

Economics 3250  
Spring 2008

Dr. Lozada  
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.

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.

1. [5 points] Compose an argument *against* the following position:  

“If global warming causes a rise in sea level, the economic effects of the sea level rise will be limited to small island nations, in which few people live anyway.”
2. [5 points] How difficult has it been—in terms of, say, sacrifices of this country’s GNP—for the US to abide by the international agreement regulating CFC’s and other chemicals which damage the ozone layer? Explain why this has or has not been difficult.  

I am not asking you to put a precise dollar value on the costs of the agreement; rather I am asking you to describe in general terms if the difficulty has been severe or not.
3. [5 points] Give an example of a government policy which damages (or damaged) biodiversity, and explain why it damages (or damaged) biodiversity. The example does not have to be from the USA, nor do you have to name the specific country which has (or had) the policy.
4. [5 points] Compose an argument saying that although the following quotation is partially true, it is not completely true:  

“As developing countries get richer, their pollution problems will all be solved.”

Be specific.
5. [5 points] In class, I discussed “circular flow” diagrams. Attached to this exam is a copy of one: Fig. 2.1 from Samuelson and Nordhaus’s *Microeconomics* (15th ed.). Discuss something of relevance to Econ. 3250 which is missing from such diagrams.
6. [5 points] Contrast the “Cornucopian” and “Deep Ecology” schools concerning:
  - (a) how worried they are about resource scarcity, and why; and
  - (b) the basis of their ethics.
7. [5 points] Show, using a graph, a tariff on imported food which is inefficient. Explain how the graph shows the inefficiency. I have attached to this exam a figure, Fig. 1, which you can use to get started.
8. [5 points] What are “opportunity costs”?
9. [5 points] Suppose:

- a pollutant is only produced by two firms, “A” and “B”;
- each firm currently produces 3 tons of pollution;
- it would cost Firm A \$10 per ton to reduce pollution (at the margin); and
- it would cost Firm B \$5 per ton to reduce pollution (at the margin); and
- society wants to reduce the total amount of pollution (Firm A’s added to Firm B’s) to 4 tons.

If a tradeable permit scheme using grandfathering were used to do this, show:

- whether any permits would be traded, and if so, who would buy and who would sell;
- how much it would cost Firm A plus Firm B to meet the new pollution target.

You do not have to compare this with a standard or a tax or any other approach.

- [5 points] Fig. 2 (attached to your exam) shows, for a fish population, a graph relating population size with “births minus deaths.”
  - Show where on this graph “carrying capacity” is. Explain why it is where you say it is.
  - Show where on this graph “maximum sustainable yield” is. Explain why it is where you say it is.
  - Why is Fig. 2 a reasonable description of the relationship between population size and “births minus deaths?”

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- ① Sea level rise will also affect coastal cities around the world, potentially inundating all or parts of New York, Los Angeles, Shanghai, Tokyo, and other large cities. This would have major economic impacts. Also, sea level rise will cause salt water contamination of fresh water aquifers in coastal areas, making agriculture impossible there. Sea level rise would also raise the level of storm surges, and could threaten much of Holland, which is certainly not a "small island nation in which few people live anyway."
- ② It has turned out to be rather easy to find substitutes for the chemicals which damage the ozone layer. Replacements for CFC's, which were mostly used as refrigerants, are almost universal in developed countries and gaining ground in developing countries. Substitute propellants and foam-blowing agents have also been found. So the economic cost has been small.

③

Government policies which encourage the conversion of land in natural ecosystems to agricultural use are responsible for loss of biodiversity.

Such policies include:

- granting cheap (or even free) land to pioneers who start farms
- subsidies to farmers for credit, machinery, fertilizer, irrigation water, or grazing rights
- tariffs on agricultural imports. (These encourage agriculture in the home country but discourage it in foreign countries.)

④

It is true that as developing countries get richer, some types of their pollution problems tend to get solved. Examples are access to safe drinking water and to urban sanitation. But other pollution problems, such as Municipal Solid Waste and emission of "greenhouse gases" such as  $\text{CO}_2$ , tend to get worse as a country gets richer.

This is the topic of the "Environmental Kuznets Curve."

⑤

What is missing is the role of Nature in supporting — indeed, in making possible — the economy. The economy receives inputs from Nature (minerals, soil, water, sunlight, oxygen) and deposits all its wastes into Nature.

Georgescu-Roegen wrote that this flow from valuable inputs to valueless waste was unidirectional — i.e., that it could not be recycled 100%. But since the Earth receives solar energy, perhaps recycling could be 100%. It certainly is nowhere near 100% today.

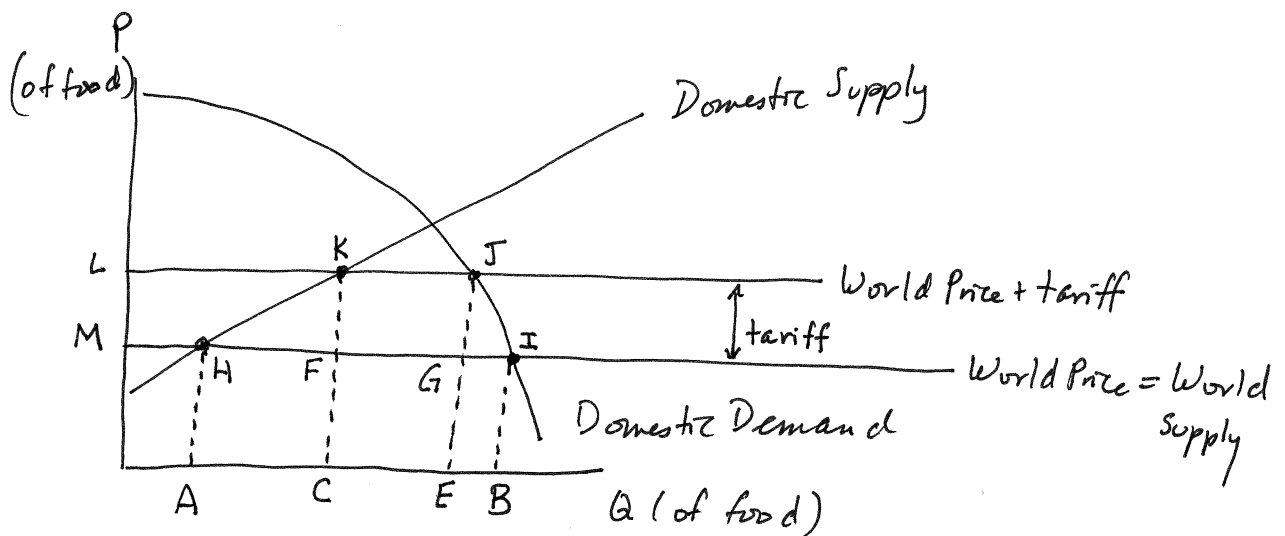
⑥

The "Cornucopian" school is not very worried about resource scarcity. They think it will be easy to find substitutes for resources which become scarce, just as they think all past generations have done. Their ethical "moral reference class" is contemporary humans.

The "Deep Ecology" school is very worried about resource scarcity, and believes resource scarcity will severely constrain economic growth.

(They advocate an economy smaller than today's, at least in its impact on Nature.) Their moral reference class includes not only contemporary humans but also future humans, non-human species, and even abiotic (that is, non-living) parts of the environment.

(7)



Without the tariff, price  $P$  is at  $M$ , domestic supply is  $MH$ , and foreign supply is  $HI$ .

With the tariff, domestic price is at  $L$ , domestic supply is  $LK$ , and foreign supply is  $KJ$ .

Imposing the tariff therefore caused  $AC$  to switch from being supplied by low-cost foreign producers, at a cost of  $H F C A$ , to higher-cost domestic producers, at a cost of  $H K C A$ . The extra production costs which the tariff creates are  $H K F$ . This is the inefficiency caused by the tariff.

There is another inefficiency:  $EB$ , whose value (area under  $J I$ ) is greater than its cost of production (area under  $G I$ ), should be produced, but under the tariff it is not produced. This is a loss to society of  $J I G$ .

⑧

The opportunity cost of choosing to do something is the value of the (next-most-valuable) alternative which you forego.

For example, if you must choose between two mutually exclusive alternatives, A and B, the opportunity cost of choosing A is the value of B and the opportunity cost of choosing B is the value of A.

⑨

The government will issue 4 tons' worth of permits. Suppose each permit ~~is worth~~ represents 1 ton of pollution.

The firms polluted equally before, so under grandfathering, each will get 2 permits.

Let "p" be a number between \$5 and \$10 per permit.

Under what circumstances will A want to buy a permit from B?  
(A is the higher-abatement-cost firm, so it won't be selling any permits to B, the lower-abatement-cost firm.) A will want to buy a permit from B if the cost of doing so, which is p, is less than the benefit of doing so, which is that it doesn't have to spend \$10 reducing pollution. So A will buy if  $p < 10$ .

Under what circumstances will B want to sell a permit? When the benefit of doing so, which is p, is less than the cost of doing so, which is the extra \$5 it'll have to pay to reduce pollution more.



So B will sell if  $p > 5$ .

Therefore if  $5 < p < 10$ , A will want to buy and B will want to sell.

If 1 permit is sold, A will have 3 permits and B will have 1 permit.

This lets A pollute as much as it did before the government regulation; there's no reason A would want to pollute more than that, so A would never buy more than 1 permit.

a)  $\Delta$

b) A has 3 permits so it doesn't have to abate pollution at all.

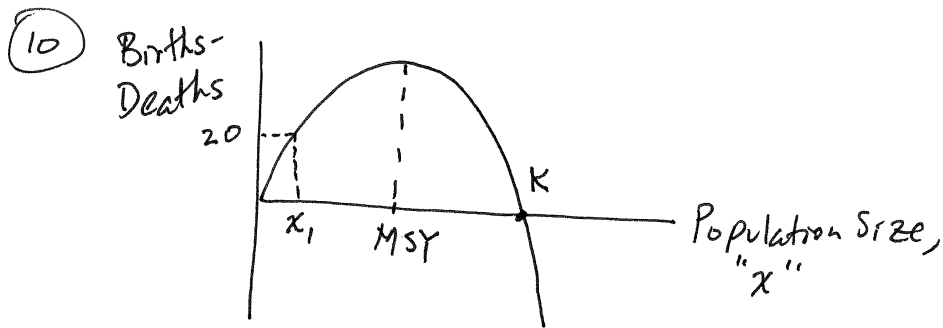
B has 1 permit so it needs to abate  $3 - 1 = 2$  tons of pollution.

That costs it  $\$5/\text{ton} \times 2\text{tons} = \$10$ .

Optional: Note that under the standard of "each firm pollutes

2 tons," abatement costs are  $\$10$  for A and  $\$5$  for B, for a

total of  $\$15$ , which is more than the permit scheme's abatement costs.



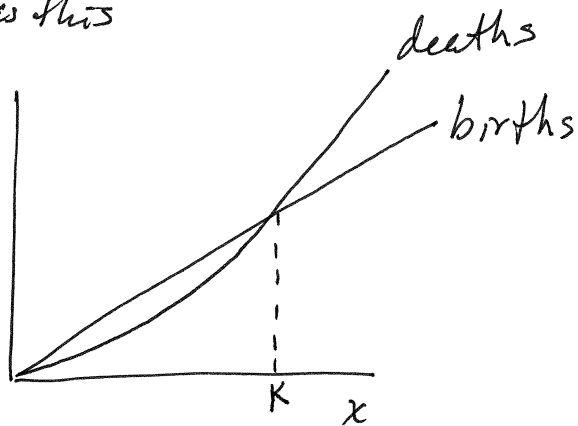
- a) The carrying capacity is at  $K$  on the graph. This is because if  $x < K$ , births-deaths  $> 0$ , so births  $>$  deaths, so the population will rise, making  $x$  rise towards  $K$ . If  $x > K$ , births-deaths  $< 0$ , so births  $<$  deaths, so the population will fall, making  $x$  fall towards  $K$ .
- b) I claim that the "Births-Deaths" curve shows sustainable yields. To see this, suppose  $x$  is at  $x_1$ . Births minus deaths equal 20. If 20 fish were harvested each year, the population change would be zero:

$$\begin{aligned}
 \text{pop. change} &= \underbrace{\text{births} - \text{natural deaths}}_{= 20} - \text{harvesting deaths} \\
 &= 20 - 20 \\
 &= 0.
 \end{aligned}$$

So that is sustainable.

The biggest (i.e., "maximum") of these sustainable yields is indicated by "MSY" in the diagram above.

c) A graph such as this



would give rise to a graph like Fig. 2.

Here, births vary more-or-less linearly with  $x$ . However, deaths climb slowly at first (the population is not greatly pressing on its food supply), then climb ever-more rapidly as  $x$  gets large and there's ever more pressure on the food supply.