EEP101/ECON125 Spring 00
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PROBLEM SET 3
Due Thursday, March 16, 2000 in class
(Late assignments will not be graded)

Part 1: Exercises

1. (Public Goods) Suppose the Albany city council is considering replacing existing dim streetlights with bright, attractive ones on the lower end of Solano Ave (near San Pablo). Providing new lights is expected to provide such benefits as increased numbers of evening strollers and shoppers as well as deter crime. Suppose further that there are 20 businesses in the area. Half of these businesses place relatively high value on these new lights and half value these new lights to a lesser extent. Specifically, the marginal benefit functions for a business in each of the two types of business can be described by their demand function for Q, the number of installed streetlights. These are

"high" value businesses: $P_H = 20 - Q$
"low" value businesses: $P_L = 8 - Q$

The marginal cost of providing streetlights is given by

$$MC = 100 + 10Q.$$

(a) Write aggregate marginal benefit curve, AMB. (be precise with ranges if there are kinks in the curve) Graph each business type's individual demand curve for streetlights as well as the aggregate marginal benefit curve. What is the most that each type of business is willing to pay for two lights?

(b) What is the socially optimal number of streetlights, Q*? What is the total cost of providing Q*?

(c) Describe features of this good that will potentially result in a sub-optimal provision of streetlights in competitive markets. What level of uniform tax should city government impose on each business in order to provide the socially optimal level of lights?

(d) Now assume that it is possible to exclude free-riders (perhaps by dimming lights in front of non-participating stores…). What would happen if the government allowed full service only upon paying some fee equal to the level of uniform tax found in part c? Can you suggest an alternative strategy?

2. (Technological Change) When trees (denoted by T) are cut and sent to saw mills, a certain amount is wasted in the process. The usable timber (m) that can be transformed into boards (the final product) is given by _T = m, where _ is a number between 0 and 1. You can think of T as the "applied" input and m as the "effective" one. Let B represent the output in board feet. The production function is

$$B = f(m) = (m)^{1/2}.$$

The competitive market price for boards, P_B, is \$100, and P_T, the market price for trees, is \$5 per tree. There is a new, more efficient, technology that can increase _ from its actual level of 0.8 to 0.9. The cost of converting to this new technology is K = 70.

(a) What is the increase in profit to producers who adopt this new technology? Given this scenario, would the producer choose to convert to the new technology?

(b) A government can encourage technology adoption by either subsidizing output prices, taxing or subsidizing input prices, or imposing a "waste" tax. Pick one, and calculate how government can induce adoption. Explain briefly. (Actually, government could also subsidize K, but that is too easy …)

Part 2: Essay

Last year, the federal and California governments announced the purchase from Pacific Lumber Company/MAXXAM of 11 000 acres of forested land in and around Headwaters Grove for \$480 million. The site includes old-growth redwoods and provides habitat for a number of listed endangered species. The area "will be managed as a nature preserve … to promote the health of the forest and all species within the forest." While public access to the site will be granted, the government reserves the right to limit that access in order to assist conservation. Write a brief report advising the government of the alternative techniques it could use to place a monetary value on the benefits from preserving the purchased land as a standing forest. Be sure to describe how these techniques could be implemented, as well as the known pitfalls and possible biases associated with each technique. [Limit your answer to one page *at most*.]