Fall 2019 - 14.41 Midterm

SOLUTIONS

1 True, False or Uncertain (30 points)

For each of the statements below evaluate whether they are true, false or uncertain. Provide brief explanations.

1. (5 points) The fact that cigarettes decrease life expectancy of the smoker should be counted as a negative externality.

2. (5 points) One of the main advantages of vouchers relative to direct provision of education in the United States is that they would reduce school segregation.

3. (5 points) To make consistent welfare statements we need consumer choices to satisfy the basic assumptions of rationality i.e. completeness, transitivity and reflexivity. Therefore, revealed preferences approaches are the correct way that we can firmly ground cost benefit analyses.

4. (5 points) The Tiebout model assumes that taxes are raised in a lump sum fashion. In practice, towns in the US rely primarily on property taxation. Thus the Tiebout

model should not be seen as a good approximation for how local public goods are provided in the US.

5. (5 points) Lotteries for charter school admissions provide a natural experiment for estimating the individual return for a student attending charter schools. We can use those estimates, basically multiplying by the number of students, to think about what would be the effects of moving all students to charter schools.

6. (5 points) The human capital view on education contrasts with the screening view. However, they have the same implications as to what the return to education would be if we were to randomly assign extra years of education to students.

2 Externalities and uncertainty (35 points)

Consider the market for air pollution reduction in Boston. The social marginal benefit curve of air pollution reduction is given by $SMB_{ap} = 100 - \frac{1}{4}R$, where R is the amount of reduction. Suppose that the government doesn't know the true costs of air pollution reduction. The government's best guess is that the marginal cost of reduction is $MC_1 = R$ for this market. There is a chance however that the actual marginal cost is $MC_2 = 20 + R$.

1. (a) (3 points) If the government wants to mandate a reduction level based on its initial estimate (MC_1), what level of reduction should it choose?

   (b) (5 points) If the actual marginal cost curve is MC_2, what is the deadweight loss?

2. Suppose instead that the government decides to levy a corrective tax.

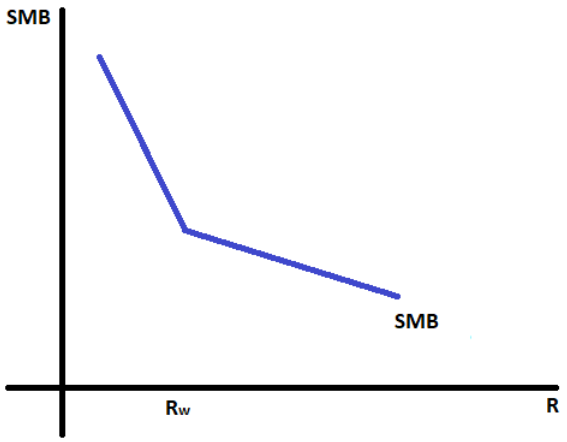
(a) (3 points) At what level should the government set the tax, if it thinks that the marginal cost is MC_1?

(b) (5 points) Calculate the deadweight loss if the actual marginal cost is MC_2.

3. (a) (3 points) What are the implications for instrument choice based on your findings in the previous questions?

   (b) (5 points) How would the results and the implications change if the marginal benefit curve was very steep? Explain the intuition.

4. (11 points) Suppose that the SMB curve for the toxic waste market is as shown in the following graph. Meanwhile, the government is uncertain about the true costs of toxic waste reduction. Discuss the pros and cons of using a tax versus a regulatory approach here. Can you think of a combination approach which might work best of all given the uncertainty? *Hint: By this we mean an EX-ANTE approach - you need to announce your policy before the uncertainty is resolved, so don't just answer that you will wait until you learn the cost!*



3 Public goods (35 points)

In a maritime trade route in Great Britain, there are N boats operating. All of them share the same production function and the only input is the total number of lighthouses L in the port at which they are arriving. Each firm can build its own lighthouses l_i at a cost p, thus $L = \sum_i l_i$. The profit function for each boat operating in the route is:

$$\Pi_i = Aln(L) - l_i p$$

1. (7 points) Assuming that lighthouses are non-excludable and non-rival, calculate the number of lighthouses that the boats provide when each boat individually maximizes its own profit function taking as given the decisions of the other boats.

2. (8 points) Define social welfare as the sum of boats' profits. Calculate the number of lighthouses that maximizes social welfare (the aggregate profits of all boats) as a function of A, p and N. Comment on the relationship between what you found in this item relative to what you found above.

3. (10 points) Suppose that boats could form a business association and vote on the number of lighthouses that they will build, financing them with a lump sum tax on each boat. Under what conditions can the voting procedure be expected to result in an efficient allocation? What if boats are heterogeneous with respect to how important lighthouses are for their profits, that is, each boat has a profit function with a different A_i?

4. (10 points) Suppose that there are two countries. In the first country there are many ports, and each of them is almost as good as any other from the point of view of the transportation companies trying to move goods in and out of the country. In the second, there is a single port. Each port is responsible for providing lighthouses around it, so that boats can arrive safely, and they finance them by levying a lump-sum tax on the boats arriving. In which of the two countries can we expect the number of lighthouses to be closer to efficient? Can we expect the number of lighthouses in any of the countries to be completely efficient? Explain using economic models discussed in class.

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