},\overline{\tau}^{B},\overline{t}^{B})$, *which B accepts or rejects.*

Stage 2: *If B accepts, A proposes* $(\overline{\tau}^{A},\overline{\tau}^{C},\overline{t}^{C})$, *where* $\overline{\tau}^{A}\leq\tilde{\tau}^{A}$, *which C accepts or rejects.*

Stage 3: *If B accepts in Stage 1 and C accepts in Stage 2, then B selects* $\hat{\tau}^{B}\leq\max[\overline{\tau}^{B},\overline{\tau}^{BNV}]$.

Stage 4: *If B accepts in Stage 1 and C rejects in Stage 2, then A proposes* $(\tau_{r}^{A},\tau_{r}^{B},t_{r}^{B})$, *which B accepts or rejects.*

[22] In this regard, Hudec (1990, pp. 23-24) notes that the designers of GATT added nullification-or-impairment provisions precisely out of a concern for maintaining reciprocity established by negotiated market access agreements.

The full extensive form of the Secure/Renegotiation Sequential MFN Game is given in Figure 5. We may now state:

Proposition 13: In the generalized terms-of-trade framework, if (A1)-(A2) and (A7) hold, and if governments are sufficiently symmetric participants in the multilateral Nash tariff war, then there exists a SGPE of the Nullification-or-Impairment/Renegotiation Sequential MFN Game in which A implements its commitment solution for $\overline{W}_D^B = W_D^B(\tau_{\backslash B}^A, \tau_{\backslash B}^C)$ and $\overline{W}_D^C = W_D^C(\tau_{\backslash C}^A, \tau_{\backslash C}^B)$, and an efficient outcome is thereby achieved.

Proof: (Contained in the Appendix).

There are many equilibrium strategies that implement A's commitment solution in the Nullification-or-Impairment/Renegotiation Sequential MFN Game, but among those that accomplish this with politically optimal tariffs, there is only one set of strategies that does not trigger a nullification-or-impairment response from B: A proposes $(\tilde{\tau}^A, \overline{\tau}^B = \tau^{Bpo}, \overline{t}^B)$ in stage 1, where $\tilde{\tau}^A$ solves $\tilde{p}^w(\tilde{\tau}^A, \tau^{Bpo}) = \tilde{p}^w(\boldsymbol{\tau^{po}})$ and $\overline{t}^B$ solves $\overline{W}^B(p^B(\tau^{Bpo}, \tilde{p}^w(\boldsymbol{\tau^{po}})), \tilde{p}^w(\boldsymbol{\tau^{po}}), \overline{t}^B) = W_D^B(\tau_{\backslash B}^A, \tau_{\backslash B}^C)$, and in stage 2 A proposes $(\overline{\tau}^A = \tau^{Apo}, \overline{\tau}^C = \tau^{Cpo}, \overline{t}^C)$, where $\overline{t}^C$ solves $\overline{W}^C(p^C(\tau^{Cpo}, \tilde{p}^w(\boldsymbol{\tau^{po}})), \tilde{p}^w(\boldsymbol{\tau^{po}}), \overline{t}^C) = W_D^C(\tau_{\backslash C}^A, \tau_{\backslash C}^B)$. The role of (A7) is to ensure that A's commitment solution may be achieved with politically optimal tariff choices, which ensure in turn that A and C have nothing to gain from triggering a nullification-or-impairment response from B with their stage-2 negotiations.[23] Notice that under these strategies, the stage-2 negotiations between A and C conform to reciprocity. Hence we may state:

Corollary: Nullification-or-Impairment provisions can induce reciprocity in tariff negotiations.

7.6 The Political Optimum in General Bargaining Environments

As we have observed in earlier sections, unanimity or renegotiation provisions can solve the forward-manipulation problem in take-it-or-leave-it bargaining environments, but it does not then

[23]In analogy with Proposition 7, we may also define a "passive" version of the Nullification-or-Impairment/ Renegotiation Sequential MFN Game, in which B and C make the take-it-or-leave-it proposals to A. In this passive version of the game, efficiency does not require that governments are sufficiently symmetric.

necessarily follow that these provisions can perform this same function in more general bargaining settings. This is because these provisions prevent stage-1 choices from affected the disagreement point for stage-2 negotiations, but they do not prevent the shape of the stage-2 bargaining frontier from being manipulated by stage-1 choices, and in more general bargaining environments this could influence the stage-2 bargaining solution and hence C's welfare. Here we point out a special feature of the political optimum: namely, that it provides no incentive for forward manipulation of the shape of the stage-2 bargaining frontier, even in general bargaining environments.

To illustrate this feature, let us reconsider the Secure/Renegotiation Sequential MFN Game and suppose that, rather than making a take-it-or-leave-it offer to C in stage 2, A's stage-2 bargain with C is characterized by any (efficient) bargaining solution that satisfies *continuity*, so that small changes in the stage-2 bargaining frontier or disagreement point will imply small changes in the stage-2 bargaining solution. This includes many popular bargaining solutions such as the Nash, Kalai-Smorodinsky and Egalitarian bargaining solutions (see, for example, Thomson, 1994, pp. 1248-1262). To fix ideas, let us focus on the case where each government is a national-income maximizer, so that the politically optimal tariffs correspond to multilateral free trade (i.e., $\boldsymbol{\tau^{po}}=[1,1,1]$).[24] In this setting, if A were to propose to B in stage 1 the tariffs $(\tilde{\tau}^A,\bar{\tau}^B=1)$, where $\tilde{\tau}^A$ solves $\hat{p}^w(\tilde{\tau}^A,1)=\tilde{p}^w(1,1,1)$, then in stage-2 it is straightforward to see that A and C would select $(\bar{\tau}^A=1,\bar{\tau}^C=1)$ and thereby implement multilateral free trade regardless of their relative bargaining power, which itself would affect only the selection of $\bar{t}^C$. This is because any deviation from $(\bar{\tau}^A=1,\bar{\tau}^C=1)$ that maintains the security of the stage-1 agreement (i.e., preserves the world price at price $\tilde{p}^w(1,1,1)$) would be bad for *both* A and C. The question is, can A do better for itself than to propose these tariffs to B in stage-1 (and the associated transfer $\bar{t}^B$ that gives B its disagreement welfare) and thereby implement multilateral free trade?

We now argue that A cannot do better than to make a stage-1 proposal that implements multilateral free trade, regardless of the allocation of bargaining power between A and C in stage 2.

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[24] The assumption that governments maximize national income simplifies (but is inessential to) the argument.

To see this, let us begin from the initial stage-1 tariff choices described just above and consider a small change in $\tilde{\tau}^A$ and $\overline{t}^B$ along B's indifference curve (similar arguments apply to small changes in any of the stage-1 policy choices $(\tilde{\tau}^A, \overline{\tau}^B, \overline{t}^B)$). Starting from the world price $\tilde{p}^w(1,1,1)$ implied by the initial tariff choices, and with B's tariff fixed at $\overline{\tau}^B = 1$, the impact on B of a small change in $\tilde{\tau}^A$ is simply the first-order income effect for B of the change in the implied world price, and a first-order adjustment in $\overline{t}^B$ must then be made to offset this impact. Now consider the stage-2 bargaining frontier. To generate any fixed level of welfare for C at the new implied world price (and hence to generate any point on the stage-2 bargaining frontier), a first-order adjustment in $\overline{t}^C$ must be made to offset the first-order income effect for C of the change in the implied world price, and then either (i) C's tariff can be maintained at $\overline{\tau}^C = 1$ in which case A's tariff must be altered to $\overline{\tau}^A \neq 1$ so as to maintain the security of the stage-1 agreement, creating a second-order loss for A, or (ii) A's tariff can be maintained at $\overline{\tau}^A = 1$ in which case C's tariff must be altered to $\overline{\tau}^C \neq 1$ so as to maintain the security of the stage-1 agreement, creating a second-order loss for C which must be offset with a second-order increase in $\overline{t}^C$, creating in turn a second-order loss for A.

We now observe that the first-order income effects for A of the change in the implied world price described above are exactly offset by the described first-order transfer changes, leaving only the described policy adjustments which imply second-order losses for A. These second-order losses are suffered by A at *every point* on the stage-2 bargaining frontier (i.e., for any fixed level of welfare for C), and by continuity they can at most generate a second-order change in the bargaining solution between A and C. Hence, the only remaining question is whether the induced second-order change in the stage-2 bargaining solution could imply a second-order improvement in A's welfare (i.e, whether the second-order conditions for A's stage-1 program are violated at the political optimum). But this would violate global concavity of A's stage-1 program. We may therefore state:

Proposition 14: Unanimity and renegotiation provisions can work to prevent the forward manipulation problem in general tariff bargaining environments provided only that the stage-1 bargaining frontier satisfies a global concavity assumption.

8. Conclusion

[To be supplied]

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Appendix

[To be supplied]

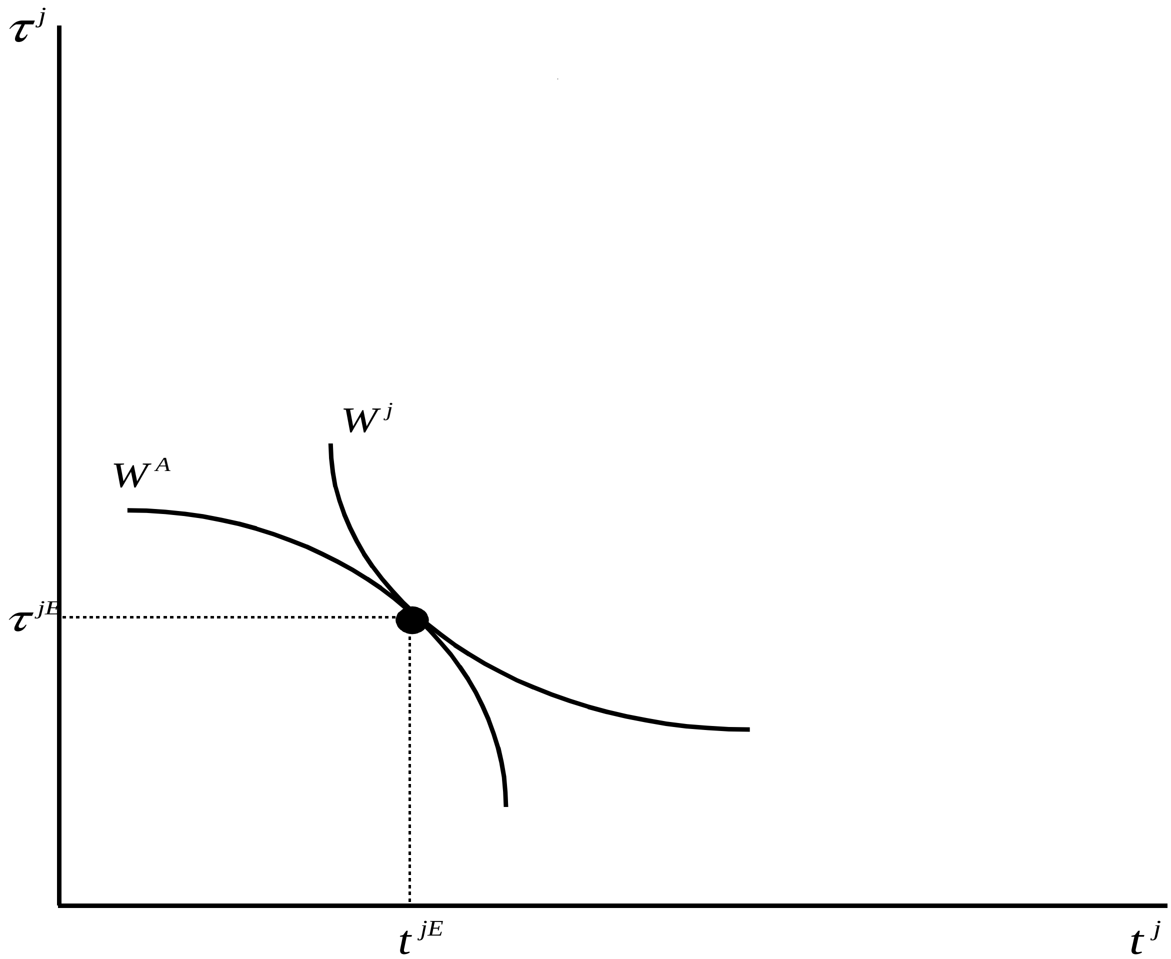

Figure 1A

(j $\in$ {B,C}; τ^A adjusts to fix $W^{\backslash j}$)

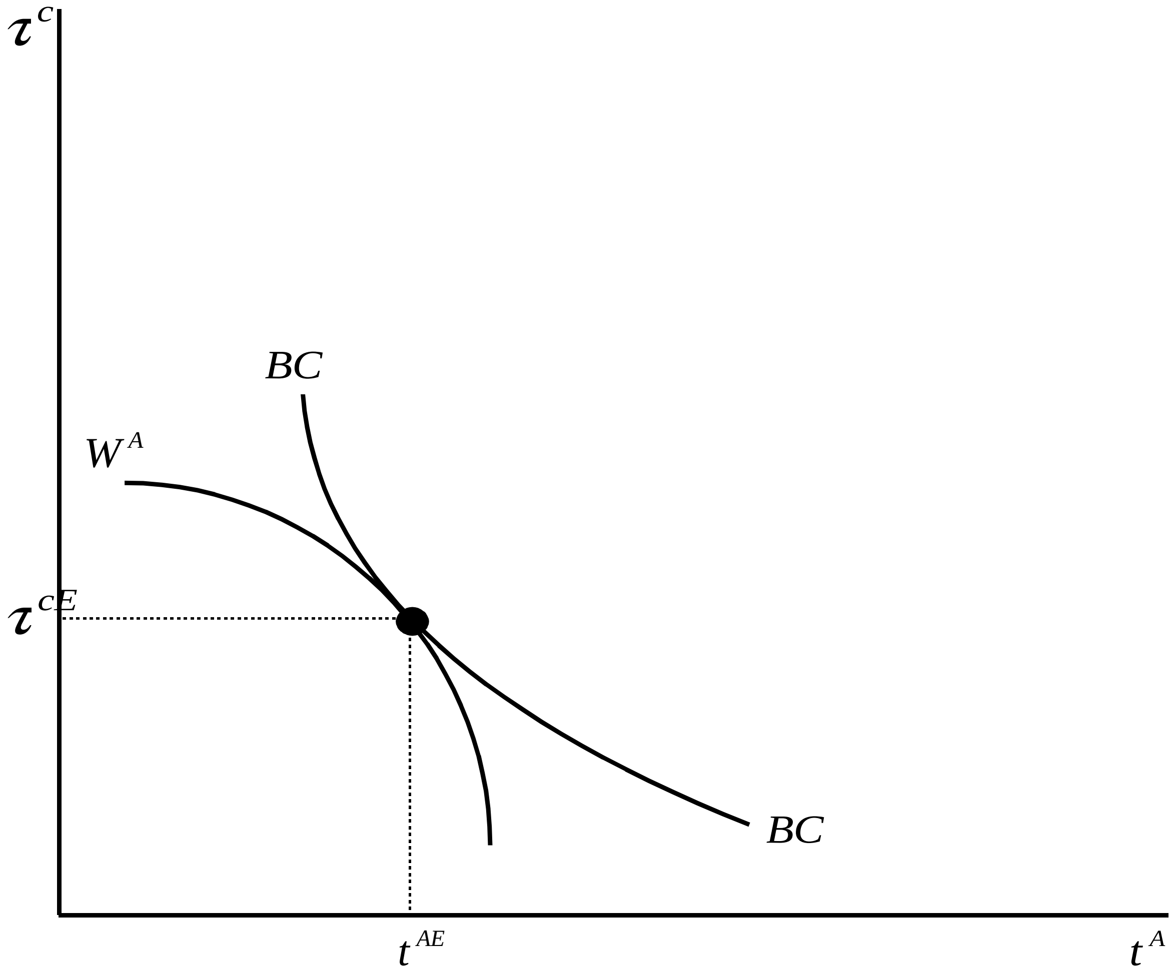

Figure 1B

(t^B (t^C) adjusts to fix W^B (W^C))

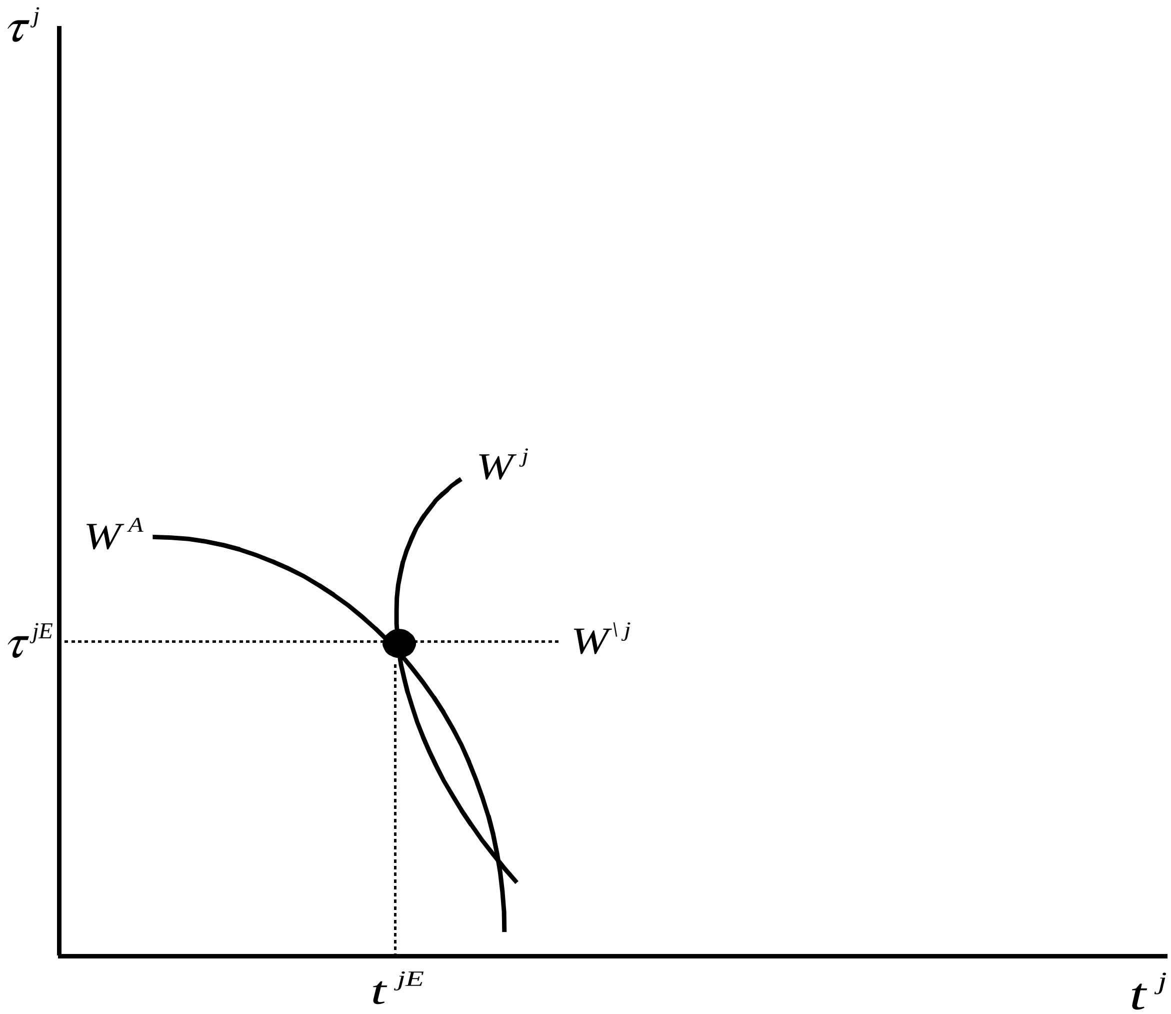

Figure 1C

$(j \in \{B, C\})$

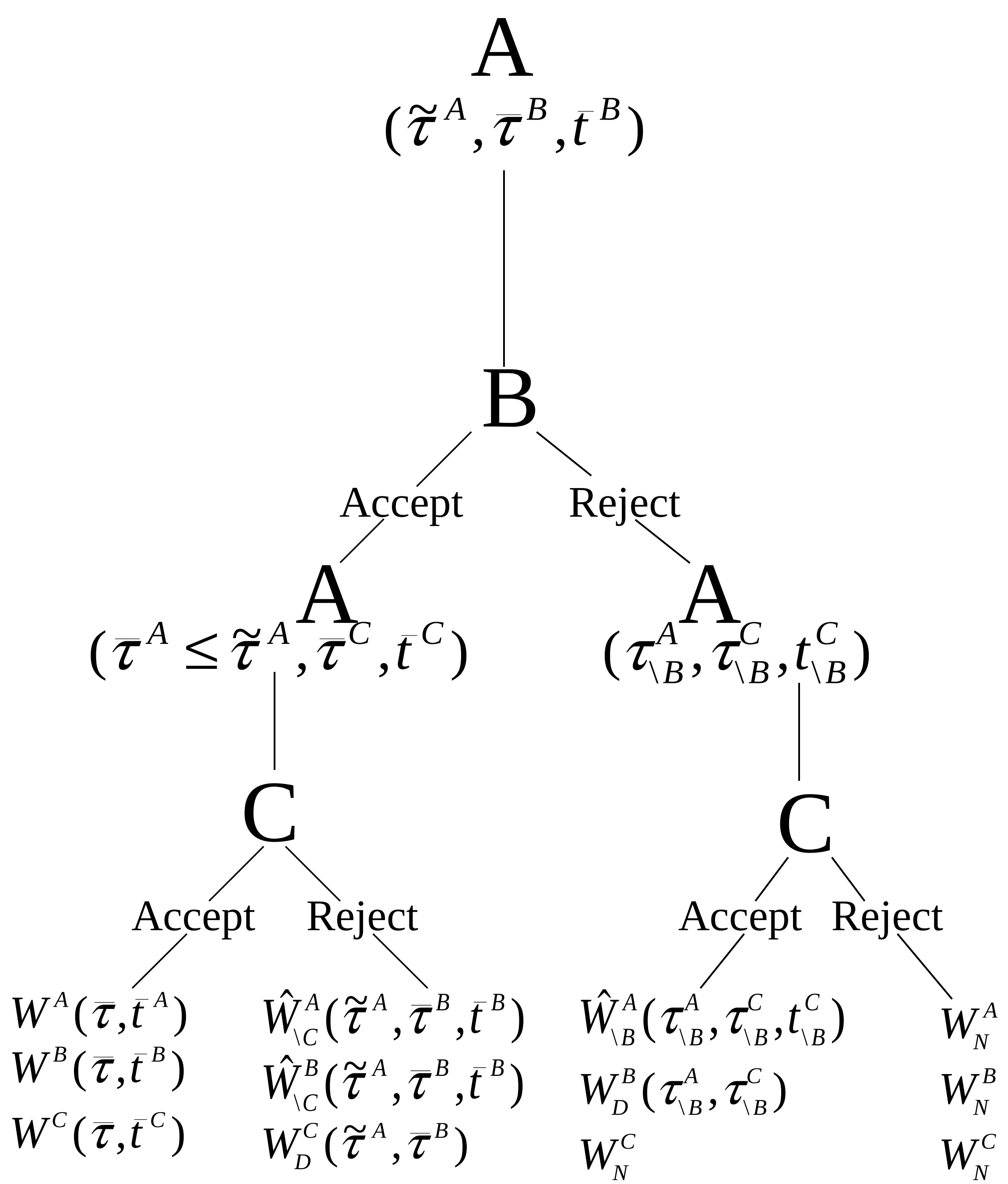

Figure 2

The Sequential MFN Game

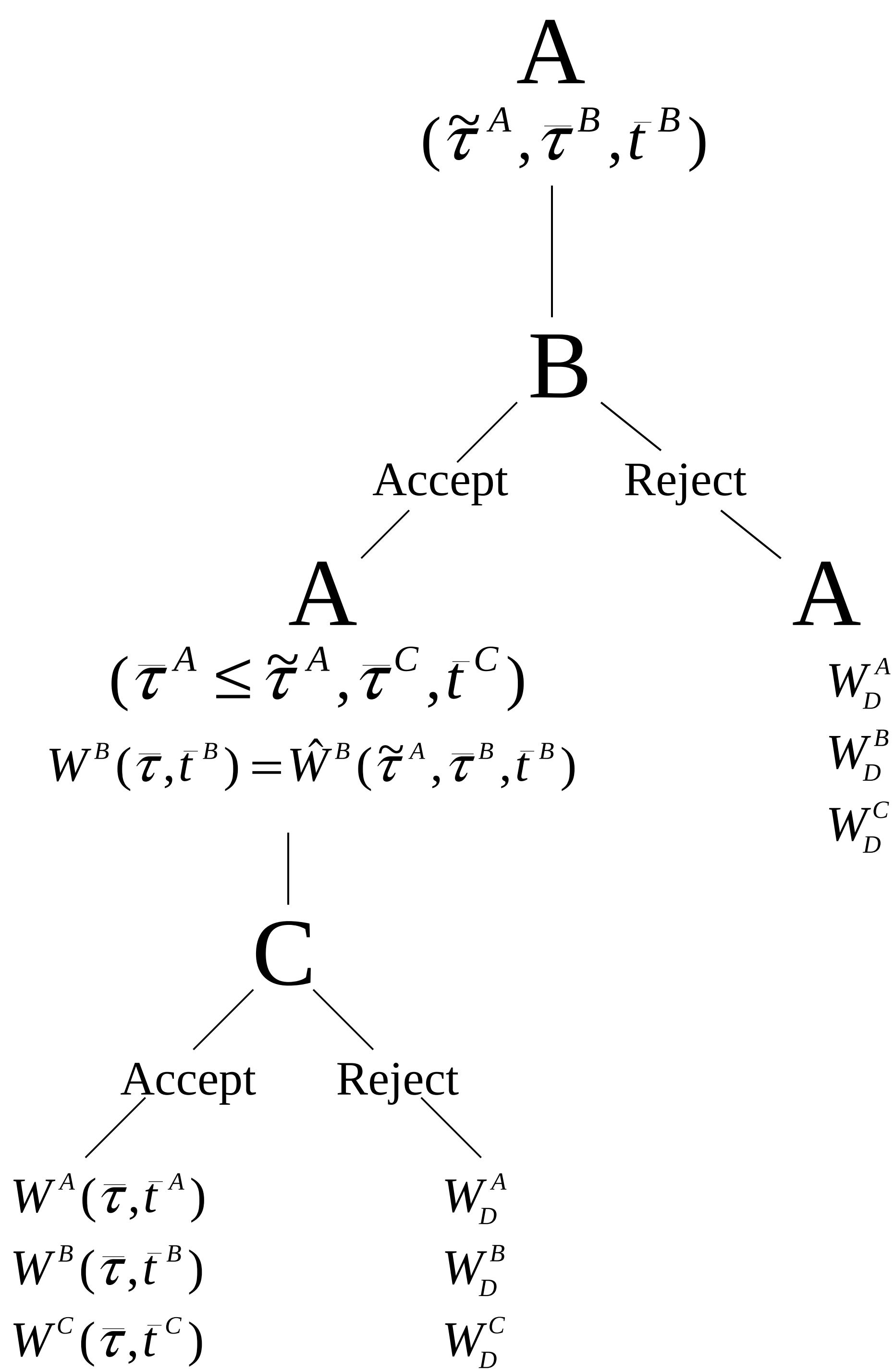

Figure 3

The Secure/Unanimity Sequential MFN Game

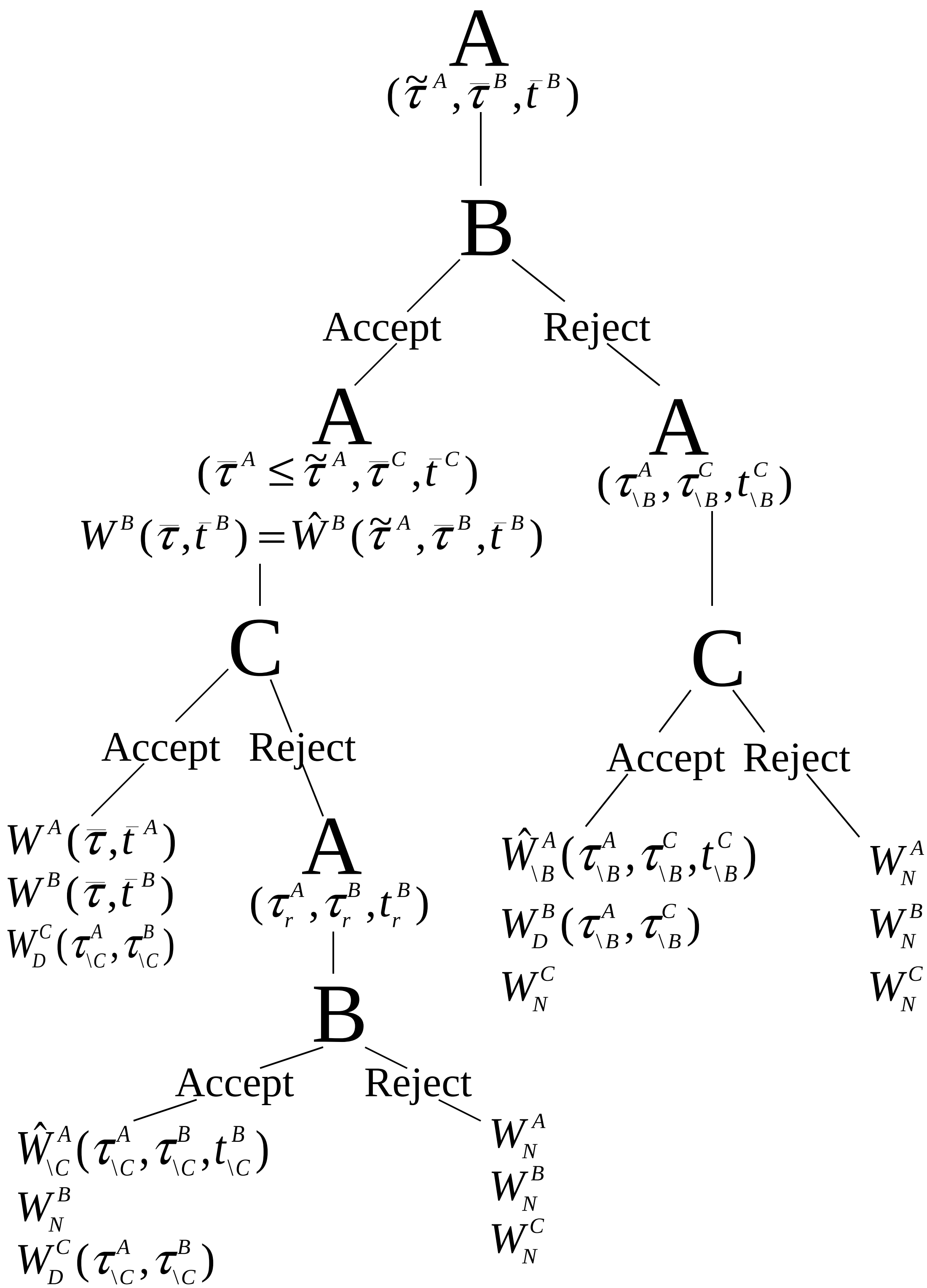

Figure 4

The Secure/Renegotiation Sequential MFN Game

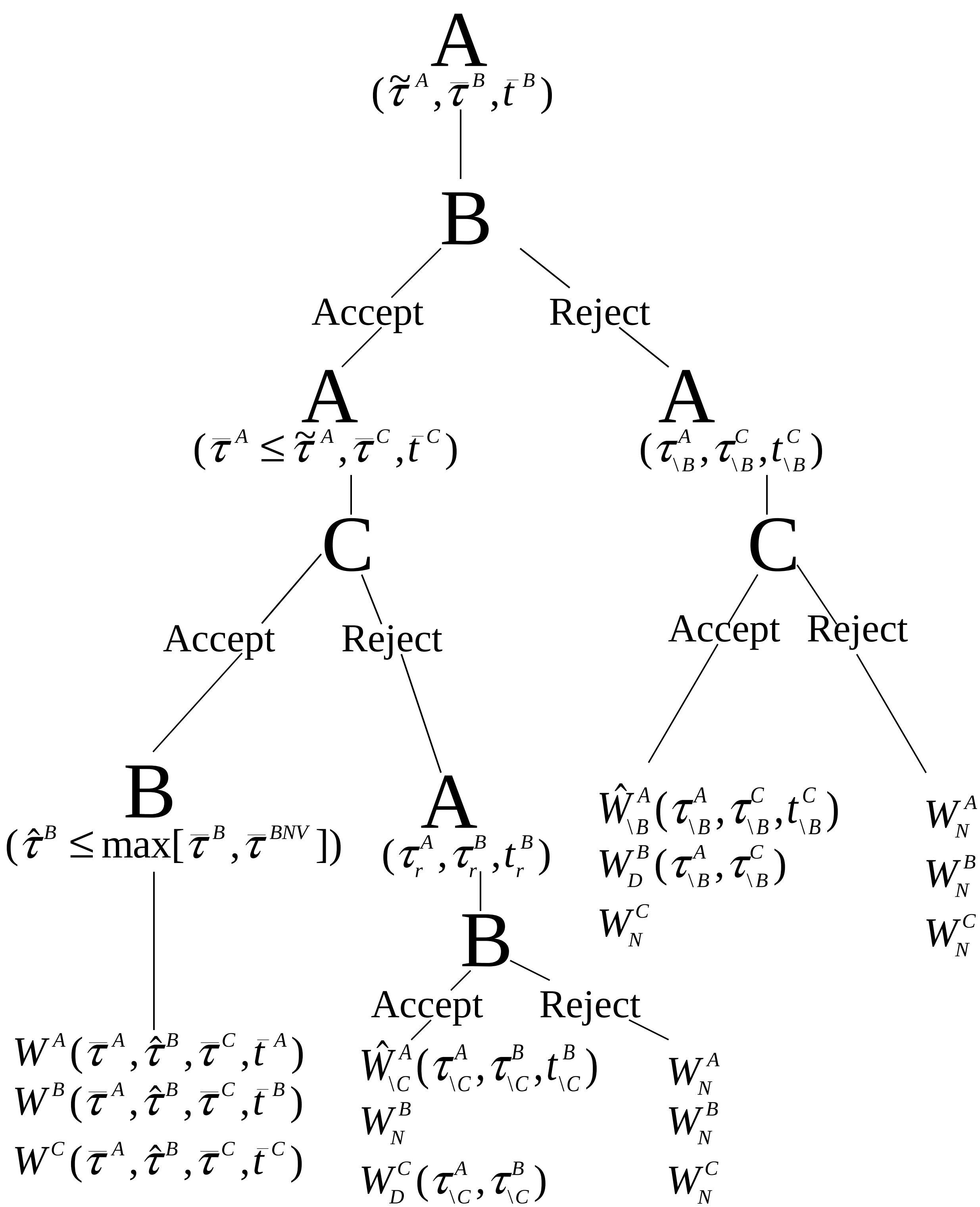

Figure 5

The N-or-I/Renegotiation Sequential MFN Game