

# Strategic Trade Policy and the Threat of Regionalism

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## Abstract

We examine the formation of trade agreements when markets are characterized by imperfect competition and governments can alter the strategic interaction between oligopolistic firms through the use of import tariffs and export subsidies. Using a simple three-country model of intra-industry trade, we show that whether preferential trade agreements are stepping stones or stumbling blocs towards the attainment of multilateral cooperation depends on the degree of product differentiation and industry concentration. However, when import tariffs are the only available policy instrument, global free trade is always sustainable. Our analysis provides a rationale for the recent attempts to strengthen international rules against the use of export subsidies. It also suggests that focusing on one dimension of strategic interaction only might result in drawing incorrect conclusions about the outcome of the trade negotiations.

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## 1 Introduction

Despite the successful conclusion of the Uruguay Round, there are still some concerns about the erosion of the rules-based multilateral trading system (Whalley and Hamilton, 1996). On the one hand, there is a fear that the proliferation of preferential trade agreements (PTAs) may be leading to the fragmentation of the world economy (see Sampson, 1996).<sup>1</sup> The risk is that “countries that join trading blocs will be more protectionist towards countries outside the blocs than they were before, so that the world as a whole will be hurt more than helped by moves that at ...rst seem to be liberalizing in intent” (Krugman, 1991).

On the other hand, there is a concern that tariæ barriers might simply be replaced with the use of less transparent trade measures. There is evidence that “protectionism has at long last fallen out of fashion. But export subsidies of all shapes and sizes seem somehow to have become tolerable stands-in. (...) They range from simple ad valorem payments to companies based on the size of their export sales, to complex systems of tax credits, loans, insurance policies and price supports” (The Economist, December 16, 2000).<sup>2</sup> The observed subsidization of exports cannot be rationalized under the hypothesis that product markets are perfectly competitive.<sup>3</sup> The literature on strategic trade policy, on the other hand, has shown that imperfect competition can

<sup>1</sup> According to Fratzscher (1996), 94 of world trade is conducted within or between the European Union (EU), the North American Free Trade Agreement (NAFTA) and the Association for South East Asian Nations (ASEAN). In the period 1948-1994, GATT contracting parties notified 118 preferential trade agreements relating to trade in goods, of which 38 in the ...ve years ending in 1994. Between 1995 and 1999, 80 additional PTAs covering trade in goods and services were notified to the WTO.

<sup>2</sup> The subsidization of ...rms engaged in international rivalry is a common practice in most industrialized countries. Since direct payments by the government to exporters are prohibited by GATT/WTO rules, countries often use indirect forms of support. For example, according to the European Union, the United States offers export subsidies in the form of tax breaks to a list of nearly ...fty products—including foods, sugars, cereals, oils, textiles, books, glass, ceramics, precious metals, clothes, footwear, toys, aircraft and spacecraft. For this reason, the European Union has recently asked the World Trade Organization permission to impose up to \$4 billion of sanctions on the United States.

<sup>3</sup> Under perfect competition, export subsidies do not appear to make much sense, since they improve the terms of trade of the importing country, thus benefiting foreign consumers (see Panagariya, 2000).

create “profit shifting motives” for the use of both import tariffs and export subsidies.<sup>4</sup>

This paper addresses the two above concerns, by examining whether PTAs are stepping stones or stumbling blocs towards the attainment of multilateral trade liberalization, when product markets are imperfectly competitive and governments can alter the strategic interaction between oligopolistic firms through the use of both import tariffs and export subsidies.

We describe international trade negotiations as a three-stage process. In the first stage, national governments decide whether to form trade agreements to cooperatively select import tariffs, export subsidies, or both policy instruments.<sup>5</sup> In the second stage, tariffs and subsidies are selected—cooperatively among countries participating in an agreement and non-cooperatively between countries belonging to separate agreements. In the last stage, firms compete in quantities. To determine the outcome of the trade negotiations, we employ the concept of Stable Agreement Structure developed by Conconi and Perroni (2000).

Focusing on the case of three ex-ante symmetric countries, we find that whether PTAs are stepping stones or stumbling blocs towards multilateral trade cooperation will depend on the degree of industry concentration and on the extent of product differentiation. We also show that an international ban on the use of export subsidies would make multilateral trade cooperation sustainable when it would not be otherwise. Thus our analysis provides a rationale for recent strengthening of GATT/WTO rules

<sup>4</sup>When domestic and foreign firms compete in the domestic market, Brander and Spencer (1984a,b) have shown that a tariff can be used to shift rents from foreign firms to the domestic firms and treasury; when domestic and foreign firms compete in a third country, Brander and Spencer (1985) have demonstrated that export subsidies can increase welfare by shifting profits from foreign to domestic firms. The profit-capture motive of trade intervention is most clearly seen when domestic and foreign firms are competing in a third country, since the home consumer surplus is not at issue. See Brander (1995) for an extensive review of the literature on strategic trade policy.

<sup>5</sup>The European Union is an example of a PTA in which member countries coordinate the use of both tariffs and subsidies: national governments cooperatively select a common external tariff and delegate to the Commission the task of ensuring that all subsidies granted within the EU are compatible with the single market objectives (see Cini and McGowan, 1998).

against export subsidies (see Laird, 1999).<sup>6</sup>

Most studies of endogenous trade bloc formation assume perfectly competitive markets.<sup>7</sup> An exception is Yi (1996), who employs a multi-country extension of Brander and Spencer (1984a)'s tariff model to describe the process of trade bloc formation under imperfect competition.<sup>8</sup> Focusing on tariff-only negotiations, he concludes that, in the case of three symmetric countries, global free trade is always sustainable.<sup>9</sup> Our analysis shows that Yi's optimistic conclusion might be reversed when one strategic dimension (export subsidies) is added to the trade negotiations. This suggests that modelling trade bloc formation as a uni-dimensional process can be misleading and might result in drawing incorrect conclusions about the sustainability of multilateral

<sup>6</sup>An alternative rationale is suggested by Bagwell and Staiger (1994). In their model, export subsidies are used to coordinate the entry decision of firms. They show that, when subsidy coordination does more to prevent entry than to promote entry, the world as a whole can be better off when export subsidies are banned.

<sup>7</sup>For example, Kennan and Riezman (1990) and Kose and Riezman (1999) construct a pure exchange general equilibrium model with three countries and three goods, in which trade patterns are determined by comparative advantage considerations. Using simulation techniques to compare optimal tariffs and welfare gains in alternative agreement structures, they show that for certain endowment distributions CUs can pose a threat to the multilateral trading system, since, due to the improvement in their terms of trade, member countries can obtain larger welfare gains than at the free trade equilibrium.

<sup>8</sup>Other studies look at the effects of exogenous trade bloc formation under imperfect competition, without considering countries' agreement choices. For example, Sinclair and Vines (1994) have extended Brander and Spencer (1984a)'s tariff model to consider the impact of the creation of CUs and free trade areas (FTAs) on the Nash equilibrium tariffs. In an infinitely repeated version of Brander and Spencer (1985)'s export subsidy game, Collie (1993) has shown that free trade can be sustained by the threat of retaliation with the Nash equilibrium export subsidies, provided that countries are similar and the discount factor is sufficiently high. Collie (1997) has employed a multi-country version of this model to study the effects of trade bloc enlargement.

<sup>9</sup>More generally, Yi finds that CUs are stepping stones towards global free trade if membership of a trade agreement is open to all players, but they might be stumbling blocs towards free trade if the formation of a trade bloc requires the agreement of all potential members and the number of negotiating countries exceeds a critical value.

cooperation. Various studies have pointed out that international tariff negotiations might be affected by the existence of alternative policy instruments.<sup>10</sup> However, none of these studies has examined the formation of trade blocs and the issue of the sustainability of multilateral trade cooperation.

The paper is structured as follows. In Section 2, we present a simple three-country model of intra-industry trade. In Section 3, we look at the welfare implications and the stability of alternative trade arrangements. Section 4 considers the effects of the introduction of an international ban on export subsidies. Section 5 concludes.

## 2 The Model

In this section, we describe a simple model of intra-industry trade between three ex-ante symmetric countries. The specification of production draws on the reciprocal-markets trade model first proposed by Brander (1981) and elaborated by Brander and Krugman (1983) and Dixit (1984).

Each country  $i \in \{1, 2, 3\}$  is endowed with an amount  $M_i$  of a numeraire good, which is transferred across countries to settle the balance of trade. A crucial assumption of the reciprocal-markets model is that markets are segmented, in the sense that firms make separate strategic decisions concerning different markets, rather than selling their output in a unified or integrated world market and relying on arbitrage to distribute it to different locations.<sup>11</sup> There exists evidence of market segmentation in economic sectors where firms have the ability to price discriminate between countries,

<sup>10</sup>For example, Coopeland (1990) has analyzed the general case of bilateral tariff negotiations when there exist non-negotiable domestic policy instruments. Gatsios and Karp (1992) have looked at the imperfect harmonization of trade and industrial policies and note the possibility of welfare reducing preferential trade agreements when members coordinate only the use of tariffs. A similar result is obtained by Richardson (1994), who shows that the uncoordinated use of domestic taxes/subsidies can render a 'pure' CU unattractive. More recently, Richardson (1999), focusing on the interaction between trade and competition policies, finds that the formation of a CU improves members' welfare only if it goes beyond mere trade coordination.

<sup>11</sup>Alternatively, one could assume that oligopolistic firms compete in an integrated market (see, for example, Horstmann and Markusen, 1986) or make a two stage decision, setting first their world-wide capacity, and then market specific quantities or prices (Venables, 1990).

thus maintaining a dominant position in their domestic markets.<sup>12</sup>

We assume that  $n$  identical firms are located in each market.<sup>13</sup> All firms in a given country produce an identical good at constant marginal cost  $c$ , but products are nationally differentiated. Let  $q_{ik}$  be sales in country  $k$  (destination) by a firm located in country  $i$  (origin), and  $Q_k = \sum_i q_{ik}$  be total sales in country  $k$ .

Preferences of a representative consumer in country  $k$  can be described by the following quasilinear utility function

$$u_k(M_k; Y_k; \mu) = M_k + v_k = M_k + a Y_k \left[ b \frac{\mu}{2} Y_k^2 + \frac{1-\mu}{2} \sum_i y_{ik}^2 \right]; \quad k \geq 1; \quad (1)$$

where  $M_k$  is the consumption of the numeraire good,  $y_{ik}$  is consumption by country  $k$  of a good produced in country  $i$ , and  $Y_k = \sum_i y_{ik}$  is  $k$ 's total consumption. The product differentiation parameter  $\mu$  ranges from 0 (independent goods) to 1 (homogeneous goods). Country  $k$ 's inverse demand for country  $i$ 's good is thus given by

$$P_{ik} = a_i \left[ b \left[ (1-\mu)y_{ik} + \mu Y_k \right] \right]; \quad (2)$$

Market clearing requires that total consumption must be equal to total sales, i.e.  $Y_k = \sum_i q_{ik}$ .

We assume that policy makers can alter the strategic interaction between oligopolistic firms through the use of import tariffs and export subsidies. Let  $t_{ik}$  denote country  $k$ 's tariffs on imports from country  $i$  and  $s_{ki}$  be its export subsidy (for home firms' exports to country  $i$ ).<sup>14</sup>

Countries may choose to form three types of trade agreements: they can form 'pure' customs unions (CUs), involving the elimination of tariffs among member countries and

<sup>12</sup>For example, evidence of market segmentation has been found in the European car market (see Flam and Nordstrom, 1994) and in the market for computer chips (see Baldwin and Krugman, 1988).

<sup>13</sup>We assume that the number of firms in each country is fixed. This can be regarded as a short-run situation or as a situation in which there are legal or technical entry barriers. See Brander and Krugman (1983) and Markusen and Venables (1988) for an analysis of the implications of trade liberalization with free entry.

<sup>14</sup>When product markets are imperfectly competitive, export subsidies and import tariffs do not 'neutralize' each other, i.e. the optimal response to a foreign export subsidy is not a fully countervailing tariff (see Dixit [1984, 1988], and Collie [1991]).

the selection of a common external tariff to maximize joint welfare;<sup>15</sup> they can form agreements to cooperatively select export subsidies; or they can form ‘impure’ CUs, coordinating the use of both policy instruments. We rule out international transfers.<sup>16</sup>

The sequential structure of the model consists of three stages. In the first stage, countries decide whether to form cooperative trade agreements.<sup>17</sup> In the second stage, tariffs and subsidies are selected—cooperatively among the members of an agreement and non-cooperatively between countries belonging to separate agreements. In the final stage, firms compete by choosing quantities in each market. As usual, we start by analyzing the last stage of the game, and solve for the equilibrium for the full game by backward induction. As a solution of the trade negotiation game, we use the concept of Stable Agreement Structure developed by Conconi and Perra (2000). We refer the reader to the original article for a formal definition. Roughly, this is a cooperative and recursive equilibrium concept: to be stable, an agreement structure must be immune from individual as well as joint deviations; and to block, an objection must involve an arrangement that is itself stable.

In the absence of transport costs,<sup>18</sup> the effective cost of supplying the traded good to country  $k$  for the firm located in country  $i$  is  $c + t_{ik} + s_{ik}$  and its profits are given by

$$\pi_{ik} = (P_{ik} + s_{ik} - c - t_{ik})q_{ik}; \quad (3)$$

<sup>15</sup>One could also consider the more general case in which the tariff agreements are characterized by non-zero tariffs between members. One institutional justification for the internal zero-tariff assumption is the fact that the General Agreement on Tariffs and Trade (GATT) permits the formation of preferential trade agreements provided that “the duties and other restrictive regulations of commerce are eliminated on substantially all trade between the constituents territories in products originating in such territories” (Article XXIV).

<sup>16</sup>The role of side-payments in international trade negotiations is examined by Kowalczyk and Sjöström (1994).

<sup>17</sup>We assume that countries can credibly commit to trade cooperation. Our analysis thus differs from the strand of the literature which argues against the legitimacy of assuming binding commitments in international trade negotiations (e.g. Bagwell and Staiger, 1997).

<sup>18</sup>Differently from Brander (1981) and Brander and Krugman (1983), we assume that firms do not incur any transport costs in supplying foreign markets. However, such costs are assumed to be prohibitive for any third-party arbitrageurs.

with associated first-order condition<sup>19</sup>

$$\frac{\partial \pi_{ik}}{\partial q_{ik}} = a_i - c_i - b(1+n)q_{ik} - b\mu \sum_{j \in i} q_{jk} + s_{ik} - t_{ik} = 0 \quad (4)$$

Equation (4) represents the reaction functions (in implicit form) for the firms supplying market  $k$ . It shows the best-reply output of a firm, given whatever level of output is produced by the other firms. Notice that the profit function satisfies Hahn (1962)'s condition for stability of a Cournot equilibrium:

$$\frac{d\pi_{ik}}{dq_{jk}} < 0; \quad \forall i \neq j;$$

that is, each firm's marginal revenue in one market declines as the output of any other firm rises.<sup>20</sup> Solving (4) for all  $k \geq 1$ , we obtain domestic and foreign sales in country  $k$  at the Cournot equilibrium:

$$q_{kk}(t_{ik}; s_{ik}) = \frac{\theta(1+n+\mu n) + \mu n \left( \sum_{i \in k} t_{ik} + \sum_{i \in k} s_{ik} \right)}{\pm}; \quad (5)$$

$$q_{ik}(t_{ik}; s_{ik}) = \frac{\theta(1+n_i\mu n) + (1+n+\mu n)(s_{ik} - t_{ik}) + \mu n t_{jk}}{\pm}; \quad (6)$$

where  $\theta = a_i - c_i$  is a measure of market size and is assumed to be positive, since otherwise a firm will never produce any output,  $\pm = b(1+n_i\mu n)(1+n+2\mu n)$ , and  $t_{ik}$  and  $s_{ik}$  are the vectors of tariffs and subsidies for all firms selling in country  $k$ . Notice that the quantities produced for market  $k$  do not depend on variables in markets other than  $k$ . As noted by Brander (1981), this separability property depends crucially on the assumption of constant marginal costs.<sup>21</sup>

<sup>19</sup>With linear demand, since profit functions are concave, the second-order conditions for profit-maximization are satisfied and there exist a unique Cournot-Nash equilibrium.

<sup>20</sup>Expression (2) also implies that the strategic variables  $q_{ik}$  and  $q_{jk}$  are strategic substitutes as defined by Bulow et al. (1985).

<sup>21</sup>If marginal costs depended on production levels, market separability would be lost and one could not rule out the kind of strategies considered by Krugman (1984), where an advantage given to a firm in one market spills over into a further advantage in another market.



We rule out corner solutions, assuming that in equilibrium each firm produces a strictly positive outcome. Since firms sell both at home and abroad, market equilibrium will involve intra-industry trade, even in the case where firms located in different countries sell homogeneous products (cross-hauling).

Equations (5)-(6) imply the following comparative statics effects:

$$\frac{dq_{ik}}{ds_{ik}} = \frac{1 + n_i \mu n}{\pm} > 0; \quad (7)$$

$$\frac{dq_{kk}}{ds_{ik}} = \frac{dq_{jk}}{ds_{ik}} = i \frac{\mu n}{\pm} < 0; \quad (8)$$

$$\frac{dq_{ik}}{dt_{ik}} = i \frac{1 + n + \mu n}{\pm} < 0; \quad (9)$$

$$\frac{dq_{kk}}{dt_{ik}} = \frac{dq_{jk}}{dt_{ik}} = \frac{\mu n}{\pm} > 0; \quad (10)$$

Hence, if a country increases its subsidy on exports to a given market, its sales in that market increase, while the sales of all other countries fall; if instead a country increases its tariff on imports from a given country, imports from that country fall, while imports from other countries and its own domestic sales increase.

Given the quasilinearity of the utility function, if profits and tax revenues are rebated back uniformly to all consumers, country  $k$ 's welfare can be written as the sum of domestic consumer surplus, government revenues, and total profits of domestic firms in all markets. Using (4), we can express a firm's domestic and foreign profits as  $\pi_{kk} = bq_{kk}^2(t_{ik}; s_{ik})$  and  $\pi_{ki} = bq_{ki}^2(t_{ki}; s_{ki})$ , respectively. Welfare can thus be written as

$$W_k(t_{ik}; s_{ik}; t_{ki}; s_{ki}) = v_k(t_{ik}; s_{ik}) + \sum_k n q_{ik}(t_{ik}; s_{ik}) p_{ik}(t_{ik}; s_{ik}) + \sum_{i \in k} n t_{ik} q_{ik}(t_{ik}; s_{ik}) + \sum_k s_{ki} q_{ki}(t_{ki}; s_{ki}) + \sum_{i \in k} n b q_{kk}^2(t_{ik}; s_{ik}) + \sum_{i \in k} b q_{ki}^2(t_{ki}; s_{ki}) \quad (11)$$

In the model described above, there are two sorts of gains from trade: the pro-competitive gains associated with the reduction in market power in the domestic industry, which increase with the degree of industry concentration (i.e. decrease with  $n$ );

and the gains from the increase in the variety of goods available to consumers, which increase with the degree of product differentiation (i.e. increase with  $\mu$ ).<sup>22</sup>

### 3 International Negotiations on Import Tariffs and Export Subsidies

In this section, we examine the formation of trade agreements when both policy instruments (import tariffs and export subsidies) are at governments' disposal. In the next section we will examine the impact of introducing an international ban on the use of export subsidies.

With three countries and two strategy dimensions, we need to consider twenty-five possible agreement structures, which, given the symmetry assumption, can be restricted to the following ten:

<sup>22</sup>Notice that, due to the quasilinearity of the utility function and the assumption of market segmentation, there are no terms of trade effects. As remarked by Yi (1996), terms of trade effects are placed solely on the numeraire good.

1. Joint Global Agreement (JGA):  
 $fft_1; t_2; t_3g; fs_1; s_2; s_3gg;$
2. No agreement on either issue:  
 $fft_1g; ft_2g; ft_3g; fs_1g; fs_2g; fs_3gg;$
3. Global tari $\alpha$  agreement, no agreement on subsidies:  
 $fft_1; t_2; t_3g; fs_1g; fs_2g; fs_3gg;$
4. Global agreement on subsidies, no tari $\alpha$  agreement:  
 $fft_1g; ft_2g; ft_3g; fs_1; s_2; s_3gg;$
5. Partial agreement on subsidies, no tari $\alpha$  agreement:  
 $fft_1g; ft_2g; ft_3g; fs_1; s_2g; fs_3gg;$
6. Partial tari $\alpha$  agreement, no agreement on subsidies :  
 $fft_1; t_2g; ft_3g; fs_1g; fs_2g; fs_3gg;$
7. Partial overlapping agreements on tari $\alpha$ s and subsidies :  
 $fft_1; t_2g; ft_3g; fs_1; s_2g; fs_3gg;$
8. Partial agreements on tari $\alpha$ s and subsidies:  
 $fft_1; t_2g; ft_3g; fs_1g; fs_2; s_3gg;$
9. Global tari $\alpha$  agreement and partial agreement on subsidies:  
 $fft_1; t_2; t_3g; fs_1; s_2g; fs_3gg;$
10. Global agreement on subsidies and partial tari $\alpha$  agreement:  
 $fft_1; t_2g; ft_3g; fs_1; s_2; s_3gg.$

For simplicity, and without loss of generality, in the rest of our analysis we set  $\alpha = b = 1$ . We first consider the case in which the traded goods are homogeneous ( $\mu = 1$ ), and then examine the case in which firms produce nationally differentiated goods ( $\mu < 1$ ).

### 3.1 The Case of Homogeneous Goods

Table 1 reports the welfare gains obtained in the different agreement structures, under alternative assumptions about the number of firms located in each market.<sup>23</sup>

As expected, welfare gains increase with the number of firms located in each market. This is due to pro-competitive effects associated with the decrease in industry concentration. Notice that, as  $n$  increases, the difference between the welfare gains obtained in different structures falls. The intuition behind this result is that, as markets become more competitive, the profit-shifting incentives for the use of import tariffs and export subsidies tend to disappear.<sup>24</sup>

Table 1 also reveals that agreement structures 1, 4 and 10 and agreement structures 5 and 7 yield the same welfare gains. This implies that tariff coordination is irrelevant for countries that are already cooperating over the use of export subsidies.

Comparing the welfare gains obtained under alternative agreement structures, we obtain the following result:

**Proposition 1** In the case of homogeneous goods, preferential trade agreements are always stumbling blocs towards the attainment of multilateral trade cooperation.

PROOF: see the Appendix.

The intuition behind Proposition 1 is that, by coordinating the use of export subsidies, two countries are able to shift rents from the firms located in the non-member country to their domestic firms and treasury,<sup>25</sup> and the profit-shifting gains more than offset the costs of forgoing cooperation with the third country.<sup>26</sup>

<sup>23</sup>The analytical expressions for the equilibrium policies used to derive the results in Table 1 can be found in the Appendix.

<sup>24</sup>The analytical results presented in the Appendix show that, as  $n \rightarrow 1$ , optimal tariffs and subsidies in all agreement structures tend to zero.

<sup>25</sup>This can be seen by comparing the equilibrium policies reported in the Appendix. It is easy to verify that, relative to the JGA, in structures 5, 7 and 9, countries 1 and 2 always choose to subsidize less their exports to country 3 and to subsidize more their exports to each other's markets.

<sup>26</sup>Notice that such costs are smaller in the case of homogeneous products, since there are no product-

Table 1: Agreement Structures and Countries' Welfare (Homogeneous Goods)  
( $\mu = 1$ )

Agreement Structure	Countries' Welfare		
	n = 1	n = 5	n = 8
1. fft <sub>1</sub> ; t <sub>2</sub> ; t <sub>3</sub> g; fs <sub>1</sub> ; s <sub>2</sub> ; s <sub>3</sub> gg	$W_k = 0:5$	$W_k = 0:5$	$W_k = 0:5$
2. fft <sub>1</sub> g; ft <sub>2</sub> g; ft <sub>3</sub> g; fs <sub>1</sub> g; fs <sub>2</sub> g; fs <sub>3</sub> gg	$W_k = 0:4339$	$W_k = 0:4902$	$W_k = 0:4952$
3. fft <sub>1</sub> ; t <sub>2</sub> ; t <sub>3</sub> g; fs <sub>1</sub> g; fs <sub>2</sub> g; fs <sub>3</sub> gg	$W_k = 0:4922$	$W_k = 0:4994$	$W_k = 0:4997$
4. fft <sub>1</sub> g; ft <sub>2</sub> g; ft <sub>3</sub> g; fs <sub>1</sub> ; s <sub>2</sub> ; s <sub>3</sub> gg	$W_k = 0:5$	$W_k = 0:5$	$W_k = 0:5$
5. fft <sub>1</sub> g; ft <sub>2</sub> g; ft <sub>3</sub> g; fs <sub>1</sub> ; s <sub>2</sub> g; fs <sub>3</sub> gg	$W_{1,2} = 0:51$ $W_3 = 0:4$	$W_{1,2} = 0:5007$ $W_3 = 0:4871$	$W_{1,2} = 0:5003$ $W_3 = 0:4941$
6. fft <sub>1</sub> ; t <sub>2</sub> g; ft <sub>3</sub> g; fs <sub>1</sub> g; fs <sub>2</sub> g; fs <sub>3</sub> gg	$W_{1,2} = 0:4873$ $W_3 = 0:4229$	$W_{1,2} = 0:4989$ $W_3 = 0:4891$	$W_{1,2} = 0:4995$ $W_3 = 0:4948$
7. fft <sub>1</sub> ; t <sub>2</sub> g; ft <sub>3</sub> g; fs <sub>1</sub> ; s <sub>2</sub> g; fs <sub>3</sub> gg	$W_{1,2} = 0:51$ $W_3 = 0:4$	$W_{1,2} = 0:5007$ $W_3 = 0:4871$	$W_{1,2} = 0:5003$ $W_3 = 0:4941$
8. fft <sub>1</sub> ; t <sub>2</sub> g; ft <sub>3</sub> g; fs <sub>1</sub> g; fs <sub>2</sub> ; s <sub>3</sub> gg	$W_1 = 0:3438$ $W_2 = 0:6667$ $W_3 = 0:4583$	$W_1 = 0:4549$ $W_2 = 0:5732$ $W_3 = 0:4684$	$W_1 = 0:4707$ $W_2 = 0:5510$ $W_3 = 0:4768$
9. fft <sub>1</sub> ; t <sub>2</sub> ; t <sub>3</sub> g; fs <sub>1</sub> ; s <sub>2</sub> g; fs <sub>3</sub> gg	$W_{1,2} = 0:5625$ $W_3 = 0:3437$	$W_{1,2} = 0:5208$ $W_3 = 0:4549$	$W_{1,2} = 0:5139$ $W_3 = 0:4707$
10. fft <sub>1</sub> ; t <sub>2</sub> g; ft <sub>3</sub> g; fs <sub>1</sub> ; s <sub>2</sub> ; s <sub>3</sub> gg	$W_k = 0:5$	$W_k = 0:5$	$W_k = 0:5$

Since world welfare is always lower when two countries form a PTA than in the case of global trade cooperation, Proposition 1 supports the concern that the world as a whole will be hurt more than helped by the formation of regional trading blocs.

### 3.2 The Case of Heterogeneous Goods

We now turn our attention to the case of differentiated goods. Tables 2 and 3 report the welfare gains obtained in the nine agreement structures, under different assumptions about the degree of product differentiation and the degree of industry concentration.<sup>27</sup>

From Tables 2 and 3, we can see that welfare gains increase with the degree of product differentiation (i.e. decrease with  $\mu$ ). The reason behind this result is that, since individuals enjoy variety, an increase in product differentiation implies an increase in consumer surplus.

Comparing the welfare gains obtained under the ten alternative scenarios, we obtain the following result:

**Proposition 2** In the case of heterogeneous goods, preferential trade agreement can be stumbling blocs or stepping stones towards the attainment of multilateral trade cooperation, depending on the degree of product differentiation and industry concentration.

**PROOF:** the analysis of Table 2 shows that, when the industry is highly concentrated ( $n = 1$ ) multilateral trade cooperation is the only negotiation outcome. This is because the gains associated with including a third country in the trade agreement (i.e. the increase in product variety and domestic competition) always outweigh the gains from excluding it (i.e. the shift of foreign firms' profit to the domestic firms and treasury). However, from Table 3 we can see that, when the industry is less concentrated ( $n = 8$ ) and traded goods are rather similar ( $\mu = 8=10$ ), international negotiations can result in the formation of preferential trade agreements. Hence, the more homogeneous the

variety welfare gains from trade cooperation.

<sup>27</sup>The analytical expressions for the equilibrium policies used to derive the results in Tables 2 and 3 can be obtained upon request.

Table 2: Agreement Structures and Countries' Welfare (Heterogeneous Goods)  
(n = 1)

Agreement Structure	Countries' Welfare		
	$\mu = 2=10$	$\mu = 1=2$	$\mu = 8=10$
1. fft <sub>1</sub> ; t <sub>2</sub> ; t <sub>3</sub> g; fs <sub>1</sub> ; s <sub>2</sub> ; s <sub>3</sub> gg	W <sub>k</sub> = 1:0088	W <sub>k</sub> = 0:7222	W <sub>k</sub> = 0:5655
2. fft <sub>1</sub> g; ft <sub>2</sub> g; ft <sub>3</sub> g; fs <sub>1</sub> g; fs <sub>2</sub> g; fs <sub>3</sub> gg	W <sub>k</sub> = 0:7551	W <sub>k</sub> = 0:5907	W <sub>k</sub> = 0:4856
3. fft <sub>1</sub> ; t <sub>2</sub> ; t <sub>3</sub> g; fs <sub>1</sub> g; fs <sub>2</sub> g; fs <sub>3</sub> gg	W <sub>k</sub> = 0:8907	W <sub>k</sub> = 0:6817	W <sub>k</sub> = 0:5526
4. fft <sub>1</sub> g; ft <sub>2</sub> g; ft <sub>3</sub> g; fs <sub>1</sub> ; s <sub>2</sub> ; s <sub>3</sub> gg	W <sub>k</sub> = 1:0088	W <sub>k</sub> = 0:7222	W <sub>k</sub> = 0:5655
5. fft <sub>1</sub> g; ft <sub>2</sub> g; ft <sub>3</sub> g; fs <sub>1</sub> ; s <sub>2</sub> g; fs <sub>3</sub> gg	W <sub>1,2</sub> = 0:9101 W <sub>3</sub> = 0:0:6957	W <sub>1,2</sub> = 0:6903 W <sub>3</sub> = 0:5203	W <sub>1,2</sub> = 0:5574 W <sub>3</sub> = 0:4329
6. fft <sub>1</sub> ; t <sub>2</sub> g; ft <sub>3</sub> g; fs <sub>1</sub> g; fs <sub>2</sub> g; fs <sub>3</sub> gg	W <sub>1,2</sub> = 0:8306 W <sub>3</sub> = 0:7334	W <sub>1,2</sub> = 0:6491 W <sub>3</sub> = 0:5650	W <sub>1,2</sub> = 0:5356 W <sub>3</sub> = 0:4672
7. fft <sub>1</sub> ; t <sub>2</sub> g; ft <sub>3</sub> g; fs <sub>1</sub> ; s <sub>2</sub> g; fs <sub>3</sub> gg	W <sub>1,2</sub> = 0:9101 W <sub>3</sub> = 0:6957	W <sub>1,2</sub> = 0:6903 W <sub>3</sub> = 0:5203	W <sub>1,2</sub> = 0:5574 W <sub>3</sub> = 0:4329
8. fft <sub>1</sub> ; t <sub>2</sub> g; ft <sub>3</sub> g; fs <sub>1</sub> g; fs <sub>2</sub> ; s <sub>3</sub> gg	W <sub>1</sub> = 0:7403 W <sub>2</sub> = 1:0748 W <sub>3</sub> = 0:8176	W <sub>1</sub> = 0:5185 W <sub>2</sub> = 0:8994 W <sub>3</sub> = 0:5483	W <sub>1</sub> = 0:3904 W <sub>2</sub> = 0:8206 W <sub>3</sub> = 0:3778
9. fft <sub>1</sub> ; t <sub>2</sub> ; t <sub>3</sub> g; fs <sub>1</sub> ; s <sub>2</sub> g; fs <sub>3</sub> gg	W <sub>1,2</sub> = 0:9788 W <sub>3</sub> = 0:7987	W <sub>1,2</sub> = 0:7426 W <sub>3</sub> = 0:5500	W <sub>1,2</sub> = 0:6068 W <sub>3</sub> = 0:4072
10. fft <sub>1</sub> ; t <sub>2</sub> g; ft <sub>3</sub> g; fs <sub>1</sub> ; s <sub>2</sub> ; s <sub>3</sub> gg	W <sub>k</sub> = 1:0088	W <sub>k</sub> = 0:7222	W <sub>k</sub> = 0:5655

Table 3: Agreement Structures and Countries' Welfare (Heterogeneous Goods)  
(n = 8)

Agreement Structure	Countries' Welfare		
	$\mu = 2=10$	$\mu = 1=2$	$\mu = 8=10$
1. fft <sub>1</sub> ; t <sub>2</sub> ; t <sub>3</sub> g; fs <sub>1</sub> ; s <sub>2</sub> ; s <sub>3</sub> gg	W <sub>k</sub> = 1:0683	W <sub>k</sub> = 0:7485	W <sub>k</sub> = 0:5760
2. fft <sub>1</sub> g; ft <sub>2</sub> g; ft <sub>3</sub> g; fs <sub>1</sub> g; fs <sub>2</sub> g; fs <sub>3</sub> gg	W <sub>k</sub> = 0:9320	W <sub>k</sub> = 0:6973	W <sub>k</sub> = 0:5585
3. fft <sub>1</sub> ; t <sub>2</sub> ; t <sub>3</sub> g; fs <sub>1</sub> g; fs <sub>2</sub> g; fs <sub>3</sub> gg	W <sub>k</sub> = 0:9547	W <sub>k</sub> = 0:7140	W <sub>k</sub> = 0:5705
4. fft <sub>1</sub> g; ft <sub>2</sub> g; ft <sub>3</sub> g; fs <sub>1</sub> ; s <sub>2</sub> ; s <sub>3</sub> gg	W <sub>k</sub> = 1:0683	W <sub>k</sub> = 0:7485	W <sub>k</sub> = 0:5760
5. fft <sub>1</sub> g; ft <sub>2</sub> g; ft <sub>3</sub> g; fs <sub>1</sub> ; s <sub>2</sub> g; fs <sub>3</sub> gg	W <sub>1,2</sub> = 1:0242 W <sub>3</sub> = 0:8606	W <sub>1,2</sub> = 0:7440 W <sub>3</sub> = 0:6320	W <sub>1,2</sub> = 0:5766 W <sub>3</sub> = 0:5291
6. fft <sub>1</sub> ; t <sub>2</sub> g; ft <sub>3</sub> g; fs <sub>1</sub> g; fs <sub>2</sub> g; fs <sub>3</sub> gg	W <sub>1,2</sub> = 0:9531 W <sub>3</sub> = 0:8926	W <sub>1,2</sub> = 0:7148 W <sub>3</sub> = 0:6639	W <sub>1,2</sub> = 0:5694 W <sub>3</sub> = 0:5449
7. fft <sub>1</sub> ; t <sub>2</sub> g; ft <sub>3</sub> g; fs <sub>1</sub> ; s <sub>2</sub> g; fs <sub>3</sub> gg	W <sub>1,2</sub> = 1:0242 W <sub>3</sub> = 0:8606	W <sub>1,2</sub> = 0:7440 W <sub>3</sub> = 0:6320	W <sub>1,2</sub> = 0:5766 W <sub>3</sub> = 0:5291
8. fft <sub>1</sub> ; t <sub>2</sub> g; ft <sub>3</sub> g; fs <sub>1</sub> g; fs <sub>2</sub> ; s <sub>3</sub> gg	W <sub>1</sub> = 0:8763 W <sub>2</sub> = 1:0867 W <sub>3</sub> = 0:9557	W <sub>1</sub> = 0:6377 W <sub>2</sub> = 0:8060 W <sub>3</sub> = 0:6803	W <sub>1</sub> = 0:5228 W <sub>2</sub> = 0:6262 W <sub>3</sub> = 0:5383
9. fft <sub>1</sub> ; t <sub>2</sub> ; t <sub>3</sub> g; fs <sub>1</sub> ; s <sub>2</sub> g; fs <sub>3</sub> gg	W <sub>1,2</sub> = 1:0356 W <sub>3</sub> = 0:8793	W <sub>1,2</sub> = 0:7542 W <sub>3</sub> = 0:6401	W <sub>1,2</sub> = 0:5867 W <sub>3</sub> = 0:5278
10. fft <sub>1</sub> ; t <sub>2</sub> g; ft <sub>3</sub> g; fs <sub>1</sub> ; s <sub>2</sub> ; s <sub>3</sub> gg	W <sub>k</sub> = 1:0683	W <sub>k</sub> = 0:7485	W <sub>k</sub> = 0:5760



traded goods and the less concentrated the industry, the higher the risk that regional agreements may lead to the fragmentation of the world economy. Q.E.D.

The results obtained in our analysis are in contrast with the more optimistic conclusions obtained by Yi (1996) who, assuming that import tariffs are the only available policy instrument, finds that free trade is the only stable outcome of the tariff negotiations between three ex-ante symmetric countries.<sup>28</sup>

#### 4 Tariff-only International Negotiations

Export subsidies are prohibited by GATT/WTO rules.<sup>29</sup> However, governments are often able to use indirect forms of export support. These include: more favourable credit conditions (the difference between these and the normal conditions applied to producers for the home market is paid by the government); insurance of certain risks (for example, that the foreign imported defaults) paid by the government; and promotional activities (such as trade fairs, advertising, etc.) organized by public agencies. For this reason, the WTO has recently attempted to strengthen the rules against the use of export subsidies (see Laird, 1999).<sup>30</sup>

<sup>28</sup>Yi (1996) employs a multi-country extension of Brander and Spencer (1984a)'s tariff game and focuses on the case in which only one firm is located in each country ( $n = 1$ ). He computes the critical number of countries such that free trade is a stable outcome under both the open regionalism and unanimous regionalism rules. This is an increasing function of the degree of product differentiation. For example, for  $\mu = 0.1$ , free trade is a stable outcome if there are less than 15 countries, while for  $\mu = 1$ , the critical value is 4.

<sup>29</sup>In the original GATT agreement in 1947 there was very little discipline on subsidies. The first substantial obligations regarding the use of export subsidies were introduced in 1955 (see Article XVI, paragraphs 2-5). A Subsidies Code was adopted at the Tokyo Round and revised at the Uruguay Round by the "Agreement on Subsidies and Countervailing Measures". The latter distinguishes between prohibited, actionable and nonactionable subsidies. See Jackson (1998) for a discussion of the evolution of the rules on subsidies and countervailing duties.

<sup>30</sup>A panel adopted by the WTO Dispute Settlement Body (DSB) in February 2000, requires, for the first time, a company to repay in full an illegal member subsidy from a member government. This case involves a dispute brought against Australia by the US over A\$30 million in export subsidies to a producer of automotive leather. Two other recent cases involve export subsidies worth billions of

In this section, we examine how the introduction of an effective ban on export subsidies would affect the outcome of the trade negotiations between three ex-ante symmetric countries. When import tariffs are the only available policy instrument, there are only three possible agreement structures, which, given the symmetry assumption, can be restricted to the following three:

1. Global Free Trade:

$$f, t_1, t_2, t_3, g, g;$$

2. Nash Equilibrium:

$$f, t_1, g, t_2, g, t_3, g, g;$$

3. Partial tariff agreement:

$$f, t_1, t_2, g, t_3, g, g.$$

Comparing the welfare gains obtained in the three alternative agreement structures, we obtain the following result:

**Proposition 3** When governments are banned from using export subsidies, global free trade is the only stable negotiation outcome.

PROOF: see the Appendix.

The reason behind this result is that the gains associated with further trade liberalization (i.e. the increase in domestic competition, product variety and export profits) always outweigh the corresponding welfare costs (i.e. the fall in domestic profits and government revenues).

Proposition 3 can be illustrated through the use of Tables 4-6, which report the welfare gains obtained in the tariff-only agreement formation game for the same parameterized examples considered in Tables 1-3 above. The same result emerges also from the analysis of Figures 1 and 2, where we plot the welfare functions corresponding to the three agreement structures for the case of homogeneous goods ( $\mu = 1$ ) and the case in which each country has only one firm ( $n = 1$ ).

\$US: one rule against US tax exemptions for exporters; the other rule that Brazil has failed to lift the export subsidies to its jet aircraft industries, as required in a previous panel.

Table 4: Agreement Structures and Countries' Welfare (Homogeneous Goods)  
( $\mu = 1$ )

Agreement Structure	Countries' Welfare		
	$n = 1$	$n = 5$	$n = 8$
1. $fft_1; t_2; t_3gg$	$W_k = 0:4688$	$W_k = 0:4981$	$W_k = 0:4992$
2. $fft_1g; ft_2g; ft_3gg$	$W_k = 0:42$	$W_k = 0:4893$	$W_k = 0:4949$
3. $fft_1; t_2g; ft_3gg$	$W_{1;2} = 0:4574$ $W_3 = 0:4055$	$W_{1;2} = 0:4967$ $W_3 = 0:4880$	$W_{1;2} = 0:4986$ $W_3 = 0:4944$

Table 5: Agreement Structures and Countries' Welfare (Heterogeneous Goods)  
( $n = 1$ )

Agreement Structure	Countries' Welfare		
	$\mu = 2=10$	$\mu = 1=2$	$\mu = 8=10$
1. $fft_1; t_2; t_3gg$	$W_k = 0:8854$	$W_k = 0:6667$	$W_k = 0:5324$
2. $fft_1g; ft_2g; ft_3gg$	$W_k = 0:7517$	$W_k = 0:58$	$W_k = 0:4710$
3. $fft_1; t_2g; ft_3gg$	$W_{1;2} = 0:8262$ $W_3 = 0:7297$	$W_{1;2} = 0:6356$ $W_3 = 0:5523$	$W_{1;2} = 0:5151$ $W_3 = 0:4491$

Figure 1: Welfare gains (homogeneous goods)

Figure 2: Welfare gains ( $n = 1$ )

Table 6: Agreement Structures and Countries' Welfare (Heterogeneous Goods)  
(n = 8)

Agreement Structure	Countries' Welfare		
	$\mu = 2=10$	$\mu = 1=2$	$\mu = 8=10$
1. $fft_1; t_2; t_3gg$	$W_k = 1:0642$	$W_k = 0:7474$	$W_k = 0:5757$
2. $fft_1g; ft_2g; ft_3gg$	$W_k = 1:0492$	$W_k = 0:7384$	$W_k = 0:5677$
3. $fft_1; t_2g; ft_3gg$	$W_{1;2} = 1:0581$ $W_3 = 1:0435$	$W_{1;2} = 0:7449$ $W_3 = 0:7315$	$W_{1;2} = 0:5743$ $W_3 = 0:5611$

Combining Propositions 1-3, we can thus conclude that, in the case of three ex-ante symmetric countries, the introduction of an effective ban on subsidies would make multilateral trade cooperation sustainable when it would not be otherwise.

Proposition (3) is in line with the results obtained by Yi (1996) for the case of three ex-ante symmetric countries. Notice, however, that his optimistic conclusion about the sustainability of free trade would be misleading if policy makers are also able to use export subsidies.

## 5 Concluding Remarks

In recent years, concerns have been raised about the erosion of the multilateral trading system due to the proliferation of bilateral and regional trade agreements and the increase in the use of non-tariff barriers in general and export subsidies. These two threats to the system are interrelated, since many PTAs "increasingly contain trade-related provisions that deal with measures other than tariffs" (Sampson, 1996).

To examine whether these concerns are justified, in this paper we have studied the

formation of trade agreements when markets are imperfectly competitive and governments can alter the strategic interaction between oligopolistic firms through the use of import tariffs and export subsidies.

Using a simple three-country model of intra-industry trade, we have shown that whether PTAs pose a threat to the global trading system depends on which policy instruments are at governments' disposal, on the degree of industry concentration, and on the extent of product differentiation. When both import tariffs and export tariffs are available and traded goods are homogeneous, PTAs involving the coordinated use of export subsidies are always stumbling blocs towards multilateral trade cooperation. If both policy instruments are available but products are nationally differentiated, multilateral cooperation is sustainable only in those sectors where the degree of product differentiation and industry concentration are large enough, so that the product-variety and pro-competitive gains from global trade cooperation outweigh the profit-shifting gains from preferential trade cooperation. When export subsidies are banned and import tariffs are the only available policy instrument, global free trade is always sustainable.

Our results provide a rationale for the recent attempts to strengthen international rules against the use of export subsidies. More generally, our analysis shows that, when national governments can use different trade policy instruments, trade bloc formation should be described as a multi-dimensional agreement formation game; focusing on one policy dimension only might result in drawing incorrect conclusions about the outcome of the negotiations.

We conclude by pointing out three directions of further research. First, it would be important to examine how the outcome of the trade negotiations is affected by changes in the number of parties involved. Second, the analysis of this paper should be extended to study the case of asymmetric countries and the bargaining problems that arise among heterogeneous agreements' members. Finally, the literature on strategic trade policy has shown that governments can use a wide range of instruments (import tariffs, export subsidies, domestic subsidies, voluntary export restraints, R&D subsidies, competition policy, etc.) to shift rents from foreign to domestic firms. More work is needed to understand how the availability of such instruments affects the incentives to form trade agreements.

## Appendix

### Equilibrium Policies (Homogeneous Goods)

In what follows, we report the optimal policies obtained for the case in which  $n$  firms are located in each country and they sell homogeneous products ( $\mu = 1$ ).

1.  $f, t_1, t_2, t_3, g; s_1, s_2, s_3, gg$ :

$$t_{ik} = 0;$$

$$s_{ik} = \frac{1}{2n};$$

2.  $f, t_1, g; ft_2, g; ft_3, g; fs_1, g; fs_2, g; fs_3, gg$ :

$$t_{ik} = \frac{1+n}{1+7n+11n^2+3n^3};$$

$$s_{ik} = \frac{1+3n+3n^2}{1+7n+11n^2+3n^3};$$

3.  $f, t_1, t_2; t_3, g; fs_1, g; fs_2, g; fs_3, gg$ :

$$t_{ik} = 0;$$

$$s_{ik} = \frac{1+n}{2(3+5n)^2};$$

4.  $f, t_1, g; ft_2, g; ft_3, g; fs_1, s_2; s_3, gg$ :

$$t_{ik} = \frac{1}{2n};$$

$$s_{ik} = \frac{1}{n};$$

5.  $fft_1g; ft_2g; ft_3g; fs_1; s_2g; fs_3gg$ :

$$t_{12} = t_{21} = \frac{1}{2};$$

$$t_{31} = t_{32} = s_{31} = s_{31} = 0;$$

$$t_{13} = t_{23} = \frac{1 + 2n + 3n^2}{1 + 7n + 9n^2 + 3n^2};$$

$$s_{12} = s_{21} = \frac{2}{n};$$

$$s_{13} = s_{23} = \frac{1 + n}{1 + 7n + 9n^2 + 3n^2};$$

6.  $fft_1g; ft_2; t_3g; fs_1g; fs_2g; fs_3gg$ :

$$t_{12} = t_{21} = 0;$$

$$t_{31} = t_{32} = \frac{1 + 4n + 6n^2}{2 + 14n + 29n^2 + 18n^3};$$

$$t_{13} = t_{23} = \frac{1 + 3n + 3n^2}{1 + 7n + 11n^2 + 3n^3};$$

$$s_{12} = s_{21} = \frac{1 + 4n + 3n^2}{2n + 10n^2 + 9n^3};$$

$$s_{13} = s_{23} = \frac{1 + n}{1 + 7n + 11n^2 + 3n^3};$$

$$s_{31} = s_{31} = \frac{1 + n}{2 + 14n + 29n^2 + 18n^3};$$

7.  $fft_1; t_2g; ft_3g; fs_1; s_2g; fs_3gg$ :

$$t_{12} = t_{21} = \frac{1}{2};$$

$$t_{31} = t_{32} = s_{31} = s_{31} = 0;$$



$$t_{13} = t_{23} = \frac{1 + 2n + 3n^2}{1 + 7n + 9n^2 + 3n^2};$$

$$s_{12} = s_{21} = \frac{2}{n};$$

$$s_{13} = s_{23} = \frac{1 + n}{1 + 7n + 9n^2 + 3n^2};$$

8.  $fft_1; t_2g; ft_3g; fs_1g; fs_2; s_3gg$ :

$$t_{12} = t_{21} = t_{31} = t_{13} = s_{12} = s_{13} = 0;$$

$$t_{32} = t_{23} = \frac{1}{n};$$

$$s_{23} = s_{32} = \frac{2}{n};$$

$$s_{31} = i \frac{1 + 4n}{2(1 + 3n + 2n^2)};$$

$$s_{21} = \frac{1 + 2n + 2n^2}{2n + 6n^2 + 4n^3};$$

9.  $fft_1; t_2; t_3g; fs_1; s_2g; fs_3gg$ :

$$t_{12} = t_{21} = t_{31} = t_{32} = t_{13} = t_{23} = s_{31} = s_{32} = 0;$$

$$s_{12} = s_{21} = \frac{1}{n};$$

$$s_{13} = s_{23} = \frac{1 + n}{4n(1 + n)};$$

10.  $fft_1; t_2g; ft_3g; fs_1; s_2; s_3gg$ :

$$t_{12} = t_{21} = 0;$$

$$t_{31} = t_{32} = t_{13} = t_{23} = s_{12} = s_{21} = \frac{1}{2n};$$

$$s_{13} = s_{23} = s_{31} = s_{32} = \frac{1}{n};$$

## Proof of Proposition 1

Substituting the optimal policies reported above into equations (5), (6) and (11), we can derive analytical expressions for the welfare gains obtained by the three countries under the alternative agreement structures. Comparing these expressions, it is straightforward to verify that

$$W_{1;2}^9 \text{ i } W_{1;2}^{5;7} > 0,$$

$$W_{1;2}^{5;7} \text{ i } W_k^{1;4;10} > 0,$$

$$W_k^{1;4;10} \text{ i } W_k^3 > 0,$$

$$W_k^3 \text{ i } W_{1;2}^6 > 0,$$

$$W_{1;2}^6 \text{ i } W_k^2 > 0,$$

$$W_k^2 \text{ i } W_3^6 > 0,$$

$$W_3^6 \text{ i } W_3^{5;7} > 0,$$

$$W_3^{5;7} \text{ i } W_3^9 > 0.$$

Hence the welfare ranking is always  $W_{1;2}^9 > W_{1;2}^{5;7} > W_k^{1;4;10} > W_k^3 > W_{1;2}^6 > W_k^2 > W_3^6 > W_3^{5;7} > W_3^9$ , independently on the degree of industry concentration.<sup>31</sup> Notice that agreement structures 5 and 7 are welfare improving for countries 1 and 2, relative to all other agreement structures, except structure 9. However, the latter is not stable, since country 3 will always object to it by leaving the tariff agreement. Structures 5 and 7, on the other hand, cannot be blocked by country 3 and are thus the only stable negotiation outcome. Q.E.D.

## Proof of Proposition 3

When import tariffs are the only available policy instrument, the optimal tariffs under the three possible agreement structures are as follows:

1. Global Free Trade:  $t_1 = t_2 = t_3 = 0$ ;

$$t_{ik} = 0:$$

<sup>31</sup>The ranking of agreement structure 8 varies with  $n$ . However, structure 8 can never be stable, since country 1 is always worse off than in any the case of no cooperation.

2. Nash Equilibrium:  $fft_1g; ft_2g; ft_3gg;$

$$t_{ik} = \frac{1 + 2n_j (\mu^2_j - 1)n^2}{2 + (5 + \mu)n + (4 + 2\mu_j - 4\mu^2_j)n^2 + (1 + \mu_j - 2\mu^2_j)n^3};$$

3. Partial tariff agreement:  $fft_1; t_2g; ft_3gg.$

$$t_{12} = t_{21} = 0;$$

$$t_{31} = t_{32} = \frac{(1 + (1 - \mu_j)n)(1 + n + 3\mu n)}{2 + (5 + 4\mu)n + 2(2 + 3\mu_j - \mu^2_j)n^2 + (1 + 2\mu_j - \mu^2_j - 2\mu^3_j)n^3};$$

$$t_{13} = t_{23} = \frac{(1 + (1 - \mu_j)n)(1 + n + \mu n)}{2 + (5 + \mu)n + (4 + 2\mu_j - 4\mu^2_j)n^2 + (1 + \mu_j - 2\mu^2_j)n^3};$$

Comparing the welfare functions obtained by plugging the equilibrium tariffs into (5), (6) and (11), we ...nd:

$$W_k^1 - W_{1;2}^3 > 0,$$

$$W_{1;2}^3 - W_k^2 > 0,$$

$$W_k^2 - W_3^3 > 0.$$

Hence, the welfare ranking is always  $W_k^1 > W_{1;2}^3 > W_k^2 > W_3^3$ , independently on the degree of product differentiation and industry concentration. Since global free trade always yields larger welfare gains than any other tariff arrangement, no country will ever want to deviate from it. Q.E.D.

## References

- Bagwell, K., and R. W. Staiger (1994). "Strategic Export Subsidies and Reciprocal Trade Agreements: The Natural Monopoly Case", NBER Working Paper No. 5574.
- Bagwell, K., and R. W. Staiger (1997). "Multilateral Tariff Cooperation During the Formation of Regional Free Trade Areas", *International Economic Review* 38, 291-319.
- Baldwin, R., and P. Krugman (1988). "Market Access and Competition: a Simulation Study of 16K Random Access Memories", in R. Feenstra (ed.), *Empirical Research in Industrial Trade*. MIT Press, Cambridge, MA.
- Brander, J. A. (1981). "Intra-Industry Trade in Identical Commodities", *Journal of International Economics* 11, 1-14.
- Brander, J. A., and P. Krugman (1983). "A Reciprocal Dumping Model of International Trade", *Journal of International Economics* 15, 313-321.
- Brander, J. A., and B. J. Spencer (1984a). "Tariff Protection and Imperfect Competition", in H. Kierzkowski (ed.), *Monopolistic Competition and International Trade*. Clarendon Press, Oxford.
- Brander, J. A., and B. J. Spencer (1984b). "Trade Warfare: Tariffs and Cartels", *Journal of International Economics* 16, 227-242.
- Bulow, J. I., J. D. Geanakoplos, and P. D. Klemperer (1985). "Multimarket Oligopoly: Strategic Substitutes and Strategic Complements", *Journal of Political Economy*, 93, 488-511.
- Cini, M., and L. McGowan (1998). *Competition Policy in the European Union*. MacMillan, London.
- Collie, D. R. (1993). "Profit-Shifting Export Subsidies and the Sustainability of Free Trade", *Scottish Journal of Political Economy* 40, 408-419.
- Collie, D. R. (1997). "Bilateralism is Good: Trade Blocs and Strategic Export Subsidies", *Oxford Economic Papers* 49, 504-520.

- Conconi, P., and C. Perroni (2000). "Issue Linkage and Issue Tie-in in International Negotiations", *Fondazione Eni Enrico Mattei, Note di Lavoro*: 57/2000.
- Coopeland, B. R. (1990). "Strategic Interaction among Nations: Negotiable and Non-negotiable Trade Barriers", *Canadian Journal of Economics* 23, 84-108.
- Dixit, A. K. (1984). "International Trade Policy for Oligopolistic Industries", *Economic Journal* 94, 1-16.
- Dixit, A. K. (1988). "Anti-Dumping and Countervailing Duties under Oligopoly", *European Economic Review* 32, 55-68.
- Flam, H. and H. Nordstrom (1994). "Why Do Car Prices Differ Before Tax Between European Countries?", *Centre for Economic Policy Research, Discussion Paper No. 1181*.
- Fratzsher, O. (1996). "Welfare Effects of Trading Blocs", *IMF mimeo*.
- Jackson, J. H. (1998). *The World Trading System: Law and Policy of International Economic Relations*. MIT Press, Cambridge, MA.
- Gatsios, K., and L. Karp (1995). "The Welfare Effects of Imperfect Harmonisation of Trade and Industrial Policy", *Economic Journal* 102, 107-116.
- Hahn, F. H. (1962). "The Stability of the Cournot Oligopoly Solution", *Review of Economic Studies* 32, 329-331.
- Horstmann, I. J., and J. R. Markusen (1986). "Up the Average Cost Curve: Inefficient Entry and the New Protectionism", *Journal of International Economics* 20, 225-247.
- Kennan, J., and R. Riezman (1990). "Optimal Tariff Equilibria with Customs Unions", *Canadian Journal of Economics* 90, 70-83.
- Kose, M. A., and R. Riezman (1999). "Understanding the Welfare Implications of Preferential Trade Agreements", *CSGR Working Paper 45/99*, University of Warwick.

- Kowalczyk, C., and T. Sjöström (1994). "Bringing GATT into the Core", *Economica* 61, 301-317.
- Krugman, P. (1984). "Import Protection and Export Promotion: International Competition in the Presence of Oligopoly and Economies of Scale", in H. Kierzkowski (ed.), *Monopolistic Competition and International Trade*. Clarendon Press, Oxford.
- Krugman, P. (1991). "Is Bilateralism Bad?", in Helpman, E. and Razin, A. (eds.), *International Trade and Trade Policy*, 9-24. MIT Press, Cambridge.
- Laird, S. "Export Policy and the WTO", *Journal of International Trade and Economic Development* 8, 73-88.
- Markusen, J. R., and A. J. Venables (1988). "Trade Policy with Increasing Returns and Imperfect Competition: Contradictory Results from Competing Assumptions", *Journal of International Economics* 24, 299-316.
- Panagaryia, A. (2000). "Evaluating the Case for Export Subsidies", *World Bank Policy Research Paper No. 2276*.
- Richardson, M. (1994). "Customs Unions and Domestic Taxes", *Canadian Journal of Economics* 27, 537-550.
- Richardson, M. (1999). "Trade and Competition Policies: Concordia Discors?", *Oxford Economic Papers* 51, 649-664.
- Sampson, G. P. (1996). "Compatibility of Regional and Multilateral Trade Arrangements: Reforming the WTO Process", *American Economic Review* 86, 82-88.
- Sinclair, P. and Vines, D. (1994). "Do Fewer, Larger Trade Blocs Imply Greater Protectionism?", *International Economics Study Group Meeting*, London.
- Venables, A. J. (1990). "International Capacity Choice and National Market Games", *Journal of International Economics* 29, 23-42.
- Whalley, J., and C. Hamilton (1996). *The Trading System After the Uruguay Round*. Institute of International Economics, Washington, DC.

Yi, S.-S. (1996). "Endogenous Formation of Customs Unions Under Imperfect Competition: Open Regionalism Is Good", *Journal of International Economics* 41, 151-175.