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# The Claremont Center for Economic Policy Studies

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*Working Paper Series*



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Producer Rent Equivalence"

by

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Draft  
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**Tariffs versus Quotas  
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The authors thank Patricia Dillon, Avinash Dixit, Tony Lowenberg, Hal McClure, Edward Tower, Clas Wihlborg, and participants in the economics workshop at the Claremont Colleges for their helpful comments on earlier versions of this paper.

### Abstract

The economic effects of tariffs and quotas used to protect a domestic monopolist from foreign imports have typically been contrasted by examining policies that yield an equivalent domestic price or level of imports. This paper emphasizes an alternative criterion for equivalence--domestic producer rent equivalence--which is especially useful for political economy analysis. We generalize earlier results for the small-country case to large countries, and show that a quota will allow more imports, but at a higher price, than the tariff that generates an identical level of domestic producer rent. The welfare ranking of the two instruments is in general indeterminate. However, the domestic deadweight costs of the tariff are necessarily lower than those of the quota in the neighborhood of the free-trade equilibrium. On the other hand, the costs imposed on foreign producers are always lower under the quota than under the tariff. Finally, as the level of protection increases--due to a downward shift in foreign costs, with domestic producer rent held constant--the quota is associated with a smaller increase in domestic opportunity cost than is the tariff. Thus, persistent increases in the international value of the domestic currency, or erosion of comparative advantage in the domestic industry, should eventually make the quota the more efficient policy.

## 1. Introduction

Under static competitive conditions, there exists an import quota that is equivalent in all of its price and quantity effects to any given tariff. If these conditions are not met, then this unique equivalence no longer obtains. Recognition of this problem by trade theorists has given rise to a number of analyses of the comparative costs of tariffs and quotas under various economic conditions and under various concepts of equivalence.<sup>1</sup> For example, McCulloch (1973) identifies four standards for comparison of tariffs and quotas--profit, output, price, and import equivalence--which reflect various potential motives for protection. Even this list is not exhaustive, since equivalence could be defined in terms of government revenue or, in the large country case, in terms of the foreign price. In recent years, there has also been increased interest in formal analysis of the political economy of protection, and a wide variety of studies have focused on the lobbying activities intended to influence the formulation of trade policies.<sup>2</sup> In this paper, we seek to combine these two traditions by comparing the effects of tariffs and quotas used to protect a domestic monopoly, under a politically relevant definition of equivalence that we call producer rent (PR) equivalence.

While the traditional welfare rankings suggest that tariffs are generally less inefficient forms of import limitation than quotas,<sup>3</sup> the general trend in recent years has been toward increased use of quotas (and voluntary export restraints) relative to tariffs. At first glance, these observations seem to be at odds with the predictions of the competitive-pressure-groups theory of political influence developed by Becker (1983). In his model, the acquisition of transfers by rent-seeking interest groups does lower aggregate economic efficiency,<sup>4</sup> but the forms of redistributive policies adopted tend to minimize the deadweight losses from such transfers.

If the objective is to minimize the welfare costs of a given level of import restriction, then the traditional ranking of tariffs over quotas is typically correct. But this is so in part because the factors that make tariffs less inefficient also tend to reduce producer rents or profits. From the perspective of Becker's political economy approach, it is more useful to compare the deadweight costs imposed by tariffs and quotas when producers have succeeded in securing a given transfer.

Looking at trade policy in this manner suggests the importance of using the producer rent concept of tariff-quota equivalence for policy analysis when monopolistic producers seek protection through the political system. Other models of the political process could yield alternative concepts of tariff-quota equivalence. We believe that it is appropriate to start with a focus on aggregate welfare costs per unit of rent transferred to producers, however, as this allows the economic interests of all who are affected by the political process to be represented. Subsequent analyses could modify the weighting mechanism for these various interests, based on alternative theories of the operation of the political process.<sup>5</sup>

In the remainder of this paper, we compare the effects of tariffs and quotas that deliver identical amounts of producer rent to a rent-seeking domestic monopoly. We consider the case of a large country for which foreign supply is not perfectly elastic, and assume static conditions and perfect certainty. This parallels the earlier analysis by McCulloch of the related notion of profit equivalence in the small-country case. One reason that extension of the analysis to the large-country case is important is that it introduces the possibility of foreign retaliation. Small countries are by definition too small to impose costs on their trading partners, but for large countries the two policy instruments may impose significantly different costs abroad. For many industrial nations, it is clearly the large-country case



that is most relevant.

In Section 2, we show that a quota generates a higher domestic price, but allows a greater quantity of imports, than does the PR-equivalent tariff. In Section 3, we compare the implications of these policies for economic welfare and government revenue. In general, quotas need not be more inefficient than tariffs in terms of deadweight costs per unit of producer rent transferred. Thus, the trend toward increased use of quantitative restrictions relative to tariffs need not contradict the hypothesis of an efficient political market for protection à la Becker.

However, we show that a tariff is always superior to a quota if the goal is to provide a low level of protection yielding an outcome close to free trade. On the other hand, a quota necessarily leaves foreign producers better off, since it allows more imports and generates a higher foreign price. This benefit goes beyond the familiar notion that quantitative restrictions in the form of voluntary export restraints allow foreigners to enjoy part of the policy rents generated. We thus have an important new rationale for use of quantitative restrictions rather than tariffs when the interests of foreigners must be acknowledged in the political process.

We also find that a quota auction necessarily generates more revenue for the government than would the PR-equivalent tariff. This result is easily obtained in the small-country case, since the quota allows a higher level of imports and generates a higher domestic price. In the large country case, the quota generates a higher domestic price and a higher level of imports, but also generates a higher foreign price. However, we show that the differential between the domestic and foreign prices is necessarily larger under the quota, which is sufficient for the result on revenues.

In Section 4, we show that if there is a downward shift in foreign costs, but the level of protection is increased so as to hold domestic producer rent

constant, then a quota entails a smaller increase in domestic deadweight cost than does the PR-equivalent tariff. This implies that domestic opportunity costs should tend to be higher for quotas at low levels of protection, but lower for quotas at higher levels of protection. Thus, since the protective effects of many quantitative restrictions imposed by the United States have been substantial,<sup>6</sup> the trend toward greater use of quantitative restrictions relative to tariffs appears consistent with the predictions of our analysis.

## 2. Price and Quantity Effects of Protection of a Domestic Monopoly

Both tariffs and quotas will reduce imports and raise the domestic price of a protected good relative to free trade, as long as the Metzler paradox does not occur. More interesting, however, are the differences between tariffs and quotas in their effects on the quantity of imports and on the domestic price. We examine these differences for an industry in which a single domestic firm produces the protected good. We assume that there is perfect competition in foreign supply and among quota holders.

Following Bhagwati (1965) we use a simple partial equilibrium model with seven equations: (1) domestic demand as a function of the domestic price, (2) foreign import supply as a function of the foreign price, (3) residual demand for domestic output, (4) an equilibrium condition for the domestic market, (5) a cost function for the domestic producer, (6) an optimality condition for the domestic producer, and (7) a link between domestic and foreign prices through an implicit or explicit ad valorem tariff rate.

$$(1) D = D(P_D)$$

$$(2) S_F = S_F(P_F)$$

$$(3) D_D = D(P_D) - S_F(P_F)$$

$$(4) D_D = S_D$$

$$(5) C = C(S_D)$$

$$(6) MR \equiv \frac{d(P_D S_D)}{dS_D} = \frac{dC}{dS_D} \equiv MC$$

$$(7) \frac{P_D}{P_F} = 1 + t$$

In condition (6), MR denotes marginal revenue under either policy and MC denotes marginal cost. We assume that marginal cost is non-decreasing and that marginal revenue is non-increasing in the relevant range:

$$(8) \quad \frac{dMC}{dS_D} \geq 0 \quad \text{and} \quad \frac{dMR}{dS_D} \leq 0 .$$

The model is closed by imposing either a tariff rate,  $t$ , or a quantitative import restriction,  $S_F = Q$ . If a tariff is imposed, (7) shows the explicit link between the domestic and foreign prices. If a quota is imposed, (7) shows the price differential implied by the use of the quota.

We show first that if a tariff and quota are PR-equivalent, then the quota allows higher imports, but generates a higher domestic price, than does the tariff. This is consistent with McCulloch's results on profit-equivalence for small countries.

Figure 1 shows the results graphically. Its axes are domestic quantity and domestic price or cost per unit. MC is domestic marginal cost, and  $D(P_D)$  is domestic demand.  $D_Q \equiv D(P_D) - Q$  is net demand for domestic output under the quota, and  $MR_Q$  is its corresponding marginal revenue curve.  $D_t \equiv D(P_D) - S_F[P_D/(1+t)]$  is net demand for domestic output under the tariff, and  $MR_t$  is its corresponding marginal revenue curve.<sup>7</sup> Under the quota, domestic output is OH, domestic price is OC, and imports are DJ. Under the tariff, domestic output is OI ( $OI > OH$ ), domestic price is OB ( $OB < OC$ ), and imports are EK ( $EK < DJ$ ). Domestic producer surplus (revenues minus variable costs) is the area ACDG under the quota, which is equal to the area ABEF, producer surplus under the tariff. An isorent curve  $\pi = \pi_0$  is shown for this level of producer surplus  $\pi$ . It is tangent to  $D_Q$  at the quota optimum D, and tangent to  $D_t$  at the tariff optimum E.<sup>8</sup>

These results may be demonstrated formally. First, the net demand curves faced by the monopolist under the tariff and quota must intersect, since otherwise one policy would yield unambiguously higher profits than the other. The diagram shows that the curves intersect at point L. Second, the optimal price-quantity combination under each policy must not be attainable by the monopolist under the other policy. Specifically, suppose that the optimal price-quantity combination under the quota is on curve  $D_Q$  below point L. Then there would be points on curve  $D_t$  that yield higher producer surplus (like the point at which the same quantity is sold at a higher price). The two policies could not yield equivalent amounts of producer rent.

Third, at the point of intersection of the two curves,  $D_t$  is more elastic than  $D_Q$ : changes in  $P_D$  under the tariff cause change in both domestic quantity demanded and in foreign quantity supplied, while changes in  $P_D$  under a binding quota only cause changes in domestic quantity demanded. Specifically, under the tariff,

$$\frac{dS_D}{dP_D} = D'(P_D) - S'_F[P_D/(1+t)]/(1+t) .$$

$D'(\ )$  and  $S'_F(\ )$  are the first derivatives of the domestic demand and foreign supply functions. We assume that  $D'(\ ) < 0$  and that  $S'_F(\ ) > 0$ . Under a binding quota,

$$\frac{dS_D}{dP_D} = D'(P_D) .$$

It is clear that at any price  $P_D$  the net demand curve  $D_t$  is flatter than the net demand curve  $D_Q$ .

Since the two curves share the same price and quantity at their point of intersection, the difference in marginal revenue under the two policies at that level of output is due to this difference in the elasticities of demand. It follows that  $MR_t > MR_Q$  at that level of output. Given that the optima must be on different sides of point L, conditions (8) on marginal revenue and marginal cost imply that the tariff optimum is to its right,<sup>9</sup> and the quota optimum to its left.<sup>10</sup> Thus, domestic production is lower, and the domestic price is higher, under the quota. Because the tariff optimum is to the right of the intersection of the two net demand curves, the level of imports is necessarily higher under the quota. The higher elasticity of demand under the tariff induces the monopolist to set a lower price, and this has the effect of squeezing the quantity of imports.

We can compare the PR-equivalent solution to the import-equivalent and price-equivalent solutions by varying the level of the quota and looking at the effects this will have on domestic price and producer rent.<sup>11</sup> It is not

difficult to show that both  $dP_D/dQ$  and  $d\pi/dQ$  are negative under our assumptions.<sup>12</sup> As we would expect, a tighter quota generates a higher domestic price and higher producer rent.

Since the PR-equivalent quota yields higher imports than does the initial tariff, we must tighten it to get a quota that is import-equivalent to the initial tariff. This implies that both producer rent and the domestic price are higher under this quota than under the tariff.<sup>13</sup> On the other hand, if we relax the quota until we get a quota that is price-equivalent to the initial tariff, the quantity of imports is higher and producer rent is lower under this quota than under the tariff.<sup>14</sup>

### 3. Welfare and Revenue Implications

The previous section examined the price and quantity implications of protection of a domestic monopolist under PR-equivalent tariffs and quotas. In this section, we contrast the welfare and revenue effects of the two policies.

We can draw several conclusions on their welfare costs. First, since the quota causes a higher domestic price and lower domestic consumption than the tariff, it causes a higher deadweight loss to consumers.

Second, although the quota leads to lower domestic production than does the tariff, it may or may not cause less inefficiency in production. This indeterminacy is due to the presence of two market distortions--domestic monopoly and the trade policy.<sup>15</sup> If the trade policy is highly protective and there is domestic overproduction, then the quota causes less overproduction and less production inefficiency. If the policy is only mildly protective and there is domestic underproduction due to the monopoly problem, however, then the quota worsens the production inefficiency.<sup>16</sup>

An important implication of this analysis is that the domestic deadweight cost of a quota necessarily exceeds that of the PR-equivalent tariff for a large country in the neighborhood of the free-trade (zero-tariff) equilibrium. Under free trade, a large country experiences only the monopoly problem, but not the distortion due to the trade policy. It thus necessarily experiences domestic underproduction (due to monopoly) under free trade. It will also have this problem under tariffs that are close to zero. Since the quota that is PR-equivalent to any of these tariffs yields an even lower level of domestic output, it will worsen the domestic underproduction problem: by lowering the elasticity of net demand for domestic output, the quota permits the monopolist to exploit its market power more than the tariff would. It thus causes a greater production loss and a greater consumption loss.

This superiority of tariffs over quotas at low levels of protection is necessarily true only for large countries. In the small-country case, the perfect elasticity of foreign supply eliminates the domestic monopoly problem. Free trade yields the optimal level of production, and a tariff necessarily causes overproduction (since foreign supply remains perfectly elastic under a tariff). On the other hand, a quota allows the domestic monopoly to exercise market power, but also restricts trade, so that quotas in general may cause domestic underproduction or overproduction. For a given tariff, if the PR-equivalent quota causes underproduction, the production loss may or may not be worse than that due to overproduction under the tariff. If the PR-equivalent quota causes overproduction, however, then it will cause less overproduction than the would tariff, and thus imposes a smaller production loss.<sup>17</sup>

At the other extreme, a prohibitive tariff yielding the same level of producer rent as a zero quota (the maximum rent attainable) necessarily yields the same prices, quantities, and welfare costs. In between, either policy may be superior in general.<sup>18</sup>

Third, the trade policies and domestic monopoly will also cause market distortions abroad. The quota allows more imports, at a higher price, than does the tariff, which means that foreign producers will be better off (and foreign real income will be higher) under the quota. This could be a powerful political-economy rationale for large countries to use quantitative restrictions rather than tariffs, since it has implications for the likelihood of foreign retaliation. On the other hand, the higher imports under the quota may or may not cause a greater distortion in foreign production relative to the global Pareto optimum. Near the free-trade equilibrium, either policy will allow the domestic monopoly to exercise its market power, and will thus pull in more imports than would be globally optimal; since the tariff results in a lower level of imports, it is less inefficient than the quota. A more protectionist policy that causes domestic overproduction will entail imports below the global optimum, however, since the combination of domestic underconsumption and overproduction implies that imports must be too low. In this case, the quota causes a smaller distortion in foreign production.

To complete the analysis, we note that trade intervention in the form of a tariff or quota generates either tariff revenue for the government or rents for holders of the quota privilege. A government that levies tariffs may be faced with revenue seeking by groups seeking direct subsidization. If the government instead auctions quotas and claims these rents as revenues, it also opens the door to revenue seeking. Bhagwati and Srinivasan (1980) and others have examined these kinds of activities in detail. We will assume simply that the directly unproductive activity associated with quota rent-seeking is no more or less costly than that associated with tariff revenue-seeking.

For price-equivalent policies, Cassing and Hillman show that quota-holder rent exceeds tariff revenue. However, this is necessarily true only under their small-country assumption that foreign prices are constant. With



constant foreign prices and identical domestic prices under the two policies, their result is a direct consequence of the higher level of imports allowed under the quota. In the large-country case the result can break down: imports are higher under the quota, but this implies that the equilibrium foreign price must also be higher. It is easy to find examples in which the smaller price differential outweighs the higher imports allowed by the quota, so that tariff revenue is higher than quota-holder rent.

In the case of PR-equivalent policies, however, the quota-holder rent is necessarily higher than the tariff revenue. Since we have shown that imports are higher under the quota than under the tariff, it is sufficient to show that the differential between domestic and foreign prices is higher as well. In the small-country case this follows trivially because the domestic price is higher under the quota and the foreign price is constant under both policies.

The proof is slightly more involved if foreign supply is not perfectly elastic. In particular, the quota implies a higher domestic price, but also a higher foreign price. We can show, however, that the differential between the two prices is necessarily greater under the quota.

The key is that the quota optimum at point D in Figure 1 requires a higher implicit tariff rate than does point L for the given level of imports  $Q = DJ$ . The tariff rate implied by point L, however, is identical to the rate required for the tariff optimum at point E in Figure 1. We have seen that the quota allows a higher level of imports, and thus implies a higher foreign price. Therefore, the quota applies a higher implicit tariff rate to a higher foreign price, and thus yields a greater domestic-foreign price differential than does the tariff.

This result is shown graphically in Figure 2. Prices  $P_Q$ ,  $P_L$ , and  $P_t$  represent the prices at points D, L, and E in Figure 1.<sup>19</sup> Under the tariff rate (call it  $s$ ) implicit in the quota, foreign supply is  $S_F[P_D/(1+s)]$ ; the

domestic price is  $P_Q$  at imports  $Q$  (equal to  $DJ$  in Figure 1). On the other hand, under the actual tariff rate ( $t$ ), foreign supply is  $S_F[P_D/(1+t)]$ ; the domestic price is  $P_L$  at imports  $Q$ , and  $P_t$  at imports  $S_{Ft}$  (equal to  $EK$  in Figure 1). Finally, to find the actual foreign price, we can refer the foreign supply curve under free trade. Since the domestic and foreign prices are equal under free trade, we can write foreign supply  $S_F( )$  as a function of  $P_D$ . Thus, the curve  $S_F(P_D)$  in Figure 2 shows the actual foreign price implied by any level of imports.

The differential between the domestic and foreign prices is  $UV$  under the quota and  $YZ$  under the tariff.  $YZ$  is equal to the tariff rate  $t$  multiplied by the foreign price  $P_{Ft}$ .  $UV$  is equal to a higher tariff rate  $s$  multiplied by a higher foreign price  $P_{FQ}$ .  $YZ$  is thus necessarily less than  $UV$ .

Therefore, the quota allows more imports and implies a larger differential between domestic and foreign prices, so that quota-holder rent unambiguously exceeds the revenue generated by the tariff in the large country case. In Figure 2, quota-holder rent is equal to  $(P_Q - P_{FQ})Q$ , while tariff revenue is  $(P_t - P_{Ft})S_{Ft}$ .

#### 4. Comparative Statics

We consider now the effects of a downward shift in the foreign supply curve--a drop in foreign costs in terms of the domestic currency--under the assumption that domestic producer rent is held constant through a trade policy adjustment like a tariff increase. We show that the domestic deadweight costs of the tariff--relative to the global Pareto optimum--necessarily increase by more than those caused by the quota.

The intuition is that the costs of the extra import substitution caused by the tariff increase as the good becomes available at lower cost from abroad.

Specifically, the net increase in the domestic welfare costs of the tariff relative to the quota is proportional to the amount by which imports under the quota exceed imports under the tariff.

This result was initially derived by McCulloch for the small-country case. The result is cleanest for small countries: perfectly elastic foreign supply effectively eliminates monopoly power in the domestic market, so that free-trade yields the global Pareto optimum. In the large-country case, there is a divergence between free trade and the global optimum, since monopoly power persists in the domestic market under free trade. An additional possibility is that domestic policy makers might try to improve the terms of trade through an optimal tariff or quota, options not available to the small country.<sup>20</sup> Thus, although we derive the opportunity costs of the two policies relative to the global Pareto optimum, it is not the only benchmark that could be used. The most suitable benchmark would depend on the best available alternative. For example, the best alternative might be free trade with domestic monopoly, in which case the link between changes in the benchmark price and the relative opportunity costs of the two policies becomes much less transparent.

For domestic producer rent to remain unchanged, it is sufficient to hold fixed the net demand curve faced by the domestic monopolist, since in this case all domestic conditions remain unchanged. Under a quota, no policy changes are required to hold net demand constant (as long as the quota remains binding). Under a tariff, however, the nature of the shift in foreign supply determines the kind of adjustment required to hold net demand constant. One of the most empirically relevant cases is also the simplest: if there is a change in international currency values that is unrelated to conditions in the domestic or foreign industry, the foreign supply curve will shift up or down by a proportional amount. The effects of this shift on net domestic demand could be negated by adjustment of the ad valorem tariff rate. If foreign

costs shift downward by a constant amount at all levels of imports, then an additional specific tariff per unit would be required to hold fixed the net demand curve faced by the domestic monopolist.<sup>21</sup>

Our result is most easily demonstrated algebraically. In the expressions below,  $P^*$  denotes the globally optimal price that would hold under free trade and perfect competition everywhere. We let  $P_Q$  and  $P_t$  be the domestic prices,  $MC_Q$  and  $MC_t$  the equilibrium levels of marginal cost,  $X_Q$  and  $X_t$  domestic production levels,  $C_Q$  and  $C_t$  domestic consumption levels, and  $I_Q$  and  $I_t$  the levels of imports, under the quota and tariff, respectively.  $S_D(P_D)$  denotes the inverse domestic marginal cost function--domestic output as a function of marginal cost.

Suppose that income effects in consumption are negligible, so that foregone consumer surplus can be used as a measure of deadweight consumption loss. Under the tariff, domestic welfare loss is the sum of deadweight losses in consumption and production:

$$(9) \int_{P^*}^{P_t} [D(P_D) - C_t] dP_D + \int_{MC_t}^{P^*} [S_D(P_D) - X_t] dP_D .$$

A similar expression holds for the quota, with Q instead of t in subscripts. We can decompose this expression for welfare loss under the quota, with the consumption and production losses shown in braces:

$$(10) \left\{ \int_{P_t}^{P_Q} [D(P_D) - C_Q] dP_D + \int_{P^*}^{P_t} [D(P_D) - C_t + C_t - C_Q] dP_D \right\}$$

$$+ \left\{ \int_{MC_Q}^{MC_t} [D(P_D) - X_Q] dP_D + \int_{MC_t}^{P^*} [S_D(P_D) - X_t + X_t - X_Q] dP_D \right\}$$

We get the net welfare loss due to the quota by subtracting (9) from (10).

This appears below, with the net consumption and production losses due to the quota shown in braces:

$$(11) \left\{ \int_{P_t}^{P_Q} [D(P_D) - C_Q] dP_D + (C_t - C_Q)(P_t - P^*) \right\}$$

$$+ \left\{ \int_{MC_Q}^{MC_t} [S_D(P_D) - X_Q] dP_D + (X_t - X_Q)(P^* - MC_t) \right\}$$

Now suppose that there is a change in foreign supply that causes  $P^*$  to change. (A drop in foreign costs will cause the global optimum price  $P^*$  to fall: it will cause net domestic demand to fall, and  $P^*$  is found at the intersection of domestic marginal cost and net domestic demand.) If domestic conditions (and thus domestic producer rent) are held constant, the change in the net domestic welfare cost of the quota,  $dW$ , can be found directly from (11):

$$dW = [(X_t - X_Q) - (C_t - C_Q)] dP^* = (I_Q - I_t) dP^*$$

Given the characteristics of demand and supply, the higher is the level of protection required to sustain a given level of producer rent (the lower is  $P^*$ ), the greater is the likelihood that a quota will be more efficient than

the PR-equivalent tariff.<sup>22</sup> Thus, if there is long-term erosion in the comparative advantage of the domestic industry, or if there is persistent real appreciation of the domestic currency, a quota would eventually become more efficient than a tariff. (Recall that tariffs are necessarily superior to quotas near the free-trade equilibrium for large countries.) Therefore, to the extent that domestic welfare costs are taken into consideration in trade policy decisions, we would expect quotas to be used to maintain higher levels of protection (higher domestic-foreign price differentials) than tariffs, all else equal.

This conclusion is consistent with the empirical results of Godek (1985) for a cross section of U.S. manufacturing industries. He finds that the ratio of tariffs to total protection increases as the level of protection decreases. However, Godek argues that tariffs tend to be used instead of quotas at low levels of protection due to their ease of administration. He suggests further that quantitative restraints may be used along with tariffs at higher levels of protection so as to share some of the policy rents with foreign producers, with the intent of lessening their opposition to the trade barriers. Our results may be viewed as providing a complementary explanation.

## 5. Concluding Remarks

This paper has used the criterion of producer rent equivalence to evaluate the effects of tariffs and quotas under domestic monopoly. We find that a quota generates a higher domestic price, but allows more imports, than does the PR-equivalent tariff. The overall welfare ranking of the two policies is indeterminate in general. However, close to free trade the quota necessarily generates higher domestic costs than does the tariff. On the other hand, the quota imposes lower costs on foreigners. Because the quota creates a bigger

wedge between domestic and foreign prices, it generates more revenue. If foreign costs drop while domestic producer rent is held constant, then the domestic deadweight opportunity costs of the tariff will increase at a constant rate relative to those of the quota.

Even though the concept of producer rent equivalence is a useful tool for analyzing the political economy of trade policy, additional considerations may affect the political choice between alternative forms of protection. The visibility of alternative measures may affect the intensity of countervailing political pressure generated.<sup>23</sup> The provisions of international agreements and domestic legislation may substantially influence the political ease of implementation of different forms. The threat of foreign retaliation may strengthen the case for measures that allow foreigners to enjoy a share of the policy rents. Indeed, were comparative deadweight cost the only politically relevant consideration, we would expect to see much less use of both tariffs and quotas, and greater use of direct subsidies.<sup>24</sup>

An important aim for future research should be to combine welfare cost considerations like those examined in this paper with richer models of the political process that include emphases on the distribution of political influence (including that of foreign parties), the visibility of alternative measures, and the effects of institutional arrangements. This should be complemented with further analyses of other important economic conditions under which the standard import or price equivalence of tariffs and quotas breaks down, like economic growth and uncertainty, using the concept of producer rent equivalence.

## Footnotes

1. See Cassing and Hillman (1985) for an extensive list of references to studies that compare tariffs and quotas under various conditions.
2. See the contributions in Colander (1984) for references.
3. Bhagwati and Srinivasan (1983) refer to the superiority of tariffs over quotas as a "general intuition." See also Kindleberger (1963).
4. Bhagwati emphasizes that the range of activities in question is broader than is implied by the term rent seeking, and suggests the term directly-unproductive profit-seeking (DUP) activities instead. For references and discussion, see the contributions in Colander (1984).
5. For example, Cassing and Hillman use voter interests as their political model. By neglecting the payment of taxes, however, they fail to give weight to all of the economic interests of voters. For further discussion, see Kaempfer, McClure, and Willett (1986).
6. See Hufbauer, Berliner, and Elliott (1986) for a concise summary of results on the quantitative effects of trade policies in many U.S. industries.
7. For clarity, Figure 1 does not show foreign import supply curves. However, foreign import supply under the tariff is simply the horizontal difference between  $D(P_D)$  and  $D_t$ . Figure 1 was drawn under the assumptions that  $D(P_D) = 500 - P_D$ ,  $S_F(P_F) = -200 + 2(P_F)$ , and  $MC = 50 + 0.2(S_D)$ . It shows a quota of amount 105.33 and a tariff at rate 0.3618. Domestic producer surplus is 27000.00 under both policies.
8. The isorent curves are downward sloping above MC, have zero slope at their intersection with MC, and are upward sloping below MC. These curves are convex to the origin as long as marginal cost is non-decreasing.
9. The tariff may have to be prohibitive, even if the quota is greater than zero. In this case, the optimal quantity for the monopolist under the tariff lies along the demand curve  $D(P_D)$  at its intersection with net demand  $D_t$  under



the tariff. There is a discontinuity in marginal revenue under the tariff at this point of intersection: it drops from the curve marginal to  $D_t$  to the curve marginal to  $D(P_D)$ . However, the curve marginal to  $D(P_D)$  is necessarily above the curve marginal to  $D(P_D) - Q$ , for any  $Q > 0$ , so that marginal revenue under the tariff still exceeds marginal revenue under the quota.

10. For any positive tariff rate, the PR-equivalent quota must be binding. A non-binding quota would force the monopolist to optimize along the free-trade net demand curve. The maximum profits obtainable along this curve are necessarily lower than those obtainable along the net demand curve implied by a positive tariff.

11. We focus on changes in the quota because the standard qualitative effects of changes in the tariff on domestic prices under perfect competition do not necessarily hold for a large country with a domestic monopoly. Our partial-equilibrium framework rules out the possibility that the Metzler paradox could occur under the quota. However, Panagariya (1981) analyzes this case in general equilibrium, and shows that the Metzler paradox cannot occur under a quota as long as the initial equilibrium lies in the elastic range of the foreign offer curve.

12. Specifically, let  $C'( )$  and  $C''( )$  be the first and second derivatives of the domestic cost function. We find that  $d\pi/dQ = C'( ) - P_D < 0$ , and that  $dP_D/dQ$  is equal to  $1 - C''( )D'( ) > 0$  divided by  $[P_D - C'( )] D'( ) + [2 - C''( ) D'( )] D'( )$ , a term that is negative under the second-order condition for profit maximization by the domestic monopolist (which is satisfied under our assumptions).

13. If the tariff is prohibitive, the import-equivalent quota is zero. This quota allows the monopolist to maximize profits over the entire range of the domestic demand curve,  $D(P_D)$ . If the tariff is sufficiently high for the monopolist to obtain the global profit maximum along  $D(P_D)$ , then the domestic price, output, and profits will be identical under the two policies.

14. The Metzler paradox is a possibility for a large country with domestic monopoly: a tariff could yield a lower domestic price than would free trade. In this case, a price-equivalent quota would not exist.
15. This is a classic example of the theory of the second best as set forth by Lipsey and Lancaster (1956-57).
16. There will be underproduction of the good at low levels of protection as long as there would be positive domestic production under free trade. With zero domestic production under free trade, any positive amount of domestic production is inefficient, but the quota causes less productive inefficiency than does the tariff.
17. For further discussion of the small-country case, see McCulloch (1973) or Kaempfer, McClure, and Willett (1986).
18. Simulations verifying this are available from the authors upon request.
19. The axes of Figure 2 have been scaled so that it can be seen more clearly.
20. See Panagariya (1981) for analysis of the optimal and revenue-maximizing quotas for a large country with a domestic monopoly.
21. A more complicated shift in foreign supply would require the addition of a nonlinear tariff schedule in order to hold net demand constant.
22. In general, we cannot say how the foreign supply shift will affect foreign deadweight opportunity costs relative to the global Pareto optimum.
23. If the visibility of alternative forms of protection strongly influences countervailing political pressure and visibility tends to be inversely related to welfare costs, then Becker's conclusion that there will be a tendency to adopt less inefficient forms of transfer could be reversed. While Becker mentions visibility issues, he gives them relatively little attention, presumably in part because his formal model involves only two actors. In the small numbers case, transfers would be difficult, if not impossible, to hide.
24. Of course, as Bhagwati (1971) and others note, direct subsidies will not be more efficient under all circumstances.

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Figure 1

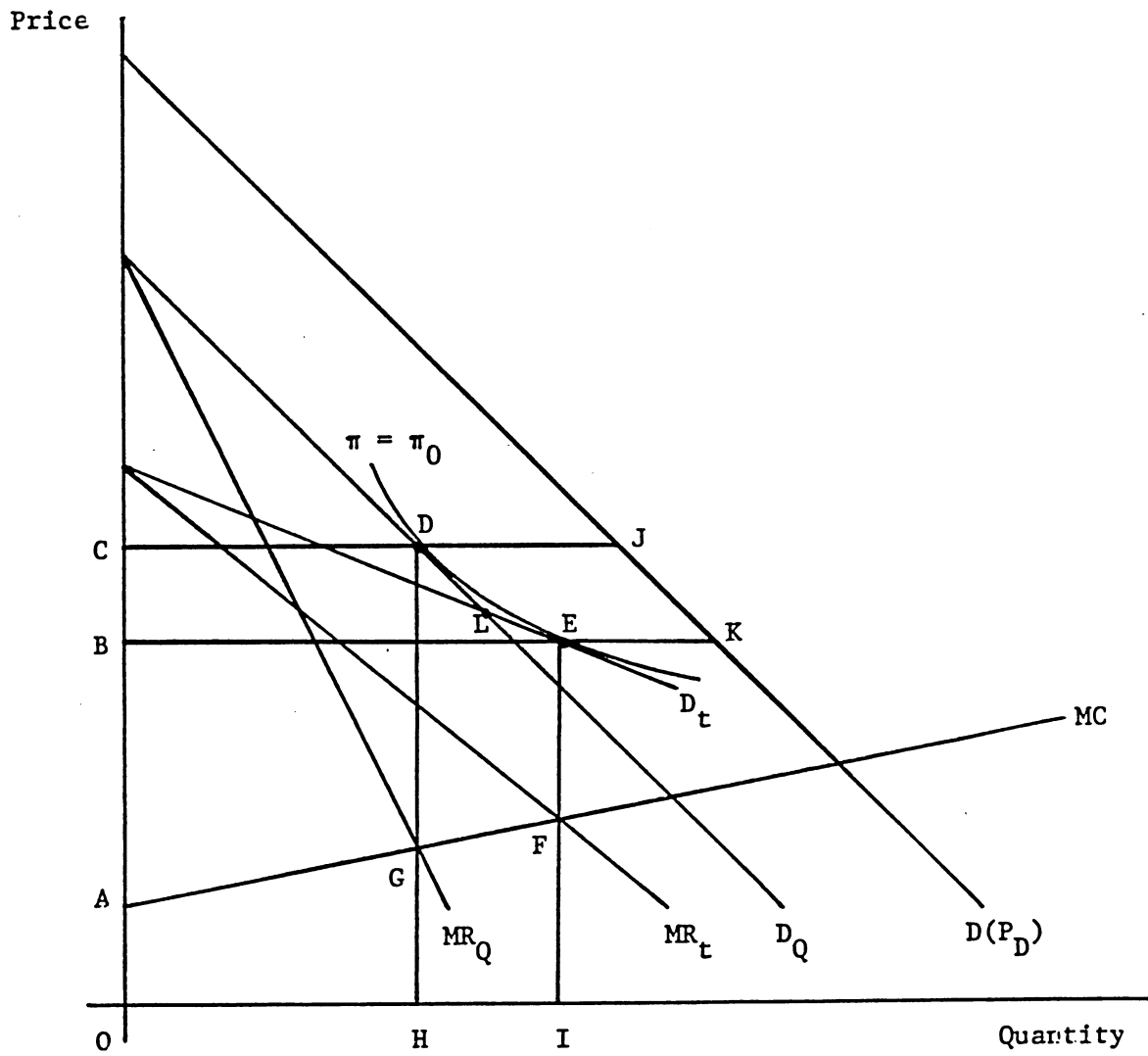


Figure 2

