

ECON/EEP 181: INTERNATIONAL TRADE ASSIGNMENT # 5 SOLUTIONS

LUOSHA DU, SHANTHI NATARAJ, AND ROBERT SANTILLANO

UNIVERSITY OF CALIFORNIA, BERKELEY

DUE: DECEMBER 10, 2008

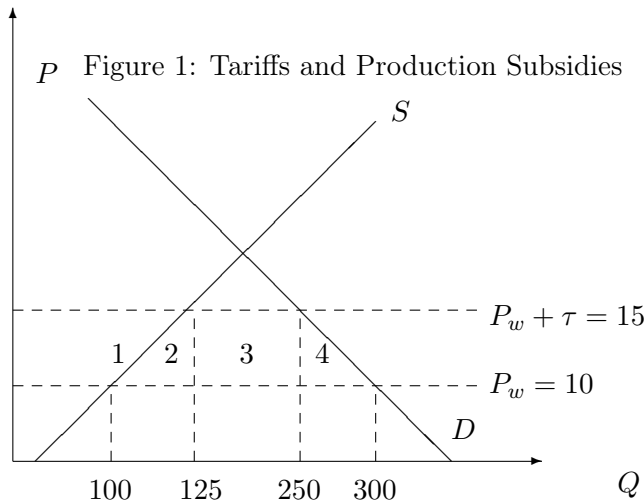
1. A small country can import a good at a world price of 10 per unit. The domestic supply curve of the good is: $S=50+5P$. The demand curve is $D=400-10P$.

In addition, each unit of production yields a marginal social benefit of 10.

- (a) Calculate the total effect on welfare of a tariff of 5 per unit levied on imports.

Let's begin by considering what happens in a world with no tariffs. Since the country is small, it takes world price as given, so $S_0 = 50 + 5(10) = 100$ and $D_0 = 400 - 10(10) = 300$, as shown on Figure 1. Now, if the country imposes a tariff, it cannot affect the world price, so its producers and consumers face $P_w + \tau = 10 + 5 = 15$, and $S_1 = 50 + 5(15) = 125$ and $D_1 = 400 - 10(15) = 250$. Imports fall from $D_0 - S_0 = 200$ to $D_1 - S_1 = 125$.

The change in consumer surplus is $-(1+2+3+4) = -(562.5 + 62.5 + 625 + 125) = -1375$. The change in producer surplus is $+1 = +562.5$. The change in government revenues is $+3 = +625$. Unlike in our previous examples, though, there's an additional benefit - the additional marginal social benefit to producing 25 more units, which is equal to $10 * 25 = +250$. So the overall change in welfare is $-1375 + 562.5 + 625 + 250 = +62.5$. If there is an externality, then a tariff *can* be welfare-improving for a small country.



- (b) Calculate the total effect of a production subsidy of 5 per unit.

A production subsidy means that suppliers now get a price of $P + 5$ for every unit they sell, but consumers still face the world price, so $S_2 = 50 + 5(15) = 125$ and $D_2 = D_0 = 400 - 10(10) = 300$. In this case, consumer surplus has not changed. Producers get the same additional producer surplus of $+562.5$. The government pays 5 for every units produced, so the change in government

revenue is -625 . The change in marginal social benefit is still $10 * 25 = +250$. So the overall welfare effect is $+562.5 - 625 + 250 = +187.5$.

(c) *Why does the production subsidy produce a greater gain in welfare than the tariff?*

The production subsidy produces a greater gain in welfare than the tariff because it is targeted directly at the externality (i.e., the additional marginal social benefit of production that producers do not capture). Therefore, it does not cause the distortion to consumption that the tariff causes.

(d) *What would the optimal production subsidy be?*

The marginal private benefit to the producers of each additional unit is the price (10), but the marginal social benefit is $P + 10 = 20$. Therefore, the optimal subsidy would be 10, because it would make the marginal private benefit equal to the marginal social benefit.

We can also calculate this value mathematically, by choosing the subsidy that maximizes the change in welfare. Note that consumer surplus doesn't change since the production subsidy doesn't affect the price consumers pay, so we only have to think about producer surplus (PS), government expenditure (GE), and social benefit (SB). Also note that the change in producer surplus (PS) is the area (+1) in Figure 1, and the change in government expenditure (GE) is the area (-1-2) in Figure 1, so $\Delta PS + \Delta GE$ is given by the area (-2) in Figure 1.

$$\begin{aligned} \Delta W &= \Delta PS + \Delta GE + \Delta SB \\ &= -0.5[S(P + \tau) - S(P)]\tau + 10[S(P + \tau) - S(P)] \\ &= -0.5[50 + 5P + 5\tau - (50 + 5P)]\tau + 10[50 + 5P + 5\tau - (50 + 5P)] \\ &= -2.5\tau + 50\tau \end{aligned}$$

Taking the derivative of the change in welfare with respect to τ and setting it equal to zero, we get:

$$-5\tau + 50 = 0 \implies \tau^* = 10$$

2. *Suppose that ABC is a Taiwanese firm, and XYZ is a Korean firm. The following payoffs result, depending on the firm decisions. What equilibrium, and what payoffs will result if there is no government intervention?*

To figure out what happens with no government intervention, we need to figure out what the Nash equilibrium is. First consider ABC's decision. If XYZ chooses Produce, ABC's payoffs are -40 for Produce and 0 for Not Produce, so it chooses Not Produce. If XYZ chooses Not Produce, ABC's payoffs are 60 for Produce and 0 for Not Produce, so it chooses Produce. Now consider XYZ's decision. If ABC chooses Produce, XYZ's payoffs are 25 for Produce and 0 for Not Produce, so it chooses Produce. If ABC chooses Not Produce, XYZ's payoffs are 150 for Produce and 0 for Not Produce, so it chooses Produce. These choices are shown in bold in the table below. The Nash equilibrium is the set of choices of firms ABC and XYZ such that neither wants to deviate, given what the other is doing. In this case, it is Not Produce for ABC (with a payoff of 0), and Produce for XYZ (with a

payoff of 150).

		XYZ	
		Produce	Not Produce
ABC	Produce	-40,25	60,0
	Not Produce	0,150	0,0

3. *Strategic trade. The cost for production is 3,000 per car in the US and 2,000 per car in Japan. Suppose automobile prices are described by the following inverse demand function*

$$P = 60,000 - 20(X_{us} + X_j)$$

- (a) *Derive the reaction function for US producers, i.e. $X_{US}(X_J)$, express the number of US cars produced as a function of Japanese production.*

To derive the reaction function for the US, we need to solve its profit maximization problem. US producers choose X_{US} to maximize profit, taking X_J as given:

$$\begin{aligned} \max \Pi_{US} &= PX_{US} - c_{US}X_{US} \\ &= [60,000 - 20(X_{US} + X_J)] X_{US} - 3,000X_{US} \end{aligned}$$

Taking the first derivative, we get:

$$60,000 - 40X_{US} - 20X_J - 3,000 = 0$$

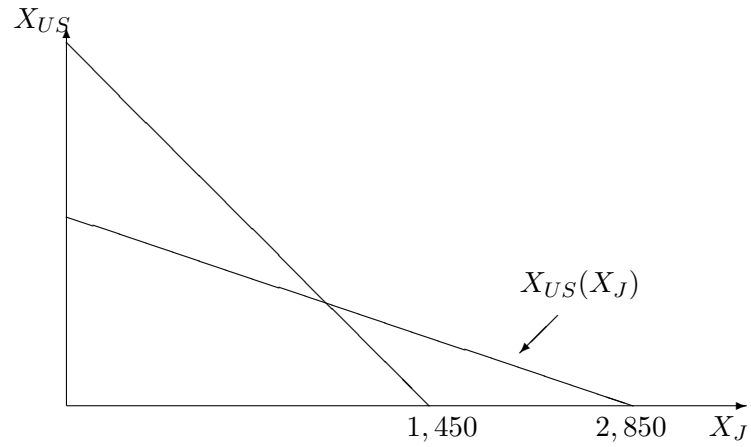
so $X_{US}(X_J) = 1,425 - 0.5X_J$

Now consider the reaction functions graphed below and use them to answer the questions b & c.

- (b) *Which reaction function does the arrow point to? $X_{US}(X_J)$ or $X_J(X_{US})$?*

The arrow points to $X_{US}(X_J)$. We can figure this out by solving for Japan's reaction function, using the same method as above, so we get $X_J = 1,450 - 0.5X_{US}$. The horizontal axis of the figure represents a situation in which $X_{US} = 0$. If $X_{US} = 0$, then the US reaction function tells us that $X_J = 2,850$, while the Japanese reaction function tells us that $X_J = 1,450$. So the reaction function that crosses the X-axis farther to the right (at 2,850 rather than 1,450) must be the US reaction function.

Figure 2: Reaction Functions



(c) *What factors may cause any US strategic trade policy attempts to fail? List 2.*

A number of factors may cause strategic trade policy to fail, including:

- i. Lack of information about which industries to target
- ii. Retaliation by other countries
- iii. US is not the first mover (i.e., another country has already tried to get the profits for their own firms!)
- iv. The industry is not oligopolistic (e.g., it is nearly perfectly competitive)