Chapter 9 – in class problems on Externalities:

1. The supply of flu shots is described by the following equation:

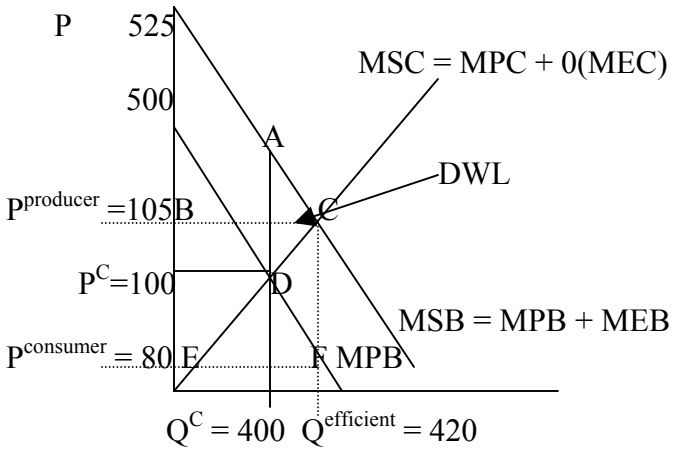
$$Q^S = 4P$$

Where Q^S is quantity supplied per day and P is the price per shot. The demand is described by

$$Q^D = 500 - P$$

Where Q^D is shot demanded per day. Because of the external benefits to society associated with flu shots, there is a marginal external benefit of $25 are associated with each flu shot.

a. Assuming that flu shots are sold in a competitive market, show this situation graphically. Be sure to properly label your graph and indicate if this market is efficient or inefficient. If it is inefficient, clearly show the deadweight loss.



b. Assuming that flu shots are sold in a perfectly competitive market, what is the market price per day? How many flu shots will be produced per day at that price?

$Q^S = Q^D = 500 - 1P = 4P$
→ 500 = 5 P
or P = 500/5 = $100 per day

Plug P into either Q^S or Q^D →
$500 - 5*100 = 4*100 = 400 = Q^C$

c. What is the efficient annual output of flu shots? How can this level of output be achieved?

Taking the positive externality into account –
MSB = MPB + MEB but in order to calculate this, you cannot merely add to the MEB, you need to rearrange your Q^D equation
→ $Q^D = 500 - P$ now becomes $P = 500 - Q^D$

Adding the MEB to this yields, $P = 500 – Q^D + 25$ which can be rearranged to give you $Q^D = 525 – P$
Re-equate this to MSC → $525 – P = 4P$ → $525 = 5P$
Or $P = 525/5 = \$105$ a day (although this is not the "real price" this price would give the efficient quantity, but note that consumers would not get to the efficient output if prices were $105).

This yields an efficient output of $Q^{efficient} = 420$
$Q^S = 4*P = 4*105$, or $Q^D = 525 – P = 525 – 105 = 420$

Again, consumers wouldn't purchase 420 units at $105 (need to look at MPB), at $105, they'd only buy MPB = $Q^D = 500 – 105 = 395$, so the government may need to subsidize – they'd set subsidy = MEB = $25.

It is reasonable to assume that Coase Theorem would not hold as the bargainers would have difficulty identifying themselves, there are a large number of bargainers, information may not be known, and zero transactions costs probably isn't a good assumption.

d. What was the inefficiency associated with the inefficient level of output? (Recall that the area of a triangle is ½ b*h.)

The area above ACD – to calculate, we need to figure out what the price at A is: To do that, you need to see what is the price at the MSB = 525 – P = 400, or P = 125.
Now, just use the ½ bh for the two triangle parts:
the top is ½ b*h = ½ (420 – 400)*(125-105) = ½ * 20 * 20 = 200,
the bottom is ½ b*h = ½ (420 – 400)*(105 – 100) = ½ *20 * 5 = 50

Therefore the total DWL is 200 + 50 = 250 the area ACD in the graph.

e. How much do consumers pay? How much to producers receive? And how much needs to be raised to achieve the efficient level?

To buy 420 units, consumers need to pay:
MPB = $Q^D = 500 – P = 420$ → $80 = P

But the only way producers would produce 420 flu shots is if they got paid $105
MSC = $Q^S = 4*P = 420$ → P = $105

Note the difference between these two prices is $25 – which means that the subsidy per unit is $25 and the total subsidy is $25*420 (subsidy * Q) = 10500 (the area above BCEF