

Review: First Challenge
Environmental Economics: ECO 345

The following questions review only the class notes since the last homework. The format is 4-5 short answer and 2-3 longer questions. The formulas provided below will also be provided on the challenge. All questions come from the notes. Also review the first homework, chapters 1-2, 3.3, 4, 5.2-5.5, 13.1, and 12.1A.

The following formulas may be useful:

Efficient Allocations

$$MRS_{xy}^1 = MRS_{xy}^2, \quad MRTS_{LK}^1 = MRTS_{LK}^2. \quad (1)$$

Market Allocations

$$MRS_{xy}^1 = MRS_{xy}^2 = -\frac{P_x}{P_y} = MRT_{xy}, \quad MRTS_{LK}^1 = MRTS_{LK}^2 = -\frac{w}{r}. \quad (2)$$

Efficient Allocations of goods with and without externalities

$$P_S = MC_S(S) = \frac{dC_s(S)}{ds}. \quad (3)$$

$$P_S = MC_S(S) + MD(S) = \frac{dC_s(S)}{ds} + \frac{dC_T(T, S)}{ds}. \quad (4)$$

Selling the Right to Pollute

$$P' = MD(S) = P_s - MC(S). \quad (5)$$

Pigouvian Tax

$$t = MD(S) = MD_1(S) + MD_2(S) + MD_3(S) = MC(S). \quad (6)$$

Question 1

Define each term in **bold** as a good or a bad, rival or non-rival, and excludable or non-excludable. Qualify your answer if necessary. Finally, for each does the market economy provide too much, too little, or the efficient amount of the good/bad?

- a. **Smog**. Smog from cars obscures the view of the ocean from a condo building.
- b. **Mercury**. Mercury in the Everglades seeps into water supplies, causing health problems.
- c. **Alcohol**. April drinks a lot of alcohol, but is careful not to drink and drive.
- d. **Carrots**. Jack breeds horses. His horses sometimes roam onto April's vegetable garden, eating her carrots
- e. **New Music**. Someone invents a technology that prevents sharing of MP3 files without paying.
- f. **Arctic Wildlife Refuge**. Jack and April derive utility from knowing the Arctic National Wildlife Refuge is pristine.

Question 2

Suppose the price of electricity is less than the marginal cost of production.

- a. Is electricity production efficient? If not, explain how to move to a Pareto preferred allocation.
- b. Will the market economy produce electricity if the price is less than the marginal cost? Explain.

Suppose now instead the price of electricity equals the marginal cost of production, and there exists a positive marginal social cost of production.

- c. Is electricity production efficient? If not, explain how to move to a Pareto preferred allocation.
- d. Will the market economy produce electricity if the price equals the marginal cost? Explain.

Question 3

Suppose reckless home buying in South Florida causes the price of homes to rise. Jack, who desires to buy a home, is worse off. Does this constitute an externality? Is the market allocation of homes efficient?

Question 4

Farmers and municipalities value water in underground wells for irrigation and consumption. States allocate “water rights” which allows the owner to drill wells. Several states, including Oklahoma, prohibit the sale of water rights once allocated by the state. Other states, such as Washington, allow the water right to be resold.

- a. Suppose the state allocates a water right to a farmer. Will the efficient allocation necessarily result in Washington? Will the efficient allocation result in Oklahoma? Explain.
- b. Suppose the water right is allocated to the municipality. Will the efficient allocation result in Washington? In Oklahoma? Explain.
- c. Does the water right in Oklahoma constitute a property right as defined in class?

Longer Questions

Question 5

Jack and April share an air basin. Jack’s demand for air quality (q_J) is:

$$P = 1 - q_J \tag{7}$$

Here P is Jack’s MWTP for air quality q_J . Similarly, April’s demand is:

$$P = 1 - \frac{1}{2}q_A \tag{8}$$

A firm’s marginal cost (P) of supplying air quality is:

$$P = q \tag{9}$$

Assume air quality is excludable, but non-rival.

- a. Calculate the efficient quantity of air quality.
- b. Graph the market for air quality, including the individual demands, total demand, market demand, and supply.
- c. Calculate the price and quantity of air quality provided by the market economy.
- d. Is the market provision efficient? Explain.

Question 6

Consider a variant of the Eagle problem in class. Suppose:

Group	Number	Surplus from developing	Surplus from not developing
Developer	1	\$48 Million	0
Bird lovers	8 Million	0	\$5 each
Bird likers	2 Million	0	\$1 each
Bird haters	1 Million	\$1 each	0

For the problems below, assume the assumptions of the Coase theorem hold. Further, assume that the negotiations are such that the owner of the property right extracts all the surplus from the other groups. That is, if one group is willing to pay $\$x$ and the owner of the property right needs at least $\$y$ compensation with $x > y$, the negotiations result in the group paying the owner $\$x$.

- Is it efficient to develop the property?
- Suppose there is no Endangered Species Act (ESA) and the developer owns the property (property right). Will the resulting allocation be efficient? Calculate the surplus for all 4 groups above.
- Suppose there is no ESA and the 8 million eagle lover's own the property (property right). Will the resulting allocation be efficient? Calculate the surplus for all 4 groups above.
- Explain the answer to (b) and (c) using the Coase theorem.

Question 7

Nintendo DS video games (G) provide utility to Jack and April, while hazardous waste (H) decreases their utility. Suppose initially Jack has 8 units of H in his room and 2 units of G , while April has 4 units of H in her room and 4 units of G . The price of H is -1, while the price of G is 2. Both Jack and April can buy or sell either commodity. At the endowment point, $MRS_{GH}^J = 1$ and $MRS_{GH}^A = 3$.

- Graph the Edgeworth box diagram for this problem, putting Jack in the lower left corner. Be sure to show the endowment point, the indifference curves at the endowment point, the market equilibrium, and the budget line.
- What does Jack buy? What does Jack sell?
- Explain briefly why Jack is better off after trading.
- What is the MRS of Jack at the market equilibrium?