Problem Set V

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1. Drug regulation and airline deregulation.

(a) People argue that airline deregulation has increased economies of scale in airlines. Explain the logic behind that argument.
(b) Describe the empirical evidence that supports the argument in (a).
(c) People argue that drug regulation has increased economies of scale in the pharmaceutical industry. Explain the logic behind that argument.
(d) Describe the empirical evidence that supports the argument in (c).
(e) If regulation of one industry and deregulation of another have both increased economies of scale, what does that tell us about the effects of regulation and deregulation?

2. Environmental Regulation

Suppose that a fossil fuel fired generating plant discharges sulfur dioxide (SO2) into the atmosphere when it burns coal to generate electricity. SO2 emissions from fossil fuel fired electric utilities are the dominate precursor of acid rain. In addition, high ambient concentrations of SO2 have long been thought to have adverse effects on human health. It would cost the plant $2 million to install a "scrubber" (a pollution abatement device) to eliminate these SO2 emissions, and doing so would result in $5 million in environmental and health related benefits to residents of the surrounding community.

(a) If the residents are assigned property rights to the air, and if each party has equal bargaining power, what will be the predicted outcome and the dollar transfer between the parties?
(b) If the firm is assigned the right to pollute, what will be the predicted outcome and the income transfer between the two parties?
(c) Suppose we do not know precisely the dollar value of the health benefits from eliminating SO2 pollution from electric utilities. How would you estimate it? Would you err on the side of over-estimation or under-estimation? Why?
(d) The Clean Air Act forbids the EPA from considering cost considerations when setting air pollution standards. What are some reasons why this is this a reasonable mandate? What are some reasons why this is an unreasonable mandate?
3. Tradable Permits

Imagine a world with two electric generating plants each which emits sulfur dioxide emissions. Suppose the environmental goal is to reduce SO2 emissions by two tons from current levels. Plant A can reduce SO2 emissions at the cost of $25 per ton. Plant B can reduce SO2 emissions at the cost of $100 per ton.

(a) One "command and control" approach to achieving the environmental goal of a two ton reduction would be to mandate that each plant reduce emissions by one ton. What is the cost of the "command and control" approach?

(b) A tradable permits approach to achieving the environmental goal of a two ton reduction is to issue to each plant permits equal to the plant’s current emissions minus one. Suppose the price of a permit is equal to $30. What is the cost of the tradable permits approach? How much does Plant A reduce emissions by? How much does Plant B reduce emissions by?

(c) Under which approach is total abatement cost lower? Demonstrate which approach Plant A is better off under. Demonstrate which approach Plant B is better off under.

4. Environmental Regulation

Suppose a two-stage cool world in which global warming may happen at stage 2 with probability $p$. In a cool world, the value of undeveloped land is 5, and the value of developed land is 10. In a warm world, the value of developed land is still 10, but the value of undeveloped land is 50. The human race may develop land at stage 1 or stage 2, but once developed, land cannot be undeveloped. Development is “all or nothing”, there cannot be development on only part of the land. The total payoff is the sum of the payoff in stage 1 (5 or 10), and the payoff in stage 2 (5, 10, or 100), so there is no discounting. The human race acts (if only) to maximize the expected total payoff.

(a) If the human race chooses development now, what are the payoffs at stage 1, in a warm world, and in a cool future (stage 2) world? What is the total expected payoff at stage 1?

(b) If there is no development now, what is the payoff at stage 1? What will happen in a warm world at stage 2, and what will the payoff be? In a cool world? What is the total expected payoff at stage 2?

(c) Under what circumstances will development occur now?

(d) Suppose now that, once land has not been developed, it never can be. Thus if the human race chooses not to develop at stage 1, then it cannot at stage 2 if the world turns out to be cool. What is the expected total payoff if both development and lack of development are irreversible decisions?

(e) What is the value to the human race of the option to develop at stage 2 if it doesn’t at stage 1?

(f) Comment in a few sentences on what effect, if any, the irreversibility of development may have on environmental regulation decisions.