Economics 3250   Dr. Lozada
Spring 2009   Final Exam

Do Not Turn This Page Over Until You Are So Instructed!

This exam has 50 points. There are ten questions on the exam. Each is worth 5 points except for Questions 8, 9, and 10. Question 8 is worth 9 points. Questions 9 and 10 are worth 3 points each.

Put your answers to the exam in a blue book or on blank sheets of paper. You have **two hours** to take this test.

Answer the questions using as much precision and detail as possible. Correct answers which are unsupported by explanations will not be awarded points. Therefore, even if you think something is "obvious," do not omit it. If you omit anything, you will not get credit for it. You get credit for nothing which does not explicitly appear in your answer. If you have questions about the adequacy of an explanation of yours during the exam, ask me.

Answer all of the following ten questions.
Each is worth 5 points except for Questions 8, 9, and 10.

1. [5 points] Compare and contrast the economic challenges posed by: (a) global warming; and (b) the "hole" in the ozone layer. In your answer, you should also give a brief scientific explanation of these two phenomena, highlighting their differences.

2. [5 points] In class, I explained why government fertilizer subsidies hurt the environment in Indonesia but help the environment in Nepal and Malawi. What is the explanation?

3. [5 points] The change in the entropy of an object, usually denoted by ΔS, is equal to the heat flow into or out of the object, usually denoted by Q, divided by the temperature of the object in (degrees) Kelvin, usually denoted by T:

$$\Delta S = \frac{Q}{T} \, .$$

   What is the scientific "explanation" for why an ice cube placed on a hot sidewalk on a summer day melts?

4. [5 points] Define all the important terms in the following assertion, then explain the reasoning behind the assertion: "A Contractarian Theory of Justice, such as the one suggested by John Rawls, would lead to intergenerational equality."

5. [5 points] Page 50 of your textbook says: "A number of parts of the world already have populations that are close to, even in excess of, the carrying capacity of their environments." Argue that this is not a bad thing. (Even if you think it is a bad thing, give the best arguments that it is not.)

6. [5 points] Explain the Coase Theorem in detail.

7. [5 points]

   (a) What is a positive externality? Give an example of one.

   (b) If an activity causes a positive externality, does a laissez faire policy result in too much or too little of the activity? Why? Answer with a graph.

8. [9 points] Suppose reducing pollution by one ton costs Firm A $20 and Firm B $30. Suppose current emissions are 5 tons from Firm A and 5 tons from Firm B, so 10 tons in total.

   Suppose society has decided to reduce pollution in total from 10 tons to 8 tons. Is it better to do so by a "command and control" policy of making both firms reduce their pollution by 1 ton, or by a "tradeable permits" policy? Why? Support your answer by using a detailed, fully-worked-out numerical example.

9. [3 points] Why do many economists object to managing fisheries according to "maximum sustainable yield"?

10. [3 points] Suppose the benefit from engaging in an environmentally-destructive activity is $100. Suppose the cost is $90 as measured by "willingness to pay" and $105 as measured by "willingness to accept." Should society engage in the environmentally-destructive activity? Why or why not?

① Global warming : a warming of worldwide climates caused by atmospheric
    pollutants (e.g., CO_2) which cause the atmosphere to
    retain more solar energy

Ozone layer's "hole" : a thinning of the ozone (O_3) layer high above
    the Earth's surface, which causes more ultraviolet light
    (radiation) to hit the Earth's surface.   Caused by CFC's.

Economic consequences : Reducing, or even eliminating, CFC's has been
    rather easy. Some CFC's are still used around the world as
    a refrigerant, but much less than before. So the economic cost of
    helping solve the "hole in the ozone layer" problem has been rather
    low. It's much harder to reduce, let alone eliminate, output of
    gases causing global warming.

    Lags (delayed responses) are long with the ozone layer but even
    longer (centuries versus decades) with global warming. This makes
    global warming harder to stop. Economically, it puts the benefits of
    current action to stop pollution further into the future, depressing the
    present value of those benefits.

Indonesia: The subsidies meant farmers did not have to practice soil conservation, so soil quality and quantity deteriorated. Also, they led to overuse of fertilizers, which can pollute water.

Nepal and Malawi: The subsidies alleviated rural poverty. By freeing peasants from constant short-term worries about starvation, they enabled the peasants to take a longer-term outlook on their farming practices. This led to soil conservation and other environmentally-beneficial actions.

③

Either:

Heat "Q" flows from the sidewalk to the ice cube, melting the ice cube

$$\Delta S = \frac{-Q}{T_{sidewalk}} + \frac{+Q}{T_{ice\ cube}}$$

$$= Q\left(\frac{1}{T_{ice\ cube}} - \frac{1}{T_{sidewalk}}\right)$$

$$= Q\ \frac{T_{sidewalk} - T_{ice\ cube}}{T_{ice\ cube}\ T_{sidewalk}}$$

> 0, _allowed_ by the Second Law of Thermodynamics

Or:

"Q" flows from the ice cube to the sidewalk, cooling the ice cube and warming the hot sidewalk

$$\Delta S = \frac{-Q}{T_{ice\ cube}} + \frac{+Q}{T_{sidewalk}}$$

$$= Q\left(\frac{1}{T_{sidewalk}} - \frac{1}{T_{ice\ cube}}\right)$$

$$= Q\ \frac{T_{ice\ cube} - T_{sidewalk}}{T_{sidewalk}\ T_{ice\ cube}}$$

< 0, _not allowed_ by the Second Law.

(This assumes the ice cube - sidewalk system is closed.)

Contractarian Theory of Justice: A social arrangement would be just if it would be part of a "contract" agreed to by the members of the society operating behind a "veil of ignorance," i.e., without knowing their position in society.

If — unlike Rawls — we imagined different generations negotiating behind the veil of ignorance, then we might think they would try to maximize the society's "minimum utility," that is, the utility of society's worst-off member (or in this case, worst-off generation). After all, Rawls argued that within a generation, it is this "maxi-min" utility function that would result from the veil of ignorance. These preferences lead to equality if equality is feasible.

(5)

Cities, especially medium-sized and large cities, are not capable of supporting themselves. They have populations beyond their carrying capacity. But cities are not a bad thing to have. They make possible division of labor and economies of scale, which increase economic output.

$/unit

Marginal External Cost to Others (MEC)

8

2

MNPB

10   20 25   30   Output "Q"
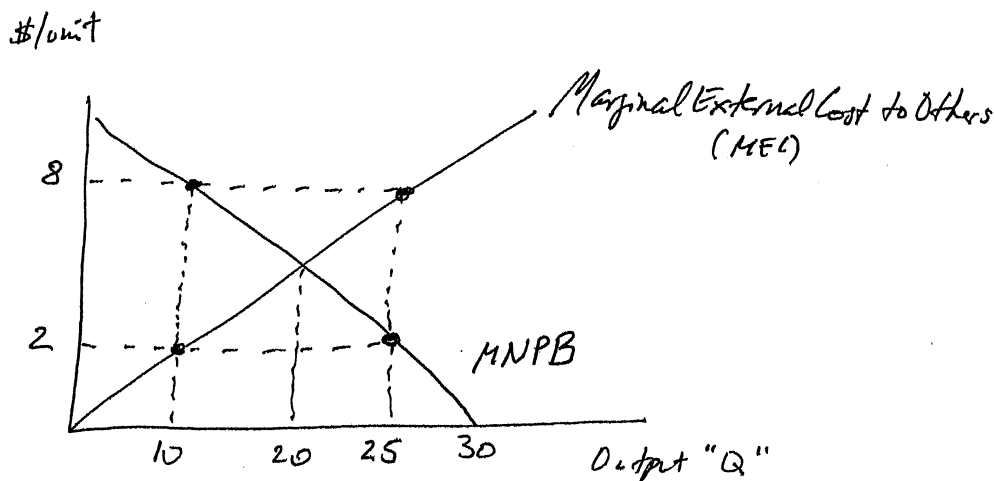
If the firm has the right to pollute: pollution victims can bribe* the firm to go from Q = 30 to Q = 20 because the amount the victims are willing to pay (MEC) is greater than the payment the firm would require (MNPB). But Q ≠ 20 because there MEC < MNPB so no deal could be struck.

If victims have the right to fresh air: the firm can bribe* the victims to go from Q = 0 to Q = 20 because the amount the firm is willing to pay (MNPB) is greater than the payment the victims would require (MEC). But Q ≠ 20 because there MNPB < MEC.

So regardless of property rights, Q goes to its $\overset{\text{socially}}{\wedge}$ optimal level of 20 with no bargaining costs.
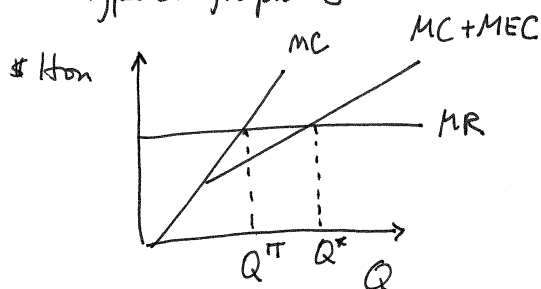
* I don't mean "bribe" in any negative way; "pay" might be a better choice of words.

⑦ a)

A positive externality is an activity which bestows benefits on a third party which has no financial ties to the people involved in the activity.

For example, bees kept only for their honey might help a farmer by pollinating the farmer's crops.

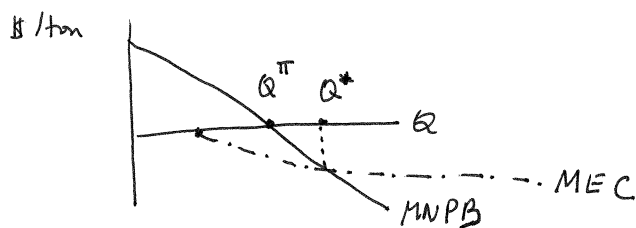b) One type of graph is

MC : marginal cost
MR : " revenue
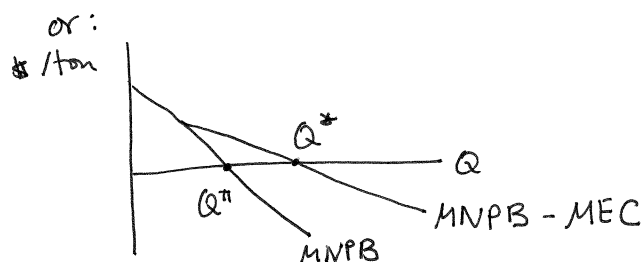MEC : " external cost (negative in this case)

Q^π : output chosen by private firms
Q^* : optimal output for the society

Another possibility is

MNPB : marginal net private benefit

or :

In all these cases, the laissez faire activity level Q^π is too little $(Q^\pi < Q^*)$.

Command and Control:

Firm	Control Cost Per Ton	Pollution Reduction	Pollution Reduction Cost
A	$20	1	$20
B	$30	1	$30
A+B			$50

Tradeable Permits:

One possibility is that each firm is given permits for 4 tons for free (grandfathering). Let's analyze this. Suppose each permit permits 1 ton of pollution to be emitted.

Let x satisfy $20 \leq x \leq 30$.

Firm B was producing 5 tons of pollution. Now it only has 4 permits. So it must either decrease pollution by 1 ton, costing $30, or buy a permit. If the permit price is x, then it will buy the permit as long as $x < 30$ (and it might buy the permit if $x = 30$).

Would Firm A be willing to sell a permit to Firm B? Yes, if the cost to Firm A of reducing pollution down to 3 tons instead of down to 4 tons is less than the permit price. This is true if $20 < x$ (the firm is indifferent if $20 = x$).

So if $20 \leq x \leq 30$,

	Pollution Level Before Trade	New Pollution Level	Pollution Reduction from Pre-regulation level	Pollution Reduction Cost
Firm A	4	3	2	40
Firm B	4	5	0	0
Firm A+B				40

Since $40 < $50, tradeable permits are more efficient than command-and-control: less costly for the same pollution reduction.

Maximum Sustainable Yield regulation takes into account neither
fishing costs nor the discount rate.

static model:

MSY
steady state revenue
cost
π
Effort
π : profit

profit
maximum ≥
social optimum
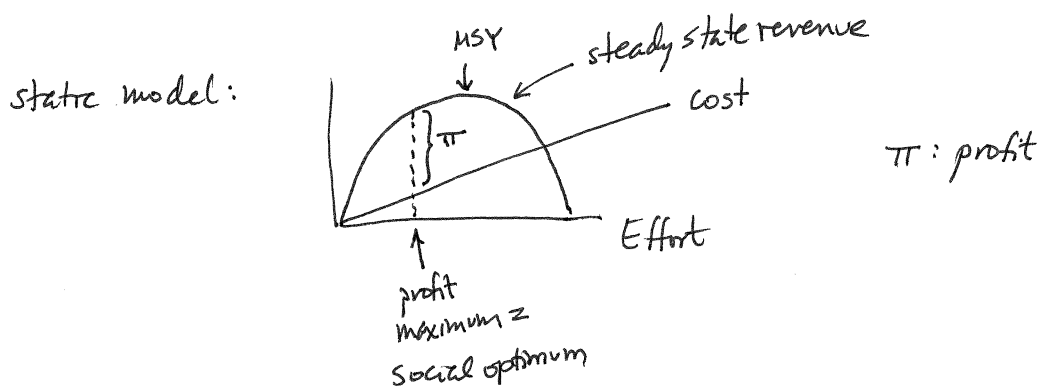
MSY would maximize profit only if fishing costs were
zero.

dynamic model, steady state:

$$\text{biological growth rate} + \text{\% } \Delta \text{ in fish price} = \text{Fishermen's Discount Rate}$$

suppose this is zero

r

$$\Rightarrow \text{biological growth rate} = r.$$

The left-hand side is actually $\dfrac{\Delta \,(\text{births}-\text{deaths})}{\Delta \,(\text{population size})}$. (It is not

$\dfrac{\text{births}-\text{deaths}}{\text{population size}}$, which is what "biological growth rate"

usually means.) The left-hand side is zero at MSY.

Since $0 \neq r$, MSY does not satisfy the optimality condition
for a dynamic steady state.

(10)

Economics cannot determine whether society should engage in this activity or not.

Engage: Benefit $100, cost (WTA compensation) $105, benefit < cost.

Don't Engage: Benefit $90 (WTP to avoid the activity),
    cost $100 (opportunity cost of not engaging in the project), benefit < cost.