Cost of Protection: Where Do We Stand?

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Economists measure the cost of protection in terms of static efficiency, growth rates and firm- or industry-level productivity effects. This survey is devoted exclusively to the literature on the static efficiency. A key preliminary point to note is that estimates in this literature are not derived econometrically from pre- and post-liberalization data. Instead, they are based on simulations of partial- or general-equilibrium models that are parameterized using estimates from the literature and calibrated around a pre-liberalization base year.

I. "Small" Triangular Losses

The natural starting point for our purpose is Harry Johnson (1960) whose central message was that static costs of protection, measured as a proportion of GNP, are inevitably low. Tariffs give rise to the triangular efficiency losses whose magnitude can be summarized in the formula:

(1) Cost of protection as a proportion of GNP = $(\frac{1}{2})\ \alpha.\eta\tau^2$

where α denotes the imports-to-GNP ratio at the tariff-ridden equilibrium, η the absolute value of the arc elasticity of demand for imports as we move from protected to free-trade equilibrium, and τ the *ad valorem* tariff rate at the domestic price. Because α is usually well below 1, estimates of η revolve around 1 or 2, and τ^2 is the square of a number less than 1, calculations based on this formula are expected to yield small numbers.

Johnson's message was echoed by a number of empirical studies published during and around 1960s and summarized in Panagariya (2002). These studies nearly uniformly found the cost of protection for different countries in different years to be no more than 1% of GNP. Many subsequent studies, which employed computable general-equilibrium models generated similar numbers, leading Richard Harris (1984) to remark, "It is well known that conventional calculations

of the costs of protection give numbers which are quite small; often in the order of 0.5 to 2.0 percent of GNP. This result holds for almost all known studies based on the competitive neoclassical model, either partial or general equilibrium."

II. High Protection, High Costs

It is easy to show, however, that low costs of protection in the conventional model are not inevitable. The impression that these costs are low stems from calculations that have themselves been done for situations involving low initial tariffs. That small deviations from the optimum are accompanied by small losses is hardly surprising.

From formula (1), the cost of protection rises at an increasing rate with the tariff. Therefore, it is not inconceivable that high tariffs might lead to high costs. This is suggested to some degree by an early calculation by Arnold Harberger (1959) for Chile: based on an average tariff rate of 50%, he calculated the cost of protection in Chile during 1950s to be 2.5 percent of GNP. Though Harberger and his contemporaries viewed this estimate as small, it was well above the other estimates obtained in the 1960s, based on tariff reductions of less than 15 percentage points.

Challenging Harberger-Johnson calculations, Bhagwati (1968) has provided a more dramatic example of losses that may result from trade interventions. Using a two-good, small country model, he offers an example in which an export subsidy that turns an importable into exportable halves the national income. Though Bhagwati does not note it explicitly, this large cost is the outcome of the large distortion he considers.

To appreciate fully the quantitative importance of the level of tariff, consider a prohibitive tariff in a two-good, endowments economy with endowments given by $X_1 = 10$ and $X_2 = 40$. Denoting consumption by C_1 and C_2, let preferences be represented by Cobb-Douglas utility function, $U = C_1^{1/2}C_2^{1/2}$. Under autarky, the relative price of good 1 turns out to be 4. If the world

relative price of good 1 is 2 and trade is freed up, we obtain $C_1 = 15$ and $C_2 = 30$. The real income relative to autarky rises by 6.5 percent. Alternatively, if the world price of good 1 is 1, the country consumes 25 units of each good and the gain from free trade jumps to 25 percent of the autarky income!

Observe that parameters underlying these examples, except arguably the autarky tariff rate in the second example, are biased towards generating small rather than large effects. With no substitution possibilities in production, protection can lead to no misallocation of resources. Likewise, Cobb-Douglas preferences exhibit demand elasticities of unity and limit substitution possibilities in consumption.

The implicit autarky tariff rate and free trade imports-to-GNP ratio in the first example are 100 and 16.67 percent and in the second one 300 and 30 percent, respectively. By way of reality check, tariff rates on many products in India during 1980s were 300 to 400 percent. Continuing imports of these products indicate that there was no water in tariffs. The simple average of tariff rates during the same period was approximately 125 percent with the imports-to-GNP ratio still in excess of 8 percent.

Recently, Douglas Irwin (2001) has estimated that the cost of a trade embargo imposed by the United States in 1807 ranged between 7 to 10 percent of GNP. The embargo amounted to approximately 70 percent tariff on imports and led to a reduction in the imports-to-GNP ratio from 20-35 percent range to 8-10 percent range. The notion that triangles are necessarily small is fragile.[1]

III. Decreasing Costs of Production

Under decreasing costs, benefits from trade may result from greater exploitation of scale economies as well as increased product variety. To introduce the essential ideas, follow Charles Kindleberger (1968, chapter 3) and assume two identical economies producing and consuming two

symmetric goods in the presence of increasing returns. Let labor be the only factor of production with total labor force in each economy L and production functions for the two goods $X_i = L_i^k$ ($\infty > k > 1$; i = 1, 2). Parameter k captures the scale effect with (k-1)/k representing the percentage decline in per-unit cost due to one percent increase in the output. Scale economies are external to the firm, validating the average-cost-pricing equilibrium. As before, the utility function is $C_1^{1/2}C_2^{1/2}$. As in Kindleberger (1968, Figure 3.9), we can represent autarky and free-trade equilibriums by points A and T, respectively, in Figure 1.

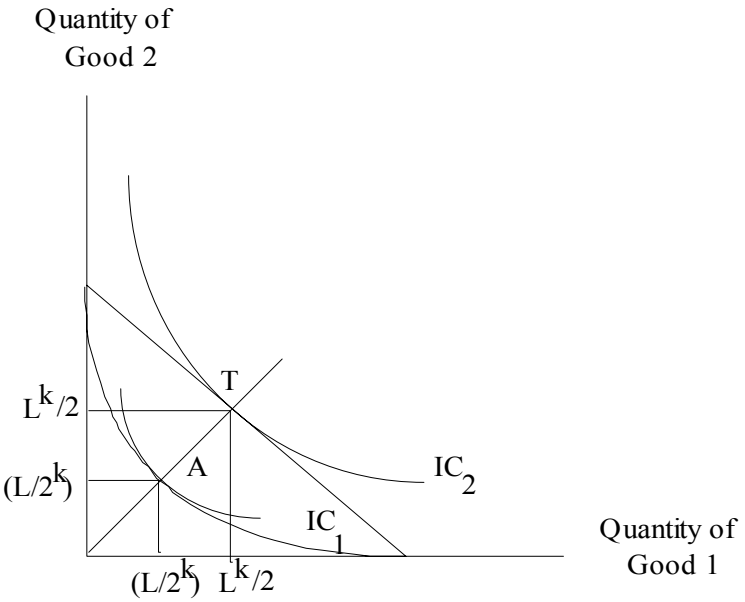

Figure 1: Economies of Scale and The Cost of Protection

Under autarky, each country devotes half of the total labor force to each sector with $X_i = C_i = (L/2)^k$. The opening to trade leads each country to specialize in one product and allows the consumption of each good in each country to rise to $L^k/2$. Correspondingly, the real income rises by $(L^k/2)/ (L/2)^k – 1 = 2^{k-1} - 1$. For k = 2, this says that the move from autarky to free trade increases each country's income by 100 percent.

This simple model can also be modified to show how trade may bring benefits through increased product variety. Retaining the symmetry across products, replace the form of the utility function by CES and assume the elasticity of substitution, σ, is larger than unity. In this case, indifference curves intersect the quantity axes at finite values and the autarky equilibrium itself may be characterized by complete specialization in one of the two products. When the countries move to free trade, each country still produces only one product but consumes both of them. The gains from trade result exclusively from increased product variety. Each country's real income can be shown to rise by the proportion $2^{1/(\sigma-1)}-1$. For $\sigma = 2$, this implies a gain of 100 percent for each country.

Being based on two-good models, these examples exaggerate the gains from trade. In the first example, trade leads to the doubling of the scale while in the second one it leads to the doubling of product variety. Once we allow for many products following Paul Krugman's (1979) pioneering work, these effects will be ameliorated. These examples also compare autarky and free trade and do not inform us about the magnitudes of effects for small tariffs. The key question therefore is whether the effects in models with many products and low tariffs will be as small as in the conventional models.

The answer to this question is in the negative. Harris (1984) constructs a general-equilibrium model of the Canadian economy first assuming constant returns and perfect competition in all sectors and then allowing for firm-level scale economies and imperfect competition in a subset of the sectors. In 1976, the year for which the model is calibrated, Canadian tariffs ranged between 0 to 33 percent and averaged 11 percent. In the constant returns, perfect competition version of the model, the removal of Canadian tariffs generates no net welfare gains: efficiency gains are (coincidentally) exactly offset by the losses from the deterioration in the terms of trade. In the

version with economies of scale and imperfect competition, even after netting out the adverse terms of trade effects, the gain is 4.1 percent of GNP.

IV. Small Tariffs Leading to the Withdrawal of Products and High Costs

Paul Romer (1994) shows that when a seller has to incur a fixed cost of introducing a product into a market such as the cost of advertising or establishment of a service and parts supply network, small tariffs may lead to large losses in real incomes.

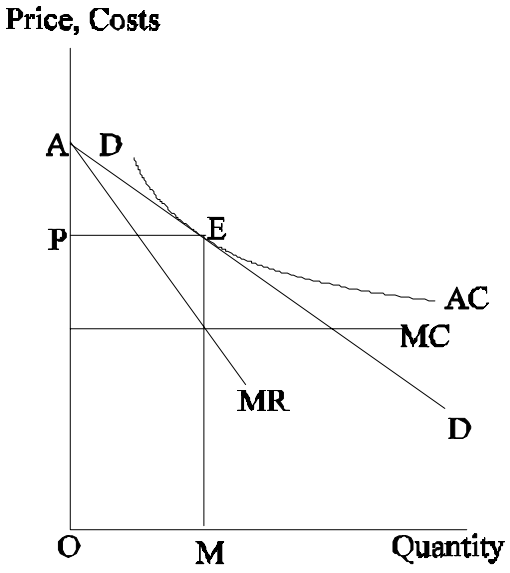

Figure 2: Protection Leading to Disappearance of Products

Romer's point is best illustrated with the help of Figure 2, which depicts the market for a product that a foreign supplier is able to produce at a constant average and marginal cost. But because he must incur a fixed cost to introduce it into the market under consideration, the overall average cost is downward sloped. As drawn, the supplier just breaks even under free trade indicating that this is the last product imported at the margin that must incur fixed selling costs. The

introduction of even a tiny tariff in this setting leads to the complete withdrawal of the product, leading to the loss of the entire consumers' surplus represented by triangle APE.

Romer incorporates this idea into a simple model in which there is a single final good, produced using labor and differentiated inputs imported from abroad. The larger the number of available inputs, the lower the cost of production. Using specific parameter values, he shows that if the number of imported inputs is held fixed at its free-trade level, a 10 percent tariff lowers real income by 1 percent of GNP just as in the conventional analysis. But if products are allowed to disappear to ensure no loss to the last input imported, the cost rises to 19.81 percent

V. X-efficiency

Reacting to the low estimates of the cost of distortions during 1960s, Leibenstein (1966) offered the idea that distortions may result in larger costs if they reduce efficiency within the firm. As Max Corden (1974) discusses systematically, this idea runs into difficulty, however, when applied on the economy-wide basis. For example, liberalization may lead to reduced profitability, increased managerial effort and hence improve X-efficiency in import-competing sectors. But symmetrically it will lead to reduced effort and X-efficiency in exportable sectors, making the net effect ambiguous.

Nevertheless, Joel Bergsman (1974) has gone on to build the losses from reduced X-efficiency under protection in his estimates. He employs a partial equilibrium model and assumes constant costs of production. He divide the import-competing sectors into two categories: conventional sectors such as textiles and clothing that will survive the freeing of trade and modern sectors such as consumer durables that will be forced out of existence by increased competition. High domestic costs under protection are identified with X-inefficiency in the former case and with allocative inefficiency in the latter. Bergsman estimates X-efficiency costs as a proportion of GNP

to be as high as 6.8 percent for Brazil in 1966. These compare with conventional allocative efficiency costs of only 0.3 percent.

VI. Directly Unproductive Profit-seeking (DUP) Activities

Anne Krueger (1974) observes that in the presence of import quotas, firms may compete for quota rents using real resources. Under perfect competition, such rent seeking will result in the waste of real resources equal in value to the entire quota rent. She estimates quota rents to be 7.3 percent of GNP in 1964 for India and 15 percent in 1968 for Turkey and surmises that these may represent extra costs of protection.

In turn, Bhagwati (1982) has broadened the concept of rent seeking and measurement of the cost of protection to include the impact of what he has christened as Directly Unproductive Profit-seeking (DUP) activities. In Bhagwati (1989), he distinguishes between *downstream* DUP activities such as rent and revenue seeking and tariff and quota evasion that take place in response to an existing distortion and *upstream* DUP activities such as tariff and quota seeking that create distortions in the first place. He correctly notes that only downstream DUP activities should be considered in the measurement of the cost of protection since upstream DUP activities are the cause, not effect, of protection.

Bhagwati (1989) argues that even downstream DUP costs may be smaller than the entire quota rent or tariff revenue for two reasons: DUP activities are unlikely to be perfectly competitive because the relatives of the licensing authority have a better chance of getting the license and the shadow prices of the resources themselves are below their respective market prices in the presence of the distortion. He concludes, however, that despite these caveats, the DUP literature strengthens the anti-protectionist hand.

VII. Concluding Remarks

This paper arrives at three conclusions. First, in the traditional neoclassical model, the static welfare costs of protection of tariffs that are 15 percent or less are unlikely to exceed 1 percent of GNP. Second, even within this model, high levels of protection can readily lead to losses nearing 10 percent of GNP. Finally, if we modify the standard model to allow for scale economies in production, fixed costs of introducing products into a market, X-efficiency, and downstream DUP activities, even low levels of protection can result in large deadweight losses.

References

Bergsman, Joel. "Commercial Policy, Allocative Efficiency and 'X-efficiency.'" Quarterly Journal of Economics, August 1974, 88(3), pp. 409-433.

Bhagwati, Jagdish. "The Theory and Practice of Commercial Policy: Departures from Unified Exchange Rates." Special Papers in International Economics, 1968, No. 8, Princeton: Princeton University Press, pp. 1-69.

Bhagwati, Jagdish. "Directly Unproductive Profit-seeking (DUP) Activities." Journal of Political Economy, October 1982, 90(5), pp. 988-1002.

Bhagwati, Jagdish. "Is Free Trade Passé After All?" Weltwirtschaftliches Archiv, 1989, 125(1), pp. 17-44.

Corden, Max. Trade Policy and Economic Welfare, Oxford: Oxford University Press, 1974, Chapter 8.

Feenstra, Robert. "How costly is protectionism?" Journal of Economic Perspectives, Summer 1992, 6(3), pp. 159-178.

Harberger, Arnold. "Using the Resources at Hand more Efficiently." American Economic Review: Papers and proceedings of the seventy-first annual meetings of the American Economic Association, May 1959, 49(2), 134-146.

Harris, Richard. "Applied General Equilibrium Analysis of Small Open Economies with Scale Economies and Imperfect Competition." American Economic Review, December 1984, 74(5), pp. 1016-1032.

Irwin, Douglas, 2001, "The Welfare Cost of Autarky: Evidence from the Jeffersonian Embargo, 1807-1809," Dartmouth College, August 21, 2001, mimeo.

Johnson, Harry. "The Cost of Protection and the Scientific Tariff." Journal of Political Economy, August 1960, 68(4), pp. 327-345.

Kindleberger, Charles. International Economics, 4th Edition, Homewood: Richard D. Irwin, 1968, chapter 3, 38-54.

Krugman, Paul. "Increasing Returns, Monopolistic Competition and International Trade." Journal of International Economics, 1979, 9, pp. 469-480.

Leibenstein, Harvey, 1966, "Allocative Efficiency vs. 'X-efficiency,' American Economic Review 56(3), June, pp. 392-415.

Panagariya, Arvind. "Alternative Approaches to Measuring the Cost of Protection," Center for International Economic, University of Maryland at College Park, January 12, 2002, mimeo.

Romer, Paul. "New Goods, Old Theory, and the Welfare Costs of Trade Restrictions." Journal of Development Economics, 1994, 43, pp. 5-38.

Footnotes

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[1] Robert Feenstra (1992) discusses additional factors that may lead to underestimation of the costs of protection but within the conventional neoclassical setting none turns out as significant as the level of protection.