ECONOMICS 2

Tutorial 9

Questions: 4,5,6,8,11

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http://personal.lse.ac.uk/BATTISTO/T9_slides.pdf

Question 4

		Fishermen	
		No treatment plant	Treatment plant
Factory	No filter	£300, £100	£300, £150
	Filter	£200, £350	£200, £200

a) If the factory and the fishermen are profit maximisers and make their decisions individually, what will they do?

Question 4

		Fishermen	
		No treatment plant	Treatment plant
Factory	No filter	£300, £100	£300, £150
	Filter	£200, £350	£200, £200

b) Which outcome is the social optimum?

Question 4

		Fishermen	
		No treatment plant	Treatment plant
Factory	No filter	£300, £100 ?	£300, £150
	Filter	£200, £350	£200, £200

c) Suppose the factory has the property right to dump effluent into the river. Suppose further that the parties are allowed to negotiate. What will happen?

- Factory would install filter if compensated with £100
- Fishermen would be better by £200

Deal: Fishermen offer £100 to factory if it install filters. The factory accepts and fishermen do not need treatment plant

Question 4

		Fishermen	
		No treatment plant	Treatment plant
Factory	No filter	£300, £100	£300, £150
	Filter	£200, £350	£200, £200

d) Suppose the fishermen have the property right to clean water, which requires the factory to install the filter. As previously, the parties are allowed to negotiate. What will happen?

Question 5

- Smith and Jones, live separately: £300 each
- Shared Apt: £450
- Indifferent between living alone or sharing except for costs:
  - Smith plays stereo at night: Sacrifice £155 rather than stop. Jones would tolerate this for £80
  - Jones sings at 6am: Sacrifice £80 rather than stop. Smith would tolerate this for £75

a) Should they live together?

- Savings $= 600\text{-}450 = 150$
- Stereo Solution: Jones tolerates for £80
- Singing Solution: Smith tolerates for £75
- Surplus for sharing: $150 - 80 - 75 = -5 \quad \Rightarrow \quad$ Do not live together

b) Smith gets free headphones. Still willing to pay £40 for listening to stereo

Should they live together? How split rent?

- Same savings (150) and singing solution (Smith pays 75)
- Stereo Solution: Smith gives up £40
- Surplus for sharing: $150-40-75=35$ $\Rightarrow$ Live Together

How to split rent:

- Smith (no rent) costs $=75+40=115$ $\Rightarrow$ Pays at most $300-115=185$
- Surplus can be split in equal parts
  - $\Rightarrow$ Smith pays $185-0.5*35=167.5$
  - $\Rightarrow$ Jones pays remaining 282.5

Question 6

- Benefits and costs of sulfur dioxide emissions
- Benefits of abating (reducing) emissions: $MB = 500 - 20A$
- Costs of abating emissions: $MC = 200 + 5A$
- A is the quantity abated in millions of tons

a) What is the socially efficient level of emissions abatement?

$$MB = MC$$

$$500 - 20A = 200 + 5A.$$

A = 12 million tons and $MB = MC = 260$

Question 6

- Benefits and costs of sulfur dioxide emissions
- Benefits of abating (reducing) emissions: $MB = 500 - 20A$
- Costs of abating emissions: $MC = 200 + 5A$
- A is the quantity abated in millions of tons

b) A = 11. What is the optimal fee per ton?

Firm's decision:

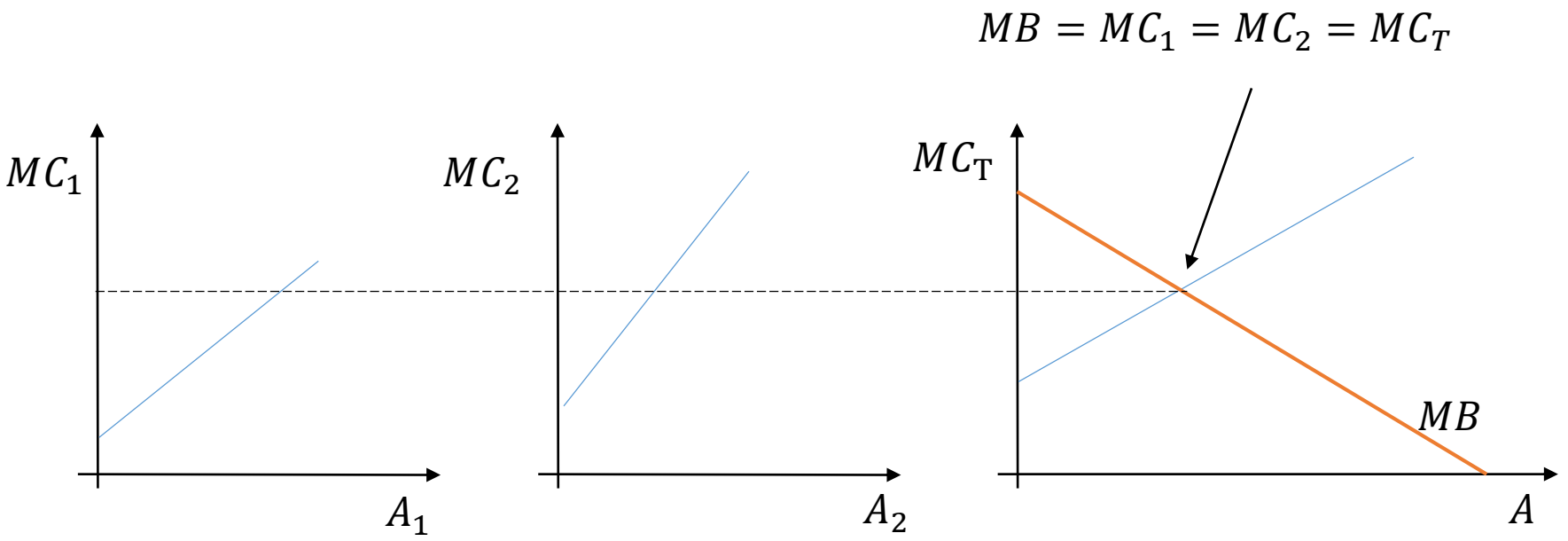
Reduce a unit at MC VS Don't reduce that unit and pay Fee

- Then, reduce units until MC = Fee.
- Set Fee = MC at social optimum = 260 to get $A = 12$

Question 8

- Two firms
- $MC_1 = 20 + 6A_1$ and $MC_2 = 50 + 2A_2$.
- $MB = 77.5 - 3.5A$
- With $A = A_1 + A_2$

a) Socially efficient level of emissions abatement



$$A_1 = \frac{MC_1}{6} - \frac{20}{6}$$

$$A_2 = \frac{MC_2}{2} - 25$$

$$A_1 + A_2 = A = \left(\frac{MC_T}{6} - \frac{20}{6}\right) + \left(\frac{MC_T}{2} - 25\right)$$

$$A = \frac{4MC_T}{6} - \frac{170}{6}$$

$$\boxed{MC_T = 1.5A + 42.5}$$

$$MC_T = MB \quad \Longrightarrow \quad A = 7\ mln\ tons.$$

b) What should the level of emissions abated by each firm be?

Rule we used: $MB = MC_1 = MC_2 = MC_T$

$$MC_T = 1.5 * 7 + 42.5 = 53$$

$$53 = MC_1 = 20 + 6A_1 \quad \Rightarrow \quad A_1 = 5.5$$

$$53 = MC_2 = 50 + 2A_2 \quad \Rightarrow \quad A_2 = 1.5$$

c) Optimal emission Fee

Firms will abate according to $MC_{\mathrm{i}} = Fee$

$$Optimal\ Fee = 53$$

Math Questions

Linear Difference Equations

$x_t = ax_{t-1} + b$ with initial condition $x_0 = q$

Solution: $x_t = Ca^t + \frac{b}{1-a}$

Find C using the initial condition

Math Questions

Behaviour of solution $x_t = Ca^t + \frac{b}{1-a}$

- $|a| < 1$ we have convergence towards a steady state
- $|a| > 1$ we have divergence
- $a > 0$ we have monotonic behaviour
- $a < 0$ we have oscillating behaviour (odd vs. even t)

Steady State (if convergence): $x = \frac{b}{1-a}$

Example: Question 9

- $y_t - 0.5y_{t-1} - 10 = 0; \quad y_1 = 5$

$$y_t = 0.5y_{t-1} + 10$$

a $\quad$ b

$$y_t = C(0.5)^t + \frac{10}{1-0.5} = C(0.5)^t + 20$$

Use initial condition to get C:

$$y_1 = 5 = C(0.5)^1 + 20 \quad \Rightarrow \quad C = 30$$

$$\boxed{y_t = 30(0.5)^t + 20}$$

Question 11

- Capital Stock in t=0 is K_0
- Investment I every period
- Depreciation δ every period

$$K_t = (1-\delta)K_{t-1} + I$$

a b

$$K_t = C(1-\delta)^t + \frac{I}{\delta}$$

$$K_0 = C(1-\delta)^0 + \frac{I}{\delta} \quad \Rightarrow \quad C = K_0 - \frac{I}{\delta}$$

$$\boxed{K_t = \left(K_0 - \frac{I}{\delta}\right)(1-\delta)^t + \frac{I}{\delta}}$$