Externalities

Vani Borooah
University of Ulster

Definition

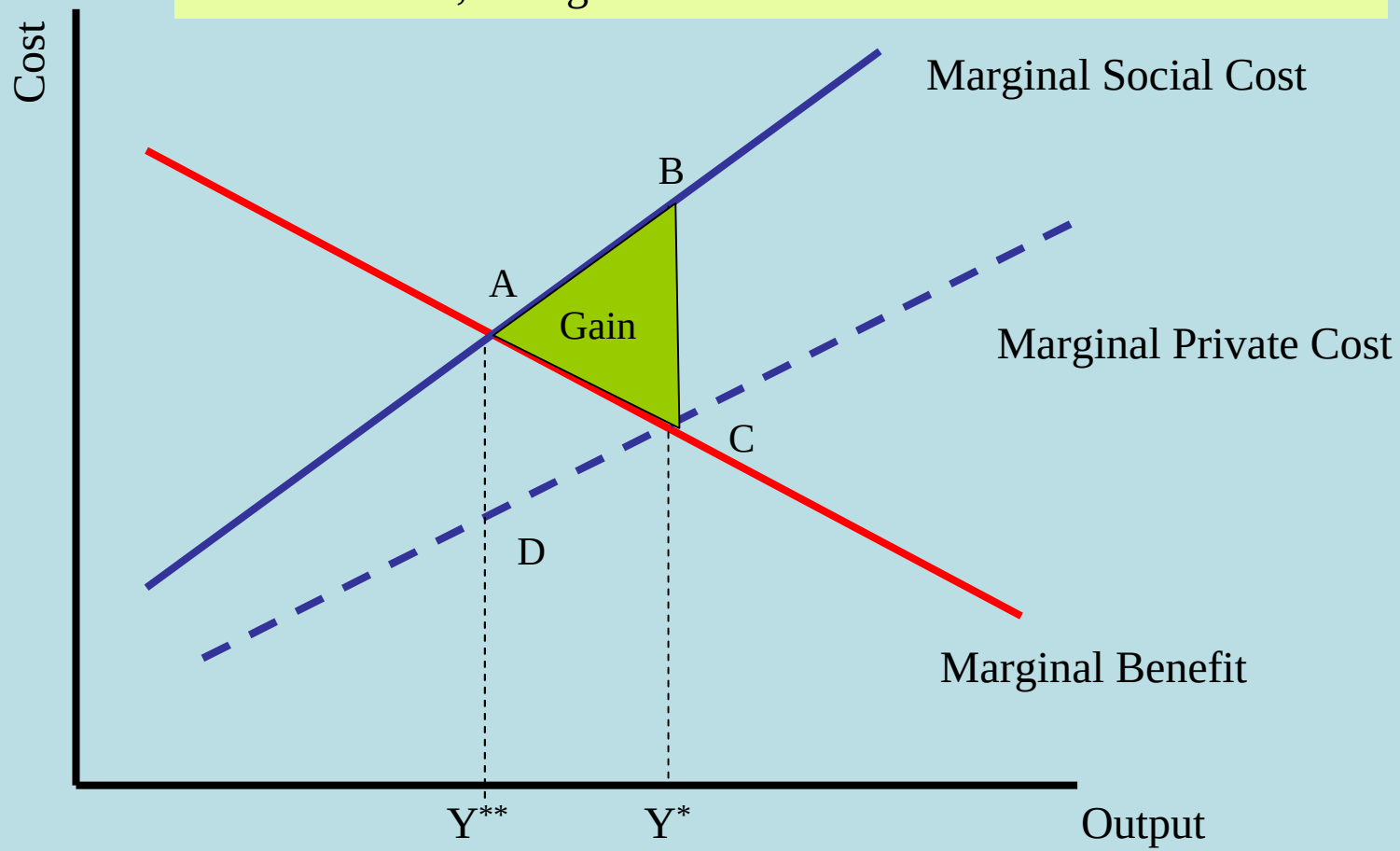
- An *externality* exists when the action of one agent unavoidably affects the welfare of another agent. The affected agent may be a consumer, giving rise to a *consumption externality*, or a producer, giving rise to a *production externality*.
- The externality may affect the other agent beneficially (*positive* externality) or detrimentally (*negative* externality)

Private versus Social Optimum

- The profit of firm 1 is: $\pi_1 = pY - C(Y)$
- The profit of firm 2 is: $\pi_2 = -E(Y)$
- Firm 1 maximises profits when: $MB = C'(Y)$ and produces Y^*
- But society should maximise: $\pi = p(Y) - C(Y) - E(Y)$
  and produce Y^{**} when: $MB = C'(Y) + E'(Y)$
- MB is marginal benefit (revenue) of Firm 1
- C'(Y) is marginal private cost
- C'(Y) + E'(Y) is marginal social cost
- E'(Y) is marginal damage
- Y^* is the private optimum > Y^{**}, the social optimum

Y^* is the private optimum; Y^{**} is the social optimum.

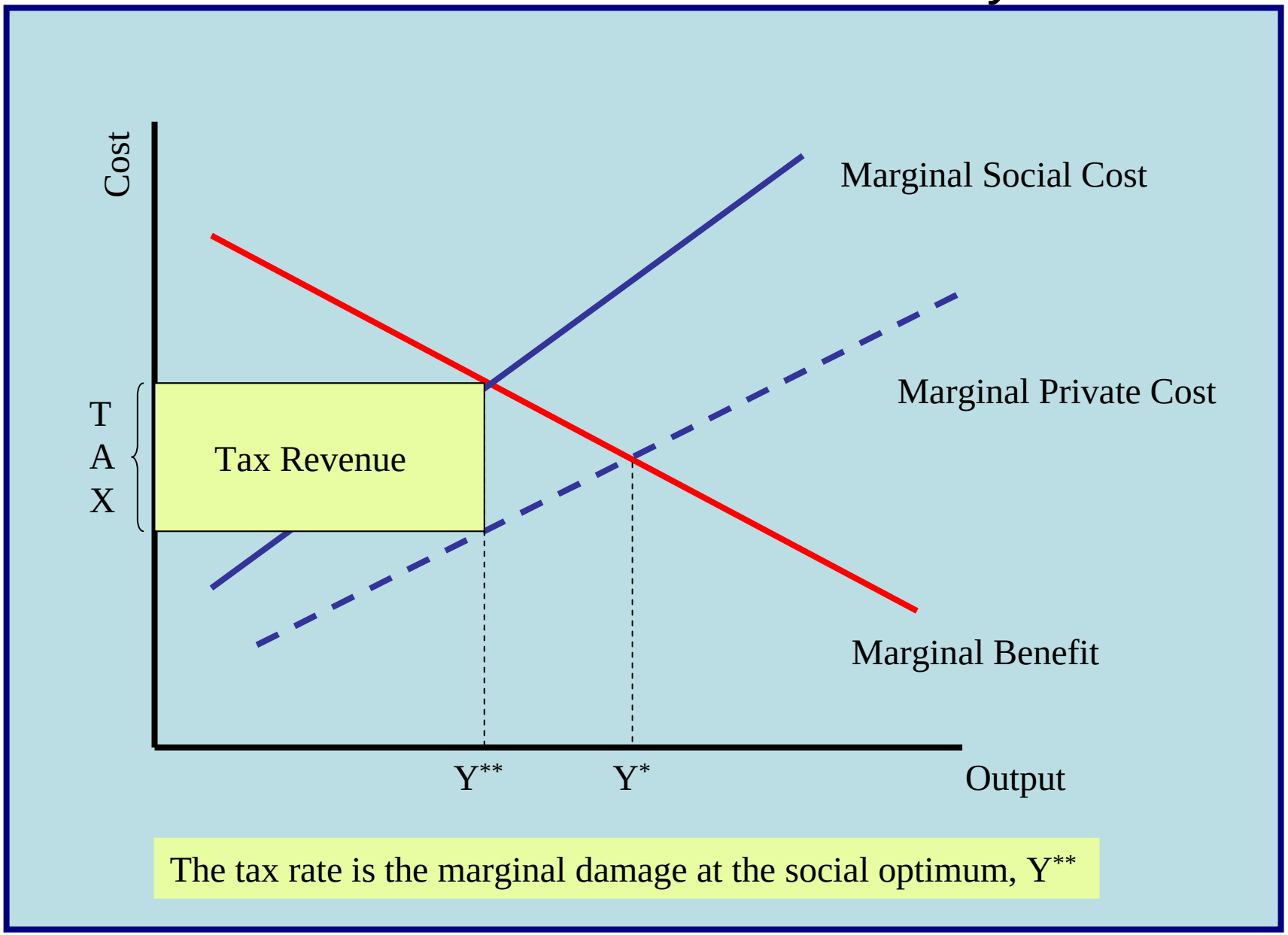
The gain to Firm 2 from output reduction = ABCD; the loss to Firm 1 = ADC; Net gain = ABC



Internalising Externalities

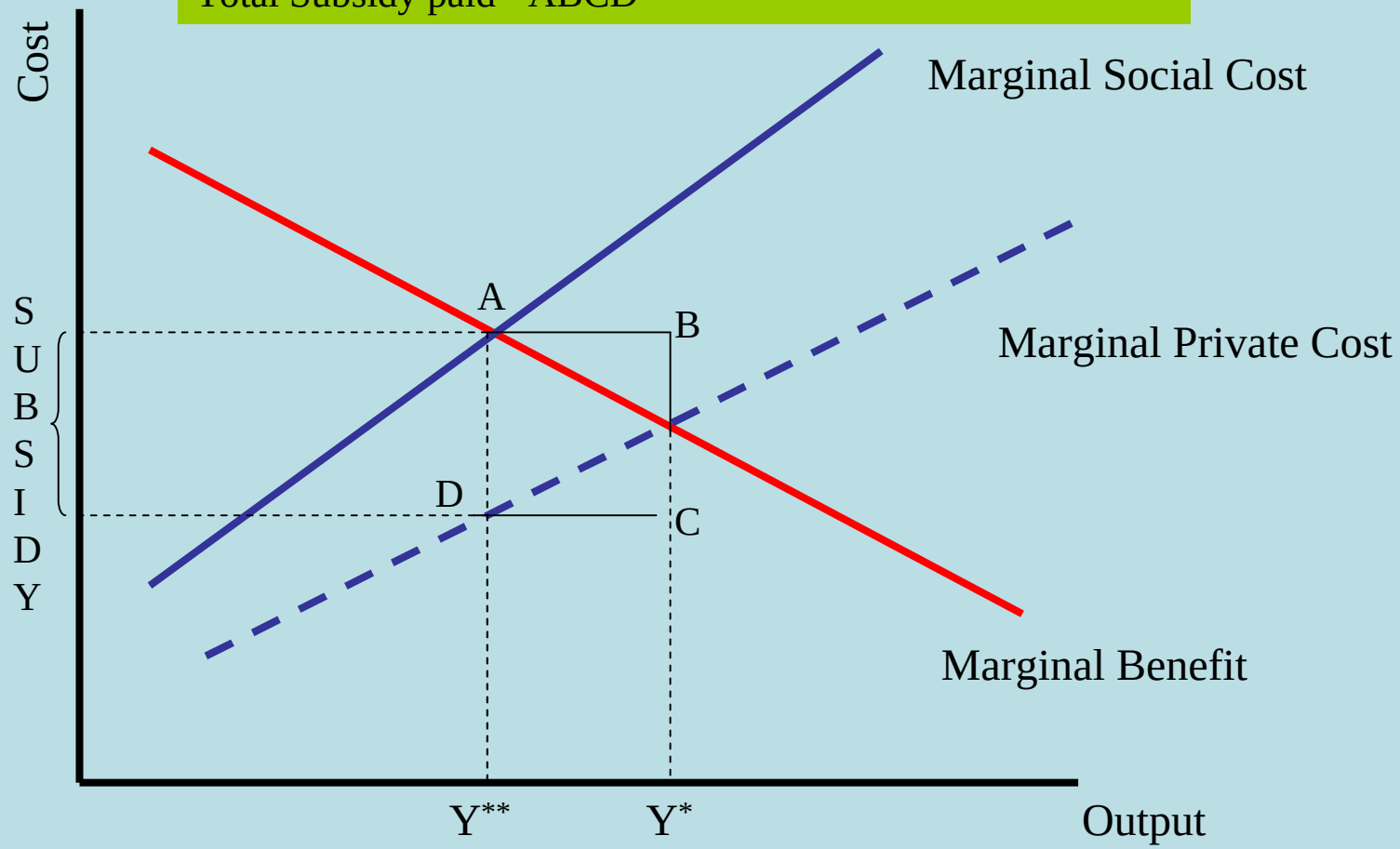
- The externality that firm 1 imposes on firm 2 can be eliminated by forming a single firm from 1 and 2
- This firm maximises: $\Pi = pY - C(Y) - E(Y)$ and the socially optimum level of output, Y^{**}, is produced
- The externality has been eliminated by being *internalised*

A Tax to Correct an Externality



A Subsidy to Correct an Externality

A subsidy is paid on every unit reduction in output below Y^*
Total Subsidy paid =ABCD



The subsidy rate is the marginal damage at the social optimum, Y^{**}

Creating a Market for the Externality: I

- The reason firm 1 can ignore the effects of its actions on firm 2 is that “externality generation” is a costless activity. A market for the externality is “missing”
- Suppose firm 2 has the right to be free of the externality but it can sell to firm 1 the right to “externality generation” for a price of $q per unit of output

Creating a Market for the Externality: II

- Firm 2's profits are now: $\pi_2 = q \times y_1 - E(y_1)$
- So, firm 2 will allow Firm 1 to produce up to:

$$q = E'(y_1)$$

- So firm 1's profits are now:

$$\pi_1 = p \times y_1 - C(y_1) - q \times y_1$$

- So, for firm 1, in equilibrium:

$$p = C'(y_1) + q = C'(y_1) + E'(y_1)$$

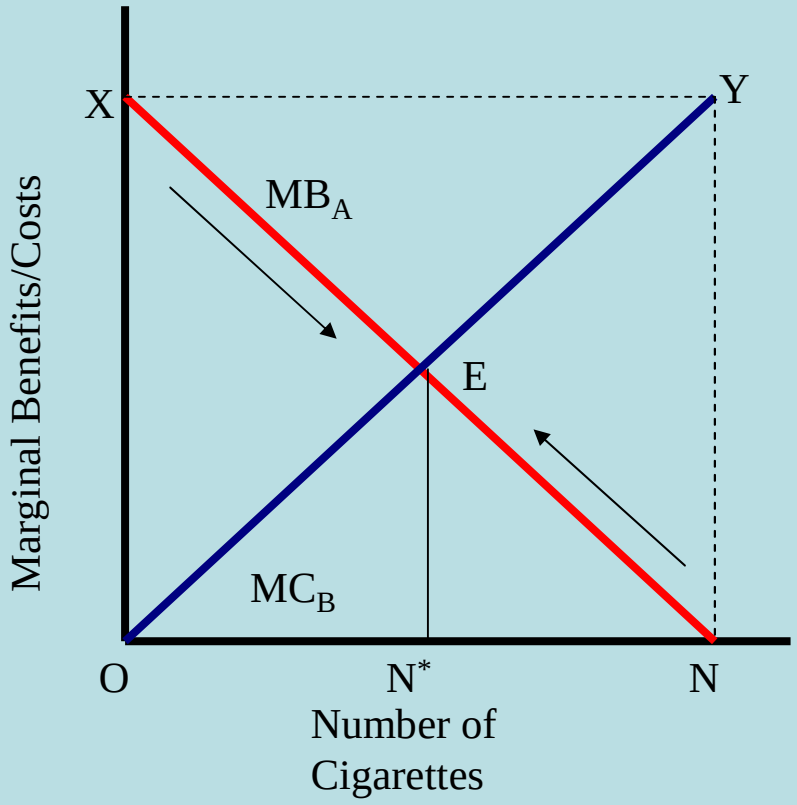
- Which is the condition for a social equilibrium

Property Rights and The Coase Theorem

- The Coase theorem is named after Ronald Coase, from the University of Chicago, who won the Nobel Prize in Economics in 1991
- It proposes that externalities between people can be easily eliminated through negotiation between them, without any need for third-party (government) involvement, provided that the costs of such negotiation are not too high

The Coase Theorem Analysed

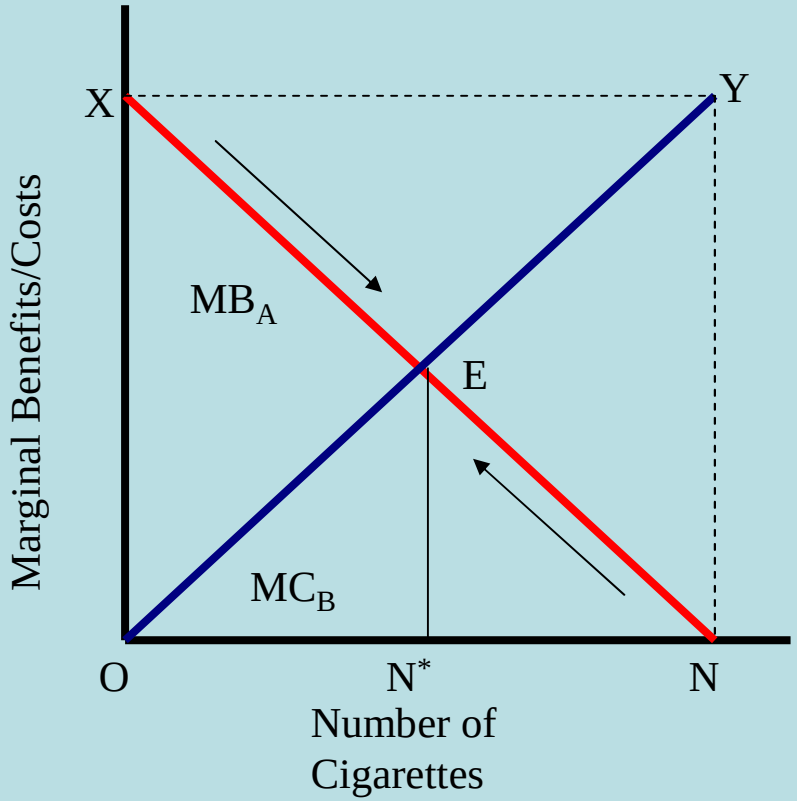
E may be reached by A reducing smoking from N or increasing smoking from 0



- There are two persons in a room, A (smoker) and B (non-smoker)
- MB_A is the marginal benefit to A, and MC_B is the marginal cost to B, from a given number of cigarettes
- If A has "property rights": he will smoke N cigarettes
  $MC_B(N) > MB_A(N) = 0$
  So B can pay A not to smoke
- If B has "property rights": he will want A to smoke 0 cigarettes
  $MB_A(0) > MC_B(0) = 0$
  So A can pay B for permission to smoke
- Coasian equilibrium is at point E, when $MC_B = MB_A$ and N* cigarettes are smoked

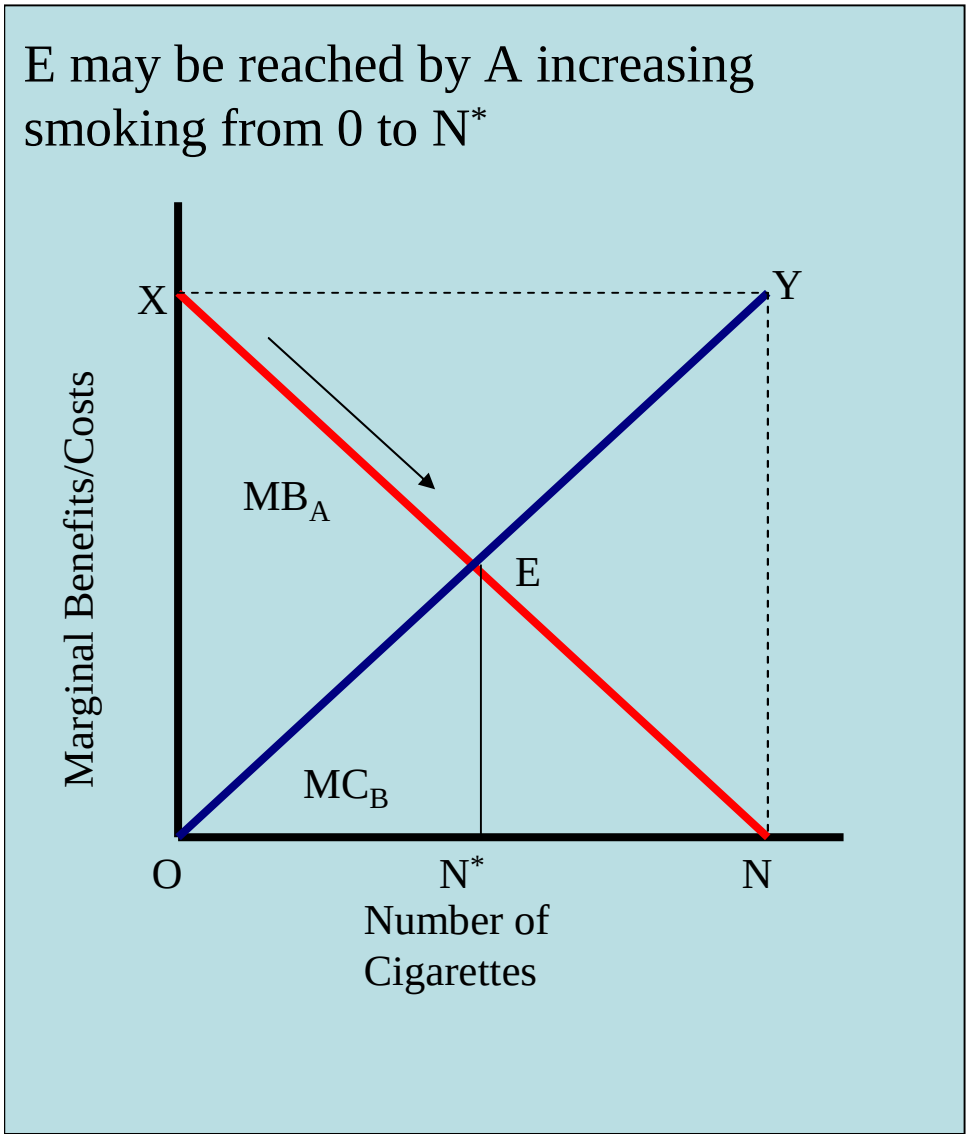
The Market for “not smoking”

E may be reached by A reducing smoking from N to N^*



- At the point E, net benefit, = total benefit to A from smoking – total cost of smoking to B is maximised
- So, E represents equilibrium in the market for “not smoking”
- At E, the net gain to society from reducing smoking from N to N^*, is the area: EYN

The Market for “smoking”

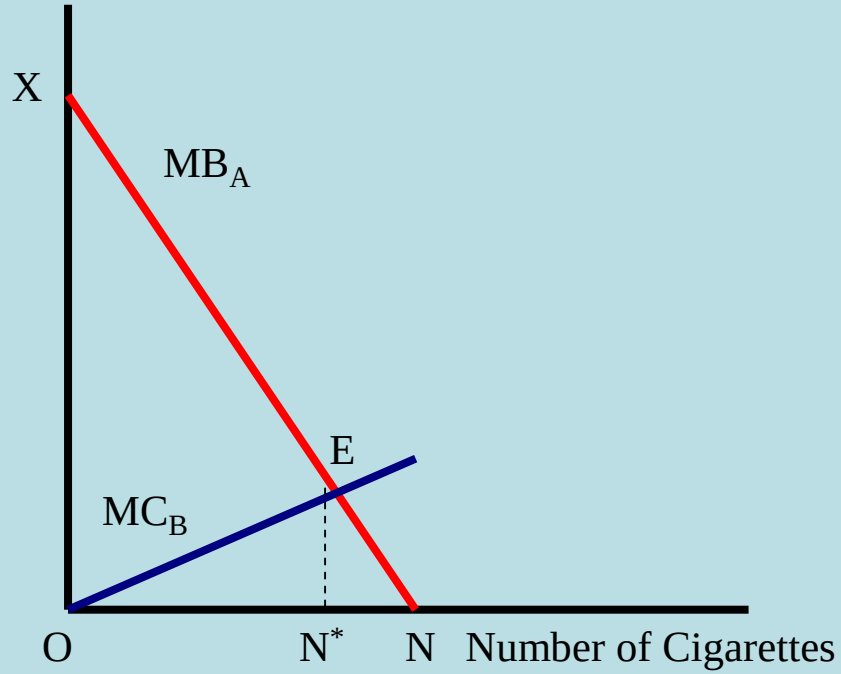


- At the point E, net benefit, = total benefit to A from smoking – total cost of smoking to B is maximised
- So, E represents equilibrium in the market for “smoking”
- At E, the net gain to society from increasing smoking from 0 to N^*, is the area: XEO

Who Should be Awarded Property Rights? Least Cost Avoidance

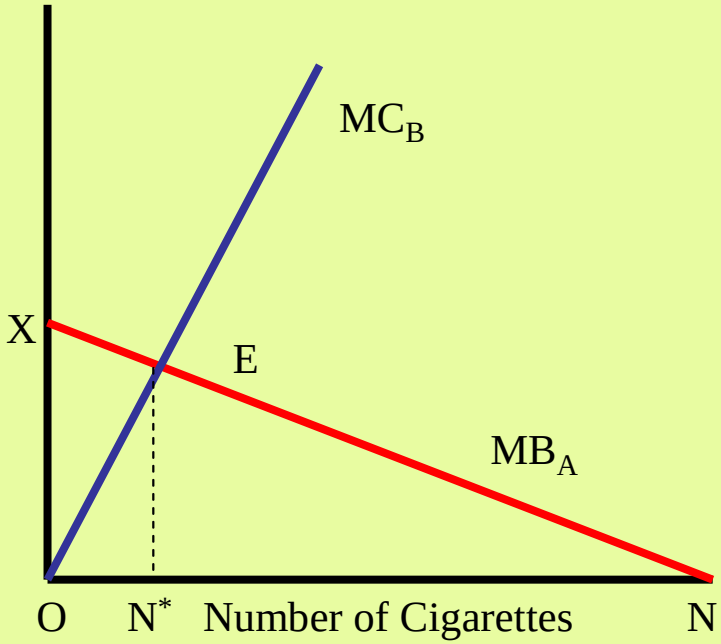
If A has the right to smoke, B would have to pay ENN* to get A to reduce to N*

If B has the right to be smoke-free, A would have to pay OXEN* to B for permission to smoke N*



B is the least-cost avoider: A should have the right to smoke

If A has the right to smoke, B would have to pay ENN* to get A to reduce to N*
If B had the right to be smoke-free, A would have to pay OXEN* to B for permission to smoke N*



A is the least-cost avoider: B should have the right to be smoke-free

Main Points of the Coase Theorem: I

- Externalities are the joint product of the ‘offender’ and the ‘victim’ *and the most efficient system of avoiding an externality is to put the onus for avoidance on the party which can avoid it at the least-cost*.
- The traditional “polluter pays” solution would only be efficient if the pollutee was the least cost avoider
- In order to remove the ill-effect of an externality, neither regulation nor taxes are necessary

Main Points of the Coase Theorem: II

- If transaction costs were zero then bargaining between the parties would lead to an efficient outcome, regardless of how property rights were defined
- The problem was not one of externalities but, rather, one of transaction costs which prevented externalities being bargained out of existence
- So, when we observe externalities in the real world, we should enquire about the level of transaction costs which prevent externalities being bargained away