Class #16
Environmental Policies in the real world

What do we know about the Environmental Protection Agency?
• When was it established?
  – 1970
• What does it do?
  – Writes and enforces regulations to implement the laws passed by Congress
• What are the main laws that the EPA must enforce?
  – Clean Water Act
  – Clean Air Act
  – CERCLA
  – CAFE Standards
  – Safe Drinking Water Act.
Nonattainment Areas

In counties where air quality does not achieve National Ambient Air Quality Standards, the EPA requires states to develop a State Implementation Plan (SIP), which lays out how the state plans to come into compliance.

Source: http://www.epa.gov/oar/oaqps/greenbk/mapnpoll.html

State Enforcement

- States typically lead enforcement of the major environmental laws.
- States cannot have weaker standards than the national minimum criteria set by EPA.
- If EPA does not approve state plans, it can take over enforcement in that state.
Pollution Trading
1990 Amendments to the Clean Air Act

- An outgrowth of the “Project 88” Report by Robert Stavins
- Picked up by the incoming administration of George Bush
- By July 1989 draft legislation had been written
  - Original draft included limits on trading to within a state or regional power pool
- Narrow focus on acid rain

Basic features of Title IV

1990: Title IV of the 1990 U.S. Clean Air Act established trading
1995: Phase I (374 large units)
2000: Phase II (1,420 more units)

SO₂ Trading Program

- National Cap with no spatial restrictions on trading.
  - By 2000 emissions were 40% lower than 1980 levels
- Allowances allocated based on prior emissions
- Allowances set for 30 years
- A small portion auctioned by EPA using revenue-neutral design
- Continuous monitoring of emissions
  - 1 allowance used for each ton emitted
- Low transaction costs
  - ~0.1% in 1999
  - Allowances traded on exchanges

SO₂ Emissions from Title IV Sources 1980–2009

SO₂ emissions through 2015 (relative to 1980 level)

Spot Allowance Prices: 2000 - 2011

Source: Acid Rain Program 2009 Progress Report (Sept. 2010)

Source: USEPA Acid Rain Program (https://ampd.epa.gov/ampd) downloaded on 3/14/2016

The End of the SO2 Trading Program


July 2010

State-by-state emissions budgets
Very limited interstate trading

SO2 Spot Prices 2008-2010

Source: http://www.cantorco2e.com
Title IV Allowance Prices

<table>
<thead>
<tr>
<th>Year</th>
<th>Allowance Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>$0.56/ton</td>
</tr>
<tr>
<td>2019</td>
<td>$0.12/ton</td>
</tr>
<tr>
<td>Prior to 2001</td>
<td>Generally fluctuated between $150 and $200</td>
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</tbody>
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What happened?

Two Vulnerabilities:

1. The multiple environmental impacts of SO₂
2. Internal conflicts in the Clean Air Act
   - NAAQS vs. Title IV

SO₂ is not uniformly dispersed

- SO₂ is not uniformly distributed.
- Pre implementation analysis ignored:
  - Effect of trading on ozone levels.
  - Effects on regional non-attainment problems.

*Source: U.S. NAPAP (1991)
Vulnerability #1: Particulate Matter Ambient Air Quality Standards

- In the early 1990's studies found a conclusive relationship between fine PM (<2.5 microns in diameter) and mortality and morbidity outcomes (e.g. Schwartz et al. 1996, Dockery et al., 1993; Pope et al., 1995).
- PM consists of a mix of chemicals and substances, both in solid and liquid form, that are present as small particles in the atmosphere.
- SO2 is a prominent precursor of PM 2.5

Implications of SO2-PM relationship

- Benefits of SO2 reductions were vastly under estimated
  - Benefit-cost assessments find most of the benefits associated with PM, not acid rain
  - The cap on SO2 is much higher than the social optimum
  - The problem cannot be reasonably regulated as a regional (or national) uniformly dispersed pollutant – it is a pollutant with local consequences.

Vulnerability #2: Internal conflicts in the Clean Air Act – NAAQS vs. Title IV

- Title I of the Clean Air Act requires the EPA to set National Ambient Air Quality Standards (NAAQS) for certain pollutants, including PM. Standards essentially uniform nationally
- “Primary standards” set to protect human health with an adequate margin of safety.
- In 1997 EPA updated the PM NAAQS standard. Added hourly and annual standards for PM2.5 Based on recent mortality risk studies.
Upwind Emissions and NAAQS

- Compliance with the NAAQS involves a complex relationship between the states and the EPA.
- Essentially compliance with the NAAQS is a state responsibility.
- However, there is an exception when out-of-state emissions contribute to NAAQS non-compliance.

Mercury and Air Toxics Standards (MATS)

- MATS proposed in March, 2011 and finalized in December, 2011.
- Affected sources are fossil fuel fired boilers for electricity generation.
- Compliance essentially required by 2016
- Traditional command and control regulation.
- EPA forecasts that SO2 price for Cross State Rule (or CAIR or Title IV) allowances will go to zero under MATS.
  - Acid gas control (HCl) expected to lead to significant ancillary benefits in SO2 because of similar chemistry.

MATS impact on Coal Fired Power Plants

- MATS compliance strategies for U.S. coal-fired generation capacity in the electric power sector (percent 2013):
  - Uncontrolled (may retrofit or retire) 26%
  - Planned retirements 5%
  - Planned IGCC 0.7%
  - Planned CCGT 5.1%
  - Steam cycle using FGD 63.7%

Note: MATS stands for Mercury and Air Toxics Standards. FGD and SO2 stand for Flue gas desulfurization and its carbon equivalent, respectively. This chart does not separate emissions from individual types of plants such as IGCC which may select an unspecified source. Planned CCGT includes 1,000 megawatts of eligible equipment credits reported to CCA when the SO2 control technology that was not select with IGCC.
Perverse Incentives

• “A perverse incentive is an incentive that has an unintended and undesirable result which is contrary to the interests of the incentive makers.” (Wikipedia)

Perverse Incentive #1: CAFE Standards

• Corporate Average Fuel Economy Standards require automobile makers to sell a fleet that, on average, achieves a certain fuel economy rate.
What perverse incentive do you think was created by the CAFE Standards?

Corporate Average Fuel Economy (CAFE) Standards 1978 - 2025

Vehicle Miles Per Gallon (VMPG)

Or, how did CAFE Standards kill the station wagon?

This is a 1980 family car

New Vehicle sales: 1931-2014

Fuel economy regulations were first introduced in 1978, only for passenger vehicles. The next year, a second category was added to light trucks. These were distinguished from heavy duty vehicles by a gross vehicle weight rating (GVWR) of 6,000 pounds or less. The GVWR threshold was raised to 8,500 pounds in 1980 and has remained at that level through 2010. (Wikipedia)
What Perverse Incentive was created by the CAFE Standards?

This is a 1980 car       This is a 1995 light truck

CAFE Standards & other environmental regulations created the SUV and killed the station wagon.

See Daniel Yergin’s *The Quest* (2011) for a discussion of this.

International Environmental Regulations

- **Q:** What type of problems require international agreements?
- **A:** When consequences and causes are not confined to a single nation.

- **Q:** Why is resolving international problems so much more difficult than single-country problems?
- **A:** Because complying with international agreements is, for the most part, voluntary and the potential for free riders is real.

The Montreal Protocol

- To reduce emissions of chemicals that deplete the ozone layer.
- Nations agree to greatly limit emissions of CFCs that deplete the ozone layer.

  - Ratified by 197 nations
  - Binding since 1989
  - Generally effective
    - Widespread adoption
    - Costs of ozone depletion recognized to be severe
    - Cost of compliance not great
Montreal Protocol Implementation

• Nation’s have gradually made the use of CFC as propellants (aerosol cans) and coolants illegal.

• Team Exercise: Since the Montreal Protocol, makes CFC propellants and coolants illegal, how does this create a perverse incentive?

Answer: Some CFC use is pushed underground, where releases are likely to be even greater.

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Unintended Consequences of the Montreal Protocol

• 1) Hydrochlorofluorocarbons, (HCFCs) were substituted for CFCs, but these, now widely used are a very potent greenhouse gas.

• 2) Here’s an amazing one – it led to dramatic increase in the cost of asthma drugs.1

• When CFCs for asthma inhalers were stopped, drug manufacturers had to develop new versions, meaning new patents.

• “That decision bumped out the generics,” said Dr. Peter Norman, a pharmaceutical consultant based in Britain who specializes in respiratory drugs.

• Albuterol, cost less than $15 a decade ago, but costs $50 to $100 per today (2013)

Perverse Incentive#2
The Endangered Species Act (ESA)

- The ESA, passed in 1973, prohibits any activity that might place at risk an endangered species.
- If you have endangered species habitat on your land, your freedom to make choices can be severely curtailed.
- Hence, there is an incentive to eliminate such habitat before the government learns about it.
- This is referred to as the incentive to “shoot, shovel and shut up.”

- NOTE: This is not to say that the ESA has not also done some good; it just isn’t always good.