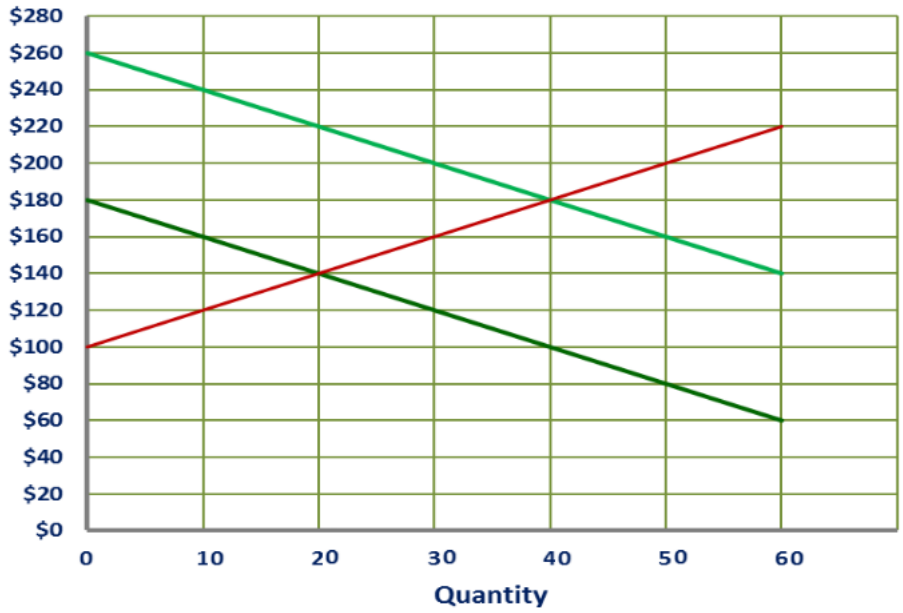
Chapter 12: Externalities

Initial Remarks:

- Negative Externalities:
  - The good is being overproduced/overconsumed compared to what society prefers: **Qs < Qp**.
  - To solve this, government **taxes** the party creating the externality, thus raising the cost and discouraging the activity creating the externality.
- Positive Externalities:
  - The good is being underproduced/underconsumed compared to what society prefers: **Qs > Qp**.
  - To solve this, the government **subsidized** the party creating the externality, thus lowering its cost and encouraging the activity creating the externality.

Example: Positive Consumption Externality



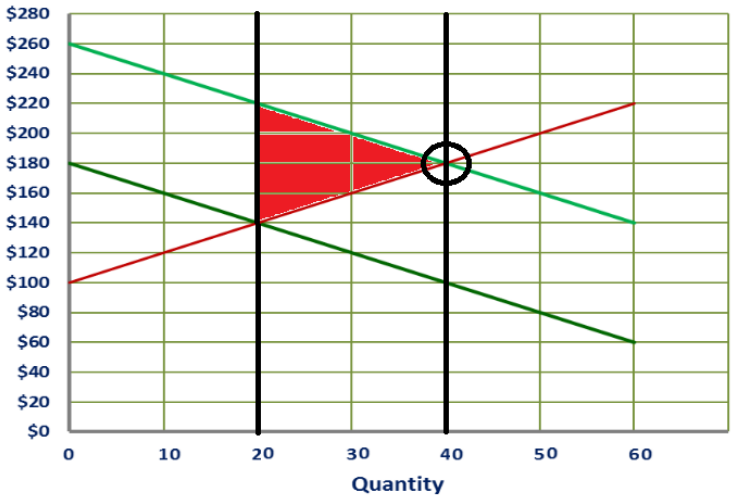
1. What is the marginal external benefit?
   Look at the price axis: the difference in the intercepts of the MPB and MSB curves tells you the size of the externality. Here, it is ($260 - $180) = $80.

2. What is the allocatively efficient amount of consumption (Qs)?
   Since there is a positive externality, we know Qs > Qp. Of the two points of intersection on this graph, we want the one associated with a higher quantity: Q = 40 units.

3. How many units will be supplied in the absence of government intervention (Qp)?
   Without government, consumption of this good is too low. We are looking for a point of intersection with a lower quantity: Q = 20 units.

4. What is the deadweight loss of externality?
   Deadweight loss is the surplus on the units that are produced at Qs, but not produced at Qp. Specifically, across units (>20) – (<40), DWL lies below the MSB curve and above the MSC curve.

   You could also draw vertical lines extending up from Qp and Qs and then calculate the area of the triangle whose tip points at Qs. In this case, DWL = (1/2)*($220 - $140)*(40-20) = $800.



5. What sort of policy would lead to Pareto efficiency?
   In the case of a positive externality, we want to provide a subsidy to encourage an activity. Since this positive externality is generated by consumers, it makes sense to give the subsidy to them. To find the amount of subsidy per unit, again check the difference between MSB and MPB on the price axis: ($260 - $180) = $80.

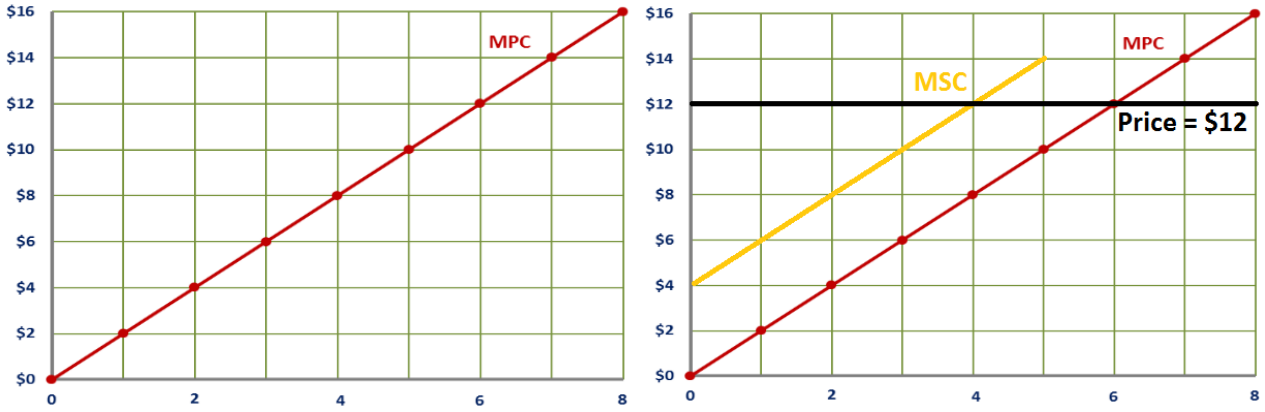
6. How much tax should the government collect to support the subsidy?
   The government will need enough money to pay $80 per unit on every unit purchased at Qs: $80*40 = $3,200.

   Side note: Notice that it would cost $3,200 to eliminate $800 of deadweight loss. Since the cost of the policy is greater than the benefit to society of eliminating the DWL, we may not wish to implement the policy after all.

7. How much will consumers pay for each unit of the product after the subsidy?
   Ordinarily, consumers would pay $180 per unit on 40 units (Qs). However, the government will also give consumers $80 on each unit purchased. In the end, consumers pay $180 - $80 = $100.

8. How much will producers receive after the subsidy?
   In order to produce 40 units, producers will require a price of $180 per unit. This is the amount they will receive.

Example: Negative Production Externality



Firm creating externality charges a price of $12 per unit and faces the above MPC (left graph). Externality results in a loss of $4 in profit per unit for a neighboring firm. The right hand graph adds this information to the left hand graph.

1. What is the marginal external cost?
   From the information given, we know that the neighboring firm loses $4 in profit per unit due to the externality. This $4 is the external cost per unit of the externality.

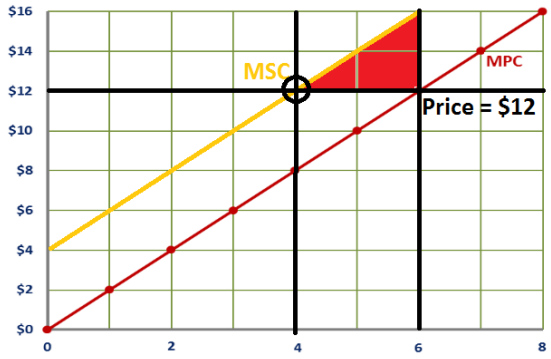
   From the graph, we can see this by calculating the difference in the intercepts on the price axis of the MPC and MSC curves: $4 - $0 = $4.

2. What is the allocatively efficient amount of consumption (Qs)?
   The intersection of the price curve and MSC gives us Qs = 4 units.

3. How many units will be supplied in the absence of government intervention (Qp)?
   When the firm uses MPC to make its decisions, it ends up producing at Qp = 6 units. Note that Qp > Qs, just as we expect under a negative externality.

4. What is the deadweight loss of externality?
   Deadweight loss in this case comes from the overproduction of the good generating the externality. Therefore, we expect DWL on units above Qs = 4 units.

   Again, we can look at the triangles created by drawing vertical lines at Qs and Qp and finding the area of the triangle that points at Qs. In this case: (1/2)*($16 - $12)*(6-4) = $4.



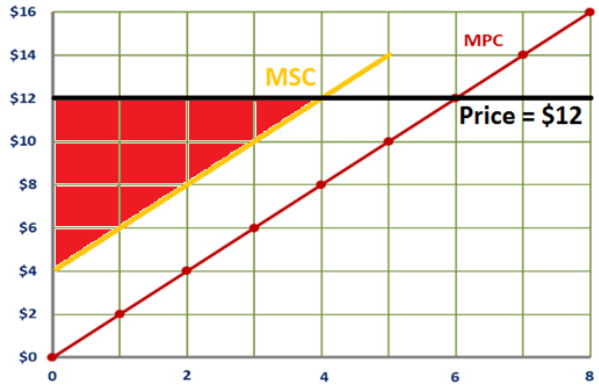
5. What will be the increase in the profits of the neighboring firm if Qs is produced instead of Qp?
   Each unit produced by the externality-generating firm results in a loss of $4 in profit per unit for the neighboring firm. If Qs=4 is produced instead of Qp=6, then the neighboring firm would gain $4 for each unit that is not produced: (6-4)*$4 = $8.

6. What is the maximum amount the neighboring firm would be willing to pay the externality-generating firm if it would produce at Qs?
   If the benefit of producing at Qs = $8, then the neighboring firm would pay up to $8.

7. What is the minimum amount the externality-generating firm would be willing to accept to produce at Qs?
   Remember, from the firm's point of view every unit through unit 6 is profitable. By asking the firm to produce Qs = 4, we are asking the firm to give up profits. The externality-generating firm will only be willing to produce Qs = 4 if it receives an amount at least as big as the profits lost by producing at this level.
   Profit is represented by the area under price = $12 and above the MPC curve: (1/2)*(12-8)*(6-4) = $4.

8. What amount of transaction cost would make negotiation no longer feasible?
   Recall that DWL = $4. If transaction costs exceed DWL, then Pareto improving negotiations are not feasible.

9. What would be the DWL if the government forced the externality-generating firm to shut down?
   Qs = 4. If the government forced a shut-down then Q = 0 and we would have DWL on the units that should have been produced. This DWL exists below the price line and above MSC on the 4 units that should be produced: (1/2)*($12-$4)*4=$16.



10. What sort of policy would lead to Pareto efficiency?
    With a negative externality, we want to tax the activity causing the externality, thus raising the cost of that activity. The tax should equal MXC = $4 per unit.

11. How much revenue will the government collect in taxes?
    The government will collect $4 per unit on each of the units produced at Qs: $4 *4 = $16.