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*Trade Wars and CGE Modelling: Wheat Trade Between
Canada and the United States*

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1. Background

Canada and the United States have a long history of agricultural trade disputes (Alston and Carter; Alston, Gray and Sumner). The Canadian-United States Free Trade Agreement (CUSTA), which came into effect in 1989, lowered trade barriers for some agricultural products, and has resulted in numerous recent bilateral trade disputes. The latest disagreement was over increased Canadian exports of wheat to the United States during crop year 1993/94. During the period 1989/90 to 1993/94, total wheat exports rose from 0.4 million tonnes to 2.8 million tonnes with exports of durum wheat increasing over the same period from 0.2 million tonnes to 0.6 million tonnes (Alberta Grain Commission). In Canada, this increased flow of south bound wheat has been attributed to: the formation of the Canada-United States Free Trade Agreement, the effects of the U.S. Export Enhancement Program (EEP) on U.S. domestic prices of wheat; a weakening of the Canadian dollar; and to less durum wheat production in the U.S.

However, in the United States, this expanded trade was seen in a different light. It has been interpreted as the consequence of two allegedly 'unfair' trade practices which are pursued by Canada, namely, rail transportation subsidies on grain export shipments and the secretive pricing policies of the Canadian Wheat Board (CWB). This sense of grievance and frustration in the U.S. was heightened by the unwillingness of Canada to reduce, by any appreciable degree, the protectionist effects of its supply management programmes and, thereby, to permit the expansion of U.S. exports to that market for dairy and poultry products.

U.S. wheat farmers were opposed to the North American Free Trade Agreement (NAFTA), which was signed in 1993. Their opposition was largely due to increased imports of wheat from Canada in the post-CUSTA period. Even although peak imports from Canada totalled less than 3 per cent of U.S. wheat supplies, they represented a major trade irritant. The U.S. administration promised Congressmen from the wheat growing States that an investigation of Canadian wheat imports would take place. In return, these same Congressmen supported the passage of NAFTA.

In addition to direct negotiation, there were three alternative avenues open to the United States administration in effecting a reduction in imports of wheat from Canada. These avenues were: first, to make use of its own domestic Section 22 legislation; second, to use the provisions of the GATT, e.g. Articles XIX or XXVIII; or third, to use the provisions of Article 701 of the NAFTA.¹ With political pressure mounting in the northern wheat-growing regions of the United States during crop year 1993/94, President Clinton decided to use Section 22 legislation to request the International Trade Commission (ITC) to investigate the effects of wheat imports from Canada on the costs and benefits of the U.S. wheat programme. The launching of this investigation was a "political" payback for Congressional support of the NAFTA legislation. In July of 1994 the ITC reported with a split decision. Three Commissioners found that imports from Canada had materially affected the costs of the U.S. wheat programme through lowering domestic prices and increasing the value of deficiency payments, thereby

¹ Section 22 legislation refers to Section 22 of the Agricultural Adjustment Act of 1933, as Re-enacted and Amended. Under this legislation, if the Secretary for Agriculture has reason to believe that imports are materially interfering with domestic programmes, including the processing of the product, then he has to advise the President and the latter has then to initiate an immediate investigation by the International Trade Commission (see Hillman, p. 165 for further details).

Article XIX of the GATT is the so-called safeguards article which permits contracting parties to take temporary, emergency action to restrict imports of particular products which are causing injury to a domestic sector. However, equivalent concessions to trading partners should accompany these restrictions (see McGovern, Appendix III for further detail).

Article XXVIII of the GATT relates to the procedures to be followed for the modification of tariff schedules. These may include bilateral negotiations. Of importance in the context of this paper is the following: "the contracting parties concerned shall endeavour to maintain a general level of reciprocal and mutually advantageous concessions not less favourable to trade than that provided for in this Agreement prior to such negotiations" (McGovern, p. 575).

Article 701.3 of CUSTA states: "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 storage, handling or other costs incurred by it with respect to those goods."

potentially triggering the use of import quotas under Section 22 to protect the programme. The other three Commissioners found that these imports had not materially affected the cost of the U.S. wheat programme but that they did have some effects on particular regions and classes of wheat.

Testimony before the ITC regarding the effects of Canadian wheat imports on the U.S. wheat programme are summarised by Alston, Gray and Sumner (1994). During the ITC hearings, the U.S. Department of Agriculture (U.S.D.A.) testified that Canadian imports lowered U.S. wheat prices and thus raised the size of deficiency payments. For 1994-95, the U.S.D.A. predicted that Canadian imports would raise the total cost of the wheat programme by 15 per cent, which is a substantial impact. However, Alston, Gray and Sumner argue that this U.S.D.A. estimate vastly overstates the effects of Canadian imports on U.S. farm programme costs. Alston *et al.* suggest that Canadian imports would raise the total cost of the U.S. programme by less than 1 per cent, much less than the U.S.D.A. figure.

All six ITC Commissioners supported the recommendation that higher import barriers should be introduced. Hence, action under Section 22 seemed to be justified and import quotas could have been imposed. These would have remained valid until the Uruguay Round Agreement on Agriculture came into force, at which time they would have become invalid because they had not in place during the base period of 1986-88.

Even before the ITC had reported on the 1994 wheat case, in April of 1994 the United States government notified the GATT under Article XXVIII that it intended to amend its tariff rates on wheat and barley imports from Canada (Simone). It can be inferred from this pre-emptive action that the United States was not seeking temporary protection from perceived injury, otherwise Article XIX should have been used as a temporary safeguard until the implementation of the Uruguay Round Agreement on Agriculture took effect.

Article 701 of the CUSTA could also have been invoked. However, it did not hold out much promise for the United States as that path had been tried earlier in 1992 for durum wheat through the establishment of a CUSTA Dispute Panel under Chapter 19, and the Panel had failed to find in favour of the United States (see Alston and Carter).

It may be concluded that in the presence of determination on the part of the U.S. to restrict imports and the absence of a negotiated settlement with Canada, Article XXVIII offered the best long-term alternative for the U.S., despite the risk that Canada would use the provisions of the Article to seek compensation or to retaliate. Thus, the threat of a trade war produced the conditions conducive to a negotiated outcome.

In August 1994, after protracted negotiations, an agreement between the two countries was reached. There were a number of elements to this agreement which include: schedules of tariff-rate quotas on durum and non-durum wheat imports by the United States from Canada; the establishment of a Joint Commission to examine each country's price support systems for grains and their effects for each country's competitiveness in third country markets, the recommendations of which will not be binding on either government; and a peace clause which limits for one year actions on grains and grain products which are inconsistent with either the NAFTA or the GATT (Alberta Grain Commission). While the U.S. withdrew its proposed actions under Article XXVIII and agreed not to take action under Section 22, Canada maintained the right to challenge U.S. actions under both the NAFTA and the GATT, although agreeing for one year from September 1994 not to use the dispute settlement procedures of either Agreement.

Why did Canada agree to this outcome which would lead to a loss of sales in the U.S. market? Could the Canadian government have forced the U.S. to use Article XXVIII of the GATT by refusing to negotiate and, then, legitimately, have imposed its own bilateral import restrictions, or sought compensation in the form of lower tariffs on other products from the United States? Because Canada had maintained that GATT

obligations took precedence over obligations under the NAFTA, it was infeasible to claim as a negotiating ploy, although perfectly legal, that the U.S. was violating Article 401 of the CUSTA by raising tariffs.² Moreover, there was some evidence, despite the 1993 Dispute Panel ruling to the contrary, that Canada, through the pricing policies of the CWB, was from time-to-time violating Article 701 (Simone, p.29). At the same time, it can hardly be claimed that Canada had embraced the spirit of the Uruguay Round Agreement on Agriculture with respect to the tariffication process of non-tariff barriers. Out-of-quota tariff rates for Canada's supply managed products were established at prohibitive levels (Miner, Table 6.1).

In order to investigate the negotiated outcome more fully and to assess alternative strategies for Canada in the face of trade threats from the U.S., a number of negotiating scenarios are defined and evaluated. A theoretical framework for the evaluation of a negotiating process is presented in Section 2. The payoffs to each country which are associated with the alternative outcomes are obtained from simulation experiments using a computable general equilibrium model. A brief description of the model is presented in Section 3. Using two different measures of welfare as payoffs, a solution to the bargaining game is obtained and the results discussed in Section 4. Some conclusions are drawn in Section 5 about the economic rationale of the negotiated settlement agreed to in 1994.

2. Theoretical Framework

In order to assess the benefits and costs of some of the economic responses available to Canada and to investigate the economic rationality of the negotiated outcome, concepts from bargaining theory will be used to provide a suitable framework. In a bargaining problem, (X, d) , X represents the convex, closed and

bounded (from above) set of feasible payoff combinations for each of the two players and d is the disagreement point which occurs if the negotiations break down.

Specifically, let the bargaining set be:

$$X = \{(x_1, x_2) \in R^2 \mid x_2 \leq f(x_1)\}$$

where f is a continuous and decreasing function which associates with any payoff for player 1, x_1 , the maximum possible payoff of player 2, x_2 . A payoff combination $d = (d_1, d_2) \in X$ is the disagreement or threat point.

There are two approaches to finding a solution to a bargaining problem. In the first, the details of the bargaining procedure are identified and a non-cooperative solution concept applied, i.e. all of the moves that each player may make are identified, the associated payoffs obtained and, say, the *Nash equilibrium* concept applied to identify the solution. In the second approach, the properties which the solution to the bargaining process should possess are specified as a set of axioms. Different sets of axioms generate different bargaining solutions, but the ones most commonly discussed in the literature are generalisations of the axioms due to Nash (1953). These axioms relate to individual rationality, Pareto efficiency, symmetry, the independence of irrelevant alternatives and the independence of equivalent utility representations (see Binmore, p.184 or Eichberger, p.251). In the remainder of this paper, it is the second approach which is adopted.

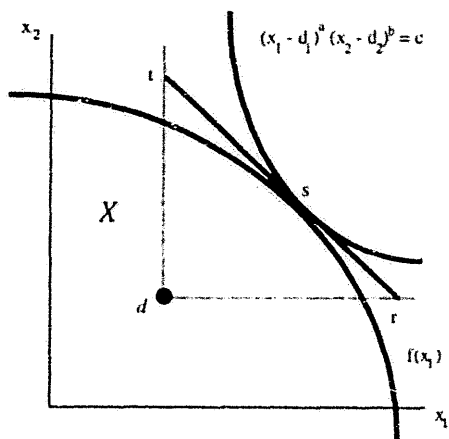
Given these axioms, with the exception of the symmetry axiom, a bargaining solution, s , can be shown to be the payoff on which rational players will agree when faced with the bargaining problem (X, d) (Binmore, p.181). Let $a \geq 0$ be the bargaining strength of player 1 and that for player 2 be $b \geq 0$, with $a + b = 1$. Then, geometrically, s is found on the boundary of X and on the supporting line to X at s , where the supporting line is determined by the disagreement point (Figure 1). The solution point and the supporting line are such that $s = ar + br$. This solution satisfies the following generalised Nash product:

² Article 401 removes tariffs on most agricultural products over a ten-year period and prevents either country from increasing or introducing any new tariffs on goods originating in the other country (Simone, p.29).

$$\max_{\substack{x \in X \\ x_2 \geq d}} (x_1 - d_1)^a (x_2 - d_2)^b.$$

It can be shown if the bargaining strengths of the two players are equal (the symmetry axiom suggested by Nash), then in the above expression both indices can be set equal to unity (Binmore, p.191). In the absence of *a priori* evidence to the contrary, it will be assumed in what follows that the United States and Canada have equal bargaining strengths in the context of this trade dispute.

Figure 1 The Generalised Nash Bargaining Solution



3. Empirical Framework

Using the theoretical framework outlined in the previous Section, a limited number of bargaining positions are defined for the United States and Canada and the corresponding payoffs obtained. The disagreement point is taken to be the payoff pair generated by actions under Article XXVIII of the GATT initiated by the U.S. and

responded to by Canada. The choice for Canada, in the absence of compensation, was to retaliate by removing previously granted tariff concessions on an equivalent value of trade. This is the response permitted by Article XXVIII.

The payoff, (x_{us}, x_c) , corresponding to each bargaining outcome is derived from simulations of the Global Trade Analysis Project (GTAP) computable general equilibrium model.³ These payoffs are measured using two different criteria: in the first, they are analysed from the national perspective using equivalent variation (EV) as the welfare measure; in the second, to reflect the rent-seeking thrust of wheat farmers in the United States, the welfare measure used is producer surplus, defined here as the change in wheat land values.

The GTAP model contains 24 regions and 37 industries but, for the purposes of this exercise, it has been aggregated into the following 4 regions and 8 industries or commodities (Table 1). The choice of regions was determined on the basis of the two protagonists, with Mexico as an assumed passive bystander but a member of NAFTA, and the rest of the world which is also assumed to play a passive role. The commodities or industries were chosen on the basis of their being agricultural and important in the trade flows between Canada and the United States. Non-agricultural sectors and some agricultural sectors (e.g. rice) were aggregated into a manufacturing and services sector.

The payoff pairs which define the bargaining set to be evaluated are identified in Table 2. It must be emphasised that any bargaining solution ultimately obtained is dependent on the elements of the bargaining set which have been chosen, together with the disagreement point. Clearly, the number of possible elements is large and some would not be legal under GATT. The identification of the particular elements chosen has been determined partly on the basis of what Canada's likely response would have been under GATT, partly on ignoring any actions under CUSTA (e.g. taking action under Article 401 or Chapters 18 and 19 – the establishment of dispute panels), and

³ A general description of this model is given in Hertel and Tsigas (1993).

partly on omitting those payoffs which would have occurred had the United States chosen to use Section 22 import quotas instead of GATT Article XXVIII. Hence, there are only three basic bargaining positions evaluated. These are the *status quo*, the 1994 Memorandum of Understanding, hereafter referred to as the Agreement, and the use of Article XXVIII of the GATT.

Table 1 Regions and Commodities Identified for the GTAP Simulations

Region	Commodities
Canada	Wheat
United States	Other Grains
Mexico	Other Crops
Rest of World	Other Livestock
	Meat Products
	Milk Products
	Other Food and Agricultural Products
	Manufacturing and Services

It is likely that, in practice, Canada would have retaliated using poultry meat because of its importance in the State of Arkansas, hence the choice of the commodity aggregate, Meat Products. Canada is a net importer of poultry from the U.S. and under CUSTA, Canada agreed to import a fixed amount of poultry each year – up to 5 per cent of Canadian consumption. This trade is particularly valuable to U.S. producers because some of them share a portion of the quota rents associated with the fixed market access. However, fruit and vegetables is another possible commodity group which would have hurt United States producers as trade in fruits and vegetables was also liberalised under CUSTA. Therefore, the disagreement outcome corresponds to the payoff when the United States uses Article XXVIII and Canada responds by limiting imports from the United States of either Meat Products or Other Crops.

Table 2 The Feasible Set of Payoffs Evaluated

		Canada		
		Status Quo	'94 Agreement	GATT Article XXVIII: Other Crops
U.S.A.				
Status Quo	Simulation base			
'94 Agreement	Experiment 4			
GATT Article XXVIII: Wheat	Experiment 1		Experiment 2	Experiment 3

In *Experiment 1*, Canada does not respond to the use of GATT Article XXVIII by the United States through which the tariff rate increase is applied on imports of wheat from Canada only. Thus, there are no changes in any other policies. The new *ad valorem* rate for this simulation is set at 50 per cent. Although there is some uncertainty surrounding the exact rate which the United States would have stipulated had it proceeded with the GATT action, the circumstantial evidence is that the rate would have been prohibitive. In the GTAP database, the *ad valorem* rate is approximately 10 percent, i.e. the power of the tariff is 1.10, and in this experiment it is reset to 1.50.⁴

In *Experiment 2*, it is assumed that Canada retaliates against the loss of market access for wheat by raising the import tariff on Other Crops exported by the United States to 50 per cent. The existing rate in the database is 36 per cent but because the value of Canadian exports of wheat to the United States are \$US187m and the value of Canadian imports from the United States of Other Crops are \$US1,281m, the shock that is applied by Canada through a higher tariff is adjusted downwards to reflect this difference in value.⁵ It was felt necessary to reflect, as far as possible, the letter of

⁴ In cge models, *ad valorem* trade taxes are often written into the equations as the power of the tax, i.e. as $(1 + t)$, where t is the tariff rate expressed to the base of unity. This procedure is necessary to avoid zeroes which appear if only t were used and then t took the value zero in the initial equilibrium. Hence, a 10% tariff, for example, would be entered as 1.10 rather than 0.10. See Dixon *et al.* p.95 for further details.

⁵ Obviously, it would have been preferable to make the adjustment based on the proportion that fruits and vegetables are in the aggregate of Other Crops. However, this information is not readily available.

GATT Article XXVIII on retaliation while accepting that Canada was determined to retaliate sufficiently to force the United States to back down, i.e. avoid choosing the disagreement point. In *Experiment 3*, retaliation takes place in Meat Products. The existing tariff rate is 23 per cent and this is raised to 50 per cent in the simulation but, again, adjusted downwards to reflect the value of Canadian imports of Meat Products from the United States of \$US532m.

Experiment 4, the essence of the 1994 Agreement is simulated. The details of this Agreement are such that they cannot be modelled exactly using the GTAP model. The model specifies total wheat, whereas in the Agreement, durum and other wheat are separated with a further distinction made between other wheat from Ontario and that from CWB areas in western Canada. Moreover, the tariff rate quotas (TRQ) which have been agreed are different for these two types of wheat. For durum wheat the TRQs are the NAFTA rate on 0 to 300,000 tonnes, \$23/tonne on 300,000 to 450,000 tonnes, and \$50/tonne on import volumes above 450,000. For ordinary wheat the TRQs are the NAFTA rate on 0 to 1,050,000 tonnes and \$50/tonne above that (Alberta Grain Commission). As a compromise for this experiment, the *ad valorem* rate was set at 12 per cent, an increase of two percentage points from the base rate. The logic is as follows. Over the period 1990/91 to 1992/93, durum wheat accounted for one half of all wheat covered by the Agreement and, on average, was 412,000 tonnes. The NAFTA tariff rate was taken to 10 per cent and the specific tariff of \$US23/tonne in the Agreement converts to an *ad valorem* rate of 13 per cent on an average price of all wheat of \$US181/tonne over the period. Then weighting the NAFTA rate by 0.73 (i.e. $300,000/412,000$) and the higher rate by $(1 - 0.73)$, provides an average tariff rate for durum wheat of 13.5 per cent. The NAFTA tariff rate on ordinary wheat is taken to be 10 per cent and it is assumed that the higher tariff threshold will not become binding. Hence, the average tariff rate on all wheat was 11.8 per cent (i.e. the quantity-weighted average of the two tariff rates).

4. Results

Experiment 1. In this experiment the tariff rate on United States imports of Canadian wheat is raised to 50 per cent. The trade effect is reduce the volume of exports by \$US89m. The welfare effects are shown in Table 3. All regions experience a loss of welfare as measured by equivalent variation (EV), with Canada losing by \$US9.0m and the United States by \$US25.3m. However, it is clear that wheat farmers in the United States gain from this policy, producer surplus (PS) rising by \$US7.1m in nominal terms. Canadian wheat farmers lose by \$US8.7m whilst there are negligible losses elsewhere.

Experiment 2. In this experiment Canada retaliates by raising her own tariff rate on imports of Other Crops from the United States. Relative to the *status quo*, there is a fall in the volume of Canadian imports of Other Crops from the U.S. by \$US45m and a fall in Canadian exports of wheat to the United States of \$US89m. The loss of producer surplus amongst wheat farmers in Canada is now slightly smaller than in Experiment 1 at \$US7.9m and the gains to U.S. wheat farmers are also less than in Experiment 1 at \$US6.6m (Table 3). In terms of equivalent variation, Canada's retaliation increases her losses relative to those obtained in Experiment 1 by a further \$US13.2, (i.e. $22.2 - 9.0$) but there are also additional losses experienced the United States of \$US10.3m.

Experiment 3. In Experiment 3, Canada retaliates by raising her import tariff rate on Meat Products rather than on Other Crops. The effect is to reduce the volume of imports of Meat Products from the United States by \$US105m and to alter bilateral wheat exports by \$US89m relative to the *status quo*. The welfare losses are greater than those in Experiment 2 with Canada losing \$US37.3m relative to the *status quo* but the United States also loses more, losing \$US44.2m (Table 3). Once again this retaliation causes a lowering of the losses in wheat producer surplus in Canada to

\$US7.0m and lowers the gain in wheat producer surplus in the United States to \$US6.4m.

Table 3 Welfare Changes in Each Experiment (1992 \$USm)

	Canada	USA	Mexico	ROW
<i>Experiment 1</i>				
EV ^a	-9.0	-25.3	-0.8	-6.0
Wheat PS ^b	-8.7	7.1		
<i>Experiment 2</i>				
EV	-22.2	-35.6	-0.4	-8.5
Wheat PS	-7.9	6.6		
<i>Experiment 3</i>				
EV	-37.3	-44.2	-0.3	-4.7
Wheat PS	-7.0	6.4		
<i>Experiment 4</i>				
EV	-0.62	-0.59	-0.1	-0.2
Wheat PS	-0.60	0.42		

Note: a - EV is equivalent variation.

b - Wheat PS is producer surplus for wheat growers, measured from the change in the value of wheat land

Experiment 4. In Experiment 4, Canada agrees to accept the imposition of a tariff rate of 12 per cent on her exports of wheat to the United States and does not impose any retaliatory policies of her own. Relative to the *status quo*, the volume of imports declines by \$US6m. The welfare effects, as measured by equivalent variation, show a loss in all four regions with Canada losing the most at \$US0.62m and with the United States losing \$US0.59m relative to the *status quo* (Table 3). At the same time, wheat farmers in the United States gain \$US0.42m in producer surplus while those in Canada lose \$0.60m.

Consider the results presented in Table 3 in the context of Figure 1. From these welfare changes, as measured by Equivalent Variation (EV), it is clear that the *status quo* Pareto-dominates the disagreement point, whether that be the result in Experiment 2 or Experiment 3. It dominates the result in Experiment 4. In other words, in terms

of national welfare, the move by the United States to restrict imports of Canadian wheat was harmful to both countries (and to the other regions) but less harmful under Experiment 1 than under either retaliatory threat by Canada. The 1994 Agreement (Experiment 4) Pareto-dominates both threat points but is not Pareto-efficient relative to the *status quo*. When changes in welfare are measured in terms of Producer Surplus to wheat growers, all outcomes lead to a loss for Canadian wheat growers but a gain for U.S. growers. But the loss is least under the 1994 Agreement (Experiment 4) and considerably greater under the other Experiments.

4. Conclusions

The purpose in this paper was to evaluate the 1994 wheat trade Agreement between the United States and Canada in the context of a potential trade war which could have erupted given the determination of the United States to restrict imports from Canada and the determination of Canada to resist. Using bargaining theory as a framework and the GTAP model as a way to obtain the necessary payoffs quantitatively, welfare effects were measured from the national perspective and from the rent-seeking perspective of U.S. wheat growers. It was shown that the *status quo* Pareto-dominated the policy interventions identified using a measure of national welfare. In terms of Equivalent Variation, the 1994 Agreement is Pareto-inefficient relative to the *status quo*. However, when measuring the policy interventions in terms of producer surplus, Canadian wheat growers consistently lose and U.S. wheat growers consistently gain. Therefore, the Pareto criterion fails.

From the viewpoint of the Canadian government and its search for an outcome which minimised the welfare loss to Canadian wheat growers in the face of determination of the part of the U.S. to threaten, the 1994 Agreement appears to have been a success. It has been a success in the sense that it averted a potentially damaging agricultural trade war but, at the same time, it has allowed at least for one year a new

trade restriction to be imposed by the United States which creates economic costs for both countries.

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