Public Economics (ECON 131)
Section #9: Externalities

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Contents

1   Externalities

1.1   Key concepts

- **Market failure:** A problem that causes the market economy to deliver an outcome that does not maximize efficiency.

    - Externalities, asymmetric information, individual failures

- **Externality:** An externality arises when the action of an agent directly makes other agents better off (positive externality) or worse off (negative externality), with no costs or benefits to the acting agent.

- Externalities can occur because of production or consumption

- Private vs. social marginal cost:

    - Private marginal cost (PMC): is the direct marginal cost of producing/consuming an additional unit of a good

    - Social marginal cost (SMC): is the PMC + marginal damages (MD), ie the PMC + any additional costs associated with production/consumption that are imposed on others in the economy

- In a free market, equilibrium where PMB = PMC

- Social optimum at SMB = SMC

- If PMB $\neq$ SMB and/or PMC $\neq$ SMC $\Rightarrow$ private market leads to inefficient outcome

- We say an agent **internalizes the externality** when, due either to private negotiations or government actions, the price of an action fully reflects the external costs or benefits of that action.

  - Private negotiations can bring result in socially optimal quantity as long as (a) there are well-defined property rights (b) costless bargaining, and (c) competitive markets (**Coase theorem**—but see lecture slides for some limitations)

  - Public policy can enter when Coase conditions are not met:
    * price policy (tax or subsidy)
    * quantity regulation (command and control or tradable permits)

1.2   Practice Problems

1.2.1   Based on Gruber Ch.05, Q.13

Suppose that demand for a product is $Q = 1,000 - 4P$ and supply is $Q = -200 + 2P$. Furthermore, suppose that the marginal external damage of this product is $6 per unit.

(a) How many more units of this product will the free market produce than is socially optimal?

(b) Calculate the deadweight loss associated with the externality.

1.3   Additional Practice Problems

1.3.1   When marginal damage is not constant

A coal-fired power plant releases air pollution into the atmosphere for every unit of electricity produced. The inverse demand function for coal-fired electricity is $P_d = 20 - \frac{1}{2}Q$, which represents the marginal benefit curve where Q is the quantity consumed when consumers pay price P_d. The inverse supply curve for coal-fired electricity is $P_s = 5 + Q$, which represents the marginal private cost curve when the power plant produces Q units. The marginal damage from emissions is given by $MD = 3.5Q$, which describes the cost of greenhouse gas emissions and local air pollution when the industry generates Q units of coal-fired electricity.

(a) Illustrate the market for the coal fired electricity with a supply/demand graph. Be sure to draw the curves for demand, supply, marginal damage, and social marginal cost.

(b) What are the equilibrium price and quantity for coal fired electricity when there is no correction for the externality?

(c) How much coal fired electricity should the market supply at the social optimum?

(d) How large is the deadweight loss from the externality?

(e) Is it possible for the government to achieve the social optimum by imposing a per-unit fee on emissions? If not, explain why it is not possible. If so, how large must the emission fee be if the market is to produce the socially efficient amount of coal fired electricity? Also, draw the firm's supply curve with the new emission fee on your graph.

1.3.2   Gruber Ch.05, Q.4

In the midwestern United States, where winds tend to blow from west to east, states tend to more easily approve new polluting industries near their eastern borders than in other parts of the state. Why do you think this is true?