

ECO 352 – International Trade – Spring Term 2010  
Week 9 Precepts – April 5  
TARIFFS AND QUOTAS – QUESTIONS

**Question 1:**

To show that the home country's optimal ad valorem tariff rate equals the reciprocal of the elasticity of the rest of the world's export supply curve. Krugman-Obstfeld mention the idea of the optimal tariff (p. 218) but do not derive a formula. You should read their discussion in advance.

**Question 2:**

To show that when the domestic producer is a monopolist but foreign suppliers are price-takers, the domestic price is higher under a quota than with a a tariff that leads to the same quantity of imports. In Appendix 2 to Chapter 8, Krugman and Obstfeld do this for a special case (when the foreign supply of home's import good is perfectly elastic), and you will find it useful to read this in advance. We will do the more general case where the foreign supply curve is upward-sloping.

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 TARIFFS AND QUOTAS – SOLUTIONS

**Question 1:**

Figure 1 is the same as the one in the lecture slide No.4 of March 30, except that some labels have been added. The free trade price common to the home country and the rest of the world,  $P_X = P_X^*$ , is denoted by  $P^F$ . The amount of the good consumed in the home country is  $X_C$ , the amount produced in the home country is  $X_P$ , and the quantity of imports is  $X_M = X_C - X_P$ .

Figure 2 shows the effect of a small increase in the tariff  $t$ . The world price  $P_X^*$  falls, the home price  $P_X^* + t$  rises. The change in the world price is denoted by  $\Delta P_X^*$ ; note that this is  $< 0$ .

The home consumption falls,  $\Delta X_C < 0$ . Home production rises,  $\Delta X_P > 0$ . The quantity of imports falls,  $\Delta X_M = \Delta X_C - \Delta X_P < 0$ .

The changes in the consumption and production dead-weight losses are respectively the vertical thick black bars adjacent to the areas 2 and 4; they add up to the corresponding vertical thick black bar in the right hand panel. There are two types of changes in the terms of trade gain (area 5). The home country gets the terms of trade benefit  $P^F - P_X^*$  on a smaller volume of imports; this is a loss represented by the vertical gray bar in the right hand panel, and is equal to the sum of the two vertical gray bars in the left hand panel. The other is the increase in the terms of trade benefit due to the fall in the world price; this is the horizontal black bar in the right or the left panels.

Therefore the overall change in home welfare is

$$(P_X - P_X^*) \Delta X_M - X_M \Delta P_X^* .$$

The first term is negative (a loss), and the second term, with the negative sign in front of it, is positive (a gain).

For the tariff  $t$  to be optimal, the marginal gain from a small further increase should be zero. Therefore the condition is

$$(P_X - P_X^*) \Delta X_M = X_M \Delta P_X^* ,$$

or

$$\frac{P_X - P_X^*}{P_X^*} = \frac{X_M}{P_X^*} \frac{\Delta P_X^*}{\Delta X_M} .$$

But  $X_M = \text{ROW's exports}$ , therefore the right hand side is just the reciprocal of the elasticity of foreign export supply.

**Question 2:**

The left hand panel Figure 3 shows how the foreign export supply curves differ under a tariff and a quota. The tariff-ridden foreign supply curve is just a vertical displacement of the

free trade one; the displacement is proportional for an ad valorem tariff (as shown); it would be parallel for a specific tariff. Under a quota, the supply curve is truncated and becomes vertical at the quota quantity.

For each price the domestic monopolist might charge, the quantity he sells will equal that demanded by domestic buyers minus that supplied by foreign exporters to the home market. This net or residual demand curve is obtained by horizontally subtracting the foreign export supply curve from the domestic demand curve.

First consider the tariff. The residual demand curve is  $RD(T)$ , shown in red. The corresponding residual marginal revenue curve is the red dashed line  $RMR(T)$ . The monopolist maximizes profit by equating  $RMR(T)$  with his marginal cost  $MC$ , producing the quantity indicated by  $T$  in the figure, and charging the price  $P(T)$ . The quantity of imports in this situation is the thick line segment marked  $m$  and colored green.

Suppose that instead of the tariff, this quantity  $m$  is set as a quota. The quota-ridden residual demand curve facing the domestic monopolist is labeled  $RD(Q)$  and colored blue. It passes through the same point where the quantity produced by the monopolist is  $T$  and the price is  $P(T)$ , but it is obtained by subtracting the constant quota quantity from the domestic demand curve. Therefore it is horizontally parallel to the latter, and therefore steeper than  $RD(T)$  as we see from the figure. The residual marginal revenue curve corresponding to  $RD(Q)$  is  $RMR(Q)$ . The monopolist's profit-maximizing quantity under the quota is where  $RMR(Q)$  meets  $MC$ , and is denoted by  $Q$ . We see that  $Q < T$ .

The intuition is that under the quota, the monopolist faces a less elastic residual demand curve; therefore he charges a higher price (and produces less).

From the point of view of the home country's aggregate welfare, even though the two policies yield the same volume of imports, the quota is worse because it generates a domestic price that is farther away from (higher than) marginal cost.