

Economics 5250/6250
Fall 2014

Dr. Lozada
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.

Answer all of the following questions.

1. **[5 points]** Define the “Theory of the Second Best” and give an example of its application.
2. **[5 points]**
 - (a) Explain the Coase Theorem using a diagram with “marginal external cost” and “marginal net private benefit.” Assume the polluter has the property rights.
 - (b) How might this explanation fail if, instead of the polluter and the pollution victim negotiating just once, they may do so repeatedly?
3. **[5 points]** Suppose the government uses a subsidy to regulate pollution. Show on a diagram the loss in social welfare if this government is fooled into thinking that “marginal external cost” is smaller than it actually is.
4. **[5 points]**
 - (a) This question concerns Figure 1. Suppose a consumer is initially at point A, enjoying E_1 units of an environmental good. The government contemplates moving the environmental good up to E_2 . What value does this consumer place on this increase in environmental good? Answer this in terms of willingness to pay, willingness to accept, compensating variation, and equivalent variation. Draw your answers on the graph, and explain your reasoning.
 - (b) This question concerns Figure 1. Suppose a consumer is initially at point B, enjoying E_2 units of an environmental good. The government contemplates moving the environmental good down to E_1 . What value does this consumer place on this decrease in environmental good? Answer this in terms of willingness to pay, willingness to accept, compensating variation, and equivalent variation. Draw your answers on the graph, and explain your reasoning.

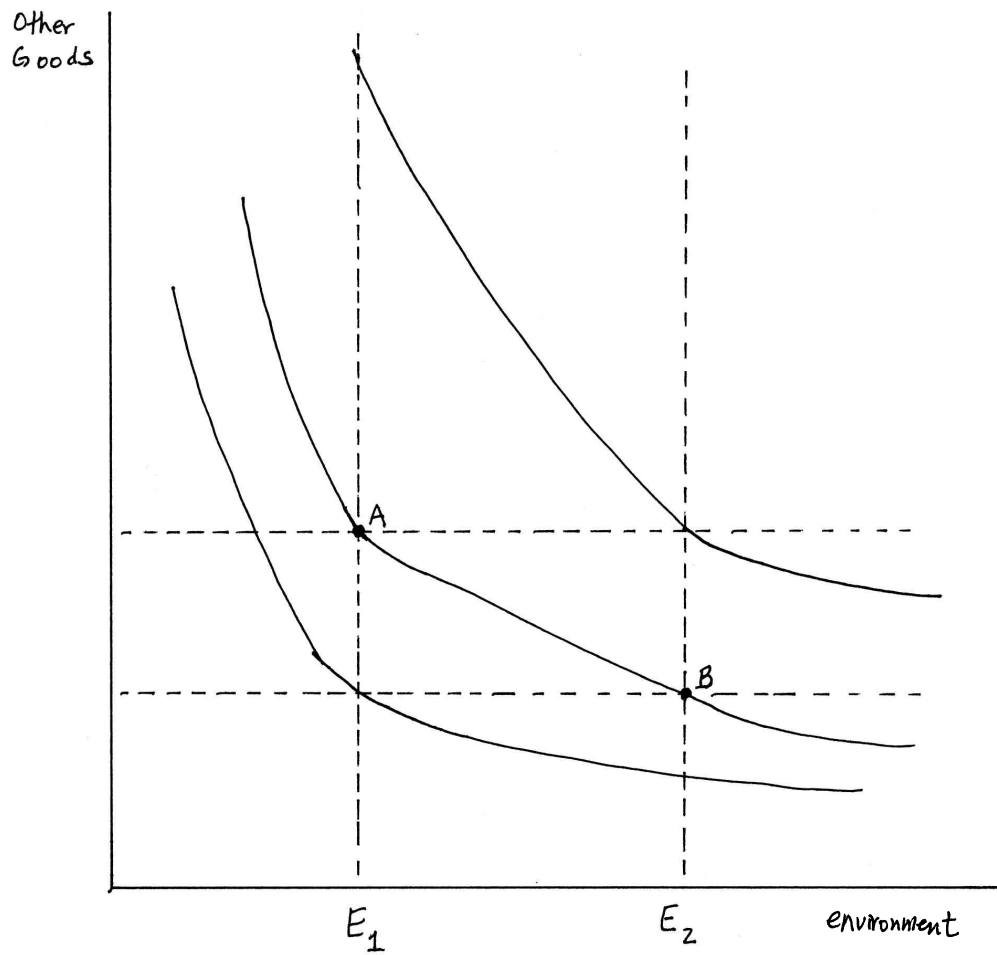


Figure 1

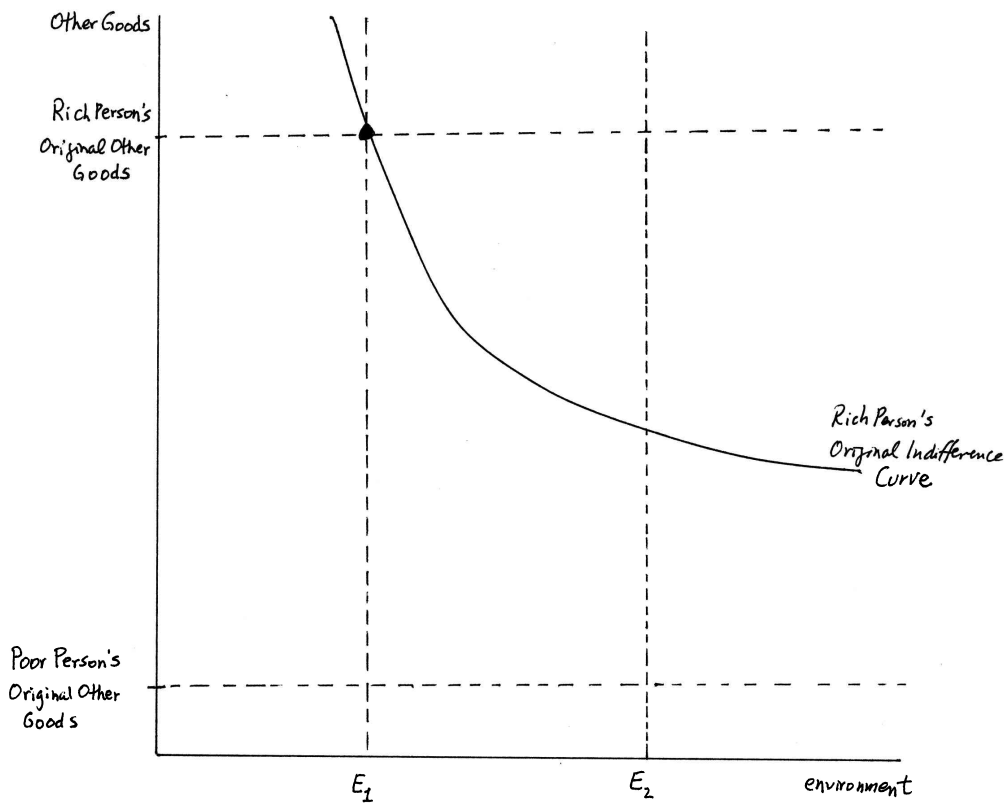


Figure 2

- (c) This question concerns Figure 2, which has nothing to do with Figure 1. This figure describes two people in the economy, one rich and one poor. Both consume the same amount of the environmental good E . The government contemplates moving the environmental good from E_1 up to E_2 .
- i. What value does the rich consumer place on this increase in environmental good in terms of willingness to pay? Draw your answer on the graph, and explain your reasoning.
 - ii. What value does the poor consumer place on this increase in environmental good in terms of willingness to pay? Draw your answer on the graph, and explain your reasoning.



Figure 3

iii. What do your answers reveal about the role that consumers' incomes play in willingness-to-pay valuation?

5. **[5 points]** Define “contingent valuation” and describe one advantage it has over other valuation methods.

6. **[5 points]**

- (a) This question concerns Figure 3, but not its main point (which is how very many political advertisements appear on U.S. television before elections). Instead, I want you to explain the connection between the man spraying something and the woman saying something about “another hole in the ozone.” What is she talking about? [The comic strip is *Non Sequitur* from 10/24/2014.]
- (b) This question concerns Figure 4. What does it have to do with a discussion we had in class? [The comic strip is *Non Sequitur* from 11/07/2014.]



Figure 4

Answers to Midterm Exam, Econ. 5250/6250

Fall 2014

- ① The Theory of the Second Best says that if there are N market imperfections with $N > 1$, then removing fewer than N of the imperfections might decrease social welfare.

An example given in class was removing Mexico's tariffs on U.S. corn imports. If the tariffs had been the only market imperfection, removing them would increase social welfare (in the sense that the "winners" could fully compensate the "losers" and still be better off). However, U.S. corn farmers' costs are artificially low because they do not pay for the external pollution costs (from fertilizers and pesticides). Eliminating the tariff threw organic, peasant corn farmers in Mexico out of business, while increasing U.S. corn output. This may be welfare-reducing overall: elimination of the tariff by itself would increase welfare, but it causes a welfare-reducing increase in pollution, and it's unclear which effect is stronger.

Another example is a polluting monopolist. The monopoly market imperfection causes output to be too small. The polluting market imperfection causes

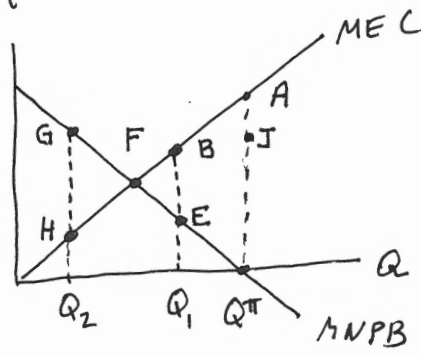
output to be too large. Together, the two imperfections partially cancel each other out, resulting in output being possibly quite close to the socially optimal output. Removing both imperfections is welfare-improving, but if that's not possible, the "second-best" policy of removing just one of the imperfections might be welfare-reducing.

(2)

a)

\$/unit

Marginal External Cost: MEC
Marginal Net Private Benefit: MNPB
Output: Q



Initially, the polluter goes to Q^π since the pollution victim has no property rights. However, the victim is willing and able to pay A for a marginal reduction in output, while the firm is willing to accept

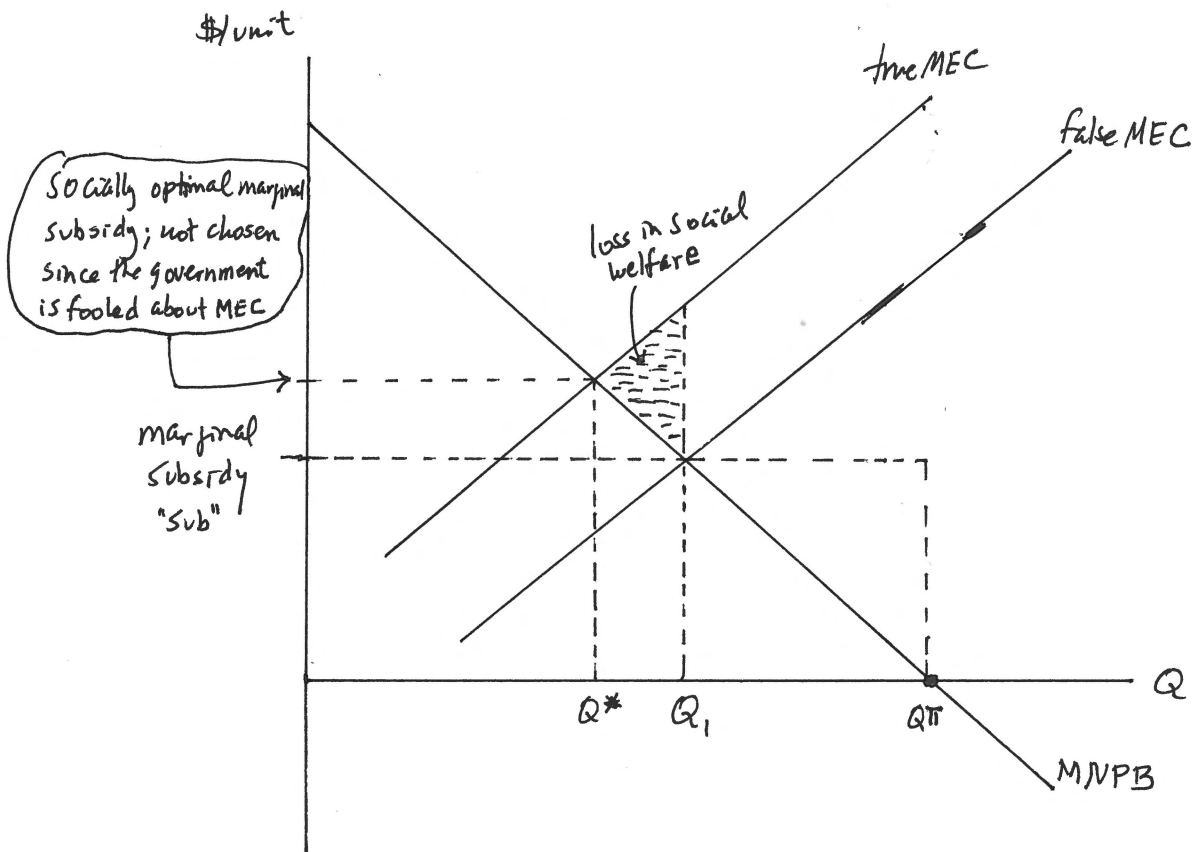
zero to reduce output marginally. So a bargain will be struck at a price between D and A (the victim pays the price to the polluter, who then decreases output from Q^π). Since $B > E$, the victim will also want to pay between E and B to get the firm to reduce output from Q_1 , which the firm will accept.

(The victim is willing to pay up to B ; the firm will accept anything above E .)

The process stops at F . To reduce from Q_2 , the firm would require at least G , while victims would be willing and able to pay up to H : there is no common ground.

b) Suppose at $Q = Q^\pi$, the firm offers to marginally reduce output if the victim pays J . Since $J < A =$ victim's willingness and ability to pay, part (a) assumed the victim would accept the offer. However, the victim now may want to establish a reputation for being "tough," so as to do better in future negotiations; and this may lead him to reject the offer of J .

3



Subsidy: each unit of Q less than Q^π receives "sub" units of subsidy.

Government: sets "sub" where $MEC = MNPB$. This subsidy is too small, so output will be too big.

Firm: if a unit has $MNPB < sub$, it's better not to produce the unit (losing $MNPB$) and getting the subsidy (gaining "sub"). Otherwise, it's better to produce the unit. So the firm will go to Q_1 .

The socially-optimal output level is Q^* ; if $Q > Q^*$, the units beyond Q^* have $MEC > MNPB$ so are socially undesirable. In the situation of the diagram, $Q > Q^*$ is being produced, generating $MEC - MNPB$ social losses between Q^* and Q_1 , which is the shaded area.

④ See the diagram on the next page.

a) WTP is CB : if he goes from A to C, he can pay CB and still be no worse off than he was at A.

willingness to pay

WTA is AD : if he had gone to C, he'd enjoy utility U_5 , so if you don't let him go to C, he requires AD of other goods to get him to U_5 .

willingness to accept

Compensating Variation : if we do this (go from E_1 to E_2) (which is a gain), how much would the agent be WTP? So

"CV"

Equivalent Variation : if we don't go from E_1 to E_2 , what is the agent WTA in return? So $EV = WTA$.

"EV"

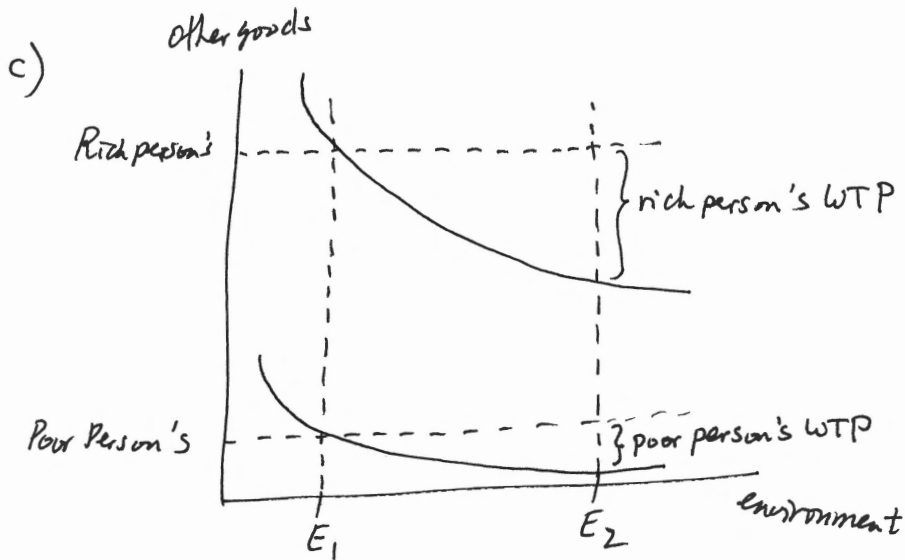
$CV = WTP$.

b) WTP is BG in order to avoid moving from B to F. This is what the agent would be WTP if the government did not do "this" ("this" = move from E_2 to E_1), so it is EV.

WTA is AF, which gets the agent back to U_4 after the fall in E moved him from B to F. This "if we do this" (move from E_2 to E_1) is a CV issue.

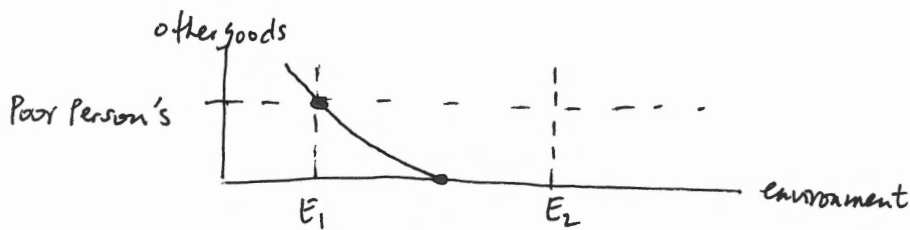
Optional: CV is the only welfare measure which is the same in (a) and (b).





WTP is the amount of other goods the person is willing and able to give up in order to go from E_1 to E_2 . The rich person's WTP $>$ the poor person's WTP, if only because the poor person has so few "other goods" they can give up. This highlights the role of income distribution in WTP valuations.

If the poor person's indifference curve looked like



then the person who's poor has no ability to pay enough "other goods" to make him as well off at E_2 as he is at E_1 . His "WTP" is thus undefined. (It is not zero.) "WTP" means "willingness and ability to pay," not just "willingness to pay."

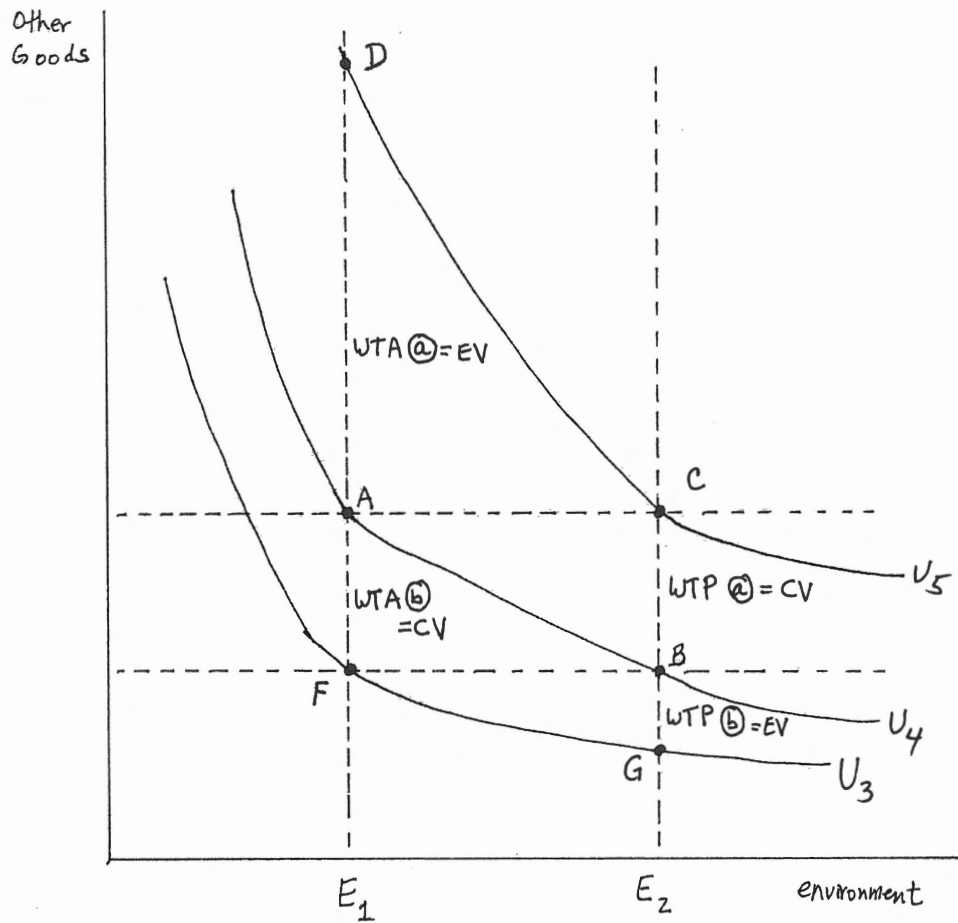


Figure 1

Same: $CV = WTP$
if we do this

$U_3 < U_4 < U_5$
(The subscripts 3, 4, and 5 are arbitrary.)

⑤ Contingent Valuation tries to value non-marketed goods by asking people their willingness to pay or willingness to accept for policies changing the amount of such goods. Example: "How much are you willing to pay to save the whales?"

One advantage it has is that it can concern any policy question, including very hypothetical ones. Other methods rely on revealed preferences, but in order for preferences to be revealed, the situation must be real, not hypothetical.

⑥ a) CFC's, chemicals which cause thinning of the Earth's ozone layer, were important propellants in spray cans. In those days, operating a spray can released CFC's, thus adversely affecting the ozone layer. (CFC's do not literally "burn a hole" in the ozone layer.) The "hole" in the ozone layer refers to the worrying thinness of the ozone layer in the Arctic and Antarctic.

b) Global Warming is "just a theory," but so are basic building blocks of science such as gravity.* Saying "global warming is a theory" does not mean it is dubious nor that it should be ignored or thought unimportant.

* Indeed most scientific ideas are called theories because they could in principle be refuted by future empirical evidence, even if no one expects that to happen (such as for the germ theory of disease), or if no one expects a replacement theory to differ much in ordinary circumstances (such as for the theory of gravity).