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Economics 437

The Maxwell School
Syracuse University

Exam 3

Spring 2016

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 (5 questions with 12 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 OR TABLET. *Any use of phones, tablets 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 (12 points)

Suppose a pollutant was recently regulated using a hybrid policy. The marginal benefits of abating the pollutant were known to be given by the equation MBA = 1100 – 4*Qa. The marginal costs of abating it were believed at the time of regulation to be given by the equation MCAe = 500 + 2*Qa. Prior to regulation, 300 tons were being emitted. The regulator set up the hybrid policy with the following features: the initial quantity of permits distributed was equal to the efficient amount of pollution, and the price of waivers (additional permits) was set to the efficient MCA (that is, the tax rate that would be efficient). After the system was in place, however, the MCA curve was discovered to be wrong: the true curve is MCAa = 200 + 2*Qa.

Please calculate: (a) the efficient total quantity of abatement and the MCA if the original MCA curve had been correct; (b) the number of permits the regulator initially issued; (c) the efficient total quantity of abatement given the true MCA; (d) the actual quantity of abatement under the hybrid policy given the true MCA; (e) the equilibrium price of a permit given the true MCA; and (f) the number of waivers sold, if any; and (g) the deadweight loss, if any.

Question 2 (12 points)

A government is considering selling forested land to a mining company. However, using the land for mining would irreversibly destroy scenic and recreational benefits now provided by the forest. No admission fee is charged for use of the forest and 78,000 people currently visit from six geographic zones labeled A through F. Information about the zones and visitors is given in the table below.

Zone	Travel Cost	Population	Visitors
A	10	8,000	6,000
B	20	20,000	12,000
C	30	40,000	18,000
D	40	80,000	24,000
E	50	120,000	18,000
F	60	70,000	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: WTP = A - B*Q, where Q is the number of visitors and A and B are constants. The government also knows there are 20,000 people who do not visit the site but who value its existence and are each willing to pay $80 to keep it protected.

The government is evaluating the project over two periods: 0 (the present) and 1 (the future). The mining company is willing to pay $5 million for the land in period 0 or $4 million in period 1. The government is not certain about the value of the forest in period 1. It believes that the value to the visitors will be the same as period 0 but is uncertain about the value to the non-visitors. It believes there is a 40% chance it will be the same as in period 0 and a 60% chance it will be 3 times higher (60,000 people willing to pay $80 each). *The government uses an interest rate of **10%** between the two periods.*

Please compute: (a) the number of people who would visit the forest in period 0 if a $10 admission fee were charged, (b) the values of A and B, (c) the amount of consumer surplus received by visitors in period 0, (d) the total benefit produced by the forest in period 0 including the people who don't visit, (e) the expected net present value of keeping the land as a forest in period 0, and (f) indicate whether or not the government should sell the land to the mining company.

Question 3 (12 points)

A government is concerned about an air pollutant that has been shown to increase the death rate from heart disease in laboratory animals. Clinical studies on animals exposed to a dose that would be equivalent in a human to 1000 parts per billion (ppb) of the pollutant have an increased risk of death in each year of 1/200,000. The pollutant is currently present in two regions, A and B. Region A has a population of 100 million and the pollutant level is 80 ppb. Region B has a population of 50 million and its pollutant level is 70 ppb. The government is evaluating two possible air quality standards to deal with the problem. The first would reduce pollution levels in both regions to 60 ppb and would have a present value cost of $2.5 billion. The second would reduce A's pollution to 70 ppb but leave B's unchanged. It would have a present value cost $500 million. The government use a VSL of $8 million and an interest rate of 5% in PV calculations.

Please calculate: (a) the expected number of fatalities in each area in each year without any change in policy; (b) the expected number of fatalities per year prevented by each policy; (c) the NPV of each policy; and (d) indicate which policy, if any, the government should adopt. Finally, (e) how many expected deaths would be prevented? You may assume that each policy would permanently begin reducing deaths starting in year 1.

Question 4 (12 points)

A wildlife refuge is visited by 100,000 people per year and their use is non-rival. They come to see rare species of animals. Each person's marginal benefit is given by MBi = 50 – 3*Q, where Q is the number of species in the refuge. The marginal cost of protecting species is given by the equation MC = $1 million + $100,000*Q. The visitors pay no admission fee.

Please determine: (a) the number of species that should be protected; and (b) the annual net social surplus produced by the refuge.

Question 5 (12 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	$WTP_0 = 900 - 0.5*Q_0$	200
1	$WTP_1 = 1200 - 0.5*Q_1$	200
2	$WTP_2 = 1400 - 0.5*Q_2$	200

Initially, there are 5230 units of the resource available. *The interest rate between the generations is **50%**.*

Please calculate: (a) the equilibrium royalty, 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 $281. Please calculate: (b) the new equilibrium royalty, 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 and (d) indicate the period(s) when the backstop will be used.