

Econ 431-01: Public Finance
Prof. Sarah West
Homework 2
50 points

1. (12 points) Environmental economists tell you that:

Consumer demand for wind power can be represented by the equation $P = 300 - Q$.
The supply of wind power can be represented by the equation $P = Q$.
The marginal environmental (external) benefit (*MEB*) of wind power equals $0.5Q$.

Prices and benefits are in dollars and quantities are kilowatt hours per minute.

- a. What are the socially efficient price and quantity of wind power?
- b. What is the amount of the optimal subsidy per kilowatt hour (kwh)? What price would consumers pay (after they get the subsidy) per kwh? What price would suppliers of electricity get? Show on a graph and solve for the numbers.
- c. What are the net social benefits (net welfare gains or net efficiency gains) of the subsidy program? Show the area on a graph and calculate the number.

2. (14 points) Consider the problem of the efficient control of garbage. Toxic chemicals from garbage can leach into the soil and contaminate ground water. An alternative to garbage is recycling, which involves a cost (you may assume that garbage has no private cost).

Start with a model of an economy with n identical consumers. The representative consumer buys goods (c) that have garbage as a byproduct, recycling services (r), and all other goods (x). Aggregate garbage waste (G) negatively affects utility. Garbage per unit of goods (GPC) is a function of recycling, where ($GPC(r)$) decreases as recycling increases. The representative consumer's utility can be represented:

$$U = U(c, r, x, G)$$

- a. Set up and derive the first-order conditions of the social planner's problem. The first step you should take is to mathematically define aggregate garbage G .
- b. Now, set up and solve the household problem. Be sure to include taxes (or subsidies) on c , recycling, and garbage (G) in the household's budget constraint.
- c. Solve for the optimal tax on garbage, and show that this tax alone induces consumers to make all the right choices.
- d. A direct tax on garbage is likely to lead to illegal dumping. Solve the model for the optimal tax or subsidy on goods, c , and on recycling, r . State whether each policy is a tax or a subsidy and explain the meaning of each part of your equations.

3. (8 points) Education:

- a. Under what conditions might education be considered a pure public good? Are these conditions likely to hold? That is, how should economists best model the market for education?

- b. What are the primary justifications for government involvement in the provision of education? Explain.
- c. Use Table 6 in Hanushek's article to describe what is known about the effect of teacher education, experience, and salary on student performance. Be sure to use statistics in your answer.
- d. On what grounds have the literature's results on the effectiveness of school resources been challenged?

4. (8 points) Card and Krueger article:

- a. What are Card and Krueger's three main hypotheses? What motivates their choice of these hypotheses? That is, why did they formulate and test them, versus testing other hypotheses? What debate does their paper inform?
- b. Consider the regression results in Table 4. Which coefficients relate directly to Card and Krueger's three main hypotheses? Interpret the meaning of these coefficients—what is the numerical meaning of each of the most important coefficients? And are they statistically significant? How robust are these estimates across regression specifications? What do their regression results imply about the validity of these hypotheses?
- c. What does Hanushek say about Card and Krueger's results?

5. (8 points) Lamm West article:

- a. What hypotheses is West testing in her paper?
- b. Which coefficients in the specification equations on page 26 provide evidence with regard to the hypotheses West is testing? What do we conclude if the signs are negative? If they are positive?
- c. Describe the role that each of West's control variables plays in her estimation, paying particular attention to her fixed effects. How is her model identified? What does this mean? Provide concrete examples in your explanation.
- d. What does West conclude?