Possible Solutions to Homework 3

Economics of Sustainability

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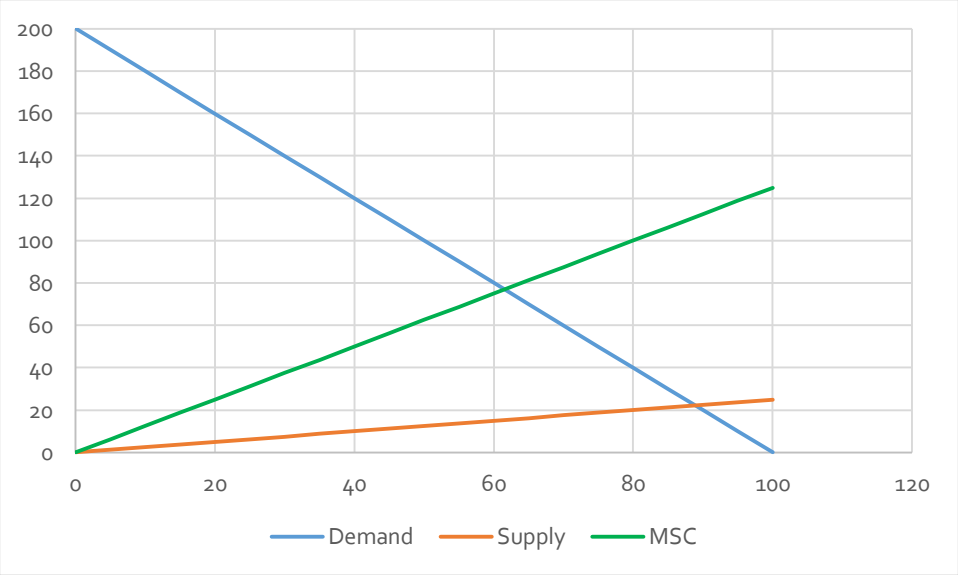
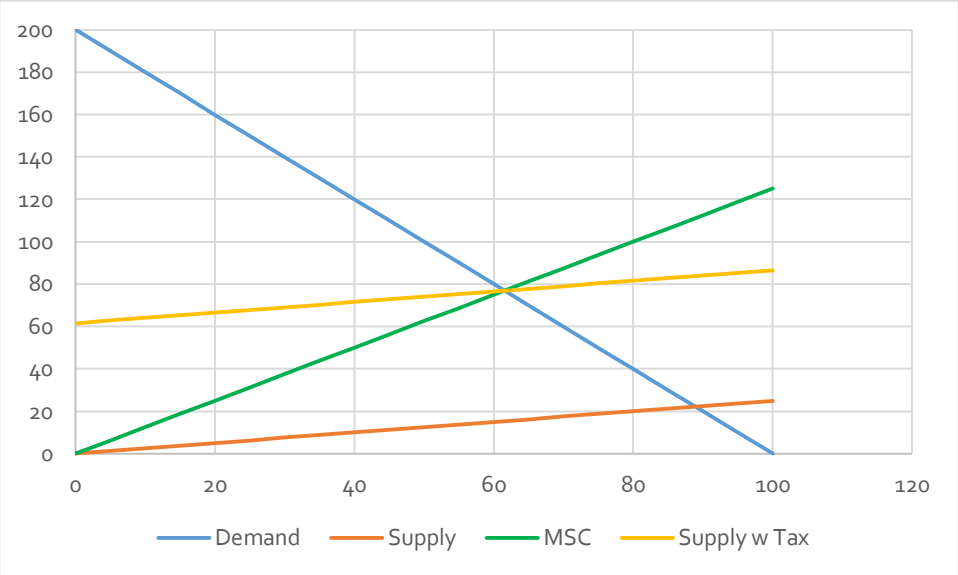
1. What are the names of people in your study group?
2. Provide some interesting and creative examples of
    a. Negative externalities from consumption and social policies to affect these
    b. Negative externalities from production and social policies to affect these
    c. Positive externalities from consumption and social policies to affect these
    d. Positive externalities from production and social policies to affect these
3. Consider the market for a product with an output that pollutes drinking water. The industry supply curve (only including private internal costs) can be represented as $Q_S = 4P_S$. The demand can be approximated as $Q_D = 100 - \frac{1}{2} P_D$. The industry's marginal external costs from pollution occur as MEC = Q.
    a. What is the privately chosen equilibrium quantity and price, when neither demanders nor suppliers take account of external costs?
    Set Ps=Pd and Qs=Qd so $4P = 100 - \frac{1}{2} P$. Then P*=22.2 and Q*=88.89.
    b. What is the MSC, the marginal social cost (the vertical sum of MC and MEC)?
    Note that MC = Ps = ¼ Qs, so MSC = ¼ Q + Q = 1.25Q.
    c. What is the social optimum level of production of this good? What is the deadweight loss created by a lack of government action?
    The social optimum is where supply equals demand, so 1.25Q = 200 – 2Q. Solve to find Q** = 61.54 at Pd=76.92. The earlier case then had a DWL due to the excess production of (88.89 – 61.54) for a total amount of 1216.



d. Suppose the government introduced a tax (per unit of output) to try to move closer to optimum. (Recall that this means that $P_D = P_S + Tax$.) What tax would reduce DWL the most?

This would require a significant tax, to get the price from 22 at the competition point up to almost 77. But this does not mean a tax of 55! The vertical height between supply and MSC, at the point Q=61.54, is 1.25Q - .25Q, so 61.54. So a tax of 61.54 would do the trick. Check back from the equation, $P_D = P_S + Tax$, $200 - 2Q = \frac{1}{4} Q + 61.54$, so Qt = 61.54.



e. Suppose that government decided that, because of external cost, it would prohibit this good entirely. What would be DWL?

If there were no trading in the good then society would lose the area of the triangle formed by demand curve and marginal social cost, so .5(200)(60) = 6000, even larger than the DWL of unrestricted trading.

f. If the government instead restricted the level of output through regulation, what regulation should be set? Would a price floor work instead?

Regulating a maximum production of 61.54 would reduce DWL just like a tax. It would also be effective to set a minimum price of 76.92, since at this high price consumers would buy less.

g. Can you suggest any alternate policies (perhaps a tax on production over a particular level)?

You are surely creative!