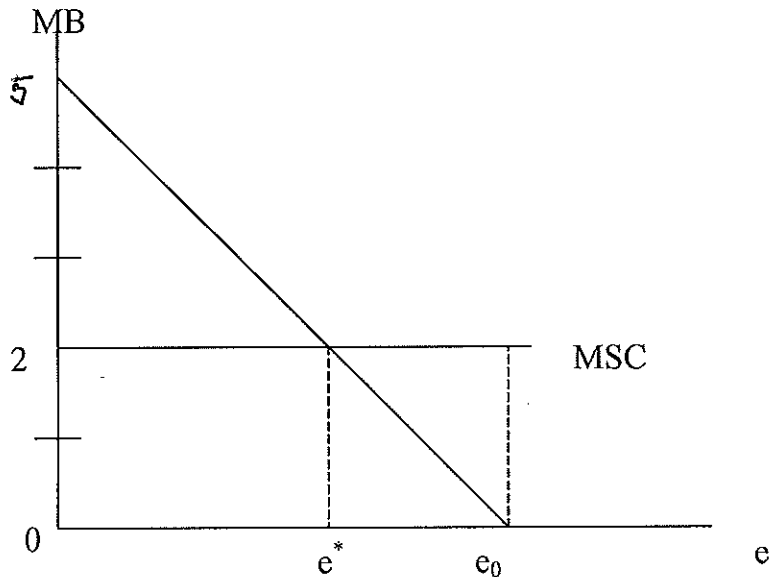


Solutions to Externalities Sample Question

Suppose a firm has a downward sloping MB schedule associated with producing pollution emissions, given by $MB(e) = 5 - e$. Suppose the marginal private cost (MPC) for the firm is equal to zero at all emission levels, and the marginal social cost (MSC) is equal to a constant $k = 2$.

a) Draw the relevant curves in the space below.

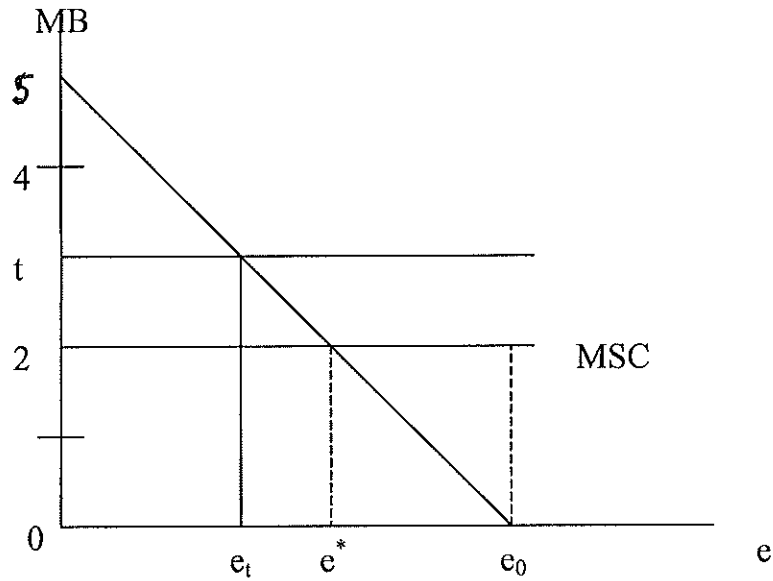


b) What emissions level will the firm produce? Please label the diagram and write the answer in one sentence.

In the absence of an regulation, the firm will set $MB = MPC$ and this occurs at $e_0 = 5$.

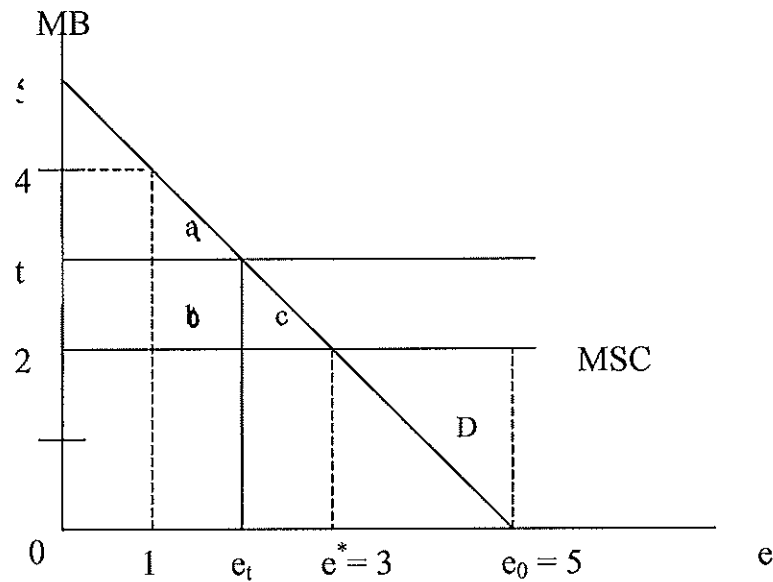
Now the government imposes a tax t on emissions, as shown in the diagram, where $t > k$. To answer the following questions, you will have to label areas of the diagram appropriately.

c) Say what are the effects of the policy on the firm are in terms of total gains or losses, relative to the initial situation.



The firm faces a loss of the triangle area loss of MB with the reduction of emissions level to e_t and the area equals to $0.5 * (e_0 - e_t) * t$.

d) Say what are the effects of the policy for users of the environment are in terms of total gains or losses, relative to the initial situation.



Note: Area $a + b + c = D$

Area D is the net social loss of emissions in the absence of tax.

Area c is the loss accrued to the firm due to the reduction in emissions level that is not recovered at tax t . Given D is bigger than c , the net gain to the society is still positive with tax t . With tax at 4, the loss accrued to the firm due to the reduction in emissions level is $a + b + c$. The net gain to the society with tax = 4 is zero as Area $a + b + c =$ Area D . If tax is higher than 4, then the incorrect tax will lead to a greater social loss than no intervention.

e) Say what are the effects of the policy on taxpayers (not counting the firm).

Taxpayers gain the revenue from the Pigouvian tax and are better off in that sense.

f) What is the net gain to society of the policy relative to the initial situation? The net gain can be negative.

As discussed in part d, the net gain to the society depends on the level of tax set. As long as tax < 4 , the net gain is positive.

g) As k rises holding t fixed, what happens to the net gain to society of the policy?

As k rises holding t fixed, the net gain to society increases and is at maximum when $k = t$.