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Canadian Trade Liberalization: Scale Economies in a Global Context

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This paper contains preliminary findings from research work
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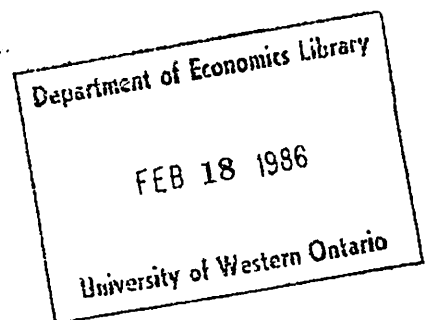LONDON, CANADA
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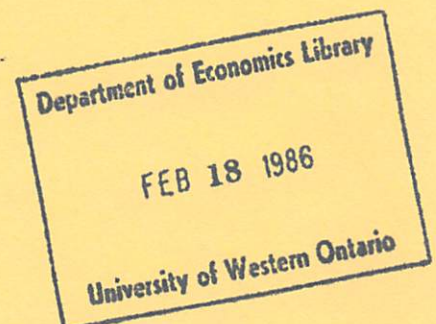
CANADIAN TRADE LIBERALIZATION:

SCALE ECONOMIES IN A GLOBAL CONTEXT

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INTRODUCTION

This paper reports the estimated effects of trade liberalization using a model incorporating economies of scale and industrial organization features in a way similar to Harris and Cox (6,12,13). The model is based on Whalley's (26) 8-bloc model of global trade.

The analysis concentrates on two proposals. The first, bilateral tariff abolition (BTA) involves the bilateral elimination of all tariffs by Canada and the U.S. This policy is evaluated because of its relevance to the current policy debate in Canada over freer trade. While the model used is similar in flavour to Harris and Cox, the results of BTA contrast with those of Harris and Cox, since bilateral tariff abolition leads to small welfare <u>losses</u> by Canada.

The "multilateral" free trade experiment evaluated by Harris and Cox is subsequently evaluated using the revised Whalley model. Dramatically smaller welfare gains are reported for Canada than those found by Harris and Cox. The source of the substantial discrepancy in results is analyzed, though only <u>part</u> of the discrepancy in welfare results is accounted for.

LIBERALIZATION ISSUES IN CANADA

A major argument in favour of trade liberalization in Canada is the Eastman-Stykolt (or E-S) hypothesis.[1] The E-S hypothesis argues that Canadian manufacturing industries are

inefficient due, in part, to the small size of the Canadian market relative to the minimum efficient scale (MES) of plant. Canadian tariffs exacerbate this problem by restricting access of more efficient foreign producers (in the U.S. in particular), who would otherwise challenge domestic producers. Foreign (especially U.S.) tariffs on Canadian exports serve to further reduce the available market for Canadian manufacturers.

Two examples cited by E-S to illustrate the effects of high tariffs are the auto industry and the appliance industry. In both cases, high tariffs lead to small plants producing short production runs of a wide variety of similar products. Canadian tariffs on appliances were above 22%, while U.S. tariffs were between 10% and 17% in 1961. Tariffs on autos and vehicles in Canada were between 10% and 15%, with the U.S. tariffs between 5% and 13%.[2]

The E-S hypothesis also suggests that <u>unilateral</u> trade liberalization could be beneficial for Canada. Unilateral liberalization is usually accompanied by losses for the liberalizing country attributable to deterioration in the terms of trade.[3] Unilateral trade liberalization could generate sufficient rationalization gains to more than offset the terms-of-trade losses.

Another corollary of the hypothesis is that the factor reallocations occasioned by movements to freer trade would be largely intra-industry in nature, as manufacturers produce

longer runs of a smaller selection of the goods currently pro-
duced in Canada. These reallocations contrast with those implied
by factor-endowment considerations.

The possibility that industrial rationalization would be
a major element of adjustment to trade liberalization changes
the policy perspective on liberalization for two reasons. First,
the adjustment costs are likely to be smaller, and second, the
employment shifts are less likely to be regionally sensitive.

While the E-S hypothesis and its corollaries represent
strong arguments in favour of liberalization from 1960s levels
of protection, it is less clear that they are as quantitatively
important today. Trade in vehicles and parts between Canada
and the U.S. is virtually free of barriers and accounts for
more than one third of Canada-U.S. trade in manufactures.
Average tariffs on Canadian imports from the U.S. will be below
5% by the end of 1987.

The fact that current U.S.-Canada tariffs are so low makes
the substantial gains reported by Harris and Cox surprising.
They report welfare gains to Canada of 8.6% and 4.1% of GNP
respectively (from 1976 levels of protection), as a result of
multilateral and unilateral trade liberalization, respectively.

REVIEW OF NUMERICAL STUDIES OF CANADIAN TRADE LIBERALIZATION

Many studies exist which analyze the effects of bilateral
or multilateral trade liberalization. These studies analyze

different precise experiments, but all come to the conclusion
that Canada would gain from multilateral or bilateral libera-
lization. Less agreement emerges from studies of unilateral
liberalization.

Studies of Bilateral or Multilateral Liberalization

Williams (27) uses a linear programming model of Canada
to analyze the effects of bilateral tariff abolition (accom-
panied by domestic commodity tax abolition)[4]. Williams's model
precludes reallocations between the primary and manufacturing
sectors. The assumption of constant costs and perfect compe-
tition precludes rationalization gains from liberalization.
Williams estimates that gains of almost $2 billion (1976) would
accrue from the bilateral liberalization experiment. Tariffs
are at 1961 levels. The calculated welfare gains of less than
4% of GNP are then adjusted to 10% of GNP to account for in-
creasing returns to scale. This brings Williams's estimates
very close to the figure suggested by Wonnacott and Wonnacott (28).

Harris and Cox (1984)

The Harris and Cox (H-C) model is made up of 20 manufac-
turing industries and 9 non-manufacturing industries. The non-
manufacturing sectors have constant returns to scale, while the
manufacturing sectors have fixed factor requirements per firm,
with constant returns to variable factors. Decreasing average
costs result from the existence of fixed costs, so that price-
taking behaviour is no longer consistent with equilibrium.

Firms in the manufacturing sectors are assumed to follow one of two pricing schemes, which are discussed in more detail below. The H-C model allows rationalization to occur as a result of free trade.

The estimated welfare gains to Canada from multilateral free trade are estimated to be large, ($13 billion in 1976 $) as are the estimated factor reallocations. Their suggested welfare gain of approximately 8.6% of GNP is again similar to the welfare gain estimated by the Wonnacotts (28). It must be remembered that the experiments considered are quite different. Wonnacott and Wonnacott consider bilateral tariff abolition with the U.S. from pre-Kennedy Round levels, while Harris and Cox consider a multilateral elimination of all trade barriers at 1976 levels.

Harris and Cox also come to the conclusion that large capital inflows are likely to result from multilateral free trade due primarily to the increased productivity of the manufacturing sectors.

Studies of Unilateral Free Trade

Boadway and Treddenick (2) and Pinchin (21) present numerical analyses of the effects of unilateral free trade for Canada. Pinchin finds that the employment effects of unilateral tariff abolition are so large that it would not be a preferred option.

Boadway and Treddenick (2) use a computable general equilibrium model to evaluate the effects of unilateral tariff abolition. They conclude that welfare in Canada would be virtually unaffected by tariff abolition, but would fall due to adverse terms-of-trade effects.

Harris and Cox (12) also evaluate the effects of unilateral abolition of all protection. Their results differ from those of Boadway and Treddenick in several respects. First, they calculate that welfare gains of 4.1% of GNP would accrue to Canada. Secondly, their evaluation of the inter-sectoral factor reallocations necessary to bring about adjustment are much larger. After aggregating to the Boadway and Treddenick (16 sector) aggregation, Harris and Cox estimate that 3.9% of workers would move between sectors in response to unilateral free trade. In response to unilateral tariff abolition, Boadway and Treddenick estimate that .35% of workers would move between sectors.

Summary

Agreement emerges from this work on some points. First, the benefits to bilateral free trade in Canada appear to be significant. This is reinforced by the findings that even unilateral movements to freer trade may prove welfare improving. There is little evidence to suggest that Canada would suffer large losses from a unilateral move to free trade.

THE MODEL

Whalley's 8-bloc model of world trade (26) was modified to address issues in Canada-U.S. trade liberalization. The model is similar to the 7-bloc model detailed in Appendix A but scale economy features (and the associated market structures) are introduced into the Canadian manufacturing industries.

The basic data used correspond to 1977, except that Canada-U.S. protection is at its 1976 level. The commodity and country groupings are listed in Table 1. Some of the basic data is presented in Appendix B.

TABLE 1: 8-Bloc Model Structure

Commodities	Blocs
1. Agriculture and Food (Ag. & Food)	1. E.E.C.
2. Mining	2. United States
3. Energy	3. Japan
4. Non-Mechanical Manufactures (M1)	4. Canada
5. Machinery and Equipment (M2)	5. Other Developed
6. Construction and Services (Non-traded)	6. O.P.E.C.
	7. Newly Industrialized Countries
	8. Less Developed Countries

Canada and the U.S. are assumed to have fixed supplies of capital and labour, and there is no international mobility of capital.

Decreasing Costs and Imperfect Competition

This section describes the market behaviour implemented in the Canadian manufacturing industries. The behavioural assumptions used are similar to those used by Harris and Cox (6,12,13). All versions of the model used have constant marginal cost, and the model corresponds to the non-product-differentiation case. Firms are assumed to adopt one of the two pricing rules described below.

Collusive (E-S) Pricing

E-S pricing involves collusion by Canadian manufacturers around the gross of tariff price of imports of comparable imports from the U.S. Such collusion may increase profits in the long-run if barriers to entry exist, but if no such barriers exist, collusion can only temporarily increase profits.

With E-S pricing, the short-run and long-run comparative statics of Canadian tariffs are straightforward. The introduction of a tariff on imports from the U.S. will cause Canadian firms to charge a higher price, equal to the new gross-of-tariff price of U.S. imports.

Referring to Figure 1, the reduction in total quantity demanded is shown as $Q_o - Q_t$, where Q_o and Q_t are the pre- and post-tariff quantities. $D_c(P_c;P_u)$ and $D_c(P_c;P_u(1+t))$ are the pre- and post-tariff total demands for the Canadian made product.

In the short run, output per firm falls from q_i^o (in the

absence of the tariff), to Q^t/n, where n is the original number of firms in the industry. Note that originally (in the pre-tariff long-run equilibrium), profits were equal to zero, so that average cost was equal to P_u at the level of output q_i^o per firm. Each firm earns a short-run profit equal to $b(Q^t/n)$. In the long-run, free entry will cause the output per firm to fall to q_i^t, again yielding zero profits.
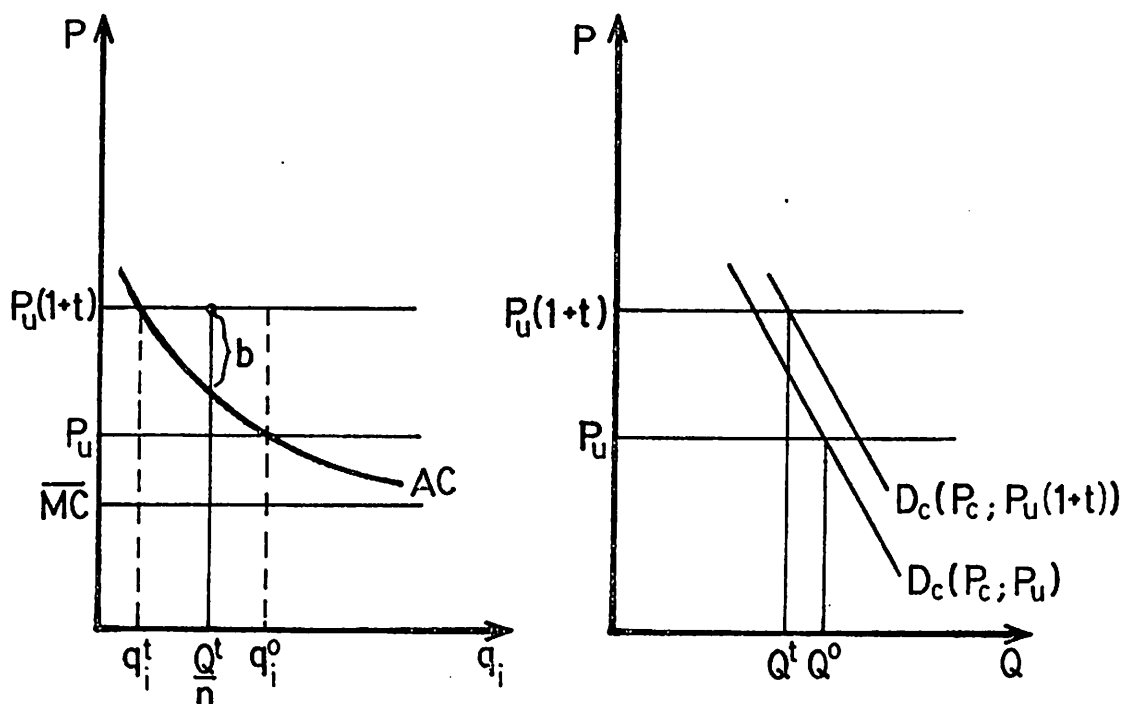

FIGURE 1: Comparative Statics of a Tariff (E-S Pricing)

With E-S pricing, an industry "supply" relation exists which is infinitely elastic at the landed price of U.S. imports. Output per firm will rise as the tariff rate falls in the long-run equilibrium. With E-S pricing, the tariff rate has an unambiguous inverse effect on the lengths of production runs.

Monopolistically Competitive Pricing

The monopolistically competitive pricing rule used by Harris and Cox and here is based on Chamberlin's (4) notion of a monopolistically competitive market. Firms produce goods that are imperfect substitutes. In this way, the pricing behaviour is consistent with the implemented structure of market demand, whereby Canadian and U.S. produced goods are imperfect substitutes.

Firms are assumed to maximize profit, given the perceived elasticity of the (firm-specific) demand curve. The elasticity of each _firm's_ demand will depend on the elasticity of total _market_ demand, the ease of substitution between different products, and the pricing policies of the other firms in the industry. If the market demand is composed of foreign and domestic components which have different elasticities of demand, then the elasticity of _market_ demand will also depend on the relative size of the domestic and foreign (export) components.

Given the prices of other firms' products, each individual firm is assumed to face a constant elasticity demand for its product.[5] If marginal cost is constant, the firm's profit maximizing pricing behaviour amounts to choosing the optimal mark-up of marginal cost. The optimal mark-up rate can be written:

$$m_i = \frac{1}{n_i - 1} \qquad (1)$$

where m_i is the mark-up rate applied to marginal cost, and n_i is the absolute value of the firms' perceived elasticity of demand.

Even the partial equilibrium comparative statics of tariffs with this type of pricing are unclear, and an example is given to illustrate them for the case where the perceived elasticity of demand does not change as a result of the tariff.

Suppose that introduction of a tariff causes the total demand curve for Canadian manufactures to be shifted to the right as domestic consumers substitute domestic for imported manufactures. Suppose further, however that the elasticity of total demand for the Canadian manufactures is unchanged. In this case (see Figure 2), the short-run effect of the tariff will be to increase total sales by Canadian firms (and thus sales per firm). If the tariff were introduced into a no-tariff long-run equilibrium, introduction of the tariff must lead to short-run excess profits.

D_i^o is the pre-tariff share of total demand for a typical firm i. Each firm produces q_i^o and there are no excess profits. The price charged by each firm is $(1+m_i)\overline{MC}$. After introduction of the tariff, if the firm's perceived elasticity of demand is not affected, the profit maximizing mark-up is unaffected, but each firm's demand has increased because of substitution by domestic consumers. In the short run each firm produces q_i^t and earns the short-run profit indicated in Figure 2. The

The graph shows:
- Vertical axis: P_i
- $P_i = \overline{MC}(1+m_i)$
- $\overline{MC}$
- ATC
- $D_i^0 = D_i^t\left(\frac{n^0}{n^1}\right)$
- D_i^t
- Horizontal axis: q_i with q_i^0 and q_i^t marked
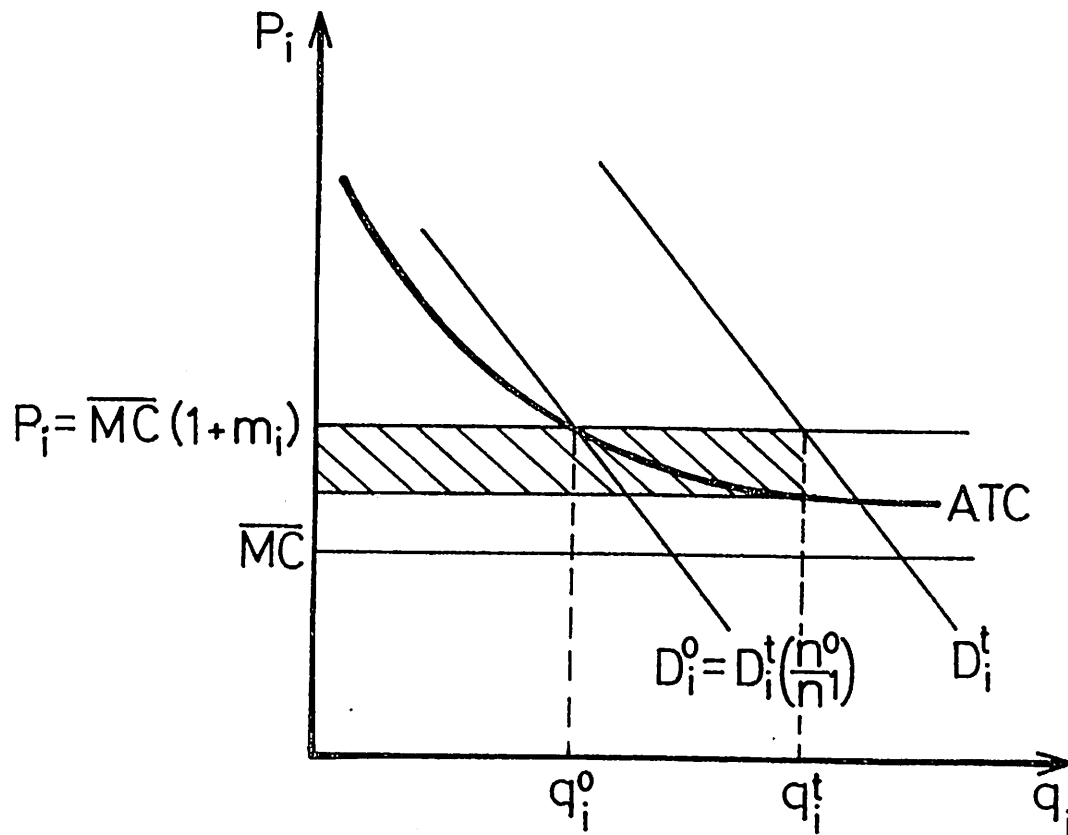
FIGURE 2: Comparative Statics of a Tariff (MC Pricing With Constant Elasticity)

original number of firms is n_o.

As entry occurs, the demand <u>per firm</u> will be reduced, even though <u>total</u> quantity demanded (at the <u>unchanged</u> price) will be unchanged at $n_o q_i^t$. Entry will occur until output per firm is precisely q_i^0 and all excess profits are eliminated. Note that if the perceived elasticity is unaffected by the tariff, the mark-up and the price charged will be unaffected by the tariff.[6] In this case, the tariff merely causes entry at the pre-tariff price and output per firm.

If the domestic demand is less elastic than the foreign demand, introduction of a tariff can have added effects. A

tariff, in this case, will cause entry, reduce output per firm and increase the price paid by consumers. This is true since the elasticity of market demand will fall. If domestic demand is more elastic than the foreign demand, the introduction of a tariff could cause output per firm to <u>fall</u>, and cause prices to be higher.

The comparative statics of tariffs with MC pricing are not clear-cut, as are those with E-S pricing, since they depend on the relation between tariff rates and the <u>elasticity</u> of demand, as well as the size of total demand. In the case where the perceived elasticity of demand is unaffected by the tariff, the length of production runs in Canada is unaffected by tariff rates.

Implementation of Decreasing Average Costs and Market Structure

The central case analyzed below involves MC pricing in the non-mechanical manufacturing industry (M1) and E-S pricing in the equipment and vehicles industry (M2).

MC pricing was assumed to hold in the M1 sector, since E-S pricing would break down in much of the sector, as a result of tariff abolition. Since Canadian tariffs are higher than the share of fixed costs in total cost in much of this sector, eliminating Canadian tariffs would cause the collusive price to be less than marginal cost. Under these conditions E-S pricing is likely to break down.

Collusion would seem most plausible where relatively few firms are involved in a market. Such is the case for the vehicles sector, which is the most important component of the equipment and vehicles sector.

The empirical basis for choosing one of these central case formulations over another is weak, and results corresponding to several alternative formulations are presented later.[7] There is no empirical evidence to aid in the choice of pricing hypotheses.

Calibration

The share parameters of all of the utility functions and of the production functions outside of Canadian manufacturing were determined from the micro-consistent data, using a method outlined in Mansur and Whalley (15).[8] The methodology used in the Canadian manufacturing industry differs from that used by Harris and Cox.

H-C first assemble a "base" data set for 1976,[9] which is assumed to be a short-run equilibrium in which excess profits exist in some sectors. A "benchmark" data set is then produced by allowing free entry and exit to remove any economic profits. H-C then use this benchmark data set as the starting point to estimate the long-run effects of the abolition of all protection (including tariff equivalents of non-tariff barriers) between Canada and all trading partners on a multilateral basis.

The benchmark data is similar to the base data as regards aggregate variables such as the wage and capital bill, and national income, but the benchmark data has 55% more firms in the manufacturing sectors, though manufacturing output falls slightly. In 11 of 20 of the manufacturing sectors, entry occurs but industry output falls. The ratio of fixed to variable factors in the benchmark data is much higher than in the base data. Further, average mark-up rates on marginal cost are in the order of 18% as opposed to less than 5% for the base data.

Harris and Cox rely on direct estimates of capital stock to infer profits. This methodology was apparently used in the belief that the departures of their data from a long-run equilibrium were more problematic than the deficiency of the capital stock data and the resulting estimates of profits. Given the implausible results of their benchmarking, and the unreliability of capital stock data, it was decided to assume that the 1977 benchmark data represented a long-run equilibrium.

CANADA-U.S. TARIFF ABOLITION

This section focuses on bilateral tariff abolition (BTA). This focus was chosen for several reasons. First, while more ambitious policy changes such as complete free trade have greater potential gains, practical problems with eliminating non-tariff barriers on agricultural commodities in particular are substantial. Secondly, the non-tariff barriers implemented in the model are presented as tariff equivalents. The procedure

for choosing the levels of such barriers, and the modelling of their incidence in the model is somewhat inadequate[10], and resulting estimates of the effects of their elimination may be poor.

Table 2 contains the estimated long-run effects of tariff abolition by Canada and the U.S. The first column shows the effect of a unilateral tariff cut by Canada on U.S. imports. The second row shows the effects of a unilateral cut by the U.S. on Canadian imports. Finally, the third row shows the effects of BTA.

A striking feature is the Canadian welfare loss, which contrasts with the large gains of Harris and Cox. This is partially attributable to the modest experiment conducted. Although the protection data present in the Harris-Cox model is very similar to the data used here, Harris and Cox analyze the effects of the reduction of all protection on all of Canada's trade with all countries.

Gains of over $1 billion annually exist to be shared between Canada and the U.S. as a result of liberalization, but without compensations, Canada could well suffer a welfare loss. The terms of trade go against Canada as a result of BTA. This is counterintuitive from the point of view of traditional trade theory. Canada is often thought of as a small open economy, with little ability to affect the terms of trade, while the U.S. is a much larger trading partner. According to traditional

TABLE 2: <u>Tariff Removal Experiments on U.S.-Canada Bilateral Trade</u>
(Long-Run Central Case)

Welfare[1]	Canada Abolishes Tariffs on U.S. Imports		U.S. Abolishes Tariffs on Canadian Imports		Bilateral Tariff Abolition	
	$B	% of GNP	$B	% of GNP	$B	% of GNP
U.S.	1.5	.1	-.3	.0	1.2	.1
Canada	-.7	-.3	.5	.3	-.1	-.1

Terms of Trade	%Δ	%Δ	%Δ
U.S.	+.8	-.2	+.6
Canada	-3.0	+.4	-2.6

Production %Δ	U.S.	Canada	U.S.	Canada	U.S.	Canada
Agr. & Food	.0	1.0	.0	.2	.0	1.2
Min.	-.2	1.7	.1	-.5	-.2	1.3
En.	.0	1.8	.1	-.2	.1	1.6
M1	.1	.3	.0	.3	.1	.6
M2	.0	2.8	.0	.9	.1	3.7
S & NT	.0	-.2	.0	.1	.0	-.1

I-O	M1	M2	M1	M2	M1	M2
# Firms	-.4%	-7.0%	.0%	-3.5%	-.4%	-10.5%
Length of Production Runs	+.7%	+9.8%	+.3%	+4.4%	+1.0%	+14.2%

Total Fixed[2] Factor Savings	$.5		$.1		$.7	

[1] Welfare effects reported as Hicksian equivalent variations (EVs) in billions of 1977 $U.S.

[2] Fixed factor savings are reported as the reduction in expenditures on fixed factors in the imperfectly competitive sectors. Values are in billions of 1977 $U.S.

theory, Canadian tariffs would be expected to cause domestic consumers to purchase less imports, but such tariffs would not have the effect of reducing the net-of-tariff price paid for the imports. This would not be true in the U.S. Tariffs imposed by the larger partner would be expected to decrease the price received by (Canadian) producers, yielding terms-of-trade gains. BTA would, thus, be expected to allow Canada to recapture some of these gains from the U.S. treasury.

This analysis is inappropriate in the current case for many reasons. First, trade in the model is not in terms of commodities which are perfect substitutes. As a result of this the hypothesized relation between elasticities of import demand and country size does not hold.[11] Secondly, Canadian tariff rates are initially about twice as high as those in the U.S. The relative height of tariffs is an important determinant of who may gain or lose from bilateral liberalization.[12] Finally, the 'terms-of-trade' effects reported in Table 2 have a second interpretation, related to the E-S hypothesis. One of the hypothesized outcomes of trade liberalization is improved efficiency of domestic producers, implying lower costs of production, and thus prices for Canadian-made manufactures. Part of the terms-of-trade losses reported are Canadian productive efficiency gains, attributable to larger production runs in both manufacturing sectors.[13]

While BTA is expected to cause small welfare losses to

Canada, this qualitative result is somewhat sensitive to the elasticity specification of the model. Systematic sensitivity analysis of the welfare effects of BTA are presented in Table 3.

TABLE 3: USSA of Long-Run Welfare Effects of Bilateral Tariff Abolition*

	Point Estimate	Mean	Minimum Value	Maximum Value	Probability of Gain
U.S. Welfare	1.24	1.23	.60	1.87	1.00
Canadian Welfare	-.13	-.13	-1.15	.91	.39

*Figures in billions of 1977 $US.

These results correspond to unconditional systematic sensitivity analysis of the results to the U.S. and Canadian trade elasticities in the model. The model was solved 125 times for alternative elasticity specifications of the model. Elasticity values were independently varied over the range +1.4 to -1.4 standard errors.

Summary: Canada-U.S. Trade Liberalization

Using a model similar in structure to that used by Harris and Cox, both unilateral and bilateral tariff abolition by Canada on trade with the U.S. are found to cause welfare losses for Canada. These results contrast dramatically with the large welfare gains estimated by Harris and Cox as a result of their unilateral and multilateral free trade experiments. While the policy experiments analyzed are different, the dramatic difference in results suggests that important differences in the

models used remain. These differences are analyzed in detail in the following section.

"MULTILATERAL" FREE TRADE RESULTS AND COMPARISONS TO HARRIS-COX

Harris and Cox analyze policy experiments, referred to as MFT and UFT. MFT involves the elimination of all tariffs and other trade barriers[14] on all of Canada's imports, accompanied by the elimination of all protection on Canada's exports to all other countries. MFT ("multilateral" free trade) is actually a comprehensive set of bilateral free trade proposals between Canada and the rest of the world. In this section, the revised Whalley model is used to estimate the effects of MFT as analyzed by Harris and Cox. Unresolved differences between the results remain.

"Multilateral" Free Trade

The revised Whalley model was used to evaluate the effects of MFT, "multilateral" free trade. In the context of the 8-bloc global model, this involved eliminating all protection on Canada's exports to all countries and all Canadian tariffs on imports from all countries. Trade restrictions on all other trade was left unchanged. The central case results of the MFT experiment are shown in Table 4.

The revised Whalley model used to evaluate the results in Table 4 has similar protection data to that used in Harris and

TABLE 4: "Multilateral" Free Trade (Elimination of all protection on all Canadian trade with all trading partners)

	Harris-Cox Central Case	Revised Whalley (Central Case)
Canadian Welfare[1]	+8.6%	+2.5%
Change in Average Length of Production Runs in Manufacturing	+67.%	+12.5%
Labour[2] Reallocation	8.5%	1.1%

[1] Hicksian EV reported as a % of GNP.

[2] % of labour force that leaves employment in one industry to become employed in another.

Cox. The primary sector protection used is identical, coming from the same source.[15] The protection on manufactures is crucially important to the size of rationalization gains. Protection is compared in Table 5.

TABLE 5: Comparisons of Tariff Rates

	Harris-Cox (Tariffs + NTBs)	Revised Whalley (Tariffs)	Revised Whalley (Tariffs + NTBs)
Canadian Tariffs			
M1	12.1%	12.4%	19.9%
M2	6.6%	5.0%	6.2%
"Foreign" Tariffs			
M1	17.3%	12.9%	15.4%
M2	4.4%	5.7%	5.7%

The welfare gains to Canada from MFT are much smaller using the revised Whalley model. This is somewhat puzzling given the similarity of the models used. The source of the difference in welfare results is now examined in detail.

Reconciliation of Harris and Cox and Revised Whalley Results

This section first identifies possible sources of the discrepancy in welfare results, and where possible evaluates the contribution of each source to that discrepancy.

Some of the potentially important differences between the models are the following:

(i)   Pricing behaviour in non-competitive industries.

(ii)   Trade elasticities.

(iii) Capital mobility assumption.

(iv)   Calibration procedure.

Pricing Behaviour

In the Harris and Cox model's central case results, 50% of the firms are assumed to adopt each of the (MC and E-S) pricing policies.

In the revised Whalley model, all of the firms in the non-mechanical manufacturing sector (M1) are assumed to follow MC pricing, while all firms in the equipment and vehicles sector (M2) are assumed to follow collusive (E-S) pricing. It is felt that the central case formulations used are comparable with

respect to the pricing behaviour used. Comparisons of model results corresponding to extreme pricing assumptions do not serve to eliminate the discrepancy in results.

TABLE 6: "Multilateral" Free Trade

	Harris and Cox Extreme Case 80% E-S Pricing	Harris and Cox (Approximation)* 100% E-S Pricing	Revised Whalley Extreme Case 100% E-S Pricing
Canadian Welfare[1]	+16.3%	+21.4%	+8.5%
% Change in Average Length of Production Runs in Manufacturing	100%*	120%*	43.%

[1] Hicksian EV as a % of GNP

* Rough estimates based on available data.

Trade Elasticities

It is well known that NGE model results are very sensitive to the elasticity configurations used to calibrate them. Harris and Cox use "high" elasticities. To facilitate comparison, the Whalley model was calibrated using a comparable elasticity configuration. These results are presented in Table 7.

These results are based on:

(i)   very similar protection data

(ii) very similar elasticity values

(iii) comparable pricing behaviour

(iv) the same trade policy experiment.

TABLE 7: <u>"Multilateral" Free Trade</u>

	Harris and Cox (Central Case)	Revised Whalley Model (High Elasticities)
Canadian Welfare[1]	8.6%	3.2%
% Change in Average Length of Production Runs in Manufacturing	+67%	+18%

[1] Hicksian EV as a % of GNP.

The Harris-Cox welfare results are almost three times as large as those from the revised Whalley model. Applying the welfare gain of 3.2% of GNP to Harris and Cox's 1976 base data, the absolute difference in the estimated welfare effects is in the order of $8.5 billion.[16]

Capital Mobility

As mentioned before, Harris and Cox assume that capital is freely mobile, or equivalently, that Canada faces an infinitely elastic supply curve of capital at the world interest rate. The revised Whalley model has no international capital mobility. A rough estimate of the added income resulting from capital mobility is available, particularly given the Cobb-Douglass structure of production assumed by Harris and Cox. If the aggregate demand for capital in Canada were to shift by equal amounts using the Harris-Cox and revised Whalley model, the added welfare gain to Canadians that should result is $.92 billion, less than 1% of GNP.

Calibration Procedure

Both models are calibrated using extraneously specified values of several elasticities. The scale elasticity of cost is an important value, since it determines the amount of "fixed" factors assumed to exist in the pre-policy data.

The procedure by which the benchmark data is obtained from the base data is not explained in detail.

If all of the fixed factors present in the benchmark data, but not in the base data were to be added to the welfare gains from liberalization, this would more than account for the un-resolved difference in welfare effects. It is unclear how these additional fixed factors might come to be added to the welfare gains of liberalization.

Summary - Reconciliation of Results

This section has attempted to reconcile the MFT results from the Harris and Cox model, and the revised Whalley model. Two features contributing to the difference in welfare results are analyzed and their impact evaluated. Differences in the trade elasticities used and the capital mobility assumptions used, account for approximately one quarter of the 6.1% diffe-rence in the central case welfare results. A third potential contributor to the difference in welfare results, the indirect calibration procedure used by Harris and Cox, is identified, but its quantitative contribution to the large welfare gains

in Harris and Cox is not estimated. Further details of the calibration procedure would aid this endeavour.

CONCLUSIONS AND POLICY IMPLICATIONS

Both unilateral and bilateral tariff abolition have been found to generate small welfare losses for Canada. At the same time, a multilateral free trade experiment was found to generate substantial welfare gains for Canada. These results suggest some policy relevant conclusions.

First, they suggest that the gains to Canada from pursuing liberalization of (relatively low) tariffs alone may be non-existent for Canada. In these cases, substantial rationalization gains to liberalization may not exist to offset possible deterioration of the terms of trade. In a related vein, these results suggest that while all liberalization proposals considered generate "joint" gains (the Canadian loss is always less than the U.S. gain), it is not necessarily true that the conclusion of a liberalization agreement must make Canada better off without compensation. This is somewhat at odds with the vast majority of previous literature on this topic.

The results also provide support for substantial cuts on a multilateral basis. Large gains (compared to results other than Harris and Cox) do accrue from such multilateral moves which involve the elimination of what are the major trade restrictions. In this latter class are included the substantial

use of quotas and VERs (notably on agricultural and textiles trade respectively). These restrictions (modelled as tariff equivalents both here and in Harris and Cox) do imply substantial welfare losses for Canada, and the liberalizing countries as a whole.

Finally, the results do pose a puzzle to the extent that the results of the "similar" models differ in the evaluation of similar policy experiments.

ENDNOTES

1. See in particular Wonnacott and Wonnacott (28, 29). English (8) raises similar points, but Eastman and Stykolt (7) are clearer in their statement of the relation between industrial rationalization and tariffs.

2. See Williams (27), Table 3.3.

3. This effect is present in Boadway and Treddenick (2).

4. The model is similar to that of Evans (9). Williams does not emphasize tax abolition although Chapter 2 clearly makes this point. See page 53.

5. Canadian firms are assumed to be unable (or unwilling) to price discriminate between Canadian and foreign consumers.

6. This partial equilibrium analysis ignores (among other things) the reduction in marginal cost likely to result from reduced tariffs on U.S. imports.

7. Hazledine (16) finds evidence that economies of scale do not exist in Canada's manufacturing industries. He finds that average costs per firm are constant but that average costs in an industry may decline as a result of tariff cuts as less efficient producers are forced from the market.

8. The central case trade elasticities used correspond to a recent survey by Harrison (15). Elasticities of capital-for-labour substitutions were estimated by the author for some related work. The elasticities used, and their standard errors are reported in Appendix A.

9. Although they suggest the protection data is for 1971, it is based on original documents corresponding to 1976.

10. This is a feature common to Harris and Cox (6, 12, 13).

11. The estimated elasticities of import demand for the U.S. and Canada are very similar. The central case elasticities used for the U.S. and Canadian import price elasticities are 1.41 and 1.19 respectively.

12. See Markusen (20).

13. The size of the terms-of-trade losses is amplified when E-S pricing is present in both Canadian manufacturing industries.

14. NTBs are modelled as tariff equivalents.

15. Protection data for both models was assembled from the same original data supplied by the office of the Special Trade Representative in Washington.

16. An additional run was completed, setting the U.S. and Canadian import elasticities, and the common export elasticity to 2.5. This further reduced, but did not eliminate, the discrepancy in results. The resulting welfare effect was still more than 3% lower than the Harris and Cox result.

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APPENDIX B

TABLE 1 - DATA

(i)   Canada-U.S. Trade and Protection

	Cdn. Exports to U.S.*	U.S. Protection		U.S. Exports to Canada*	Cdn. Protection	
		Tariffs	NTBs**		Tariffs	NTBs**
A&F	1.2	5.2%	31.1%	1.2	3.6%	51.0%
Min.	4.4	.0%	.0%	1.2	.0%	.0%
En.	4.3	.5%	.0%	1.1	2.9%	94.5%
M1	7.6	2.3%	7.5%	7.1	11.2%	7.5%
M2	11.6	1.1%	.0%	14.4	4.3%	1.2%

*   These figures are in billions of $US (1977).

** NTBs are present as tariff equivalents of non-tariff barriers.

(ii)   Canadian Value Added by Industry

	Output*	Labour*	Value Added*	Ratio of Other Value Added to Labour
A&F	22.3	5.6	7.8	.4
Min.	15.6	4.9	8.9	.8
En.	7.7	2.2	4.0	.8
M1	131.7	32.8	39.6	.2
M2	35.5	15.8	19.1	.2
NT	199.7	69.0	100.1	.5
		130.3	179.5	

*   These figures are in billions of $US (1977)

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APPENDIX B

TABLE 2 — TRADE ELASTICITIES USED

ELASTICITY	VALUE	STANDARD ERROR
SIG(EC)	1.109	.350
SIG(US)	1.413	.341
SIG(JAPAN)	1.024	.322
SIG(CANADA)	1.194	.363
SIG(OD)	.962	.482
SIG(OPEC)	.897	.383
SIG(NIC)	1.365	.789
SIG(LDC)	1.472	.718
SIGI	1.082	.326

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