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THE NEW REGIONALISM: TRADE LIBERALIZATION OR INSURANCE?

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ABSTRACT

Several of the recently negotiated regional trade agreements (Canada-U.S., NAFTA, E.C.-Hungary/Poland/Czeck and Slovak Republics) contain significantly fewer concessions by the large countries to smaller countries than vice versa. Yet, it is small countries that have sought them and see themselves as the main beneficiaries. In this paper we attempt to resolve this seeming paradox by interpreting such agreements as insurance arrangements for smaller countries, which partially protect them against the consequences of a global trade war. What they offer to the large countries in return is largely non-trade benefits (such as restraints on domestic policies in the smaller countries, firmer intellectual property protection, firmer guarantees of royalty arrangements affecting resources on state-owned lands).

When evaluated alongside the regional trade arrangements of the 1960s (such as the E.C.), these agreements may appear to produce little or no benefit relative to the *status quo* for smaller countries; but when evaluated relative to a post-retaliation tariff equilibrium, the value of these agreements to small countries is large because they help preserve existing access to larger foreign markets. There is little incentive for large countries to negotiate such arrangements without side payments of the non-trade variety, because these agreements constrain their ability to play strategically against smaller neighbouring countries (who are still important trade partners) in a trade war. Such regional agreements compared across constrained and unconstrained Nash outcomes will typically be welfare worsening for large countries, and side payments are needed for the agreements to proceed.

We compute post-retaliation Nash tariffs by region under various regional and other trade arrangements using a calibrated numerical general equilibrium model of world trade, with aggregates of importables and exportables for the key trading areas (U.S., E.C., Japan, Canada, Mexico, Other Western Europe, Rest-of-the-World). Regional agreements constrain strategic behaviour within each trading area, and (at least in Customs Union case) enhance it outside the bloc. Results confirm the intuition that without side payments large-small country regional agreements will not occur, and provide insights on other related issues such as sequential bloc formation (Mexico to follow Canada), and simultaneous bloc formation (NAFTA and E.C.-EFTA).

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1 Introduction

The new regionalism that has entered global trade arrangements in the last few years (Canada-U.S., NAFTA, E.C. accession agreements with Eastern European countries), has received considerable attention in both academic and popular literature.[1] Our point of departure in this paper is in characterizing much of this new regionalism as (in effect) one-sided, in contrast to more conventional reciprocity-based Free Trade or Customs Union agreements widely analyzed in theoretical literature. We then suggest that without side payments these agreements would likely never have been negotiated.

We argue that, in the main, these new regional arrangements are the outcome of smaller countries with little negotiating power seeking safe-haven trade arrangements with larger countries, primarily so as to make their access to large markets more secure. In the resulting agreements, larger countries have been able to both extract a price for their participation, largely in the form of non-trade concessions, as well as enhance their power in bloc-wide negotiation. As such, we argue that these agreements should be seen as insurance arrangements (with premia paid by smaller countries to large countries) as much as conventional trade liberalization.

To develop these arguments, we use a general equilibrium trade model of tariff

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[1] See the two recent edited research volumes on the new regionalism from the World Bank (De Melo and Panagariya (1993)) and GATT (Anderson and Blackhurst (1993)). There is also substantial discussion of it in recent issues of the trade policy journal *The World Economy*: see Bhagwati (1992), Jackson (1993), Sapir (1993), Winters (1992), and the January 1992 symposium on model-based evaluations of NAFTA.

retaliation, and use numerical simulation methods to evaluate some of the recent regional agreements in this light. For this purpose, we compute post-retaliation Nash outcomes in global tariff games under the various restraints on retaliation that these agreements imply. In the presence of a Free Trade Area, members maintain zero barriers to each other even in a global trade war, but they each retaliate separately against non-members. In the presence of a Customs Union, retaliation against third countries takes place via a common external tariff used jointly by all members of the union.

Our model incorporates seven regions (United States, Canada, Mexico, Japan, the European Community, Other Western Europe, and a residual Rest-of-the-World) allowing us to capture some of the key regional trading features of the current global economy, and is calibrated to 1986 inter-country trade flow data, and to literature-based trade elasticities. Because of the large dimensionalities involved in computing Nash equilibria in the presence of multiple goods and countries,[2] we limit ourselves to formulations with two goods (importables, exportables) for each country—with the importables being treated as qualitatively different across sources of supply (by exporting country).

We first use our model to evaluate both the effects of, and the country incentives to participate in a Canada-U.S. agreement. We compute non-cooperative Nash tariff equilibria in the global economy with and without a Canada-U.S. agreement, and with and without side payments. Our results suggest that for the U.S., it does not pay to conclude a regional agreement with Canada if no side payments are allowed.

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[2]See the discussion in Hamilton and Whalley (1983).

Even in the case of the formation of a Customs Union, where there is more leverage for the U.S. in a tariff war with the E.C. and ROW, losing the opportunity to play strategically against Canada more than offsets this source of gain. On the other hand, since Canada benefits substantially from preferential duty-free access to U.S. markets in a bloc-wide rather than a country-wide trade war, the side payment that the U.S. can demand of Canada more than compensates for such losses. Thus, in a trade war between blocs with side payments within blocs, the U.S. is better off participating in a regional agreement than not. Under this scenario, both large and small countries see it as in their interests to form insurance-based regional trade blocs, even if the barrier changes relative to the pre-trade war *status quo* are small.

The plan of the paper is as follows. Section 2 examines recent regional trade agreements and puts forward our main arguments. Section 3 describes a numerical general equilibrium model of tariff retaliation and bargaining, and Section 4 describes the data and parameters used to calibrate the model. Section 5 presents results of numerical simulations. Section 6 presents our conclusions.

2 Interpreting recent regional trade agreements

Represented, among others, by the 1988 Canada-U.S. Agreement, the NAFTA text, new E.C.-EFTA arrangements, E.C. association agreements with Hungary, Poland, and the Czech and Slovak republics, and proposed arrangements in the Pacific (PAFTA, AFTA and others), most recent regional trade agreements contrast with older regional arrangements such as the Treaty of Rome and EFTA in country coverage and un-

derlying objectives.[3] Perhaps the most striking feature of the recent regionalism is that seemingly small countries with little negotiating power have initiated trade negotiations with larger countries and successfully concluded them. This has been, in large part, because their concern has primarily been security of access to their largest markets, rather than a desire to only generate improvements in access through conventional reciprocal exchange of trade concessions.[4] Thus, the large countries have had substantially more negotiating power than the smaller countries, and have been able to extract a payment for insurance through trade and non-trade concessions made by the smaller countries; and the smaller countries have been willing to pay the required insurance premium.

Any cursory examination of the Canada-U.S. or NAFTA agreements reveals that the substantial majority of the concessions are by the smaller acceding country (see Table 1). These include restraints on their domestic policies affecting royalty, pricing, and security of supply arrangements, as well as explicit trade concessions.[5] Along with

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[3]The details of these agreements are discussed in a number of recent pieces in the policy oriented literature. The Canada-U.S. agreements and NAFTA are discussed in Whalley (1993) and Hufbauer and Schott (1992); E.C. agreements are discussed in Winters (1993a,b); and agreements in the Pacific are summarized in Bollard and Mayes (1992).

[4]The Toronto paper *The Globe and Mail*, April 10, 1990. p. B1, reported President Salinas of Mexico as saying at an early stage of the NAFTA negotiating process "What we want is closer commercial ties with Canada and the United States, especially in a world in which big regional markets are being created. We don't want to be left out of any of those regional markets, especially not out of the Canadian and American markets."

[5]The word "concession" here is used in a negotiating sense, and covers policy and other changes

Table 1: Asymmetric Concessions in Recent Regional Agreements

1. U.S.-Canada Agreement

- Phased bilateral tariff elimination over 10 years
- New bilateral dispute settlement procedures

Asymmetric concessions

(i) exclusions (textiles/apparel; shipping)

(ii) security of supply provisions in energy

(iii) domestic policy restraints over energy pricing

(iv) limits on investment screening

(v) changes in patent/intellectual property arrangements (not formally in agreement)

(vi) changes in domestic arrangements in wines and spirits

2. NAFTA

- Phased trilateral tariff elimination over 15 years
- Dispute settlement procedures as in U.S.-Canada Agreement

Asymmetric concessions

(i) asymmetric liberalization in agriculture (corn/beans in Mexico: little in U.S./Canada)

(ii) domestic policy restraints on energy pricing in Mexico

(iii) limits on investment screening

(iv) sugar protection in Mexico raised to match U.S. levels

(v) Mexico adopts auto content rules along lines of U.S.-Canada Agreement (with revised numbers)

(vi) Mexico finances border environmental clean up (not formally in agreement)

(vii) Mexico strengthens intellectual property protection (not formally in agreement)

3. E.C./Hungary-Poland-Czech and Slovak Republics

- Liberalization to E.C. exports and investment in return for phased reciprocal elimination of E.C. duties in "sensitive" products

Asymmetric concessions

(i) protection for E.C. investment in Hungary, Poland, and Czech and Slovak Republics

(ii) guarantees of competition policy/antitrust reform in Hungary, Poland, and Czech and Slovak Republics

formal concessions as part of these agreements, domestic policy changes sought by the larger country have also occurred simultaneously with the negotiations and, while not being part of an explicit treaty arrangement, become implicitly so.[6] That recent regional trade agreements are largely one-sided in their outcome has been noted by a number of authors;[7] while we claim no novelty for this observation, it is nonetheless one that is not often heard in policy debates on their merits or effects.

Thus, Canada's desire to avoid being "sideswiped" by U.S. trade actions aimed at other countries was a key factor behind their request for a bilateral negotiation in 1985,[8] a concern which subsequently translated into requests for special treatment under U.S. trade remedy laws. Mexico's 1990 request for a bilateral negotiation with the U.S. (subsequently trilateralized to the NAFTA negotiation) was motivated, in part, by similar concerns, although the desire of Mexican policy makers to use trade agreements as a way of locking in domestic policy reform was also important. The subsequent interest in acceding to NAFTA expressed by Chile, Colombia, Costa Rica,

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which may benefit domestic consumers as well as foreigners.

[6]These have included changes in patent protection for foreign pharmaceuticals in Canada, and commitments of funds to environmental programmes in Mexico.

[7]See the discussion of the Canada-U.S. agreements and NAFTA in Whalley (1993), comments in similar vein about the NAFTA outcome in Wonnacott (1993), and discussion of E.C. accession agreements for the Eastern European countries in Winters (1993b).

[8]See the Report of the MacDonald Commission; the Federal Government body in Canada that initially recommended Canada negotiate a bilateral trade agreement with the U.S. (Canada, Royal Commission on the Economic Union and Development Prospects for Canada (1985)).

New Zealand, Venezuela, and others, reflects similar insurance-driven objectives for all these countries.

The objectives of the EFTA countries, Eastern European countries, Turkey, North African countries, and others, in seeking negotiations with the European Community have also been similar; achieving safe-haven agreements with their largest trading partners with, in these cases, also containment and eventual removal of explicit sectoral protection severely affecting key export industries (garments, footwear, steel, and agriculture). While agreements in Asia perhaps have fewer of these elements (the 1985 Australia-New Zealand Agreement is of the older type), they can nonetheless be found; as, for instance, in the 1987 Japan-ASEAN arrangement.[9]

The resulting imbalance of concessions is apparent in the outcomes in each case. In the Canada-U.S. case, tariffs were so low before the agreement that, save in apparel, petrochemicals and a few other areas, their bilateral elimination meant little.[10] But in apparel, a remaining tariff quota restrains entry to U.S. markets for Canadian producers at trade levels above the pre-agreement situation; in transportation, the restrictive Jones Act in the U.S. is preserved: in energy, differential domestic/foreign pricing in Canada is outlawed and security of supply provisions granted to U.S. purchases of energy products; in investment, screening procedures are relaxed in Canada; and (although not in the agreement, but occurring simultaneously) significant Canadian

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[9]See the discussion of this in Hamilton and Whalley (forthcoming).

[10]As noted by Whalley (1993) p. 355, before the Agreement came into force, the average tariff on Canadian exports to the U.S. was approximately 1%, and nearly 80% of Canadian trade with the U.S. was already duty free.

changes were made in patent protection, including patents affecting foreign pharmaceuticals.

In the case of NAFTA, tariff elimination is asymmetric because of higher initial levels in Mexico;[11] Mexico liberalizes substantially in corn and beans with no significant U.S. or Canadian agricultural liberalization, raises sugar protection to match U.S. levels, eliminates the Mexican auto decree, adopts auto content provisions as in the Canada-U.S. Agreement, agrees to and partially finances environmental clean-up, and also commits not to use differential domestic/export pricing of energy. In the E.C. accession agreements with Eastern Europe, guarantees of competition/anti-trust policy reform in acceding countries appear, along with protection for direct E.C. foreign investment and liberalization to E.C. products in return for only phased reciprocal elimination by the E.C. in "sensitive" products.[12]

This view of recent regionalism as small country insurance is surprisingly absent from recent professional literature on its effects and consequences. While circumspect as to the merits of new regional arrangements in the current global economy, such literature has not as yet focussed centrally on the nature of these agreements: asking instead whether more conventional regional arrangements are necessarily bad since losses from higher post-retaliation barriers between blocs are offset by gains from freer trade within larger blocs (Krugman (1991)); or whether a drift towards regional blocs

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[11]Weintraub (1991) reports an average Mexican tariff of 9%; Hart (1991) puts trade weighted Mexican tariffs at 8%. This is in contrast to GATT bound Mexican tariffs of 50%, and average Mexican tariffs before 1985 (the start of the current liberalization programme) of around 45%.

[12]See Winters (1993b) p. 122.

is inevitable in the global system since in a dynamic game with enforced penalties for deviation from multilateral rules, multilateral co-operation can reassert itself (Bagwell and Staiger (1992)). Viewed as insurance driven, the incentives for the larger countries to join such negotiations become clearer; namely, to take advantage of an opportunity to deal with non-trade issues with the smaller country; to elevate, even if only incrementally, their bargaining power with other large countries; and to use the threat of proceeding to regional arrangements to pressure recalcitrant multilateral negotiating partners of similar size.[13]

Thus our contention is that the large country-small country trade arrangements which dominate the new regionalism have to be seen as insurance-based agreements with side payments, not as reciprocity-driven, and that the risks of such trade wars occurring in large part drive the formation of blocs. Under these arrangements, insurance is granted to small countries, while premia are paid to large countries in the form of concessions of the non-trade variety. These safe-haven agreements affect the large country's bargaining power with other large countries, reducing it in the case of a Free Trade Area, enhancing it in the case of a Customs Union; in both cases, the larger countries forgo the opportunity to play strategically against smaller countries.[14] Small

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[13]Then Senator Bentzen, Chairman of the Senate Finance Committee, is quoted by Dymond (1989) in the debate on the Canada-U.S. Free Trade Area as saying "The FTA with Canada means that the United States can say in Geneva 'If you won't work with us to open up world trade, then we can negotiate trade agreements with other countries on a bilateral basis and those countries will have the advantage of it and you won't be sharing in it'."

[14]Thus, evaluated relative to an unconstrained trade war outcome, the net effect of the formation of a Free Trade Area is to raise global welfare, whereas the global welfare effect of a Customs Union

countries obtain protected and preferential access to the larger country's market,[15] and, in the Customs Union case, see their retaliatory power against third countries increased. For this protection, large countries can exact payments from the smaller countries participating in these arrangements.[16]

3 A general equilibrium trade model of tariff retaliation with and without regional arrangements

We analyze the insurance basis for new regional arrangements using an enlarged version of the Nash tariff retaliatory international trade structure first used by Johnson (1954), and Gorman (1957), and subsequently expanded in Hamilton and Whalley (1983), Markusen and Wigle (1989), Kennan and Riezman (1990), and elsewhere. Here we compute Nash equilibria in tariff rates in higher dimensional space than previous literature, with a more complex analytical structure and without the restriction to constant-elasticity excess demand forms used in some of the earlier literature.

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is ambiguous. See Kennan and Riezman (1990).

[15]In the event of a trade war, trade between blocs will fall, but intra-bloc trade will rise.

[16]And if large countries calculate that, with these side payments, the formation of regional blocs is to their advantage, multilateral arrangements may become less attractive to large countries than a two-tier system of multilateral-type rules only among the larger countries, with safe-haven regional arrangements with smaller satellites.

In our model, regional trade arrangements represent constraints on retaliation. The introduction of such constraints produces gains or losses for the countries involved relative to an unconstrained trade war.[17] Thus, compensation in the form of other non-trade concessions may be required for an agreement to proceed. To obtain estimates of the side payments involved, we use a two-stage game structure as described in Riezman (1985). In the first stage of the game, countries form coalitions: in the second stage of the game, Nash tariffs are determined. We extend Riezman's framework, however, by allowing for side payments within coalitions, and by introducing uncertainty in the first-stage bargaining game.

3.1 Technology and preferences

Our model is a simplified version of the older numerical competitive international trade models which incorporate internationally differentiated products (often referred to as "Armington" trade models),[18] but here only one good is produced in each region. This implies that, if primary factors are assumed to be internationally immobile, we can represent production as fixed supply. This specification, in effect, amounts to a pure exchange economy, where trade offer curves are fully determined by endow-

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[17]The risk to smaller countries which underlies their search for regional trade agreements is in reality one that their largest trading partner (U.S. for Canada) may turn protectionist, as much as the outbreak of a full global trade war. Such contingency could be captured through a first-step optimal tariff calculation for the larger partner. Numerical results would change, but the interpretation of regional agreements as insurance arrangements could still apply.

[18]As in Whalley (1985) or, more recently, in Nguyen, Perroni and Wigle (1991).

ments and preferences. A fixed supply $\bar{S}^j$ of a single good is produced in each region ($j = 1, \ldots, R$), but consumers in region j demand both domestic output and an aggregate of imports from all other regions. Thus, the supply of exportables by each region is perfectly inelastic, although by an appropriate setting of elasticities in demand functions similar trade responses to those from models with less-than-perfectly inelastic supply responses can be generated.[19]

We use an LES representation of preferences, so that for region j's representative consumer the utility function can be written as

$$U^j(D^j, A^j) = \left[(b_D^j)^{\frac{1}{\sigma^j}} (D^j - \bar{D}^j)^{\frac{\sigma^j - 1}{\sigma^j}} + (b_A^j)^{\frac{1}{\sigma^j}} (A^j - \bar{A}^j)^{\frac{\sigma^j - 1}{\sigma^j}} \right]^{\frac{\sigma^j}{\sigma^j - 1}}, \quad \forall j, \quad (1)$$

where D^j and A^j represent respectively final demands for domestic output and for an import aggregate. The b^js are share parameters and σ^j is the elasticity of substitution between domestic production and the import aggregate. $\bar{D}^j$ and $\bar{A}^j$ are LES shift parameters which can be interpreted as subsistence levels.

Consumption of the import composite A^j is a CES aggregation of imports, M_i^j, from all regions $i = 1, \ldots, R$ (other than region j):

$$A^j(M_1^j, \ldots, M_{j-1}^j, M_{j+1}^j, \ldots, M_R^j) = \left[\sum_{i \neq j} (a_i^j)^{\frac{1}{\mu^j}} (M_i^j)^{\frac{\mu^j - 1}{\mu^j}} \right]^{\frac{\mu^j}{\mu^j - 1}}, \quad \forall j, \quad (2)$$

where the a_i^js are share parameters, and μ^j is the elasticity of substitution in region j among imports from different origins.

This use of LES preferences allows us to set both income and price elasticities of demands for imports at values other than unity. These utility functions also do

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[19]Our choice of a single good model structure is principally dictated by the sparsity of available empirical estimates of income and price elasticities for trade flows disaggregated by product type.

not yield constant-elasticity excess demand functions, for which computation of Nash tariffs is simplified since optimal strategies by countries are independent of responses (as noted by Johnson (1954) and Gorman (1957)).

3.2 Market equilibrium (for given tariffs)

Given tariff rates in each region, we first describe a competitive equilibrium for this structure, and then subsequently discuss the computation of Nash equilibria. p_D^j denotes the net-of-tariff price of region j's goods (i.e., the domestic price in region j), t_i^j is the *ad valorem* tariff rate on imports from region i by region j, and Y^j is disposable income in region j. The latter is equal to the sum of the value of output and tariff revenues:

$$Y^j = p_D^j \bar{S}^j + \sum_{i \neq j} t_i^j p_D^i M_i^j, \quad \forall j. \tag{3}$$

Domestic demand for domestic production can be expressed as

$$D^j = b_D^j \frac{Y^j - p_D^j \bar{D}^j - p_A^j \bar{A}^j}{\left[b_D^j \left(p_D^j\right)^{1-\sigma^j} + b_A^j \left(p_A^j\right)^{1-\sigma^j}\right] \left(p_D^j\right)^{\sigma^j}} + \bar{D}^j, \quad \forall j, \tag{4}$$

where p_A^j is the gross-of-tariff price of region j's import aggregate:

$$p_A^j = \left\{ \sum_{i \neq j} a_i^j \left[(1 + t_i^j) p_D^i\right]^{1-\mu^j} \right\}^{\frac{1}{1-\mu^j}}, \quad \forall j. \tag{5}$$

Export supply for region j is then

$$X^j = \bar{S}^j - D^j, \quad \forall j. \tag{6}$$

Given domestic demand for the import aggregate in region j.

$$A^j = b_A^j \frac{Y^j - p_D^j \bar{D}^j - p_A^j \bar{A}^j}{\left[b_D^j \left(p_D^j\right)^{1-\sigma^j} + b_A^j \left(p_A^j\right)^{1-\sigma^j}\right] \left(p_A^j\right)^{\sigma^j}} + \bar{A}^j, \quad \forall j. \tag{7}$$

import demands for good i (from region i) by region j are

$$M_i^j = A^j a_i^j \left[\frac{p_A^j}{(1+t_i^j)p_D^i} \right]^{\mu^j}, \quad \forall i \neq j. \tag{8}$$

Total demand for region i's exports is then given by

$$M_i = \sum_{j \neq i} M_i^j, \quad \forall i. \tag{9}$$

International markets clearing requires equality between export supplies from each region and total import demands for the product in all other regions:

$$X^i = M_i, \quad \forall i. \tag{10}$$

An equilibrium for this model is thus given by values p_D^j, p_A^j, Y^j, D^j, A^j, X^j, $\forall j$, M_i^j, $\forall i \neq j$, and M_i, $\forall i$, which satisfy equations (3) to (10).

3.3 Computation of Nash tariff equilibria

Computation of Nash tariff equilibria was first discussed by Johnson (1954), who noted that in the case where net trade functions are of constant elasticity form, optimal tariff rates by one country are independent of any retaliation by the other country, making computation of Nash equilibria trivial. With multiple countries and imperfect substitution among sources of imports, these simplifying features of the Johnson formulation no longer hold. With more than two regions, retaliation can take place against different regions at different levels. And using nested LES functional forms implies that excess demand functions need not be restricted to the constant-elasticity form.

We compute Nash tariff equilibria by sequentially computing optimal tariff rates for each region, holding the other regions' tariff rates constant in each calculation.[20] All regions are assumed to play strategically in their tariff setting, with the exception of the ROW, who offers no strategic response. This assumption reflects the observation that trade policies in a large number of countries belonging to the ROW bloc are in reality not coordinated in any meaningful way, implying that strategic power of each individual country in the ROW is negligible.[21]

In the central-case version of our model, the objective of the tariff-setting authority in each region is welfare maximization for its representative consumer. For Customs Unions, the tariff setting authority is assumed to maximize a linear combination of the welfare levels of the representative consumers of its member countries, where the weights are proportional to benchmark GNP levels.[22] No side payments are made at this stage of our calculations.

We iterate through a sequence of calculations, moving across regions until we achieve convergence. Successful application of this approach relies heavily on the stability of such equilibria (which in turn depends on the monotonicity and slope

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[20] We use the GAMS/MINOS (Generalized Algebraic Modeling System) numerical optimization software (Brooke, Kendrick and Meeraus (1988)).

[21] This implication is perhaps a little strong, as the ROW includes a number of larger economies such as China, India and Brazil, although their individual shares in total world trade are small.

[22] Although this appears to be a heuristically appealing rule, it has been shown that under certain conditions it may be optimal for smaller countries to fully delegate tariff setting to larger countries when forming a Customs Union, i.e., to have a zero weight in the objective of the tariff-setting authority. See Gatsios and Karp (1991).

of reaction functions). But, as Hamilton and Whalley (1983) found earlier in lower dimensional space, for the class of functional forms we use here (CES, LES), this procedure works well in practice. We also note that this computational procedure does not check for the presence of multiple Nash equilibria.[23]

In those cases where two or more regions form a Free Trade Area or a Customs Union, computation of Nash equilibria takes place in the presence of additional constraints on each region's optimization problem. Regions within a Free Trade Area have tariffs on bilateral trade frozen at zero. For Customs Unions we require that external barriers be identical for all members of the union, in addition to freezing bilateral tariffs.[24] We also require that import levies set by all other regions be uniform across exports originating from all members.[25]

Post-retaliation Nash tariffs are directly related to import demand elasticities (and hence also to export supply elasticities), with tariff levels increasing sharply as

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[23]The reaction functions generated by our numerical model for the chosen parameterization are monotonic, but as Johnson (1954) noted forty years ago, multiple equilibria in tariff games can occur even with monotonic reaction functions. We have, however, repeated our solution procedure using different starting points, and never detected such an occurrence.

[24]This is a somewhat restrictive form of Customs Union. A looser arrangement would be one where the Custom Union plays strategically as a single bloc by coordinating its individual members' policies, but no constraints are placed on its external tariffs and on other countries' external tariffs.

[25]We assume that the Rest of the World, which does not set its tariffs strategically, also conforms to this rule. We assume the common tariff rate levied by the ROW on its imports from the Customs Union to be equal to the lowest tariff rate on imports from any member of the Customs Union in the initial equilibrium.

import demand elasticities approach unity (in absolute value). With the Armington treatment in preferences, two levels of substitution are involved: one between imports as a composite and domestically produced goods (which in our model is determined by σ^j), and the other between imports of different origin (which in our model is determined by μ^j). These two separate substitution elasticities jointly determine import demand elasticities by import type within regions; and, at the same time, export supply elasticities in all regions.

3.4 Bargaining and side payments

To help assess the implications of tariff retaliation for trade bloc formation and to explore the role of side payments between members of a regional arrangement, we also embed the non-cooperative equilibrium structure described in previous sections within a model of cooperative bargaining under uncertainty. Since no markets in state-contingent claims exist and regions cannot provide each other with full insurance,[26] trade agreements accompanied by side payments can provide a way of making possible inter-country trades across states of the world. Thus, to assess the viability of a given prospective trade agreement, we search for vectors of state-independent, inter-regional lump-sum transfers which, in combination with the agreement itself, produce an expected utility gain for all regions participating in the agreement (i.e., a Pareto improvement). Since these transfers have an effect both on trade flows and on non-cooperative tariff equilibria, they must be computed simultaneously with all the other variables in the model.

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[26] In our model specification, we explicitly assume that such markets do not exist.

For simplicity, we consider two possible states of the world: one in which regions do not engage in strategic tariff setting, N ("No Trade Wars"), and one where a non-cooperative Nash outcome prevails, W ("Trade Wars"). The representative consumer in region j attaches subjective probabilities, π_N^j and π_W^j ($\pi_N^j + \pi_W^j = 1$), to each of these states. These are taken as given and hence independent of the formation or otherwise of regional trade arrangements.

We represent consumer preferences over these states of the world by means of a linearly homogeneous representation of a Constant-Coefficient-of-Relative-Risk-Aversion (CCRRA) expected utility function.[27] This takes the form

$$EU^j(U_N^j, U_W^j) = \left[\pi_N^j \left(U_N^j\right)^{1-\rho^j} + \pi_W^j \left(U_W^j\right)^{1-\rho^j}\right]^{\frac{1}{1-\rho^j}}, \quad \forall j, \tag{11}$$

where U_N^j and U_W^j are utility levels of region j in states N and W, and ρ^j is region j's coefficient of relative risk aversion. Thus, when two or more regions agree to form a Free Trade Area or a Customs Union, expected payoffs can be computed by comparing equilibrium expected utility levels with and without the agreement.

We will denote by C_i^j a positive or negative transfer from region i to region j, where $\sum_i \sum_j C_i^j = 0$. Disposable income in region j, Y^j, is then equal to the sum of the value of output, tariff revenues and total transfers to and from other regions:

$$Y^j = p_D^j \bar{S}^j + \sum_{i \neq j} t_i^j p_D^i M_i^j + \sum_i C_i^j. \quad \forall j. \tag{12}$$

If a Pareto improvement for all member regions through a compensation scheme is possible, the solution will typically not be unique: there will exist many configurations of transfers that support a Pareto improvement for the participating regions, each

[27] Thus, expected utility is linear in the vector of utility levels in the two states of the world.

corresponding to a different distribution of the expected surplus from the agreement among these regions. The vectors of transfers that support Pareto improvements form the bargaining set of a cooperative game.[28] Given the above, we can use a cooperative game solution concept (such as the Nash bargaining solution[29]) to explicitly determine equilibrium transfers supporting a given trade arrangement.

4 Data and calibration

Our model incorporates seven regions: United States. Canada, Mexico, Japan, the European Community, Other Western Europe (OWE), and a residual Rest-of-the-World (ROW). A number of data sources are used in model calibration, and elasticities chosen based on literature estimates.

4.1 Production, trade and protection

The 1986 data set we use is taken from Nguyen. Perroni and Wigle (1993). GNP levels for each region (Table 2) are from the Penn World Tables. Aggregate bilateral merchandise trade flows for the year 1986 are derived from UNCTAD bilateral trade

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[28]This characterization of the first-stage bargaining game thus abstracts from other potentially important aspects of bargaining in trade negotiations, such as the choice of the weights to be used in the tariff setting rule for Customs Unions.

[29]Nash (1953). Notice that the Nash bargaining solution is not invariant with respect to transformations of the players' utility functions. In the absence of any economic criterion to guide the selection of a cardinal representation of preferences, our choice of a linearly homogeneous specification appears to be a natural one.

Table 2: 1986 Gross World Product, by Region (U.S. $B)

Region	GNP
U.S.	4266.500
Canada	393.700
Mexico	378.990
Japan	1415.380
E.C.	3462.120
OWE	409.370
ROW	9947.854

Source: Nguyen, Perroni and Wigle (1993).

data, adjusted for consistency and discrepancies, and are summarized in Table 3. Benchmark average *ad valorem* combined tariff and non-tariff rates of protection (also based on Nguyen, Perroni and Wigle (1993)) are summarized in Table 4.[30]

4.2 Trade elasticities

We base our model specification of import trade elasticities on the results of several empirical studies, which are summarized in Table 5 (based on Marquez (1990)). As we note above, trade elasticities and specifically import price elasticities, are crucial

[30] *Ad valorem* equivalent levels of protection by region are difficult to determine with precision. The estimates we use include protection effects of domestic agricultural programmes, textile quotas and other VERs, and trade restrictive practices in services.

Table 3: 1986 Bilateral Merchandise Trade Flows between Regions (U.S. $B)

	Destination						
Origin	U.S.	Canada	Mexico	Japan	E.C.	OWE	ROW
U.S.	-	48.844	11.917	23.864	69.578	8.013	87.453
Canada	50.611	-	0.396	4.244	9.354	0.964	12.482
Mexico	13.441	0.997	-	1.616	5.672	0.487	5.971
Japan	70.748	5.544	1.328	-	38.810	6.427	89.113
E.C.	88.477	13.989	4.879	25.856	-	67.774	236.090
OWE	13.492	2.198	0.901	4.621	74.885	-	41.997
ROW	110.882	11.395	2.918	61.925	188.682	19.895	-

Source: Nguyen, Perroni and Wigle (1993).

Table 4: Average Rates of Protection by Region, against Imports from Other Regions (%)

	Destination						
Origin	U.S.	Canada	Mexico	Japan	E.C.	OWE	ROW
U.S.	-	9.4	19.5	22.7	19.8	13.1	38.5
Canada	8.2	-	23.7	23.5	19.1	14.3	43.9
Mexico	10.2	10.0	-	17.5	18.7	17.2	48.2
Japan	9.3	10.5	18.2	-	18.3	10.3	42.4
E.C.	12.3	12.7	22.0	15.3	-	6.9	48.9
OWE	11.4	12.7	20.8	13.1	10.1	-	56.8
ROW	14.7	14.4	25.3	20.7	22.8	17.3	-

Source: Nguyen, Perroni and Wigle (1993).

Table 5: Import Elasticity Estimates
Comparison of Results from Selected Studies

	A	B	C	D	E	F	G
Uncompensated Own Price Elasticities							
U.S.	-0.54	-1.46	-1.66	-4.8/-8.8	-0.20	-1.2/-3.2	-0.63/-0.92
Canada	-1.46	-0.61	-1.30	-1.2/-2.8	-0.46	0.1/-1.0	-0.33/-1.02
Japan	-0.72	-0.93	-0.78	-1.3/-7.7	-0.33	-0.7/-0.9	-0.28/-0.93
Germany	-0.24	-1.00	-0.88	0.1/-1.9	-0.30	0.5/-1.3	-0.58/-0.60
U.K.	0.22	n/a	-0.65	0/-3.2	0.14	-1.4/-2.4	-0.47/-0.49
Other OECD	n/a	n/a	n/a	n/a	n/a	n/a	-0.26/-0.49
LDCs	n/a	n/a	n/a	n/a	n/a	n/a	-0.34/-0.81
Income Elasticities							
U.S.	1.51	n/a	n/a	4.03	1.72	2.01	1.89/1.94
Canada	1.20	n/a	n/a	1.87	1.35	1.82	1.06/1.84
Japan	1.23	n/a	n/a	1.69	1.17	0.41	0.35/0.48
Germany	1.80	n/a	n/a	1.46	1.59	1.49	1.88/2.09
U.K.	1.66	n/a	n/a	2.58	1.12	-1.10	2.09/2.51
Other OECD	n/a	n/a	n/a	n/a	n/a	n/a	2.02/2.03
LDCs	n/a	n/a	n/a	n/a	n/a	n/a	0.38/0.40

A: Houthakker and Magee (1969)

B: Adams and Junz (1971)

C: Stern, Francis and Schumacher (1976)

D: Wilson and Takacs (1979)

E: Thursby and Thursby (1984)

F: Warner and Kreinin (1983)

G: Marquez (1990)

parameters in the determination of Nash tariffs. It is also the case that conclusive evidence as to appropriate values remains elusive, with significant variation across studies.

Income elasticity estimates are fairly consistent across studies; beginning with Houthakker and Magee (1969) all studies find elasticity values in excess of unity for all developed countries, with the notable exception of Japan. The estimates obtained by Marquez for LDCs are also less than unity. In contrast, price elasticity estimates vary widely across studies. Overall these studies seem to suggest high elasticity values for the U.S., Japan and E.C. countries, and lower values for Canada and LDCs.

4.3 Calibration and model parameterization

Model parameters are calibrated to 1986 output, trade flows and protection data, using the procedures described in Mansur and Whalley (1984). On the basis of our survey of elasticity studies, supplemented by information on relative country size, we adopt a central case configuration of price and income elasticities (Table 6). We subsequently perform some sensitivity analysis around these by varying elasticities values, inevitably limited by the number of potential combinations of elasticity configurations.

The application of calibration methods to this model is straightforward. From given bilateral trade flows and protection data, and from given import price and income elasticities, we can infer parameter values for the elasticity of substitution between imports and domestic production, σ^j, subsistence levels $\bar{D}^j$ and $\bar{A}^j$, and all share parameters. For the second-tier Armington elasticities (the elasticities of substitution among imports of different origin), in the absence of firm empirical estimates,

Table 6: Central Case Specification
of Import Elasticities

Region	Uncompensated Own Price Elasticity	Income Elasticity
U.S.	-1.50	1.50
Canada	-0.85	1.25
Mexico	-0.85	1.00
Japan	-1.01	1.00
E.C.	-1.25	1.25
OWE	-0.85	1.25
ROW	-0.85	1.00

we use a value that is 50% higher that the upper-tier elasticities, i.e., $\mu^j = 1.5\ \sigma^j,\ \forall j$, reflecting the intuition that importables from different regions are seen as more substitutable than is the case between imports and domestic goods.[31]

5 Simulation results

The model described in the previous section has been used to compute a number of counterfactual equilibria. These include Nash (post-retaliation) equilibria where trade wars are unconstrained; cases where trade wars are constrained by prior regional agreements (member countries of a Free Trade Area or Customs Union do not

[31]This intuition has received some limited support in empirical studies. See Reinert and Shiells (1993).

retaliate against each other); cases where trade wars occur with differing regional groupings; and, for the sake of comparison, cases where no trade wars occur, but regional agreements are implemented. In all cases, as noted earlier, we make the assumption that the ROW uses no retaliatory tariffs. This implies that retaliation is limited to six regions in the model rather than the seven that are represented.

In Table 7, we report results for the case of a Nash tariff war which involves all six (non-ROW) regions treated as setting their external tariffs strategically, with no prior regional agreement constraining retaliation. We use the central case elasticity specification of the model and compute tariffs, trade, and other characteristics of the post-retaliation Nash equilibrium.

As can be seen from the results, post-retaliation Nash tariffs are extremely high and the more so the larger the country. This finding corresponds to the widespread intuition that an all-out global trade war would be extremely destructive of trade, and yield large shocks to individual economies. Thus, in the case of the E.C., tariffs in the range of 900 to 1000 percent are generated by the model, with rates around 500 percent in the case of the U.S.:[32] the difference between these two reflecting the relative importance of trade to GDP in these countries. Smaller estimates are obtained for Mexico and Canada which have less retaliatory power than the E.C., the U.S. and Japan. As we emphasize below, these high post-retaliation tariffs are also a direct reflection of the elasticity values we use in our central case specification of the

[32]Notice that in some cases, such high tariff rates amount effectively to prohibitive import barriers, resulting in reductions in trade flows of almost 100 per cent, although with internationally differentiated products in the model trade flows can never become zero.

Table 7: Post-Retaliation Equilibrium
for the Central Case Elasticity Model Specification[a]

A. Tariff Rates (%)

	Destination						
Origin	U.S.	Canada	Mexico	Japan	E.C.	OWE	ROW
U.S.		123	132	228	931	167	38
Canada	514		131	226	935	167	44
Mexico	480	118		223	923	168	48
Japan	430	118	131		897	168	42
E.C.	426	118	131	220		179	49
OWE	435	118	131	220	890		57
ROW	481	117	131	235	1013	170	

B. Changes in Trade Flows (%)

	Destination						
Origin	U.S.	Canada	Mexico	Japan	E.C.	OWE	ROW
U.S.		-81	-82	-87	-95	-77	-75
Canada	-37		+1	+1	-27	-2	+33
Mexico	-48	-21		-25	-46	-15	+9
Japan	-79	-54	-56		-77	-52	-39
E.C.	-98	-87	-89	-93		-87	-85
OWE	-24	-12	-13	-21	-43		+18
ROW	+48	+33	+40	+35	+8	+29	

C. Welfare Effects

	Region							
	U.S.	Canada	Mexico	Japan	E.C.	OWE	ROW	World
EV (U.S. $B)	+52.5	-100.2	-32.1	-73.9	+128.4	-131.7	-1051.0	-1208.1
EV (% of income)	+1.2	-25.5	-8.5	-5.2	+3.7	-32.2	-10.6	-6.0

[a] The first six regions above are assumed to play strategically against all regions (including the ROW). The ROW is treated as passive and its tariffs remain at benchmark levels throughout the trade war (see text for details). Because imports from different regions are treated as imperfect substitutes in the model, each region has differential optimal tariffs across imports from other regions.

model,[33] which, while literature-based, might nonetheless seem to many to be on the low side. Associated impacts on trade flows in the Nash tariff equilibrium are also presented in Table 7, with large reductions in particular bilateral trade linkages, such as between Canada and the U.S., where high retaliatory tariffs occur in the larger country.

Table 7 also reports the long-run equilibrium welfare effects implied by this form of unconstrained trade war. These suggest that large countries benefit substantially from unconstrained retaliation, with the E.C. gaining nearly $130 billion (3.7 percent of income in 1986), and the U.S. gaining over $50 billion (1.2 percent of income in 1986). Large countries have more strategic leverage than small countries, and small countries experience sharp reductions in bilateral trade flows with their largest trading partners (Canada and Mexico with the U.S., and Other Western Europe with the E.C.). Thus, smaller countries lose; and in the case of Canada and Other Western Europe these losses are large, in the region of 25 percent of national income. Losses for Mexico are considerably smaller, reflecting the feature that, in our 1986 data set, international trade flows for Mexico are also smaller relative to GDP.

These results also underscore our proposition that it is a threat of global trade wars during which small countries are excluded from access to large-country markets which propels the smaller countries into regional trade negotiations with the larger countries. In other words, the main objective of smaller countries in regional negoti-

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[33]The U.S.-Canada Nash tariffs computed by Markusen and Wigle (1989) are much smaller than the ones here. Their model, however, is calibrated to demand and supply elasticities and not directly to literature estimates of trade elasticities as here.

ations becomes insurance rather than improvements in access relative to the present *status quo*.

In Table 8, we report welfare results for a variety of regional trade agreements which constrain retaliation in a non-cooperative tariff game. In the second column we report welfare effects of a trade war in the presence of a Canada-U.S. Free Trade Agreement, in which Canadian and U.S. tariffs are constrained to remain bilaterally at zero in a trade war. Large benefits accrue to Canada from this arrangement because of both continued and ever more valuable preferential access to U.S. markets. This is reflected in the sharply different results which are obtained relative to an unconstrained trade war, shown in the first column of Table 8; gains to the U.S. are converted to a loss, and the previous large loss to Canada is now converted to a small gain. This small gain reflects not only continued access to the U.S. market, but the added feature that this access is preferential. As barriers rise progressively in the U.S. markets against other suppliers from Japan, the E.C. and elsewhere, the value of trade preferences to Canada becomes progressively larger. Gains to the E.C. are higher in the event of a Canada-U.S. Free Trade Area than in the unconstrained trade war case, because a Free Trade Agreement constrains retaliation by the U.S., owing to the significantly lowered tariff which Canada applies to third-country markets even in the event of a global trade war between Canada and the U.S.

This result is reversed if the U.S. and Canada form a Customs Union rather than a Free Trade Area, since their retaliatory power against the E.C. is now enhanced (third column of Table 8). In the Customs Union case, bilateral tariffs are zero, as in a Free Trade Area, but a common external tariff applies against third countries. A surprisingly large difference in results for the U.S. occurs with this change. There

Table 8: Welfare Effects in Nash Post-Retaliation
Trade War Equilibria in the Presence of
Alternative Retaliation Constraining Regional Trade Agreements
(Comparison to 1986 Benchmark)

A. Hicksian EVs (U.S. $B)

Region	1 Unconstrained Trade War[a]	2 Canada-US FTA[b]	3 Canada-US CU[c]	4 Mexico-US FTA[b]	5 Mexico-US CU[c]	6 North American FTA[b]	7 North American CU[c]	8 Simultaneous[d] North American and European FTA[b]	9 Simultaneous[d] North American and European CU[c]
U.S.	+52.5	-9.5	+22.1	+22.2	+46.5	-15.3	+18.6	-4.5	+19.6
Canada	-100.2	+5.1	+3.4	-77.4	-101.5	+1.2	+1.5	+13.6	-2.9
Mexico	-32.1	-19.9	-32.2	+7.2	+2.9	-0.3	+0.5	+4.6	-1.2
Japan	-73.9	-33.8	-73.7	-49.2	-74.2	-28.7	-73.6	-17.4	-76.7
E.C.	+128.4	+142.0	+119.4	+135.0	+125.2	+145.3	+116.6	+38.7	+87.3
OWE	-131.7	-119.7	-135.5	-123.4	-134.7	-118.1	-137.0	+42.3	+41.5
ROW	-1051.0	-879.1	-1082.5	-933.8	-1082.6	-857.9	-1101.9	-461.7	-1330.0
World	-1208.1	-914.8	-1179.0	-1019.8	-1218.2	-873.9	-1175.2	-384.4	-1262.3

B. Hicksian EVs in % of National Income

Region	1 Unconstrained Trade War[a]	2 Canada-US FTA[b]	3 Canada-US CU[c]	4 Mexico-US FTA[b]	5 Mexico-US CU[c]	6 North American FTA[b]	7 North American CU[c]	8 Simultaneous[d] North American and European FTA[b]	9 Simultaneous[d] North American and European CU[c]
U.S.	+1.2	-0.2	+0.5	+0.5	+1.1	-0.4	+0.4	-0.1	+0.5
Canada	-25.5	+1.3	+0.9	-19.7	-25.8	+0.3	+0.4	+3.5	-0.7
Mexico	-8.5	-5.2	-8.5	+1.9	+0.8	-0.07	+0.1	+1.2	-0.3
Japan	-5.2	-2.4	-5.2	-3.9	-5.2	-2.0	-5.2	-1.2	-5.4
E.C.	+3.7	+4.1	+3.4	+3.9	+3.6	+4.2	+3.4	+1.1	+2.5
OWE	-32.2	-29.2	-33.1	-30.1	-32.9	-28.9	-33.5	+10.3	+10.1
ROW	-10.6	-8.8	-10.9	-9.4	-10.9	-8.6	-11.1	-4.6	-13.4
World	-6.0	-4.5	-5.8	-5.0	-6.0	-4.3	-5.8	-1.9	-6.2

[a] Unconstrained trade war involves all regions except ROW adopting optimal bilateral tariffs against each and all trading partners.

[b] In an FTA, tariffs are bilaterally zero among member countries, and remain so throughout any retaliatory trade war.

[c] In a CU, tariffs are bilaterally zero among member countries, remaining so throughout any retaliatory trade war, and a common external tariff is set strategically by the union against third countries. See text for more details.

[d] North America is U.S., Canada, and Mexico; European implies E.C. plus Other Western Europe.

are significant benefits to the U.S. and reduced benefits to Canada. Positive benefits for the U.S. reflect the feature that, with a common external tariff, the U.S. can now induce Canada to follow a higher tariff along with the U.S. against third countries. As a result, and as we indicate above, gains to the E.C. in a trade war are reduced.

Both these results, however, also clearly suggest that the bilateral trade agreement between Canada and the U.S. would not occur were it not also accompanied by side payments, since it would represent a losing proposition for the United States compared to a full Nash equilibrium, while it would be a dramatically gaining proposition for Canada. And hence the form of Canada-U.S. regional agreement that has emerged, as essentially one-sided liberalization with side payments, as we argue above, becomes more explicable with these results.

Table 8 also reports welfare effects of a trade war in the presence of a Mexico-U.S. Free Trade Area or Customs Union, as well as a North American Free Trade Area and Customs Union. In both cases where a bilateral arrangement is implemented, Mexico benefits substantially from the arrangement; and, as in the Canada-U.S. case, the U.S. is better off under a Customs Union arrangement than under a Free Trade Agreement. In the absence of side payments, the U.S. is better off entering into a Free Trade Area with Mexico than with a U.S.-Canada Free Trade Agreement. This finding is due to the fact that, in our 1986 data set, U.S.-Mexico trade flows are smaller than U.S.-Canada trade flows, implying that the retaliatory power of the U.S. is less affected by a Free Trade arrangement with Mexico than by one with Canada. North American trilateral arrangements have similar effects to those of the bilateral Canadian and Mexican agreements, except that now the benefits of access are shared by Canada and Mexico and benefits to the U.S. are lowered. Under a trade war in the

presence of a North American Free Trade Area, the U.S. loses rather than gains as it would with a Customs Union. Also, the U.S. gains less with a three-way Customs Union than it would in a two-way union with either Canada or Mexico.

Welfare effects of simultaneous bloc enlargements occurring in Europe and in North America[34] are reported in the final two columns of Table 8. The gains to the E.C. and the U.S. are significantly lower than in a full unconstrained trade war, the more so with Free Trade Areas than with regional Customs Unions. The biggest loser is the ROW bloc who loses even more than in the unconstrained case. Also notice that, a trade war with the simultaneous formation of a North-American and a European Customs Unions produces a larger negative aggregate welfare effect than an unconstrained trade war.[35]

As we emphasize above, the high post-retaliation tariffs reported in Table 7, are, in large part, a reflection of the elasticity values we use in our central case model specification. While these are literature-based and values of this size are used by other modellers, as we also comment above they would be considered in some circles to be unrealistically low. In the upper panel of Table 9 we report recomputations of post-retaliation Nash tariffs for cases where all trade elasticities are increased by 33 percent. In this case, post-retaliation optimal tariffs fall substantially: from nearly

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[34]The European trade arrangements we consider are more comprehensive than the current E.C.-EFTA agreement, since the OWE bloc includes countries which do not belong to EFTA.

[35]As Kennan and Riezman (1990) have shown, the formation of a Customs Union in a strategic tariff setting has ambiguous welfare effects, whereas the formation of a Free Trade Area unambiguously improves world welfare. More recently, Krugman (1991) and Haveman (1992) have described examples where the formation of Customs Unions reduces world welfare.

Table 9: Sensitivity Analysis of Post-Retaliation Equilibrium Tariff Rates (%)
Higher Uncompensated Import Price Elasticities (+33%)

A. $\mu^j = 1.5\sigma^j$ [a]

	Destination						
Origin	U.S.	Canada	Mexico	Japan	E.C.	OWE	ROW
U.S.		66	69	94	144	83	38
Canada	140		68	93	147	84	44
Mexico	135	65		92	147	84	48
Japan	123	64	68		144	84	42
E.C.	120	64	68	91		86	49
OWE	122	64	68	91	153		57
ROW	129	64	68	96	161	86	

B. $\mu^j = \sigma^j$ [a]

	Destination						
Origin	U.S.	Canada	Mexico	Japan	E.C.	OWE	ROW
U.S.		126	146	222	409	138	38
Canada	363		147	227	414	139	44
Mexico	360	128		227	414	140	48
Japan	338	128	147		412	139	42
E.C.	350	128	147	226		138	49
OWE	356	128	147	228	407		57
ROW	367	128	147	229	428	140	

[a] μ^j refers to the elasticity of substitution between import types (by region of origin). σ^j refers to the elasticity of substitution between the domestic good and the import composite. In the central case, we assume $\mu^j = 1.5\sigma^j$.

1000 percent to around 150 percent for the E.C.

In the lower panel of the same table we report equilibrium tariffs for a parameterization involving the same higher import price elasticities, but where the second-tier Armington substitution elasticities are assumed to be equal to the elasticity of substitution between domestically produced goods and the import aggregate. These rates are higher than those in the upper panel (around 400 percent for the E.C.) but still considerably lower than those found in our central-case calculations. These results underscore the point that, given present literature and uncertainties as to model elasticity values, all the estimates of characteristics of Nash equilibria we report in our paper have to be taken as indicative of ranges rather than as providing precise estimates.

In Table 10, we report welfare effects of alternative regional arrangements in the absence of any strategic tariff setting. Generally speaking, the effects are small relative to the trade war effects shown in Table 8. In most cases, all participants in the regional arrangements benefit, the more so with Customs Unions than with Free Trade Areas. In the few cases where regional participants lose, such as the U.S. in a Free Trade Area with Canada, and the U.S. and E.C. with the simultaneous formation of North American and European Free Trade Areas, this is a reflection of elasticity parameters and asymmetrical initial protection levels. The small size of the welfare effects from these regional agreements serves to emphasize the main theme of our paper, namely the dominance of the insurance objectives of these agreements over conventional trade liberalization.

We have been able to elaborate on the results from Tables 8 and 10 for the Canada-U.S. Free Trade Area and Customs Union cases, by explicitly calculating side

Table 10: Welfare Effects of Alternative
Regional Arrangements
No Retaliation Equilibria
(Impact of Liberalization Relative to 1986 Benchmark)

A. Hicksian EVs (U.S. $B)

Region	1 Global Free Trade[a]	2 Canada-US FTA[b]	3 Canada-US CU[c]	4 Mexico-US FTA[b]	5 Mexico-US CU[c]	6 North American FTA[b]	7 North American CU[c]	8 Simultaneous[d] North American and European FTA[b]	9 Simultaneous[d] North American and European CU[c]
U.S.	+9.2	-1.6	-1.3	+0.4	+3.6	-1.2	+1.7	-1.8	+3.2
Canada	+4.0	+4.0	+4.3	-0.2	-0.2	+3.9	+4.3	+3.8	+4.6
Mexico	+0.9	-0.1	-0.1	+0.9	+0.9	+0.8	+0.8	+0.7	+0.9
Japan	+9.4	-0.5	-0.6	-0.2	-1.5	-0.7	-2.2	-1.0	-0.8
E.C.	+22.7	-0.8	-1.2	-0.3	-0.7	-1.2	-1.7	-5.3	-15.9
OWE	+13.2	-0.1	-0.1	-0.04	-0.1	-0.1	-0.2	+8.2	+8.0
ROW	-8.7	-1.1	-0.8	-0.5	-0.9	-1.6	-1.6	-6.0	+6.3
World	+50.8	-0.3	+0.1	-0.06	+1.1	-0.2	+1.1	-1.5	+6.2

B. Hicksian EVs in % of National Income

Region	1 Global Free Trade[a]	2 Canada-US FTA[b]	3 Canada-US CU[c]	4 Mexico-US FTA[b]	5 Mexico-US CU[c]	6 North American FTA[b]	7 North American CU[c]	8 Simultaneous[d] North American and European FTA[b]	9 Simultaneous[d] North American and European CU[c]
U.S.	+0.2	-0.04	-0.03	+0.01	+0.8	-0.03	+0.04	-0.04	+0.1
Canada	+1.0	+1.0	+1.1	-0.04	-0.1	+1.0	+1.1	+1.0	+1.2
Mexico	+0.2	-0.03	-0.02	+0.7	+0.2	+0.2	+0.2	+0.2	+0.2
Japan	+0.7	-0.04	-0.04	-0.01	-0.1	-0.05	-0.2	-0.07	-0.05
E.C.	+0.7	-0.02	-0.04	-0.01	-0.02	-0.03	-0.04	-0.2	-0.5
OWE	+3.2	-0.02	-0.03	-0.01	-0.02	-0.02	-0.05	+2.0	+1.9
ROW	-0.1	-0.01	-0.01	-0.01	-0.1	-0.02	-0.05	-0.06	+0.06
World	+0.3	-0.001	+0.0005	-0.0003	+0.005	-0.0008	+0.006	-0.007	+0.03

[a] All trade barriers are removed.

[b] In an FTA, tariffs are bilaterally zero among member countries.

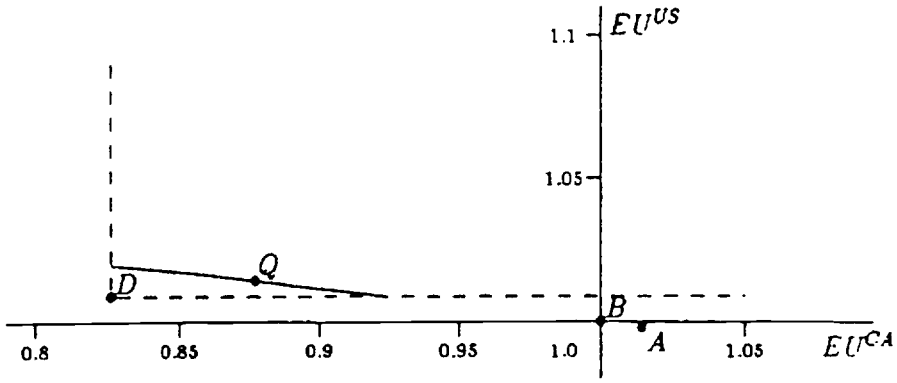
[c] In a CU, tariffs are bilaterally zero among member countries, remaining so throughout any retaliatory trade war, and a common external tariff applies to imports from third countries. See text for more details.

[d] North America is U.S., Canada, and Mexico; European implies E.C. plus Other Western Europe.

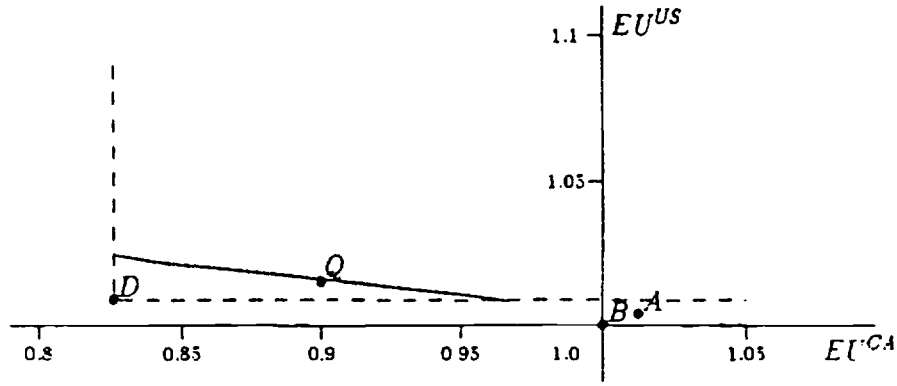
payments which would support a Pareto improvement for U.S. and Canada relative to an unconstrained scenario. For a given assumed configuration of values for the subjective probability of a trade war occurring and for the coefficient of relative risk aversion as discussed in the previous section, we use a series of calculations to trace out the bargaining sets for Free Trade and Customs Union agreements between Canada and the U.S. by varying transfers between members. These sets are shown in Figure 1. Point D, the "disagreement point", depicts the expected payoffs to the U.S. and Canada in the absence of an agreement, while the expected payoffs from an agreement with no side payments are represented by point A. For both a Free Trade Area and a Customs Union, in the absence of side payments the expected payoff to the U.S. is below its reservation expected utility. Parametrically varying inter-country transfers then allows us to trace the bargaining set for the agreement, i.e., the set of points which are Pareto superior to the disagreement point. The Nash bargaining outcome is shown as point Q. As we noted above, in the absence of side payments (point A), the U.S. is better off in a Customs Union than in a Free Trade Area, whereas Canada is almost indifferent between the two. For Canada, this implies lower equilibrium side payments and a higher expected payoff (point Q) in the Customs Union case than in the Free Trade Area case.

We have also computed the side payments associated with a Nash bargaining outcome for different values of the coefficient of relative risk aversion and various subjective probabilities values of trade wars occurring (assuming these parameters to be identical across countries). These are reported in Table 11; and suggest that for a Canada-U.S. Free Trade Area side payments could be as high as $50 billion. The side payments to a Customs Union agreement are smaller than in the Free Trade Area

A. Free Trade Area



B. Customs Union



B: 1986 benchmark (no retaliation)

D: unconstrained trade war

A: trade agreement with no side payments

Q: Nash bargaining solution

$\pi_W^{CA} = \pi_W^{US} = 0.5$ (π_W: subjective probability of a trade war occurring)

$\rho^{CA} = \rho^{US} = 1.0$ (ρ: coefficient of relative risk aversion)

Figure 1: Bargaining Sets for Alternative Canada-U.S. Trade Arrangements

Table 11: Equilibrium Side Payments from Canada to the U.S. (U.S. $B)
Central Case Elasticity Model Specification

A. Free Trade Area

	ρ			
π_W	0.25	1.0	5.0	10.0
1%	2.5	2.6	3.1	5.4
25%	15.9	16.8	22.7	29.6
50%	28.9	30.0	35.2	39.2
75%	41.1	41.9	44.7	46.4
99%	52.0	52.2	52.2	52.2

B. Customs Union

	ρ			
π_W	0.25	1.0	5.0	10.0
1%	2.4	2.5	3.0	5.0
25%	13.1	14.0	19.7	25.7
50%	23.6	24.7	29.8	33.2
75%	33.5	34.3	37.0	38.5
99%	42.5	42.6	42.7	42.7

ρ: coefficient of relative risk aversion

π_W: subjective probability of a trade war occurring

case, as would be expected from the results in Table 8, with this difference increasing in the probability of a trade war. Estimating the actual side payments implied by the 1988 Canada-U.S. Free Trade Agreement (and its accompanying process), of course, difficult. but with stronger patent protection, pricing restraints implied by the energy provisions, and other features, implicit side payments in the range of $15 billion per year by Canada to the U.S. may not be an unreasonable estimate.[36]

Finally, in Table 12, we look at the issue of sequential bloc formation, evaluating the desirability or otherwise of first negotiating with a large country, or allowing others to negotiate and then joining the agreement later.[37] For the Customs Union case, we find that there are substantial gains for both Canada and Mexico from being first in entering into an agreement with the U.S. This is because the exclusion from the initial regional grouping increases the bargaining power of the larger group, and thus makes it more costly to enter later. For the Free Trade Area case, there are be-

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[36]This is based on conjectures circulating at the time of the agreement that firmer intellectual property protection in Canada for U.S. firms might be worth around $5 billion a year. We add to this the value of the guarantee of no differential domestic and export pricing for sales of energy from U.S. company owned leases. Lenjosek and Whalley (1986) report estimates of the rent losses to Canada from eliminating differential energy pricing which range from $2.5 to $10 billion U.S. (using 1980 data). Further smaller concessions were made by Canada in the investment screening and security of energy supply areas. Thus, an overall figure of around $15 billion a year as non-trade benefits to the U.S. could be plausible.

[37]We first compute the Nash bargaining solution for the first-stage bilateral arrangement (we assume myopic behaviour in the first-stage bargaining game) and then use this outcome to define the disagreement point for the second-stage trilateral bargaining game.

Table 12: Expected Payoffs from Sequential Bloc Formation
Central Case Elasticity Model Specification
$\pi_W = 0.5, \quad \rho = 1.0$

A. Free Trade Area			
	Expected Utilities		
Sequence	U.S.	Canada	Mexico
U.S.-Canada, U.S.-Canada-Mexico	1.015	0.883	0.977
U.S.-Mexico, U.S.-Canada-Mexico	1.013	0.889	0.987
U.S.-Canada-Mexico	1.014	0.873	0.994
B. Customs Union			
	Expected Utilities		
Sequence	U.S.	Canada	Mexico
U.S.-Canada, U.S.-Canada-Mexico	1.018	0.917	0.971
U.S.-Mexico, U.S.-Canada-Mexico	1.017	0.872	1.018
U.S.-Canada-Mexico	1.016	0.894	1.009

ρ: coefficient of relative risk aversion

π_W: subjective probability of a trade war occurring

nefits to Canada from following Mexico in the arrangement. This is because. as the results in Table 8 show, the first entry of Canada into a Free Trade Area with the U.S. would entail a substantial loss for the U.S.; the side payment requested by the U.S. for a first entry by Canada would be accordingly large. By delaying entry, Canada can thus lower the cost of its admission into a North American Free Trade Area. This result is opposite to that which is now frequently ascribed to NAFTA, as having detrimental effects on sequential entrants because of their limited ability to obtain new benefits since their entry merely reapportions gains which have already accrued to other trading partners. The opposite result for Mexico in this case is a reflection of the relative sizes of Canada and Mexico, and of the consequent reduced impact of a Mexico-U.S. Free Trade Agreement on the retaliatory power of the U.S.

In both the Free Trade Area and Customs Union cases, the U.S. is better off by negotiating sequentially with its smaller partners than by engaging in multilateral trade negotiations. This latter result thus serves to emphasize the theme of this paper: namely that viewing regional agreements as insurance rather than more conventional trade liberalization seems to accord with the observed patterns of the new regionalism: that large countries can extract significant benefits from such agreements because of the risk of global trade wars. The dynamic instability of a regime in which large countries turn away from multilateralism, raising the risk of trade wars, increasing the size of the side payments they can extract, and further raising the incentives for a weakened commitment to multilateralism is what haunts the multilateralists in the trade policy community. Its analytical underpinnings are borne out in our results.

6 Concluding remarks

This paper suggests that recent regional arrangements, which are both complex and seemingly of little trade-liberalizing substance, are as much if not more insurance arrangements than reciprocity-based trade treaties. Firmer assurances of access to large markets are given to smaller countries in return for side payments or premia (restraints on domestic policies, firmer intellectual property protection, and other concessions).

We use numerical simulation methods to explore how different countries value their participation in regional trade arrangements under the threat of a global trade war. We calibrate the model to literature-based elasticities and share parameters on the basis of 1986 bilateral trade flow data, and compute post-retaliation Nash tariff equilibria, under alternative regional arrangements. These include Canada-U.S. Free Trade Agreements and Customs Unions, similar Mexico-U.S. and North American arrangements, as well as enlargements of the E.C.

Our results suggest that for the U.S. it does not pay to negotiate a regional agreement with Canada if no side payments are allowed. This is because, while there may be more leverage in a tariff war with the E.C. or the Rest-of-the-World (at least in the Customs Union case), losing the opportunity to play strategically against Canada more than offsets the source of gain. Since Canada benefits substantially from preferential duty-free access to U.S. markets in a bloc-wide rather than country-wide trade war, the side payment that the U.S. can demand of Canada more than compensates in a trade war with side payments allowed within blocs. The U.S. is thus better off participating in a bloc than not and, if side payments occur, both large and small countries will see it as in their interest to form blocs because of the insurance

and side-payment elements involved.

Similar themes emerge for other arrangements, although with nuances. The U.S. is better off in a regional arrangement with Mexico with side payments than not, and similarly the E.C. with Other Western European countries. Customs Unions seem preferred by all members over a Free Trade Area since their joint retaliatory power is increased; but the side payments which can be extracted are typically lower. We use a Nash bargaining solution concept to compute the side payments associated with different trade arrangements, and conjecture that the ranges involved in the Canada-U.S. case may not fall too far short of the implicit side payments in the 1988 Canada-U.S. Agreement.

The theme that emerges is that recent regional trade agreements are more readily understandable as insurance arrangements with premia than as conventional trade liberalization treaties; especially so since it is the smaller countries who have sought them. But their value to large countries rises as the risk of global trade conflicts rises, since they can extract increasingly larger premia. The threat they present to the trading system thus becomes more apparent when viewed in this light than a more conventional assessment might reveal.

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