Economics 5250/6250 Dr. Lozada
Fall 2015 Midterm Exam

This exam has 33 points. There are six questions on the exam; you should work all of them. Half the questions are worth 5 points each and the other half are worth 6 points each.

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. 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.

The figures for this exam appear on the pages numbered 2 and 3. For questions involving figures, you may either draw on the original figures, then remove them from the exam and include them with your answers; or you may redraw the figures on your answer sheet. If you choose the first option, write your first name on each page (to prevent confusion if the page gets separated from the rest of your exam).

Answer all of the following six questions.
(The questions continue on page 4).

1. **[6 points]** Find the socially optimal level of a polluting output Q for each of the diagrams shown in Figure 1, and explain your answers. In one of the diagrams, it is not possible to determine the optimal Q unambiguously; in that case, narrow down the location of the optimal Q as much as possible.

2. **[5 points]** In a graph with the amount of a polluting output Q on the horizontal axis and "dollars per unit of output" on the vertical axis, draw typical "marginal external cost" and "marginal net private benefit" curves, then show which level of a pollution tax would give rise to the socially optimal level of Q. Explain carefully.

3. **[6 points]**

   (a) In Figure 2a, explain why "D" shows the demand for pollution permits by pollution victims if they are allowed to buy pollution permits in a cap-and-trade ("marketable permit") system.

   (b) In Figure 2b, show:

      i. the socially optimal amount of pollution; and

      ii. the price of pollution permits if a cap-and-trade ("marketable permit") system is established for the socially-optimal amount of pollution, and pollution victims are not allowed to buy permits.

      iii. Now suppose pollution victims are allowed to buy permits. Explain why, with the price of permits as in part (ii), pollution victims actually will not buy any permits (that is, the amount of pollution will not be reduced from that given in part (i)). It may help to indicate on the horizontal axis of your graph each unit of pollution which is produced, and contrast that indication with the units discussed in part (a).

4. **[5 points]** Briefly define and contrast:

   (a) use value (consumptive and non-consumptive);

   (b) option value;

   (c) existence value;

   (d) bequest value; and

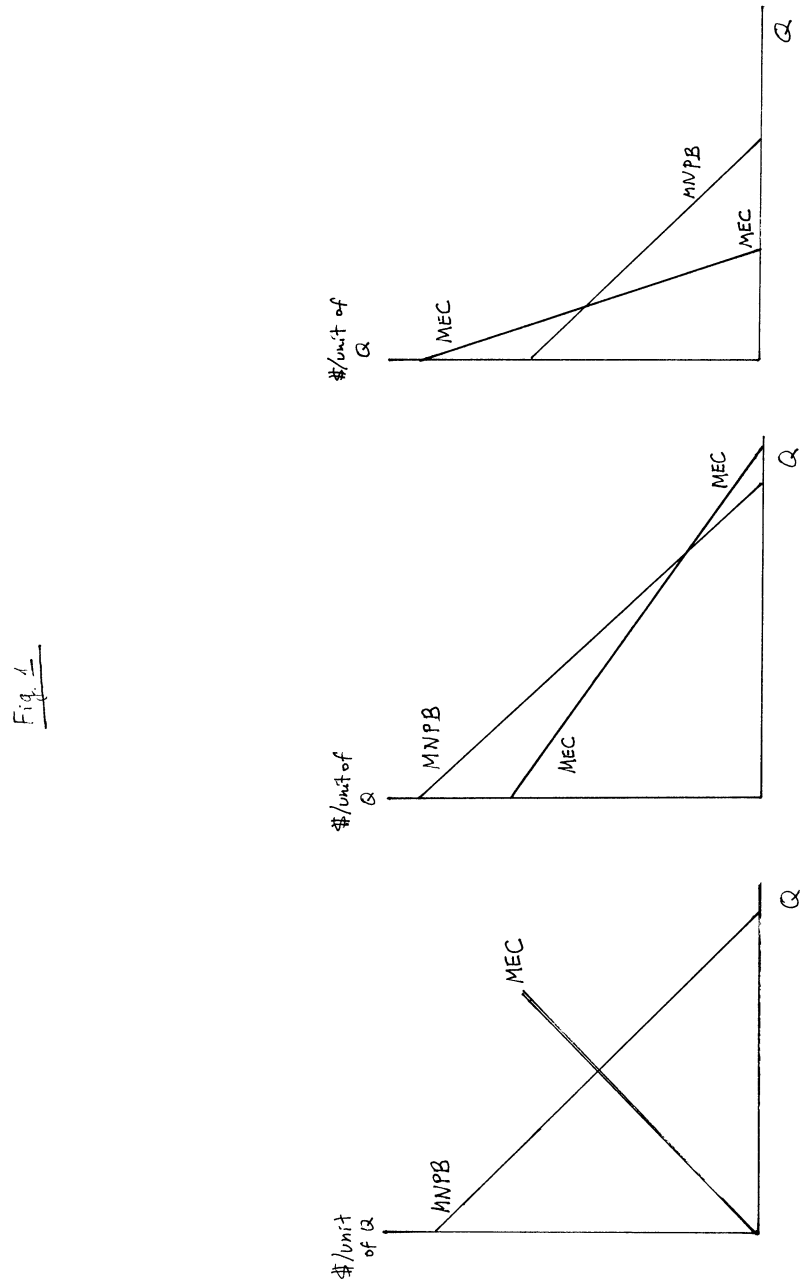


Figure 1

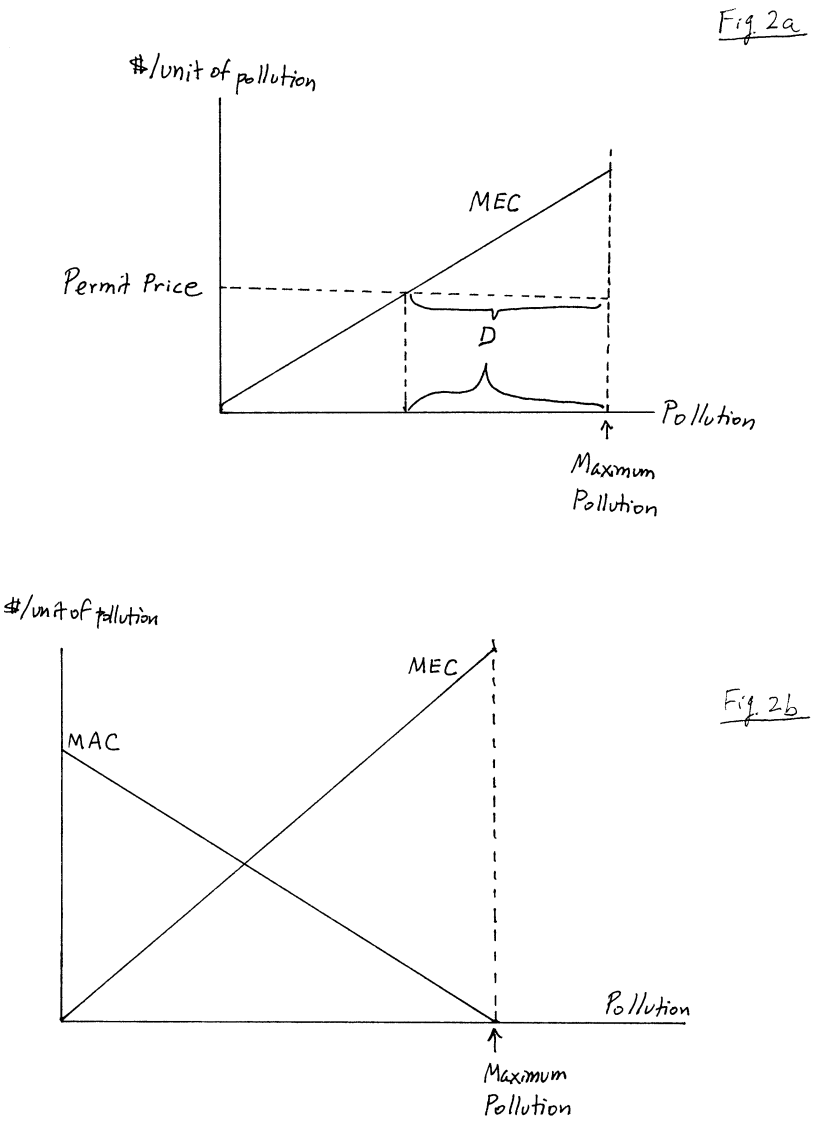


Fig 2a
$/unit of pollution
MEC
Permit Price
D
Pollution
Maximum Pollution
$/unit of pollution
MEC
MAC
Fig. 2b
Pollution
Maximum Pollution

Figure 2

(e) quasi-option value.

5. **[6 points]** Suppose one is conducting a "travel cost" study to determine the external cost ("EC") of air pollution in the Salt Lake Valley during wintertime inversions by studying how many Salt Lake Valley residents travel to Park City during inversions. Suppose one observed that very few poor residents of the Valley make such a trip.

   (a) Give an explanation of this observation using "opportunity cost."

   (b) From the perspective of standard neoclassical economics, will this observation distort the measurement of EC? Why or why not?

   (c) From the perspective of egalitarian social justice, will this observation distort the measurement of EC? Why or why not?

6. **[5 points]** Define "tipping point" and give an example pertaining to global climate change.

Answers to Econ. 5250 Exam 1, Fall 2015

(1) If [MNPB of an extra unit of output > MEC of an extra unit of output] then society wants 1 more unit of output

" < " " society wants 1 less unit of output

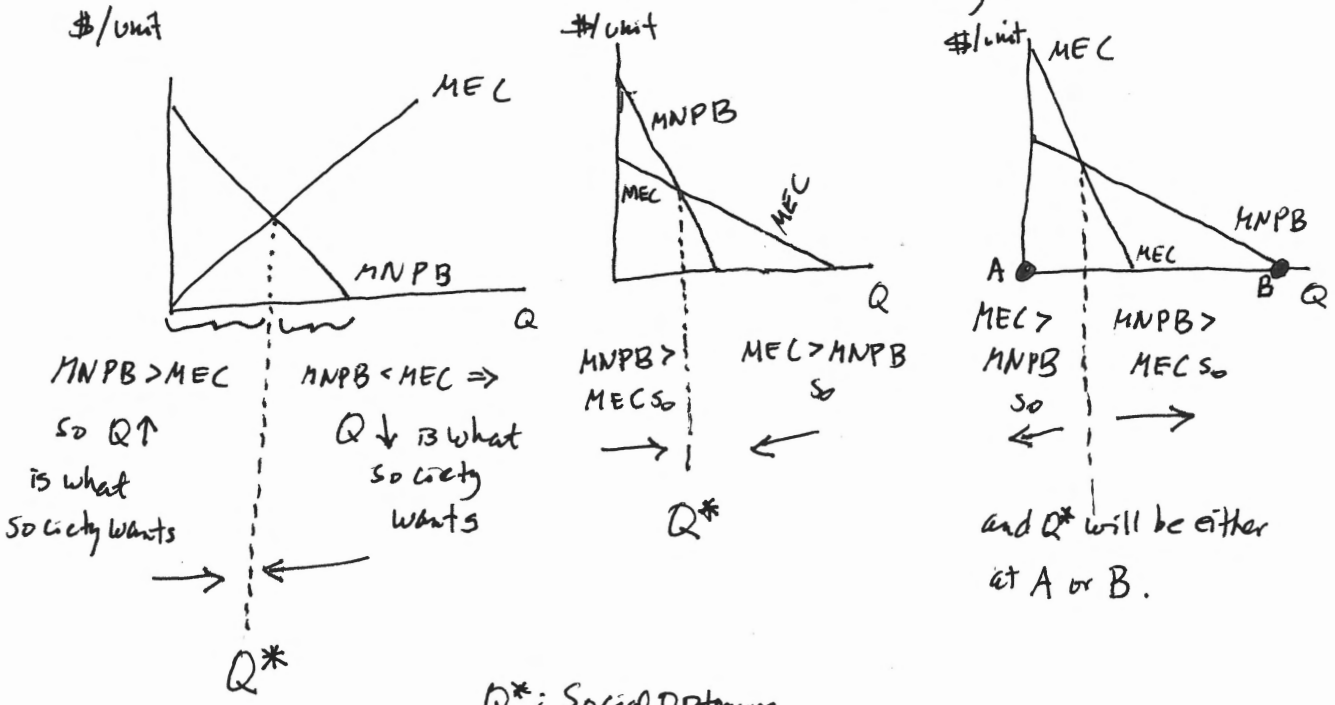
" = " " society wants no change in output at the margin (Sometimes, Society does want non-marginal changes)

MNPB: marginal net private benefit

MEC: marginal external cost

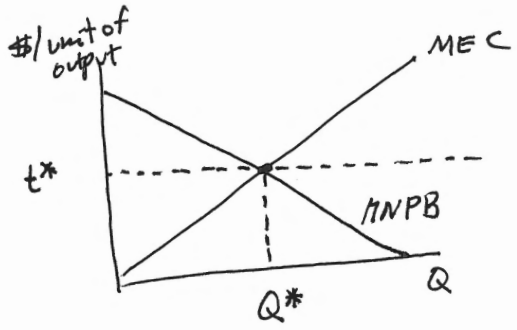
MNPB − MEC: marginal net social benefit (if this is positive, making 1 more unit of output will increase social benefit)

MNPB − MEC > 0 ⇔ MNPB > MEC



Q*: Social Optimum

(2)



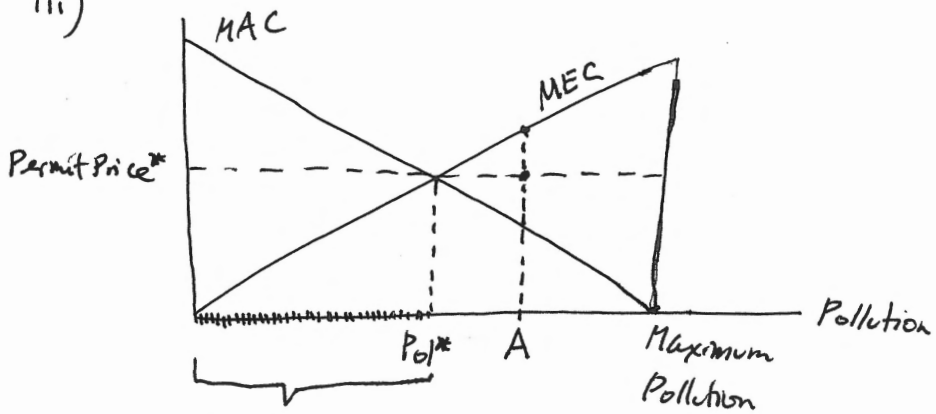
Q^* is the socially optimal level of output because to its left, MNPB > MEC, so society would want ↑Q, while to its right, MEC > MNPB, so society would want ↓Q.

If MNPB > tax rate, the firm wants to ↑Q because its after-tax marginal net private benefit is MNPB − tax rate > 0. If MNPB < tax rate, the firm likewise wants Q↓. So a taxed firm will produce where MNPB = tax rate.

So at a tax rate of t^*, MNPB = tax rate at Q^*.

With this permit supply and permit demand, equilibrium price is at p^*.

iii)

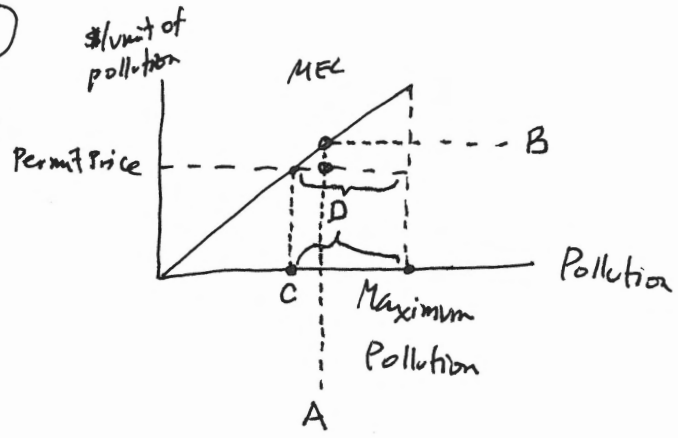


Pollution units being produced under the part (ii) cap-and-trade system.

At this permit price, victims would be willing to buy permits to eliminate units such as A, which have MEC > permit price. But these units are not being produced by the polluters any way. The only pollution units which the polluters are still producing have MEC < permit price, so they aren't worthwhile for the victims to pay the permit price to eliminate.

(3)

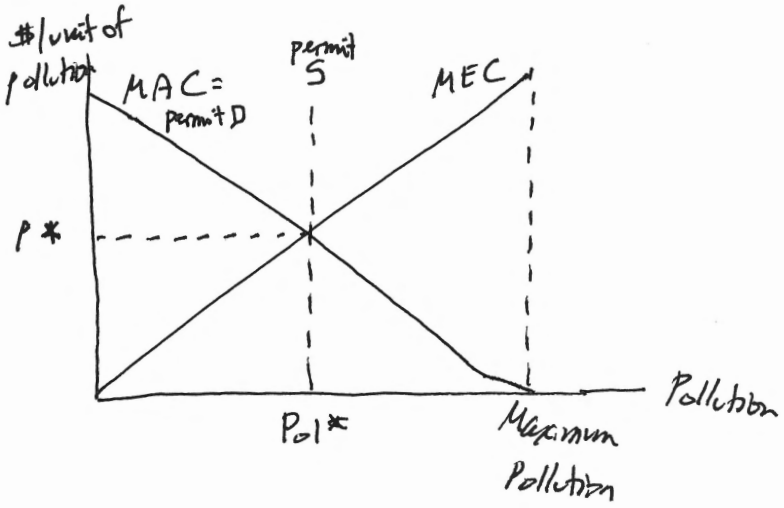
a)



Consider pollution level A. It causes damage (MEC, marginal external cost) of B. Victims can pay "permit price" to stop A from being produced. Since B > permit price, victims are willing and able to buy the permit to stop A from being produced. This is true for all pollution units to the right of C.

To the left of C, Permit Price > MEC, so victims won't buy these permits.

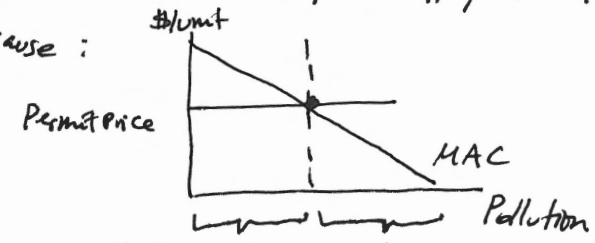
b)



MAC: marginal abatement cost

i) Pol* is socially optimal: to its left, pollution control costs MAC exceed pollution control benefits MEC; to its right, pollution control has larger benefits (MEC) than costs (MAC).

ii) In a cap-and-trade system, the government sets permit supply at Pol*. Permit demand is MAC because:



Here the firm wants to buy the permits since they are cheaper than abating

Here the firm does not want to buy the permits because they cost more than abating would

(4)

a) Value from either using up the resource ("consumptive") or being in its presence or enjoying it from afar ("nonconsumptive").

b) Value of the option to have use value in the future.

c) Value of knowing that the resource exists.

d) Value of giving the resource to other persons, or ensuring that other persons have the resource to enjoy and use.

e) Value coming from the possibility (not the certainty) that the resource will have some other type of value in the future.

(5) a) Poor people may have little "ability to pay" for clean air. If they live "paycheck to paycheck," they may suffer large financial losses (say, not have enough food to eat) if they take a day off of work to escape an inversion. Those losses are the opportunity costs of the trip to Park City. Another cost is the transportation cost, which a poor person might have trouble paying. *

b) No: the value of escaping an inversion is based on the "effective demand" for such escapes, and effective demand depends on income.

c) Yes: poor people may pschologically wish to escape inversions as much or more than rich people, but the cost of air pollution to them will not be counted much using the travel cost method, because they usually don't make the trip to Park City for the low-income-related reasons given in (a). This not counting of poor people is not egalitarian.

* Note that the opportunity cost of a poor person is probably much less than the opportunity cost of a rich person in absolute dollar terms – for instance, a poor person's daily wage is less than a rich person's (or at least some rich people's). But relative to, say, the poverty line, the subjective value of one day's wage can be higher for a poor person.

(6)

A "tipping point," or "point of no return," refers to pushing a system so far from its previous conditions that a self-perpetuating process starts which pushes it even further from its previous conditions.

Example: global warming → melting permafrost in the Arctic → methane emissions, a "vicious cycle" that, beyond a tipping point, will be impossible to stop. (Note that a tipping point may not be associated with a "vicious cycle," also known as a "positive feedback loop.")

Example: global warming → melting of ice in the Arctic → less sunlight reflected back into space because there's less ice (ice is very reflective) → more heat absorbed by earth

Example: global warming → melting of ice in Greenland → North Atlantic becomes less saline near its surface → Gulf Stream may cease to flow ↓ Europe becomes much colder