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THE CANADA-U.S. AUTO PACT OF 1965: AN EXPERIMENT IN SELECTIVE TRADE LIBERALIZATION

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ABSTRACT

In this paper we analyse the Canada-U.S. Auto Pact, a selective trade liberalization agreement which created a duty-free North American market for the major U.S. multinational automobile producers, but continued to protect them from offshore producers. The new international trade/I.O. literature predicts that, given the probable unexploited economics of scale and specialization in the tariff-protected small Canadian economy prior to 1965, rationalization leading to large efficiency gains in Canadian production vis à vis U.S. production would occur in a free trade environment. We estimate that the Auto Pact did not induce a substantial improvement in Canadian relative production efficiency. The missing ingredient seems to have been the competition-increasing effects of free trade in an oligopolistic setting that is emphasized by the new trade/I.O. literature. The Auto Pact did not increase the number of rivals in the oligopolistic Canadian industry since the major players in the industry had production facilities on both sides of the Canada-U.S. border before 1965, and no significant new entry into Canada occurred.

In the 1962-64 period, Canadian automotive production was 27% less efficient than U.S. production. By 1970-72 this deficiency had been reduced to 19%, but was not further reduced by the end of the 1970's. Of the 8 percentage points reduction in the Canadian disadvantage, we attribute only 3 percentage points to the rationalization process induced specifically by the Auto Pact.

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I. Introduction

Manufacturing industries in small economies, such as Canada, which are protected by tariffs generally are believed to be inefficient relative to corresponding industries in large economies such as the United States. The reason given is that in a protected small market, consumer preference for diversity implies that there will be too many firms producing too many products, so that rationalization will not occur because economies of scale and specialization will remain unexploited. In addition, output price differentials between small and large economies may be even higher than unit cost differentials if protection facilitates oligopolistic coordination. In recent years there has been renewed interest in the integration of industrial organization features such as economies of scale and imperfect competition with the analysis of international trade. Examples of theoretical contributions include Brander (1981), Helpman (1981), Krugman (1980) and Helpman and Krugman (1985). Recently, Harris (1984a,b) and Cox and Harris (1985) have developed a numerical general equilibrium model of a small open economy and used this model to estimate the effects for Canada of trade liberalization policies. They find large gains in manufacturing efficiency due to rationalization and output price reductions from a movement to free trade, either unilateral or multilateral. Of particular importance to this study is the fact that the transportation equipment industry is a big winner, even when the tariff is removed unilaterally in that industry alone.

In common with other numerical general equilibrium exercises, Harris's results are based on a <u>hypothetical</u> experiment using crucial parameter values which are not estimated from the data employed in the

experiment. However, there exists an actual experiment in trade liberalization - the Canada-U.S. Automotive Products Trade Agreement of 1965 (better known as the Canada-U.S. Auto Pact) which eliminated some, but by no means all, features of protectionism with respect to North American trade in automobile products.[1] The Auto Pact was designed to permit North American (primarily U.S. multinational) producers to rationalize production facilities by removing, for these firms, the Canadian and U.S. tariffs on transborder shipments of completed vehicles and original equipment parts. The Pact thus opened up on a duty-free basis the complete North American market to automotive products originating in Canada. It was expected that, with tariff barriers removed, producers in the small economy (Canada), who also were the primary producers in the large economy (United States), would achieve substantial relative efficiency gains by rationalizing production facilities in Canada to take advantage of any economies of scale and specialization that existed. It is important to note that tariff protection from off-shore (e.g. European and Japanese) producers remained and only "designated" manufacturers in Canada and the U.S. could take advantage of the provisions of the Auto Pact - hence the term selective trade liberalization in the title of this paper. For example, manufacturers in the U.S. had to achieve a certain minimum level of production in Canada in order to achieve designated (i.e. duty-free) status.[2] The opportunity to rationalize was created by the Auto Pact, but the oligopolistic industry in Canada[3] was not forced to rationalize by the cold wind of competition, as assumed in the Harris computations. In fact, it could be argued (Johnson (1963)) that the Auto Pact increased

effective protection for North American producers to the extent that costs could be reduced behind an unchanged nominal tariff barrier applied to offshore manufacturers.

In this paper, we analyse, using an econometric cost function methodology in which the crucial parameters are estimated internally from the historical data, the rationalization effects of the Auto Pact. Since the automobile industry in Canada prior to 1965 was a classic case of an industry with apparently unexploited economies of scale and specialization producing exclusively for a small domestic market, one would expect, if the Auto Pact were effective, to observe a substantial narrowing of the Canada-U.S. production efficiency gap. During the 1962-64 period (prior to the Auto Pact), we estimate that Canadian producers were 27% less efficient than their counterparts in the U.S., confirming the small, protected economy hypothesis stated earlier. By 1970-72, Canadian producers were still 19% less efficient than U.S. producers, and by 1979 the gap had grown slightly to 20%. In addition, of the 8 percentage points relative improvement in Canadian efficiency by 1970-1972, only 3 percentage points could be attributed to the rationalization process induced specifically by the Auto Pact. The selective trade liberalization did not substantially improve Canadian automobile production efficiency.

We also estimate that the Auto Pact induced a price decline in Canada relative to the U.S. of only 3% by 1970-72.[4] This is considerably less than what would have been expected from the elimination of a Canadian tariff of 17 1/2%, had the benefits of trade liberalization been extended beyond North American manufacturers so that arbitrage

possibilities could be exploited by individual retailers or consumers. The selective nature of the trade liberalization appears to have protected the oligopolistic automobile industry from the competitive pressures that a policy of fuller trade liberalization would have brought forth.

The plan of the paper is as follows. In Section II we present a description of the Auto Pact and a discussion of the expected effects on production costs of the provisions of the Pact. Section III provides an outline of the econometric cost function model used in the analysis. The extent and sources of unit production cost differences between Canadian and U.S. producers over the 1962-80 period are presented in Section IV. Section V analyses the Auto Pact per se through a counter-factual experiment. We construct a set of production flows which we estimate would have occurred in the absence of the Auto Pact and determine the unit cost implications had the historical experience been altered. In Section VI we provide concluding remarks and discuss the implications of our results for trade policy strategy.

II. THE CANADA-U.S. AUTO PACT OF 1965

The Canadian automobile industry is dominated by U.S. multinational firms. Prior to 1965, as noted in the Introduction, both Canada and the U.S. imposed substantial tariffs on the entry of assembled vehicles and parts. The Auto Pact eliminated these tariffs for manufacturers of completed vehicles and original equipment parts, conditional on these manufacturers maintaining certain minimum production levels in Canada and domestic content in North America. Hence the Auto Pact provided a mixture of trade liberalization and protection. On the one hand, vehicle manufacturers in both countries had potential duty-free access to Canadian and U.S. markets. On the other hand, since only designated manufacturers had this access opportunity, the production and domestic content provisions required for designation might be expected to protect, at least to some extent, the inefficient Canadian industry.[5]

The Auto Pact stipulated the following content and production requirements for manufacturers:

1. For tariff-free entry of Canadian automobiles or original equipment parts into the U.S. market, these automobiles must contain at least 50% North American (U.S. or Canada) content.

2. For tariff-free entry of U.S. finished vehicles or original equipment parts into Canada, manufacturers in Canada must satisfy the following criteria:

a) Manufacturers must maintain a certain ratio between the net sales value of vehicles made in Canada and the net sales value of vehicles sold in Canada.

b) The amount of Canadian value added for all classes of vehicles made in Canada must be at least as great as the amount which was achieved in the base year (1964).

c) In each model year, the value added in Canada should amount to at least 60% of the growth in the value of cars sold in the base year (1964); for commercial vehicles (e.g. trucks), the value added should amount to at least 50% of the growth in the value of commercial vehicles sold in the base year.

d) Vehicle manufacturers were collectively to increase the amount of value added in Canada between 1965 and 1968 by a further $260 million beyond the requirements under (c).

All the above constraints potentially interfere with trade liberalization and provide protection. Provision 1 protects North American parts manufacturers from world-wide competitors. Provision 2 provides protection for Canadian parts producers and vehicle assemblers vis a vis U.S. producers. Provision 2(a) biases production in Canada toward assembly and away from parts production.

An observer of the provisions of the Auto Pact would be tempted to conclude that there exists an obvious reason why manufacturing efficiency did not improve substantially in Canada relative to the U.S. - the provisions of the Pact prevented North American rationalization to the

fullest extent desired by manufacturers. This conclusion would imply that manufacturers were constrained by the content provisions of the Pact - an implication which is contrary to the evidence. At no time during the period 1965-80 have constraints 1, 2(b), (c) or (d) been binding constraints. In most years manufacturers have exceeded the minimum requirements by wide margins. Provision 2(a) was binding in 1980 and possibly 1968, but in all other years, manufacturers comfortably exceeded the minimum requirements.[6]

Hence it would appear that the "safeguards for Canada" built into the Auto Pact did not appreciably constrain the North American allocation of production facilities or the amount of value added produced in Canada. This fact would seem to contradict our result that Canadian production has remained inefficient relative to U.S. production. However it is not relative efficiency which matters in the competition for production activity but rather relative costs. As we demonstrate in Section IV, Canadian producers have remained cost competitive primarily due to lower factor prices, and in the latter part of the period, due to a devaluing currency.

III. THE ECONOMETRIC COST FUNCTION MODEL

In order to analyse empirically the relative unit costs of production for Canadian and U.S. producers and the impact of the Auto Pact on Canadian production, we have estimated the cost function specified below utilizing 3 digit data (vehicle assembly + parts production) drawn from the automobile sectors of Canada (1961-80), the U.S. (1961-80) and Japan (1968-80). The model is developed in detail elsewhere (Fuss and Waverman (1985, 1986, 1987) and will only be summarized here due to space limitations.

Utilizing the duality between cost and production under the assumption of cost-minimizing behaviour[7], we specify that the automobile production process can be represented indirectly by the cost function

$$C_{it} = G_{it}(\underset{\sim}{w}_{it}, Q_{it}, \underset{\sim}{T}_{it}) \qquad (1)$$

where C_{it} is the total cost of production in country i at time t, $\underset{\sim}{w}_{it}$ is a vector of factor prices, Q_{it} is a scalar of output and $\underset{\sim}{T}_{it}$ is a vector of technological conditions which could be viewed as the "characteristics" of the production process. Characteristics used in this study are an index of Research and Development expenditures (a proxy for technical change), capacity utilization, and an index of the size mix of vehicles produced. The use of this characteristics approach was proposed by McFadden (1978) and has been applied to telecommunications [Denny, et al. (1981a,b)], trucking [Spady and Friedlaender (1978), Kim (1984)] and U.S. automobile production [Friedlaender, Winston and Wang (1983)]. The logarithm of the cost function (1) is approximated by a function in the logarithms of $\underset{\sim}{w}_{it}$, Q_{it}, $\underset{\sim}{T}_{it}$ and $\underset{\sim}{D}$; (where $\underset{\sim}{D}$ is a vector of country-specific dummy variables) of the form:

$$
\begin{aligned}
\log C_{it} = {} & \alpha_o + \alpha_{oi}D_i + \sum_k (\alpha_k + \alpha_{ki}D_i)\log w_{kit} \\
& + (\beta_1 + \beta_{1i}D_i)\log Q_{it} \\
& + \sum_\ell (\theta_1 + \theta_{\ell i}D_i)\log T_{\ell it} \\
& + \tfrac{1}{2}\Big[\sum_k \delta_{kk}(\log w_{kit})^2 + \mu_{11}(\log Q_{it})^2 \\
& + \sum_\ell \phi_{\ell\ell}(\log T_{\ell it})^2\Big] \\
& + \sum_k \sum_{\substack{m \\ k<m}} \delta_{km} \log w_{kit} \log w_{mit} \\
& + \sum_\ell \sum_{\substack{p \\ \ell<p}} \phi_{\ell p} \log T_{\ell it} \log T_{pit} \\
& + \sum_k \lambda_{k1} \log w_{kit} \log Q_{it} \\
& + \sum_k \sum_\ell \Lambda_{k\ell} \log w_{kit} \log T_{\ell it} \\
& + \sum_\ell \tau_{1\ell} \log Q_{it} \log T_{\ell it} \\
& + \tfrac{1}{2} \sum_k \rho_{k11} \log w_{kit} (\log T_{1it})^2 \qquad (2)
\end{aligned}
$$

where i indexes the country

t indexes the time period

k,m index the factors of production

ℓ,p index characteristics

$D_i = 1$ if the observation is in country $i \neq 0$

$= 0$ otherwise

and country 0 is the "reference" or "base" country.

Specification (2) is a translog cost function with the exception of the last (3rd order) row which has been added to insure that envelope consistency between short- and long-run average costs (Viner (1952)) is maintained within a suitably flexible functional form. The inclusion of the dummy variable vector permits parameters associated with zero order and first order terms of the cost function to differ across countries. Utilizing Shephard's Lemma results in the cost share equations

$$S_{kit} = \alpha_k + \alpha_{ki}D_i + \delta_{kk} \log w_{kit} + \sum_{m\neq k} \delta_{km} \log w_{mit}$$

$$+ \lambda_{kl} \log Q_{it} + \sum_{\ell} \Lambda_{k\ell} \log T_{\ell it} + \frac{1}{2} \rho_{kll}(\log T_{lit})^2$$

$$k = 1,\ldots,K \qquad (3)$$

Estimates of the parameters of the system are obtained by estimating simultaneously (using maximum likelihood techniques) the cost function (2) and K-1 equations from (3), imposing the standard constraints

$$\sum_k \alpha_k = 1, \quad \sum_k \alpha_{ki} = 0, \quad \sum_m \delta_{mk} = 0, \quad \delta_{mk} = \delta_{km},$$

$$\sum_k \lambda_{kl} = 0, \quad \sum_k \Lambda_{k\ell} = 0, \quad \sum_k \alpha_{ki} = 0, \quad \sum_k \rho_{kll} = 0, \quad \phi_{\ell p} = \phi_{p\ell} \qquad (4)$$

and the envelope consistency constraints (see Fuss and Waverman (1985a) for a detailed derivation):[8]

$$\theta_l = \beta_l$$

$$\theta_{li} = \beta_{li}$$

$$\phi_{l\ell} = \tau_{l\ell} \qquad \ell \neq 1$$

$$\Lambda_{kl} = \lambda_{kl}$$

$$\tau_{ll} = \mu_{ll} \qquad (5)$$

The exogenous variables contained in (2) were specified as follows:

input prices (K=3) - capital (1); materials (2); labour (3)

output - constant dollar capacity (normal or designed) production of vehicles and parts

technological conditions (L=3) - capacity utilization (1); technological change proxy index - index of real stock of R & D expenditures (2); index of product mix (3)

A description of the data used to construct these variables is contained in Fuss and Waverman (1985, 1986) and especially in Fuss and Waverman (1987, chapter 4).

The cost function was estimated subject to the regularity conditions (e.g. monotonicity, concavity, linear homogeneity in prices) being satisfied. Details of the estimation procedure can be found in Fuss and Waverman (1985).

The lengthy list of parameter estimates are not presented due to space limitations. These parameter estimates, along with asymptotic standard errors and the usual diagnostic summary statistics also can be found in Fuss and Waverman (1985). However, in order that the reader have some feel for the estimated production structure, Tables 1 and 2 present estimates of factor price elasticities, elasticities of substitution and other elasticities of interest.

Table 2 demonstrates that production in both the U.S. and Canada is subject to increasing returns to scale at the mean data point. Surprisingly, Canada has the lower mean scale elasticity.[9] The capacity utilization elasticity shows that costs increase proportionately less than actual output, so that there are short-run economies of fill. Technical change appears to have approximately the same cost-reducing impact in both countries.

The cost-product mix elasticities are very small. This is not surprising since the output variable has been calculated from value and price data so that it is denominated in "standard" units (see Fuss and Waverman (1987) for details concerning the construction). If the long-run marginal cost of producing a vehicle is proportional to weight, then the cost-product mix elasticity would be zero. If there are economies of scale (i.e., non-proportionality) in producing larger (heavier) automobiles then the elasticity would be negative.

Applying a Taylor's series expansion generalization of the Quadratic Lemma[10] introduced by Denny and Fuss (1983), the following decomposition of the inter-country unit production cost percentage difference at time t can be obtained (Fuss and Waverman (1985)):

$$\begin{aligned}\log (C_i/Q_i) - \log (C_o/Q_o) &= \Delta \log (C/Q) \\ &= \frac{1}{2} \sum_k [S_{ki} + S_{ko}] \cdot [\log w_{ki} - \log w_{ko}] \\ &+ \frac{1}{2} [ECQ_i + ECQ_o - 2] \cdot [\log Q_i - \log Q_o] \\ &+ \frac{1}{2} \sum_\ell [ECT_{\ell i} + ECT_{\ell o}] \cdot [\log T_{\ell i} - \log T_{\ell o}]\end{aligned}$$

$$+ \frac{1}{2} \sum_k \rho_{kll} [\log w_{ki} - \log w_{ko}].[\log T_{li} - \log T_{lo}]^2$$

$$+ \theta_{io} \qquad (6)$$

where the time subscript t has been suppressed for simplicity, and where

$$\theta_{io} = \frac{1}{2} \left[\frac{\partial G}{\partial D_i}\Big|_i + \frac{\partial G}{\partial D_i}\Big|_o \right] . [D_i - D_o]$$

ECQ = elasticity of cost with respect to output

ECT = elasticity of cost with respect to the technological characteristic

Following Denny and Fuss (1980), the index of cost efficiency difference between countries i and o at any point in time is given by

$$CED_{i,o} = \Delta\log (C/Q) - \frac{1}{2} \sum_k [S_{ki} + S_{ko}][\log w_{ki} - \log w_{ko}] \qquad (7)$$

The expression for CED in equation (7) is just the dual formulation of the translog index of interspatial productivity difference introduced by Jorgenson and Nishimizu (1978).

Rearranging equation (7), we obtain an alternative equation for $\Delta\log (C/Q)$:

$$\Delta\log (C/Q) = \frac{1}{2} \sum_k [S_{ki} + S_{ko}] . [\log w_{ki} - \log w_{ko}] + CED_{i,o} \qquad (8)$$

Combining (7) and (8) we obtain an expression for CED in terms of efficiency sources:

$$CED_{i,o} = \frac{1}{2} [ECQ_i + ECQ_o - 2] . [\log Q_i - \log Q_o]$$

$$+ \frac{1}{2} \sum_{\ell} [ECT_{\ell i} + ECT_{\ell o}] \cdot [\log T_{\ell i} - \log T_{\ell o}]$$

$$+ \frac{1}{2} \sum_{k} \rho_{kll} [\log w_{ki} - \log w_{ko}][\log T_{li} - \log T_{lo}]^2$$

$$+ \theta_{io} \qquad (9)$$

Equations (6), (8) and (9) provide the formulas for decomposing unit cost differences and efficiency differences into their various sources.

Consider equation (6). The left hand side is the average cost difference between two countries at a point in time. This difference is due to differences in factor prices (the first row on the right hand side), the effects of scale economies (the second row), the effects of technological characteristics (the third row), the interaction between factor prices and characteristics (the fourth row), and θ_{io} (the fifth row). The term θ_{io} measures any systematic cost difference between the two countries not accounted for by factor prices, scale, and technology. It will be called the country-specific efficiency effect, and is presumably a combination of managerial and environmental effects.

Now consider equation (8). The average cost difference between the two countries is due to differences in factor prices (the first term), and differences in cost efficiency (the second term). Finally consider equation (9). The cost efficiency difference between two countries is due to scale effects (the first row), technological effects (the second row), the interaction effect (the third row), and the country-specific efficiency effect (the fourth row).

IV. THE EXTENT AND SOURCES OF COST AND EFFICIENCY DIFFERENCES BETWEEN U.S. AND CANADIAN PRODUCERS, 1961-80

In this section we present the empirical results on cost and efficiency level comparisons between the United States and Canada using equations (6), (8) and (9). The results are presented in Tables 3 and 4. Table 3 contains the unit production cost differentials for a number of years and periods. The "contribution" of each source is measured as the percentage difference in unit production cost which would result if the only difference between the two countries were that particular source. In this calculation all other sources are held constant at their geometric mean levels for both countries' observations combined. Hence the interaction effect will disappear as an explicit source of difference. For example, the second element in the first row indicates that if all that differed between Canadian and U.S. producers in the 1962-64 period was the price of labour, and all other variables affecting costs were equal in the two countries at the geometric average of their values in the two countries in the years 1962 through 1964, then unit production cost would have been 6.0% lower in Canada than in the U.S. (both costs measured in Canadian dollars).

Somewhat surprisingly, the data indicate that in the years preceding the Auto Pact there was little significant unit production cost difference between Canada and the U.S. as measured in Canadian dollars. However the respective tariffs in the two countries were sufficiently high to discourage inter-country trade. In 1962-64, considering only factors affecting cost efficiency differences (CED) between U.S. and Canadian producers, unit production costs would have been 26.9% higher in

Canada than in the U.S. Over the fifteen year period to 1979 the Canadian CED disadvantage diminished, but by only 6.7 percentage points. We find that in 1962-64, scale differences alone would have accounted for 21.1% higher unit production costs in Canada than in the U.S., (where all other variables are held at their mean levels). Wonnacott and Wonnacott (1967) estimated that inefficient scale increased costs in Canada by 13%. Our calculations based on an estimated cost function show this effect to have been some 50% greater than that calculated by the Wonnacotts. Scale is measured in our model by the level of aggregate output which could be produced when there is no underutilization of capacity.

Besides the disadvantage in scale, we also find two other sources of inefficiency in Canada in this earlier period - underutilization of capacity and the "country specific efficiency effect" (CSE). For 1962-64, unit production cost would have been 2.2% higher in Canada than in the U.S. due to underutilization of capacity. The CSE effect has been specified to include any differential effect due to unequal rates of technical change, and hence includes the contribution of the R&D proxy variable to unit cost differences.[11] In essence, this effect is a residual category which will include any systematic influence on Canada-U.S. relative efficiency other than scale, capacity utilization, and product mix. It will include any cost-reducing effects of increased specialization (aggregate output held constant) not captured by the product mix variable. For 1962-64, unit production cost would have been 2.2% higher in Canada than the U.S. due to CSE.

The sources of inefficiency in Canada (scale, CSE and capacity utilization) would have led to a substantially higher unit production cost in Canada than in the U.S. in 1962-64 except for the favourable impact of lower factor prices in Canada.

As we view the Canadian automobile industry vis à vis the U.S. in 1962-64 we see substantial 'scale' (or aggregate output) disadvantages in Canada offset by lower factor prices - suggesting that improvements in scale, ceteris paribus, would potentially improve the industry's relative performance.

Between 1965 and 1972, the Canadian auto producers apparently rationalized their assembly production,and the scale of aggregate output in Canada also increased substantially. By 1970-72, the scale disadvantage to Canada had fallen by 45% from its 1962-64 level (from 21.1% in row 1 to 12.1% in row 2).

The reduction in the scale disadvantage was due to the faster growth in Canadian production relative to U.S. production in the post 1965 period. Was this faster growth due to the Auto Pact? In Section V we examine a counter-factual case - holding auto trade between Canada and the U.S. at its 1962-64 level and allowing the domestic Canadian market to expand at the actual rate experienced over the 1966-1980 period in order to answer this question.

We expected that unit production cost would have fallen substantially in Canada as compared to the U.S. between 1962-64 and 1970-72 due to the narrowing of the scale disadvantage. In fact Canadian relative unit production cost rose by 5.5 percentage points. How do we explain this surprising result, especially when movements in capacity

utilization also favoured Canada over this period? First, Canada's relative CSE, already at a disadvantage with respect to the U.S. in 1962-64, continued to deteriorate (by 3.5 percentage points in unit production cost terms over the period). Recall that the scale effect captures the reduction in unit cost resulting from the increase in aggregate output. If rationalization of Canadian production substantially reduced unit production cost in Canada, then the CSE term should have shown a relative improvement for Canada over the 1962-64 to 1970-72 period. It does not. Of course, rationalization in the auto industry could have improved CSE in Canada as compared to what would have occurred in the absence of the Auto Pact, i.e., the CSE term might have changed even more to Canada's disadvantage in other industries. We consider this issue in more detail on page 27, where we demonstrate that the Canadian automobile industry's CSE experience over the period from 1966 to 1972 was unlikely to have differed substantially from the experience in total manufacturing.

An additional factor leading to an increased relative unit production cost in Canada over this period is the deterioration in Canada's very favourable factor price regime of 1962-64. The major component of this deterioration was the price of capital services. In 1962-64, differences between the price of capital in the two countries alone yielded 12.6% lower production costs in Canada than in the U.S. By 1970-72, this advantage to Canada had diminished to a 3% advantage in unit production costs.

After 1965 intra-industry trade between Canada and U.S. expanded rapidly even though Canada's average relative cost position

deteriorated. A pattern developed (that has continued to the present time) in which Canada generated a trade surplus in completed vehicles and a deficit in original equipment parts. Since our data consist of aggregated vehicle assembly and parts, they presumably mask (during 1970-72) a Canadian cost advantage in assembled vehicles (on average) and a cost disadvantage in parts production.

Between 1970-72 and 1977-79, substantial changes occurred in the relative unit production cost between the two countries. While the unit production cost in 1970-72 was 6.9% higher in Canada than in the U.S., by 1977-79 it was 2.9% lower in Canada; in 1979 alone, 8.9% lower. This reversal in relative cost between the two countries occurred because of a substantial relative improvement in the price of materials in Canada's favour[12] and because of a continued increase in the scale of Canadian automobile production. Note, however, the substantial relative decline in the Canadian CSE between the 1970-72 and 1977-79 periods. If the only difference between the costs of automobile production in the two countries was the CSE, then Canadian unit production costs in 1979 would have been 11.5% higher than costs in the U.S. This deterioration in CSE occurs <u>despite</u> the rationalization of the Canadian auto industry.

Between 1979 and 1980, unit production costs fell 5.6 percentage points in Canada relative to the U.S. This large one year change was almost entirely due to the relative decline in capacity utilization in the U.S.[13]

To summarize Table 3, in the fifteen years between 1962-64 and 1977-79, unit production costs fell in Canada relative to the U.S., so that in the latter period, Canadian unit production costs were well below

that of the U.S. This overall relative decline in Canadian unit production costs was itself the result of several conflicting movements. First was the substantial improvement in the scale of Canadian automobile production - a result that some would attribute to the Auto Pact. Second, the Canadian CSE declined relative to the U.S. Removing scale effects, the efficiency level of Canadian automobile production declined relative to U.S. production in the period following the Auto Pact. Third, relative price changes between the U.S. and Canada occurred over the fifteen year period, some to Canada's advantage and some to the advantage of the U.S. Relative changes in product mix and in capacity utilization had no major impact over this period.

The Depreciation of the Canadian Dollar

In Table 4, we reproduce the results of Table 3 except that exchange rate movements in excess of changes in purchasing power parity (PPP) are separated out as a distinct source of unit cost differences.[14] From Table 4, we see that the lower price of labour in Canada would have created a 4.6% to 6.6% Canadian cost advantage (at PPP exchange rates) over the U.S. throughout the period 1962-80.[15] The price of capital services rose considerably in Canada relative to the U.S. so that the Canadian advantage in capital costs fell sharply by 1970-72. The price of materials changed substantially in favour of Canada over the period from a 3% disadvantage (in terms of unit production costs) in 1962-64 to a 10% advantage in 1980.[16]

Movements in exchange rates relative to PPP accounted for the worsening of Canada's relative unit production cost from the 1962-64 to

1970-72 period in the sense that, had the exchange rate been at its PPP level in 1962-64, Canadian unit production cost would have been 10% higher than the U.S. cost; which should be compared with a 7% differential in 1970-72 when the exchange rate was at its PPP level. Only part of the improvement in the Canadian relative unit production cost in the 1977 to 1980 period can be attributed to depreciation of the Canadian dollar relative to its PPP level.[17]

Output Price and Marginal Cost Differences

The second column of Table 5 gives the output price differences between automobile wholesale prices in Canada and those in the U.S. In 1962-64, wholesale prices in Canada were 4.8% above those in the U.S. (in Canadian dollars). By way of contrast, in those same years long-run marginal cost (i.e., marginal cost assuming full utilization of capacity) was 2.6% higher in Canada, whereas short-run marginal cost was 7.1% lower in Canada due to relative underutilization of capacity. In our model underutilization of capacity raises unit (average) cost and lowers marginal cost in the short run. From 1962-64 to 1970-72, the difference between Canadian and U.S. wholesale prices increased. The difference between both short-run and long-run marginal costs also increased, and marginal cost differences increased more substantially than wholesale price differences. Between 1970-72 and 1977-79, wholesale prices as well as marginal costs fell in Canada relative to the U.S, with the reductions in marginal costs being more pronounced. In 1979 the differential between Canadian and U.S. wholesale prices was less than the differential between either short-run or long-run marginal costs. In

1980, a year of relative underutilization of U.S. capacity, the Canadian output price advantage was less than its advantage in long-run marginal cost. Short-run marginal cost was higher in Canada than in the U.S.

From Table 5 it is obvious that swings in marginal costs were much more pronounced than swings in prices. This suggests that automobile firms were probably using pricing rules which involved a markup over average variable cost that is only partially adjusted in the face of changing market conditions, and that these firms have sufficient market power to sustain this behaviour even when confronted by low levels of capacity utilization and hence low levels of short-run marginal cost.

V. A COUNTER-FACTUAL EXAMPLE - COST CHARACTERISTICS OF CANADIAN AUTOMOBILE PRODUCTION IN THE ABSENCE OF THE AUTO PACT

From Table 6 we see that, following the Auto Pact of 1965, motor vehicle output grew more quickly in Canada than in the U.S. leading to increased relative efficiency and reduced unit production cost in Canada. But the output of the Canadian automobile industry may have grown as quickly without the Auto Pact, given the fast growth of income and population and changing demographics of Canada in the post-1965 period. In order to examine a hypothetical world which did not include the Auto Pact, we made the following calculations. First, we calculated that, in the 1962-64 period, the ratio of U.S. imports to Canadian domestic production (parts and completed vehicles) was 26% and that 2% of Canadian output was exported to the U.S. For the years 1966 to 1980 we assumed that in a no Auto Pact (NAP) hypothetical world net imports from the U.S. to Canada would remain at these percentage levels. We also assumed that exports from Canada to the U.S. above the 1962-64 percentage level would not have occurred and therefore we deducted the value of these exports from the value of domestic Canadian production.[18] Finally, we assumed that imports from the U.S. to Canada above the 1962-64 percentage level would have been produced in Canada (we therefore added these imports to the value of domestic Canadian production).[19] In this hypothetical world, Canadian firms produce for the domestic market rather than being integrated into the North American market. We incorporated one other effect in making these hypothetical calculations. The differential between wholesale prices in Canada and those in the U.S. narrowed after the introduction of the Auto Pact. We hypothesized

that in the absence of the Auto Pact, Canadian wholesale prices would have remained at their 1962-64 ratio to U.S. wholesale prices (in Canadian dollars). This calculation raises the wholesale price in Canada in the post-1965 period by 3% in the absence of the Auto Pact. Assuming a unitary elasticity of demand, we reduced Canadian output correspondingly by 3%.

Using these hypothetical output data, we recalculated unit production cost differences and their sources from equations 2 and 6, assuming all other exogenous variables were unaffected by the introduction of the Auto Pact. Table 6 presents the differences between this hypothetical NAP world and actual experience.[20]

By 1970-72, we calculate that the Auto Pact had reduced unit production cost in Canada by 3.1% over what it would have been during those years in the absence of the Pact. This improvement in unit production cost comes about primarily through improvements in scale and CSE. If all that differed between the U.S. and Canada were scale (all other variables held at their mean levels) then the increase in the level of Canadian aggregate output due to the Auto Pact reduced unit costs by 2.0%. As noted previously, rationalization of facilities should influence the CSE effect.[21] The Auto Pact led to a 0.6% improvement in CSE. Directionally, these values are as expected. They are, however, considerably lower than the proponents of the Auto Pact believe. Our results suggest that most of the reduction in unit cost post-1965 relative to the U.S. was due to increases in aggregate output. The majority of the output expansion which actually occurred over the 1962-64

to 1970-72 period would have occurred anyway through the growth of the domestic Canadian market.

Between 1970-72 and 1977-79, the improvements in Canadian unit production costs vis à vis those in the U.S. in our NAP world mimicked the improvements that actually occurred. We estimate that in the absence of the Auto Pact, unit production cost would have been 1.7% higher in Canada in 1977-79. Economies of scale attributable to the Auto Pact result in a small decrease in cost (0.6% of unit production cost in 1977-79). The Auto Pact also reduced unit cost in Canada by improving CSE over what it would have been in the absence of the Pact; this improvement (rationalization) increases slightly over time and accounts for a 0.9% lower unit production cost in 1979. Again, directionally the effect is as expected but lower than the proponents of the Pact would suggest.

Our empirical results demonstrate that the Auto Pact was but one of a number of forces impinging on the Canadian auto industry. The Auto Pact had its most significant effect by 1970-72, reducing unit production cost in Canada by 3.1%; in later years this cost reduction diminishes. The impact of the Auto Pact was less than commonly believed for two reasons. First, aggregate sales in the domestic Canadian market increased substantially leading to the realization of scale economies by domestic producers. Second, the data suggest that after accounting for scale, the technical efficiency of Canadian auto production fell relative to that experienced in the U.S.; the Auto Pact did improve Canadian CSE over what it would have been but not substantially.

Can these rather surprising results (at least in terms of the conventional wisdom) be correct? We now proceed to demonstrate that our results are consistent with auxiliary information which is not conditional on our modelling activities. First, had the Auto Pact eliminated efficiency differences, one would have expected by 1979 an overwhelming Canadian cost advantage in automobile production, given lower wage rates and the depreciation of the Canadian dollar. We estimate that, given equal efficiency in the two countries, the Canadian unit cost in 1979 would have been 20%-35% less than the U.S. cost. The wholesale price was however only 4% lower in Canada. In addition, during 1979 Canada had a net deficit of $2.7 billion in trade in automobile products with the U.S. under the Auto Pact. Neither output price differentials nor trade patterns are consistent with a large Canadian cost advantage.[22]

Second, our results are not in fact surprising when one considers total factor productivity (TFP) growth in the two countries. The actual growth rates in TFP are shown in Table 7. These rates are not computed from the cost function model, but rather from the actual data using the Tornqvist aggregation procedure. Hence the rates are independent of the parameter estimates.

During the 1966-72 period the TFP growth rate was higher in Canada than in the U.S. (1.5% versus 1.0%). However, if the 27% Canadian efficiency disadvantage (see Table 3) were to be eliminated by 1972, the Canadian TFP annual growth rate during the 1966-72 period would have had to be 5%, over 3 times the actual rate! Over the longer 1966-79 period, TFP growth in Canada is not substantially faster than in the U.S. These

data on TFP growth rates underline our basic results - the Auto Pact does not appear to have greatly improved the efficiency of Canadian automobile production.

We are now in a position to consider the question posed earlier as to whether the deterioration in the Canadian relative CSE during 1966-72 would have been substantially worse without the Auto Pact. Berndt and Fuss (1986) estimate that TFP in U.S. total manufacturing grew at a rate of 0.6% per annum over the 1965-73 period. For Canada, the corresponding rate has also been estimated as 0.6% over this period (Denny and Fuss (1980)). The similarity in relative Canada-U.S. TFP growth rates in total manufacturing during 1965-73 suggests that the Canadian CSE in manufacturing in general did not deteriorate to a significantly greater extent than occurred in automotive production. The much more rapid output growth rate in automobile production (12.8% versus 4.7% in total manufacturing during 1966-72) meant that economies of scale were exploited to a greater extent in automobile manufacturing than in manufacturing in general. This fact, only partially attributable to the Auto Pact, accounts for the narrowing of the efficiency gap in automobile manufacturing, whereas no such narrowing occurred in total manufacturing.[23]

Most previous analysts of the Auto Pact (Beigie (1970), Wilton (1976)) have been misled by equating labour productivity (LP) gains with efficiency gains. LP grew much more rapidly in Canada than in the U.S., both after the Auto Pact agreement (1966-72) and during the longer period (1966-79) (Table 7). In fact, from Table 8 we can see that a Canadian LP disadvantage of 29% in 1966 had been eliminated by 1972, and had been

replaced by a 23% advantage by 1979. But LP gains are not synonymous with efficiency (TFP) gains. The growth in LP is equal to the growth in TFP plus a factor substitution effect (due to changes in relative input prices) plus a bias effect.[24] This bias effect measures the differential impact on labour demand relative to other factors of production of events which can yield efficiency gains through TFP growth (e.g. scale expansion, technical change, increases in capacity utilization), but is not itself a measure of efficiency gains.

Table 9 demonstrates that less than 20% of the growth in LP is due to efficiency gains (TFP growth). The remainder is due to substitution away from labour (primarily towards materials) in response to a higher wage rate relative to other factor prices, and the net labour saving bias of increases in scale and technical change.[25]

VI. CONCLUSIONS

The major finding of this study is that the Canada-U.S. Auto Pact's selective trade liberalization provisions did not substantially improve the efficiency of Canadian automobile production relative to U.S. production. This finding is consistent with Cox and Harris's (1985) computational results that, as of 1976, the transportation equipment industry in Canada would be the big winner from unilateral or multilateral free trade primarily because "the possibility of substantial rationalization exists".[26] Nevertheless, our empirical results are surprising, since profit maximizing firms pursuing cost-minimizing strategies would rationalize if permitted to do so, and the Auto Pact provided the needed mechanism.

There exist several possible explanations for our result. First, economies of scale and specialization disadvantages in small economies may be less than previously thought. Our estimated "actual" scale elasticity for Canadian auto production for 1968 is 1.04, well below the estimate of 1.25 used by Cox and Harris.[27] But, if unexploited economies of rationalization are not present, how does one explain the persistent 20% Canadian efficiency disadvantage? Second, the Canadian domestic content provisions of the Auto Pact may have prevented a high degree of rationalization. This explanation appears unlikely, since as noted in Section II, manufacturers have consistently exceeded the content requirements by wide margins. Finally, and perhaps most likely, the oligopolistic structure of the automobile industry in Canada during the period 1966-72[28] probably meant that competitive pressures for cost

reducing rationalization were minimal, and the Auto Pact did nothing to increase them.

If the automobile industry in Canada is typical of oligopolistic industries in small economies with unexploited opportunities for rationalization, half-way measures such as the selective trade liberalization policy represented by the Auto Pact are unlikely to improve efficiency substantially. The existence of the opportunity to rationalize appears inadequate compared to the competitive pressures which can be unleashed by unrestricted trade liberalization.[29]

FOOTNOTES

1. The three digit (SIC) automobile products industry (vehicle assembly plus parts production) comprised 85% of the value of shipments in the two digit transportation equipment industry in 1976, the year from which data were drawn to calibrate the Harris model.
2. Duty free entry was conditional on manufacturers maintaining minimum assembly and value-added levels in Canada. Details of these provisions are presented in the next section. Manufacturers who did not qualify under the Auto Pact faced, as of 1965, Canadian tariffs of 17.5% on completed vehicles and 0 to 25% on parts. U.S. tariffs ranged from 6.5% to 8.5% on completed vehicles and parts.
3. In 1966 the "Big Three" U.S. manufacturers (G.M., Ford and Chrysler) controlled 86% of Canadian sales of new vehicles. In 1971, these three companies controlled 75% of new vehicle sales.
4. The new trade/I.O. literature emphasizes that in an oligopolistic setting one of the main gains from trade liberalization for the small country is that the small country's producers, after liberalization, will be faced with a larger market and more rivals so that their perceived demand curves will become more elastic and output prices will decline (Markusen (1981), Helpman and Krugman (1985)). However in this case the bulk of the automotive industry was controlled by the same firms on both sides of the Canada-U.S. border. After liberalization, these firms did not face new markets, and the number of major rivals in Canada remained the same since only Volvo entered (as a small producer) as a result of

the Auto Pact. Hence there is no reason to believe that the perceived demand elasticities of the dominant firms were altered by the Auto Pact.

5. Johnson (1963) reviewing the recommendations of the Bladen Royal Commission Inquiry into the Canadian automobile industry, an inquiry which preceded the Auto Pact, emphasized the protectionism inherent in the type of content provisions contained in the Pact.

6. For details see Federal Task Force (1983) and Fuss and Waverman (1987).

7. It might appear that the cost function model utilized would be misspecified due to the content and production provisions of the Auto Pact detailed in Section II. However, since these provisions did not constrain the activities of the producers to any appreciable extent, a provision-restricted cost function formulation would be observationally equivalent to the unrestricted version that was actually estimated. While we do not know whether the content provisions in force in Canada prior to 1965 were binding, deleting these observations from the sample yielded parameter estimates which were not statistically significantly different from the parameter estimates obtained using the complete sample. Neither the U.S. nor Japan had domestic content or production provisions during the sample period.

8. One additional set of constraints was imposed on the parameters. As described in more detail in Fuss and Waverman (1987), the product mix variable (T_3) was computed as an index where typical weights are assigned to different classes of automobiles (sub-compact, compact,

intermediate, etc.) and an average weight for actual production computed. This variable fluctuated fairly tightly around 2500 for Japan and 3500 for Canada and the U.S. Hence it almost served as a dichotomous dummy variable for Japan versus North America. From initial estimation results it became clear that second order parameters involving T_3 could not be estimated and were set to zero. This had the effect of constraining the cost-product mix elasticity to be a constant over time for each country, although the elasticity could differ among countries.

9. Our estimates of the scale elasticity for the Canadian automobile industry suggest only modest returns to increasing aggregate output (1.08 in 1961 falling to 1.03 in 1980). Other econometric studies report similar results. For example Fuss and Gupta (1981), using establishment data divided into 6 aggregate size classes, estimate a mean scale elasticity for 1965-68 of approximately one. Robidoux and Lester (1986), using individual establishment data, estimate a scale elasticity for 1979 which is slightly less than one. However, even if aggregate output scale elasticities are close to unity, substantial efficiency gains may be possible through reduction in product lines to exploit economies of specialization. We will consider this issue in more detail in Sections IV and V.

10. For a description of the Quadratic Lemma see Diewert (1976) and Denny and Fuss (1983).

11. See Fuss and Waverman (1985, Data Appendix) for the rationale behind this aggregation procedure.

12. This substantial relative improvement in the price of materials is somewhat puzzling. Below we distinguish between movements in the value of the Canadian dollar and changes in factor prices in each country. The depreciation of the Canadian dollar explains most of the factor price effect. However, since materials are largely semi-finished components, there is a possibility that if net imports into Canada from the U.S. are an important component of materials costs, transfer price changes could account for the observed changes in relative materials costs. With higher tax rates in Canada than the U.S., transnational automobile firms could raise the transfer price of materials into Canadian production, thus transferring profits to the lower tax regime - the U.S. This difference in tax rates would explain relative increases in Canadian materials costs, the opposite of actual experience.

13. The oil crisis of 1979 did not affect consumer demand in Canada for North American produced automobiles to the same extent as in the U.S., because actual shortages of gasoline did not occur in Canada and the federal government subsidized the price of crude oil in order to maintain a price below world levels.

14. The purchasing power parity calculations underlying this decomposition and the decomposition formulas can be found in Fuss and Waverman (1987).

15. If the wage rate were constant in both countries over a two year period, but the Canadian dollar appreciated by 5% relative to its purchasing power parity rate in that period, then it would appear in the results of Table 3 that the Canadian wage rate rose by 5%

relative to the U.S. rate. In Table 4 this change in relative wage rates caused by exchange rate fluctuations is allocated to an exchange rate effect. By using this convention we are implicitly adopting a partial equilibrium framework since we assume, for the purposes of this discussion, that exchange rate changes have no effect on factor prices measured in a country's own currency.

16. If net imports of materials into Canada from the United States form an important component of material costs then the exchange rate effect could be overestimated and the materials price effect underestimated. This may occur because, while, for example, a devaluation of the Canadian dollar makes inputs into U.S. production purchased in the U.S. more expensive as measured in Canadian dollars, inputs into Canadian production purchased in the U.S. (presumably materials) will also be more expensive in Canadian dollars. Hence, some of the apparent factor price advantage to Canadian producers from devaluation will cancel out. Similarly, the corresponding appreciation of the U.S. dollar will not lead to an increase in material prices (in Canadian dollars) for those materials imported from Canada. The evidence from Table 4 is that this complication is probably not of importance empirically. The Canadian advantage due to lower material prices increased considerably during 1977-80, the period of substantial devaluation of the Canadian dollar.

17. From a different perspective, the depreciation of the Canadian dollar relative to par value with the U.S. dollar (which existed in the mid 1970's) is the main reason for the Canadian cost

advantage as of 1980. The further depreciation of the Canadian dollar during the 1980's has probably increased the Canadian cost advantage.

18. We also deducted from the value of Canadian output the materials inputs which would have been used to produce these finished vehicle exports. The materials input to assembly output ratio was held at its average 1962-64 value.

19. Offsetting changes were made to the value of U.S. production to ensure that total output matched actual values.

20. It is possible that the Canadian wage rate would have been lower without the Auto Pact since the United Auto Workers may have been less successful in pressing for nominal wage parity in vehicle manufacturing. However this effect, if operative, would further reduce the cost-savings attributable to the Auto Pact. The hypothetical exercise described in this section is theoretically susceptible to the Lucas Critique since the cost function parameters might not be invariant to the variation in policies, as assumed. We expect this issue to be unimportant empirically since, as discussed in Section II, the domestic content provisions introduced by the Auto Pact did not become binding constraints.

21. We did not change the product mix variable to take account of the fact that a reversal of rationalization would influence this variable. The actual effect of this variable on unit cost differences is minimal and any change in the variable could also be expected to have a minimal effect.

22. Since 1982 Canada has been in a surplus position with respect to trade with the U.S. under the Auto Pact. This fact does not diminish our argument since by 1982 a further (and continuing) substantial devaluation of the Canadian dollar had occurred.

23. The thrust of this section is supported by Baldwin and Gorecki's (1986) Canada-U.S. value-added TFP level comparisons which utilize disaggregated Canadian individual establishment data. They find that for the two digit transportation equipment industry (consisting of 8 four digit sub-industries), the Canadian industry was only 72% as efficient as its U.S. counterpart in 1970, and only 67% as efficient in 1979. After eliminating the effect of scale economies, Baldwin and Gorecki estimate that the Canadian CSE disadvantage (in terms of productivity rather than cost efficiency) was 23% in 1970 and 22% in 1979.

24. For a derivation of this result see Fuss and Waverman (1987).

25. The fact that LP grew more rapidly than TFP in this industry also holds for value-added measures of productivity. Sharpe (1983) obtained the following results on a value-added basis:

Industry	Productivity Measure	1961-73 (average % growth)		1973-79 (average % growth)	
		U.S.	CANADA	U.S.	CANADA
transportation equipment	LP	3.6	6.4	1.0	3.3
	TFP	2.9	2.4	0.3	0.7
motor vehicles & equipment	LP	4.3	8.5	1.6	1.5
	TFP	not calculated		not calculated	

26. Cox and Harris (1985) p.131.

27. Cox and Harris used an estimate that was approximately half-way between the econometric estimate for 1968 calculated by Fuss and Gupta (1981) and the engineering estimate contained in Gorecki (1978). Our estimate is very close to the Fuss and Gupta estimate. As noted by Cox and Harris, the econometric estimates are consistently below engineering estimates. However, since the engineering estimates assume a single product line, they include any theoretical cost savings from specialization. Had we applied Cox and Harris's scale elasticity estimate of 1.25 to our aggregate output growth, we would have obtained a larger efficiency gain attributable to scale economies under the Auto Pact but a correspondingly smaller (probably negative) gain attributable to CSE (i.e. specialization), since the sum of the two (relative TFP growth) would remain unchanged.

28. After the oil crisis of 1973, the switch in consumer preferences towards small energy-efficient automobiles led to increased competitive pressures from European and Japanese producers. The Voluntary Restraints Agreements between Japan and Canada and the U.S. since 1981 have substantially reduced the competitive threat of Japanese imports.

29. We are not suggesting that the selective trade liberalization of the Auto Pact provided no significant benefits to Canada, but rather that a substantial decline in Canadian relative unit cost was not among the benefits. The elimination of tariffs for North American producers led to a very large increase in intra-industry trade

across the U.S.-Canada border as producers exploited intra-industry cost advantages. In addition, Canada has been a clear winner in terms of the distribution of production. We estimate that the Auto Pact led to a 52% increase in Canadian production capacity by 1970 over what it otherwise would have been, although this advantage declined to 24% by 1975 (Fuss and Waverman 1987). U.S. production capacity was 4% less in 1970 than it would have been without the Auto Pact. This disadvantage declined to 2% by 1975.

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TABLE 1a

Factor Own Price Elasticities
(computed at the mean data point for each country)

Input	United States	Canada
Capital	-0.33	-0.16
Materials	-0.17	-0.09
Labour	-0.53	-0.43

TABLE 1b

Elasticities of Substitution (Allen-Uzawa)
(computed at the mean data point for each country)

Inputs	United States	Canada
Capital-Materials	0.35	0.17
Capital-Labour	0.58	0.22
Labour-Materials	0.67	0.53

TABLE 2

Cost-Output Elasticities, Scale Elasticities, Capacity Utilization Elasticities, Technical Change Elasticities, and Product Mix Elasticities

(computed at the mean data point for each country)

Elasticity	United States	Canada
Cost-Output	0.93	0.96
Scale	1.07	1.04
Cost-Capacity Utilization	0.82	0.79
Cost-Technical Change	-0.24	-0.21
Cost-Product Mix	0.02	-0.09

TABLE 3

Unit Production Cost Difference and Its Sources - Canada-United States

Time Period	Unit Production Cost Difference (%)*	SOURCES OF DIFFERENCE (%)							
		Price of Labour	Price of Capital	Price of Materials	Cost Efficiency Difference	Product Mix	Scale Economies	Capacity Utilization	Country Specific Efficiency
1962-64	1.4	-6.0	-12.6	-2.8	26.9	0.1	21.1	2.2	2.2
1970-72	6.9	-4.7	-3.0	-2.8	19.0	0.4	12.1	0.7	5.7
1977-79	-2.9	-5.7	-3.4	-12.2	21.4	0.0	7.8	1.6	10.3
1979	-8.9	-6.2	-5.0	-14.9	20.2	-0.0	7.0	2.3	11.5
1980	-14.5	-7.2	-6.6	-12.6	13.0	-0.2	8.3	-3.1	10.5

* $(\frac{\text{Canada}}{\text{U.S.}} - 1) \times 100$

TABLE 4

Unit Production Cost Difference and Its Sources, Including Exchange Rate Fluctuations from Purchasing Power Parity - Canada-United States

Time Period	Unit Production Cost Difference (%)*	SOURCES OF DIFFERENCE (%)								
		Price of Labour	Price of Capital	Price of Materials	Cost Efficiency Difference	Product Mix	Scale Economies	Capacity Utilization	Country Specific Efficiency	Exchange Rate Fluctuation
1962-64	1.4	-4.6	-11.4	3.0	26.9	0.1	21.1	2.2	2.2	-8.3
1970-72	6.9	-4.7	-3.0	-2.7	19.0	0.4	12.1	0.7	5.7	-0.1
1977-79	-2.9	-5.5	-3.2	-11.2	21.4	0.0	7.8	1.6	10.3	-1.5
1979	-8.9	-5.7	-4.6	-12.7	20.2	-0.0	7.0	2.3	11.4	-3.5
1980	-14.5	-6.6	-6.0	-10.0	13.0	-0.2	8.3	-3.1	10.4	-4.2

* $(\frac{\text{Canada}}{\text{U.S.}} - 1) \times 100$

TABLE 5

Output Price and Marginal Cost Differences

Time Period	Output Price Difference*	Short-Run Marginal Cost Difference*	Long-Run Marginal Cost Difference*
1962-64	4.8	-7.1	2.6
1970-72	6.0	4.4	10.3
1977-79	-1.4	-9.8	-2.3
1979	-3.8	-14.8	-6.8
1980	-2.4	2.8	-4.9

* $(\frac{\text{Canada}}{\text{U.S.}} - 1) \times 100$

TABLE 6

Canadian Relative Unit Cost Reductions Due to the Auto Pact and Its Sources - Motor Vehicle Industry

Time Period	Relative Production Cost Reduction (%)*	SOURCES OF REDUCTION	
		Scale Economies	Country Specific Efficiency
1970-72	3.1	2.0	0.6
1977-79	1.7	0.6	0.8
1979	1.4	0.3	0.9
1980	1.9	0.6	0.9

* $(\frac{\text{Canada}}{\text{U.S.}} - 1) \times 100$

TABLE 7

Annual Growth Rates in the Automobile Industry (%)

	OUTPUT		TOTAL FACTOR PRODUCTIVITY		LABOUR PRODUCTIVITY	
	U.S.	CANADA	U.S.	CANADA	U.S.	CANADA
1966-72	2.8	12.8	1.0	1.5	3.0	8.7
1966-79	3.5	9.8	1.1	1.3	2.5	7.2

TABLE 8

Labour Productivity
(Real Output/Hr. Worked)

	Canada	U.S.	% U.S. Advantage*
1966	25.4	32.7	28.7
1972	40.8	40.0	-2.0
1979	59.7	46.0	-23.0

* $(\frac{\text{U.S.}}{\text{Canada}} - 1) \times 100$

TABLE 9

Labour Productivity Growth in the Canadian Automobile Industry and Its Sources

Time Period	Labour Productivity Growth Rate (%)	% CONTRIBUTION DUE: Total Factor Productivity Growth	Bias	Factor Substitution
1966-72	8.7	17.8	55.8	26.4
1966-79	7.2	18.6	60.7	20.7