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Economics 437

The Maxwell School
Syracuse University

Exam 2

Spring 2012

VERSION P

Instructions

1. Write your **SU ID NUMBER** on your blue book and DO NOT write your name.

2. Write the **EXAM VERSION** from the box above on your blue book.

3. Do not open the exam until you are told to do so.

4. Please turn off the ringer on your phone right now – before the exam begins.

5. If you are wearing a baseball cap, please remove it or turn it backward.

6. SHOW ALL YOUR WORK. Numerical answers without supporting work will receive little or no credit.

7. You have 120 minutes to work on the exam. There are 60 points possible (6 questions with 10 points each); please budget your time accordingly. Also note that many of the questions have (a), (b), etc., inserted into the text to help you avoid overlooking part of the answer.

8. YOU MAY NOT USE YOUR PHONE. *Any use of phones or other wireless devices during the exam will be presumed to be collaboration and therefore cheating.*

9. Cheating of any kind will result in an F on the exam and referral of the case to the Dean's office for further sanctions.

10. Calculators *may not* be shared.

11. Some handy formulas:

$$PV = \frac{B}{(1+r)^t} \qquad PV = \frac{B}{r}$$

Question 1 (10 points)

The marginal benefits of abating a pollutant are given by MBA=1500–10*Q. Two sources of the pollutant were recently regulated. Just before regulation, each source was emitting 150 tons (300 tons total). At the time of regulation, the sources were believed to have abatement costs given by: MCA1=20*Q1 and MCA2=10*Q2. Using this information, the regulator set up a tradable permit system and gave each source exactly the number of permits it would need for its abatement to be efficient. After the system was in place, however, the MCA curves for both sources were discovered to be wrong. The true curves are MCA1=5*Q1 and MCA2=5*Q2.

Please calculate: (a) the efficient total quantity of abatement and the MCA if the original MCA curves had been correct; (b) the number of permits the regulator gave each firm; (c) the efficient total quantity of abatement given the true MCAs; (d) the deadweight loss, if any, under the permit system; (e) the equilibrium price of a permit under the actual MCAs; and (f) the value of any permit sales from one firm to the other.

Question 2 (10 points)

A government would like to determine the value of a wilderness area. No admission fee is charged and 21,000 people visit each year. They come from six geographic zones labeled A through F. The cost of a round trip to the site from each zone is shown in the table below, along with each zone's population and the number of people who visit.

Zone	Travel Cost	Population	Visitors
A	$5	2,000	1,400
B	$10	20,000	11,000
C	$15	12,500	5,000
D	$20	8,000	2,000
E	$25	16,000	1,600
F	$30	9,000	0

The public's willingness to pay for visits (including people from all zones) is known to be given by an equation of the form: W2P = A - B*Q, where Q is the number of visitors and A and B are constants.

In addition, it is also known that 40,000 people who do NOT visit the site value its existence and are each willing to pay $3 per year to keep it protected.

Please compute: (a) the number of people who would visit if a $5 admission fee were charged, (b) the values of A and B, (c) the amount of consumer surplus received by visitors each year, (d) the annual benefit received by people who don't visit, and (e) the present value of keeping the land in its current condition forever (starting from period 1) when the interest rate is 10%.

Question 3 (10 points)

A government agency is concerned about the level of arsenic in the drinking water of two groups of communities. Group A communities have 15 micrograms of arsenic per liter (µg/L) in their water and have a total population of 20 million. Group B communities have 25 µg/L and have a total population of 10 million. Arsenic causes lung and bladder cancer and the annual risk per person *per µg/L* is 0.4 in a million or $4x10^{-7}$.

The agency is considering two new standards. One standard (call it "20") would require communities to have no more than 20 µg/L. To bring group B arsenic levels down to 20 µg/L would cost $100 million per year. The other standard (call it "10") would require communities to have no more than 10 µg/L. To bring levels in A and B down to 10 µg/L would cost $800 million per year. The agency uses $6 million as the value of a statistical life. Please treat the policies as separate options: you do not need to consider whether they could both be done together.

Please calculate: (a) the expected number of cases of cancer per year without any change in policy; (b),(c) the expected number of fatalities prevented by each standard; (d),(e) the net benefits of each standard. Finally, (f) explain which standard, if any, should be adopted and why.

Question 4 (10 points)

Suppose a city that consists of two neighborhoods, "H" and "L", is considering a new wastewater treatment plant. You may treat the plant as a non-rival good that will serve both neighborhoods, and you may also assume that no one else lives in the city. The government must decide on the capacity of the facility, Q, and where it should be located. The marginal cost of a unit of capacity (before considering any externalities) is $400,000. However, the neighborhood selected for the plant will incur external costs (MCext) as well. The neighborhood *not* selected will have *no* external costs. The table below summarizes facts known about the two neighborhoods:

	H	**L**
Population	200,000	400,000
Individual MB	MBhi=10-(1/100)*Q	MBli=1-(1/1000)*Q
External Costs	MCext=200,000	MCext=80,000

Please determine: (a) where the plant should be located; (b) how large it should be and what will it cost (excluding externalities); (c) the net social surplus produced by the plant; and (d),(e) the gross benefits received by each neighborhood. Suppose the cost of building the plant is split between the neighborhoods based on their populations (1/3 for H, 2/3 for L). What is (f) the overall net benefit to neighborhood L? Finally, (h) what political problem would you expect to happen and how could that be avoided (be quantitative)?

Question 5 (10 points)

Consider the allocation of an exhaustible resource across three generations. The following information is available about demand and MEC in the three periods (today is generation 0):

Period	Demand	MEC
0	$W2P_0 = 600 – 2Q_0$	300
1	$W2P_1 = 1200 – 2Q_1$	300
2	$W2P_2 = 1800 – 2Q_2$	300

Initially, there are 1245 units of the resource available. The interest rate between generations is 100%.

Please calculate: (a) the equilibrium royalty, extraction cost, price and quantity that would occur in each period, and summarize your results in a table. Then suppose that a backstop is available at a marginal cost of $340. Please calculate: (b) the new equilibrium royalty, extraction cost, price and quantity in each period, summarizing your results in a second table. Finally, calculate (c) the total amount of the resource produced via the backstop.

Question 6 (10 points)

Suppose that a resource is to be allocated across two periods. The demand for the resource in period 0 is given by $W2P_0 = 1000 – 2*Q_0$ and the demand for the resource in period 1 is given by $W2P_1 = 2000 – 2*Q_1$. Initially, 1150 units of the resource are know to be available and can be extracted at MEC = $200 in either period. However, it is possible to find more of the resource via exploration. The cost of drilling an exploratory well is $360. In 90% of the wells, no new deposits will be found. However, in 10% of the wells, an average of 30 units will be found. The marginal cost of extracting any new units is the same as the existing deposits: $200. The interest rate is 100%.

Please calculate: (a) the marginal discovery cost; (b) minimum price that will induce exploration; (c) the market equilibrium price and quantity in each period without exploration (summarize in a table); (d) the equilibrium price and quantity in each period taking exploration into account (summarizing in a second table); (e) the amount of the resource that will be found via exploration; and (f) the expected number of wells that will be drilled.