

Answer all 8 questions. Efficiently allocate your four hours. Take some time to think and plan before you write out your answers. Clarity, exposition, etc. are all important.

Thanks.

Have a very enjoyable summer.

Some of my thoughts are attached.

1. (20 points) What is the travel-cost method for valuing site-specific recreational activities? Explain what it is and how it can be used to value recreational sites. Your audience is the PhD students in our department who have just finished the first year with grades of B+ or better in the micro theory courses.

Make sure your answer includes a detailed explanation of how one can derive estimated of the compensating and equivalent variation associated with changes in the prices and/or characteristics of the sites. I need more than “one uses the data to estimate the demand function and then uses the estimated demand function to derive an estimate of consumer’s surplus.

2. (20 points) Assume Boulder has three factories that emit a total of 100 tons of particulates into Boulder air everyday. Further assume that the EPA has decided that total emissions should be reduced to 70 tons. Is it efficient to achieve this level by requiring each factory to reduce their emissions by ten tons? Explain why or why not. If equal reductions are not efficient, what is the efficient way to achieve the 30 unit reduction? As part of your answer, define, in words, efficiency in this context, and mathematically derive the condition for efficiency.

Your answer has been most likely based on the implicit assumptions that

$\partial C_i(A_i) / \partial A_i > 0$ and that $\partial^2 C_i(A_i) / \partial A_i^2 > 0$ for all i , where $C_i = C_i(A_i)$ is the cost of abatement function for firm i , and A_i is the amount abated by firm i . How would your answer differ if one maintained the implicit assumption that the first derivative was always positive, but dropped the assumption that the second derivative is always positive. To answer this second part it is acceptable to assume two rather than three firms. A graph might help.

3. (5 points) Does efficiency dictate that different regions have different ambient air quality standards? Yes or no and explain.

The efficient level of ambient air quality will vary likely vary from place because the marginal cost and marginal benefit functions for increasing ambient air quality will likely vary from place to place. It is highly unlikely that they would cross at the same level in each region.

Reasons why marginal benefit function can vary from region to region: different preferences, different income levels, different numbers of people.

Reasons why the marginal cost function can vary from region to region, assimilative capacity of the regions differ, differ number and types of emitters, locations of emitters differ by regions. Note that the state of technical knowledge is likely to be the same in all regions

4. (5 points) Argue that in the case of nonpoint agricultural water pollution (runoff, not stuff that comes out of pipes) it might make more sense to tax one or more of the agricultural inputs than to tax the emissions directly. Does your argument contradict what we learned in the first section of the course?

As you both pointed out, if there is a one-to-one relationship between the quantity used of an input and the level of emissions efficiency can be achieved by either taxing the emissions or that output.

If there is not such a one-to-one relationship between an input and emissions, and if the tax collector can costly measure emissions, then taxing the input would not lead to efficiency. However, in the real world, it is very difficult (costly) to measure the quantity of nonpoint pollution by source. In such cases, when one account for the cost of monitoring, taxing an input or inputs can be efficient.

5. (5 pts) Do individuals have well-defined preferences? Discuss the implications of a no answer for the calculation of compensating and equivalent variations.

Compensating and Equivalent variations are money measure of utility changes. If one does not have well-defined preferences, those preferences can not be characterized with a utility function, and money measure of utility changes don't exist. One is trying to measure something that does not exist.

6. (5 pts) What is the difference between a market commodity and a nonmarket commodity? As part of your answer define both terms.

Market commodities are those commodities that can be bought and sold in the marketplace. From the consumer's perspective, price is exogenous and quantity is endogenous.

In contrast, nonmarket commodities are commodities that are not bought and sold in the market place. They are available in levels determined exogenously from the consumer's perspective. The consumer experiences the levels provided/available. The value (total and marginal) a consumer gets from these levels is endogenously determined by his preferences and his other constraints. In this sense, "price" (marginal value) is endogenous and quantity is exogenous.

7. (15 points) Define (both in words and in terms of vectors of exogenous variables) an

individual's CV for the change in the quantity of an environmental amenity. From your definition, derive an expression for this CV in terms of the

- a. expenditure function
- and
- b. the indirect utility function

See notes on the derivation of the CV and EV. Did you show how the expressions for the CV in terms of the indirect utility function and the expenditure function are derived from the basic definition.

8. (25 points)
 - a. Define what is meant by the term "market failure" (Don't define market failure by example)
 - b. Now define one specific type of market failure that plagues the environmental sector of the economy. (Your definition of a specific type of market failure should also be example free)
 - c. Explain, as if to another individual in this class, the impact this specific type of market failure will have on the allocation of resources.
 - d. Now give an example of this type of market failure in the /environmental sector.
 - e. Now discuss two ways the government might correct your example of market failure. (Your discussion of corrections should consider their distributional implications and their political feasibility.)

Did the two policies that you suggested account for the stylized facts of your example. For example, with nonpoint source pollution, it would be very costly to monitor emissions by source.