Economics 5250 Dr. Lozada
Fall 2005 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, 3, and 4 are worth 6 points each.

Put your answers to the exam in the blue books you have brought. The figure for the exam appears after the questions.

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]** The two parts of this question are unrelated to each other.
   (a) On p. 64 of your textbook, the authors write, "Calls for 'no pollution' thus appear illogical." Using a graph, explain why this is incorrect (at least in so far as a single source of pollution is concerned).
   (b) Explain both graphically and in words how the presence of an environmental assimilative capacity would affect the socially optimal amount of pollution.
2. **[6 points]** Suppose production of a good pollutes the environment.
   (a) Sketch a graph showing how the optimal Pigouvian tax is calculated if *output* is on the horizontal axis.
   (b) Sketch a graph showing how the optimal Pigouvian tax is calculated if *pollution* is on the horizontal axis.
   (c) Under what situations (if any) is it better, worse, or just as good to model the optimal Pigouvian tax as a tax on output instead of a tax on pollution?
3. **[6 points]** Using Figure 1, compare and contrast a *Pigouvian tax scheme* versus a *marketable permit scheme* with regards to how the two schemes affect:
   (a) total social abatement costs;
   (b) profit of Firm 1; and
   (c) profit of Firm 2.
4. **[6 points]** Recently the federal government suggested allowing airplanes landing and taking off from the Salt Lake City airport to fly low over parts of Salt Lake County which airplanes are now prohibited from flying low over. What would be the best way to go about estimating the economic damages which this change would cause?
5. **[5 points]** Draw two graphs:
   (a) The first graph should have time on the horizontal axis and carbon dioxide concentration on the vertical axis. Call this the "policy" graph.

(b) The second graph should have time on the horizontal axis and global mean temperature on the vertial axis. Call this the "effect" graph.

Then answer:

(a) On the "policy" graph, show what will happen if current trends continue. Show the effect of this on the "effect" graph.

(b) On the "policy" graph, show what will happen if the Kyoto Protocol were universally adopted. Show the effect of this on the "effect" graph.

(c) On the "effect" graph, show a return to preindustrial temperature. What would the relationship on the "policy" graph have to be in order to have this effect?

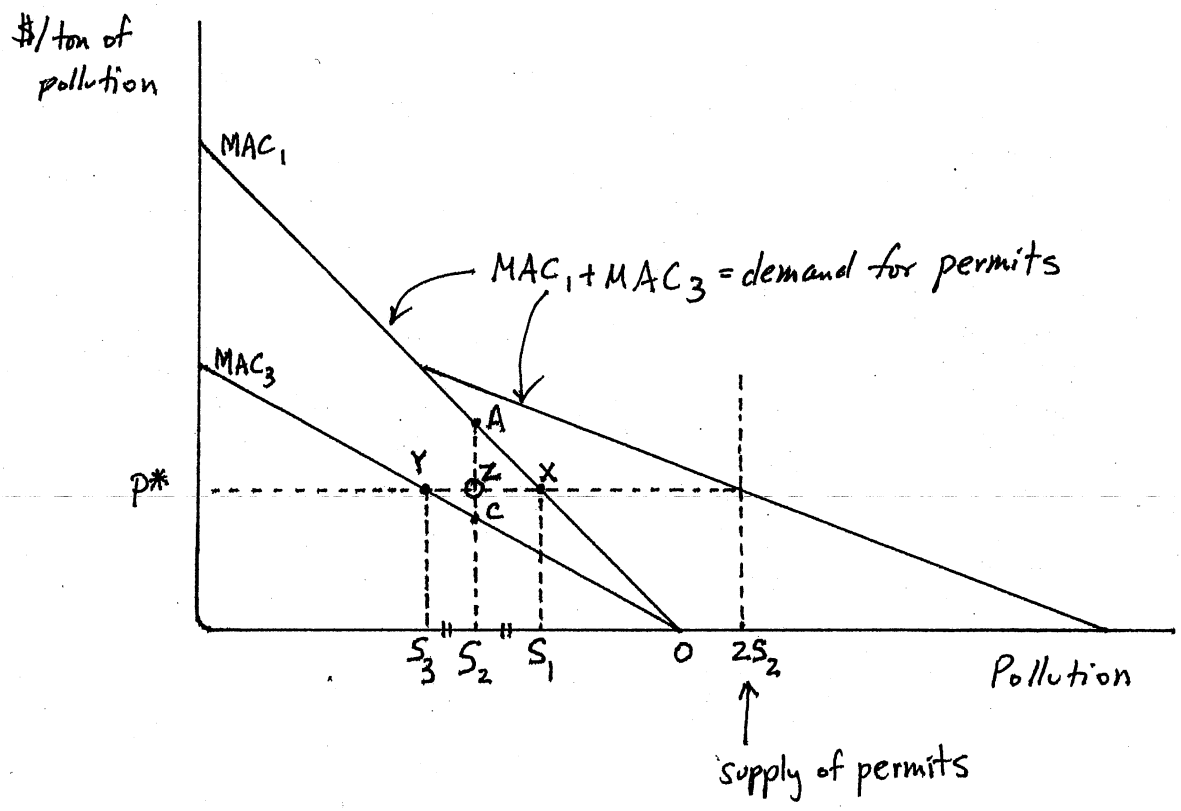
6. **[5 points]** Answer *either* part (a) *or* part (b) *but not both.*

(a) Some extreme environmentalists hold a consequentialist philosophy and some do not. How could you tell which group a particular extreme environmentalist belonged to?

(b) Some extreme anti-environmentalists hold a consequentialist philosophy and some do not. How could you tell which group a particular extreme anti-environmentalist belonged to?

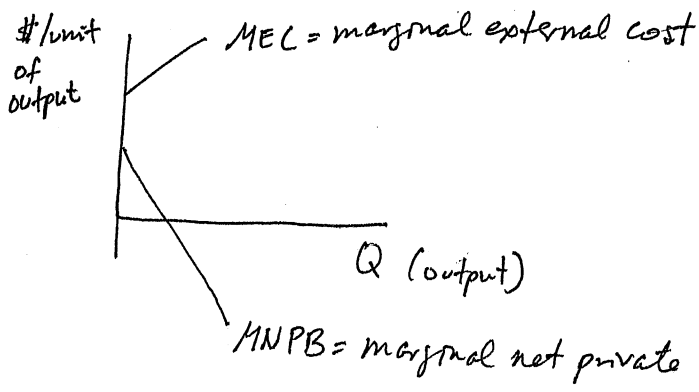
Figure 1

Suppose $S_3 S_2 = S_2 S_1$.



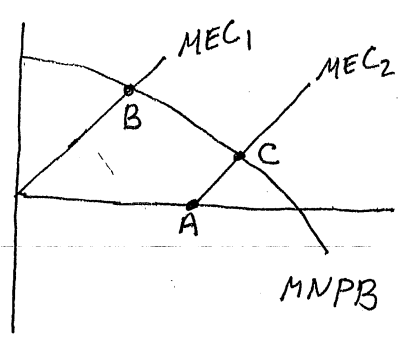
Answers to 5250 Midterm Exam, Fall 2005

① a)



Since MEC > MNPB for all Q, it is never socially worthwhile to create any output (any pollution).

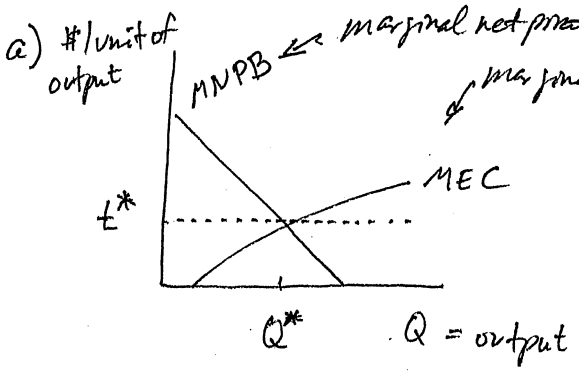
b)



If the environment can assimilate some pollution, then more pollution should be permitted, because Nature will (costlessly) clean it up.

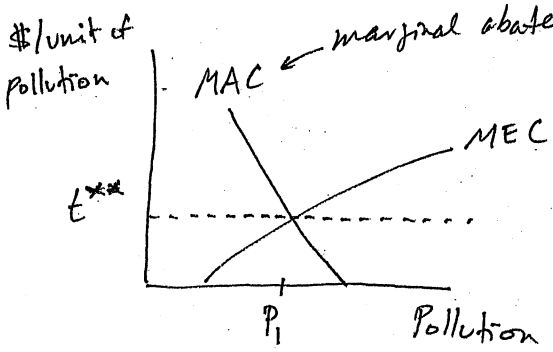
In the graph, MEC_1 and MEC_2 only differ in that MEC_2 has a positive environmental assimilative capacity of A, while MEC_1 has no environmental assimilative capacity. The amount of output Q which is socially optimal to produce is greater with MEC_2 (see point C) than with MEC_1 (see point B).

(2)

a) 

t^* is the optimal tax on output

t^* induces firms to set $Q = Q^*$.

b) 

t^{**} is the optimal tax on pollution

t^{**} induces firms to set pollution = P_1

c) If abatement is impossible, so that there is a rigid, one-to-one relationship between output and pollution, then the two approaches give the same result. Otherwise, it's better to model a tax on pollution, not a tax on output, since it's pollution that generates the MEC; output per se doesn't generate external costs.

On the other hand, if pollution is hard to measure and output is easy to measure, it might make sense to measure output instead of pollution.

(3) Under the permit scheme, if both firms are given S_2 permits each (for free), then Firm 3 will sell $ZX = YZ$ permits to Firm 1. Social abatement costs will be $0XS_1 + 0YS_3$. Firm 1's abatement costs are $0XS_1$ and its costs of buying permits is ZXS_1S_2. Firm 3's abatement costs are $0YS_3$ and its revenues from selling permits are YZS_2S_3.

Under a tax of P^*, abatement costs are $0XS_1$ for Firm 1 and $0YS_3$ for Firm 3. Tax payments are the rectangle under P^*Y for Firm 3 and the rectangle under P^*X for Firm 1.

Let TC be total costs without pollution controls. TR is total revenue. Then:

	Permit		Tax
Social Abatement Costs	$0XS_1 + 0YS_3$	$=$	$0XS_1 + 0YS_3$
π_1	$TR - TC - 0XS_1 - ZXS_1S_2$	$>?$	$TR - TC$ – area under $P^*Y - 0XS_1$
π_2	$TR - TC - 0YS_3 + YZS_2S_3$	$>$	$TR - TC$ – area under $P^*X - 0YS_3$

The sign for π_1 is not certain. In my graph, π_1 is higher with permits.
The sign for π_2 is certain if $TR - TC$ is the same under permits and taxes.

Optimal:

With permits, $\pi = TR(Q) - TC(Q) - P^*(\text{pollution} - S_2) - \text{Abatement}(\text{pollution})$

With taxes, $\pi = TR(Q) - TC(Q) - t^*(\text{pollution}) - \text{Abatement}(\text{pollution})$.

Since $\partial\pi/\partial Q$ is the same for these two cases, $TR - TC$ will be the same for these two cases.

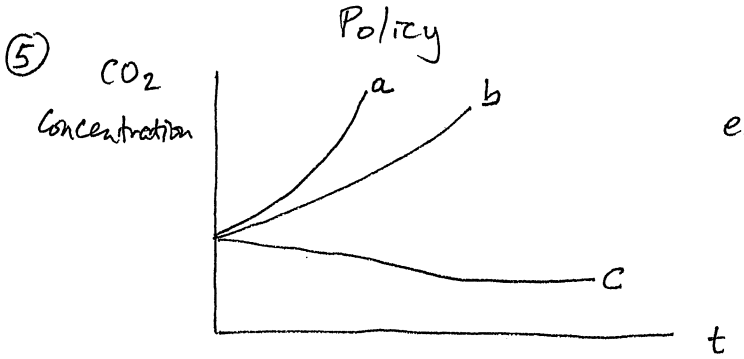
(4)

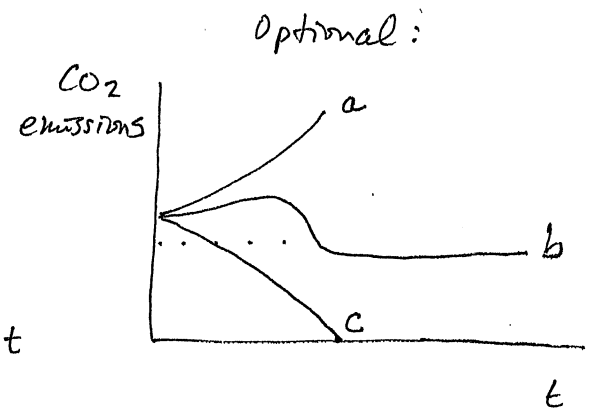
One could use the Hedonic Pricing Method to estimate how much lower house prices are under the current flight path compared to the price of roughly the same house not under the current flight path. This involves estimating a relationship like

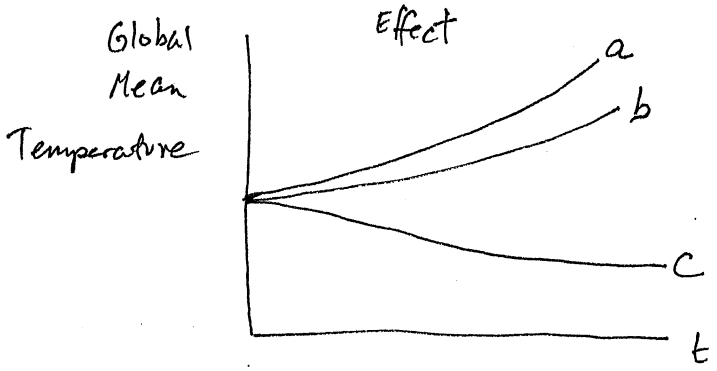
House Price = f (property variables, neighborhood variables, accessibility variables, environmental variables including overhead flight noise).

Then apply this formula to houses under the proposed new flight path, assuming the flights occur there, and calculate how much this reduces the total value of real estate under the proposed flight path.

⑤







a) emissions rise, concentration rises, temperature rises most rapidly

b) emissions level off, " " forever but more slowly than in (a),
temperature rises forever but more slowly than in (a)

c) emissions go to zero, concentration and temperature eventually return to pre-industrial levels

(6)

a) The consequentialists would argue for environmental protection because of the good consequences that would have for humans and animals. The nonconsequentialists would argue for environmental protection because the environment has a right to be protected, irrespective of the consequences of that protection.

b) The consequentialists would argue the environment does not have to be protected (much) because pollution doesn't affect people adversely (much). The nonconsequentialists would argue no one has the right to interfere with the actions of polluters, regardless of the consequences those actions might have.