Economic Incentive Instruments (continued)

• Marketable Emissions Permits
  - Cap and Trade
  - Emission Reduction Credits (ERC)

Cap and Trade—Theory

• Dales –1960 Proposed—
• Officials do not need to know abatement costs
• Get a cost minimizing solution
• Modest monitoring burdens for regulators
• Although can have high transaction costs for regulated
• Promotes technological innovation
Cap and Trade--Theory

• Creates a market for the right to pollute
• Outcomes similar to taxes and subsidies approach but works in terms of quantities and not prices

Cap and Trade—Theory

• To be efficient and effective =
• Must have a property rights structure that supports trading

Cap and Trade-- Theory

• Total Quantity to be Allowed (e.g. The Cap) (must be constraining)
• Rule: All polluters must have permits for quantity of their emitted pollution
• Monitoring and Effective Penalties (Penalties are greater than permit prices)
Cap and Trade—Theory

- An initial allocation of permits
- Transferability of permits
- Firms can hold more permits than they are using (Bankable)
- Limited number of well defined permits
- Low transaction costs (Stavins)

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Cap and Trade—Theory

- All profits from trades belong to traders
- Permits cannot be expropriated

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Cap and Trade—Theory

- Trade will occur where \( MC \) of abatement are equal
- Occurs at a price that will generate an equilibrium permit price
- Identical level of emissions that would emerge from an efficient emissions tax
- Distributional effects = \( f(\text{method on which initial permit allocations are made}) \)
**Cap and Trade—Initial Allocation of Permits**

- Auction permits
- Free initial allocation on arbitrary basis

**Cap and Trade—Initial Allocation of Permits**

- In a well functioning competitive market, same market price would emerge from either allocation method
- Monopolization leads to strategic behavior
- Allocation methods will differ as to their impact on income and wealth and agency revenue generation

**Cap and Trade—Compared with Conventional Markets**

- Environmental Goods and Services Markets differ from Conventional Goods and Service Markets
- Buyers are not knowledgeable what is being traded
- Demand is driven by regulatory requirements of a cap
Cap and Trade—Compared with Conventional Markets

• Supply is determined by what regulators say can be exchanged
• Quality consciousness is only as good as required by regulator
• Three parties—demanders, suppliers, and regulators

Cap and Trade—Point Source Example

• U.S.—Sulfur Oxide (SO₂) Emission Trading
• Established 1990 Clean Air Act Amendments
• Goal: Reduce emissions by half or 10 million tons
• 9 million tons worth of permits issued
• Target was electricity sector

U.S. Sulfur Oxide Program

• Anyone can buy permits
• Penalties set at $2000 a ton
• Original estimates of probable permit prices were as high at $1500
• Prices actually were much lower than predicted—as low now as $150
**U.S. Sulfur Oxide Program**

- Coincided with deregulation of transportation
- High sulfur coal out competed the cleaner coal from western states
- Firms switched fuel
- Efficiency of air scrubbers rose from 90 to 95%

**U.S. Sulfur Oxide Program**

- Firms used permits as insurance against scrubber breakdown
- Cost savings substantial
  - Est.: $7 B CAC-scrubbers
  - $2.5B with Cap and Trade
- Few trades but lots of savings

**Tietenberg—Lessons**

- Substitution for Regulation CAC
  - Flexibility to private sector
- Cost Effective
  - F(Transaction Costs)
  - Staving
- Reduce Transaction Costs
  - Price discovery
- Uniformly mixed pollutants
- Dynamic-technological innovation
Tietenberg– Other Countries?

• Do they have sufficient organizational resources and capacity to use cap and trade?
• Property right structure matters
• Chile-Santiago industrial air point sources of particulates

Stavins–Lessons

• Point of control
• Information needs and costs
• Initial allocation of permits