

Environmental Economics and Policy (Econ 231-01)

Homework 2

Due Thursday, October 7

60 points

Label and explain all graphs

1. (10 points) Sustainability

- a. How does Solow define sustainability?
- b. Is Solow's approach inconsistent with the maintenance of the population of a particular species? Explain.

2. (10 points) Command-and-Control Policies versus Cost-minimizing Policies. Two coal-burning electric power plants in Wisconsin emit sulfur dioxide (SO_2), which leads to acid rain and increased particulate matter. To address this problem, the EPA is considering two policies: requiring both plants to abate by the same amount, or allowing them to trade pollution permits. They have asked you to calculate the costs of each policy, and provide you with the following information on the abatement costs at each plant:

A plant in Green Bay, Wisconsin has marginal abatement costs: $MAC_1 = 1.5A_{GB}$

A plant in Milwaukee, Wisconsin has marginal abatement costs: $MAC_2 = 0.3A_M$

The EPA would like to reduce SO_2 emissions from 220 to 100.

- a. If the EPA mandates that each plant abate by the same amount, what are the total costs of this abatement?
- b. If the EPA allowed the plants to trade permits, how much less would the tradable permit plan cost compared to both plants abating by the same amount?
- c. By how much did the U.S. sulfur dioxide tradable permit system reduce emissions of SO_2 ? How much was saved by using permits rather than a command-and-control approach? Use specific numbers and cite your sources.

3. (10 points) Emissions from paper recycling plant

About a mile from Macalester on Highway I-94, sits a huge paper recycling plant. Emissions from this plant can sometimes be smelled on campus when the wind is blowing from the northwest.

- The marginal social benefit of recycled paper can be represented by the equation $MSB = 600 - Q$.
- You may assume that the market internalizes the external benefits of recycled paper but not the external costs.

- The marginal external cost of the emissions is given by $MEC = 0.5Q$
- The supply of recycled paper can be represented $P = 2Q$.
- Prices are in dollars.
 - a. In the absence of any bargaining or government intervention, what are the private competitive market output and price of paper?
 - b. What is the optimal tax on output of recycled paper? Solve for the number. If only this tax were implemented, would the allocatively-efficient amount of emissions be attained? Why or why not?

4. (10 points) A Subsidy to Hybrid Vehicles.

Environmental economists tell you that:

Consumer demand for hybrid cars can be represented by the equation $P = 300 - Q$.
 The supply of hybrid cars can be represented by the equation $P = 2Q$.
 The marginal environmental benefit of hybrid vehicles equals 60 dollars.

Prices and benefits are in dollars and quantities are per month.

- a. What is the amount of the optimal subsidy per hybrid vehicle? What price would consumers pay (after they get the subsidy) per vehicle? What price would suppliers of hybrids get? Show on a graph and solve for the numbers.
- b. Is the hybrid subsidy an allocatively efficient method of reducing vehicle emissions? Explain.

5. (5 points) The Coase Theorem

Callan and Thomas Chapter 3, page 67, number 4.

6. (10 points) Policies for the Reduction in Gasoline Consumption

- a. Describe the “per-mile” and the “per-gallon” external costs associated with vehicle use. What are the dollar values of these external costs?
- b. Why, and under what conditions, is a gasoline tax more efficient than a fuel-economy standard (in particular, than the CAFE standard) at internalizing the external costs you describe in part (a)?
- c. Under what conditions might a fuel-economy standard or a feebate be needed to efficiently reduce gasoline consumption? Which of these two options is more likely to be efficient? Why?

7. (5 points) Morality and Buying the Right to Pollute. Under what condition might the removal of the moral stigma associated with polluting reduce the potential for cost-effective pollution abatement? Explain.