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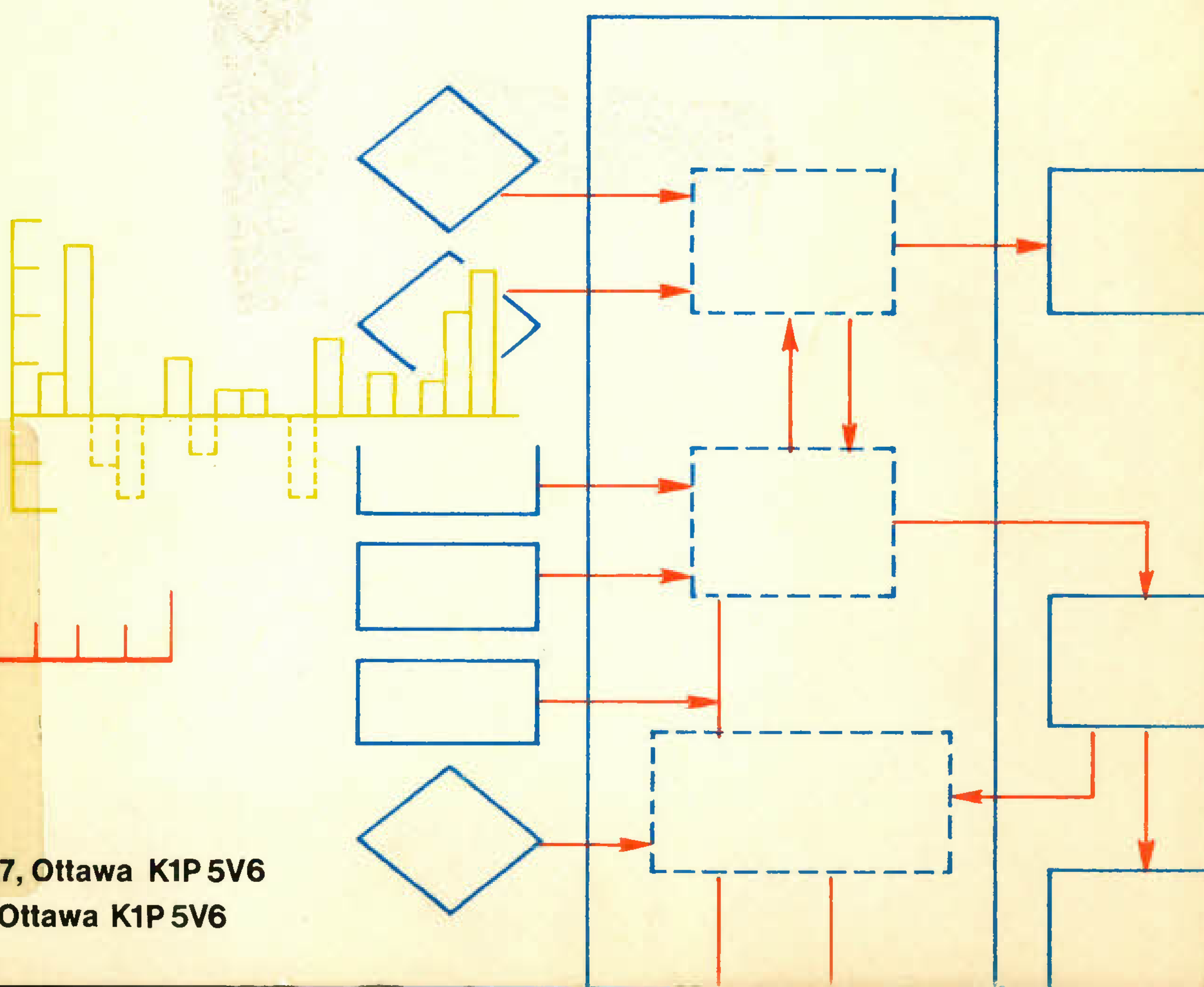

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DISCUSSION PAPER NO. 110

PROTECTION; AND PRICES, PROFITS AND PRODUCTIVITY IN THIRTY-THREE CANADIAN MANUFACTURING INDUSTRIES

by

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RÉSUMÉ

Ce document étudie les répercussions de la protection tarifaire au Canada sur les prix, la profitabilité et la productivité dans 33 industries. Il est démontré que l'hypothèse de travail généralement admise, suivant laquelle les prix seraient déterminés au Canada en ajoutant la valeur des tarifs aux prix internationaux, n'est pas valide en général. La structure du marché intérieur et le coût des facteurs de production limitent la latitude de l'industrie canadienne à tirer profit de la protection tarifaire.

L'absence d'une relation significative entre les tarifs et la profitabilité suggère que la protection a été absorbée par des coûts plus élevés, ne permettant pas aux industries de se l'approprier sous forme de rentes.

Une analyse plus poussée des liens de causalité entre protection et coûts révèle que des coûts élevés conduisent à des tarifs élevés. La protection tarifaire ne semble pas encourager un accroissement des coûts. Au contraire, les industries les mieux protégées ont connu un taux d'augmentation de leurs coûts unitaires inférieur à la moyenne, au cours de la période 1961 à 1972.

ABSTRACT

This paper examines the effects that tariff protection has on prices, profitability, and productivity in 33 Canadian industries. It is found that the common assumption of pricing up to the tariff is not, in general, valid -- domestic market structure and cost factors limit the extent to which Canadian industry takes advantage of tariff protection.

No relationship is found between tariffs and profitability, which suggests that protection is dissipated in higher costs; not captured as rents by the industry.

Further investigation of the protection-costs relationship reveals that causation runs from high costs to high tariffs. Tariff protection does not appear to encourage costs to rise; on the contrary, the more highly protected industries showed a better-than-average rate of change of unit costs over the period 1961-72.

I Introduction and Summary

The nature of the relationship between prices and tariffs is of obvious importance to the measurement of the costs of trade protection -- only if we know how domestic costs and prices are affected by tariff barriers can we forecast the consequences of raising or lowering these barriers.

Typically, however, theoretical and empirical work has proceeded on the simple and untested assumption that domestic price is set equal to the world price plus the full amount of the tariff.[1]

If the assumption is not valid -- if domestic sellers do not price up to the tariff, and especially if the price/tariff relationship differs across industries -- then neither will the calculations of the effects on industries and regions of changes in tariff protection be valid.

In section II the plausibility of the traditional pricing model is questioned on the basis of evidence of intra-industry trade and non-unique prices of traded commodities. An alternative pricing model incorporating domestic cost and market structure variables is proposed in section III. In section IV, the two pricing models are

1 Cf. Wilkinson and Norrie (1975), Grubel and Johnson (1971).

compared directly for their ability to explain variations in the U.S./Canada price ratios of thirty-three manufactured commodities.

The proposition that foreign prices and the tariff are the sole determinants of domestic price is rejected by the data -- domestic cost and structure factors do matter -- but tariff protection does appear to be one of the important variables in the pricing process.

Next, in section V, we take the investigation a step further by asking whether the higher prices associated with higher tariffsare captured as rents by the protected domestic industry, or whether they are associated with higher costs reflecting lower domestic productivity. The latter appears to be true, since the rate of protection bears no relationship, in our sample of data, to profitability.

This results leads us on to section VI, to query the direction of causation in the link between costs and protection. Does the shelter of a tariff wall allow costs to drift up, or is it just that relatively high-cost industries receive the most sympathetic hearing from government when it is formulating its commercial policy? In Canada, it seems that the causation runs from high costs to high protection. Indeed, highly protected industries had a lower than average rate of increase in unit costs over the period 1961-72. As well, however, they tended to apply a somewhat larger price mark-up to increases in costs than was average for the sample.

These results may not generalize to other countries. Canada has an unusually high degree of interdependence with its major trading partner, an interdependence reflected not just in the magnitude of commodity trade,[2] but also in its composition. Many American and Canadian firms have plants in both countries, so that much of the trade is between subsidiaries under common ownership.

Nevertheless, the results will be useful if they stimulate similar research on pricing in other trading economies, so that we may begin to strengthen what, up until now, has been a rather weak link in the chain of tariff protection calculations.

II Models of Pricing

The traditional pricing assumption of the protection literature may be written:

$$P_{di}/P_{wi} = 1 + t_i \qquad (1)$$

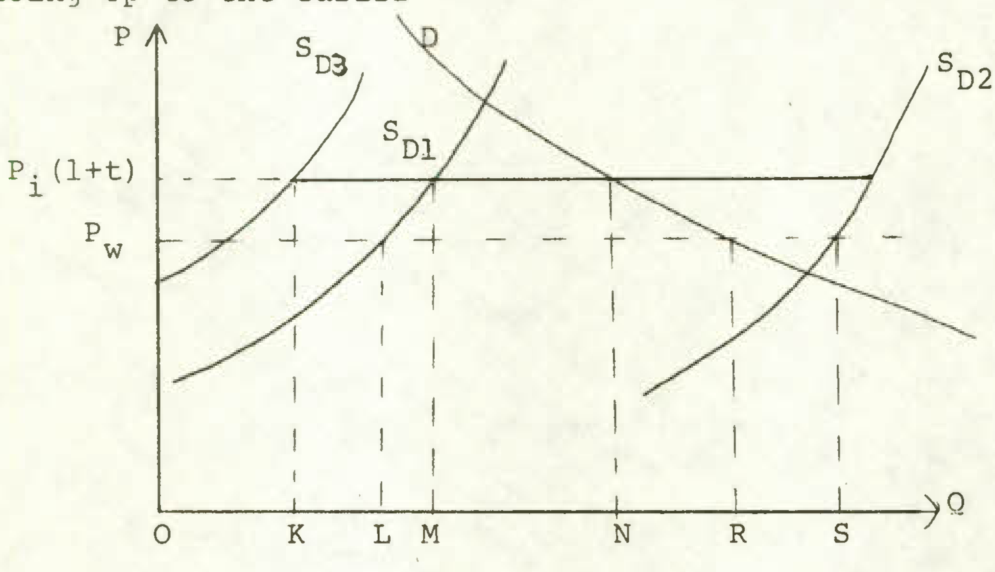
The divergence from one of the domestic/world price ratio equals the tariff rate on commodity i. Equation (1) is true for markets for a homogeneous good in infinitely elastic supply on the world market. This situation is illustrated in

2 Around 70 per cent of Canada's imports are from the United States.

Figure 1. The homogeneous good assumption means that the price of domestically produced output cannot be greater than the world price plus the tariff, and since domestic producers can sell all they want to at this price, they will not sell below (P_w+t), so Equation (1) holds. With a tariff, t , and a domestic supply curve S_{D1} , total domestic demand is ON, of which MN is imported. If the tariff were removed, demand would increase to OR, and local production fall to OL, leaving LR to be supplied from abroad. If the domestic supply curve was to the right of the demand curve at P_w, the economy would be an exporter of quantity RS.[3]

Figure 1

Pricing Up to the Tariff



3 Presumably, there would be no tariff in an exporting industry. If there were, then it would pay the domestic producers to price discriminately, selling locally at P_w+t, and internationally at P_w.

Apart from the pricing Equation (1), this model has three notable features:

(1) A commodity is either exported or imported, but not both.[4]

(2) Domestic costs have no effect on price. An increase, say, in unit costs, shifting the supply curve to S_{D3}, reduces domestic output to OK, but does not change price.

(3) Domestic market structure has no effect on price. The industry supply curves in Figure 1 are the horizontal summation of the marginal cost schedules of all the domestic producers. It makes no difference whether there is one such producer or one thousand -- since the industry is a price-taker there is no opportunity for market power to arise.

All these properties are questionable on the basis of what we know, or think we know, about the economy. First, there is quite pervasive evidence, notably of Grubel and Lloyd (1975), of <u>intra</u>-industry trade -- industries in which we observe both exports and imports simultaneously. Grubel and Lloyd calculate a coefficient of the extent of

$$B_i \equiv \frac{(X_i + M_i) - |X_i - M_i|}{(X_i + M_i)} \times 100 \qquad (2)$$

(X = value of exports, M = value of imports)

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4 If there are transport costs, there will be a zone of possible intersection points of domestic supply and demand curves in which no trade takes place.

intra-industry trade, and calculate it for 3-digit industries in ten countries for the year 1967. The average value for this sample was 50 per cent. For the thirty-three Canadian 3-digit industries to be studied in this paper, the average value of B_i was very similar, at 49 per cent.

To get a feel for the magnitude of intra-industry trade, note that a value of 50 per cent would be shown by an industry in which imports were one-third as large as exports (or vice versa). Furthermore, Grubel and Lloyd's case study of Australia (1975, Chapter 4) which examines trade flows down to the 7-digit level, suggests that intra-industry trade is not just a statistical illusion attributable to using too-highly aggregated industrial classifications.

Second, the property that domestic cost conditions do not affect price is surprising in view of the prominent role domestic costs play in most time-series econometric specifications of the pricing equation. Indeed, these specifications often attribute all the variation in domestic prices to the mark-up on costs, with no role given to the price of competing imports (for Canada, cf. Bodkin and Tanny, 1975).

Finally, the irrelevance of market structure may conflict with the numerous studies in the industrial organization area, which apparently uncover some sort of a statistical link between domestic market structure variables and profitability, and interpret this as a relationship between structure and price-setting (for Canada, cf. McFetridge(1973), and Jones, Laudadio and Percy (1973)).

III An Alternative Pricing Model

The key to building a model of domestic price-setting that is consistent with the evidence noted in the previous section is to drop the assumption of a homogeneous good in each market. There are good empirical grounds for so doing; Isard (1977), found significant evidence of exchange-rate-related fluctuations in the ratio (in U.S. dollars) of U.S. import-to-export unit values at the 7-digit commodity level, which is inconsistent with the homogeneous good/unique price postulate. This suggests a picture of a typical industry as one in which firms and products are differentiated by reputation, reliability, availability, ability to meet special requirements, and so on, so that whereas some consumers, at home and abroad, prefer the domestic product , others prefer foreign brands, and we may observe both exports and imports in the same industrial classification.

This product heterogeneity suggests, too, that domestic producers do not, in general, face a perfectly elastic supply of perfect substitutes for their output, so that they are no longer price-takers in the absolute sense of Figure 1 -- they have some market power in that they can make a change in price without experiencing an infinite change in the quantity demanded.

Thus, price becomes a decision variable, its level to be set by each domestic producer according to the prices of his competitors, both domestic and foreign.

In the pricing of a differentiated product we can expect both costs and market structure to matter. When the demand curve is downward-sloping the most profitable level of output (and thus price) is not in general invariant to shifts in the marginal cost schedule, and the position and slope of the demand curve will be determined by the sensitivity of demand to prices of substitutes, which in turn should be related to structural factors such as size of market area, "stock" of good-will achievable through economies of scale in advertising, control of patents and licences, and ownership or control of retailing outlets.

There is a trade-off between introducing realism into our specification of the pricing process and analytical neatness -- there does not seem to be any way of incorporating structure and cost factors in a simple diagram like Figure 1. Nevertheless, a reasonable specification of the augmented hypothesis might be:

$$\frac{P_{di}}{P_{wi}} = 1 + f(P_i^s, \ t_i, \ C_i, \ X_i) \qquad (3)$$

where P_i^s is a vector of the prices in Canada of products competing (non-zero cross-price elasticities) with i, t_i is the tariff rate on i, as before, and C_i and X_i are vectors of relative cost and market structure variables affecting the industry producing commodity i.

Equation (3) and the traditional model (1) will be specified econometrically and compared in the next section.

IV Testing the Pricing Models

In order to specify and compare empirically models (1) and (3), they must be put in a form amenable to regression analysis on the data available.

Our empirical work is built around recent calculations by Frank (1977) of 1972 Canadian/U.S. relative domestic output and input prices for thirty-three manufactured commodities. In using these data we are assuming that the "world" price can be proxied by the U.S. domestic price. Given the importance noted above of imports from the United States in total Canadian imports, this may be a reasonable assumption; only *ex post*, on the basis of the results, can we judge this.

Tariff data are those calculated for 1970 by Dauphin (1978). Both "net" and "gross" rates are available. The latter includes tariff protection only on the final commodity, and the former measure adjusts final protection of domestic producers by the tariffs imposed on their inputs. Net protection is the same as the concept of "effective protection" (cf. Wilkinson and Norrie (1975)), except that it is measured relative to the gross price rather than to value added. In the traditional model (1), in which domestic price is set entirely by the landed price of competing imports with no price effect of changes in costs, the gross rate of tariff protection is appropriate. For the augmented model, on the other hand, in which costs are expected to matter, net protection should be more appropriate.

The data on the market structure factors in (3), are taken from the Canadian Input-Output Tables and other Statistics Canada publications. All data are sourced and defined precisely in the Appendix. Estimation is by the Ordinary Least Squares (OLS) program on the MASSAGER package. OLS should be adequate to estimate the cross-sectional models, since we have no problems with serial correlation of the errors, and the use of ratio forms for the variables reduces the chance of heteroscedasticity mattering.

First, (1) is estimated using the Canadian/U.S. price ratio as the dependent variable, trying both net and gross rates of tariff protection (NP, GP), and not imposing the constraint that the coefficient on the constant be equal to one. The results are:

$$P_{Ci}/P_{US,i} = \underset{(32.18)}{1.006} + \underset{(2.50)}{0.868}\ NP_i\ , \quad \bar{R}^2 = 0.168 \qquad (4)$$

$$P_{Ci}/P_{US,i} = \underset{(27.30)}{0.987} + \underset{(2.64)}{0.685}\ GP_i\ , \quad \bar{R}^2 = 0.184 \qquad (5)$$

On the face of it, these regressions seem to give some support to the traditional model. The constant terms are very nearly one, GP performs better than NP, and its coefficient is not significantly (two standard errors) different from one -- the shortfall might easily be attributable to measurement error. However, although it is encouraging to find that our price and protection data are not independent random variables, the explanatory power of regression (5) is not very high, and it seems worthwhile to test the augmented specification.

First, a straightforward linear model is estimated, incorporating variables measuring relative costs and market structure, and trying out NP and GP:

$$\begin{aligned} P_{Ci}/P_{US,i} = {} & \underset{(3.36)}{0.595} + \underset{(2.30)}{0.446}\ HF_i - \underset{(-1.27)}{0.091}\ EX_i \\ & - \underset{(-2.94)}{0.249}\ RPROD_i + \underset{(3.48)}{0.560}\ RMATP_i \\ & + \underset{(2.71)}{0.786}\ NP_i\ , \quad \bar{R}^2 = 0.490 \qquad (6) \end{aligned}$$

$$P_{Ci}/P_{US,i} = \underset{(3.62)}{0.660} + \underset{(2.17)}{0.444}\, HF_i - \underset{(-1.04)}{0.083}\, EX_i$$

$$- \underset{(-2.69)}{0.240}\, RPROD_i + \underset{(2.93)}{0.489}\, RMATP_i$$

$$+ \underset{(1.99)}{0.479}\, GP_i\,, \quad \bar{R}^2 = 0.434 \qquad (7)$$

The new variables are the Herfindahl index of concentration, HF, the proportion of exports to domestic shipments, EX, and two relative cost variables, the ratios, in each industry, of Canadian to U.S. labour productivity (RPROD) and materials prices (RMATP). The market structure variables are two of the four that I have found to be important in explaining profitability in Canadian industries (cf. Hazledine (1978a), and section V, below). The other two -- the proportion of output sold to other firms (rather than to final consumers), and the proportion of domestic demand imported, were not significant in explaining relative Canadian/U.S. prices. This may be because the U.S. values of these variables affect the U.S. price, and do not differ much between the two countries, so that their effect on relative prices cancels out, whereas, given their different sizes, Herfindahl indexes may not be strongly related in similar industries in the two economies, nor, perhaps, the export/shipments ratio.

Examining the results of the regression, we see that the augmented hypothesis is a success. At least one market structure variable, the Herfindahl index, and both relative cost measures, are significant determinants of relative prices. Protection matters, too, with NP doing better than the gross protection variable, GP, as predicted. The goodness of fit is considerably higher in (6) than for the traditional specification, and the latter should therefore be rejected.

Next we develop further the augmented model. In (6), structure and cost variables affect relative prices independently of tariff protection. An interesting hypothesis is that the degree to which an industry can take advantage of tariffs to mark up domestic prices is a function of structure and cost factors. This suggests restricting (3) to:

$$P_{di}/P_{US,i} = 1 + t_i g(C_i \, , X_i) \qquad (8)$$

Equation (8) is estimated assuming g to be a linear function of the C and X variables:

$$\begin{aligned} P_{Ci}/P_{US,i} = \underset{(40.70)}{1.004} + NP_i(&\underset{(-2.08)}{-3.872} + \underset{(2.84)}{4.713}\, HF_i \\ &- \underset{(-0.30)}{0.350}\, EX_i - \underset{(-3.17)}{3.269}\, RPROD_i \\ &+ \underset{(3.69)}{6.668}\, RMATP_i) \;, \quad \bar{R}^2 = 0.520 \end{aligned} \qquad (9)$$

This specification achieves a higher $\bar{R}^2$ than (6), supporting the model of Equation (8). To get an idea of the magnitude of the effect of market power on pricing-up-to-the-tariff, I calculated the expression inside brackets in (9) for the mean values of EX, RPROD and RMAT, and over a range of Herfindahls (cf. Appendix for variable means). These are shown in Table 1.

Table 1

Values of the Coefficient of NP

Herfindahl	0.00	0.05	0.10	0.15	0.20
NP coefficient	0.394	0.630	0.865	1.101	1.336

(Calculated as 0.394 + 4.71 HF.)

These figures imply a quite strong influence of market power on pricing. An "atomistic" industry (HF = 0.00) would, according to Table 1, pass on only about 40 per cent of the tariff, whereas an industry with a Herfindahl somewhere between 0.10 and 0.15 (the mean value of HF for the thirty-three industries is 0.104), is able to price right up to the tariff barrier. We should not, I expect, place a lot of trust in the NP coefficients for high Herfindahls, which apparently are greater than one -- the linearity assumption is probably not valid for outlying observations (only seven of the thirty-three industries have Herfindahls greater than 0.15).

The results of this section, in summary, are that cost and market structure factors do influence domestic prices;

in particular, that they limit the extent to which an industry can take advantage of tariff protection. The figures in Table 1 imply that using the traditional assumption of full pricing-up-to-the-tariff will, for most industries, over-estimate the value of protection.

Although these regressions do attribute a significant role to domestic factors in establishing the link between tariffs and prices, we should not rule out the possibility that some of the difference between the Canadian/U.S. price differential and the tariff is due to the price of U.S. exports to Canada being less than the domestic prices measured by Frank. When there is some elasticity of supply, some of the burden of a tariff will, in general, be borne by the exporting country. To test for this we would need data on the prices actually paid in Canada for goods imported from the United States.[5]

Finally, we may observe that these price equations represent some advance over the earlier results, using 1963 data, of West (1971), who did not find a significant measure of protection and did not test market structure variables.

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5 Note that the success of the pricing equation supports the use of the U.S. price as a "world" price. Even in the six clothing and textile industries, for which we might expect the U.S. price not to be a good proxy for the Canadian import price, three of the residuals in (9) were positive and three negative, and none of them unusually large.

V Protection and Profitability

Having discovered a significant, market power-related link between tariffs and prices, we ask next who gains from protection -- to what extent are higher prices captured as rents by protected domestic producers, and to what extent are they associated with higher costs? We approach these questions by proposing an equation to explain industry profitability as a function of market structure and tariff protection:

$$SURP_i = h(X_i , t_i) \tag{10}$$

where X_i is the vector of structural variables, and t_i a measure of tariff protection, as before. The dependent variable, SURP, or "surplus" is measured as the ratio of gross profits to "normal returns" in 1972;

$$SURP_i \equiv Profits_i/(Normal\ Returns)_i \tag{11}$$

where

$$(Normal\ Returns)_i = R_K K_i + R_M W_i \tag{12}$$

Normal returns are defined as the profits that would be earned on the resources committed to the industry by an entrepreneur with no market power. They are measured in (12) as a mark-up on K, the capital stock plus inventories, plus a mark-up on the wage bill, W, reflecting the returns to managing a labour force. The R_K and R_W values are selected by a search over a grid of possible values -- those chosen (0.05 and 0.50, respectively), allowed a specification of the function h to be estimated that best predicted values of gross profits. The Surplus measure of profitability is explained more fully in Hazledine (1978a). Its validity is not of crucial importance to the present study, since specifying a profitability equation with the conventional gross margin on sales as dependent variable gives similar results to those reported below.

I specified h as a linear function of four market structure variables and the net rate of protection. The regression equation is:

$$\begin{aligned} SURP_i = {} & \underset{(6.42)}{1.449} + \underset{(3.85)}{4.646}\, HF_i + \underset{(1.30)}{0.896}\, EX_i \\ & - \underset{(-3.23)}{0.756}\, INT_i - \underset{(-1.22)}{0.856}\, IM_i \\ & + \underset{(0.08)}{0.177}\, NP_i, \quad \bar{R}^2 = 0.365 \end{aligned} \tag{13}$$

The two new structure variables are the proportion of sales made to intermediate users (INT), and the proportion of the total domestic market supplied by imports, IM.

In Equation (13), the Herfindahl is a significant regressor, having its expected positive relationship with profitability. The export ratio has a positive coefficient, whereas its effect in the pricing Equation (9) was negative.

Although the statistical associations are too feeble for much to be made of this, we might at least note that the coefficient signs on EX are consistent with a picture of exporters as relatively efficient operators who pass on some, but not all, of their productivity advantages in lower prices.

The coefficient on INT implies that it is more profitable selling to final consumers than to other firms, presumably because the latter have more "countervailing power". This is consistent with the results from other samples (Hazledine, 1978 a, b). The propensity to import is not a significant factor, which I do not find very surprising, since I am unable to formulate an unambiguous sign prediction for the coefficient of this variable. It could be the most profitable industries that attract the most entry from foreign suppliers; on the other hand, imports may flow in as a residual to a market which domestic producers find it unprofitable to service.

Of most interest, of course, is the performance of the protection variable. It shows absolutely no statistical significance, implying that protected producers do not thereby earn any measurable rents -- high prices are matched by high costs. Fiddling with the specification (for example, by substituting GP for NP), does not alter this conclusion.

The preferred profitability model, therefore, does not include a measure of protection as a regressor:

$$SURP_i = \underset{(7.96)}{1.460} + \underset{(3.94)}{4.655}\ HF_i + \underset{(1.47)}{0.867}\ EX_i$$

$$- \underset{(-3.30)}{0.754}\ INT_i - \underset{(-1.35)}{0.831}\ IM_i \qquad \bar{R}^2 = 0.387 \qquad (14)$$

VI Protection and Costs

The findings of the previous sections -- that, while prices are related to protection, profits are not -- imply that costs must be positively associated with protection. These results do not, however, give us any information on the important matter of the causation of the protection-costs linkages.

Helleiner (1977) suggests that Canada's relatively low-skilled industries will be the ones which are most susceptible to competition from developing countries, and that the tariffs on such industries will be relatively less likely to be affected by the rounds of GATT negotiations.

> Since developing countries have not had as much to bargain with..., and since in these products the developed countries have more to fear from developing countries than from each other, the relevant tariffs of the OECD countries have not been lowered as much. (1977, pp. 318-19.)

Helleiner uses the wage per worker as a proxy for "skill" intensity. It could more broadly be interpreted as a proxy for labour productivity in an industry, when this can vary due to factors external to workers' skill levels, if regional or other rigidites allow different wages for similar workers to persist.

Estimating a simplified version of Helleiner's model on our data base (we do attempt to include various structural variables tried and found to be insignificant by Helleiner), results in regression equations for gross and net protection:

$$GP_i = \underset{(4.91)}{0.268} - \underset{(-2.82)}{23.84}\ W/E_i + \underset{(1.58)}{4.59}\ P/E_i \qquad \bar{R}^2 = 0.159 \tag{15}$$

$$NP_i = \underset{(3.01)}{0.135} - \underset{(-1.51)}{10.48}\ W/E_i + \underset{(1.01)}{2.40}\ P/E_i \qquad \bar{R}^2 = 0.009 \tag{16}$$

In (15) and (16) W/E and P/E measure the wage and nonwage value added per worker. Regressions with just total value added per worker were not successful (nor for Helleiner), which is not surprising since its two components in (15) and (16) show opposite signs.

Three points may be made about these results. First, although we cannot compare the overall goodness of fit of two regressions with different dependent variables, the t-statistics do suggest that the gross protection specification is the more successful. If so, this is consistent with the direction of causation being as implied in the specification -- from costs to protection -- since it would be the net protection rate, if anything, that would affect costs. The better performance of GPR suggests that policy-makers suffer from what might be called "tariff illusion" (cf. Helleiner, p. 323, for some discussion of this point).

The second and third points are that wages per employee have a negative and quite significant effect on GP_i,[6] as expected, and that there is weak evidence of a positive link between protection and non-wage value added per employee -- a linkage which I am not able to rationalize.

The evidence of "tariff illusion" suggests an interpretation of the result that, in regressions (4) and (5) GP_i was somewhat superior to NP_i in "explaining" relative prices, in the absence of cost and structure variables. The causation may be in the other direction -- from prices to protection, if prices are a proxy for costs, in which case the results of this section make it unsurprising that GP_i is more strongly correlated with prices than is NP_i.

We can look more directly at the question of causation in the association between costs and protection by examining changes in these variables, using the data on effective and nominal protection calculated by Wilkinson and Norrie (1975) for 1961 and 1970, since the protection rates from Dauphin used in the rest of this paper are only available for 1970.

I did not have any statistically significant success in adding to our understanding of the tariff-setting process by modelling changes in protection rates. This is not very

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6 This negative correlation seems to rule out the possibility that the failure of protection and profits to show any relationship is because all the rents are captured by labour in higher wages.

surprising, since the explanatory power of the level of protection regressions (15) and (16) is not high, and we should probably not expect to do any better at fitting the "lumpy" political mechanisms through which changes in tariffs are effected.

Much more successful and interesting are the results of regressing the change in costs between 1961 and 1972 on the level of protection at the beginning of the decade:

$$\dot{c}_i = \underset{(9.77)}{0.600} - \underset{(-5.25)}{0.013}\ EPROT61_i \qquad R^2 = 0.470 \qquad (17)$$

where $\dot{c}$ is the rate of change of total (labour and materials) costs per unit of real output, and EPROT61 is the Wilkinson and Norrie rate of effective tariff protection for 1961.

The striking feature of (17) is the negative and significant coefficient on EPROT61 -- industries enjoying higher rates of protection at the start of the period show a better than average cost performance record over the ten years. Although (17) is no more than an *ex post* statistical correlation (it should not be interpreted as a 'model' explaining cost changes by the level of protection), the sign of the correlation gives strong support to our earlier inference that causation runs from industries with high levels of costs getting more protection rather than high protection giving a shelter from competition, behind which costs creep upwards.

Regression (17) is consistent with the Canadian authorities having followed a successful infant industry protective policy -- giving initially high cost but promising industries some shelter behind which they eventually achieve scale economies and efficient operating practices.

However, regressing various measures of industry growth on EPROT61 leads to a rejection of the infant industry policy explanation of (17):

$$\dot{e}_i = \underset{(3.58)}{0.702} - \underset{(-2.59)}{0.0205}\ EPROT61_i \qquad R^2 = 0.178 \qquad (18)$$

$$\dot{k}_i = \underset{(5.20)}{1.168} - \underset{(-2.76)}{0.0250}\ EPROT61_i \qquad R^2 = 0.198 \qquad (19)$$

$$\dot{s}_i = \underset{(4.75)}{1.397} - \underset{(-2.21)}{0.0262}\ EPROT61_i \qquad R^2 = 0.136 \qquad (20)$$

where $\dot{e}$, $\dot{k}$, and $\dot{s}$, are the 1961-72 rates of growth in each industry of employment, real capital stock and real value of shipments.

These regressions imply that high protection is associated with declining industries, not growing infants. In declining industries we might expect improvements in average costs, as the least efficient operators are forced out of business first. About all we can conclude from (17) is that protection has not prevented rationalization from taking place in high-cost industries, but we cannot say whether it has impeded or encouraged the process.

Finally, we look at price changes over the decade:

$$\dot{p}_i = \underset{(-0.38)}{-0.019} + (\underset{(5.26)}{0.706} + \underset{(2.21)}{0.016}\ EPROT61_i)\dot{c}_i$$

$$\bar{R}^2 = 0.627 \qquad (21)$$

The rate at which industries passed on increases in costs into increases in prices was positively related to the level of protection at the beginning of the period. Regression (21) implies that price-cost margins widened in more protected, relative to less protected, industries. Since protection was not significant in explaining profitability in regression (13), we can infer that the degree of widening of margins was not very large; nevertheless, regression (21) is a warning that tariff protection gives an industry some additional market power which it may not always use in ways that the policy-makers intended.

Like (17), though, (21) should not be taken too seriously as a model of price changes -- obviously margins cannot widen without limit if a high level of protection is maintained indefinitely. What it does show is just that some of the changes in price-cost margins that actually occurred between 1961 and 1972 can be associated with the level of protection at the start of this period.

DATA APPENDIX

(Means of variables in brackets)

$P_{Ci}/P_{US,i}$	(1.069)	-- ratio Canadian/U.S. unit shipments price, Canadian quantity weights, 1972 (Frank, 1977, Table 6, pp. 49-53).
$RMATP_i$	(1.021)	-- ratio Canadian/U.S. materials price, Canadian quantity weights, 1972 (Frank, loc. cit.).
$RPROD_i$	(0.761)	-- ratio Canadian/U.S. net output per man-hour, Canadian prices, 1972 (Frank, Table 7, pp. 56-60).
NP_i	(0.073)	-- rate of protection of shipments net of protection on inputs, 1970 (Dauphin, 1978, Table 3-3, pp. 60-63).
GP_i	(0.120)	-- rate of protection on domestic output, gross of protection on inputs, 1970 (Dauphin, Table 3-2, pp. 50-56).
$EPROT61_i$	(22.47)	-- simple effective rate of protection 1961 (Wilkinson and Norrie, 1975, Table A-1, pp. 76-80). Note: mean $EPROT61_i * \dot{c}_i = 5.491$
HF_i	(0.104)	-- Herfindahl index of concentration, 1972 (Statistics Canada Cat. No. 31-402, 1972, Table 3, pp. 107-111).
EX_i	(0.135)	proportion of exports to total domestic shipments (calculated from Statistics Canada, Input-Output Tables, Cat. Nos. 15-506, 15-502).
INT_i	(0.565)	-- proportion of intermediate to total domestic sales (Input-Output Tables).
IM_i	(0.145)	-- proportion of imports to total domestic sales (Input-Output Tables).

W/E_i (0.00775) -- total activity salaries and wages per employee, 1972 (calculated from Statistics Canada, Cat. No. 31-203, Table 3, 1972).

P/E_i (0.00788) -- total activity gross profits (= value added - salaries and wages) per employee, 1972 (as W/E_i).

$SURP_i$ (1.514) -- (total activity gross profits)/(0.05 * mid-year net capital stock + 0.05 * start year total inventories + 0.50 * total activity salaries and wages), 1972 (mid-year net stock, in millions of current dollars, from Statistics Canada. Fixed Capital Flows and Stocks, III-digit industries, unpublished. Inventories from Cat. No. 31-519, Table 2, or from annual individual industry reports from the Census of Manufactures. Other variables sourced above.)

$\dot{c}_i$ (0.308) -- rate of change of total (= labour + materials) costs per unit of real output, 1961-1972 (costs and output data from Cat. No. 31-203, Section A, 1962, Table 4, and Cat. No. 31-203, 1972, Table 3. Output price deflators are industry selling prices from Cat. No. 62-002, Table 2, October 1974).

$\dot{e}_i$ (0.242) -- rate of growth of total activity employment, 1961-1972 (sources as above).

$\dot{s}_i$ (0.809) -- rate of growth of total activity shipments, 1961-1972 (sources as above).

$\dot{k}_i$ (0.606) -- rate of growth of mid-year net capital stock, constant price (for source cf. $SURP_i$).

$\dot{p}_i$ (0.284) -- rate of growth of industry selling price (for source cf. $\dot{c}_i$).

subscripted i (=1, ..., 33) for each of thirty-three III-digit manufacturing industries. (Cf. Frank (1977) Table 6, pp. 49-53, for a list of the industries.)

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