

Economics 5250  
Fall 2008

Dr. Lozada  
Midterm Exam

This exam has 33 points. There are six questions on the exam; you should work all of them. Question 3 is worth 8 points, while the other questions are worth 5 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]** What is the “assimilative capacity” of the environment for a pollutant?  
Other things being equal, in which situation is the socially optimal level of pollution larger: when the assimilative capacity is zero or when it is strictly positive? Illustrate with a graph.
2. **[5 points]** How would you defend the position that imposing a socially optimal Pigouvian Tax is unfair to the polluting firms? (You may well not agree with this position, but I am asking you to defend it anyway.)
3. **[8 points]** Construct a graph showing the operation of a marketable pollution permit scheme when there are two polluting firms. You do not have to prove anything about abatement costs; just explain why the permit price is what you think it is, explain which firm(s) will be buying permits and which will be selling permits (assume a free and equal initial distribution of permits), and what the pollution levels of each firm will be.
4. **[5 points]** State whether the following is true or false, and explain why: “Neoclassical economics only considers the use value of objects; it ignores all other aspects of the object, such as [fill in as many other appropriate aspects as you can here].”
5. **[5 points]** Do you think Contingent Valuation surveys would lead respondents to decide to overstate or understate their values for an environmental amenity? Why? Or would it depend on the circumstances? (If you answer the latter, explain what circumstances.)
6. **[5 points]** An article from *Time* magazine’s web site by Bryan Walsh dated Tuesday, Oct. 28, 2008, and entitled “What the Public Doesn’t Get About Climate Change” begins:

As I report on climate change, I come across a lot of scary facts, like the possibility that thawing permafrost in Siberia could release gigatons of carbon dioxide into the atmosphere or the risk that Greenland could pass a tipping point and begin to melt rapidly. But one of the most frightening studies I’ve read recently had nothing to do with icebergs or mega-droughts. In a paper that came out Oct. 23 in *Science*, John Sterman—a professor at Massachusetts Institute

of Technology's (MIT) Sloan School of Management—wrote about asking 212 MIT grad students to give a rough idea of how much governments need to reduce global greenhouse gas emissions by to eventually stop the increase in the concentration of carbon in the atmosphere. These students had training in science, technology, mathematics and economics at one of the best schools in the world—they are probably a lot smarter than you or me. Yet 84% of Sterman's subjects got the question wrong, greatly underestimating the degree to which greenhouse gas emissions need to fall. When the MIT kids can't figure out climate change, what are the odds that the broader public will?

[...] almost all of the subjects in Sterman's study ... assum[ed] instead that you could stabilize carbon concentration simply by capping carbon emissions at their current level. That's not the case...

Someone as smart as Bill Gates doesn't seem to get it. "Fortunately climate change, although it's a huge challenge, it's a challenge that happens over a long period of time," he said at a forum in Beijing last year. "You know, we have time to work on it." But the truth is we don't.

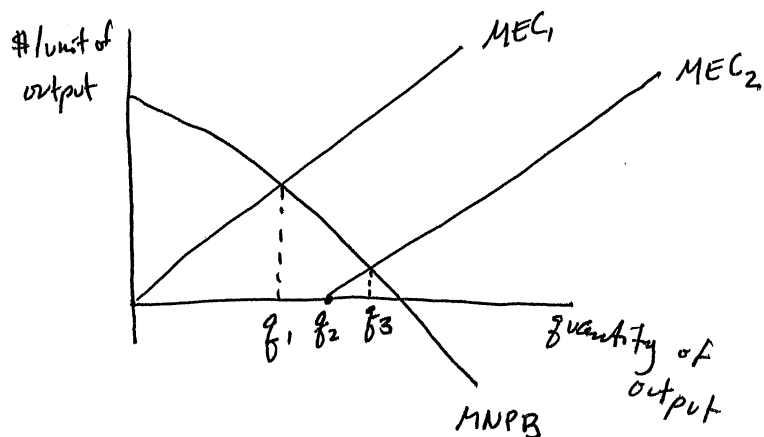
It is somewhat odd for the author to refer to MIT graduate students as "kids," but otherwise, this is a well-written article.

- (a) The second paragraph I quoted ends with "That's not the case. . . ." Why not?
- (b) The third paragraph I quoted ends with "we don't." Why not?

Answers to Econ. 5250 Midterm, Fall 2008

①

Assimilative capacity is the amount of a pollutant which the ecosystem can absorb without generating any external costs.



MEC: Marginal External Cost

MNPB: Marginal Net Private Benefit

Social optimum:  $MNPB = MEC$

$MEC_2$  has a strictly positive assimilative capacity of  $q_2$ .

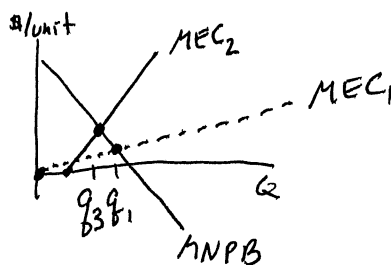
$MEC_1$  has a zero assimilative capacity.

$q_3$  is the optimum quantity with  $MEC_2$ ;

$q_1$  " " " "  $MEC_1$ ;  $q_1 < q_3$ .

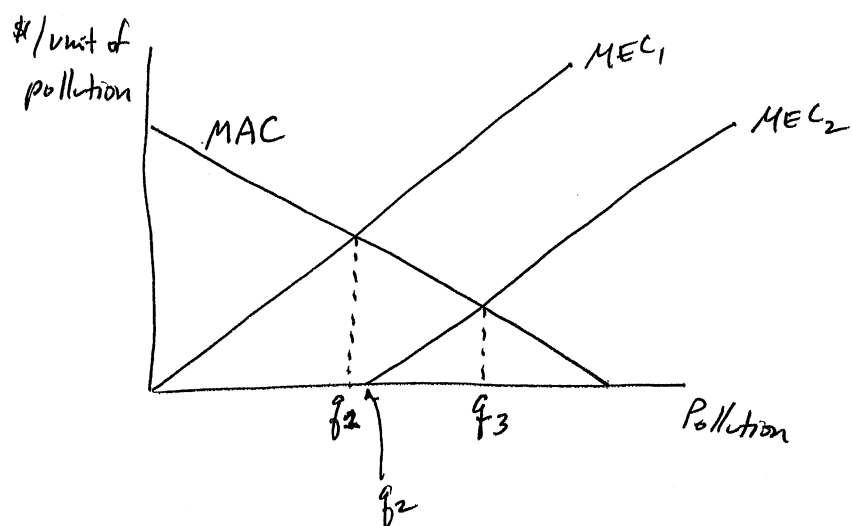
So socially optimal pollution is larger when assimilative capacity is strictly greater than zero than when it is zero.

(There are strange exceptions:



I doubt they are very important.)

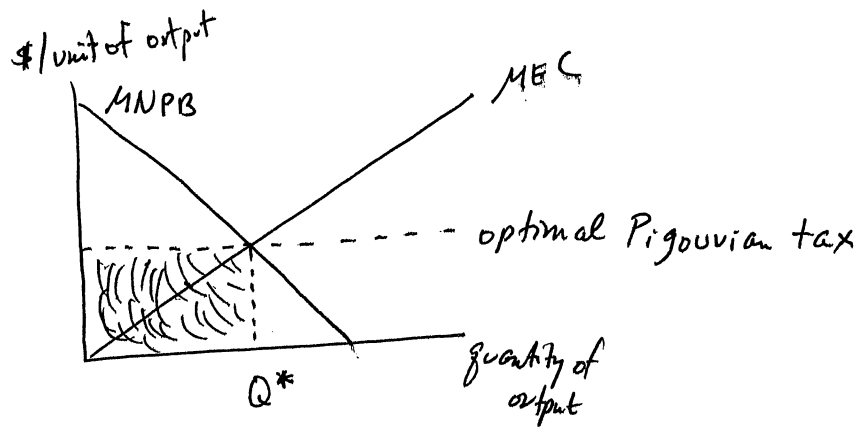
Alternatively, this can be illustrated by



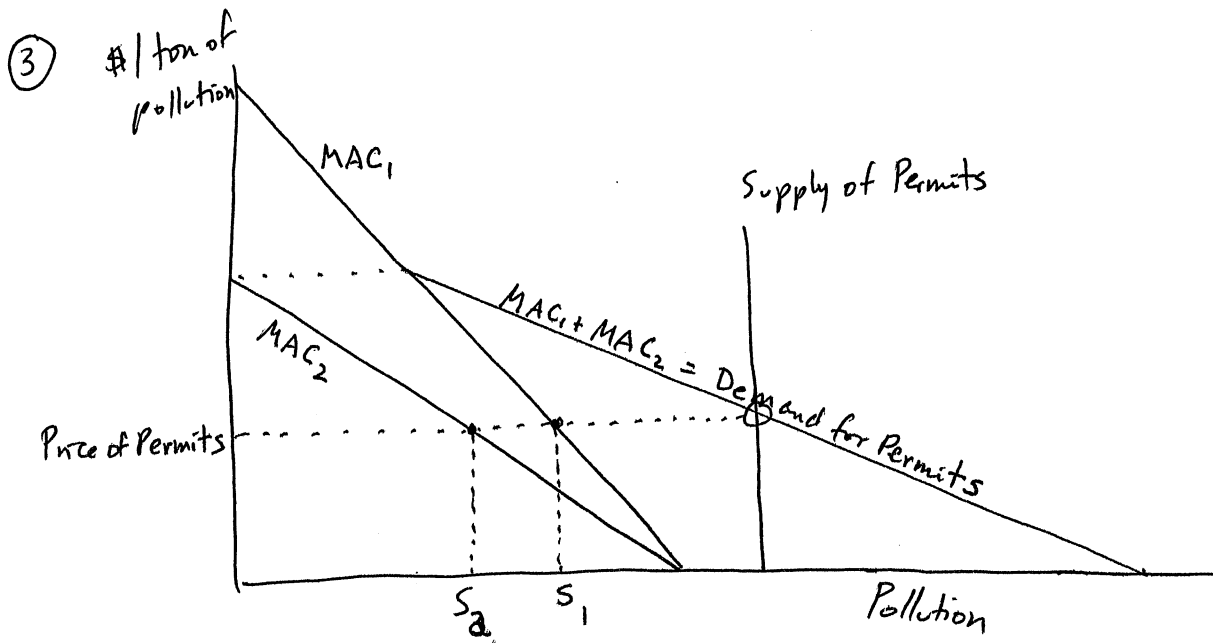
MAC: marginal abatement cost

$q_1, q_2, q_3$  defined as before

②



The firms have to pay the shaded area in taxes even though they are producing the socially optimal level of output. "It's unfair to make them pay when they are doing what we want them to do" would be the argument.



MAC: marginal abatement cost

Firm 1 wants  $S_1$  permits and Firm 2 wants  $S_2$  permits (at the prevailing price of permits). Since  $S_1 > S_2$ , Firm 1 will buy from Firm 2.

④ False, because neoclassical economics also considers

option value : the value of having the ability to consume in the future  
(this includes bequest value, the ability for your  
descendants - or society's descendants - to consume  
in the future)

existence value : the value of an environmental amenity existing  
(without being used, or being used passively, with no  
effect on the amenity)

quasi-option value : value of the chance that the environmental  
amenity could acquire an option or existence value  
in the future



⑤ a) In one situation, respondents are told that they will actually have to pay whatever their expressed "willingness to pay" is if society decides to undertake the action they said they were willing to pay for. This induces "free riding," an understatement of the true "WTP": each respondent thinks that since he is a small part of the total, an underpayment by him will not affect the social decision but will leave him with more money.

b) In another situation, respondents are completely anonymous. This induces exaggeration — overstating their "WTP" or "Willingness to Accept" ("WTA") — because that increases the likelihood of society making the decision the respondent wants, without any cost to the respondent.

⑥

a) Stabilizing greenhouse gas emissions at their current level is like reducing the flow of water into a container to a steady flow: the container will still get more and more water in it (so the analogy is that the atmospheric stock of greenhouse gases will still increase).

Only zero emissions of greenhouse gases will stabilize their atmospheric concentration.

b) Due to significant time lags in the global climate system, changes we have already made will, unless undone quickly (which seems highly unlikely), cause climate change for centuries to come.