ON MEASURING THE BENEFIT FROM SELLING STEEL IN CANADA RATHER THAN EXPORTING ABROAD

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ON MEASURING THE BENEFIT FROM SELLING STEEL IN CANADA RATHER THAN EXPORTING ABROAD

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May 1975

On Measuring the Benefit from Selling Steel in Canada rather than Exporting Abroad

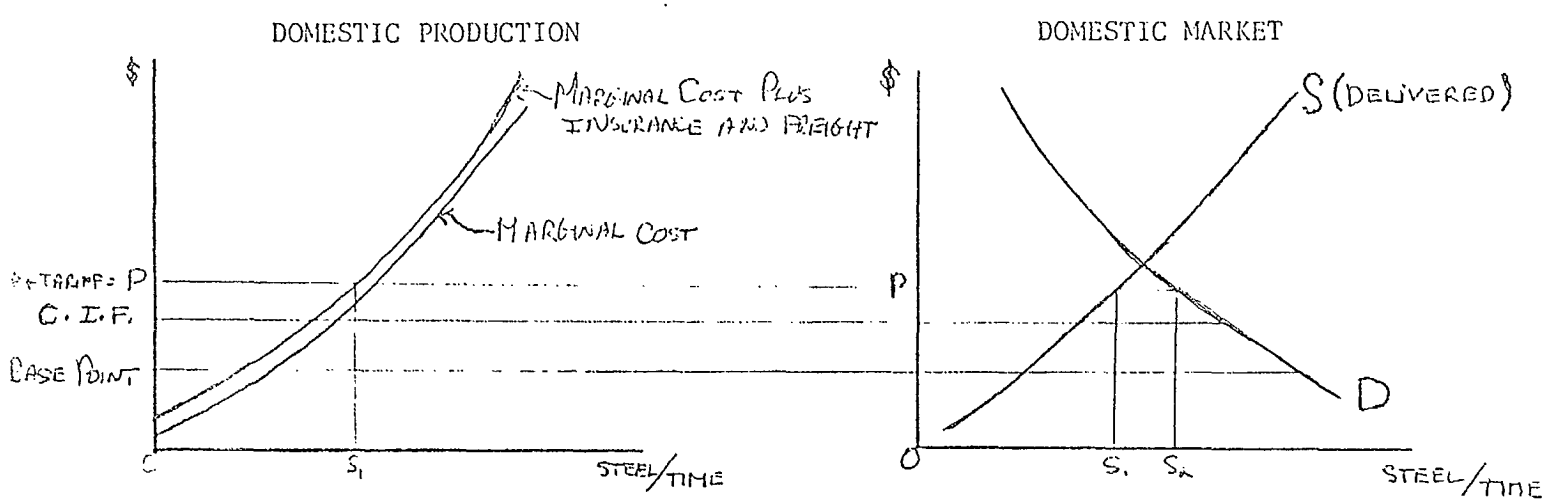
I INTRODUCTION

The purpose of this paper is to explore the nature of the benefits accruing to Canada as a result of selling in Canada, as opposed to exporting, the output of a large steel plant located in Eastern Canada.

II INITIAL SITUATION

Suppose the initial situation is as follows. Canada is a price taker on world steel markets and has a tariff T on imports of steel. At the gross-of-tariff price it is assumed that existing domestic producers supply only part of the market, the remaining purchases being satisfied through imports.

The price of steel is made up of a base point price, say the world price F.O.B., plus transportation and insurance costs to the domestic market, plus the tariff. Transportation and insurance costs are assumed to be supplied at constant cost. The initial situation is summarized in Figure 1.



Domestic production supplies OS_1, per period at price P equal to the C.I.F. price plus the tariff. The excess demand at price P is $(S_2 - S_1)$ and is satisfied by imports.

III INTRODUCTION OF THE NEW PLANT

Allow a new steel plant to enter the picture and assume that the output available to the domestic market, given the current price of steel, exceeds the volume of imports. Since the volume of steel available from the new plant (N) exceeds the volume of imports, price will fall to P^* in Figure 2C. This price reduction will have three major effects to which we must direct our attention, namely:

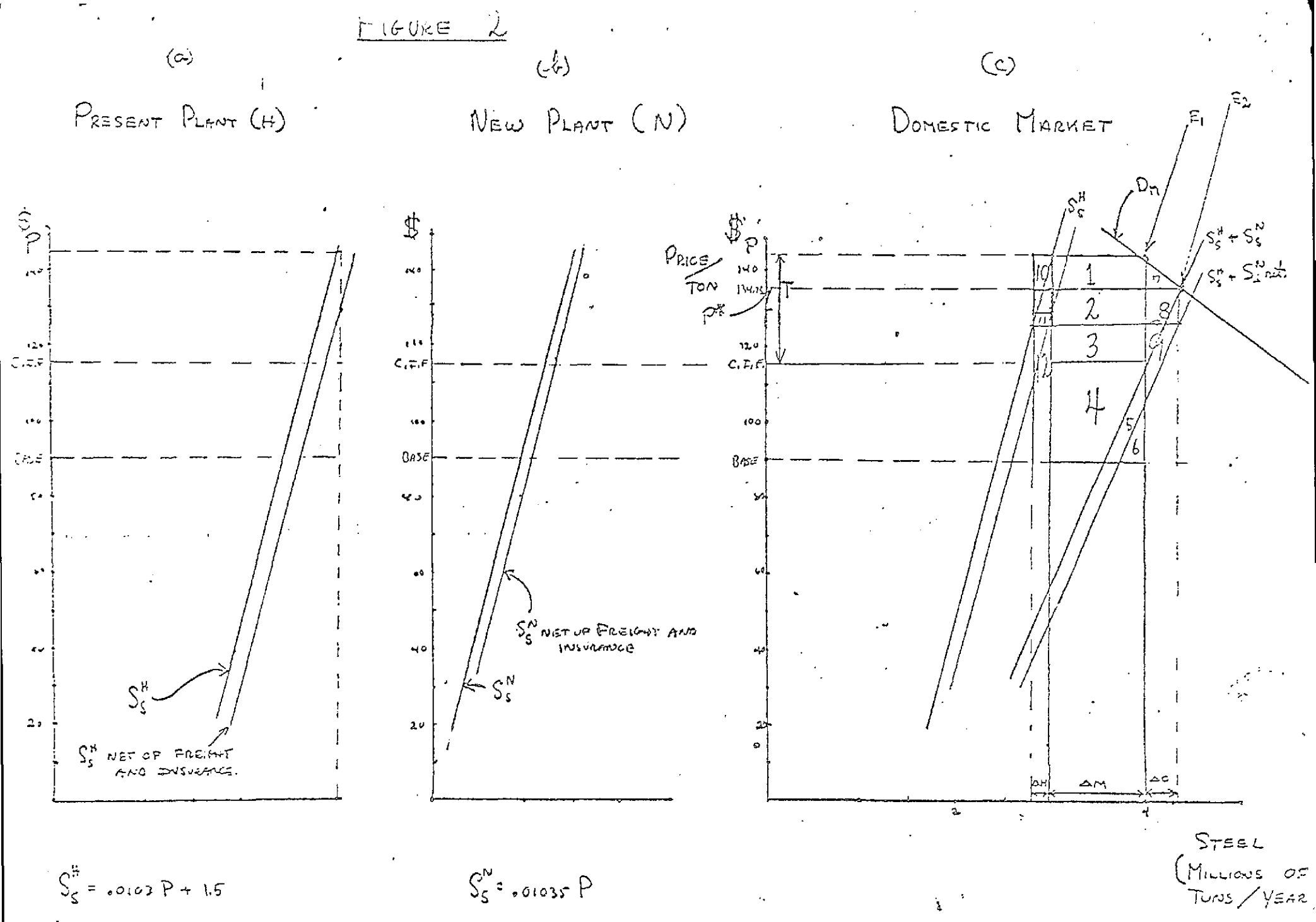
1) consumption of steel, will rise by Δ C,
2) the original domestic producer (H) will reduce his output by ΔH, until the new price P* equals his short run marginal cost plus his transportation and insurance costs,
3) imports Δ M will fall to zero.

The reduction in imports, Δ M, implies a decrease in the demand for foreign exchange and hence causes the Canadian dollar to appreciate somewhat. The output of export producing activities declines slightly. The resources released by the reduction in exports and saved by the reduced production of existing domestic suppliers are transfered to increased production of steel by N.

IV BENEFITS

What are the benefits Canada enjoys from this re-allocation? Examine first the change in imports, Δ M. The area 1 in Figure 2(c) was a transfer from Canadians to steel consumers, and hence is not a benefit. The new steel plant is able to sell Δ M of its product sold in the domestic market with an increase in revenue equal to areas 2, 3, 4, 5, 6, but not all of this gain in revenue can be counted as a benefit to Canada. The area 2, given by transport costs from N times (ΔM), was also tariff revenue, but now represents the real resource costs of moving steel from N to the domestic market. Area 3 was also tariff revenue and is now part of the extra rent N receives from selling in the domestic market, hence a transfer. Areas 4 and 5 were revenue received by foreign freight carriers and insurance companies, but are now part of the extra rent N receives from selling at home, hence a benefit. Area 6 was also revenue to foreign freight carriers and insurance companies; it is now part of the extra resource cost of producing steel for domestic consumption.

FIGURE 2



$S_S^H = .0103\,P + 1.5$

$S_S^N = .01035\,P$

The benefits of the Δ M steel sold in domestic markets, therefore, are equal to the saving in foreign freight and insurance costs (areas 4, 5, and 6) less the resource costs of transporting Δ M steel from N to the market (area 2), less any excess of costs over the base point price for N of producing steel for the domestic market rather than for export (area 6). Since foreign freight and insurance costs are paid in foreign exchange, their saving ought to be valued in terms of the social opportunity cost of foreign exchange.

The change in consumption, Δ C, creates two benefits. First the additional consumer surplus (area 7) and second the additional producers rent (area 9) which excludes the real payment to Canadian freight carriers and insurance companies (area 8).

The reduction in output by producer H provides the following benefits: area 10 minus 11 is the saving in freight costs from supplying the domestic market from N rather than from H; areas 12 and 11 are the saving in the excess of the real resource costs of producing steel at H over the export value of the same quantity from N (valued at the social opportunity cost of foreign exchange). On the Δ H of steel supplied to the domestic market from N rather than H, therefore, the benefit is the difference between the initial market price P and the foreign exchange value (using the social opportunity cost of the foreign exchange) of the exports which otherwise would have occured, minus the transportation costs from N to the market for that quantity.

The total additional benefits to Canada of producing steel for consumption in the domestic market rather than exporting it abroad are thus equal to the following:

the saving in costs of foreign freight and insurance on imports displaced (valued at the social opportunity cost of foreign exchange),

plus the difference between the prevailing market price and the export value (calculated at the social opportunity cost of the foreign exchange) lost on the reduced shipments from existing domestic suppliers to the market.

plus the gain in consumer surplus from any increased consumption in the domestic market as the result of any decrease in price,

plus any difference between the new market price for steel minus N's marginal costs of production for any increased consumption in the domestic market,

minus the transportation costs incurred by N in getting its product to the market;

minus any excess of costs of production over the export, or base point, price incurred by N in expanding output to satisfy the domestic market.

V A NUMERICAL EXAMPLE

For this example we assume that the domestic market, Montreal, absorbs about 4 million metric tons of steel per year, about one quarter of which is imported. The market price $145 includes a tariff of $30; hence the CIF price from the U.S. is $115. Insurance and freight charges from Hamilton amount to $15. Further assume that the supply curve (gross of transportation and insurance costs) of steel from Hamilton is linear and a has point elasticity ϵ_s equal to 0.5 at the initial equibilbrium. Demand is also assumed linear and has point elasticity equal to -1 at the initial eqiuilibrium. The implied demand and supply curves are :

Demand: $S_D = -.0276\ P + 8$

Supply: $S_s^H = .0103\ P + 1.5$

Initially equilibrium is established with $P = 145$, $S_s^H = 3$ million metric tons per year, and therefore, imports (M) equal 1 million tons per year.

Now allow the New Eastern Canadian Steel Project (N) to open. Assume that at the current price of $145 per metric ton, N would like to supply 1.5 million tons annually to the Montreal market. Assume further that transport and insurance costs are $10 per metric ton from N, and that newer technology allows N to supply steel with supply elasticity equal to one. This implies a supply curve $S_s^N = .01034\ P$. There is a total supply curve $S^{Total} = 0.0206\ P + 1.5$. the new equilibrium occurs with the following variable values:

$P = 134.73$ $S_S^N = 1.394$ $M = 0$

$S_S^H = 2.888$ $S^{Total} = 4.28$

These imply $\Delta C = .28$, $\Delta M = -1$ $\Delta H = -.112$

The benefits from selling the ΔM units of steel in Canada are as follows:

1) the saving in foriegn freight and insurance costs (area 4,5,6) valued in terms of the social opportunity cost of foriegn exchange.

$- [C.I.F. - BASE] [\Delta M]$ TTs

$= (115 - 90)(1)(1.1)$

$= (25)(1.1) = 27.5$ (million dollars)

ii) less the real resource costs of transporting the ΔM units of steel from N to Montreal (area 2)

$(10)\Delta M = (10)(1) = 10$ (million dollars)

iii) less the excess of resource costs over base price for N of producing steel for the domestic market rather than for export (area 6):

$\frac{1}{2} [111.35 - 90] [4-3.56]$

$= 4.70$ (million dollars)

Total benefits from selling the ΔM units of steel in Canada are then 27.50 - 10 - 4.70 = \$12.80 million per year.

The benefits resulting from increased consumption are:

1) additional consumers surplus (area 7)

$\frac{1}{2} [P - P^*] [\Delta C]$

$= \frac{1}{2} [145 - 134.73] [.28]$

$= 1.44$

ii) additional producers surplus exclusive of freight and insurance payments to Canadian firms (area 9)

$$\tfrac{1}{2}\left\{\left[\bar{P}^* - 10\right] - 111.35\right\}\Delta C$$

$$= \tfrac{1}{2}\left\{(134.73 - 10) - 111.35\right\}(.28)$$

$$= 1.87$$

Total benefits from increased consumption come to $3.31 million annually.

Reduction in H's output provides benefits captured by the difference between the initial market price P and the foreign exchange value of the exports which could otherwise have occurred minus the transportation costs from N to the market for that quantity:

$$- \left[P - (BASE)(\Pi_S) - 10\right] \Delta H$$

$$= \left[145 - (90)(1.1) - 10\right] (.112)$$

$$= \$4.03 \text{ million per year}$$

Total benefits accruing to Canadians as a result of selling N's production in Canada rather than exporting it are thus \$12.80 + \$3.31 + \$4.03 = \$20.14 million annually. Discounting at 10 percent, the present value of benefits over 25 years is \$182.81 million.

Conclusion

This paper has briefly investigated the benefits accruing to Canada as a result of selling the output of a new steel plant in a domestic market as opposed to exporting it. We found that benefits accrued as a result of three effects caused by the new steel available:

a) a reduction in higher cost steel production from other domestic producers;

b) a larger volume of steel consumption in the domestic market;

c) a re-allocation of resources into producting more steel at thc new plant as a result of the effect of lower imports on the exchange rate.

APPENDIX : DERIVATION OF LINEAR DEMANDS AND SUPPLIES

INITIAL EQ: $P = \$145$, $S=4$ (M=1, H supplies 3)

1 H's supply function

$\epsilon_S^H = .5$ at E. (H supplies 3 million)

$\therefore \frac{ds}{dp} \cdot \frac{145}{3} = .5 \Rightarrow \frac{ds}{dp} = \frac{(1.5)}{145} = .0103$

$S_s^H = \int .0103 dp = .0103\ P + C$

But at $P = 145$, $S = 3$

$\therefore C = 1.5$

$\therefore S_s^H = .0103\ P + 1.5$

2 N's Supply Function

$\epsilon_s^N = 1$, at P 145, H would supply 1.5 million

$\therefore \frac{ds}{dp} \cdot \frac{145}{1.5} = 1$ or $\frac{ds}{dp} = .0103$

$S = \int .0103 dP = .0103\ P + C$

But at $P = 145$, $S_s^N = 1.5 \therefore C = 0$

3 MARKET DEMAND D_M

AT E_1 $\eta = -1$

$\therefore \frac{ds}{dp} \cdot \frac{145}{4} = -1$ or $\frac{ds}{dp} = \frac{-4}{145} = -.0276$

$S = \int .0276\ dp = -.0276P + C$

But at $P = 145$, $S = 4$

$C = 4 + (.0276)\ (145) \cong 8$

$\therefore D_M$: $S_D = .0276\ P + 8.$

4 S^{TOT} is simply the sum of S_s^H and S_s^D

$S^{TOT} = (.0206)P + 1.5$