Economics 3250 Dr. Lozada
Spring 2015 Exam 2

This exam has 25 points. There are six questions on the exam. Most of the questions are worth 4 points, but one is worth 5 points.

Put your answers to the exam in a blue book or on blank sheets of paper.

Answer the questions using as much precision and detail as the time allows. Correct answers which are unsupported by explanations will not be awarded points.

Answer all of the following six questions.

1. **[4 points]** Define "race to the bottom" in the context of international pollution control.

2. **[5 points]** Suppose:

   - an industry contains only two firms A and B;
   - each firm currently emits 10 tons of pollution;
   - Firm A's marginal abatement costs are \$80/ton and Firm B's marginal abatement costs are \$100/ton;
   - the socially optimal total amount of pollution is 18 tons;
   - a "command and control" policy will require equal reduction of pollution by both firms;
   - a "tradeable permit" policy will use grandfathering.

   Using these numbers, show that a tradeable permit policy is more efficient than the command-and-control policy.

3. **[4 points]**

   (a) Draw a graph of "births minus deaths" versus "population size" for a fishery.

   (b) On your graph, locate "carrying capacity" and "maximum sustainable yield."

   (c) Increases in fishing effort will cause what sort of movement on this graph?

4. **[4 points]** The Hotelling Rule for an exhaustible resource industry says that marginal profit will rise at the discount rate (the rate of interest). What does this imply about the time path of profit?

5. **[4 points]** Describe two ways in which increased government restrictions on pollution could actually increase the profit of some types of companies.

6. **[4 points]** Give your opinion as to whether a marketable permit scheme be a good policy to adopt for Municipal Solid Waste management. State your reasons.

Answers to Exam 2, Econ. 3250, Spng 2015

(1) If one country allows more pollution than another, industries might decide to move to it instead of to the country that limits pollution more. Knowing this, and wanting to attract industries, countries might compete against each other to try to be the most "business-friendly," which in this context means the dirtiest. Therefore they successively reduce their pollution controls (increase their pollution). This is a "race to the bottom": a "race" because countries are competing against each other, and "the bottom" because they are going to the worst environmental quality.

This can also apply to different states or cities competing with each other. It can also apply to worker safety laws, workmans' compensation insurance (which pays workers who are injured on the job), and other regulations which hurt profits but benefit some groups in society.

(2)

	Firm A	Firm B	
Current pollution	10 tons	10 tons	
Marginal abatement costs	$80/ton	$100/ton	"MAC"
Command-and-control pollution levels	9 tons	9 tons	because 9+9=18, which is the socially optimal level, and Command-and-Control is assumed to require equal reduction (1 ton) by both firms
Abatement costs under command-and-control	$80 * (10-9) = $80	$100 (10-9) = $100	Abatement costs are MAC times the amount of abatement. Social total abatement costs are $80+$100=$\boxed{\$180}$ under command-and-control.
Tradeable permits	9 tons	9 tons	Grandfathering gives equal permits because past levels of pollution (10 tons and 10 tons) were equal. 18 tons of pollution are allowed under permits.
If this trading happened (see next page)	-1 permit	+1 permit	
then pollution would be	8 tons	10 tons	and abatement costs
would be	$80 (10-8) = $160	$100 (10-10) = $0	for a total of $\boxed{\$160}$, less than $180 under command-and-control, so permits are more efficient. →

On the previous page, command-and-control and tradeable permits generated the same pollution (18 tons), but tradeable permits did it more cheaply.

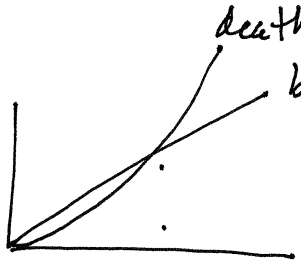
But will the trading of permits shown on the previous page occur? Will Firm A willingly sell a permit to Firm B, and will Firm B willingly buy it? Suppose the permit trades at a price of "$x." Firm A gets $\$x$ but then has to abate 1 more ton of pollution, which costs it \$80, so Firm A will only sell the permit if $\$x > \$80$. Firm B buys the permit, costing Firm B $\$x$, but then Firm B saves the cost of abating 1 ton of pollution, which is \$100. So Firm B will only buy the permit if $\$100 > \$x$. If

$$\$80 < x < \$100$$

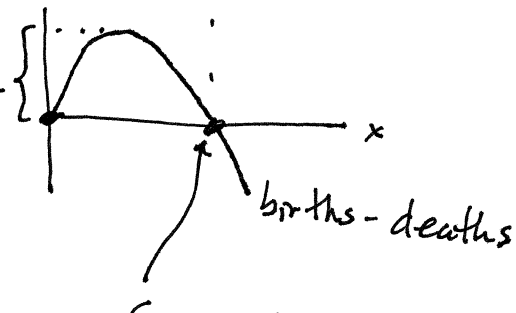
then Firm A will want to sell and Firm B will want to buy.

(3)

a) Optional:



Required:



b)

Maximum Sustainable Yield. If yield, which is harvest, is equal to births - deaths (that is, is equal to this graph), then

Yield = births - deaths ⇒

Yield + deaths = births ⇒ total deaths = births ⇒ population does not change (it is "sustainable").

↑ human-caused deaths

↑ natural deaths

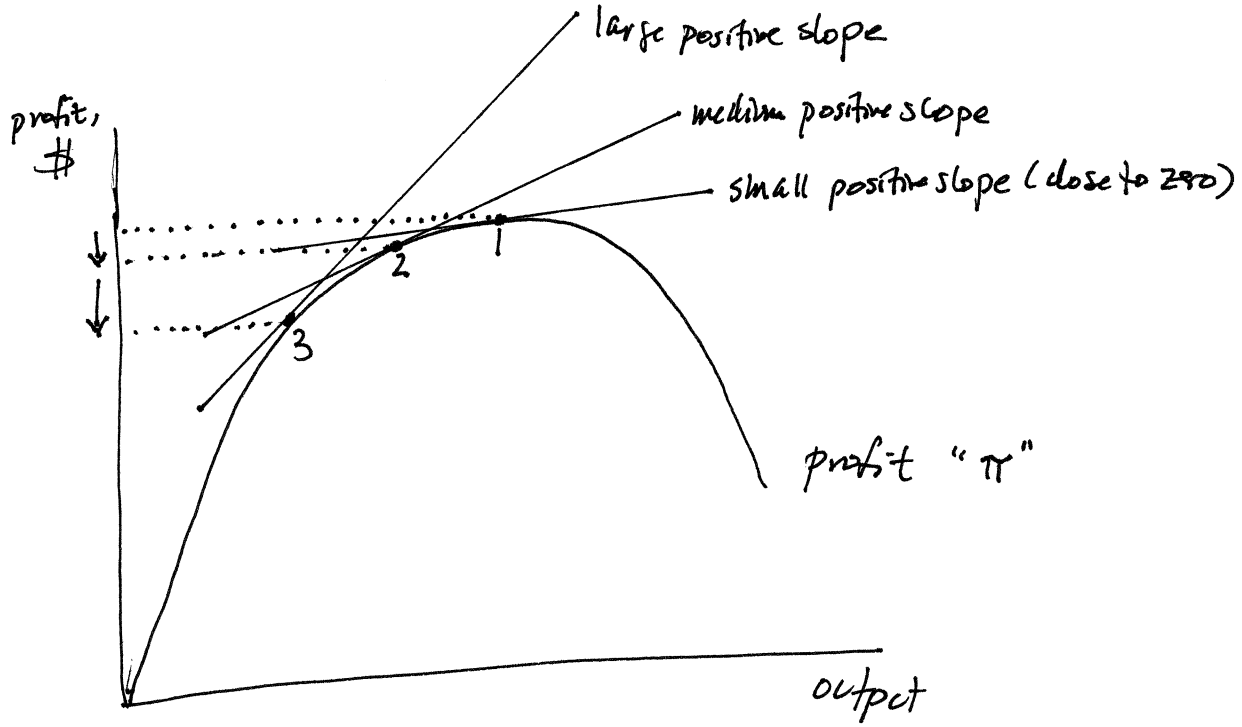
total deaths

Carrying capacity: if x is bigger than this, births - deaths < 0 ⇒ population falls towards this; if x is less than this, births - deaths > 0 ⇒ population rises towards this.

So the graph shows sustainable yield. Its tallest point is the maximum sustainable yield.

c) More fishing effort, all else equal, causes x to fall (more fish get caught). This is motion to the left on the graph.

(4)



Marginal profit "MΠ" is the slope of π. In this graph, as you go from 1 to 2 to 3, the slope of the tangent lines (which is the slope of π) gets larger. So a rising MΠ is like going from 1 to 2 to 3. As you can see from the vertical axis, this means that profit π falls over time.

(5)

Some firms specialize in environmental cleanup and pollution control, or in "clean" energy production. These firms clearly benefit if government restricts pollution more.

Other firms, faced with increased pollution regulation, may engage in research and developement to develop new, cleaner technologies. They thus gain a competitive advantage in knowledge compared to other firms. If increased pollution control eventually come to all countries, this increased knowledge can lead to more long-run profit for the "early adopters" of clean technology, while the dirtier firms struggle to adapt to the new regulatory environment.

⑥ [Various opinions are possible here.] Marketable permit schemes require monitoring and the ability to enforce the system's rules. This could be troubling for Municipal Solid Waste ("MSW"). With new restrictions on MSW, households might be tempted to cheat by illegally dumping garbage. This might be quite hard to punish, because catching people illegally dumping garbage is difficult. This could cause a tradeable permit system for MSW to perform poorly.