

NBER WORKING PAPER SERIES

STRATEGIC TRADE, COMPETITIVE INDUSTRIES  
AND AGRICULTURAL TRADE DISPUTES

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Working Paper 7822  
<http://www.nber.org/papers/w7822>

NATIONAL BUREAU OF ECONOMIC RESEARCH  
1050 Massachusetts Avenue  
Cambridge, MA 02138  
August 2000

We thank the NSF (SES-9905460) for generous financial support. The views expressed herein are the authors' and do not necessarily reflect those of the National Bureau of Economic Research.

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August 2000  
JEL No. F02, F11, F12, F13

**ABSTRACT**

The primary predictions of strategic-trade theory are not restricted to imperfectly-competitive markets. Indeed, these predictions emerge in a natural three-country extension of the traditional theory of trade policy in competitive markets, once the theory is augmented to allow for politically-motivated governments, so that the sign of export policy may be converted from tax to subsidy. This suggest that the ongoing agricultural trade disputes may be best interpreted from the perspective of strategic-trade theory. In fact, these disputes may offer the most important example yet of strategic-trade theory.

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# Strategic Trade, Competitive Industries and Agricultural Trade Disputes

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## 1. Introduction

As Jackson (1997) emphasizes, the treatment of export subsidies in GATT and now its successor organization, the WTO, is perplexing and controversial. On the one hand, it is sometimes argued that export subsidies expand the volume of trade, enhance consumer welfare and thus warrant encouragement. But others take a less positive view of export subsidies, arguing that such subsidies create “unfair” advantages, distort market forces and thus should be prohibited. These conflicting views are manifested in the ambiguous manner in which subsidies are

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treated in GATT and the WTO. For example, GATT Article XVI states conditions under which export subsidies are prohibited for industrial products; yet, important exceptions for "primary" products such as agricultural goods are allowed, provided that the subsidy received does not displace the exports of another member and thereby provide the recipient with "more than an equitable share of world export trade in that product."

Given the vague language which accompanies the GATT agricultural exception, it is not surprising that a number of disputes arose in connection with this exception. For example, as Trebilcock and Howse (1999, p. 249) discuss, in a wheat flour case from the late 1950's, the GATT panel ruled against a French export subsidy, since the subsidy contributed to an increase in the French export market share and an associated displacement in the export market share of Australia (the complainant). But in a wheat flour case of the early 1980's, described in detail by Rhodes (1983, pp. 201-225), the panel found in favor of an E.C. export subsidy, even though over the time period in question (1959 to 1981) the E.C.'s share of the world market appreciated considerably (from 29% to 75%) and the world market share for the U.S. (the complainant) depreciated markedly (from 27% to 9%). The other major wheat flour exporters experienced similar losses: the world market shares of Australia and Canada fell from 20% to 2% and 26% to 9%, respectively. In this case, the panel cited the difficulty of attributing the market share changes to particular export subsidies. Frustrated with this ruling, the U.S. then initiated a complaint against the E.C.'s policy of subsidizing pasta exports. This dispute centered on the question of whether pasta qualified as a "primary" product, and the GATT panel issued a split decision, with the majority in favor of the U.S. position.

The single most important objective of the Uruguay Round, which culminated with the formation of the WTO, was agricultural trade reform (Jackson (1997, p. 314); Rhodes (1993, p. 221)). Against the backdrop of the wheat-flour disputes, members recognized that agricultural trade policy must be brought more clearly and fully under the rules and discipline of GATT. Two specific goals were to clarify the circumstances under which agricultural export subsidies could be used and to significantly reduce the overall extent of export subsidization in agricultural markets. Important strides were made, particularly with regard to the first objective, but the discussion was highly contentious.

The U.S. took the position that agricultural export subsidies should be phased out. This view was endorsed as well by a consortium of countries that are strong

exporters in agricultural commodities, known as the "Cairns Group."<sup>1</sup> On the other side of the debate, the E.C. agreed to a principle of "progressive reduction in support," but argued against an outright prohibition of export subsidies for agricultural products. As well, a group of African countries that were net importers of agricultural products were fearful of the consequences of a reduction in agricultural export subsidies. As Croome (1995) explains, the dispute that arose between GATT members concerning the appropriate treatment of agricultural export subsidies was deep, as it delayed considerably the completion of the Uruguay Round - and quite nearly derailed the round altogether.<sup>2</sup>

In the end, however, an agreement was reached. In the Agreement on Agriculture, the exception granted under GATT Article XVI to primary products is altered, in that member governments from developed countries agree to reduce over a six-year period by 36% the value of agricultural export subsidies and by 21% the volume of agricultural products that receive such subsidies. And many envision that further agricultural trade reform will be achieved in the next WTO round. This remains to be seen, however, and indeed it is often argued that the continuing disputes over agricultural subsidies were the central cause of the failure of the WTO meeting in Seattle.<sup>3</sup>

What are the essential features of the ongoing agricultural disputes? No simple list can capture all of the relevant considerations, but the following features seem fundamental. First, the disputants use export subsidies in order to compete for third-country export markets. This stands in contrast to the familiar disputes over import tariffs, where the discussion centers on competition for the trading partner's home market. Second, exporting governments sought to cooperate by agreeing upon a reduction in export subsidies of agricultural products, although there were divergent views among GATT members as to the proper extent of the reduction. Third, unlike many other subsidy disputes (e.g., commercial aircraft), the agricultural dispute emerges from a market that has competitive characteristics. Finally, political-economy issues are of particular relevance, as agricultural subsidies are often attributed to powerful farm lobbies, who in turn argue that agriculture warrants special support since this would promote national self-

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<sup>1</sup>The Cairns Group is comprised of Argentina, Australia, Brazil, Canada, Chile, Colombia, Fiji, Hungary, Indonesia, Malaysia, New Zealand, the Philippines, Thailand and Uruguay. It has been estimated that these countries account for around one quarter of the total world exports of agricultural goods. See Croome (1995, p. 31).

<sup>2</sup>For similar interpretations, see, e.g., Löw (1993), Oxley (1990), Preeg (1995) and Rhodes (1993).

<sup>3</sup>See, for example, Brooke (1999) and Olson (2000).

sufficiency, offset the unusual risks (e.g., weather) that farmers face, and preserve the rural way of life (Trebilcock and Howse, 1999, pp. 252-54).

How are these experiences interpreted by existing theories? Given the significant role that agricultural disputes have played in world trading relationships, it is perhaps surprising that economists have not developed a theoretical framework that is directed toward an interpretation of the agricultural disputes. On closer examination, however, it is easy to see how this omission came about. Each of the prevailing trade-policy theories is, on its own, immediately inconsistent with one of the fundamental features described above.

Consider first the traditional economic approach to trade agreements. The traditional model, as formalized originally by Johnson (1953-54), involves two countries that trade two goods in a competitive-market setting. Governments maximize national income and are attracted to trade-policy instruments as a means to influence the terms of trade. When this theory is developed in a general equilibrium context, the Lerner symmetry theorem ensures that the trade-policy decisions of governments can be summarized in terms of the export policies that they adopt. A well-known result is then that the optimal unilateral policy for a government is an export tax. In essence, a government uses the export tax to induce its competitive export sector to restrict output, so that monopoly rents may be created and retained. This theory is problematic as a framework from which to interpret the agricultural disputes, though, since it fails even to offer a potential reason for export subsidization.

When the traditional economic approach is augmented to allow that governments also have political motivations, as for example in Bagwell and Staiger (1999) and Grossman and Helpman (1995), this limitation can be overcome. For example, if a government weighs heavily the welfare of its export sector, then the government may find export subsidies desirable. But other incompatibilities remain. Notably, the terms-of-trade implications of trade-policy intervention confront governments with exaggerated costs of stimulating their export sectors. When a government subsidizes its exports, the world price falls, and as a consequence some of the benefit of the export subsidy is received by its trading partner's consumers. When the (politically-augmented) traditional theory is recast in terms of export policies, therefore, the two governments agree that a trade agreement should be designed to encourage export subsidization. This, of course, stands in stark contrast to the desire among the governments of exporting countries to *reduce* agricultural export subsidies.

Consider next the theory of strategic-trade policy, as pioneered by Brander

and Spencer (1985). Working with a three-country model in which export sectors are imperfectly competitive in the Cournot sense and governments maximize national income, they show that it is possible to rationalize both the potential appeal of export subsidies and the desire of exporting countries to limit their use. In their model, each of two exporting countries is tempted to offer an export subsidy, in order to give its exporter a cost advantage and thereby shift profits in the ensuing Cournot competition. Since both exporting governments face this temptation, a Prisoners' Dilemma problem arises between the exporting countries, as they would each do better if export subsidies were prohibited than if they were allowed to "compete" with subsidies. World welfare, however, rises when exporting countries compete in subsidies, since the gain to consumers in the importing country more than offsets the loss in welfare to the exporting countries. Hence, when governments engage in strategic export subsidization of Cournot industries, exporting nations seek to negotiate limits on export subsidies, and importing governments are opposed to such limits.

Strategic-trade theory offers a promising foundation from which to interpret the agricultural disputes. The theory accounts for export subsidies, explains as well the desire of exporting countries to cooperate and limit the use of such subsidies, and puts at centerstage the competition between exporting governments for third-party export markets. And the theory also could be naturally augmented to include political-economy motivations for governments. The key limitation, however, is that strategic-trade theory is commonly understood to be applicable only for imperfectly-competitive (namely, Cournot) markets.<sup>4</sup> The clear implication is that this theory is more appropriate for the commercial aircraft industry, for example, than for the agricultural market.

In this context, it is important to disentangle the two primary positive contributions of strategic-trade theory.<sup>5</sup> The first contribution concerns the *sign* (tax or subsidy) of export policy: the theory establishes that a government indeed has a potential incentive to intervene with an export subsidy. This is the contribution

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<sup>4</sup>See, for example, Brander (1995) and Helpman and Krugman (1989, p. 88), who argue that imperfect competition is a defining characteristic for strategic-trade policy. In their discussion of strategic-trade theory, Krugman and Obstfeld (1997) describe some important case studies that illustrate the possible application of the theory. These cases - the Japanese targeting of steel, the European support of aircraft and the Japanese targeting of semiconductors - all involve highly oligopolistic markets.

<sup>5</sup>Strategic-trade theory also carries the normative implication that an export subsidy may be appealing even to a national-income-maximizing government. We emphasize instead the positive predictions of this theory, since we seek to interpret the agricultural trade disputes.

that has most captured the interest of economists, who have gone on to show that the export-subsidy incentive is sensitive to the form of oligopolistic competition (Eaton and Grossman (1986), Maggi (1996)) and the number of domestic firms (Dixit (1984)). Second, the theory also offers predictions concerning the *ranking* of export policies: exporting governments would prefer to cooperate with lower export subsidies, whereas the world as a whole would benefit from higher export subsidies. The second contribution implies a Prisoners' Dilemma problem between exporting governments, and thereby suggests a framework within which to interpret export-policy disputes.

The theory of export policy that we present may be understood as a simple synthesis of the approaches mentioned above. Like the traditional theory, we assume a competitive market, and our governments are well aware of the terms-of-trade implications of their trade-policy choices. We also augment the traditional assumptions, by positing that each government has as well a political motivation to enhance the welfare of its export sector. Finally, we follow the three-country set-up of the strategic-trade model. Two exporting countries select export policies and all consumption occurs in a third importing country.

Under these assumptions, we argue that the two primary contributions of strategic-trade theory are maintained. First, if the political motivations of exporting governments are such that they weigh heavily the profit (producer surplus) enjoyed by their respective export industries, then the sign of export policy is as in the strategic-trade model: governments intervene with export subsidies (despite the associated terms of trade loss). Second, whatever the political motivations of exporting governments, our competitive model delivers the essential Prisoners' Dilemma structure that arises in the strategic-trade-policy model: exporting governments would gain from an agreement in which they cooperate with less trade-promoting export policies, and importing-government and world welfare are lower when exporting governments cooperate in this way.

The primary predictions of strategic-trade theory are therefore not restricted to imperfectly-competitive markets. Indeed, these predictions emerge in a natural three-country extension of the traditional theory of trade policy in competitive markets, once the theory is augmented to allow for politically-motivated governments, so that the sign of export policy may be converted from tax to subsidy. This suggests that the ongoing agricultural trade disputes may be best interpreted from the perspective of strategic-trade theory. In fact, these disputes may offer the most important example yet of strategic-trade theory.

The paper is organized as follows. We develop our basic model in Section



2. Next, in Section 3, we present our main findings. We return to the agricultural disputes in Section 4, and consider these disputes in further detail from the perspective of the model. Section 5 concludes.

## 2. The Model

We adopt a partial-equilibrium approach and follow Brander and Spencer (1985) in considering two identical countries ( $A$  and  $B$ ) that export a homogeneous good to country  $C$ , where all consumers reside. Countries  $A$  and  $B$  are allowed to each select specific export subsidies, and for simplicity it is assumed that country  $C$  does not intervene in trade. We depart from Brander and Spencer with the assumption that the export industries in countries  $A$  and  $B$  are perfectly competitive.

Formally, the competitive export industry in country  $A$  is described by supply and profit (producer surplus) functions,  $Q(P_a)$  and  $\pi(P_a)$ , where  $P_a$  denotes the price of the export in country  $A$  and where  $\pi'(P_a) = Q(P_a)$ . The competitive export industry in country  $B$  is described symmetrically, with supply  $Q(P_b)$  and profit  $\pi(P_b)$ , where  $P_b$  denotes the price of the export in country  $B$ . Finally, the demand function in country  $C$  is given by  $D(P_c)$ , where  $P_c$  is the price of the good in country  $C$ . We assume throughout that  $Q' > 0 > D'$ .

Prices satisfy arbitrage conditions  $P_c = P_a - s_a$  and  $P_c = P_b - s_b$  and a market-clearing condition:

$$D(P_c) = Q(P_a) + Q(P_b), \quad (2.1)$$

where  $s_a$  and  $s_b$  are the specific export subsidies in countries  $A$  and  $B$ , respectively. These yield the market-clearing price in country  $C$ ,  $P_c(s_a, s_b)$ , which is decreasing in  $s_a$  and  $s_b$ . The market-clearing prices in countries  $A$  and  $B$  are given as  $\hat{P}_a(s_a, P_c(s_a, s_b)) = P_c(s_a, s_b) + s_a$  and  $\hat{P}_b(s_b, P_c(s_a, s_b)) = P_c(s_a, s_b) + s_b$ . It may be verified that  $\hat{P}_a$  increases as  $s_a$  rises, and an analogous observation applies for  $\hat{P}_b$ .

We develop most of our arguments using only the general structure just described. At times, however, it is convenient to have functional forms, so that solutions may be characterized in closed form. We therefore impose the specific assumptions that  $Q(P_a) = P_a/2$ ,  $\pi(P_a) = (P_a)^2/4$  and  $D(P_c) = 1 - P_c$ .<sup>6</sup>

<sup>6</sup>Our specific supply, profit and demand functions may be derived from underlying production and utility functions, and our partial-equilibrium model may be translated into a general-

We emphasize that these restrictions are not necessary for our results. Using the specific structure of the model, the market-clearing price for  $P_c(s_a, s_b)$  is  $1/2 - 1/4(s_a + s_b)$ . It can now be verified that trade is not prohibited from either exporter if  $2 > \max\{s_b - 3s_a, s_a - 3s_b\}$ , a condition which holds in the equilibrium derived below.

We assume that exporting governments maximize profits less subsidy expenses, where profits are scaled by a parameter representing political-economy influences.<sup>7</sup> The importing government welfare is given by consumer surplus. Government welfare functions for the three countries are thus defined as follows:

$$W_a(\hat{P}_a(s_a, P_c(s_a, s_b)), P_c(s_a, s_b)) = \gamma_e \pi(\hat{P}_a) - [\hat{P}_a - P_c]Q(\hat{P}_a) \quad (2.2)$$

$$W_b(\hat{P}_b(s_b, P_c(s_a, s_b)), P_c(s_a, s_b)) = \gamma_e \pi(\hat{P}_b) - [\hat{P}_b - P_c]Q(\hat{P}_b) \quad (2.3)$$

$$W_c(P_c(s_a, s_b)) = \int_{P_c}^1 D(P)dP, \quad (2.4)$$

where  $\gamma_e \geq 1$  is a political-economy parameter, with  $\gamma_e > 1$  when political-economy considerations influence the government. Observe that the world price (i.e., the terms of trade) in this model is given by  $P_c$ , and it is direct from (2.1) and (2.2)-(2.4) that a change in  $P_c$  simply reflects an income transfer, having no effect on the combined welfare of the three governments.

### 3. Subsidies

We now characterize and compare the Nash, cooperative and efficient subsidy levels. We then offer some general observations.

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equilibrium model. The supply and profit functions are implied by an underlying production function of the form  $Q = (L)^{1/2}$ , where  $L$  is labor, under the assumption that labor supply is infinitely elastic at a unitary wage. Likewise, the demand function emerges from a representative-agent utility function of the form  $U = (C - C^2/2) + N$ , where  $C$  and  $N$  denote the consumption of the traded good and a numeraire good, respectively. If the numeraire good is sufficiently abundant in each country so that it is always consumed in positive amounts by each agent, the marginal utility of income is fixed at one and our partial-equilibrium analysis is appropriate. Trade in the numeraire good is determined by the requirement of overall trade balance.

<sup>7</sup>This representation of political-economy influences, which we borrow from Baldwin (1987), has been given micro-analytic foundations in the explicit lobbying model developed by Grossman and Helpman (1994).

### 3.1. Nash Subsidies

Consider the optimal subsidy function for the government of country  $A$ . Maximizing  $W_a$  with respect to  $s_a$  yields the following first-order condition:

$$\frac{\partial W_a}{\hat{P}_a} + \lambda \frac{\partial W_a}{\partial P_c} = 0, \quad (3.1)$$

where  $\lambda = [\partial P_c / \partial s_a] / [d\hat{P}_a / ds_a]$  reflects the impact of the subsidy on the terms of trade and is negative.<sup>8</sup> The first-order condition in (3.1) may be rewritten as follows:

$$\{Q(\hat{P}_a)(\gamma_e - 1) - s_a Q'(\hat{P}_a)\} + \lambda Q(\hat{P}_a) = 0. \quad (3.2)$$

As (3.2) reveals, an increase in the export subsidy has three effects on the welfare of the government of country  $A$ .

First, an increase in country  $A$ 's export subsidy raises the local price in country  $A$ , and at a fixed volume of production the value to the country- $A$  government of the associated redistribution to its export industry is captured by the term  $Q(\hat{P}_a)(\gamma_e - 1)$ . When  $\gamma_e > 1$ , this political-economy effect indicates a benefit to an increase in the export subsidy. Second, the local-price increase in fact raises the level of production, and this distortion increases subsidy expenses, as captured by the term  $s_a Q'(\hat{P}_a)$ . This distortion effect describes a cost to a higher export subsidy. Finally, an increase in the export subsidy lowers the world price and thus diminishes country  $A$ 's terms of trade. The terms-of-trade effect is captured by the term  $\lambda Q(\hat{P}_a)$ , and this effect also indicates a cost to a higher export subsidy. Consistent with the traditional model, when the political-economy effect is absent ( $\gamma_e = 1$ ), an export tax is optimal.

A symmetric first-order condition determines the optimal policy for the government of country  $B$ . Let the solution to (3.2) be denoted  $s_a^R = s_a^R(s_b)$ , where the "R" indicates that this is the government of country  $A$ 's export-subsidy reaction function. Given the symmetry between countries  $A$  and  $B$ , we may find the Nash subsidy level,  $s^N$ , by solving  $s^N = s_a^R(s^N)$ .

Using the specific assumptions of our model, we find that  $\lambda = -1/3$ , and we may solve (3.2) to obtain  $s_a^R(s_b) = [(3\gamma_e - 4)(2 - s_b)] / [3(8 - 3\gamma_e)]$ . To interpret this expression, let us assume that  $s_b < 2$ , indicating that country  $B$ 's export subsidy is not so large as to drive  $P_c$  to zero when country  $A$  has no subsidy, and that

<sup>8</sup>Given the symmetry of the model, the same parameter  $\lambda$  also describes the effect of a subsidy by country  $B$  on the world and its domestic price.

$\gamma_e < 8/3$ , ensuring that the second-order condition is satisfied. Observe now that an export tax is best for the government of country *A* if political-economy effects are not large (i.e.,  $\gamma_e < 4/3$ ). The optimal export policy is an export subsidy, however, if political-economy considerations are important (i.e.,  $\gamma_e \in (4/3, 8/3)$ ). Finally, there is a critical intermediate level for the political-economy parameter (i.e.,  $\gamma_e = 4/3$ ) at which the desire to subsidize for political-economy reasons is just offset by the desire to tax for terms-of-trade reasons, resulting in an optimal policy of *laissez faire*.

We may now solve for the Nash subsidy level, finding that it is given by  $s^N = (3\gamma_e - 4)/(10 - 3\gamma_e)$ . Thus, in the Nash equilibrium, the governments of countries *A* and *B* select export subsidies (taxes) if the political-economy parameter is sufficiently large (small), while a policy of *laissez faire* is optimal if the political-economy parameter assumes the critical intermediate value.

The Nash equilibrium when political-economy motives are absent (i.e.,  $\gamma_e = 1$ ) is depicted in the southwest quadrant of the Figure 1, and the Nash equilibrium when political-economy motivations are important (i.e.,  $\gamma_e \in (4/3, 8/3)$ ) is represented in the northeast quadrant of this figure. The former equilibrium is labeled  $N_0$  while the latter equilibrium is denoted as  $N_1$ . In each case, the Nash equilibrium is determined as the point where the iso-welfare contour of the government of country *A* (country *B*) is vertical (horizontal), so that neither government can increase its welfare with a unilateral policy change.

### 3.2. Cooperative Subsidies

We consider next a different thought experiment and allow that the governments of countries *A* and *B* “cooperate” through an agreement under which they choose  $s_a$  and  $s_b$  so as to maximize their combined welfare. The first-order condition with respect to  $s_a$  for this cooperative program is

$$\frac{\partial W_a}{\partial \hat{P}_a} + \lambda \left[ \frac{\partial W_a}{\partial P_c} + \frac{\partial W_b}{\partial \hat{P}_b} + \frac{\partial W_b}{\partial P_c} \right] = 0. \quad (3.3)$$

Comparing (3.3) with (3.1), it is apparent that cooperative exporting governments attempt to internalize the effects of one government’s export subsidy on the welfare of the other. In particular, when the government of country *A* increases its export subsidy, the domestic price in country *B* drops, reducing profits in country *B*. Cooperative exporters recognize this profit-shifting externality, whereas noncooperative exporters do not.

Using the particular functional forms specified for the model, and exploiting symmetry across countries  $A$  and  $B$ , we find that the optimal cooperative export subsidy,  $s^C$ , is given by  $s^C = (\gamma_e - 2)/(4 - \gamma_e)$ , so that the optimal cooperative policy may involve an export subsidy, but only if the political-economy parameter is quite large (i.e.,  $\gamma_e \in (2, 8/3)$ ). We may now compare the Nash and cooperative policies, finding that

$$s^N - s^C = \frac{4}{(10 - 3\gamma_e)(4 - \gamma_e)} > 0,$$

which indicates that exporting governments reduce subsidies when they cooperate.

Figure 1 also illustrates the determination of the cooperative export policies, again for the case in which political-economy concerns are absent (labeled  $C_0$ ) and for the case in which political-economy concerns are important (labeled  $C_1$ ). In each case, cooperative exporting governments agree to adjust their export policies so as to restrict export volumes from non-cooperative Nash levels. In fact, when the governments cooperate, they agree on a pair of export policies at which their iso-welfare contours are tangent.<sup>9</sup>

### 3.3. Efficient Subsidies

Finally, we consider the efficient subsidy policy, in which  $s_a$  and  $s_b$  are selected to maximize the total welfare of the governments of countries  $A$ ,  $B$  and  $C$ . Recalling that changes in the world price  $P_c$  are simply income transfers, it follows that the first-order condition for  $s_a$  can be written as follows:

$$\frac{\partial W_a}{\partial \hat{P}_a} + \lambda \frac{\partial W_b}{\partial \hat{P}_b} = 0. \quad (3.4)$$

It is interesting to compare the condition for efficiency, (3.4), with the noncooperative condition, (3.1). When the government of country  $A$  sets its policy efficiently, it internalizes the negative externality that its subsidy has on profits in country  $B$ . It also recognizes the positive externality that its subsidy has for consumers in country  $C$ , who experience a terms-of-trade improvement. This terms-of-trade improvement exactly offsets the terms-of-trade loss experienced by countries  $A$

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<sup>9</sup>In practice, there is an important issue of how such subsidy agreements are to be enforced, which we are ignoring here. If enforcement issues constrain the possible agreements that exporting governments can negotiate, then in terms of Figure 1 it may only be feasible for governments to move part way from the Nash point ( $N_0$  or  $N_1$ ) to the cooperative point ( $C_0$  or  $C_1$ ).

and  $B$ , and so the government of country  $A$  ignores the terms of trade altogether when setting its policy in an efficient manner. Similarly, as a comparison of (3.3) and (3.4) reveals, when the government of country  $A$  sets its policy in a cooperative fashion, it recognizes the negative externality between countries  $A$  and  $B$ , but it doesn't internalize the terms-of-trade improvement experienced by consumers in country  $C$ .

In fact, the symmetric efficient subsidy solving (3.4) must satisfy  $\partial W_a / \partial \hat{P}_a = 0 = \partial W_b / \partial \hat{P}_b$ . Referring to (3.1), we may thus interpret the symmetric efficient subsidy level as being the subsidy level that would be optimal for a government in a non-cooperative setting if that government were not motivated by the implications of its subsidy for the terms of trade. In other words, whether or not political-economy effects are present, the Nash equilibrium subsidy level is inefficient from the governments' perspective if and only if governments are motivated by the terms-of-trade consequences of their trade policies.<sup>10</sup>

Using the specific assumptions of the model, we now calculate the efficient subsidy,  $s^E$ , finding that it is given as  $s^E = (\gamma_e - 1) / (3 - \gamma_e) \geq 0$ , so that efficiency calls for an export subsidy if and only if political-economy effects exist. Direct calculations yield that the efficient subsidy exceeds the Nash subsidy and thus the cooperative subsidy:

$$s^E - s^N = 2(3 - \gamma_e)(10 - 3\gamma_e) > 0.$$

Since the Nash export subsidy exceeds the cooperative subsidy, total welfare of the three governments is higher when exporting countries act noncooperatively than when they cooperate.

Returning to Figure 1, we complete the graphical representation of the results by depicting the determination of the efficient export policies for the case in which political-economy motivations are absent (labeled  $E_0$ ) and for the case in which these motivations are important (labeled  $E_1$ ). Efficient export policies expand export volumes from their Nash levels, and these policies are determined by the point at which the iso-welfare contours of each exporting government are tangent to the iso-world-price locus.<sup>11</sup> Since the iso-world-price locus also represents the

<sup>10</sup>This point is developed more generally by Bagwell and Staiger (1999), for a model in which governments set import tariffs. In the terminology of that paper, we may refer to the (symmetric) subsidy level that satisfies  $\partial W_a / \partial \hat{P}_a = 0 = \partial W_b / \partial \hat{P}_b$  as the "politically optimal" subsidy. Our analysis confirms (for a three-country export-policy model) that politically-optimal policies are efficient.

<sup>11</sup>Recall that the world price,  $P_c(s_a, s_b)$ , is decreasing in both  $s_a$  and  $s_b$ ; thus, the iso-world-

iso-welfare contour for the importing government, we have that all three iso-welfare contours are tangent at the efficient export policies.

### 3.4. Observations

Drawing from this discussion, we summarize now the broader implications of the competitive strategic-export-subsidies model. We consider first the implications of this model for the *sign* of export policies. In this regard, we observe that (i). the Nash export subsidy is positive (zero) (negative) if political-economy effects are large (intermediate) (small); (ii). the cooperative export subsidy can also be positive if political-economy effects are strong; and (iii). the efficient export subsidy is non-negative. The first observation is perhaps the most interesting, as it confirms that the inclusion of political-economy motivations provides a reason for governments to subsidize the exports of competitive industries.

We consider second the implications of the model for the *ranking* of export policies. We observe that (i). the efficient export subsidy is always higher than the Nash export subsidy, and (ii). the Nash export subsidy is always higher than the cooperative export subsidy. This ranking is independent of the political-economy motivations that governments hold, and indeed the ranking holds in the traditional model in which governments maximize national income. The ranking of export policies is entirely determined by the terms-of-trade externalities that are associated with export policies. The competitive model thus preserves the essential Prisoner's Dilemma structure of the imperfect-competition strategic-trade model: noncooperative exporting-country governments attempt to shift profits with export subsidies and would thus gain from an agreement in which they cooperate by restraining the use of export subsidies, and importing-country and global government welfare are higher when exporting-country governments select export subsidies noncooperatively than when they cooperate and reduce subsidies.

In comparing the competitive model developed here with the Brander-Spencer (1985) imperfect-competition model, we note that the ranking of noncooperative, cooperative and efficient export subsidy levels is the same in each model, being completely determined by the terms-of-trade externalities of export subsidies for foreign profits and consumer welfare. The models differ only in the mechanism through which the traditional optimal export tariff is converted in sign into an export subsidy. Export subsidies arise in the competitive model as a consequence

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price locus takes a negative slope in Figure 1. Given our specific functional forms, this locus is in fact linear, as Figure 1 depicts.

of political concerns, whereas the Cournot nature of firm interaction generates an export subsidy in the imperfect-competition model.

#### 4. Agricultural Trade Disputes: A Prisoners' Dilemma

The discussion in the preceding section establishes that the theoretical scope for strategic-export policy is wider than commonly thought, as it extends beyond oligopolistic markets and into competitive markets. An interesting practical implication is that agricultural export subsidies might be interpreted from a strategic perspective, with exporting countries attempting to use a GATT restriction on export subsidies as a means to escape from a Prisoners' Dilemma problem. The discussion in the Introduction is broadly consistent with this interpretation. In the present section, we describe the agricultural trade disputes in further detail, and offer a more explicit interpretation based on the model presented above.

In the 1970's, the Prisoners' Dilemma flavor in the U.S./E.C. interaction was already apparent. As Rhodes (1993, p. 209) notes, the U.S. Millers' National Federation filed a Section 301 complaint with the USTR in 1975, charging that E.C. wheat-flour export subsidies had been the cause of a reduction of "sales of competitive United States wheat flour in the markets where the E.E.C. is subsidizing its wheat flour." (USTR, 1979). A similar complaint was filed by Great Plains Wheat, and according to Echols (1980-81) this complaint alleged that "subsidized Community exports of wheat displaced sales by U.S. exporters in a third country market, Brazil, and depressed world markets." The U.S. delayed action, though, until the Code on Subsidies and Countervailing Duties was completed as part of the Tokyo Round in 1979. This agreement, however, did not greatly clarify the appropriate use of agricultural export subsidies.

In the early 1980's, the disputes intensified. As mentioned in the Introduction, the U.S. experienced no real success through GATT when protesting the E.C. wheat-flour export-subsidization policy. The U.S. then retaliated with its own wheat-flour export-subsidization program in 1983, which targeted the Egyptian market. As Rhodes (1993, p. 215) explains, the prevailing U.S. view was that

"...only if the United States matched the European Community subsidy for subsidy, so traditional E.C. markets were lost in favor of U.S. exporters, would the community seriously reconsider agricultural trading methods."

As Boger (1984, p. 230) details, however, the E.C. instead responded aggressively, choosing to expand its subsidization efforts. A subsidy war was launched.



By the mid 1980's, the costs of the subsidy war were beginning to be understood. In the Uruguay Round negotiations, the U.S. and other major exporters that formed the "Cairns Group" emphasized the costs of a mutually-defeating subsidy war, and they sought to clarify and extend GATT restrictions on agricultural export subsidies as a means to eliminate these costs. As Croome (1995, p. 73) reports:

"Almost all governments were increasingly conscious of the burden which subsidies placed on their national budgets and taxpayers, and of the risk that any subsidy introduced to give a competitive advantage would only be matched by other countries in (as the United States put it) 'a self-defeating spiral.' An Uruguay Round agreement that could in effect provide a mutual disarmament treaty for subsidies would serve the interests of all."

As mentioned in the Introduction, both the U.S. and the E.C. approached the Uruguay Round with a central focus upon the reduction of agricultural export subsidies. They disagreed, though, as to the proper extent of the reduction.

It is interesting to note as well that some GATT members from countries that were net importers of agricultural products feared restrictions on agricultural export subsidies. Croome (1995, p.113) refers to a mostly African group of net food-importing countries that

"...relied heavily on imports of grain and other products to feed their populations. They feared that an international agreement to cut export subsidies would result in higher and, for them, unaffordable world prices."

Thus the Uruguay negotiations featured a set of countries (the U.S. and the Cairns Group) that sought severe restrictions on agricultural export subsidies, a bloc (the E.C.) that favored moderate reductions, and a group (a set of net food-importing countries) that feared any reductions. It is perhaps not surprising, then, that an agreement did not come quickly.

We may now observe that the preferences attributed to exporting and importing governments as described above parallel those that are predicted by the model. From the perspective of the model, we would interpret the E.C. as initially exercising a strategic export policy, with the U. S. and others then retaliating in kind and inducing an outcome analogous to the Nash equilibrium of the model.<sup>12</sup>

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<sup>12</sup>Of course, this is not to say that the E.C. subsidies were pursued only for strategic beggar-

Upon learning first-hand the costs of the resulting subsidy war, the key exporting governments, corresponding to governments *A* and *B* in the model, sought to negotiate a reduction in agricultural export subsidies, corresponding to the cooperative solution in the model. Naturally, the governments of some net food-importing countries were concerned, just as would be the government of country *C* in the model. And indeed, from a global efficiency point of view, these concerns appear valid: the model predicts that a trade agreement that is efficient from the three governments' perspective would call for greater agricultural export subsidies.

It is interesting that exactly the same qualitative conclusions emerge from the imperfect-competition model of strategic trade that Brander and Spencer (1985) first developed. A finding of the present paper is that the logic of strategic trade applies equally well to competitive markets, once political-economy variables are introduced so that export intervention entails a subsidy. Accordingly, the dispute associated with agricultural export subsidies may represent one of the more compelling applications of strategic-trade-policy themes, despite the apparent competitive characteristics of the markets for agricultural exports.<sup>13</sup>

As a final point, we note that our symmetric model predicts that both the U.S. and the E.C. would agree as to the appropriate extent of the reduction in agricultural export subsidies. This, of course, was decidedly not the case. A natural interpretation is that E.C. representatives (and especially the French) placed a larger weight on the welfare of their agricultural export sectors. The model could be amended to handle this difference across exporters, if the political-economy weight,  $\gamma_e$ , were allowed to vary across exporters.

## 5. Conclusion

We have presented a model of strategic trade that applies for markets with competitive characteristics. We have argued as well that the model predicts quite well

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thy-neighbor reasons. Rather, the argument is that the E.C. subsidies were excessive from the perspective of the governments of exporting countries, since some of the cost of the program was borne by competing exporters from non-E.C. countries, who sold at a reduced world price.

<sup>13</sup>In applying the theory developed here to the agricultural experience, we must mention also two caveats that warrant further attention. First, to the extent that the supply of a country's agricultural export is determined by a centralized national marketing board, the agricultural market may have some imperfect-competition characteristics. Second, if indeed the agricultural market is well represented as a (short-run) competitive market, one may still question the size of the rents that are available for governments to "shift" with their export policies.

the broad features of the agricultural trade disputes, which are perhaps the most important trade disputes in recent decades.

We conclude with some final thoughts as regards the treatment of export subsidies in GATT and now the WTO. Our model suggests that exporting countries prefer a limit on export subsidies in order to stem the rivalry in subsidies that otherwise occurs. Importing countries and the world as a whole lose if exporting countries are successful in this endeavor. From this perspective, the perplexing manner in which GATT and the WTO treat export subsidies may represent conflicting consequences that restrictions on export subsidies have for exporting and importing governments. To the extent that the prohibition of export subsidies has been effective, this policy may correspond to a victory for exporting governments at the expense of importing government - and world - welfare. In future work, we hope to examine the robustness of this conclusion to other modeling frameworks.<sup>14</sup>

At a broader level, it is clear that no simple approach toward export subsidization could ever satisfy all goals. Perhaps, as Jackson (1997, pp. 298-99) emphasizes, if the costs and benefits of a subsidization program are kept within national borders, and thus not shifted onto trading partners, then the program should not be a matter of concern for the WTO. But while this may be a sound principle, cross-border effects are indeed expected when export subsidies are used. And these effects are complicated, too, cutting in different ways in different scenarios: the consumers in importing countries may be inclined to send a "note of thanks;" the import-competing firms in these countries may be harmed; and competing exporters from other countries are also likely to be harmed. Our model describes a trading pattern under which overall government welfare increases when the subsidization program is enhanced. But other trading patterns could carry different conclusions. In this perplexing setting, we believe that theoretical models, motivated in terms of actual export-subsidy disputes, are of particular value. Such models can clarify the key cost-shifting effects and thereby contribute importantly toward a better understanding of the appropriate manner in which to treat export subsidies within the WTO. This paper is intended as a step in this general direction.

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<sup>14</sup>It is possible to identify particular circumstances in which world welfare is advanced by a prohibition against export subsidies. Bagwell and Staiger (1997) present this result in a model in which export subsidies influence the pattern of entry into a "natural monopoly" export market, and Collie (forthcoming) reaches a similar conclusion, in a model of strategic export subsidies in which subsidies are financed by distortionary taxation.

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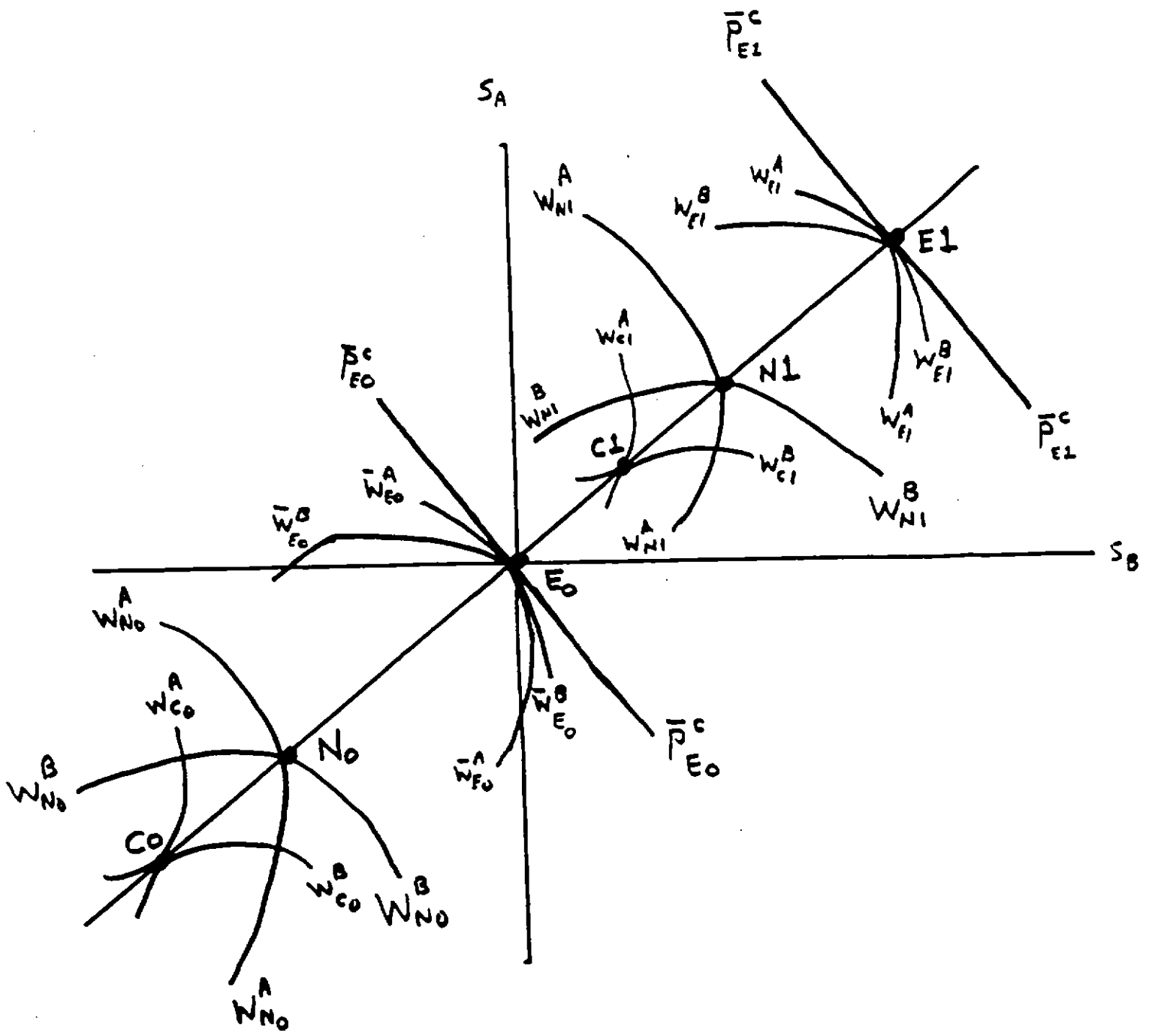


Figure 1