EconS 301 – Intermediate Microeconomics

Review Session #14 – Chapter 17: Externalities and Public Goods

1) Why is it generally not socially efficient to set an emission standard allowing zero pollution?

Answer

If the government were to set an emissions standard requiring zero pollution, this standard would probably not be socially efficient. By setting the standard at zero, the government could reduce pollution by preventing polluting industries from producing goods that society values. By setting the standard at zero, however, the government will also eliminate the benefits to society from production of these goods. In general, the social benefits from producing will likely exceed the social costs up to some non-zero level of production (pollution) implying the socially efficient level of production is non-zero.

2) A competitive refining industry produces one unit of waste for each unit of refined product. The industry disposes of the waste by releasing it into the atmosphere. The inverse demand curve for the refined product (which is also the marginal benefit curve) is $P^d = 24 - Q$, where Q is the quantity consumed when the price consumers pay is P^d. The inverse supply curve (also the marginal private cost curve) for refining is $MPC = 2 + Q$, where MPC is the marginal private cost when the industry produces Q units. The marginal external cost is $MEC = 0.5Q$, where MEC is the marginal external cost when the industry releases Q units of waste.

a) What are the equilibrium price and quantity for the refined product when there is no correction for the externality?

b) How much quantity should the market supply at the social optimum?

c) How large is the deadweight loss from the externality?

d) Suppose the government imposes an emission fee of \$T per unit of emission. How large should this emission fee be if the market is to produce the economically (socially) efficient amount of the refined product?

Answer

a) If there is no correction for the externality, the equilibrium will occur at the point where the marginal benefit curve, $P^d = 24 - Q$, intersects the marginal private cost curve, $MPC = 2 + Q$. This occurs at

$$24 - Q = 2 + Q$$
$$Q = 11$$

At $Q = 11$, price is $P = 13$.

b) At the social optimum marginal benefit, $P^d = 24 - Q$, will equal marginal social cost, $MSC = MPC + MEC$. This occurs where

$$24 - Q = (2 + Q) + 0.5Q$$
$$Q = 8.80$$

Thus, the social optimum is to produce $Q = 8.80$.

c) At the uncorrected equilibrium, the marginal social cost is $MSC = 2 + 1.5(11) = 18.5$. Thus, the deadweight loss will be $0.5(11 - 8.80)(18.5 - 13) = 6.05$.

d) The emissions fee of $\$T$ should be set to shift the MPC curve so that it intersects the marginal benefit curve at $Q = 8.80$, the socially optimal quantity. At $Q = 8.80$ the marginal benefit is $P = 15.2$ and the marginal private cost is $MPC = 2 + 8.80 = 10.80$. Therefore, the optimal tax is $T = 15.2 - 10.8 = 4.4$.

3) Amityville has a competitive chocolate industry with the (inverse) supply curve $P^s = 440 + Q$. While the market demand for chocolate is $P^d = 1200 - Q$, there are external benefits that the citizens of Amityville derive from having a chocolate odor wafting through the town. The marginal external benefit schedule is $MEB = 60 - 0.05Q$.

a) Without government intervention, what would be the equilibrium amount of chocolate produced? What is the socially optimum amount of chocolate production?

b) If the government of Amityville used a subsidy of \$S per unit to encourage the optimal amount of chocolate production, what level should that subsidy be?

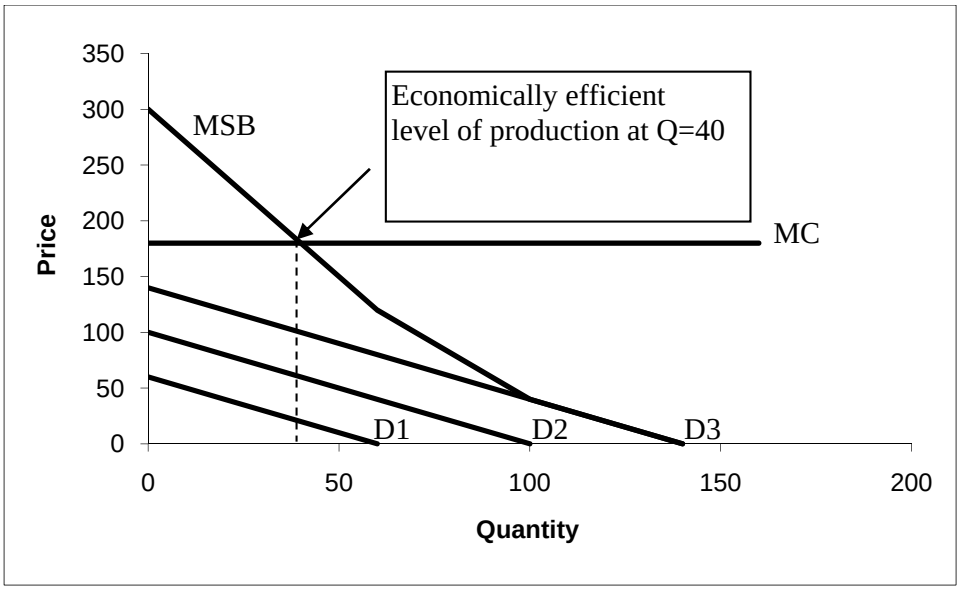
Answer

a) The equilibrium level of output occurs where $P^d = P^s$, or $1200 - Q = 440 + Q$. Equilibrium output is then $Q = 380$. Taking into account the positive externality, the social optimal amount of production sets $P^d + MEB = P^s$, or $1200 - Q^* + 60 - 0.05Q^* = Q^* + 440$, yielding $Q^* = 400$.

b) With a subsidy of \$S, equilibrium occurs where $P^d + S = P^s$ or $1200 - Q + S = 440 + Q$. To get $Q = Q^* = 400$ the subsidy must satisfy $1200 - 400 + S = 440 + 400$ or $S = 40$.

4) There are three consumers of a public good. The demand for the consumer are as follows:
Consumer 1: $P_1 = 60 - Q$
Consumer 2: $P_2 = 100 - Q$
Consumer 3: $P_3 = 140 - Q$
Where Q measures the number of units of the good and P is the price in dollars. The marginal cost of the public good is \$180. What is the economically efficient level of the production of the good? Illustrate your answer clearly on a graph.

Answer



The economically efficient level of output occurs where $MSB = MC$. Since this occurs where all three consumers are in the market we have

$$(60 - Q) + (100 - Q) + (140 - Q) = 180$$
$$3Q = 120$$
$$Q = 40$$

5) Some observers have argued that the Internet is overused in times of network congestion.

a) Do you think the Internet serves as common property? Are people ever denied access to the Internet?

b) Draw a graph illustrating why the amount of traffic is higher than the efficient level during a period of peak demand when there is congestion. Let your graph reflect the following characteristics of the Internet:

i. At low traffic levels, there is no congestion, with marginal private cost equal to marginal external cost.
ii. However, at higher usage levels, marginal external costs are positive, and the marginal external cost increases as traffic grows.

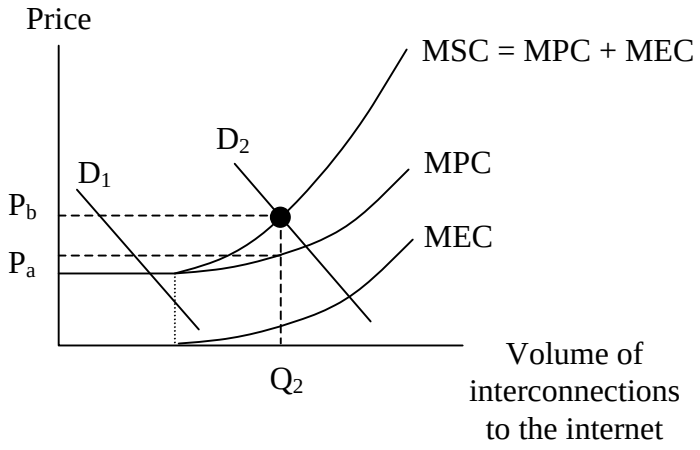
c) On your graph explain how a tax might be used to improve economic efficiency in the use of the Internet during a period of congestion.

d) As an alternative to a tax, one could simply deny access to additional users once the economically efficient volume of traffic is on the Internet. Why might an optimal tax be more efficient than denying access?

Answer

a) The Internet can be viewed as common property because virtually anyone has access to it. In practice, people are sometimes denied access, particularly when the congestion is great and consumers cannot connect to it.

b) The graph might be very similar to Figure 17.5.



When the demand for connections to the internet is D_1, there is no congestion. However, when the demand is high at D_2, congestion creates a positive marginal external cost.

c) When the demand is large, a tax equal to ($P_b - P_a$) would lead users to demand the efficient number of connections Q_2.

d) A tax would ensure that users who value connections the most would be able to connect. If access is denied to some users, some users with a higher value for an interconnection might be unable to connect, while other users with a lower value for a connection might be able to go online. This would not be economically efficient because the scarce resource (connections) would not necessarily be allocated to consumers who value connection the most.