Economics 5250
Fall 2007

Dr. Lozada
Midterm Exam

This exam has 33 points. There are six questions on the exam; you should work all of them. Questions 1, 5, and 6 are are worth 5 points each, while Questions 2–4 are worth 6 points each.

Put your answers to the exam in the blue books you have brought.

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. 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 six questions.

1. [**5 points**] Which do you think was (or is) more effective: the 1987 Montréal Protocol or the 1997 Kyoto Protocol? Why?

2. [**6 points**] Set up a graph with output Q on the horizontal axis and "dollars per unit of output" on the vertical axis. Suppose a firm has the legal right to emit as much pollution as it wishes. Let Q^{π} be the firm's profit-maximizing level of output and let Q^* be the socially optimal level of output. (Draw your graph so that $Q^* > 0$.)

   (a) Illustrate the Coase Theorem using your graph, assuming there are no transactions costs (and no "wealth effects"). Explain.

   (b) Suppose the firm knows everything about the pollution sufferers, but the pollution sufferers know nothing about the firm. So the firm can fool the pollution sufferers by pretending that its curve in your Coase Theorem diagram is in a different place than where it truly is. If the firm fooled the pollution sufferers, what would happen? Would the firm be tempted to reveal its secret?

3. [**6 points**] Attached to your exam is a class handout comparing pollution standards to marketable permits. Change the first table on that page to compare, not a standard to a marketable permit, but a standard to an optimal Pigouvian tax.

   Also change the first two rows of the second table on that page to illustrate changing not from a standard to marketable permits, but changing from a standard to an optimal Pigouvian tax. (Do not attempt to figure out how the last row of that table changes.)

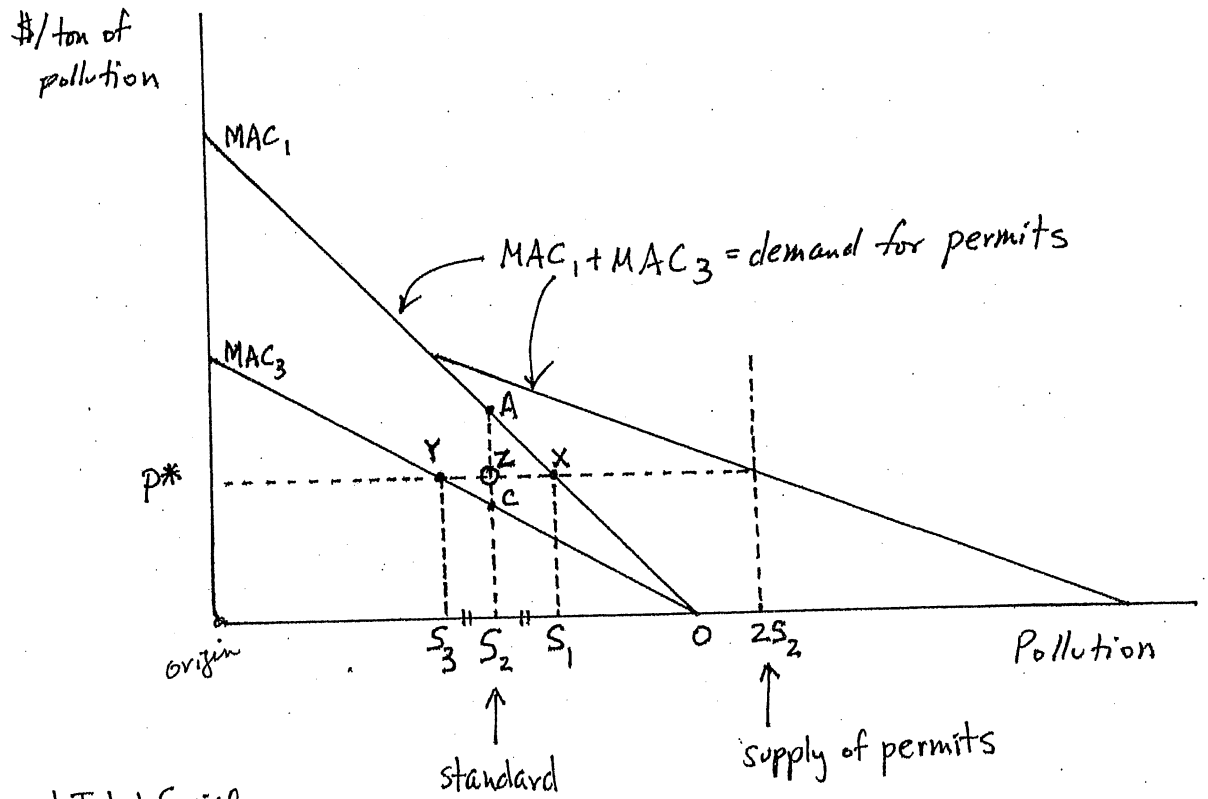
4. [**6 points**] Why is it a problem that Willingness to Pay might not equal Willingness to Accept? Show with an example.

5. [**5 points**] Your textbook says, "tomorrow's satisfaction matters, not today's assessment of tomorrow's satisfaction." Explain what this means using utility functions. Also explain why, if this is true, planning might he hard.

6. [**5 points**] In environmental regulatory law, what did the "Best Available Control Technology" mean in practice?

Corrected Fig. 8.2

Suppose $S_3S_2 = S_2S_1$.



	Total Social Abatement Costs
Standard	$0AS_2 + 0CS_2$
Mkt. Perm.	$0XS_1 + 0YS_3$
Perm. Advantage	$+AXS_1S_2 - YCS_2S_3 > 0$

	Firm 1	Firm 3
abatement costs	save AXS_1S_2	pay YCS_2S_3
permits	pay ZXS_1S_2	receive $ZXS_1S_2 = YZS_2S_3$
Perm. advantage	AXZ	$> YZC$

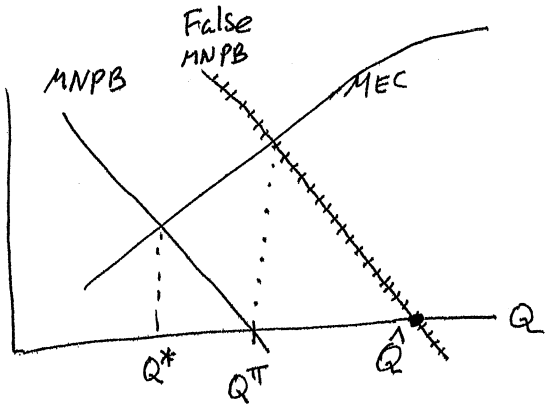
Answers to Econ 5250 Midterm Exam, Fall 2007

① The Montreal Protocol's goal was to reduce emissions of chemicals that depleted the ozone layer in the upper atmosphere. Ozone there protects living things from dangerous levels of ultraviolet ("UV") radiation. The agreement has been a big success, leading to large reductions or eliminations of all important ozone-depleting chemicals (particularly chlorofluorocarbons, "CFC's").

The Kyoto Protocol did not even go into effect until well past its 1997 negotiation. It targets "greenhouse gases" which cause "global warming." The USA is not a signatory to the Kyoto Protocol, though it is a major emitter of greenhouse gases. The Protocol does not require a reduction of targeted emissions' stock in the atmosphere, just a reduction of their continued flow into the atmosphere. Therefore it would not be very effective in reversing climate change even if the USA were part of it.

(2)

a)



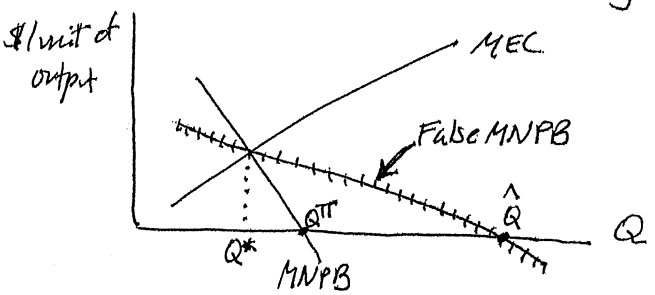
MEC: Marginal External Cost. Willingness and ability of victims to pay for pollution reduction, on the margin.

MNPB: Marginal Net Private Benefit (profit)

A firm with the legal right to emit will go to $Q = Q^{\pi}$, maximizing profit by setting marginal profit equal to zero. But victims are willing and able to pay as much as MEC to bribe the firm to reduce Q. The firm demands at least MNPB to agree to reduce Q. As long as MEC > MNPB, the victims and the firm are both better off by reducing Q, with the victims paying the firm to do that. So Q will fall to Q^*. Hence Q^* is achieved privately, with no government regulation necessary. (Under the assumptions of the question.)

b) If the firm acted according to, for example, the "False MNPB" in the graph above, the Coasian bargain would end at Q^{π} (where the firm wanted to be anyway). Victims would pay the firm to reduce output from $\hat{Q}$ to Q^{π}, while the firm actually had no plans to produce $> Q^{\pi}$ anyway.

Having gotten to Q^{π}, though, firms might be tempted to reveal their true MNPB, so they could get paid for going to Q^*. However, the firm's future credibility would be hurt. This problem would be eliminated by the graph below.



(3)

	Total Social Abatement Costs
Standard	$OAS_2 + OCS_2$
Optimal Pigouvian Tax	$OXS_1 + OYS_3$ presuming a tax level of P^*. Firms pollute as long as the cost of pollution, which is the tax P^*, is less than the cost of abatement, which is MAC.
Tax Advantage	$+AXS_1S_2 - YCS_2S_3 > 0$

	Firm 1	Firm 3
abatement costs	save AXS_1S_2	pay YCS_2S_3
tax payments	pay P^*XS_1 Origin	pay P^*YS_3 @ Origin

Firms will prefer a marketable permit system if they have been given the permits for free, to a tax, which they just have to pay.

(4)

In general, Willingness to Pay (WTP) is less than Willingness to Accept (WTA).

Consider an environmentally damaging project in which the victims' WTP to stop the project is $50, the victims' WTA compensation if the project goes forward is $200, and the project's net private benefit (firm profit) is $100. (The $100 should include consumer surplus too.)

Either the project is built or it is not.

If it is built, the gross benefit is $100 to society as a whole. The firm that gained the $100 is unable to pay the losers their WTA = $200, so building the project is not a Pareto-improving (i.e., "efficient") decision.

If it is not built, the firm requires at least $100 in compensation, but the potential victims are only WTP $50. So not building the project is inefficient too.

Economics cannot answer the question "should the project be built?"

(If both WTP and WTA were less than $100, the project should be built, with the firm paying WTA (or more) and still being better off than before. If both WTP and WTA were more than $100, the project should not be built, with potential victims paying at least $100 to the firm and still having some of their WTP left over.)

(5)

Possible Social Welfare Functions:

$f(u_1, u_2)$ $\quad u_i$: utility of generation i

$g(c_1, u_2)$ $\quad c_i$: consumption of generation i

$h(c_1, c_2)$

$j(u_1, c_2)$

To know u_2 you need to know "tomorrow's satisfaction," but that is an unknown function. Future generations will have different tastes than we do. So it's more practical to use c_2 instead of u_2 : there's less uncertainty about c_2 than about u_2. However, u_2 is more important than c_2 according to the question's quotation.

(The quotation may be wrong; think about future generations being "snobs.")

Key Points:

- intergenerational distribution
- uncertainty about future generations' preferences (not necessarily their opportunities)

(6) In practice it meant using pollution control technology that was good but not "too costly," where this was a vague idea. It did not mean the least-polluting technology available, if that was "too" expensive.

(This is a command-and-control way of limiting pollution without setting a standard.)

(BACT was a U.K. standard, regulating emissions rather than ambient air quality.)