

PROBLEM SET 4

Due Thursday, April 22, 1999, in class

(Late assignments will not be graded)

1. The private owner of a forest can sell lumber at a fixed price. He owns 10,000 acres of timber which consists primarily of old-growth forest. If left unharvested, the amount of timber in the forest grows by 2% annually. Timber sells at a price of P dollars per volume per acre cut, and for simplicity, assume there are no harvesting costs. Finally, assume that trees which are harvested take very long to regrow, so cut areas are effectively gone from the calculation after the harvest.
 - (a) If we assume that the nominal interest rate is currently 6%, the expected inflation rate is 3%, and the forest owner is harvesting at a constant rate of 400 acres annually, which is sold at the end of each year, what would the government need to pay him to induce him to stop logging for preservation purposes?
 - (b) Assuming he follows the 400 acres per annum logging policy, if the expected inflation rate changes at the end of the first period to 2%, how does the value of his future harvest change as of that time?
 - (c) Assume the same conditions given in part (a), but now assume that the price of timber (P) is expected to increase at a rate of 1% annually. What would the government need to pay him to induce him to stop logging for preservation purposes in this case?

2. The government has determined that the use of tin in containers for canned goods can be detrimental to people's health under certain circumstances. It decides to indefinitely ban the use of tin, but allows the industry a two-year "adjustment" period. The annual (inverse) demand for tin is $p = 700 - 0.25x$ where x is in tons and p is in thousands of dollars. The marginal cost of extracting the metal is \$150/ton and there are 3000 tons of remaining reserves. Finally, assume that there is a 2% interest rate. (Round off all of your answers to two decimal places.)
 - (a) At the same time, you are asked to present evidence at a hearing under the auspices of the anti-trust branch of the Department of Justice against alleged price-fixing by tin producers. If the observed price of tin is \$297.06 in the first year, do you think it is likely that tin producers are engaging in anti-competitive behavior? Compute a monopolist's extraction level and price in each period.
 - (b) In response to the allegations, industry representatives complain that the price is, in fact, too low. They accuse the Bureau of Land Management of granting too many extraction

rights to tin deposits on public land. Verify the reasonableness of this claim by using the information you have available to predict the open access outcome (extraction and prices in both years) and comparing this with the observed price.

- (c) Familiar with the accusations that it mismanages the resources on the territories under its responsibility, the BLM retorts that it has implemented an effective solution to the open access problem on public lands. Discuss what that solution might be.
- (d) Using the information you have available, compute the socially optimal levels of extraction and prices in both periods. Does this correspond with the observed data?
- (e) Suppose you then learn that a new technology will allow cans to be made from aluminum instead of tin. If it costs \$300/ton to mine aluminum and equal amounts of aluminum and tin will produce the same number of cans, does this help you solve the puzzle?