EXTERNALITIES

BASIC CONCEPT

Almost every economic action of consumers and producers creates costs and benefits for others
When I consume something, there is less left for others
    If I have to pay price = true MC to society, I bear just the right cost, so don't overuse
When I produce something, I create a benefit to its consumers but also use up resources
    If I receive price = true societal MB, and pay prices = true societal MC for inputs
General idea: market prices can align individual incentives with the social benefits and costs
This can fail because:
    [1] society values people's benefits differently because of distributional concerns
    [2] market prices differ from marginal costs or benefits due to monopsony or monopoly
    [3] market prices do not include some part of social marginal costs or benefits
Externalities are item [3] – unpriced cost or benefit consequences of individuals' actions

Positive externality : My action benefits others and I don't receive full price or reward
    I will not take such actions at all or stop below the optimal level
    Examples – network effects in communication, health care, education, ...
Negative externality: My action inflicts cost on others and I don't have to pay / compensate
    I will carry such actions to excess beyond the socially optimal level
    Examples – congestion, pollution, some aspects of depletion of natural resources, ...
Ways to correct these inefficiencies: [1] government action – taxes/subsidies, quotas/standards
    [2] government action – extend property rights so currently unpriced activities are priced
    [3] private action – localized externalities can be internalized by groups

INEFFICIENCY OF EQUILIBRIUM WITH EXTERNALITIES (P-R pp. 642-5)

Example – smoking. Consider mini-economy with two people; 1 smokes and 2 does not

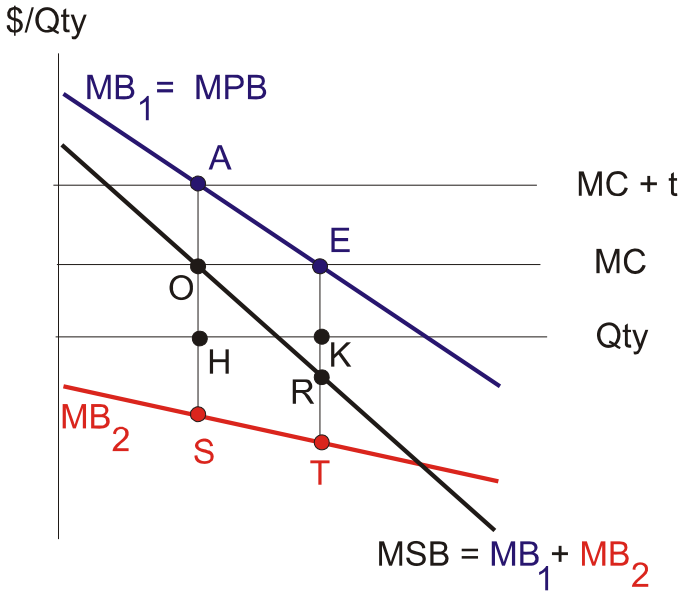
1's demand curve (= marginal benefit MB_1)

Creates negative marginal benefit MB_2 to 2

Marginal private benefit to person making the choice is MPB, here MB_1

Marginal benefit to whole society is MSB here $MB_1 + MB_2 < MB_1$

Assume constant marginal cost MC = price to avoid producer surplus complications



Given freedom of choice, 1 chooses E where MPB = MC (this is market equilibrium)

Social optimum is at O where MSB = MC

Compared to that, in E

1 gains area AOE, 2 loses area HKTS = AERO (because AO = HS, ER = KT)

Society loses area AERO – AOE = OER, between the MC and MSB curves

GOVERNMENT POLICY FOR CORRECTING INEFFICIENCY

Optimum can be achieved if government levies tax t = OA = MPB – MSB evaluated at optimum

Then 1 chooses A, at MPB = MC + t

Called Pigovian tax, after Pigou who developed this theory

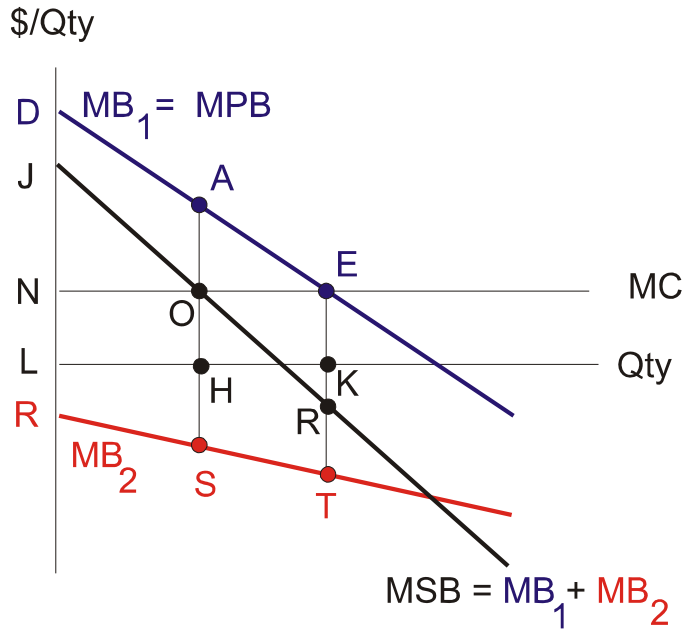
Problem: To implement correct tax, government to know the marginal benefit curves

But if asked, B will exaggerate the harm, so need clever screening mechanism

COASE THEOREM – RESOLVING EXTERNALITIES BY PRIVATE NEGOTIATION (P-R 659-62)

Government fixes initial allocation of property rights and then allows voluntary trades. Two cases

1. "Right to clean lungs"
   1 must pay 2 for permission to smoke
   To choose A, 1 willing to pay DAON
   To allow, 2 needs LHSR = DAOJ < DAON
   So agreement possible
   To go further to E, 1 willing to pay AEO more
   To allow, 2 needs HKST = AERO > AEO
   So this extension not possible



2. "Freedom to choose"
   2 must pay 1 to induce him not to smoke
   Without this, 1 would choose E
   To cut down to A, 2 willing to pay HKTS = AERO
   To agree, 1 wants compensation AEO < AERO,
   so agreement possible
   To cut down further to zero, 2 willing to pay LHSR = DAOJ more
   To agree, 1 wants additional DAON > DAOJ So this extension not possible
   (Can similarly analyze part-way extensions)

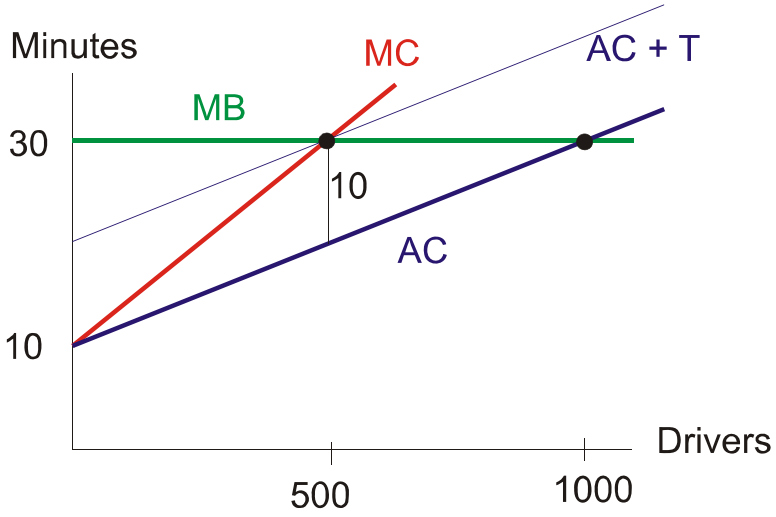
General statement – if property rights are well-defined and negotiation is costless,
then private contracting can optimally resolve or "internalize" externalities

It does not matter who initially gets the property right; they will trade to the same outcome
The allocation of rights affects only the distribution of income or wealth between the 2

Practical problems – costs of negotiation & enforcement in larger group, asymmetric information

CONGESTION EXTERNALITIES

Each extra user raises the average cost for all others, therefore
social cost of extra user = MC > AC = private cost of each user
Consider road, where cost is time taken to drive, and benefit measured in time units
N drivers, treated as continuous variable
Each user's benefit = 30 (time on alternate road?)
Each user's private cost AC = 10 + N / 50
Total cost = $10 N + N^2 / 50$
MC = 10 + 2 N / 50 = 10 + N / 25
Equilibrium of private use:
30 = 10 + N / 50, so N = 1000
Social optimum:
30 = 10 + N / 25 , so N = 500



Social optimum can be achieved if
1. Government levies toll
= (MC-AC) evaluated at optimum
= (10 + 500 / 25) – (10 + 500 / 50) = 30 – 20 = 10
2. Road is privately owned, and the owner sets toll to maximize profit
If toll is T, private use equilibrium has 30 = 10 + N / 50 + T , so N = 50 (20 – T)
Owner's profit = T * 50 (20 – T) = $1000 T - 50 T^2$
To maximize this, 1000 – 100 T = 0, so T = 10 and then N = 500
This is a Coase Theorem type result (valid for any increasing AC, not just linear)

REDUCING NEGATIVE EXTERNALITIES AT A COST (P-R pp. 645-650)

Firms and consumers can take preventive or abatement action to reduce pollution

Note: this is not the level of pollution, but a reduction in the level, therefore a good, not bad

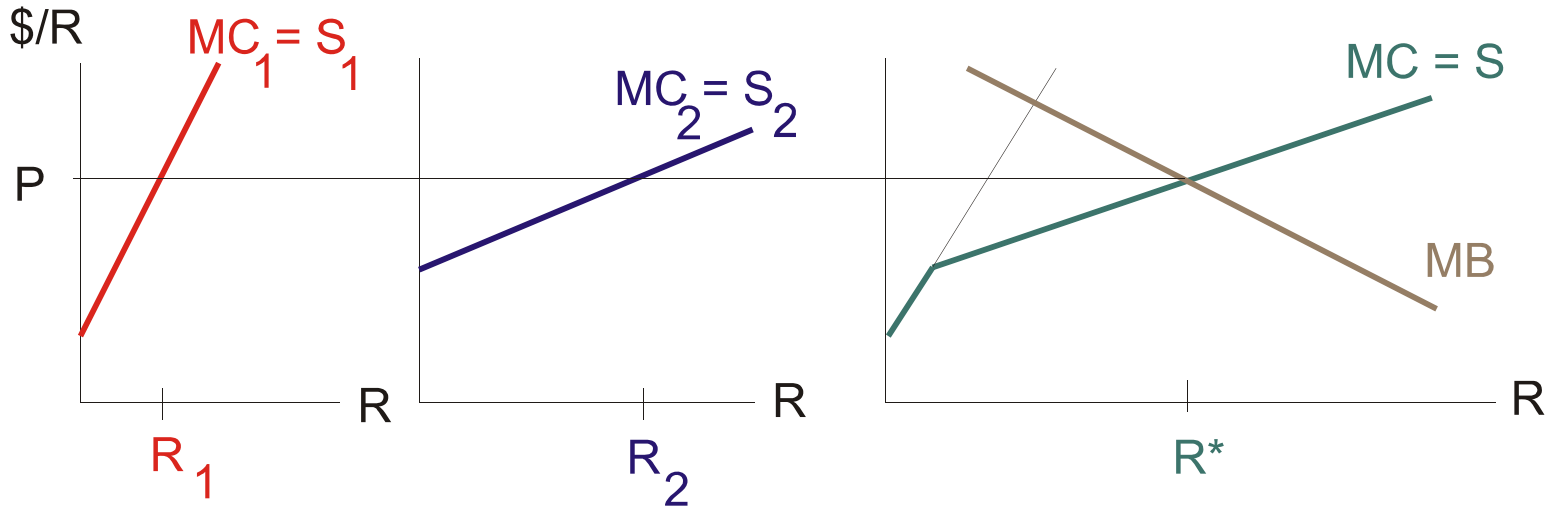
We can compute the marginal benefit or societal demand curve for pollution reduction : MB

and the firms' marginal costs of pollution reduction constitute a supply curve

MC_1 and MC_2 for the two firms, horizontally adding to aggregate reduction S

Efficient quantity R* of reduction is at the intersection, the two firms supply R_1 and R_2

(this is like P-R Fig. 18.5 p. 648 with the horizontal axis reversed left to right and v.v.)



Two ways to achieve this : prices vs. quantities

(1) Government sets price P – pays for abatement or charges for polluting

Choosing the right price needs good information on aggregate MB and MC curves

(2) Government sets quotas

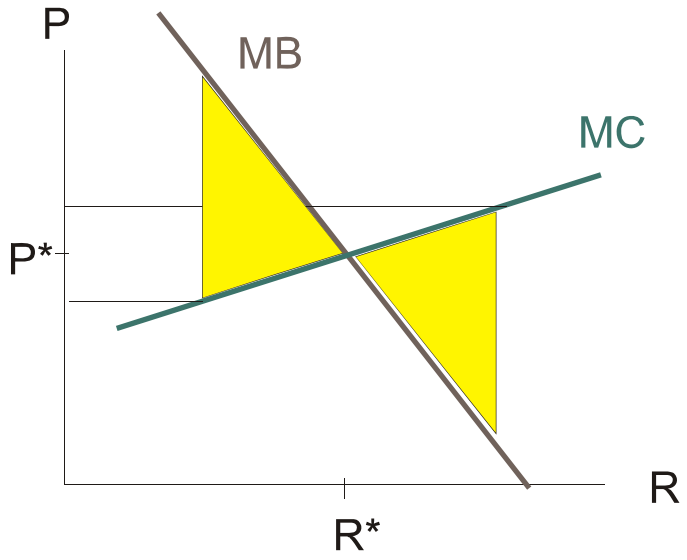
Separate quota on each firm needs detailed information on individual MC's

Aggregate quota R* can be chosen based on aggregate information and then made tradeable among firms. Market will achieve efficient allocation of abatement responsibility or permission to pollute – firms with highest cost of abatement will buy permits from those who can abate more cheaply; the latter will do more abatement

In both, need later monitoring to ensure that the firm has actually reduced pollution as agreed

Must also consider effects of getting policy wrong

An error in setting price has a large efficiency cost
if MB from pollution reduction is steep
and MC of pollution reduction is flat
because a slightly wrong price leads firms to
choose very wrong amounts of reduction;
that causes large change in MB and
creates a large deadweight loss



Conversely if MB flat and MC steep,
error in quota-setting more serious

(P-R Fig. 18.6 p. 649 has same analysis,
but their horizontal axis is pollution,
not abatement, so their MB is my MC and vice versa)