Economics 100A
Fall 2001

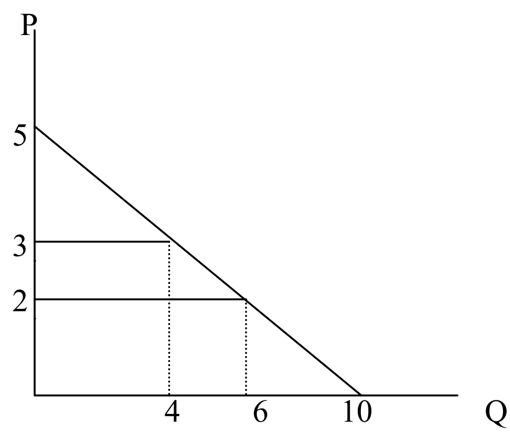
Microeconomic Analysis
PROBLEM SET 6

ANSWERS

1. Sheri's demand curve for apples is: $Q = 10 - 2P$, where Q is the pounds of apples per week, and P is the price per pound of apples.

(1) if the price of apples is \$3 per pound, what is Sheri's consumer surplus?

(2) if the price goes down to \$2 per pound, what is the change in consumer surplus?



The inverse demand for apples is $P = 5 - \frac{1}{2}Q$, which is shown in the above diagram. The quantities corresponding to P=3 and P=2 are calculated according to the demand function.

(1) When the price is \$3, the consumer surplus $CS = \frac{1}{2} * 4 * (5-3) = 4$

(2) When the price is \$2, the consumer surplus $CS = \frac{1}{2} * 6 * (5-2) = 9$

So the change in consumer surplus is $\Delta CS = 9 - 4 = 5$

(We can also calculate the change in consumer surplus by using the formula for trapezoid $\Delta CS = \frac{1}{2}(4+6)*(3-2) = 5$, or by adding the rectangle and triangle together: $\Delta CS = (3-2)*4 + \frac{1}{2}(3-2)*(6-4) = 4+1 = 5$)

2. Suppose that the inverse demand function for wool is $P = \frac{A}{q}$ for some constant A.

   Suppose that 1/4 of the world's wool is produced in Australia. If Australian wool production increases by 1% and the rest of the world holds its output constant, what will be the effect on the world price of wool?

The world demand for wool is $q = \frac{A}{p}$.

The price elasticity of demand is $\varepsilon = \frac{p}{q}\frac{dq}{dp} = \frac{p}{A/p}(-\frac{A}{p^2}) = -1$. So wool has unit elastic demand. That means, if the price of wool falls by 1%, the quantity of wool demanded will increase by 1%.

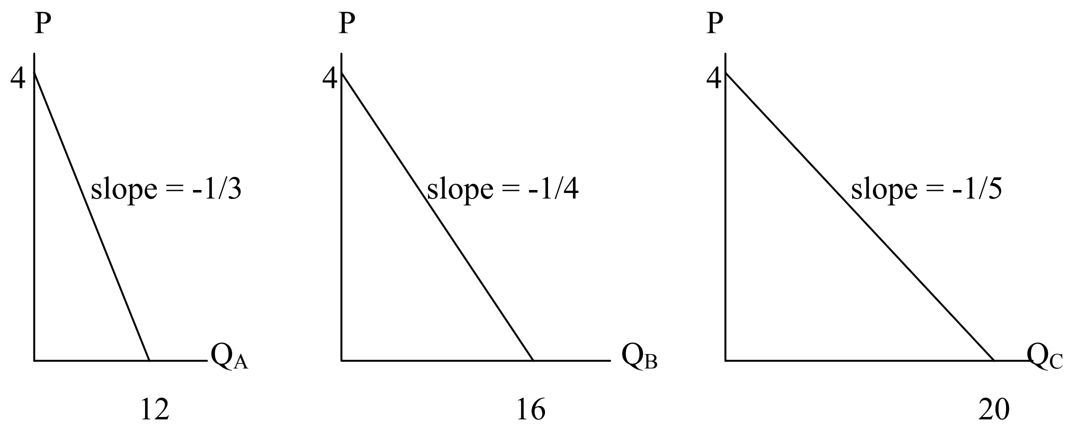
If Australian wool production increases by 1% and the rest of the world holds its output constant, then the total wool production in the world increases by 0.25% since only 1/4 of the world's wool is produced in Australia. When market is clear, the quantity demanded equals the quantity supplied. Therefore, as the quantity demanded increases by 0.25%, it must by true that the price falls by about 0.25%.

3. Jerry's monthly income is $1000. He spends 40% of his income on food and the rest on all other goods. The City Council thinks it is unfair that people spend more than 35% of their income for food. In order to lower the proportion of income going to food, the City Council gives Jerry $200. If Jerry's income elasticity of food is 2, will the City Council accomplish its goal? Explain.

Originally Jerry spends $400 ($1000*40%) on food. After Jerry receives $200 from the City Council, his income increases by 20%. Since his income elasticity of food is 2, his spending on food will increase by 40% (20%*2), which is equal to $560 ($400*(1+40%)). Then the proportion of Jerry's income going to food is 47% (560/1200), which is higher than 40%. Thus, the City Council will not accomplish its goal.

4. Andrew's demand for fish is: $Q_A = 12 - 3P$. Betty's demand for fish is: $Q_B = 16 - 4P$. Cathy's demand for fish is: $Q_C = 20 - 5P$. Where Q is the pounds of fish, P is the price of fish per pound.

(1) Graph each person's demand curve.



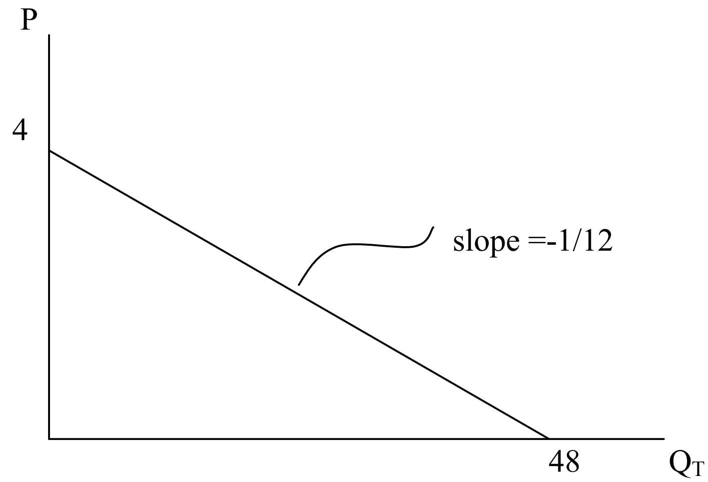
Andrew's demand Betty's demand Cathy's demand

(2) If Andrew, Betty and Cathy are the only people living in Adia Village, what is the total market demand for fish in Adia Village? Give the equation and graph the total demand curve.

The total market demand is:

$$Q_{total} = Q_A + Q_B + Q_C = (12 - 3P) + (16 - 4p) + (20 - 5P)$$
$$Q_{total} = 48 - 12P$$

The inverse demand is $P = 4 - \frac{1}{12} Q_T$, which is shown in the following figure. It is noted that the market demand is the horizontal summation of the individual demand curves.

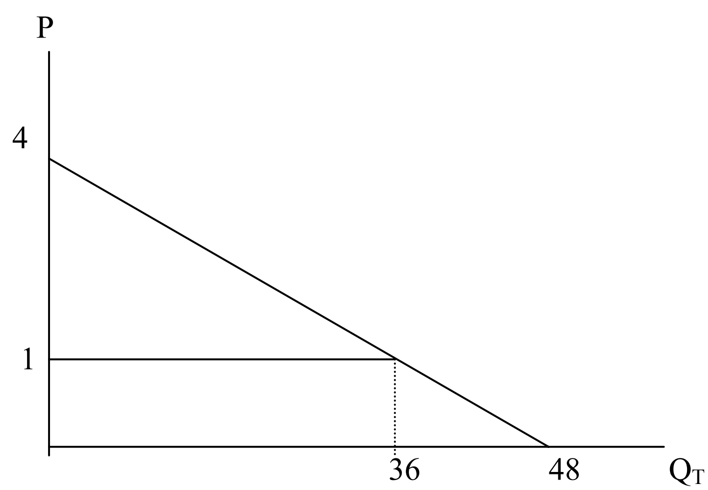


(3) A neighbor village, Bdia, always catches more fish than it can consume. Since the location is extremely good, the cost for Bdia to catch fish is zero. Bdia always shares fish with Adia, allowing Adians to take as many fish as they want for free. However, for some reasons Bdia decides to charge Adians $1 on each pound of fish from next year.

(a) How will Adia's social surplus change next year compared to before?

(b) How much will Bdia gain in revenue from the charge next year?

(c) What is the deadweight loss next year?



(a) When Bdia charges nothing, Adia Village consumes 48 pounds of fish. The social surplus is $SS = \frac{1}{2} * 4 * 48 = 96$. If Bdia charges $1 per pound next year, Adia Village will consume only 36 pounds of fish ($Q_T = 48 - 12 * 1 = 36$). Then the social surplus is $SS = \frac{1}{2} * (4-1) * 36 = 54$. So the change in social surplus is $\Delta SS = 96 - 54 = 42$.

(b) Revenues = 36*1= 36

(c) Deadweight loss = 42 - 36 = 6

5. Suppose the market demand for cigarettes is: $D = 10 - P$, and the supply of cigarettes is: $S = -2 + P$, where P is the price per pack of cigarettes. If the government imposes a cigarette tax of $1 per pack,

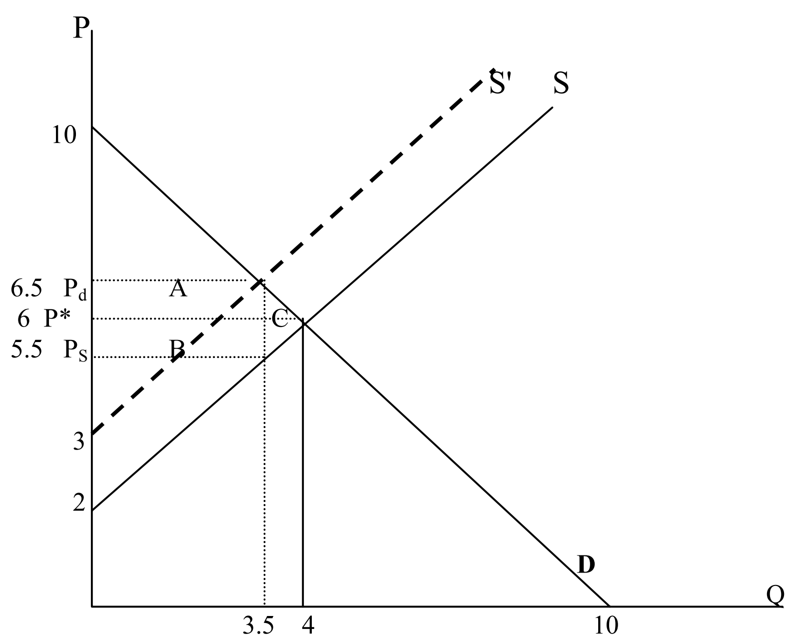
(1) what is the price paid by consumers? What is the price faced by suppliers?

(2) What is the government revenue from the tax?

(3) How much is consumers' tax burden?

(4) How much is producers' tax burden?

(5) What is the deadweight loss of the tax?



To study to impact of the cigarette tax, we can shift the supply curve up by $1 (we can also shift the demand curve down and obtain the same results). Then the price paid by consumers is determined by the intersection of the demand and the shifted supply.

The equilibrium without tax is P*=6 and Q*= 4.

(1) The inverse original supply is $P = 2 + S$, so the shifted supply is $P = 3 + S$. Setting the shifted supply to be equal to the demand, $10 - P = -3 + P$, yields P_d = 6.5. Plugging P_d into the demand function yields Q = 3.5. Plugging Q into the original supply yields P_s = 5.5. Thus, the price paid by consumers is 6.5, and the price paid by supplies is 5.5.

(2) The tax revenue = (6.5 - 5.5)*3.5 = 3.5

(3) Consumers' tax burden = (6.5- 6)*3.5 = 1.75

(4) Producers' tax burden = (6 -5.5)* 3.5 =1.75

(5) The deadweight loss = 1/2 *(6.5-5.5)*(4-3.5) = 0.25