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EXPORT SUBSIDIES AND THE GAINS FROM TRADE LIBERALIZATION: THE CASE OF CANADA-U.S. DURUM WHEAT TRADE

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Abstract

Following the 1989 Canadian-U.S. Free Trade Agreement sales of Canadian wheat to the United States have grown rapidly, resulting in political confrontations and several trade disputes. The economic basis of the conflicts has revolved around the trade effects of other farm policies. The existence of other farm policies modifies the size and distribution of the gains from trade, and makes implementing a free trade agreement difficult, but may still permit increased trade volume and mutual benefits from freer trade. In the case of durum wheat, Canada is likely to gain from increased access to the U.S. market, especially because the U.S. export subsidy program raises U.S. domestic prices and this makes it attractive for Canada to sell into the United States, rather than to third markets. In theory, given its export subsidy policy and internal farm programs, the United States might gain or lose from more imports. An empirical analysis suggests that, given the U.S. policy of subsidizing durum exports to third countries, the United States would be better off as a result of restricting durum wheat imports from Canada in a normal year. However, in a year such as 1993/94, where weather-damaged U.S. durum is a poor substitute for Canadian durum, closing the border would result in U.S. welfare losses overall.

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1. INTRODUCTION

There has been much discussion in recent years of the gains from a general movement toward freer trade in agricultural products (especially under the auspices of the multilateral Uruguay Round of GATT negotiations, see Tyers and Anderson 1992) and also of the gains from trade agreements to reduce import barriers (such as the process of European Community enlargement, the Closer Economic Relations agreement between Australia and New Zealand, and the free trade agreements between the United States and Canada and Mexico).

Such discussions have often ignored the implications of other distortions for the gains from reducing border distortions. Occasionally, the existence of farm programs is used as an argument against trade liberalization, or is held as a caveat against some forms of liberalized trade (indeed, agricultural exemptions from free trade agreements have been the norm), but usually that has been a reflection simply of the implications of freer trade for the continued viability of the existing farm programs (e.g., the U.S. sugar program or the Canadian supply management schemes). In addition, sometimes the pressure that freer trade places on domestic subsidy policies is considered (by economists at least) as a further rationale for such agreements.

An evaluation of the impact of agricultural policies on benefits from a free trade agreement is of interest since, with multiple distortions, reducing some barriers to trade is not always mutually beneficial nor globally welfare improving. This paper explores the implications of distortions arising from farm programs for the size and distribution of gains from a bilateral trade liberalization. We use the case of the expanding trade and related disputes between Canada and the United States over durum wheat to illustrate the ideas—a case where the benefits from freer bilateral trade have been conditioned by the impacts of export subsidies to third markets.

2. CANADIAN-U.S. AGRICULTURAL TRADE, CUSTA AND DURUM TRADE DISPUTES

Tariffs between Canada and the United States for agricultural products reached an all-time high in the 1930s and, although they have been gradually reduced since then, trade barriers have remained high for many commodities and have included non-tariff barriers as well as tariffs. Against this historical background, the Canadian-U.S. Free Trade Agreement (CUSTA), which came into effect in 1989, will gradually eliminate tariffs for certain agricultural products while leaving other barriers in place. The Uruguay Round Agreement, to take effect in 1995, will also reduce some bilateral barriers while converting existing absolute quotas to tariff-rate quotas.

Since CUSTA was implemented, agricultural trade between the Canada and the United States has grown substantially. The additional trade has resulted in numerous bilateral trade disputes including disagreements over wheat, pork, corn, and sugar (e.g., see Moschini and Mielke 1992; Lermer and Klein 1990). Several disputes have concerned durum wheat, since Canada's share of the U.S. domestic durum wheat market has gone from essentially zero a few years before CUSTA, to thirty-five percent recently.[1]

Durum wheat is a special variety of hard wheat that is used primarily for pasta products.[2] Worldwide annual production of durum averages about 25 million metric tons (mmt). As shown in table 1, production is concentrated in North America, Western Europe and

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[1] Prior to the free trade agreement, barriers of importance were Canadian import licenses on wheat (and wheat products) and a U.S. tariff. As result of the CUSTA, a formula was developed to allow for removal of the Canadian import licenses and in return the U.S. agreed to gradually eliminate its tariff of $0.21 per bushel on wheat. Under CUSTA, the trigger for the removal of Canadian import licenses was equalization of wheat Producer Subsidy Equivalents (PSEs)—government support as percentage of the value of production plus direct payments. In compliance with article 705 of CUSTA, wheat import licenses were eliminated in May 1991, based on the average of 1988/89 and 1989/90 PSEs. Canadian farmers received an average wheat PSE of 31 percent, compared with 27 percent in the U.S. over that two-year period.

[2] Although a small amount of hard spring wheat is sometimes used by millers in a blend with durum, the substitutability between spring wheat and durum is very limited.

North Africa. North American average production of 5.4 mmt. per year is only about 20% of the world total but the United States and Canada dominate durum exports: together they account for over 80% of world exports. The large importers are North Africa, Algeria and the USSR. The European Community (EC) both exports and imports, but on net is an importer of durum. This is interesting given that the EC has been involved in a long-standing trade war with the United States over wheat export subsidies, including durum.

In recent years, most U.S. durum exports have been subsidized under the Export Enhancement Program (EEP), in competition with EC export subsidies on durum. Notwithstanding its position as a major exporter, over the past five years the United States has imported significant amounts of durum from Canada. There has been a steady rise in U.S. imports of Canadian durum wheat, beginning in the mid- to late-1980s, going from less than 0.10 to 0.74 mmt (table 2). Almost all of this is imported as grain from Canada. U.S. durum imports from other sources are in the form of pasta converted to grain equivalents in the data.

[Tables 1 and 2 about here]

The shipments of durum from Canada have become a major trade irritant to the United States. The U.S. government has argued that the Canadian Wheat Board (CWB) violated section 701.3 of CUSTA; that U.S. customs import data on unit values show that the CWB is selling below acquisition cost (including storage, handling and freight).[3]

> *Neither Party, including any public entity that it establishes or maintains, shall sell agricultural goods for export to the territory of the other Party at a price below the acquisition price of the goods plus any storage, handling or other costs incurred by it with respect to those goods.* (CUSTA Article 701.3).

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[3] The Canadian Wheat Board is responsible for the export sale of all prairie-grown wheat and for domestic wheat sales for human consumption.

Although CUSTA eliminated Canadian subsidized freight rates on grains exported to the United States through the west coast of Canada, freight subsidies were retained for exports to the United States through the Great Lakes. This has become litigious. Durum wheat producers in North Dakota viewed the freight subsidy as an export subsidy, in violation of CUSTA.

> *Neither party shall introduce or maintain any export subsidy on any agricultural goods originating in, or shipped from, its territory that are exported directly or indirectly to the territory of the other party.* (CUSTA Article 701.2)

U.S. producers raised the issue in 1989 but the United States Trade Representative determined that Canada had not violated this article because the freight subsidy applied to all shipments to Thunder Bay, whether destined for export or domestic use. However, also in 1989, the U.S. Congress instructed the United States International Trade Commission (USITC) to examine the "conditions of competition" between the U.S. and Canadian durum industries.[4] The USITC report rejected the argument that the CWB had been "dumping" durum into the United States (i.e., selling into the United States below acquisition price) and concluded that the drought of 1987-89 was the main reason for increased durum imports from Canada.

An important component of CUSTA was the agreement on a trade dispute settlement mechanism, which established binational panels for antidumping (AD) and countervailing duty (CVD) cases. The case of Canadian durum wheat sales was also heard before a binational panel in 1992, under Chapter 18 of the CUSTA. The United States again alleged that the growth in Canadian exports was due to the CWB selling into the United States at less than acquisition cost and that, in addition, the Canadian transportation subsidy led directly to increased Canadian exports to the United States. The binational panel did not agree, and made its final ruling in

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[4] USITC Investigation No. 332-285 "Durum Wheat: Conditions of Competition Between the U.S. and Canadian Industries" began on December 4, 1989. The final report was released in June 1990.

favor of Canada in January 1993. This panel agreed with the USITC that there was no compelling evidence that the CWB was selling below its acquisition cost.

A more likely theory is that the primary impetus for increased Canadian durum exports has come from export subsidies, under the U.S. EEP, creating a premium market in the United States for Canadian durum that has been exploited increasingly in the post-CUSTA period.[5] EEP was established in 1985, to boost the volume of U.S. exports, and has played an important role in durum wheat exports. Approximately one-half of U.S. durum exports in 1987 were sold under EEP, almost 100% in 1988, and about 20% in 1989. The size of the EEP bonus ranged from $25 to $50 per metric ton over the 1986 to 1989 period (Abel, Daft and Earley 1990). In 1992, 0.90 mmt of U.S. durum exported under EEP (70% of all durum exports) received a total EEP subsidy of $38.1 million, an average of $42.50 per metric ton.

The EEP subsidies drive a wedge between U.S. domestic and world prices: they depress the international price and raise the domestic U.S. price. Such policies can work for the United States only so long as there are barriers to U.S. imports that prevent the price wedge from being arbitraged. The fact that the U.S. border has been opened to Canadian durum has meant that the EEP policy has been undermined to some extent by imports from Canada.[6] U.S. trade barriers, particularly before CUSTA, and apparent voluntary restraint by the CWB, have meant that the arbitrage has been only partial, however.

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[5] For a description of the EEP program see Ackerman and Smith (1990) and Gardner (1993).

[6] The CWB has never been precluded from selling into the U.S. market. With CUSTA, however, there has been lower tariffs and less threat of imposition of Section 22 of the Agricultural Adjustment Act of 1933 which allows the U.S. Secretary of Agriculture to impose quotas on imports if it is determined that such imports threaten U.S. price support programs. Under the Uruguay Round GATT Agreement, the U.S. is scheduled to give up its "Section 22 waiver," but even in 1994 the United States pursued a Section 22 case against Canadian wheat.

Under these conditions, it is not surprising that an opening of the border under CUSTA resulted in more Canadian wheat flowing into the United States Such an increase in trade following a reduction in trade barriers normally would be expected to be mutually beneficial. However, in this case, both countries are exporters of the commodity in question and, while an increase in exports of durum to the United States would be expected to benefit Canada as a net exporter, it is natural to suspect that an increase in imports would be to the detriment of a net exporter (such as the United States for durum wheat). We demonstrate below that additional Canadian durum sales into the United States can be beneficial to the United States (and, indeed, can be detrimental to Canada as a result of Canada's farm export policies).

The rest of this paper considers the economic effects of trade and trade restrictions between the United States and Canada in durum wheat, in the presence of export subsidies to third markets. We describe the qualitative impacts of freer trade in durum wheat, and draw inferences about the likely directions of gains from increased durum trade, taking explicit account of the distortions caused by a Canadian freight-subsidy policy and a U.S. export-subsidy policy. Our results are relevant to the more general issue of freer trade impacts in countries with farm programs. We use a theoretical model to show that increased Canadian durum sales into the United States can be beneficial or harmful to both the United States and Canada. And we use a three-region empirical trade model to simulate the impacts of import restraints in the durum market and to evaluate the welfare consequences under a range of export policy and market scenarios.

The other components of the Canadian and U.S. farm programs for wheat—such as the Canadian crop insurance, and gross revenue insurance programs, and the U.S. acreage reduction

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program, target prices, and deficiency payments—are not modeled explicitly. It is legitimate to treat the commodity program payments as approximately exogenous in our analysis of U.S.-Canada durum trade. Apart from the WGTA freight subsidies, which are incorporated explicitly in our model, Canadian domestic policies are primarily multicommodity revenue insurance programs. U.S. domestic subsidy programs for wheat provide direct payments to farmers that are now essentially independent of current acreage planted or yield per acre. Thus they have little or no effect on U.S. production of durum. Further, there is a single program for all U.S. wheat, of which durum comprises about three percent, so that while the payment a grower receives does depend on the average price of wheat, it is largely unaffected by the price of durum over the range of price changes considered in most of the analysis below. The one notable exception is when we simulate elimination of U.S. export subsidies, which do have significant effects on farm program costs, and in that case we calculate the impacts on farm program costs separately.

3. A MODEL OF U.S.-CANADA TRADE AND A STYLIZED EXPORT SUBSIDY PROGRAM

Figure 1 represents U.S. trade in durum wheat in the presence of a stylized export subsidy program. In panel (b) of figure 1, D_{RW} represents the net export demand facing the United States and ES_{US} is the U.S. excess supply curve. The price without export subsidies is P_F. The U.S. export subsidy is depicted as a shift of export supply out from ES_{US} to ES_{US}-S in figure 1, given a subsidy of S per unit exported, which equals the vertical distance $P_{US}^S - P_W^S$. The export subsidy increases U.S. exports and drives up the domestic price from P_F to P_{US}^S. The export subsidy program drives a wedge (of $S = P_{US}^S - P_W^S$) between U.S. domestic and world prices, a

result that rests on the United States having a barrier to imports (such as natural protection provided by transportation costs, or tariffs, or other interventions at the border) so as to prevent imports from undermining the domestic price. Prior to CUSTA the United States used a tariff of $0.21 per bushel, combined with suasion applied to the CWB, to limit CWB sales to the U.S. market. For simplicity, we model that situation as if there were no imports from Canada.

[Figure 1 about here]

In the analysis shown in figure 1, U.S. welfare is necessarily reduced by its export subsidy policy. In panel (b) of figure 1, the net U.S. loss as a result of its subsidy is given by the area abc + $P_F bc P_W^S$. In addition, U.S. export subsidies harm the interests of competing exporters (including Canada) to the extent that prices are depressed in importing countries (not shown in figure 1).

Following CUSTA, the Canadian Wheat Board has an enhanced incentive to arbitrage the price wedge between the U.S. internal price and the price in third countries, by reducing sales to third markets (such as Algeria) and increasing sales to the United States. This change in Canadian behavior has two consequences. First, the reduction of Canada's third market sales increases ROW import demand facing the United States from D_{RW} to D_{RW}^*. The impact of this movement is to tend to reduce the gap between the United States and world prices by driving the world price up. Second, at the same time, the increased supply from Canada into U.S. markets causes the domestic U.S. demand (for U.S. grown durum) to shift leftward from D_{US} to D_{US}^* and, therefore, the U.S. excess supply curve (ES_{US}) shifts right to ES_{US}^*. This shift would tend to depress the world price (offsetting part of the increase in excess demand caused by the Canadian withdrawal from the world market), but it would be expected to be smaller than the

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shift of the excess demand that precipitated it. Hence a new equilibrium (incorporating the U.S. export subsidy and the two effects of the Canadian shift from third markets to the U.S. market) is established with a lower domestic U.S. price, P_{US}^* and a higher price for U.S. exports, P_W^*. The quantitative impacts of this set of interactions—on market-clearing prices, and quantities produced, consumed, and traded, and on welfare and its distribution in the two countries—will depend on market parameters and the specifics of the policy.

For a given U.S. export subsidy regime, the United States exports more durum and imports more durum when the U.S. border is opened. The third-country effects add an element to the supply and demand response when the barriers against Canadian durum are reduced (represented as rightward shifts of the excess supply and demand curves for U.S. wheat in panel (b) of figure 1), that augments the effects of movements along the stationary curves that would apply if the third-country effects were absent (or were ignored).

One can envision scenarios where the wedge (i.e., the per unit export subsidy) would be greater than (or stay the same as) it would be without the border trade with Canada. As figure 1 is drawn, the price wedge due to the export subsidy is smaller when the (partial) arbitrage by the CWB is allowed to take place. In fact, the reduction in the subsidy (from S to S^*) is greater than the shift in excess supply in the price direction (from ES_{US} to ES_{US}^*) so that the effective excess supply shifts *up* (from ES_{US}-S to ES_{US}^*-S^*). Whether the subsidy falls or rises depends on the rules of the export subsidy policy.[7] In our simulations below, we consider two

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[7] It also depends in part on the behavior of the CWB and its perception of the U.S. policy response. The fact that the CWB has sole export powers over durum means that the arbitrage is not driven solely by competitive forces. Instead, it would be expected to be managed to meet longer-run CWB objectives. For instance, the CWB might choose not to arbitrage the market to the point that would maximize short-run profits, in order to avoid a confrontation with the United States that could lead to a return to a closed border.

alternative U.S. export policy rules: (a) a fixed per unit subsidy, that does not change when the border is opened, and (b) a fixed total subsidy budget, under which the subsidy rate falls in a particular fashion when exports rise after the border is opened.

From the U.S. perspective, ceteris paribus, a smaller price wedge would imply a smaller triangle of social loss due to the subsidy. However, the quantity of subsidized U.S. exports is greater so that the impact of CUSTA on the budgetary cost of the export subsidy policy is ambiguous: it depends on the relevant supply and demand elasticities, and the size of the induced change in the export subsidy rate. Hence, the U.S. welfare impacts in the market for U.S. durum are ambiguous. In addition, the full U.S. welfare impacts cannot be seen in figure 1 because we have not explicitly included the U.S. market for Canadian durum, a close but not perfect substitute for U.S. durum. And, we have not considered farm program costs. Even from Canada's point of view, the welfare impacts are ambiguous once we include Canada's own policies. We cannot rule out from theory alone the possibility that Canada is worse off from freer trade, but the opposite result seems much more likely.

As shown by Alston and Martin (1994) the welfare impact of a border price change in the presence of *any* distortion depends on the effect of the border price change on the social cost of the pre-existing distortion.[8] The U.S. export subsidy policy is a distortion whose social costs might be diminished by the opening of the border with Canada; in such a case the United States may benefit from greater durum imports from Canada. Thus, there may be *mutual* gains from an increase in U.S. imports from Canada. In order to establish measures of the welfare impacts

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[8] Markusen (1981) analyzed the distribution of gains from bilateral tariff reductions and showed that both countries might not gain. In Markusen's analysis, the pre-existing distortion is that the existing tariff is less than the optimal tariff so that a tariff reduction worsens the distortion.

of the U.S. export subsidies, in interaction with the changes in U.S.-Canadian border policies, we need to specify explicitly quantitative aspects of the policies. We also need to specify explicitly the market conditions and the market-clearing processes that account for the coexistence of U.S. exports and imports, and for the incomplete arbitrage.

4. A Simulation Model of U.S.-Canada Durum Trade and Policy

We developed a three-region empirical model of durum production, consumption, policy and trade. The three regions are Canada, the United States, and an aggregate representing the rest of the world (ROW). Each region has a supply equation. Durum is differentiated according to regional origin in an Armington-type specification. Thus regions have demand equations for durum from different sources. Canada consumes only Canadian durum; the United States consumes U.S. and Canadian durum; the ROW consumes durum from all three regions. (Pasta imports into the United States are treated as negligible and exogenous).

The supply and demand equations are represented in the model by linear approximations with elasticities at the point of approximation (the "base" case of current policy, prices and quantities), used to parameterize the curves. The model is closed with a set of quantity clearing identities and price policy rules that define the behavior of the CWB and the U.S. government. Although the individual equations of the model are linear, the model requires a nonlinear solution algorithm because the CWB objective function or the U.S. policy rule are nonlinear in some cases. The model was defined and solved using the *Solver* option of *Microsoft EXCEL*.

The CWB has monopoly power in that it has sole export powers and can discriminate among export markets. However, the CWB has no authority to control domestic production of

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durum or other grains. Producers respond to the average (pooled) price they expect to receive for durum. The CWB objective is to maximize net revenue from the sale of the crop by equating marginal revenues across markets. This objective ignores the effects of current decisions on future profits.[9] The CWB is assumed to behave rationally in that, in optimizing its allocation of Canadian durum among markets, it also takes account of the U.S. government policy response to its actions, and U.S.-ROW durum trade responses.

The U.S. EEP, is represented in the model as an export subsidy, with two alternative assumptions about how the subsidy responds to changes in market conditions. One assumption is that the total export subsidy budget is fixed and the subsidy per tonne is endogenous. The alternative is that the per unit export subsidy is fixed and total expenditure is endogenous. Neither of these assumptions is likely to be strictly accurate, but the two alternatives capture the essence of a complex and informal policy of setting per unit bonuses for individual sales within a flexible set of overall allocations of funds and tonnages for each export market.

As noted above, U.S. farm income support programs have no effect on durum supply. In recent years they have become essentially decoupled. Further, remaining provisions treat durum and the relevant alternative crops equally, in a way that means they are effectively neutral. Hence, over the relevant price range, producers respond to changes in the domestic market price for durum, and this response is represented by the supply function. Hence, the only relevant U.S. policy, in terms of defining the market equilibrium, is the export subsidy

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[9] In some of the analysis, we broaden this objective function to allow for a potential retaliatory response from the United States if too much Canadian durum crosses the border. We consider a voluntary restraint on Canadian exports (i.e., where marginal revenue from the U.S. market is above marginal revenue from other markets but exports are restricted in view of the dynamic implications). In 1994, the U.S. government did press Canada to "voluntarily" limit its wheat exports to the United States.

program that drives a wedge between the domestic price (common to producers and consumers) and the export price of U.S. durum.

The first objective of the simulations is to examine the welfare effects of eliminating durum trade barriers between the United States and Canada, under CUSTA; in particular, to test the hypothesis that both nations gained from lowering tariffs and opening wheat trade. In order to examine this question we consider whether both countries would lose if quantitative trade restrictions were introduced in the current "free trade" environment. This may be particularly relevant since the U.S. and Canadian governments have been negotiating "voluntary" export restraints on durum (and other commodities) as a direct result of the durum trade dispute.

Four base simulations were defined by combining the two different assumed U.S. export subsidy rules with two different assumed values for the elasticity of substitution among different types of durum, $\sigma = 2$ and $\sigma = 20$.[10] The larger value of the elasticity of substitution represents a typical year, in which Canadian and U.S. durum are regarded as being fairly close substitutes, but not perfect substitutes.[11] The lower value might represent a year such as 1993/94 when U.S. quality was low, due to weather effects during the growing season, and Canadian durum was regarded as significantly better than much of the U.S. crop. In such years pasta makers blend grain from different regions to meet their requirements.

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[10] Johnson (1971) suggested that elasticities of substitution around 3 were typical in Armington models of commodity markets including the market for wheat. Wheat, however, is a more aggregated commodity than durum, likely to be characterized by much greater quality variation. U.S. and Canadian durum are probably quite close substitutes in a normal year, as reflected in an elasticity of substitution of 20.

[11] The U.S. and Canadian durum wheat production areas are contiguous, with similar soil and climatic conditions. There are important differences in grain quality, however. The licensing and grading systems are different in the two countries and as a result Canadian durum has a reputation of being of high quality and uniform (see U.S. Congress, Office of Technology Assessment 1989a, 1989b). Government regulations in Canada tightly restrict the development and release of new wheat varieties. The upshot is that Canadian durum wheat has better milling characteristics and *ceteris paribus* would be preferable to a miller, over U.S. durum.

Under each of the four sets of combined elasticity/export subsidy assumptions the effects of various *exogenous* policy changes affecting durum trade between the United States and Canada were simulated. In practice, for each set of assumptions, the model was parameterized under the current (unrestricted) trade scenario.[12] In each case, an optimal export quantity (maximizing the CWB objective function) was calculated first; then various reductions in that quantity, down to zero, were simulated.

The simulated values of prices, quantities, policies and trade were used to compute welfare impacts of freer trade between the United States and Canada, including consumer surplus, producer surplus, and government revenues in each region. These welfare impacts are more complicated than is typical in analysis of commodity policies for two reasons. First, the markets are distorted by government policies that are to some extent endogenous. Second, multiple qualities of durum (i.e., effectively multiple differentiated commodities) are included with jointly endogenous prices and quantities. This means that an explicit multimarket evaluation of consumer surplus must be undertaken. An appendix provides details.

5. CONSEQUENCES OF U.S. IMPORT BARRIERS

Welfare Effects of Trade Restrictions with A Fixed per unit Export Subsidy

Table 3 shows the market equilibrium under alternative policies, assuming $\sigma=20$. Comparing the two scenarios in table 3, the base and a U.S. import quota of $Q = 0$, shows that

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[12] When parameter values or policy rules are changed, the *base* simulations change, too. None of these base simulations corresponds exactly to any actual recent year, since they represent the hypothetical result of the CWB optimizing the allocation of Canadian wheat among markets, given the assumed parameter values. However, by comparing the simulated base against the actual data in table 2 for 1992/93, it can be seen that the simulated base values are not grossly at odds with recent reality.

with a fixed export subsidy rate, closing the border, relative to the present situation, would increase the U.S. price of U.S. durum only slightly, from $161 to $163/tonne, with the United States (shadow) price of Canadian durum rising much further, from $163 to $188/tonne. Canadian exports to the ROW would rise by 54 percent, and U.S. exports would fall by 41 percent, with corresponding price changes in the ROW.

[Table 3 about here]

Table 4 shows the welfare effects of various U.S. import quotas for durum under alternative assumptions about the substitutability between Canadian and U.S. durum, and the export subsidy policy rule. The first three columns in table 4 refer to welfare effects of using a quota to restrict Canadian exports to the United States from the unrestricted base of 0.85 mmt to either 0.8 mmt, 0.5 mmt or zero.[13] Eliminating the imports would increase total U.S. economic surplus by $16.1 million per year while Canadian welfare would decrease by $21.9 million per year. In the United States, annually, consumers would lose $13.1 million but this would be more than offset by savings in export subsidy expenditure of $22.9 million, and producer benefits of $6.3 million, if Canadian imports were eliminated. The ROW would gain slightly but the world as a whole would lose from eliminating the Canada-U.S. durum trade.

[Table 4 about here]

The effects of intermediate import quantities (corresponding to voluntary export restraints by the CWB of 0.8 and 0.5 mmt per year) are also shown. These intermediate cases show some interesting results. World welfare would fall if the border were closed altogether, but would rise if Canada's durum exports to the United States were reduced to 0.8 or 0.5 mmt per year. The

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[13] The base situation is defined by the CWB pricing rule, $\sigma=20$, and the fixed per unit EEP, and no explicit trade barriers, as presented in table 3.

reason is that Canadian losses rise rapidly as the quota is progressively tightened below 0.5 mmt. Net world welfare is highest at some quota around 0.5 mmt. Free trade in durum between Canada and the United States does not maximize global welfare, given U.S. export subsidies.

Effects of Reduced Substitutability on Welfare Effects of Trade Restrictions

The next two columns in table 4 show welfare effects when $\sigma=2$ instead of $\sigma=20$. When durums from different sources are very close substitutes (i.e., $\sigma=20$), closing the border led to a U.S. welfare gain overall. When substitutability is reduced ($\sigma=2$), however, eliminating U.S. durum imports leads to U.S. welfare losses of $12.7 million per year—the consumer loss outweighs the other effects. (But limiting imports to 0.2 mmt would be even worse than zero imports, from a U.S. perspective.) In addition, all of the other gains and losses are greater when there is less opportunity to substitute among durums in response to a change in U.S. durum imports. In particular, Canada's losses from closing the border roughly doubled. Also note, in the low substitution case, the quantity of imports under free trade is only 0.49 mmt compared with 0.85 mmt when $\sigma=20$.

Welfare Effects of Trade Restrictions with a Fixed Total Export Subsidy Budget

The results just discussed were obtained by assuming that the export subsidy was $30 per tonne, so that the total subsidy budget was endogenous. The final set of columns in table 4 show the corresponding results when it is assumed instead that the total export subsidy expenditure on durum is fixed (i.e., the per unit subsidy is endogenous). Under this policy (with $\sigma=20$), the base quantity of U.S. imports is 0.8 mmt.

The U.S. consumer losses from closing the border (almost $30 million per year) are greater than with a fixed per unit export subsidy, but producer surplus gains are larger, too.

However, since export subsidy savings are zero in this case, overall U.S. gains are only about $5.6 million (compared with $16.1 million when subsidy expenditure was endogenous). Under the assumption of a fixed total export subsidy budget, Canadian losses are much greater, ROW gains are much greater, and global losses are much greater, than under a fixed per unit subsidy.

The contrast between the different results in table 4 illustrates the role of U.S. export subsidy rules and CWB behavior. Since the base case without quota restrictions would maximize producer benefits in Canada, a reduction in U.S. imports from Canada would reduce Canada's overall gains from durum production and consumption. With a fixed export subsidy budget, eliminating Canadian imports would result in a net U.S. welfare gain of about $5.6 million per year, while restricting imports to only 0.4 mmt (about half the CWB optimum) would generate a U.S. loss compared with the status quo. The net U.S. welfare effects of changing U.S. durum imports with a fixed export subsidy budget are less important than the distributional effects.

6. EFFECTS OF ALTERNATIVE POLICIES WITHOUT IMPORT BARRIERS

The political discussions of Canada-U.S. border wheat trade have involved various speculations about what has really driven changes in trade patterns and prices. In particular, U.S. producers have blamed the Canadian WGTA freight subsidies and the CWB, while Canadian sources (including producers and the CWB) and some economists have pointed toward the U.S. EEP. To provide some insight into these positions, we can use our simulation model to consider the trade and welfare implications of several exogenous policies applied under the assumption of an open border. The price and quantity effects of various alternatives are shown in table 5, and the corresponding welfare effects are shown in table 6.

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[Tables 5 and 6 about here]

In each case it is assumed that $\sigma=20$, and the U.S. export subsidy, when present, is a per unit subsidy of $30/tonne. Four alternative policy scenarios are reported. In each of these scenarios it was assumed that the CWB would choose its exports to the United States (and the other markets) so as to maximize current net revenues. In the first scenario, in order to examine the quantitative effects of U.S. export subsidies on the impacts of freer durum trade, it is assumed that the U.S. government ceases to subsidize durum exports. In the second scenario, it is assumed that the U.S. government ceases to subsidize durum exports directly at $30/tonne but, instead, applies a $30/tonne output subsidy and a $30/tonne consumption tax. This is equivalent to retaining the export subsidy and introducing an import tariff of $30/tonne.[14] In the third scenario, in order to examine the quantitative effects of Canadian rail freight subsidies on the impacts of freer durum trade, it is assumed that the Canadian government ceases to subsidize rail freight of grain under the WGTA. Finally, in the fourth scenario, the effects of eliminating both WGTA and U.S. export subsidies together are considered. If export subsidies were eliminated, the effects on U.S. durum prices would be sufficient to measurably affect U.S. average wheat prices and farm program costs, so in the cases where export subsidies are being eliminated, we also compute the effects on U.S. wheat deficiency payments.[15]

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[14] In simple trade models, a consumption tax combined with an output subsidy at the same rate is equivalent to an export subsidy. When the border is not closed to imports, however, a consumption tax plus an output subsidy is equivalent to an export subsidy plus an import tariff at the same rate.

[15] Program payments are calculated based on a national average wheat price, for all wheat classes, calculated to the nearest cent per bushel. Since durum makes up about 3% of all wheat, even relatively large changes in durum prices may have a negligible effect on the relevant price of all wheat. To calculate the effects on program payments we multiplied the change in the U.S durum price by 3% (the durum share of base) to compute a change in the overall wheat price, and we multiplied that by the wheat payment quantity of 54.43 million tonnes. Then, 3% of the computed change in deficiency payments was apportioned to durum wheat growers with the remaining 97% going to other wheat growers.

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Effects of U.S. Export Subsidies on the Gains from Trade

If there were no U.S. export subsidies, opening the border between the United States and Canada would have had much smaller effects on durum trade. In the second column of table 5, it can be seen that eliminating the export subsidies would leave U.S. imports at 0.37 mmt, less than half the base of 0.85 mmt. Canada's exports to the ROW would be greater (1.56 rather than 1.34 mmt per year). Table 6 shows that eliminating the durum export subsidy would cause a gain in U.S. welfare (losses to durum producers and increased wheat program costs are more than offset by gains to nondurum wheat producers and consumers, and savings in export subsidies), a loss in Canadian welfare (Canada has been a beneficiary of export subsidies on durum), and a gain in ROW welfare overall. These results are due to the interaction of EEP and the other distortions.

Effects of a Combined U.S. Consumption Tax and Output Subsidy

Surprisingly little attention has been given in either policy discussions or academic analysis to the option of replacing the current U.S. export subsidies with an "equivalent" consumption tax and output subsidy. It is true that the U.S. EEP scheme has not been a textbook export subsidy, in that different markets have been subsidized at different rates, and so it would not be possible to devise an "equivalent" domestic tax-subsidy scheme. In particular, the use of a domestic tax-subsidy instead of EEP would effectively subsidize all export markets at the same rate, including Japan, which has not been subsidized under EEP. On the other hand, introducing a domestic tax-subsidy scheme might be advantageous for the United States in that it would be equivalent, broadly, to introducing a tariff on durum imports that would protect U.S. export subsidies and domestic farm support programs. Such a policy

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would seem to be legal under the rules of GATT and even under the new rules introduced in the Uruguay Round.

The simulated prices and quantities arising from a U.S. domestic consumer tax and output subsidy of $30/tonne (instead of an export subsidy of $30/tonne), are shown in the second column of table 5. The corresponding welfare effects are shown in the second column of table 6. Under the tax-subsidy scheme, U.S. imports of Canadian durum are much smaller than with export subsidies (0.10 rather than 0.85 mmt). Such a change in U.S. policy would reduce Canadian producer welfare and would increase Canadian consumer welfare, with a net loss of Canadian welfare overall of $17.7 million per year. In the United States, consumers would lose and durum producers would gain. But the net welfare effects also include the effects on government revenues. While the U.S. government would avoid export subsidy costs of $56.2 million it would incur a cost (of output subsidies less tax revenues) of only $33.1 million so that, overall, there would be a U.S. gain of $16.3 million per year compared with the current policy. There would be a small ROW loss and, from a global perspective, the effective introduction by the U.S. government of a tariff on durum imports (at the same rate as the export subsidy) would be welfare reducing.

Effects of WGTA on the Gains from Trade

Many U.S. interest groups have argued that the WGTA (grain freight subsidies) mean that the CWB is effectively dumping wheat into U.S. markets. In the simulation experiments shown in the second-last column of table 5, it can be seen that if the WGTA subsidies on durum were removed, Canadian durum exports to the United States would actually increase. The reason is that the WGTA subsidies are a greater effective subsidy on CWB sales to eastern

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Canada and the ROW than to the United States—effectively an export tax on sales to the United States, and an even greater tax on consumers of durum in the Canadian prairies, combined with an output subsidy. Thus, the WGTA freight subsidies have acted as a brake on CWB exports to the U.S. market and have mitigated the U.S. impacts of freer durum trade with Canada.

The second-last column of table 6 shows the simulated welfare effects of eliminating the WGTA. Eliminating the WGTA on durum would generate a small welfare loss to Canadian consumers, a welfare loss to Canadian durum producers of $41.6 million, a benefit to taxpayers of $60.3 million, and a net benefit of $18.2 million per year to Canada. Eliminating WGTA would result in slightly *increased* exports from Canada to the United States, and dramatically reduced exports from Canada to the ROW. There would be a benefit to U.S. consumers from greater imports of lower-priced Canadian durum and a benefit to U.S. producers (although they would lose some domestic sales to the CWB, they would gain more from exporting more to the ROW at a higher price). U.S. exports and export subsidy costs would rise if WGTA were eliminated. Eliminating the WGTA would yield global welfare gains of $13.6 million per year, with positive net benefits to Canada, but a net loss to the ROW (a beneficiary of the effective export subsidy) and, strikingly, a small net loss to the United States.

Effects of Eliminating both Export Subsidies and WGTA

The last column of table 5 shows the simulated prices and quantities if both U.S. export subsidies and the WGTA were eliminated. The last column of table 6 shows the corresponding welfare effects relative to current policies. Eliminating both policies would reduce U.S. imports of Canadian durum to 0.45 mmt, a little over half the base quantity. U.S. durum producers would be much worse off (by $51.8 million per year), but other U.S. wheat producers would

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gain $22.2 million and U.S. consumers and taxpayers would be much better off (by $59.2 million per year), leaving a net U.S. gain of $29.6 million per year.

In Canada, eliminating both policies would lead to a small net gain ($8.1 million per year), but the impacts on particular groups would be dramatic: durum producers would lose $72.5 million per year, consumers and taxpayers would gain $80.6 million per year. The ROW is a beneficiary of Canadian and U.S. durum export subsidies, and would lose $21.3 million per year if they were eliminated. Global welfare would be increased by $16.4 million per year.

Summary of Effects of Alternative Export Subsidy Policies

As can be seen in table 6, from the U.S. point of view, compared with the status quo, welfare would be increased most by eliminating both the Canadian WGTA and the U.S. export subsidies (a gain of $29.6 million per year). The second-best policy, and nearly as good, would be to eliminate the U.S. export subsidies alone, yielding a U.S. gain of $28.3 million per year (but this would be a bit worse from the point of view of U.S. durum producers than eliminating both the export subsidies and the WGTA).[16] If export subsidies are to be retained, the United States could gain $16.3 million per year by effectively augmenting them with a tariff on imports at the same rate; this could be done legally under GATT by replacing the export subsidy with a domestic consumer tax and output subsidy at the same rate. This policy would be slightly better from the U.S. standpoint than closing the border to Canadian durum, given the export subsidy program. (The United States might lose directly from closing the border if Canadian durum is a poor substitute for U.S. durum, and would face retaliation from Canada or would

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[16] We did not formally analyze the impacts of eliminating the CWB, allowing competition which would result in a more complete arbitraging of the Canadian and U.S. markets. Such arbitraging would increase the U.S. losses from freer durum trade under CUSTA. Curiously, in recent times the U.S. government has claimed, unreasonably, that the CWB has had the opposite effect, undercutting price in the U.S. market.

be required to pay compensation under the GATT.) From the U.S. national perspective, the worst option would be to eliminate the WGTA alone (it would result in a small loss, whereas all other options involve a U.S. gain).

From Canada's perspective, eliminating the WGTA would confer the greatest gains. Eliminating U.S. export subsidies as well would not be as desirable, since Canada benefits from the U.S. export subsidies. Changes in U.S. policy—to eliminate export subsidies, impose a tariff, or close the border altogether—would result in Canadian welfare losses. All of the U.S. or Canadian policy alternatives in table 6 would confer a loss on Canada's durum producers compared with the status quo. In short, the results for Canada and the United States confirm intuition: each country stands to gain most from eliminating its own distorting policy. From a global perspective, the worst option would be to close the border completely, and the next worst would be to introduce a tariff. Eliminating either the U.S. export subsidies, or Canadian freight subsidies under the WGTA, or both, would be globally welfare improving.

7.   CONCLUSION

Increases in bilateral trade, associated with reduced trade barriers, might not be beneficial to either party or both parties when trade is affected by other distortions. Thus the existence of farm programs, freight subsidies, or export subsidies to third country markets can mean that it is not welfare-improving to join a bilateral trade agreement. On the other hand the existence of such distortions need not eliminate the possibility of gains from trade arising from the formation of a trade agreement.

Canada has gained from freer trade in durum with the United States. Whether the United States has gained from increased durum imports is less clear. In a year like 1993/94, when U.S. and Canadian durum were relatively poor substitutes, closing the border would reduce overall U.S. welfare; in a more typical year, we find the United States would gain from restricting the trade. As well as depending on market parameters, the answers depend on policy rules.

A clear understanding of welfare impacts requires detailed information on both U.S. and CWB policy rules. However, it seems obvious that U.S. durum producers' interests have not been served by the movement towards freer trade, and those producers have consistently pushed for closing the border. The coexistence of the WGTA and EEP provides large gains to Canadian and U.S. producers, at the expense of consumers and taxpayers. Eliminating both policies would cost producers in both countries (a total of $125 million per year), but would save taxpayers and consumers in the two countries a total of over $160 million per year. The current squabble over the distribution of those transfers between Canadian and U.S. producers might lead to a policy change that is not in the interest of producers in both countries.

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Table 1. *World Durum Wheat Production and Trade: 1983/84 - 1989/90 Averages*
(million metric tons)

	U.S.	Canada	EC	North Africa	Algeria	USSR	Other	Total
Production	2.4	2.9	6.3	3.0	0.0	0.0	10.8	25.5
Exports	1.4	2.2	0.5	0.0	0.0	0.0	0.3	4.4
Imports	0.0	0.0	0.6	0.5	1.4	0.8	--	--

Source: International Wheat Council, World Wheat Statistics.

Table 2. *U.S. and Canadian Durum Supply and Demand: 1983/84-1992/93*
(million metric tons)

	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93
U.S.										
Production	1.99	2.80	3.08	2.67	2.53	1.23	2.50	3.32	2.83	2.64
Domestic Use	1.39	1.20	1.17	1.44	1.36	1.61	1.63	2.07	2.34	2.26
Ending Stocks	2.70	2.70	3.30	2.60	2.30	1.60	1.40	1.70	1.50	1.33
Imports	0.08	0.11	0.08	0.16	0.25	0.30	0.35	0.54	0.49	0.74
Exports	1.69	1.66	1.44	2.23	1.69	0.54	1.50	1.44	1.23	1.28
Canadian										
Production	2.62	2.11	1.96	3.88	4.01	1.91	4.14	4.20	4.59	3.14
Domestic Use	0.45	0.50	0.52	0.82	1.22	0.65	0.78	0.76	0.86	1.00
Ending Stocks	0.76	0.52	0.55	1.62	1.63	0.85	1.36	1.57	2.21	2.04
Exports	2.58	1.85	1.40	1.99	2.79	2.03	2.85	3.23	3.09	2.30

Source: USDA Wheat Situation and Outlook various issues, and Statistics Canada, Cereals and Oilseeds Review Series, Cat. No. 22-007.

Table 3. *Market Impacts of Policy Change*

Policy	Base Quantities (mmt)	Base Prices $/t	Q=0 Quantities (mmt)	Q=0 Prices $/t
U.S. Markets				
U.S. Use of U.S. Durum	0.53	161	1.34	163
U.S. Use of Canadian Durum	0.85	163	0	188
Production	2.40	161	2.44	163
Exports	1.87		1.11	
Canadian Markets				
Canadian Use of Canadian Durum	0.83	181	0.82	183
Production	3.02	159	2.89	152
Exports	2.19		2.07	
Other Markets				
ROW Use of U.S. Durum	1.87	131	1.11	133
ROW Use of Canadian Durum	1.34	143	2.07	140
ROW Production & Use of ROW Durum	22.23	130	22.25	130

Table 4. *Welfare Effects of U.S. Durum Import Quotas Under Alternative Assumptions about*
U.S. Export Subsidy Rules and Substitutability
($ million per year)

Substitution Elasticity (Base Import Quantity)	Fixed Per Unit Subsidy					Fixed Subsidy Budget	
	σ=20 (0.85 mmt)			σ=2 (0.49 mmt)		σ=20 (0.80 mmt)	
Import Quota (mmt)	0	0.5	0.8	0	0.2	0	0.4
	-- Welfare Changes --						
U.S. Consumer Surplus	-13.10	-7.51	-1.19	-34.93	-27.09	-29.73	-15.65
U.S. Producer Surplus	6.31	2.32	0.29	16.16	9.08	35.35	15.20
U.S. Export Subsidy Budget	22.93	9.45	1.28	6.05	3.64	0	0
U.S. Total	16.13	4.27	0.39	-12.73	-14.38	5.62	-0.46
Canadian Surplus	-21.86	-4.14	-0.16	-41.61	-16.01	-35.33	-10.96
ROW Surplus	0.29	0.45	0.07	10.77	11.36	11.23	6.45
World Total	-5.44	0.58	0.30	-43.57	-19.03	-18.48	-4.97

Notes: Linear supply is based on 1988-1991 average quantities and prices.
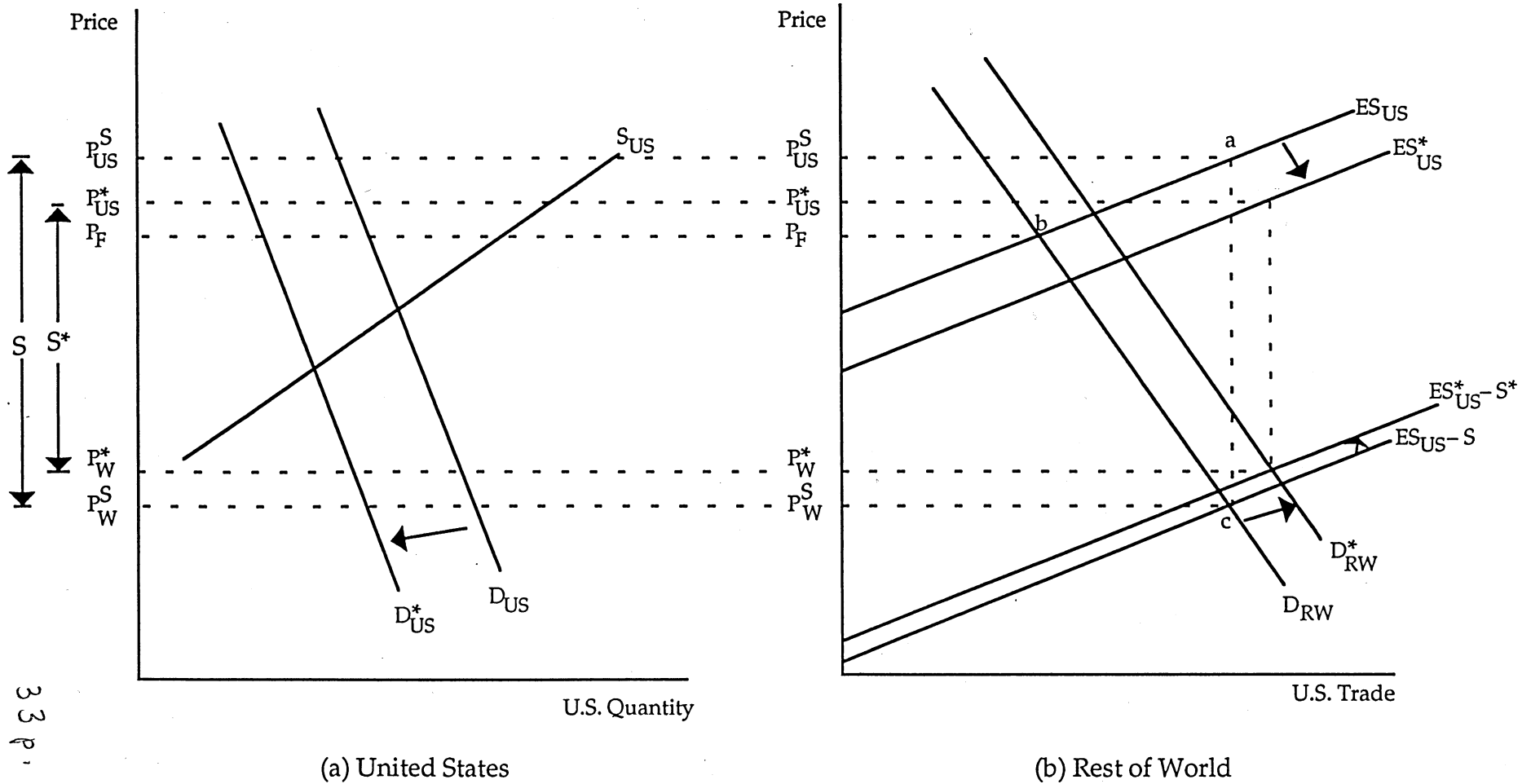Linear demand based on Armington demand elasticities, with σ=20 or 2, η=.5.

Table 5. *Market Price and Quantity Impacts of Policy Change*

	Base		EEP=0		S=T=$30/t		WGTA=0		EEP=0; WGTA=0	
	Quantities (mmt)	Prices US$/t	Quantities (mmt)	Prices US$/t	Quantities (mmt)	Prices US$/t	Quantities (mmt)	Prices US$/t	Quantities (mmt)	Prices US$/t
U.S. Markets										
U.S. Use of U.S. Durum	0.53	161	1.09	136	1.24	163	0.46	162	1.02	137
U.S. Use of Canadian Durum	0.85	163	0.37	150	0.10	185	0.92	162	0.45	149
Domestic Production	2.41	161	2.04	136	2.44	163	2.42	162	2.05	137
Exports	1.87		0.95		1.20		1.96		1.04	
Canadian Markets										
Canadian Use of Canadian Durum	0.83	181	0.89	156	0.85	175	0.83	182	0.89	157
Domestic Production	3.02	159	2.83	149	2.87	151	2.74	144	2.52	133
Exports	2.19		1.94		2.03		1.91		1.63	
Other Markets										
ROW Use of U.S. Durum	1.87	131	0.95	136	1.20	133	1.96	132	1.04	137
ROW Use of Canadian Durum	1.34	143	1.57	145	1.93	141	0.99	145	1.18	148
Total Imports	3.21		2.51		3.13		2.95		2.22	
ROW Use of ROW Durum	22.23	130	22.66	133	22.28	131	22.39	131	22.84	134

Table 6.   *Welfare Impacts of Alternative Policies*
(US$ million per year)

	No Export Subsidy	No Export Subsidy & S=T=$30/t	Export Subsidy of $30/t & WGTA=0	No Export Subsidy & WGTA=0
	-- welfare change from base situation --			
U.S. Markets				
Consumers	26.3	-12.8	0.8	25.9
Durum Producers	-53.6	6.0	1.7	-51.8
Nondurum Producers	20.6	--	--	22.2
Subsidy Savings	-21.2	-33.1	--	-22.9
EEP Savings	56.2	56.2	-2.6	56.2
Total	28.3	16.3	-0.0	29.6
Canadian Markets				
Consumers	21.0	4.8	-0.6	20.3
Producers	-28.6	-22.6	-41.6	-72.5
Taxpayers (WGTA)	--	--	60.3	60.3
Total	-7.6	-17.7	18.2	8.1
ROW Markets				
Consumers	-71.6	-7.8	-25.5	-102.0
Producers	56.4	6.7	21.1	80.7
Total	-15.2	-1.1	-4.4	-21.3
World	5.5	-2.5	13.6	16.4

Figure 1. Arbitrage Effects of Canadian Durum Exports to the United States on Domestic and Export Markets for U.S. Durum

(a) United States

(b) Rest of World