Economics 431
Public Economics

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Final Exam
Spring 2004

Instructions

1. Write your SU ID NUMBER on your blue book. Please do NOT write your name.
2. Do not open this exam until you are told to do so.
3. Please turn off the ringer on your phone right now – before the exam begins.
4. Write on both sides of the bluebook pages.
5. SHOW ALL YOUR WORK. Numerical answers without supporting work will receive little or no credit.
6. Label all graphs, axes, curves, lines, points, etc., carefully.
7. Use economic reasoning.
8. Partial credit will be awarded for incomplete answers.
9. You have 120 minutes to work on the exam. There are 60 points possible; please budget your time accordingly.
10. Calculators may be used but may NOT be shared.
11. You may NOT use any of the following devices or technologies: cell phones, computers, personal digital assistants, or text messaging. Use of such devices or technologies on the exam will result in a failing grade.
12. This is a closed-book exam: you may NOT use any books or notes.
13. Please do your own work: collaboration of any kind on the exam is not allowed. Cheating will result, at a *minimum*, in a failing grade for the exam.

Part 1 (10 points)

(a) About 50 tons of mercury are emitted each year by coal-burning power plants in the US. Mercury is known to cause a range of serious health problems and it is widely agreed that emissions should be reduced. However, little is known about how much abatement will cost. If the damage from mercury were calculated to be $20 million per ton (and there were *no* threshold below which damages were sharply lower) what sort of policy would you recommend? Why? Please explain your reasoning in detail: you'll be graded on the quality of the explanation.

(b) Suppose the US Geological Survey has collected the information below about *discovered* deposits of a resource. It is also known that only 10% of the area where this resource might be found has been explored. The price of the resource is currently $27.

Grade of ore	A	B	C	D	E	F
MEC ($)	15	20	25	30	35	40
Quantity (tons)	2000	2500	2500	3000	4000	7000

Given this information, please calculate what the USGS would report as (1) proven reserves, (2) identified subeconomic reserves, (3) undiscovered economic reserves, and (4) undiscovered subeconomic reserves. (In other words, construct the four-cell USGS table for this data.) Be sure to explain how you calculated your numbers. Using this data, give examples of three specific events that would increase proven reserves by 100%.

Part 2 (20 points)

Suppose a city is attempting to reduce its levels of airborne particulates. Particulates are initially uncontrolled and 500 tons are being emitted. The emissions come from two sources. Source 1 emits 200 tons and can abate its emissions at a marginal cost given by MC1=30*Q1, where Q1 is the amount of abatement it does. Source 2's marginal abatement cost is MC2=60*Q2. The marginal benefits of abating particulates have been estimated to be MB = 4500 - 30*Q, where Q is the total amount of abatement.

(a) Determine the efficient level of abatement. How much should source 1 clean up? Source 2?

(b) Design a tradable permit policy that would achieve the efficient amount of abatement while spreading the overall cost equally between the two firms. How many permits would you distribute to each firm? What would the price of a permit be in equilibrium?

[exam continues on the next page]

Part 3 (15 points)

Suppose you've been asked to determine the recreational and scenic value a wilderness area in the Rockies. At the moment, no admission fee is charged. A researcher has interviewed a sample of the visitors and concluded that they come from 5 geographic zones. She has collected the following information, where "Travel Cost" is the round-trip transportation cost of visiting the area:

Zone	Travel Cost	Pop.	Initial Visitors
A	$10	6,250	1,000
B	$12	5,000	600
C	$14	25,000	2,000
D	$16	17,500	700
E	$18	46,250	0

(a) Using the travel cost method, calculate the number of people who would visit if an admission fee of $2 were imposed.

(b) It is also known that the total number of visits to the area (including people from all zones) is given by an equation of the form: P = A – B*Q, where P is the admission fee, Q is the number of visitors, and A and B are constants. Using this fact and the information above, calculate the value of the area.

(c) Is the value from part (b) likely to overstate or understate the true value of the wilderness? What technique could you use to determine the extent of over or understatement? Please explain in detail.

Part 4 (15 points)

Natural gas is usually obtained from wells drilled into underground reservoirs. However, a vast amount of gas exists in the form of frozen deposits called methane hydrates found in very deep water in the Gulf of Mexico and elsewhere. This problem explores the relationship between the two sources.

Suppose the quantity of gas in conventional underground deposits is 650 units and the marginal cost of extracting it is constant at $20 per unit. Extracting gas from methane hydrates is much more expensive, $150 per unit, but the supply is so large that you can assume it is unlimited. Finally, suppose that we're interested in allocating gas over 3 identical periods. The interest rate is 100 percent and each period has a demand curve given by Pi = 500 - 2*Qi.

(a) Find the efficient allocation of gas. What will the price, quantity, marginal social surplus and royalty be in each period? When will methane hydrates be used, if at all? Will the market reach the efficient allocation? Please explain.

(b) Now suppose that before any gas is actually extracted, a team of researchers announces a new technology for extracting gas from methane hydrates that lowers the cost to $80 per unit. Please calculate the new equilibrium and discuss how it compares to the one from part (a).