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Economics 437

The Maxwell School
Syracuse University

Exam 2

Fall 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 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 (10 points) Hybrid Policy

The marginal benefits of abating a pollutant are given by MBA=1700–Q. Two sources of the pollutant were recently regulated. Just before regulation, each source was emitting 300 tons (600 tons total). At the time of regulation, the sources were believed to have abatement costs given by: MCA1=14*Q1 and MCA2=7*Q2. Using this information, the regulator set up a 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 curves for both sources were discovered to be wrong. The true curves are MCA1=15*Q1 and MCA2=15*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 initially issued; (c) the efficient total quantity of abatement given the true MCAs; (d) the actual quantity of abatement under the hybrid policy given the true MCAs; (e) the deadweight loss, if any.

Question 2 (10 points) Land Valuation

A government is considering selling a section of scenic coastline to a private developer. The area is currently used as a public beach and no admission fee is charged. The government is evaluating the decision over two periods: 0 and 1. Period 0 is the present, and it is known that 1,080,000 people visit the beach. 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	$20	120,000	120,000
B	$40	600,000	480,000
C	$60	400,000	240,000
D	$80	100,000	40,000
E	$100	1,000,000	200,000
F	$120	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: WTP = A - B*Q, where Q is the number of visitors and A and B are constants. The government also knows that in period 0 there are 500,000 people who do not visit the site but who value its existence and are each willing to pay $20 to keep it protected.

The government is not certain about the value of the beach in period 1. It believes there is a 75% chance it will be the same as period 0 and a 25% chance it will be twice the period 0 value. The developer has offered to pay $60 million for the land in either period. If the land is sold, the developer would immediately and irreversibly convert it to private use and the public benefits would drop to zero. The government uses an interest rate of 100% between the two periods.

Please compute: (a) the number of people who would visit in period 0 if a $20 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 beach in period 0 including the people who don't visit, (e) the expected net present value of keeping the land as a public beach, and (f) indicate whether or not the city should sell the land to the developer.

Question 3 (10 points) Risk Management

Radon is a naturally occurring colorless odorless radioactive gas. It is emitted by certain kinds of rock and can collect in homes. Long term exposure to radon increases the risk of lung cancer, especially in smokers. Radon exposure is measured in picoCuries per liter or pCi/L. It is known from studies on miners that people exposed to a lifetime average dose of 20 pCi/L have an increased annual risk of 48/100,000 of dying of lung cancer if they've never smoked and an increased annual risk of 340/100,000 if they're smokers.

Not everyone is exposed to radon and people who are usually receive lower doses. In this question, you may assume that 60 million people in the US are exposed to radon and their average dose is 5 pCi/L. Approximately 70% of the population has never smoked and 30% are smokers. The dose-response function is approximately linear.

The government is considering two policies. Policy A would cut everyone's exposure in half and would cost $90 billion per year. Policy B would focus on smokers alone and would cut their exposure in half. Because there are fewer smokers, Policy B would cost less: $27 billion per year. You may assume that the public is willing to pay $6 million per fatality avoided (the VSL is $6 million).

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

Question 4 (10 points) Public Goods

A park is visited by 1 million people per year and their use of the park is nonrival. They pay no admission fee and each person's enjoyment of Q square miles of park land is given by the equation MBi = 30 - Q. The marginal cost of providing Q square miles of park is given by the equation MC = 4M + 1M*Q where M indicates millions.

Please determine: (a) the quantity of park land that should be provided; and (b) the annual net social surplus produced by the park.

Question 5 (10 points) Backstop Technology

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	$WTP_0 = 600 - 2Q_0$	300
1	$WTP_1 = 1000 - 2Q_1$	250
2	$WTP_2 = 1400 - 2Q_2$	200

Initially, there are 775 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 $400. 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 and (d) indicate the period(s) when the backstop will be used.

Question 6 (10 points) Exploration

Suppose that a resource is to be allocated across two periods. The demand for the resource in period 0 is given by $W2P_0 = 800 - Q_0$ and the demand for the resource in period 1 is given by $W2P_1 = 1600 - Q_1$. Initially, 1500 units of the resource are know to be available and can be extracted at MEC = $300 in either period. However, it is possible to find more of the resource via exploration. The cost of drilling an exploratory well is $90. In 80% of the wells, no new deposits will be found. However, in 20% of the wells, an average of 3 units will be found. The marginal cost of extracting any new units is the same as the existing deposits: $300. 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.