Econ 101: Principles of Microeconomics Fall 2012

Homework #4 Answers October 4-5, 2012

Problem 1: South Korea has the following domestic supply and demand for baseball hats:

$$P_d = 20 - 2Q_d, \quad P_s = 5 + Q_s$$

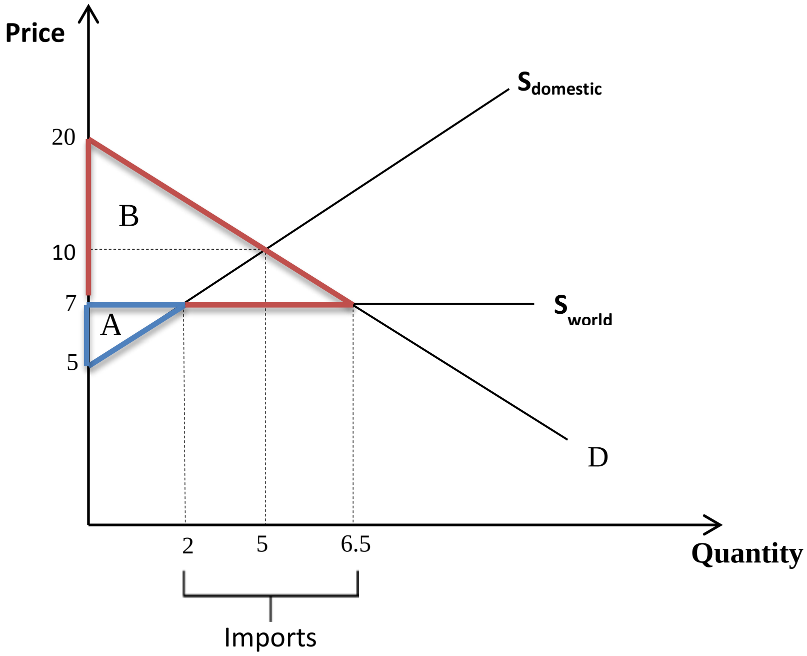
The world price for baseball hats is 7 dollars.

(1) Initially, what is the number of baseball hats that South Korea imports/exports? How many baseball hats are made by domestic Korean companies?
(2) What is the consumer surplus? The domestic producer surplus?

As depicted on the graph below, initially South Korea imports 4.5 baseball hats. This quantity is found by determining the number of baseball hats that domestic suppliers are willing and able to sell at the world price of 7 dollars, and then finding the number of baseball hats that domestic consumers are willing and able to buy at 7 dollars. The difference between these two quantities is the number of baseball hats that domestic consumers will purchase from foreign suppliers. The algebra is:

$$7 = P_d = 20 - 2Q_d \rightarrow Q_d = 6.5$$
$$7 = P_s = 5 + Q_s \rightarrow Q_s = 2$$

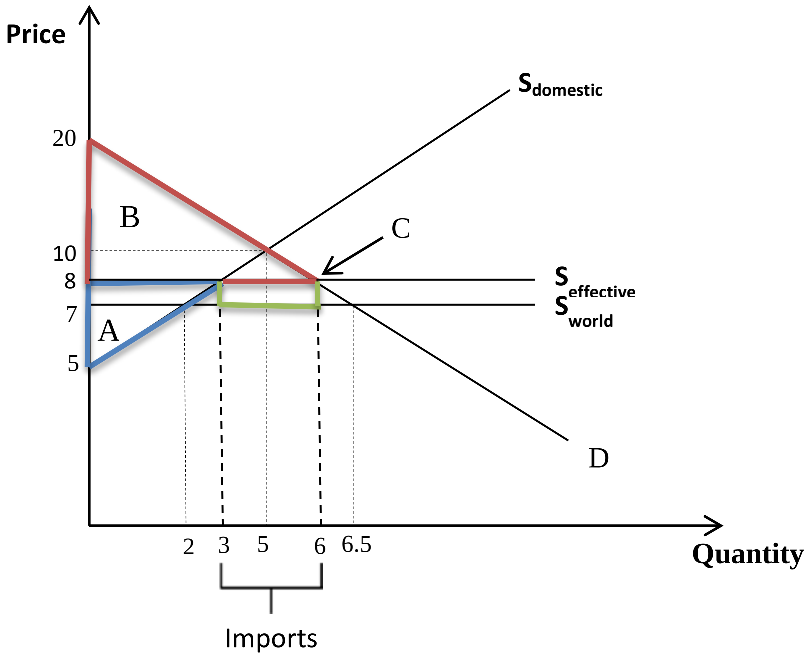
The consumer surplus is the area below the demand curve and above the price consumers pay (this is true not just for trade problems, but in general. On the graph below, the area is labeled B, which equals: (20-7)*6.5/2 = 6.5^2 = 42.25. Producer surplus is the area above the supply curve and below the price the producers receive. It is labeled A on the graph below. The area is equal to: (7-5)*2/2 = 2.



(3) The government wants to protect domestic production of baseball hats and decides to impose a $1 tariff on foreign baseball hat makers. How does this change the consumer and producer surplus? How much revenue does the government raise?

Consumer surplus is given by the area below the demand curve but above the price they pay. Since the $1 tariff effectively raises the world price to $8, consumers now pay $8 and their surplus changes accordingly. Domestic producers, however, are now paid $8 instead of the $7 they were paid before. Government revenue is the number of foreign products imported times the price of the tariff ($1). On the graph below, consumer surplus is labeled B, producer surplus is labeled A, and government revenue is labeled C.

At the new price of $8, domestic consumers now demand 6 units of baseball hats and domestic producers are willing and able to produce 3 units. Calculating the areas yields: A = (8-5)*3/2 = 4.5, B = 12*6/2 = 36, and C = (6-3)*1 = 3.



(4) As with most government policies, there are winners and losers from the adoption of tariffs. Using the information from your answer to (3), who favors tariffs: domestic consumers or domestic producers of baseball hats?

Domestic producers favor the adoption of tariffs. Intuitively, the higher effective world price allows more producers to supply their goods at the price at which their foreign competition does. If the world price is lower than the domestic equilibrium, then the domestic producer surplus increases from a tariff, but the domestic consumer surplus will decrease.

(5) The tariff idea gets shot down by the legislature. So the government decides to implement a quota restricting the quantity of hats that may be imported to 2: what is (i) the quantity of baseball hats produced domestically, (ii) domestic consumer and producer surpluses, and (iii) how much is the quota rent?

First, we need to find the effective price under a quota. We find this by looking at the supply curve in the following way:

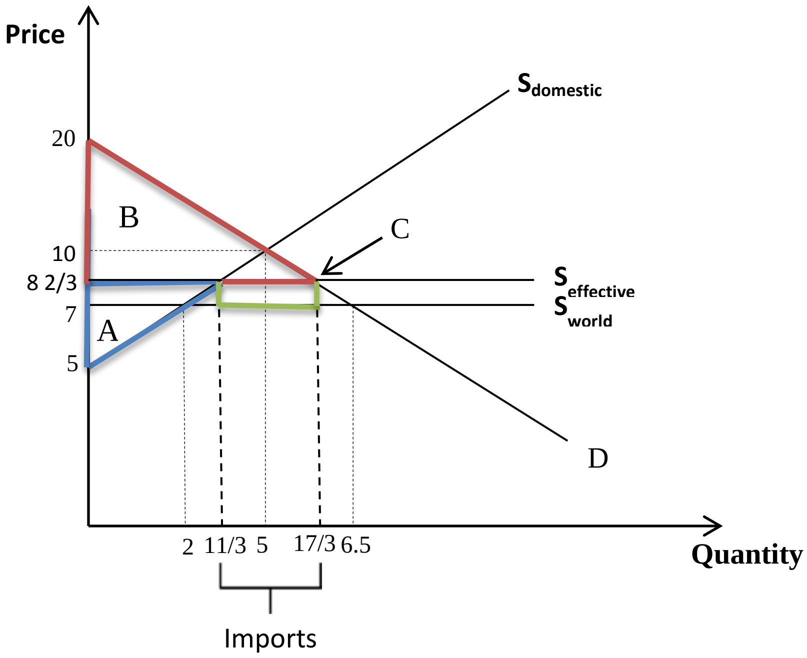
$$Q_s = Q_{domestic} + Q_{foreign}$$
$$Q_s = P - 5 + 2 = P - 3$$

Where quantity of foreign goods supplied is restricted to 2 by the quota. We then set supply and demand to be equal to one another, and get:

$$P - 3 = -\frac{P}{2} + 10 \rightarrow P = 8\frac{2}{3}$$

The quantity demanded from the domestic consumers is then: 17/3. The quantity supplied domestically is: 11/3. So: how many baseball hats are imported? 17/3 – 11/3 = 2.

Consumer surplus is the area B in the graph below, producer surplus is A, and the quota rent is given by C. Numerically, consumer surplus is: (17/3)^2, producer surplus is: 0.5*(11/3)^2, and quota rent is: 2*5/3=10/3.



(6) What is the main difference between these two policies?
The quota policy generates foreign producer surplus (or quota rent) whereas the tariff policy generates government revenue through an explicit tax on imports.[1]

Problem 2: The government of Ecuador wants to protect its domestic production of shrimp against foreign competition. The world price is 12 (in millions of dollars). The government sets a target quantity of 4 million pounds of shrimp (Q=4). The domestic inverse supply and demand (in millions of pounds of shrimp) is given by:

$$P_d = 23 - Q_d$$
$$P_s = 3 + 3Q_s$$

(1) If there are no governmental restrictions, what quantity of shrimp will be imported into Ecuador and how many shrimp will Ecuador produce domestically?

We determine the quantity of shrimp produced in Ecuador by finding the quantity of shrimp produced at the world price of 12. Setting 12 = 3 + 3Qs yields Qs=3. In order to find the quantity of shrimp imported, we find the quantity that domestic consumers demand at the world price and take the difference between quantity demanded and quantity supplied by domestic producers. Setting 12 = 23 – Qd yields Qd=11. So the country imports 8 units of shrimp. On the graph below, consumer surplus is labeled B and producer surplus is labeled A.

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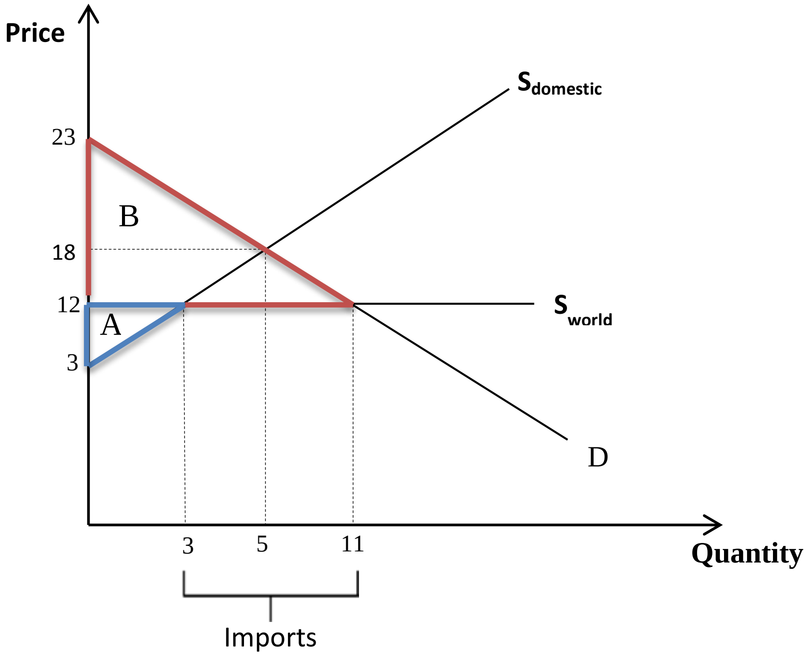
[1] In practice the domestic producer surplus (or quota rent) may be captured by the domestic government by selling off permits that allow foreign firms to sell a certain number of units in the domestic market. How much would foreign producers be willing to pay for this privilege? Collectively, they would be willing to pay the entire amount of surplus they receive from selling in the domestic market at the quota price.



(2) Find a tariff such that 4 million pounds of Ecuadorian shrimp will be sold to domestic consumers, and calculate the resulting change in consumer surplus, producer surplus and government revenue.

We want to find the price such that domestic producers are willing and able to supply 4 million pounds of shrimp. Setting Qs = 4 yields: 3 + 3*4 = 15 = P. Since the world price is 12 dollars, that means the Ecuadorian government must set a tariff of 3 dollars a unit.

Problem 3: The country of Saudi Arabia can produce oil more cheaply than can most other countries. Let the world price of oil be 100 dollars a barrel, and say the domestic supply and demand for Saudi Arabia are given by:

$$P_s = 70 + Q_s, P_d = 100 - \frac{1}{2}Q_d$$

(1) Assume that Saudi Arabia follows a free trade policy. How many barrels of oil will Saudi Arabia export? What are the domestic consumer's surplus and the producer's surplus?

Since the world price of oil is 100, and setting 100 = P in the domestic demand function yields: 100 = 100 – 0.5Q, the domestic consumers will not be willing or able to purchase any of the oil produced in Saudi Arabia. Therefore, the domestic producers will export all of the oil they produce. Setting P=100 in the domestic supply function (100 = 70 + Qs) gives Qs = 30. So Saudi Arabia exports 30 units of oil.

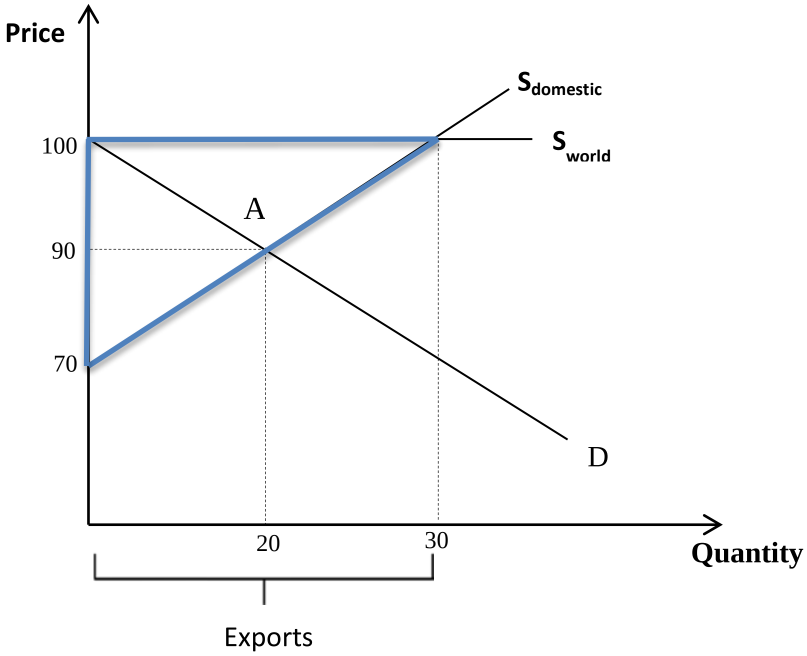
Consumer surplus is 0 since no units are purchased by domestic consumers. Producer surplus is equal to the area A in the graph below (outlined in blue), or: 30*30/2 = 450.

(2) What if Saudi Arabia changes its commitment to free trade and decides to close off its oil supply to the world, allowing no oil to leave the country? What happens to consumer and producer surplus?

Now, the problem becomes the usual supply and demand problem. To find the equilibrium price and quantity, we set the domestic demand and supply curves equal to each other, giving us:

$$100 - \frac{1}{2}Q = 70 + Q \rightarrow Q = 20, P = 90$$

Consumer surplus is then the area below the demand curve and above the price they pay (90), and producer surplus is the area above the supply curve and below the price they receive (90), or the areas labeled B (producer surplus) and C (consumer surplus) on the graph below. B = (90-70)*20/2 = 200. C = (100-90)*20/2 = 100.



(3) In this case, who is in favor of the governmental restriction: producers or consumers?
The consumer is in favor of governmental restriction on export, since this lowers the price of the good when it is sold domestically. Essentially, this policy removes the producer's "outside option" when dealing with the domestic consumer. Formerly, the producer could say to the consumer: would you like to buy a certain quantity of oil at this price? If the domestic consumer responded no, the producer could ask the same question to the foreign consumer where the producer might receive a "yes" response. This policy removes that option and so the price decreases and consumer surplus rises (but notice: not by as much as producer surplus falls).