Externalities and Public Goods (Chp.-5 and Chp.-6)

Part-2
Previous Lecture

• Negative Externalities
  – Production
  – Consumer

• Positive Externalities
  – Production
  – Consumer

• Solutions
  – Private Negotiations (Coasian)
Public-Sector Remedies for Externalities

• Recall the steel factory-river pollution case
Public-Sector Remedies for Externalities

• Two instruments for the government:
  – Change the price of the externality (taxes, subsidies)
  – Impose restrictions on the quantity of the externality (regulation)
Public-Sector Remedies for Externalities
Corrective Taxation

• Corrective taxation (Pigouvian Taxation)
  – The idea is to increase the private marginal cost of the externality for the party creating the negative externality so that

  \[ PMC + \text{Tax} = \text{SMC} \]
  \[ \text{Tax} = \text{MD} \]
Public-Sector Remedies for Externalities

Corrective Taxation

- Corrective taxation (Pigouvian Taxation)

\[ SMC = PMC_2 = PMC_1 + MD \]

\[ S = PMC_1 \]

\[ D = PMB = SMB \]
Public-Sector Remedies for Externalities

Subsidies

- The idea is to decrease the private marginal cost of the externality for the party creating the positive externality so that

\[ PMC - \text{Subsidy} = SMC \]
\[ \text{Subsidy} = MB \]
Public-Sector Remedies for Externalities

- Subsidies

![Diagram showing the concept of subsidies in economics. The graph illustrates the supply and demand for oil, with the supply curve labeled as $S = PMC_1$ and the demand curve labeled as $D = PMB = SMB$. The equilibrium point is marked by point A, with prices $P_1$ and $P_2$, and quantities $Q_1$ and $Q_2$. The subsidy is calculated as $PMC_1 - MD$. The marginal benefit (MB) is indicated by arrows.]
Public-Sector Remedies for Externalities

Regulation

• Regulation
  – The idea is to mandate the party creating the negative externality to produce the socially optimal level of externality

\[ Q \text{ (imposed)} = Q \text{ (socially eff.)} \]
Public-Sector Remedies for Externalities

• Regulation
Taxes or Regulation? Basic Case

• Instead of the production of the good, use the ‘market’ for pollution reduction.
  – PMC: Marginal cost of reducing pollution to the firm
    • Increases as the reduction increases
    • Equal to SMC, since the end product, production of steel, introduces the externality, not reducing the pollution
  – PMB = 0, since there is no gain to the firm’s private interests from reducing pollution
  – SMB = MD: The marginal social benefit of reducing pollution is equal to the marginal damage the pollution causes
    • Assume that it is constant and equal to $100.
Taxes or Regulation?
Basic Case

• Instead of the production of the good, use the ‘market’ for pollution reduction.
Taxes or Regulation?
Basic Case

• First, assume that the government places a tax of $100 per unit of pollution.
Taxes or Regulation?
Basic Case

- Second, assume that the government mandates a reduction of $R^*$
Taxes or Regulation?
Basic Case

• What does the government need to know under the two cases?

  – Corrective taxation: only the MD curve
  – Regulation: both the MD curve and the private marginal cost of the firm
Taxes or Regulation? Multiple Plants

- Two plants with each plant dumping 200 units of sludge.
- The marginal damage done by each unit of sludge is $100.
- For plant A, the marginal cost of reducing sludge is lower than plant B at any level of reduction.
Taxes or Regulation?

Multiple Plants
Taxes or Regulation? Multiple Plants

- First Option: Quantity regulation (100 unit reduction asked from both firms)
Taxes or Regulation?
Multiple Plants

• Second Option: Tax of $100/unit
Taxes or Regulation?  
Multiple Plants

• Third Option: Quantity regulation with tradable permits
  – Ask for a reduction of 100 units from both firms
  – Let them trade their pollution permits
Taxes or Regulation? Multiple Plants

• Third Option: Quantity regulation with tradable permits
Taxes or Regulation?
Multiple Plants

• Summary:
  – Quantity regulation: not socially efficient
  – Corrective tax: socially efficient
  – Quantity regulation with tradable permits: socially efficient
Taxes or Regulation?
Uncertainty About Costs of Reduction

• Government believes:
  \[ \text{PMC} = \text{MC}_1 \]

• Actually:
  \[ \text{PMC} = \text{MC}_2 \]
Taxes or Regulation? Uncertainty About Costs of Reduction

• Two cases:
  – Global warming (flat marginal damage)
  – Nuclear leakage (steep marginal damage)
Taxes or Regulation?
Uncertainty About Costs of Reduction

(a) Global warming
Taxes or Regulation?
Uncertainty About Costs of Reduction

Diagram showing the relationship between cost of pollution reduction and the level of pollution reduction, with a graph depicting various lines and points labeled A, B, C, D, and E, and the areas shaded to represent different costs. The axes are labeled 'Cost of pollution reduction ($)' on the y-axis and 'Reduction Pollution' on the x-axis.
Taxes or Regulation?

• Conclusions:
  – When there is uncertainty about the private marginal costs, the choice of instrument depends on the situation (shape of the marginal damage curve)
Taxes or Regulation?

• Conclusions:
  – If the government wants to get the amount of pollution reduction right
    • Regulation
  – If the government wants to minimize the costs
    • Taxation, since the firms will never reduce pollution for more than the tax they must pay. In other words, the cost can not exceed the tax.