International Economics
June 2014
Answer key

PROBLEM 1

1.1 False. Mobile factors that can work in either sector may either gain or lose.

1.2 False. Under external economies of scale the cost per unit produced depends on the size of the industry (and not the firm), so the individual firm perceives its own effect on total industry production as being negligible. External economies of scale is therefore consistent with perfect competition.

1.3 True. If the foreign market is small then the domestic firm does not gain much in terms of higher profits in the foreign market, but it is still exposed to more competition in the home market. This is the so-called profit shifting effect.

1.4 True. All countries granted "most favored nation" status under the GATT pay the same tariff rates. The GATT makes one exception where countries in a preferential trading agreement are allowed to have zero tariffs between agreeing countries.

1.5 True. In the model of horizontal foreign direct investment firms have stronger incentives to do HFDI when trade costs are high because the alternative to HFDI is exporting, which is more costly with high trade costs.

PROBLEM 2

Home is a large importing country with import demand for toys $M = 10 - P$*, where* P *is the internal price of toys in Home. Foreign's export supply of toys is* $X^* = 2 + P^*$*, where* P^* *is the world price.*

Question 2.1: *Consider first the case of free trade, i.e., the price is* $P_F = P = P^*$*. Find* P_F *and the quantity of toys imported in Home.*

Equilibrium under free trade is determined by the intersection of import demand and export supply in Foreign:

$$10 - P_F = 2 + P_F \Rightarrow P_F = 4$$

With this price it is straightforward to find the imported quantity of toys: $M = 10 - P_F = 6$.

Home now introduces a tariff, $t = 2$*, such that* $P = P^* + 2$.

Question 2.2: *Illustrate graphically the impact of the tariff on prices and the volume of trade. Find the prices,* P *and* P^**, and the quantity imported in Home.*

The impact of the tariff on prices and the volume of trade may be illustrated by the use of a figure like Figure 10A-1 in Krugman, Obstfeld and Melitz (2012).

With the tariff $t = 2$ equilibrium is now determined by the equation

$$\begin{aligned} & 10 - P = 2 + P^* \\ \Rightarrow \quad & 10 - P = 2 + (P - 2) \\ \Rightarrow \quad & P = 5 \end{aligned}$$

We also have that $P^* = P - t = 5 - 2 = 3$. The quantity imported is $M = 10 - 5 = 5$.

The import demand function in Home is defined by the difference between supply and demand for toys in Home. The demand is $D = 12 - \frac{1}{2}P$ *and the supply is* $S = 2 + \frac{1}{2}P$*. The tariff changes Home's welfare due to efficiency losses and a terms of trade gain.*

Question 2.3: *Use the demand and supply curves to illustrate and explain the efficiency losses and the terms of trade gain. Find the values of the efficiency losses, the terms of trade gain and the change in total welfare.*

The tariff reduces Home's welfare due to efficiency losses caused by a production distortion and a consumption distortion. The production distortion arises because the

tariff leads domestic producers to produce too much of the good. The consumption distortion arises because the tariff leads consumers to consume too little of the good. The tariff increases Home's welfare due to a terms of trade gain. This gain arises because the tariff lowers foreign export prices. These effects are illustrated by the use of a figure like Figure 10A-2 in Krugman, Obstfeld and Melitz (2012).

The efficiency loss is simply the area of the two triangles representing the production and consumption distortion. That is, it is given by

$$\begin{aligned} Loss &= \frac{1}{2}(S_2 - S_1)(P - P_F) + \frac{1}{2}(D_1 - D_2)(P - P_F) \\ &= \frac{1}{2}(S_2 - S_1 + D_1 - D_2)(P - P_F) \\ &= \frac{1}{2}(4.5 - 4 + 10 - 9.5))(5 - 4) \\ &= \frac{1}{2}. \end{aligned}$$

The gain is given by the area of the rectancle representing the terms of trade gain:

$$\begin{aligned} Gain &= (P_F - P^*)(D_2 - S_2) \\ &= (4 - 3)(9.5 - 4.5)) \\ &= 5 \end{aligned}$$

Thus introduction of a tariff, $t = 2$, increases total welfare by $5 - 0.5 = 4.5$.

The Home government is uncertain whether the tariff, $t = 2$, maximizes welfare. Consider instead a general tariff of t, such that $P = P^* + t$.

Question 2.4: *State the efficiency losses and the terms of trade gain (i.e., the change in total welfare) as a function of the tariff, and find the optimum tariff that maximizes Home welfare.*

With a general tariff of t, such that $P = P^* + t$, the prices may be found as a function of t :

$$\begin{aligned} & 10 - P = 2 + P^* \\ \Rightarrow \quad & 10 - P = 2 + (P - t) \\ \Rightarrow \quad & P = 4 + \frac{1}{2}t. \end{aligned}$$

We also have that $P^* = P - t = 4 - \frac{1}{2}t$. The quantities demanded and supplied with the new prices are $D_2 = 12 - \frac{1}{2}(4 + \frac{1}{2}t) = 10 - \frac{1}{4}t$, and $S_2 = 2 + \frac{1}{2}(4 + \frac{1}{2}t) = 4 + \frac{1}{4}t$.

The efficiency loss is now given by

$$\begin{aligned} Loss &= \frac{1}{2}(S_2 - S_1)(P - P_F) + \frac{1}{2}(D_1 - D_2)(P - P_F) \\ &= \frac{1}{2}(S_2 - S_1 + D_1 - D_2)(P - P_F) \\ &= \frac{1}{2}(4 + \frac{1}{4}t - 4 + 10 - (10 - \frac{1}{4}t))(4 + \frac{1}{2}t - 4) \\ &= \frac{1}{2}(\frac{1}{4}t + \frac{1}{4}t)(\frac{1}{2}t) \\ &= \frac{1}{8}t^2. \end{aligned}$$

The gain is:

$$\begin{aligned} Gain &= (P_F - P^*)(D_2 - S_2) \\ &= (4 - (4 - \frac{1}{2}t))(10 - \frac{1}{4}t - (4 + \frac{1}{4}t)) \\ &= 3t - \frac{1}{4}t^2. \end{aligned}$$

The change in welfare is now given by

$$\begin{aligned} \Delta W &= Gain - Loss \\ &= 3t - \frac{1}{4}t^2 - \frac{1}{8}t^2 \\ &= 3t - \frac{3}{8}t^2, \end{aligned}$$

so the tariff that maximizes welfare may now be found:

$$\begin{aligned} & \frac{\partial \Delta W}{\partial t} = 3 - \frac{3}{4}t = 0 \\ \Rightarrow \quad & t_0 = 4. \end{aligned}$$

The Home government considers whether it should introduce an import quota of $\overline{Q} = 3$ instead of the tariff. The license to import the restricted quantity of toys is given to a domestic firm.

Question 2.5: *Find the prices, P and P^*, and the change in welfare relative to the case of free trade. Is welfare with the quota higher than welfare with the tariff, $t = 2$? Is it*

possible to define a quota that yields higher welfare than $\overline{Q} = 3$*?*

With a quota of $\overline{Q} = 3$ the prices must be $M = 10 - P = 3 \Rightarrow P = 7$ and $X^* = 2 + P^* = 3 \Rightarrow P^* = 1$. The quota therefore corresponds to a tariff of $t = P - P^* = 7 - 1 = 6$. From the welfare function in the previous question we can find the change in welfare of a tariff, $t = 6$:

$$\Delta W = 3t - \frac{3}{8}t^2 = 18 - \frac{3}{8}36 = 4.5,$$

which is exactly the same welfare as with a tariff equal to $t = 2$, see question 2.3. We also know that the tariff that maximizes welfare is $t = 4$, and the corresponding imported quantity is $M = 10 - P = 10 - (4 + \frac{1}{2}4) = 4$. So a quota equal to $\overline{Q} = 4$ yields the highest welfare.