Negotiating Free Trade*

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May 13, 2004

Abstract

We develop a dynamic bargaining model in which a leading country endogenously decides whether to sequentially negotiate free trade agreements with subsets of countries or engage in simultaneous multilateral bargaining with all countries at once. We show how the structure of coalition externalities shapes the choice between sequential and multilateral bargaining, and we identify circumstances in which the grand coalition is the equilibrium outcome, leading to worldwide free trade. A model of international trade is then used to illustrate equilibrium outcomes and how they depend on the structure of trade and protection. Global free trade is not achieved when the political-economy motive for protection is sufficiently large. Furthermore, the model generates both "building bloc" and "stumbling bloc" effects of preferential trade agreements. In particular, we describe an equilibrium in which global free trade is attained only when preferential trade agreements are permitted to form (a building bloc effect), and an equilibrium in which global free trade is attained only when preferential trade agreements are forbidden (a stumbling block effect). The analysis identifies conditions under which each of these outcomes emerges.

JEL Classification: C78, F13

Keywords: bargaining, trade agreements.

*We thank Ran Spiegler for a useful discussion, Jane Trahan for editorial assistance, and Helpman thanks the National Science Foundation for financial support.

1 Introduction

One of the most debated questions in international economics concerns the relative merits of regionalism versus multilateralism as alternative strategies for the achievement of global free trade. According to Bhagwati (1993), the first wave of regionalism took place in the 1960s, and it failed to spread because the U.S. supported a multilateral approach at that time. But the U.S. has changed positions, and — starting with the 1980s — has favored regional trade agreements. This led to a second wave of regionalism, which has been successful in forming a multitude of such agreements. The gradual enlargement of the European Union, the U.S.-Canada Free Trade Agreement, NAFTA and MERCOSUR are examples of this trend. Between 1958 and March 2004, the GATT/WTO secretariat received notification of 203 agreements.[1] The recent stalling of the Doha round further suggests that multilateralism, which was the dominant force towards free trade in the first few decades after World War II, is falling out of fashion.

Economists disagree on whether preferential trade agreements are "building blocs" that facilitate the attainment of global free trade, or "stumbling blocs" that derail the process of trade liberalization. The latter view has been forcefully promoted by Bhagwati (1991, 1993), who also coined these terms.[2] In this view, even when preferential trade agreements generate static welfare gains they can reduce the incentives to seek further trade liberalization. The importance of this "dynamic path" question was clearly laid out by Bhagwati (1993) and Krugman (1993). The latter also showed that in some circumstances welfare reaches a minimum when the world is composed of two or three customs unions.[3] The welfare consequences of stalled multilateralism, caused by the rise of regionalism, could therefore be significant.

Other economists, such as Summers (1991), think that preferential trade agreements do not impede global free trade. They argue that partial trade liberalization is better than none, and that the consolidation of a large number of countries into a small number of trading blocs may facilitate multilateral negotiations. And Baldwin (1996) argues that a deepening of integration between a subset of countries may raise the incentives of outside countries to seek accession to the free trade area. Under these circumstances preferential trade agreements encourage further trade liberalization and the expansion of the free trading

[1] Many preferential trade agreements are *not* regional. The U.S.-Israel free trade agreement is a notable example. Following Bhagwati (1993, p. 22), we use a terminology in which 'regionalism' is "...defined broadly as preferential trade agreements among a subset of nations." That is, we downplay the regional nature of preferential trade agreements and emphasize instead the fact that they constitute an agreement between a subset of countries.

[2] See Panagariya (2000) for a recent survey of this literature.

[3] See Deardorff and Stern (1994), Bond and Syropoulos (1996), and Frankel, Stein and Wei (1996) for an analysis of this issue in alternative economic frameworks.

blocs.[4]

Another way to pose the question of regionalism versus multilateralism is to ask whether multilateral bargaining or sequential bargaining are more likely to lead to global free trade. In multilateral bargaining all countries simultaneously participate in a single round of trade negotiations. In sequential bargaining negotiators proceed through several rounds, with different subsets of countries participating at different stages of the process. In this paper we compare these two alternative negotiation strategies. Since trade negotiations involve bargaining, we believe that it is important to address these issues in a framework that fully specifies the bargaining process.

We develop a dynamic bargaining model of coalition formation, where a coalition consists of a preferential trade agreement. A leading country decides endogenously whether to negotiate sequentially with only a subset of countries or simultaneously with all the countries. If the leading country chooses the sequential path, it also has to decide which follower countries to approach first, which second, and so on. We follow Bhagwati (1993) in adopting the view that the U.S. has been the leading country in the post–World War II period, and that it has disproportionately affected the process of trade liberalization. For this reason we model the bargaining game as a game in which one country, the leader, has special agenda-setting power.

In Section 2 we develop a simple transferable-utility game between three countries. One of the countries is the leader with agenda-setting power. In the first stage the leader decides to negotiate multilaterally or sequentially. If it chooses multilateral bargaining, the leader makes a simultaneous offer to form a coalition with the two follower countries. If it chooses the sequential path, the leader also decides which follower country to approach first. At each stage of the game the agenda-setter makes take-it-or-leave-it offers. This bargaining game allows us to identify the payoff of every coalition as a function of the *coalition structure*, i.e., the value function, and this mapping allows us then to characterize the solution to the bargaining game.

We first take the value function as given, and, motivated by features of standard general-equilibrium models of international trade, define two properties of this function that play an important role in the subsequent analysis: *coalition externalities* and *grand-coalition superadditivity*. A coalition is subject to coalition externalities when its payoff depends on which other coalitions form. In the simple three-country setup, this means that coalition externalities emerge whenever the size of a country's payoff depends on whether the other two countries form a coalition or not. Payoffs exhibit grand-coalition superadditivity when the payoff of the grand coalition is larger than the payoff of all countries combined in alterna-

[4]Furthermore, if the existing trading bloc follows a policy of "open" regionalism, by which accession is sequentially granted to all countries that demand it, this sequential process is likely to lead to worldwide free trade. See Yi (1996) for a discussion of "open" versus "closed" regionalism.

tive coalition structures. This condition is satisfied in models of international trade when free trade is Pareto-efficient and every country seeks to maximize its aggregate welfare. The concepts of externalities and superadditivity have been used by Ray and Vohra (1997, 1999), Gomes (2003) and Maskin (2003) in various applications.

With these concepts in hand, we describe in Section 3 a benchmark result: if the payoffs are grand-coalition superadditive and no coalition externalities exist, then the agenda-setter is indifferent between multilateral and sequential bargaining and the grand coalition forms in equilibrium. Crucial for this result is the ability of countries to transfer utility within coalitions by means of side payments. This ensures that the leader country is able to internalize the welfare gains from the grand coalition. In the absence of such transfers global free trade may not to be the equilibrium outcome, as Riezman (1985) showed in a cooperative game-theoretic model.[5] We believe, however, that it is realistic to model trade negotiations as games with transferable utility, because the exchange of concessions on non-trade-related issues often serves the role of transfers that redistribute the gains from trade liberalization.

The benchmark result relies on the assumption that there are no coalition externalities. As we show in Section 4, however, non-zero coalition externalities are the rule in the formation of free trade areas. Intuitively, if the reduction in trade barriers associated with a free trade area (FTA) affects world prices, the welfare of outside countries or trading blocs will be affected by the FTA.[6] Importantly, we show that externalities can be positive or negative, depending on whether the FTA raises or lowers the world price of certain goods, and whether outside countries are net importers or exporters of these goods.

This illustration motivates our analysis of the case with coalition externalities. In Section 5 we show that if the payoffs are grand-coalition superadditive and the coalition externalities are nonzero, then the leader is *not* indifferent between multilateral and sequential bargaining. In particular, the leader strictly prefers sequential bargaining when the coalition externalities are negative in at least one country, and it strictly prefers multilateral bargaining when the coalition externalities are positive in both follower countries. Furthermore, we show that — regardless of the sign and size of coalition externalities — the grand coalition forms in equilibrium, leading to global free trade. We also extend the latter result to more complex bargaining games: games with many countries in which a rejection of the leader's offer ends the process of coalition formation, games with many countries in which a rejection of the leader's offer transfers the agenda-setting power to a different country in a predetermined order, and games with many countries in which a rejection of the leader's offer transfers

[5] Burbridge et al. (1997) develop an alternative coalition-formation game in which the grand coalition fails to form even with transfers within customs unions. Their result is, however, driven by the static nature of the game and special features of the coalition formation process.

[6] Chang and Winters (2002) provide evidence of this type of externalities caused by MERCOSUR. Bagwell and Staiger (2002) argue that the WTO's principles of reciprocity and nondiscrimination have been designed to neutralize such externalities. These principles do not apply, however, to preferential trade agreements.

stochastically the agenda-setting power to another country. In all these games grand-coalition superadditivity leads to global free trade. Importantly, this superadditivity condition is satisfied in cases in which free trade is Pareto-efficient and every country maximizes its aggregate welfare.[7]

In Section 6 we use two examples to illustrate the results of the free trade proposition from Section 5. In the first example sequential bargaining is the equilibrium outcome, and it leads to global free. In the second example multilateral bargaining is the equilibrium outcome, also leading to global free trade. We show how these equilibria depend on trade structure and the structure of protection.

A corollary of the results from Sections 5 and 6 is that, when grand-coalition superadditivity holds, preferential trade agreements are neither building blocs nor stumbling blocs on the way to worldwide free trade. Although, as in Levy (1997) and Krishna (1998), a preferential trade agreement may raise the reservation payoff of member countries in subsequent negotiations, grand-coalition superadditivity ensures that the leader has an incentive to strike deals that bring about global free trade. Similarly, although a preferential trade agreement may exert a negative externality on outside countries, as in Baldwin (1996), and make sequential negotiations more attractive for the agenda-setter, grand-coalition superadditivity ensures that multilateral negotiations also lead to global free trade. As a result, preferential trade agreements affect the distribution of payoffs but not the attainment of global free trade.

In Section 7 we explore implications of the failure of grand-coalition superadditivity that results from political economy considerations. As we pointed out before, payoffs are grand-coalition superadditive in economies that maximize aggregate welfare, for which free trade is Pareto-efficient. When negotiators maximize a *political* objective function, however, grand-coalition superadditivity need not hold. Using an extreme version of the Grossman and Helpman (1994) model of politics with special interest groups, we adopt a specification in which a country's objective is to maximize aggregate profits. We then construct two examples that illustrate the building bloc and stumbling bloc effects of sequential bargaining under these circumstances.

In the first example, political pressure from special interests does not prevent multilateral bargaining from leading to free trade. Nevertheless, world profits are highest when the leader forms a free trade area with one country only, and the leader prefers this limited FTA to every other feasible outcome. Therefore the leader chooses sequential bargaining that does

[7] Our efficiency result is distinct from the Kemp and Wan (1976) result about customs unions. In our general model global free trade is attained for coalitions that can be customs unions, free trade areas, or economic unions. In particular, in the analysis of free trade areas, which we use to illustrate the broader logic of these results, the external tariffs of countries in a coalition do not change as a result of the formation of an FTA. Moreover, the impact of the coalition on outside countries is precisely what determines the choice between sequential and multilateral bargaining. Instead, our efficiency result is driven by the transferability of utility, which ensures that one country always becomes the residual claimant of the gains from trade liberalization.

not lead to global free trade. In this case preferential trade agreements are stumbling blocs to worldwide free trade. If the WTO rules limited negotiations to multilateral bargaining, these constraints would ensure a free trade outcome in economies of this sort.[8]

In the second example multilateral bargaining does not lead to global free trade, because the leader's status-quo profits are higher than the residual profits it can get from an all-encompassing FTA that the follower countries are willing to join. Moreover, the leader prefers sequential bargaining, in which it gradually builds the grand coalition. In this case WTO rules that restrict trade negotiations to multilateral bargaining would harm the prospects of free trade, whereas preferential trade agreements would encourage it.

Finally, we explain the coalition externalities that generate stumbling bloc and building bloc effects and relate them to the structure of trade and protection. Conclusions are discussed in Section 8.

2 The Bargaining Game

We consider a transferable-utility game between three countries: a, b, and c. We describe the game in partition form. We define a *coalition structure* as a partition Γ of $\{a, b, c\}$. That is, every country belongs to exactly one coalition. We interpret a coalition as a free trade area (FTA) in which member countries trade at zero tariffs.

For every partition Γ and every coalition $C \in \Gamma$ the value function $v(C;\Gamma)$ assigns a payoff to C given the coalition structure Γ. This payoff is gross of lump-sum transfers. In this and the next section we treat these value functions as given, but later we will show how to construct them in specific models of international trade. The payoff functions have to be constructed from the objective functions that countries use to evaluate trade agreements.

The game is played as follows: One country is the leader, which means that it is the agenda-setter. Without loss of generality we assign this role to country c. In the first stage of the game the leader decides whether to enter multilateral or sequential bargaining, as shown in Figure 1.

If c chooses multilateral bargaining, it makes a simultaneous take-it-or-leave-it offer to the follower countries a and b. The offer consists of an FTA that includes all countries and a system of lump-sum transfers. The transfers determine the payoffs $P(a)$ and $P(b)$ to countries a and b, respectively. If the offer is accepted by both countries, $\Gamma = \langle\{abc\}\rangle$ is the resulting coalition structure and the game ends. In this case Γ has a single element, consisting

[8] In Krishna's (1998) model the stumbling bloc effect is derived in a model in which (i) markets are imperfectly competitive and internationally segmented; (ii) governments maximize domestic profits; and (iii) side payments within coalition members are not allowed. Our analysis suggests that only the second of these features is necessary for a stumbling bloc effect. Furthermore, our analysis suggests that this feature is sufficient to produce a building bloc effect, which Krishna (1998) also derives (see his footnote 20), but chooses to de-emphasize.

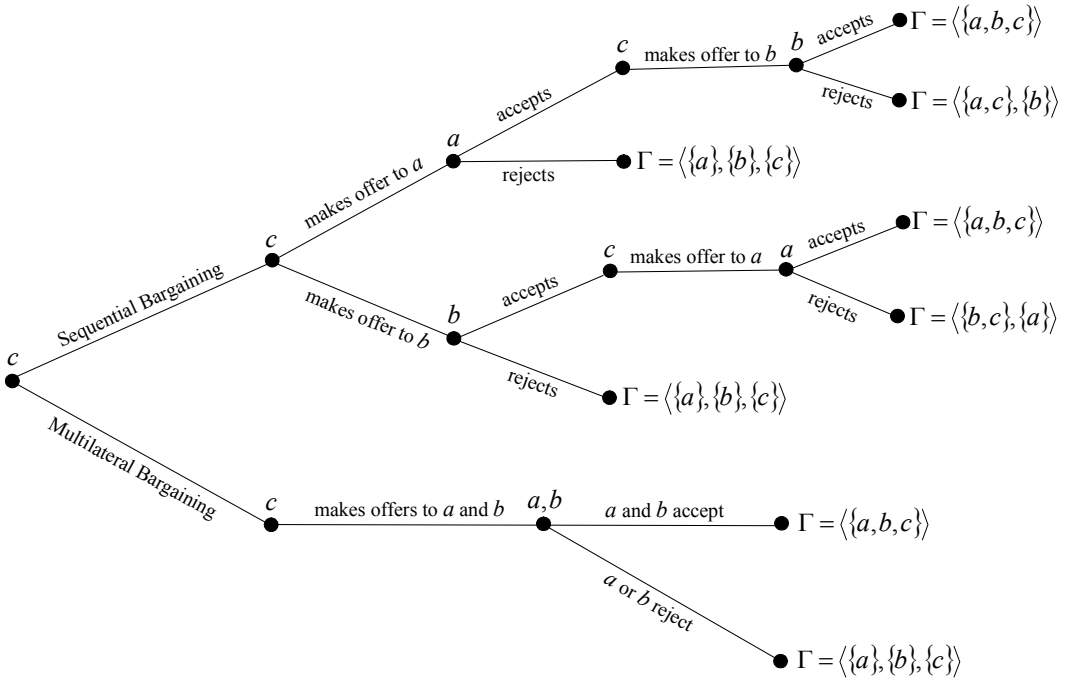

Figure 1: Game tree

of the grand coalition, and the FTA leads to worldwide free trade. This sequence of events is described in the lower part of the game tree in Figure 1.

If one of the follower countries rejects c's offer, then the coalition $\{abc\}$ does not form and the game ends with no agreement. In this event the coalition structure is $\Gamma = \langle \{a\}, \{b\}, \{c\} \rangle$. This too is depicted in the lower part of the game tree in Figure 1.

Next consider the subgame in which c chooses sequential bargaining. In this event c has to decide whether to make the first take-it-or-leave-it offer to a or to b. If it makes the first offer to a, the offer consists of an FTA between a and c and lump-sum transfers between them that provide a with a payoff $P(a)$. If a accepts the offer, $P(a)$ is a's payoff independently of whether the FTA is expanded to include country b. If a rejects the offer the game ends and the coalition structure is $\Gamma = \langle \{a\}, \{b\}, \{c\} \rangle$.

Whenever a accepts c's offer country c proceeds to make a take-it-or-leave-it offer to b, which consists of an expansion of the FTA to include all three countries and lump-sum transfers that provide b with a payoff $P(b)$. If b accepts the offer the coalition structure is $\Gamma = \langle \{abc\} \rangle$, and there is free trade. If b rejects the offer the coalition structure is $\Gamma = \langle \{ac\}, \{b\} \rangle$, i.e., a and c form a free trade area in which b is not included.

The subgame in which country c makes its first offer to b is symmetric and we omit its discussion. The upper part of Figure 1 describes the branches of the sequential bargaining

subgame.[9]

It is important to note that in this game global free trade can emerge when the leader chooses either multilateral or sequential bargaining, and lack of free trade can also occur under both bargaining procedures. We seek a subgame perfect equilibrium. Country c chooses the bargaining method that maximizes its payoff.

In order to simplify the notation, we define the following functions, which describe gross payoffs (i.e., exclusive of lump-sum transfers):

$$W(j) \equiv v(j; \{a\}, \{b\}, \{c\}) \quad \text{for all } j = a, b, c,$$

$$W_F(j) \equiv v(j; \{j\}, \{k\ell\}) \quad \text{for all } j, k, \ell = a, b, c \text{ and } j \neq k,\ j \neq \ell,\ k \neq \ell,$$

$$W(k\ell) \equiv v(k\ell; \{j\}, \{k\ell\}) \quad \text{for all } j, k, \ell = a, b, c \text{ and } k \neq \ell,\ k \neq j,\ \ell \neq j,$$

$$W(abc) \equiv v(abc; \{a, b, c\}).$$

In this notation $W(j)$ is country j's payoff when there are no free trade agreements; $W_F(j)$ is country j's payoff when the other two countries form an FTA in which j is not included; $W(k\ell)$ is the joint payoff of countries k and ℓ when they form an FTA in which the third country is not included; and $W(abc)$ is the joint payoff of all three countries when they form an all-inclusive free trade agreement.

A coalition C is not subject to coalition externalities when its payoff is independent of what other coalitions form. In our three-players game this suggests a simple definition:

Definition: Coalition Externalities *There are positive coalition externalities in country j when $W_F(j) > W(j)$, negative coalition externalities when $W_F(j) < W(j)$, and no coalition externalities when $W_F(j) = W(j)$.*

We also need a concept of superadditivity, which we define as follows:

Definition: Grand-Coalition (GC) Superadditivity *There is GC superadditivity if*

$$W(abc) > W(a) + W(b) + W(c), \quad \textit{and}$$

$$W(abc) > W_F(j) + W(k\ell) \quad \textit{for all } j \neq k,\ j \neq \ell.$$

In other words, grand-coalition superadditivity requires the joint payoffs of the three countries to be larger under global free trade than under no free trade agreements whatsoever or a free trade agreement between any two countries k and ℓ.

[9] We discuss extensions of this game in Section 5.

3 Benchmark

In this section we characterize equilibria for games with GC superadditivity and no coalition externalities in the follower countries. This helps in developing the intuition and provides a benchmark for more general games.

First consider the subgame with multilateral bargaining. Let c offer a free trade agreement between all countries, with payoffs $P(a)$ and $P(b)$. If $W(a) > P(a)$ country a rejects the offer, because a gets a higher payoff in the coalition structure $\Gamma = \langle \{a\}, \{b\}, \{c\} \rangle$. And if $W(b) > P(b)$ country b rejects the offer. When the offer is rejected by either a or b, the leader's payoff is

$$P(c) = W(c).$$

It is evident that under these circumstances c has to offer a at least $W(a)$ and it has to offer b at least $W(b)$ for the FTA to be accepted by both countries. Therefore c's highest payoff from offers that are accepted by a and b is

$$P(c) = W(abc) - W(a) - W(b), \tag{1}$$

where $P(a) = W(a)$ and $P(b) = W(b)$ are c's offers. GC superadditivity implies, however, that

$$W(abc) - W(a) - W(b) > W(c).$$

Therefore in the subgame of multilateral bargaining c prefers to make an offer that the follower countries accept, which leads to the formation of the grand coalition and to worldwide free trade.

Next consider the subgame with sequential bargaining, and examine the case in which c approaches a first and offers it an FTA with a payoff $P(a)$. If $W(a) > P(a)$ the offer is rejected and c's payoff is $P(c) = W(c)$. Therefore c has to offer a at least $W(a)$ for a to accept the offer, and it is in c's interest to offer just $W(a)$. If c then proceeds to make b an offer that b rejects, the leader's payoff is

$$P(c) = W(ac) - W(a).$$

If, instead, c wants to make b an acceptable offer, c has to offer b a payoff of at least $W(b)$, and c has no interest in making a higher offer.[10] Therefore (1) also describes c's payoff from an offer that b accepts. But GC superadditivity implies that

$$W(abc) - W(a) - W(b) > W(ac) - W(a).$$

[10] More accurately, c has to offer b at least $W_F(b)$, but $W_F(b) = W(b)$ because there are no coalition externalities in b.

Therefore c prefers to make acceptable offers to both follower countries rather than only to a. Note also that under GC superadditivity

$$W(abc) - W(a) - W(b) > W(c),$$

which implies that country c prefers to make acceptable offers to the follower countries rather than an offer that a rejects.

Similar results obtain when country c makes its first offer to b. In fact, in the subgame with sequential bargaining the leader's payoff is the same independently of whether it approaches a or b first. In both cases c prefers to make offers that both follower countries accept, which leads to the formation of the grand coalition and to worldwide free trade.

We note that in both the multilateral and sequential bargaining subgames, the grand coalition forms, and (1) is country c's payoff. We have therefore proved the

Benchmark Proposition *If there are no coalition externalities in the follower countries and there is GC superadditivity, then:*

(i) the leader is indifferent between multilateral and sequential bargaining; and

(ii) the grand coalition forms and there is global free trade.

This proposition establishes our benchmark. Deviations from this benchmark can result from coalition externalities or from the failure of GC superadditivity. We first show in the next section that coalition externalities are generic features of free trade agreements, and we characterize in the subsequent section equilibria with such externalities and GC superadditivity. There we argue that GC superadditivity is satisfied in a competitive environment in which the objective function of every country is to maximize the aggregate welfare of its residents.

4 Coalition Externalities

We show in this section that free trade agreements lead naturally to coalition externalities. We interpret an FTA as an agreement that removes tariffs on trade between members of the FTA whereas every country in the FTA maintains its original rates of protection vis à vis countries outside the FTA. This interpretation is consistent with GATT Article XXIV.

Consider a particular industry whose goods are imported from b by countries a and c and in which the rate of protection is higher in a than in c. Figure 2 depicts the import demand function in country a, $C_a - X_a$, where C_a represents demand and X_a represents supply in a, as well as two possible supply functions in c, $X_c[1]$ and $X_c[2]$.[11] The international price of

[11] This discussion borrows from Grossman and Helpman (1995). See also Richardson (1993).

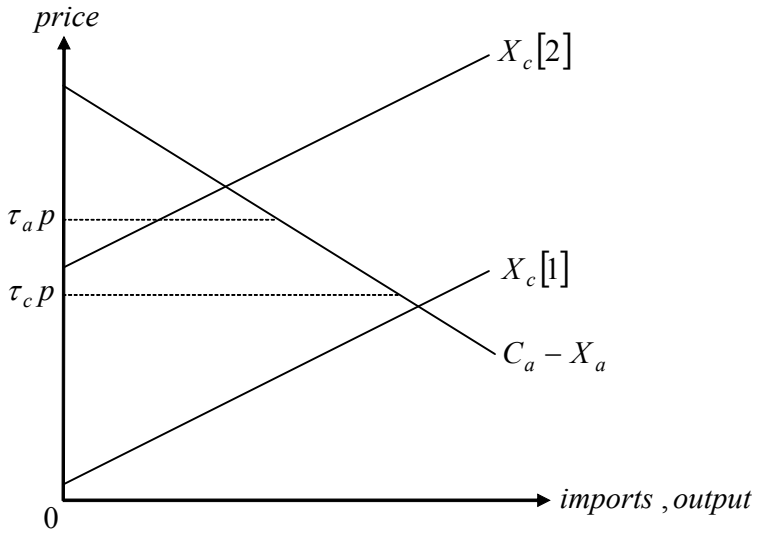

Figure 2: Coalition externalities

the product is p whereas τ_a and τ_c represent 1 plus the rate of protection in countries a and c, respectively. By assumption, $\tau_a > \tau_c$, and therefore the consumer and producer price in a, $\tau_a p$, exceeds the consumer and producer price in c, $\tau_c p$. We also assume that the export supply function of country b, not drawn in the figure, is upward sloping.

First suppose that $X_c[1]$ is the supply function in c and let us examine how the joint excess demand of countries a and c changes as a result of an FTA between them. It is evident from the figure that if the price in a were to decline to the price $\tau_c p$ in c, then country c would be able to supply the entire import demand of a at this lower price. For this reason the price in a declines to $\tau_c p$ and a switches to import the product from c without violating the *rules of origin*, which are standard provisions of such agreements.[12] This is a case of *reduced protection*, which leads to trade creation within the free trade area. Since prices do not change in c, c's net import demand $C_c - X_c[1]$ does not change as well. It follows that, at the original international price p, the joint import demand of a and c rises. As a result, the world's excess demand for the product rises, leading to a higher international price p. The increase in the international price affects the payoff of country b. If, for example, the objective function of country b is to maximize the aggregate welfare of its residents, then the FTA between a and c imposes a positive coalition externality on b, because it improves b's terms of trade. In this event $W_F(b) > W(b)$. Naturally, this discussion is confined to one

[12] Note that the FTA reshuffles trade flows. Country a ceases to import from b despite a's expansion of imports. But country c increases its imports from b in order to allow a to purchase goods in c. Yet standard rules of origin are not violated, because a can import from c only products that are produced in c. There is no need for products that c imports from b to be exported from c to a in order to meet a's demand.

industry only and a proper evaluation of coalition externalities requires an examination of the aggregate effects across all sectors. Yet the main message of this example is broad: we should expect nonzero coalition externalities when free trade areas form.[13]

Coalition externalities can be positive or negative. We showed in the previous paragraph that they can be positive. Now we show that they can be negative.

Suppose that the supply function in country c is $X_c[2]$. In this event, suppliers in c do not offer enough output at the price $\tau_a p$ to satisfy country a's import demand at this price, so even if country a were to purchase all of c's output it would still need to import from b. As a result an FTA between a and c does not change the consumer and producer prices in country a, which remain $\tau_a p$, and it does not change the consumer price in c, which remains $\tau_c p$. However, it does change the producer price in c, which rises to $\tau_a p$, the price in a. The producer price in c rises because the FTA permits these producers to sell in a without the tariff impediments, and the price in a is higher than in c. As a consequence producers in c sell their entire output in a and consumers in c import their entire consumption from b. This is a case of *enhanced protection*; the FTA leads to higher (producer) prices. Since the consumer prices do not change while the producer price rises in c and does not change in a, the joint import demand of countries a and c declines. Therefore p declines, worsening b's terms of trade. This worsening of the terms of trade generates a negative coalition externality on b if b's objective is to maximize the joint welfare of its residents, i.e., $W_F(b) < W(b)$.

It is now clear that there are very good reasons for non-zero coalition externalities in free trade agreements.[14] We therefore proceed to discuss solutions to the bargaining game in the presence of such externalities.

5 Free Trade with Coalition Externalities

Consider payoffs $v(C;\Gamma)$ that exhibit coalition externalities, but which are GC superadditive. This specification deviates from the benchmark in Section 3 by allowing coalition externalities. Under these circumstances the payoff of c from multilateral bargaining is the same as in the benchmark case, i.e., (1), because the solution to the multilateral subgame depends only on GC superadditivity and not on coalition externalities. It follows that multilateral bargaining leads to the formation of the grand coalition and to free trade.

Next consider sequential bargaining. If c first offers a an FTA and a payoff $P(a) = W(a)$,

[13] This example delivers precise answers about coalition externalities when the economic structure is of the type discussed in Section 6.

[14] The empirical evidence points in the same direction. Chang and Winters (2002) find that MERCOSUR has worsened the terms of trade of a number of non-member countries, including the U.S. and Japan. MERCOSUR is a customs union between Argentina, Brazil, Paraguay and Uruguay. Unlike a free trade area, a customs union imposes common external tariffs on non-member countries. Chang and Winters find that foreign prices charged to Brazil declined as a result of Argentina's reduction of tariffs on Brazilian exports.

then a accepts the offer.[15] In this event c has to offer b a payoff $P(b) = W_F(b)$ for b to join the FTA. Since GC superadditivity implies that

$$W(abc) - W(a) - W_F(b) > W(ac) - W(a),$$

country c gains from expanding the free trade area to include b once it has formed an FTA with a, because the left-hand-side of this inequality represents c's payoff from an all-encompassing free trade area while the right-hand-side represents c's payoff from a free trade area with a only. It follows that c's payoff from making acceptable offers in a sequential bargaining subgame in which c approaches a first is

$$P^{a,b}(c) = W(abc) - W(a) - W_F(b).$$

By similar argument c's payoff from making acceptable offers in a sequential bargaining subgame in which c approaches b first is

$$P^{b,a}(c) = W(abc) - W(b) - W_F(a),$$

as long as there is GC superadditivity. Comparing $P^{a,b}(c)$ with $P^{b,a}(c)$ we see that c is indifferent between which country it approaches first if and only if $W_F(a) - W(a) = W_F(b) - W(b)$, i.e., the coalition externalities are the same in the two follower countries. This holds in the benchmark case, in which the coalition externalities are zero. Moreover, a comparison of these payoffs shows that c strictly prefers to approach the country with the higher coalition externalities first, i.e., it prefers to approach a first if $W_F(a) - W(a) > W_F(b) - W(b)$ and it prefers to approach b first if $W_F(a) - W(a) < W_F(b) - W(b)$. The reason is that by approaching the country with the higher coalition externalities first the leader reduces the joint outside options of the follower countries. We conclude that c's highest payoff from sequential bargaining with acceptable offers is

$$P_{accept}(c) = W(abc) - W(a) - W(b) - \min\{W_F(a) - W(a), W_F(b) - W(b)\}. \quad (2)$$

Now note that c has the option of making offers that are rejected by the first country. A rejection gives c the payoff $W(c)$. For this reason c does not proceed with acceptable offers unless $W(c) \leq P_{accept}(c)$.

It remains to compare the leader's payoffs from multilateral and sequential bargaining.

[15] Note that a accepts every offer that satisfies $P(a) \geq W(a)$, but it is in c's interest to offer $W(a)$. In what follows we restrict c's offers to the lowest payoffs $P(j)$ that the other parties accept, which is a condition for subgame perfection.

Comparing (1) with (2) implies

$$P_{accept}(c) = P_{multi}(c) - \min\{W_F(a) - W(a), W_F(b) - W(b)\},$$

where $P_{multi}(c) = W(abc) - W(a) - W(b)$ is c's payoff in the multilateral subgame. It follows immediately that c prefers sequential bargaining when

$$\min\{W_F(a) - W(a), W_F(b) - W(b)\} < 0$$

and multilateral bargaining when[16]

$$\min\{W_F(a) - W(a), W_F(b) - W(b)\} > 0.$$

Moreover, whichever subgame c prefers leads to the formation of the grand coalition and to global free trade. We have thereby proved

Free Trade Proposition *If there is GC superadditivity, then:*

(i) the leader is indifferent between multilateral and sequential bargaining if and only if there are no coalition externalities in the follower countries;

(ii) the leader strictly prefers sequential bargaining when there are negative coalition externalities in at least one of the follower countries;

(iii) the leader strictly prefers multilateral bargaining when there are positive coalition externalities in both follower countries; and

(iv) the grand coalition forms and there is worldwide free trade.

This proposition states that global free trade is the unique equilibrium outcome when payoffs are GC superadditive. It also identifies conditions under which sequential or multilateral bargaining is the equilibrium outcome. Sequential bargaining is the equilibrium outcome when negative coalition externalities exist in at least one follower country, while multilateral bargaining is the equilibrium outcome when positive coalition externalities exist in both follower countries.

This proposition has important implications. Consider a neoclassical world in which production sets are convex, tariffs are the only distortions, and all markets are competitive. Also suppose that the payoff of every country is represented by the aggregate welfare of its

[16] Note that $\min\{W_F(a) - W(a), W_F(b) - W(b)\} < 0$ implies $P_{accept}(c) > P_{multi}(a) > W(c)$, where the last inequality results from GC superadditivity. Therefore in this case c prefers sequential bargaining with acceptable offers to sequential bargaining in which the first offer is rejected. The only case in which c prefers sequential bargaining in which the first offer is rejected rather than accepted is when c also prefers multilateral to sequential bargaining.

residents. Then GC superadditivity holds, because global free trade is Pareto-efficient. That is, in this sort of world, lump-sum transfers ensure that the joint welfare of all three countries combined is higher under free trade than under limited free trade agreements or no free trade agreement at all. Under these circumstances our free trade proposition applies, and trade negotiations lead to global free trade.

It follows from this proposition that in the presence of GC superadditivity there is no need to restrict countries to multilateral bargaining — as favored by Bhagwati (1991) — in order to safeguard free trade, because it is not in the interest of the leading country to choose sequential bargaining *unless* it leads to free trade. True, an institutional prohibition on sequential bargaining secures free trade. But, as we will show in Section 7, this potential advantage of multilateral bargaining disappears when payoffs are not GC superadditive for political economy reasons. Finally, note that even with GC superadditivity, restrictions on bargaining have distributional implications. The leading country's payoff is higher when it is free to choose whether to bargain sequentially or multilaterally than when it is restricted to bargaining multilaterally, unless it prefers multilateral bargaining. Recall, however, that the leader prefers sequential bargaining if and only if at least one follower country has negative coalition externalities. In this case a switch from unrestricted bargaining to mandatory multilateral bargaining redistributes payoffs from the leading country to the follower country with the largest negative coalition externalities.[17]

5.1 Generalizations

Our free trade proposition can be generalized. Three generalizations and modifications, based on part (iv) of the proposition — which states that the grand coalition forms, leading to global free trade — are offered in the appendix. The first generalization considers a world with many countries, but maintains the assumption of the simple model that the game ends when the leader's offer is rejected by one of the follower countries. As in the simple game, the leader can make a simultaneous offer to all follower countries, which we refer to as multilateral bargaining. Alternatively, it can engage in sequential bargaining, in which case it makes an offer to a subset of the follower countries. If this offer is rejected the game ends and there are no FTAs. If the offer is accepted, the leader can make a second offer to a subset of countries that are not yet included in the FTA. If the offer is rejected the game ends and the coalition structure consists of the FTA formed in round one. If, however, the offer is accepted, the FTA is expanded and the leader country can make a new offer to a subset of countries that are still outside the FTA. This process continues until either an offer is rejected by one of the

[17] To illustrate, suppose that $W_F(b) - W(b) < W_F(a) - W(a)$ and $W_F(b) - W(b) < 0$. Then a's payoff is $W(a)$ under sequential and multilateral bargaining, but b's payoff is $W_F(b)$ under sequential bargaining and $W(b)$ under multilateral bargaining. Evidently, b prefers multilateral bargaining while c prefers sequential bargaining.

follower countries or all the countries are included in the free trade area.

The second extension also considers a world with many countries, but this time a rejection of the leader's offer does not end the game. Instead, the agenda-setting power is transferred to another country in a predetermined order. That is, if the original leader's offer is rejected by one of the follower countries, then the agenda-setting power is transferred to a follower country. The country chosen is the first in the queue for leadership among the countries that are not members of the first leader's FTA. The new leader can form a new FTA by offering membership to countries that are not yet members of an FTA. In this way a new FTA forms. When an offer of the new leader is rejected, the agenda-setting power is again transferred to a country that is not a member of an FTA, using the predetermined queue. And the process continues in the same way with additional leaders. The game ends when all countries are members of FTAs, some of which may consist of one country only, and there are no more leaders to whom the agenda-setting power can be transferred. An important difference between this model and the previous model is that now there can be many FTAs in equilibrium.

In our final extension a rejection of the leader's offer again leads to the transfer of agenda-setting power to a follower country that is not a member of an FTA. This time, however, the next leader is chosen randomly from the eligible set of countries, defined as countries that are not members of an FTA and were not leaders in earlier rounds of negotiations. This setup is similar to Gomes (2003).[18]

We conclude from these extensions and modifications that GC superadditivity is a powerful feature; it ensures the formation of the grand coalition and global free trade for a variety of bargaining protocols, independently of the structure of coalition externalities. The coalition externalities affect the sequence in which the FTA expands, but not the equilibrium coalition structure. They also affect the equilibrium payoffs, i.e., the distribution of the gains from trade negotiations. Moreover, although multilateral negotiations ensure the formation of the grand coalition in all the above discussed cases, the equilibrium bargaining process need not consist of an offer to all follower countries combined; the leader may sometimes gain more by making sequential offers.

Finally, note that our results also apply to situations in which countries organize themselves into free trade areas prior to the beginning of the game. In this event a country can be interpreted as a bloc of countries that have formed an FTA, and all the arguments made above remain valid. This means that if there are regional trade agreements or other preferential trade agreements prior to the beginning of our negotiation process, then these limited agreements do not prevent the attainment of global free trade when payoffs are GC superadditive.

[18] We are grateful to Eddie Dekel and Attila Ambrus for referring us to this paper.

6 Illustrations of the Free Trade Proposition

In this section we construct an economic model that gives precise meaning to the payoff functions $W(\cdot)$ and $W_F(\cdot)$, and we use the model to illustrate the free trade proposition. In this model importing countries impose tariffs and a coalition consists of a free trade area. Standard rules of origin apply in the FTA and they prohibit a member country from importing goods from outside the FTA via another member country that has lower tariffs.

We assume that the utility function of the residents of country j is quasi-linear, given by

$$U_j = y_j + u_j(x_j), \tag{3}$$

where y_j is their consumption of good y and x_j is their consumption of good x. The function $u_j(\cdot)$ is increasing and concave. Good y is the numeraire; its price is one and it is not protected by tariffs. As is well known, if such consumers have enough income to consume both goods, which we assume to be the case, the demand for x depends only on its price, $x_j = C_j(q_j)$, and this demand function is downward sloping. Then country j's indirect utility function is

$$V_j = I_j + S_j(q_j),$$

where I_j is its income and $S_j(q_j) \equiv u_j[C_j(q_j)] - q_j C_j(q_j)$ is the consumer surplus function. By standard arguments $S_j'(q_j) = -C_j(q_j)$.

Assume that good y is produced with 1 unit of labor per unit output, whereas x is produced with labor and a sector-specific input under constant returns to scale. Then the wage rate equals 1 as long as the country produces y, which we assume to be the case, and the income of the sector-specific input, which we shall identify with profits, is an increasing convex function $\Pi_j(q_j)$. By standard arguments $\Pi_j'(q_j) = X_j(q_j)$, where $X_j(q_j)$ is an upward sloping supply function of x.

Let τ_j be 1 plus the MFN tariff rate on imports of x.[19] If x is exported by country j we set $\tau_j = 1$. That is, we assume that there are no export taxes or subsidies. Then $q_j = \tau_j p$ is the consumer and producer price in the absence of free trade agreements, where p is the international price of good x. Tariff revenue is distributed to country j's residents, who also own the country's labor and sector-specific input. Under these circumstances income I_j consists of labor income, profits and tariff revenue. Therefore in the absence of free trade

[19] MFN tariff means that the same tariff rate applies to imports from all sources, according to the most favored nation (MFN) clause. We use this specification in the examples, but our free trade proposition applies also when the tariffs do not satisfy this requirement.

agreements the indirect utility function is[20]

$$V_j = L_j + \Pi_j(\tau_j p) + (\tau_j - 1)\, p\,[C_j(\tau_j p) - X_j(\tau_j p)] + S_j(\tau_j p), \tag{4}$$

where L_j is labor supply. In the absence of free trade agreements the international price p is determined by the market clearing condition

$$\sum_{j=a,b,c} [C_j(\tau_j p) - X_j(\tau_j p)] = 0.$$

Evidently, the international price depends on the rates of protection.

In the following examples we assume that $W(j)$ equals the indirect utility V_j that country j attains in the absence of free trade agreements; $W(jk)$ equals the sum of the indirect utilities $V_j + V_k$ that countries j and k attain when they form an FTA that does not include the third country; $W_F(j)$ equals the indirect utility V_j that j attains when it is not included in a free trade area formed by the other two countries; and $W(abc)$ equals the sum of the indirect utilities $V_a + V_b + V_c$ that the three countries attain under free trade. As is well known, under these circumstances free trade yields the highest sum of utilities and therefore the payoffs are GC superadditive. These payoffs are generated by governments that maximize the aggregate welfare of their residents.

Example 1: Equilibrium Sequential Bargaining

Suppose that in the equilibrium with no trade agreements country c exports x while countries a and b import x. Moreover, a and b impose tariffs $\tau_a > 1$ and $\tau_b > 1$. Also suppose that if c forms a free trade area with one of the follower countries the FTA leads to reduced protection (recall the discussion of reduced and enhanced protection in Section 4). Then the free trade area with one of the follower countries raises the international price of x.

This is illustrated in Figure 3 for an FTA between c and a. The supply of exports by c is represented by $X_c(p) - C_c(p)$ while the aggregate import demand function of the follower countries is $\sum_{j=a,b} [C_j(\tau_j p) - X_j(\tau_j p)]$. In the absence of free trade agreements the international price is determined by the intersection of these two curves, identifying p_n as the equilibrium price.

An FTA between c and a shifts rightward the aggregate import demand curve of countries a and b to the broken-line curve, because the import demand function of country a shifts from $C_a(\tau_a p) - X_a(\tau_a p)$ to $C_a(p) - X_a(p)$.[21] The international price rises, worsening b's terms of

[20] As we have seen in Section 4, free trade agreements can produce a deviation of the consumer price from the producer price. The formulation of the indirect utility function has to be modified in an obvious way when this happens.

[21] Reduced protection requires $C_a(p_n) - X_a(p_n) < X_c(p_n)$.

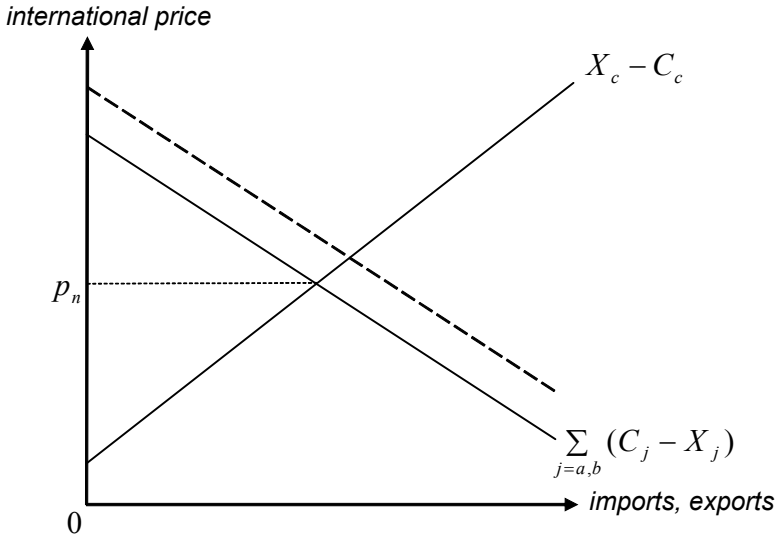

Figure 3: FTA raises b's import price

trade. As a result V_b declines. In this event there are negative coalition externalities in b.[22] Therefore our proposition implies that in this example the equilibrium consists of sequential bargaining in which c makes an offer to the country with the larger coalition externalities first, and an offer to the country with the smaller coalition externalities second, which in this case is negative.

Example 2: Equilibrium Multilateral Bargaining

Suppose that in the equilibrium with no trade agreements country c imports x from each one of the follower countries and c's MFN tariff is $\tau_c > 1$. Figure 4 depicts c's import demand function $C_c(\tau_c p) - X_c(\tau_c p)$ and the joint export supply function $\sum_{j=a,b}[X_j(p) - C_j(p)]$ of the follower countries. With no free trade agreements the equilibrium international price is p_n.

Now suppose that c forms an FTA with a, and assume that the FTA leads to reduced protection.[23] Then the price in c declines to the price in a, which equals the international price. As a result the import demand function $C_c(\tau_c p) - X_c(\tau_c p)$ changes to $C_c(p) - X_c(p)$, which is depicted in the figure by a rightward shift of the $C_c - X_c$ curve to the broken-line curve, and the international price rises. Unlike the previous example, however, this time the

[22] Note that (4) implies

$$\frac{\partial V_j}{\partial p} = -(C_j - X_j)\tau_j + (\tau_j - 1)p\left(C_j' - X_j'\right)\tau_j .$$

This is negative if j imports x, and it is positive if j exports x and $\tau_j = 1$.

[23] Namely, $C_c(p_n) - X_c(p_n) < X_a(p_n)$.

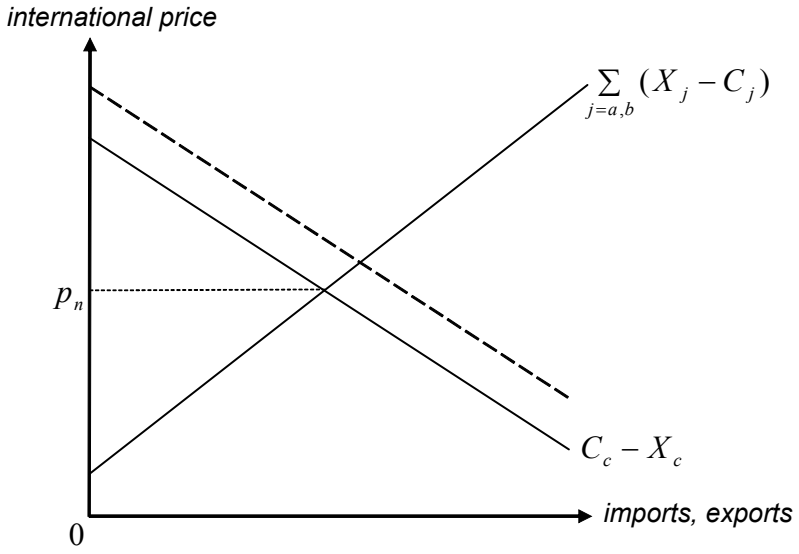

Figure 4: FTA raises b's export price

price hike concerns b's exports. Therefore b's terms of trade improve and V_b rises. Evidently, b has positive coalition externalities.

We can establish in similar fashion positive coalition externalities in a. Under these circumstances our proposition implies that multilateral bargaining takes place in equilibrium.

These two examples together with the examples discussed in Section 4 suggest that the equilibrium bargaining method depends not only on the pattern of trade, but also on finer details of the supply and demand functions. To see why, reconsider Example 2. We assumed in the example that the formation of an FTA between c and either one of the follower countries leads to reduced protection. This was important for the positive coalition externalities in the follower countries. Now suppose instead that the formation of an FTA between c and a leads to enhanced protection. Namely, $C_c(\tau_c p_n) - X_c(\tau_c p_n) > X_a(\tau_c p_n)$. In this event b is subject to negative coalition externalities, because — by raising the supply price in a to the supply price in c — the FTA raises the export supply of country a, thereby reducing the international price. The lower international price of x is detrimental to b, which exports x. In this event our proposition implies sequential bargaining in equilibrium, because negative coalition externalities exist in one of the follower countries. Evidently, the same pattern of trade can lead to different equilibrium bargaining protocols.

7 Political Economy

GC superadditivity is central to our benchmark and free trade propositions. In particular, when GC superadditivity fails, free trade is not necessarily the unique equilibrium outcome. We argued in the previous section that GC superadditivity holds when the aggregate welfare of a country's residents is used as its payoff, no distortions exist other than tariffs, production sets are convex, and all markets are competitive. A modification of any one of these requirements can destroy GC superadditivity. If, for example, markets are not competitive, then free trade is not Pareto-efficient, and GC superadditivity may not hold.

In this section we examine a lack of GC superadditivity that stems from political economy considerations. Suppose that the payoffs from free trade agreements are not represented by the aggregate welfare of a country's residents, but rather by a political objective function. Following Grossman and Helpman (1994) we think about this political objective function as a function of aggregate welfare and contributions.[24] In their case the interaction of a government with special interest groups leads to a decision making process that maximizes the weighted average of a country's aggregate welfare and the aggregate welfare of its special interests. We adopt this perspective in order to illustrate how political economy considerations can destroy GC superadditivity and lead to equilibria without free trade. Moreover, we adopt this perspective in order to evaluate the desirability of restrictions on the bargaining procedure.[25]

As discussed in the introduction, economists disagree about the merits of restricting trade negotiations to multilateral bargaining. Prominent economists, and Bhagwati (1991) in particularly, hold the view that preferential trade agreements that do not include all countries are detrimental to the achievement of worldwide free trade. We interpret this position as an objection to sequential bargaining in the formation of trade agreements. Using Bhagwati's terminology, preferential trade agreements are "stumbling blocs" rather than "building blocs" on the way to global free trade. We show in the following examples that this is not necessarily the case. In particular, when interest-group preferences weigh heavily in a country's objective function, partial agreements may serve as stumbling blocs to global free trade, but they can serve also as building blocs.

Our first example constructs a world in which multilateral negotiations lead to free trade while sequential negotiations lead to an FTA between two countries only. Nevertheless, the leader prefers sequential negotiations. This is the sense in which the availability of partial agreements prevents the attainment of free trade. In this sort of world a rule that prohibits

[24] See Grossman and Helpman (2001) for a systematic discussion of such political objective functions and the ways in which they can arise in various polities.

[25] Note that in this framework GC superadditivity holds when the weight on aggregate welfare is sufficiently higher than the weight on contributions. This follows from continuity and the fact that when this relative weight goes to infinity GC superadditivity holds.

partial agreements and forces the countries to engage in multilateral bargaining leads to global free trade. Our second example constructs a world in which multilateral negotiations are doomed to fail, i.e., they do not lead to free trade. Yet sequential bargaining does lead to global free trade, as the leader offers an FTA first to one follower country and afterwards induces the second follower country to join. In this case, rules that restrict trade negotiations to multilateral bargaining harm the prospects for global free trade.

In both examples we use aggregate profits as a country's payoff. This objective function arises in the Grossman and Helpman (1994) framework when policy makers attach zero weight to aggregate welfare and the ownership of sector-specific inputs is highly concentrated.[26]

Example 3: Stumbling Blocs

As in the previous examples, there is an outside good y with constant marginal utility, which serves as numeraire, and a product x with diminishing marginal utility; both are traded internationally. The utility function of country j is given by (3).

The example has the following features. Countries a and c import x in the initial equilibrium, both impose import tariffs, and the tariff is higher in a. Goods in sector y are freely traded. Every country seeks to maximize its profits in sector x.

Under these circumstances global free trade leads to a higher international price of x, because the removal of tariffs raises import demand in countries a and c. But the hike in the international price is not enough to compensate producers in a and c for the removal of the tariffs. As a result, profits decline in countries a and c and rise in country b. But the increase in profits in b more than compensates for the decline in profits in a and c, leading to a rise in aggregate world profits. Therefore multilateral bargaining leads to the formation of the grand coalition and to global free trade.

When c chooses sequential bargaining, it finds that its payoff is highest when it approaches country a first. But an FTA between countries a and c leads to reduced protection, with the price of x in a declining to the international price times the rate of protection in c. This, in turn, leads to an increase in aggregate world demand, thereby bidding up the international price. As a result profits rise in b and c and decline in a, because the rise in the international price does not compensate producers in a for the fall in the rate of protection. The resulting aggregate world profits exceed aggregate world profits under global free trade. In this event country c's payoff is higher from forming a free trade area with a only than from forming a free trade area with a and b. For this reason the equilibrium in the sequential bargaining subgame consists of an FTA between a and c only, a stumbling bloc.

[26] Many studies use political objective functions that attach differential weights to producer and consumer surplus. See, for example, Laffont and Tirole's (1993) analysis of economic regulation.

We now show the details. Assume that $u_j(x)$ is quadratic, implying the demand functions

$$C_a(q) = 4 - q,$$

$$C_b(q) = 3 - q,$$

$$C_c(q) = 8 - q,$$

where q is a price. We also assume that the profit functions $\Pi_j(q)$ are quadratic, given by

$$\Pi_a(q) = \frac{5}{4}q,$$

$$\Pi_b(q) = \frac{5}{2}q + \frac{1}{2}q^2,$$

$$\Pi_c(q) = \frac{17}{4}q + \frac{1}{2}q^2.$$

These profit functions yield the supply functions

$$X_a(q) = \frac{5}{4},$$

$$X_b(q) = \frac{5}{2} + q,$$

$$X_c(q) = \frac{17}{4} + q.$$

In the initial equilibrium countries a and c import x while b exports it. The tariff rates are $\tau_a = 2$, $\tau_b = 1$ and $\tau_c = 1.5$. Under these circumstances the equilibrium international price of x, p_n, can be solved from the market clearing condition

$$\sum_{j=a,b,c} C_j(\tau_j p_n) = \sum_{j=a,b,c} X_j(\tau_j p_n).$$

This yields $p_n = 1$. In addition, given the assumption that $W(\cdot)$ equals profits, we have

$$W(a) = \Pi_a(\tau_a p_n) = 2.5,$$

$$W(b) = \Pi_b(\tau_b p_n) = 3,$$

$$W(c) = \Pi_c(\tau_c p_n) = 7.5.$$

Next note that under free trade the equilibrium international price $p(abc)$ is solved from

the market clearing condition

$$\sum_{j=a,b,c} C_j \left[p \left(abc \right) \right] = \sum_{j=a,b,c} X_j \left[p \left(abc \right) \right],$$

which yields $p\left(abc\right) = 1.4$. Therefore the payoff of the grand coalition is

$$W\left(abc\right) = \sum_{j=a,b,c} \Pi_j \left[p \left(abc \right) \right] = 13.16.$$

It follows that in the multilateral bargaining subgame country c's payoff from offering the follower countries $P\left(j\right) = W\left(j\right)$, $j = a, b$, is

$$P_{multi}\left(c\right) = W\left(abc\right) - W\left(a\right) - W\left(b\right) = 7.66.$$

This payoff exceeds $W\left(c\right) = 7.5$. Therefore in this subgame the grand coalition forms, leading to global free trade.

Now consider sequential bargaining, and suppose that c approaches a first. The tariff rate is higher in c than in a, therefore, as we have seen in Section 3, this can lead to enhanced or reduced protection. But in this example $C_a\left(\tau_c p_n\right) - X_a\left(\tau_c p_n\right) < X_c\left(\tau_c p_n\right)$. Therefore, an FTA between a and c leads to reduced protection, i.e., the price in a declines from τ_a times the international price to τ_c times the international price. As a result, the new equilibrium international price $p\left(ac\right)$ is the solution to the market clearing condition

$$\sum_{j=a,c} C_j \left[\tau_c p \left(ac \right) \right] + C_b \left[\tau_b p \left(ac \right) \right] = \sum_{j=a,c} X_j \left[\tau_c p \left(ac \right) \right] + X_b \left[\tau_b p \left(ac \right) \right],$$

which is $p\left(ac\right) = 14/13$. Under these circumstances the joint payoff of a and c is

$$W\left(ac\right) = \sum_{j=a,c} \Pi_j \left[\tau_c p \left(ac \right) \right] = 10.189$$

whereas the payoff of b is

$$W_F\left(b\right) = \Pi_b \left[\tau_b p \left(ac \right) \right] = 3.2722.$$

It follows that

$$W\left(abc\right) - W\left(ac\right) - W_F\left(b\right) = -0.3012 < 0.$$

That is, GC superadditivity does not hold and c has no incentive to offer b the payoff $P\left(b\right) = W_F\left(b\right)$ in order to induce b to join the FTA. As a result c's payoff from forming an FTA with a only, which is the highest payoff from sequential bargaining when c approaches a first, is

$$P^{a,b}(c) = W(ac) - W(a) = 7.6893.$$

Note that this payoff exceeds $W(c) = 7.5$ as well as $P_{multi}(c) = W(abc) - W(a) - W(b) = 7.66$. Therefore sequential bargaining dominates multilateral bargaining from the point of view of country c.

It remains to examine sequential bargaining in which c approaches country b first. Note that $C_c(p_n) - X_c(p_n) < X_b(p_n)$. Therefore an FTA between b and c leads to reduced protection. In this event the international price $p(bc)$ is determined by the market clearing condition

$$\sum_{j=b,c} C_j[p(bc)] + C_a[\tau_a p(bc)] = \sum_{j=b,c} X_j[p(bc)] + X_a[\tau_a p(bc)],$$

which yields $p(bc) = 7/6$. As a result, the joint payoff of b and c is

$$W(bc) = \sum_{j=b,c} \Pi_j[p(bc)] = 9.2361$$

and a's payoff is

$$W_F(a) = \Pi_a[\tau_a p(bc)] = 2.916\,7.$$

It follows that

$$W(abc) - W(bc) - W_F(a) = 1.0072 > 0,$$

which implies that once c has formed an FTA with b, country c gains by offering a a payoff of $P(a) = W_F(a)$ in order to induce a to join the FTA. That is, if c approaches b first, then the subgame perfect equilibrium leads to global free trade. But note that under these circumstances c's payoff is

$$P^{b,a}(c) = W(abc) - W(b) - W_F(a) = 7.2433,$$

and this payoff is smaller than the payoff $P^{a,b}(c) = 7.6893$ from making a an offer first. Therefore, despite the fact that one branch of the sequential bargaining subgame leads to worldwide free trade, the leader prefers the other branch, that leads to a free trade agreement between a and c only. Moreover, as we have seen above, the leader also prefers the FTA between a and c only to the global free trade outcome under multilateral bargaining. Therefore c chooses sequential bargaining and it approaches a first. Evidently, in this situation sequential bargaining produces a stumbling bloc to global free trade.

The key features of this example, which are general requirements for a stumbling bloc equilibrium in which c forms an FTA with a, are the following:[27] Multilateral bargaining

[27] A symmetric set of conditions can be formulated for the case in which c forms an FTA with b.

leads to the formation of the grand coalition, therefore $W(abc) - W(a) - W(b) > W(c)$. But, c prefers an FTA with a to multilateral bargaining, i.e., $W(ac) - W(a) > W(abc) - W(a) - W(b)$, and c has no incentive to attract b to the FTA with a, i.e., $W(ac) - W(a) > W(abc) - W(a) - W_F(b)$. These conditions hold if and only if

$$W(ac) + \min\{W(b), W_F(b)\} > W(abc) > \sum_{j=a,b,c} W(j).$$

Finally, c prefers to approach a first and b second in sequential bargaining, which requires

$$W(ac) > W(a) - W(b) + \max\{W(bc), W(abc) - W_F(a)\}.$$

It is evident from these inequalities that a large payoff $W(ac)$ and large and positive coalition externalities increase the likelihood that this sort of stumbling bloc equilibrium will emerge.

Example 4: Building Blocs

In this example we also have two sectors, x and y, and preferences given by (3). Both goods are traded internationally and there are no impediments to trade in y. Countries a and b export x and c has a tariff on imports of x. Every country seeks to maximize profits.

As in the previous example, free trade leads to an increase in c's imports of x, thereby bidding up its international price. As a result, profits rise in countries a and b and decline in c, because the rise in the international price does not compensate producers in c for the removal of the tariff. In this case, however, the fall in c's profits is larger than the rise in the joint profits of a and b. Therefore GC superadditivity fails and in the multilateral subgame c prefers the status quo to offers of an FTA that countries a and b will accept. In this event multilateral bargaining does not lead to global free trade.

In the sequential subgame c prefers to approach a first. An FTA between a and c leads to enhanced protection, namely, the producer price in a rises to the tariff rate in c times the international price. This raises the aggregate world supply of x and depresses its price. The lower international price hurts profits in b, but it raises profits in a, because the decline in the international price is smaller than the tariff rate in country c. The new aggregate world profits are lower, however, than the profits under free trade. For this reason c has an incentive to bring b into the FTA. It follows that sequential bargaining leads to the formation of the grand coalition and to global free trade. Moreover, the equilibrium payoff to c exceeds c's payoff from multilateral bargaining. Thus, in this example a restriction to multilateral bargaining does not lead to global free trade, yet the choice of sequential bargaining, which c prefers, does lead to free trade following a gradual buildup of the FTA by including a and c first and then adding b. In this case the FTA between a and c is a building bloc to worldwide free trade.

Now the details. The demand functions are

$$C_a(q) = 1 - 2q,$$

$$C_b(q) = 15 - 2q,$$

$$C_c(q) = 8 - q.$$

The profit functions are

$$\Pi_a(q) = 2q + q^2,$$

$$\Pi_b(q) = 15q + \frac{1}{2}q^2,$$

$$\Pi_c(q) = 3q.$$

As a result, the supply functions are

$$X_a(q) = 2 + 2q,$$

$$X_b(q) = 15 + q,$$

$$X_c(q) = 3.$$

We assume $\tau_a = 1$, $\tau_b = 1$, $\tau_c = 1.5$. In this event market clearing requires

$$\sum_{j=a,b,c} C_j(\tau_j p_n) = \sum_{j=a,b,c} X_j(\tau_j p_n),$$

yielding the equilibrium price $p_n = 0.47059$. Therefore

$$W(a) = \Pi_a(\tau_a p_n) = 1.1626,$$

$$W(b) = \Pi_b(\tau_b p_n) = 7.1696,$$

$$W(c) = \Pi_c(\tau_c p_n) = 2.1177.$$

Under free trade the equilibrium international price $p(abc)$ is solved from the market clearing condition

$$\sum_{j=a,b,c} C_j[p(abc)] = \sum_{j=a,b,c} X_j[p(abc)],$$

which yields $p(abc) = 1/2$. Therefore the payoff of the grand coalition is

$$W(abc) = \sum_{j=a,b,c} \Pi_j[p(abc)] = 10.375.$$

It follows that in the multilateral bargaining subgame country c's payoff from offering the follower countries $P(j) = W(j)$, $j = a, b$, is

$$W(abc) - W(a) - W(b) = 2.0428,$$

which falls short of $W(c) = 2.1177$. Under these circumstances c's payoff from multilateral bargaining is $W(c)$, and this payoff is attained by making an offer that is rejected by either a or b.

Next consider sequential bargaining. If c makes the first offer to a and a accepts it, then the FTA between a and c leads to enhanced protection, because $C_c(\tau_c p_n) - X_c(\tau_c p_n) > X_a(\tau_c p_n)$. In this event the international price $p(ac)$ is determined by the market clearing condition

$$\sum_{j=a,c} C_j[\tau_j p(ac)] = \sum_{j=a,c} X_j[\tau_c p(ac)] + X_b[\tau_b p(ac)],$$

which is $p(ac) = 0.421\,05$. Under these circumstances the joint payoff of a and c is

$$W(ac) = \sum_{j=a,c} \Pi_j[\tau_c p(ac)] = 3.5568$$

whereas the payoff of b is

$$W_F(b) = \Pi_b[\tau_b p(ac)] = 6.4044.$$

It follows that

$$W(abc) - W(ac) - W_F(b) = 0.41385 > 0.$$

In this event c has the incentive to expand the FTA to include b. Therefore, if c approaches a first, then the grand coalition forms, leading to global free trade. The leader's payoff is then

$$P^{a,b}(c) = W(abc) - W(a) - W_F(b) = 2.808.$$

This payoff exceeds $W(c) = 2.1177$. Therefore c prefers sequential to multilateral bargaining.

It remains to examine whether in sequential bargaining c prefers to approach a first or b. If c approaches b first and they form an FTA, then this leads to reduced protection, because $C_c(p_n) - X_c(p_n) < X_a(p_n)$. Therefore this FTA leads to global free trade, because it reduces c's price to the international price. In this event the international price $p(bc)$ is equal to $p(abc)$. Therefore, global free trade is also achieved on this branch of the sequential subgame. However, in this case c's payoff is

$$P^{b,a}(c) = W(abc) - W(b) - W_F(a) = 2.0428.$$

And since $P^{b,a}(c) = 2.0428 < P^{a,b}(c) = 2.808$, country c prefers to approach a first.

In this example sequential bargaining leads to global free trade while multilateral bargaining does not. In the subgame perfect equilibrium of this game an FTA between a and c is a building bloc to free trade; this FTA is expanded in the second stage to include country b.

The key features of this example, that are general requirements for a building bloc equilibrium in which c forms an FTA with a, are the following:[28] First, country c prefers the status quo to the grand coalition in multilateral bargaining, i.e., $W(c) > W(abc) - W(a) - W(b)$. Second, c prefers b to join its FTA with a, which requires $W(abc) - W(a) - W_F(b) > W(ac) - W(a)$. Third, c's payoff from sequential bargaining with a first and b second is higher than from multilateral bargaining, i.e., $W(abc) - W(a) - W_F(b) > W(c)$. Together these conditions hold if and only if

$$\sum_{j=a,b,c} W(j) > W(abc) > \max\{W(ac), W(a) + W(c)\} + W_F(b).$$

Finally, c's payoff from approaching a first is higher than its payoff from approaching b first, or

$$W(abc) > W(a) - W(b) + \max\{W(bc), W(abc) - W_F(a)\} + W_F(b).$$

Evidently, these conditions are more likely to be satisfied the smaller are $W(ac)$ and $W(bc)$ and the more negative are the coalition externalities in b. In particular, no such equilibrium exists when the coalition externalities are positive in the follower countries.

We conclude from the discussion of these examples that stumbling bloc equilibria are more likely to exist the larger is the value of a bilateral FTA between c and one of the follower countries and the larger are the coalition externalities in the follower countries. Building bloc equilibria are more likely to exist the smaller are the values of bilateral FTAs between c and each one of the follower countries and the more negative are the coalition externalities in one follower country. Building bloc formation is furthered by an asymmetry in coalition externalities: a large negative in one follower country and a large positive in the other follower country. Without negative coalition externalities there are no building bloc equilibria. Naturally, there can be equilibria that are neither stumbling nor building blocs of free trade.

8 Concluding Comments

We have developed a dynamic model of bargaining with transferable utility in order to evaluate the relative merits of multilateral and sequential trade negotiations. An evaluation of this

[28] A symmetric set of conditions can be formulated for the case in which c forms an FTA with b.

sort is needed to assess the articles of agreement of the WTO. We believe that an explicit modelling of the bargaining process is necessary for this purpose. Although we recognize the limitations of our model, which may be too simple for the task at hand, we also feel that it provides valuable insights that help in thinking about these issues. In particular, it identifies superadditivity and coalition externalities in the structure of payoffs as important determinants of the relative performance of these bargaining protocols. True, the nature of these influences may vary with the bargaining procedure, but we believe that superadditivity and coalition externalities are important in every realistic bargaining procedure.

Our main findings can be summarized as follows: First, under GC superadditivity global free trade is the unique equilibrium outcome, independently of whether preferential trade agreements are allowed or forbidden and independently of the structure of coalition externalities. Therefore, although we have discussed only coalitions that consist of free trade areas, it is evident that our results also apply to customs unions, economic unions, and other forms of trade liberalization. This follows from the fact that the leading country is a residual claimant on the surplus from global free trade, and that it has the ability to compensate other countries for the abandoning of suboptimal agreements.

Second, under GC superadditivity the leading country strictly prefers sequential bargaining when coalition externalities are negative in at least one follower country. The reason is that in this case the leading country gains more from first forming an FTA with the country that has the higher coalition externalities and then expanding the free trade area to encompass all countries, than from making simultaneous offers to all follower countries. The reason is that once an FTA exists, it is cheap to "buy" a country with negative coalition externalities. And conversely, the leading country prefers multilateral bargaining when the coalition externalities of the follower countries are positive, because then sequential bargaining makes it expensive to "buy" outside countries.

Third, countries do not maximize national welfare in the presence of special interests. As a result, payoffs are not necessarily GC superadditive. Under these circumstances global free trade may not result in equilibrium. We showed that in this case preferential trade agreements can facilitate the achievement of global free trade in the presence of negative coalition externalities. In the opposite case of positive coalition externalities, preferential trade agreements are stumbling blocs to free trade, whereas multilateral bargaining may liberalize trade around the world. In realistic circumstances in which political economy plays an important role, comparing alternative negotiation strategies is significantly more complex. Yet the structure of coalition externalities plays a key role in these cases too.

We illustrated these conclusions with a simple competitive model of international trade in which global free trade is Pareto-efficient. The model clarifies the sources of coalition externalities. They are related to trade structure and the structure of protection. They also depend on features of demand and supply in each country. A free-trade agreement removes

tariffs on trade between members of the FTA, whereas FTA members maintain their original rates of protection vis à vis outside countries. In this model, coalition externalities stem from the impact of FTAs on world prices, which affect the welfare or political objectives of the trading partners. Coalition externalities on welfare-maximizing nonmember countries tend to be negative when an FTA reduces prices of their exportables, and positive when an FTA reduces prices of their importables. If every country's negotiators maximize aggregate welfare and trade taxes are the only distortions, then GC superadditivity holds and global free trade is attained in equilibrium. If, however, special interests induce country negotiators to maximize profits instead of aggregate welfare, GC superadditivity can fail to hold and preferential trade agreements can be either building blocs or stumbling blocs of free trade, as explained above.

Because our model of trade negotiations has some special attributes, it will be useful to study alternative specifications of the bargaining process. First, we have examined cases in which the agenda-setter is predetermined, and we have discussed in the appendix cases in which there are many predetermined agenda-setters as well as randomly chosen leaders. Yet agenda-setting power can be related to a country's characteristics, such as it economic size, the level of its technology, financial development and the like. Under these circumstances the characteristics of the leader will be correlated with the coalition externalities that its FTAs impose on nonmember countries. Second, we have examined lack of superadditivity that stems from special interest politics. Alternative sources of nonadditivity can be lack of competition, distortions in labor markets, or institutional constraints on economic transactions. It would be interesting to know how these different reasons for lack of superadditivity impact the building and stumbling bloc effects of preferential trade agreements. Third, our model disregards geography. Many of the preferential trade agreements are regional, however. What features of geography drive this bias? And do these features affect the choice between sequential and multilateral bargaining? Finally, our game of coalition formation allowed a country to join one coalition only. This is obviously too restrictive. Some countries are members of more than one preferential trade agreement. Does this option make a difference? And if it does, does it bias the outcome towards stumbling or building bloc equilibria? These are some of the directions in which this line of research can proceed in order to shed new light on how best to structure trade negotiations.

Appendix

We discuss in this appendix three generalizations and modifications of the free trade proposition.

Many countries

We first generalize the bargaining model to a world of many countries. Let country c be the agenda-setter, and assume that there are $N \geq 2$ follower countries indexed by $c_1, c_2, ..., c_N$. The set of all countries, the grand coalition, is denoted by $C_G = \{c, c_1, c_2, ..., c_N\}$, and the set of all follower countries is denoted by $C_O = \{c_1, c_2, ..., c_N\}$.

The game is played as follows. In stage one country c chooses to make an offer to any subset $S_1 \subset C_O$ of the follower countries. The offer consists of a coalition $C_{F,1} = c \cup S_1$, i.e., an FTA among all the countries in $C_{F,1}$, and payoffs $P(j)$ for all $j \in S_1$. If the offer is rejected by at least one country in $C_{F,1}$ the game ends. If, however, all countries accept the offer, the game moves to the second stage. In the second stage c makes an offer to a subset S_2 of the remaining follower countries, i.e., $S_2 \subset C_O \backslash S_1$. The offer consists of a coalition $C_{F,2} = C_{F,1} \cup S_2$ and payoffs $P(j)$ for all $j \in S_2$. If the offer is rejected by at least one country, the game ends. Otherwise the game continues to the third round. More generally, if c's offers where not rejected in the first $t-1$ rounds, then in round t country c makes an offer to a subset $S_t \subset C_O \backslash \cup_{i=1}^{t-1} S_i$ of the follower countries, which consists of a coalition $C_{F,t} = C_{F,t-1} \cup S_t$ and payoffs $P(j)$ for all $j \in S_t$. The game ends at some stage T when either c's offer is rejected or the grand coalition forms, i.e., $C_{F,T} = C_G$. It is self-evident that this game collapses to our three-country game when $N = 2$. In particular, when c makes a simultaneous offer to all follower countries we say that c has chosen multilateral bargaining. And when c chooses to follow any other branch of the game tree, we say that c has chosen sequential bargaining.

We now need a more general notion of grand-coalition superadditivity, which we generalize as follows: *GC superadditivity exists if* $v(C_G; \langle C_G \rangle) > \sum_{C \in \Gamma} v(C; \Gamma)$ *for every* $\Gamma \neq \langle C_G \rangle$. In other words, GC superadditivity ensures that the aggregate payoff of the grand coalition exceeds the aggregate payoff of every other coalition structure.

We now show that GC superadditivity implies that the grand coalition forms in equilibrium and global free trade emerges. Suppose to the contrary, that $\Gamma = \langle C_{F,T}, \{h_1\}, \{h_2\}, ..., \{h_M\} \rangle$ is the equilibrium partition in this bargaining game, where $C_{F,T} \neq C_G$ and $h_1, h_2, ..., h_M$ are the countries not included in the FTA. Let $P(j; \Gamma)$ be j's payoff in this equilibrium.

Now suppose that instead of making an offer that is rejected in stage T, country c invites countries $h_1, h_2, ..., h_M$ to join the FTA by offering h_i the payoff $P(h_i; \Gamma) = v(\{h_i\}; \Gamma)$,

$i = 1, 2, ..., M$. This offer is accepted by every country. As a result, c's payoff is

$$v\left(C_G; \langle C_G \rangle\right) - \sum_{i=1}^{M} v\left(\{h_i\}; \Gamma\right) - \sum_{j \in C_{F,T}, j \neq c} P\left(j; \Gamma\right).$$

But $\sum_{j \in C_{F,T}} P\left(j; \Gamma\right) = v\left(C_{F,T}; \Gamma\right)$. Therefore c's payoff equals

$$P\left(c; \Gamma\right) + v\left(C_G; \langle C_G \rangle\right) - v\left(C_F; \Gamma\right) - \sum_{i=1}^{M} v\left(\{h_i\}; \Gamma\right),$$

and GC superadditivity implies that this payoff exceeds $P\left(c; \Gamma\right)$. Therefore Γ is not an equilibrium partition. Thus, the grand coalition forms in equilibrium.

Additional leaders

In the previous game a rejection of an offer ended the game. We now modify the game and assume instead that when an offer is rejected the agenda-setting power shifts to another country. In particular, and without loss of generality, suppose that c is the first leader whereas countries $c_1, c_2, ..., c_N$ are the leaders in the order of their subscript, i.e., c_1 follows c, c_2 follows c_1, etc. This ordering means the following: When an offer of country c is rejected, where an offer consists of an invitation to a subset of follower countries to join c's FTA and payoffs to these countries, the agenda-setting role shifts to country c_i with the lowest index i among the countries that are not already members of c's FTA. From this point on, the new agenda-setter, say country $\hat{c}_1$, is the leader until its offer is rejected. $\hat{c}_1$ is allowed to make offers to follower countries that are not members of c's FTA. As in the case of country c, an offer consists of an invitation to a subset of these countries to join $\hat{c}_1$'s FTA, including payoffs to these countries. When $\hat{c}_1$'s offer is rejected the leadership role shifts to the lowest index country c_i that is in neither the FTA formed by c nor by $\hat{c}_1$, say country $\hat{c}_2$. And so on. The game ends when either the last free-standing follower receives agenda-setting power or it joins the FTA formed by the country that gained agenda-setting power in the last round.

We argue that with GC superadditivity the grand coalition forms in the equilibrium of this game and global free trade emerges. To prove the argument, assume to the contrary that the equilibrium partition is $\Gamma = \langle C_c, C_1, ..., C_L \rangle \neq \langle C_G \rangle$, where C_c is the coalition formed by country c and C_i is the coalition formed by country $\hat{c}_i$, $i = 1, 2, ..., L$. That is, there is one free trade area C_c formed by c, possibly consisting of country c only, and L free trade areas C_i formed by countries $\hat{c}_i$, $i = 1, 2, ..., L$, with C_i possibly consisting of country $\hat{c}_i$ only. Let $P\left(j; \Gamma\right)$ be the payoff of country j in this equilibrium.

Now suppose that after forming C_c country c invites all countries not in C_c to join its FTA, offering payoffs $P\left(j; \Gamma\right)$ to all $j \notin C_c$. If Γ is a subgame perfect equilibrium, then these

countries accept the offer. As a result c's payoff is

$$v\left(C_G;\langle C_G\rangle\right)-\sum_{i=1}^{L}\sum_{j\in C_i}P\left(j;\Gamma\right)-\sum_{j\in C_c,j\neq c}P\left(j;\Gamma\right).$$

Note, however, that $\sum_{i=1}^{L}\sum_{j\in C_i}P\left(j;\Gamma\right)=\sum_{i=1}^{L}v\left(C_i;\Gamma\right)$ and $\sum_{j\in C_c}P\left(j;\Gamma\right)=v\left(C_c;\Gamma\right)$. Therefore c's payoff can be expressed as

$$P\left(c;\Gamma\right)+v\left(C_G;\langle C_G\rangle\right)-\sum_{i=1}^{L}v\left(C_i;\Gamma\right)-v\left(C_c;\Gamma\right).$$

GC superadditivity implies, however, that this payoff exceeds $P\left(c;\Gamma\right)$. Therefore Γ is not an equilibrium partition. It follows that the grand coalition forms in equilibrium and leads to global free trade.

Random leaders

In the previous version of the bargaining game the order in which countries gain agenda-setting power is predetermined. An alternative is to assign agenda-setting power randomly to one of the countries that do not belong to an existing coalition. Thus, for example, if at stage t the partition is $\Gamma_t=\langle C_c,C_1,...,C_L,\{h_1\},\{h_2\},...,\{h_M\}\rangle$ and an offer of the agenda-setter $\hat{c}_L$ is rejected, then one of the countries $j\in\{h_1,h_2,...,h_M\}$ becomes the leader, and the leadership is determined by a draw from some distribution function H_t over $\{h_1,h_2,...,h_M\}$. The distribution function H_t can be time dependent and it obviously depends on the set of eligible countries $\{h_1,h_2,...,h_M\}$ at stage t. The other details of the game are the same as above. We argue that in this case too the grand coalition forms in equilibrium and worldwide free trade occurs when the payoffs are GC superadditive.[29]

Suppose to the contrary, that the equilibrium partition is random, with $\Gamma^k=\left\langle C_c,C_1^k,...,C_{L^k}^k\right\rangle$ for $k=1,2,...,K$ having positive probability and $\Gamma^k\neq\langle C_G\rangle$ for some k. Note that C_c is the same in all these partitions, because the uncertainty arises only after c's offer is rejected, and it stems from uncertainty regarding the identity of future agenda-setters. In this event the *expected* payoff of country j is $P\left(j;C_c\right)=\mathcal{E}P\left(j;\Gamma^k\right)$, where $\mathcal{E}$ is the expectations operator over Γ^k.

Now consider the following strategy of country c at stage t, after it has formed the coalition C_c in stage $t-1$. Country c invites all countries not in C_c to join the FTA and offers each one the payoff $P\left(j;C_c\right)$, for all $j\notin C_c$. The payoffs to countries in C_c remain $P\left(j;C_c\right)$ for $j\in C_c\backslash c$. Under these circumstances the countries not in C_c accept the offer while the

[29] Gomes (2003) provides a general analysis of a coalition-formation game with randomly assigned agenda-setting power. His model is somewhat different from ours, but it is a close kin. He shows that the grand coalition forms with probability 1 when GC superadditivity holds and the future is not discounted.

follower countries in C_c obtain the payoff that they were promised. The resulting payoff to country c is

$$v\left(C_G;\langle C_G\rangle\right)-\sum_{j\in C_G\backslash c}P\left(j;C_c\right).$$

Note, however, that

$$\sum_{j\in C_G}P\left(j;C_c\right)=\mathcal{E}\sum_{j\in C_G}P\left(j;\Gamma^k\right)=\mathcal{E}\left[v\left(C_c;\Gamma^k\right)+\sum_{i=1}^{L^k}\sum_{j\in C_i^k}v\left(C_i^k;\Gamma^k\right)\right].$$

Therefore, by taking expectations over Γ^k, c's payoff can be expressed as

$$P\left(c;C_c\right)+v\left(C_G;\langle C_G\rangle\right)-\mathcal{E}\left[v\left(C_c;\Gamma^k\right)+\sum_{i=1}^{L^k}\sum_{j\in C_i}v\left(C_i^k;\Gamma^k\right)\right].$$

GC superadditivity implies, however, that

$$v\left(C_G;\langle C_G\rangle\right)-v\left(C_c;\Gamma^k\right)-\sum_{i=1}^{L^k}\sum_{j\in C_i}v\left(C_i^k;\Gamma^k\right)>0$$

for every $k=1,2,...,K$. Therefore c's payoff under the proposed strategy exceeds $P\left(c;C_c\right)$ and $\Gamma^k\notin\langle C_G\rangle$ cannot have positive probability in equilibrium. It follows that the grand coalition forms with probability 1, leading to free trade. Naturally, the game with random agenda-setters is a generalization of the game with predetermined agenda-setters and therefore this result is a generalization of the result for the previous subsection.

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