

Topic 5

- Environmental Policy Instruments
- "What Should Firms Be Doing"
- Porter Hypothesis

Policy Solutions for Pollution

- Command and control regulation
- Emission taxes / Abatement subsidies
- Emission permits (abatement credits)
- Threat of litigation/regulation

Corporate Environmental Actions

- What can firms do to reduce emissions?
- What should firms be doing to reduce emissions?
 - ▷ In response to government intervention
 - ▷ In the absence of government intervention

What Should Firms Be Doing?

- Can't do:
 - ▷ Increase costs to reduce environmental impact and then go out of business
 - ▷ Ignore environmental issues and then get hammered with clean-up costs, law suits, and lost market share due to negative consumer reaction

What Should Firms Be Doing?

- Can do:
 - ▷ Measure and understand environmental costs of operations
 - ▷ Understand the incentives associated with the regulatory environment
 - ▷ Behave responsibly
 - ▷ Explicitly think about environmental strategy
 - ◇ Look for win-win opportunities
 - ◇ Look for sources of strategic advantage / risk reduction

What Should Firms Be Doing?

- Environmental impact is not itself evil – firms produce valuable goods at the expense of other valuable goods
- If you have to pay for the goods used as inputs, then the market “sanctions” and “governs” this tradeoff. But if you don’t have to pay for an input or compensate people for a “bad” by product that is produced, then profit-maximizing behavior does not necessarily drive you to socially optimal behavior. Should you care?
 - ▷ Long run consequences
 - ▷ Reputation effects
 - ▷ Liability
 - ▷ Ethics

Being “Responsible”

- Understand environmental costs and don't try to drive them to zero, but rather look for ways to incorporate those costs into your decision making.
 - ▷ Example: Jet travel imposes an environmental cost that can be approximated by the cost of an appropriate carbon offset (approx. \$20 per hour of flight time)
 - ▷ Implies you should reduce jet travel relative to what you otherwise would choose
- Look beyond direct operations
 - ▷ Example: Coca Cola's syrup
 - ◇ 2.5L of water in for each 1L out in product
 - ◇ 100s of liters of water (embedded use) associated with inputs such as sugar
 - ◇ Waste water from inputs dwarfs plant water run off
 - ▷ Ask for scorecards from suppliers on relevant environmental issues
 - ▷ Walmart is developing a sustainability index – expected to become the default standard

Measuring Corporate Environmental Risk – 1 of 3

- Sources of Environmental, Social and Governance Scores (ESG scores)
 - ▷ MSCI (Morgan Stanley Capital International)
 - ◇ Focused on highlighting financially relevant risks
 - ▷ FTSE (Financial Times Stock Exchange)
 - ◇ More than one index – green behavior within company, green revenue, etc.
 - ◇ Focused on helping investors change corporate behavior.
 - ▷ RepRisk AG
 - ◇ More than one index – local pollution, child labor, tax evasion, etc.
 - ◇ Focused on helping investors change corporate behavior.
- Sources: Wall Street Journal, "If You Want to Do Good, Expect to Do Badly," June 29, 2018, Wikipedia: MSCI, RepRisk, FTSE.

Measuring Corporate Environmental Risk – 2 of 3

- The indexes listed on the previous slide are proprietary. PSU does not subscribe to any as best I can determine.
- An alternative is to look at the prospectus of ESG funds and see what they invest in.
- Problems: Identifies the best, not the worst. Influenced by market cap
- Vanguard FTSE Social Index
 - ▷ Apple, Microsoft, Alphabet, Facebook, JP Morgan, Johnson & Johnson, Bank of America, Intel, Wells Fargo, Visa.
- TIAA-CREF Social Choice Equity Fund
 - ▷ Alphabet, Microsoft, Johnson & Johnson, Procter & Gamble, Verizon, Coca-Cola, Merck, PepsiCo, Walt Disney, Cisco

Measuring Corporate Environmental Risk – 2 of 3

- Another alternative is to use Yahoo Finance filters
 - ▷ No market cap restriction
 - ◇ Worst environmental scores: Jardine Matheson, Blackstone, PT Bank, Zijin Mining, Cboe, East West Bancorp, Grupo Financiero, KAR Auction, Cullen/Frost, Synovus, Lazard, Jiangxi,
 - ◇ Best environmental scores: NTT Docomo, AXA SA, KBC Group, DNB, Swiss Re, Swisscom, Kubota, Atos, Gecini, Koninklijke, Cidy Developement, Icade, Electrolux
 - ▷ Large market cap firms
 - ◇ Worst environmental scores: Facebook, Alibaba, Altaba, Intuitive Surgical, CME, Crown Castle, Vertex, Public Storage, Monster Beverage, Service Now, TAL Education, Arista, SBA, BioMarin, Check Point Software, Realty Incom, CoStar, Incyte, ANSYS, Liberty Broadband, Seattle Genetics, Duke Realty, UDR, Ionis
 - ◇ Best environmental scores: Microsoft, Johnson & Johnson, Oracle, NVIDA, Bristol-Myers, Biogen, Celgene, Regeneron, Prologis, Mettler-Toledo,

Customer Pressure for Responsibility

- Environmental and social (ES) policies propagate from customers to suppliers, especially for customers with higher bargaining power and suppliers in countries with lower ES standards.
- Suppliers decrease their toxic emissions, litigation, and reputation risk, and improve their financial performance due to ES propagation.
- Schiller, Christoph M., (2018) “Global Supply-Chain Networks and Corporate Social Responsibility,”
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3089311

University Pressure for Responsibility

- Graduation Pledge
 - ▷ “I pledge to explore and take into account the social and environmental consequences of any job I consider and will try to improve these aspects of any organizations for which I work.”

Financial Pressure and Responsibility

- Financial constraints affect corporate environmental policies because of significant abatement costs associated with hazardous waste management.
- Relaxation of financial constraints reduces firms toxic releases
- The impact on toxic releases is amplified by weaker regulatory monitoring and enforcement, by myopic managers with short horizons, and when managers are under pressure to meet earnings targets.
- Kim, Taehyun and Qiping Xu (2018), “Financial Constraints and Corporate Environmental Policies,”
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3028768

Ownership and Responsibility

- Private firms have lower greenhouse gas emissions than comparable public firms and incur fewer EPA penalties/fines
 - ▷ Not driven by endogeneity of listing decision
 - ▷ No evidence for role of disclosure
- Shive, Sophie, and Margaret Forster (2018), “Corporate governance and the pollution externalities of public and private firms,” Paper, Western Finance Association, San Diego, June 19, 2018.

Porter on Regulation

- To increase the likelihood of innovation offsets, regulation should maximize opportunity for innovation. Market incentives can encourage the introduction of technologies that exceed current standards.
 - ▷ focus on outcomes not technologies
 - ▷ regulate as late in the production chain as practical
 - ▷ where possible use market incentives (pollution taxes, deposit-refund schemes, tradable permits)
 - ▷ encourage preemptive standards (with oversight to avoid collusion)
 - ▷ create demand pressure (“Blue Angel” eco-label, certification for organics, etc.)

Porter on Regulation

- Six benefits of regulation
 1. Signals companies about likely inefficiencies
 2. Raises corporate awareness
 3. Reduces uncertainty on value of environmental investments
 4. Motivates innovation
 5. Levels the playing field
 6. Needed if offsets are not complete

Porter Hypothesis

- Porter and van der Linde (2005)
- Argue environmentalism and industrial competitiveness go hand-in-hand
 - ▷ “We will argue that properly designed environmental standards can trigger innovation that may partially or more than fully offset the costs of complying with them. Such ‘*innovation offsets*,’ as we call them, can not only lower the net cost of meeting environmental regulations, but can even lead to absolute advantages over firms in foreign countries not subject to similar regulations. Innovation offsets will be common because reducing pollution is often coincident with improving the productivity with which resources are used.”
 - ▷ “Companies must start to recognize the environment as a competitive opportunity—not as an annoying cost or a postponable threat.”

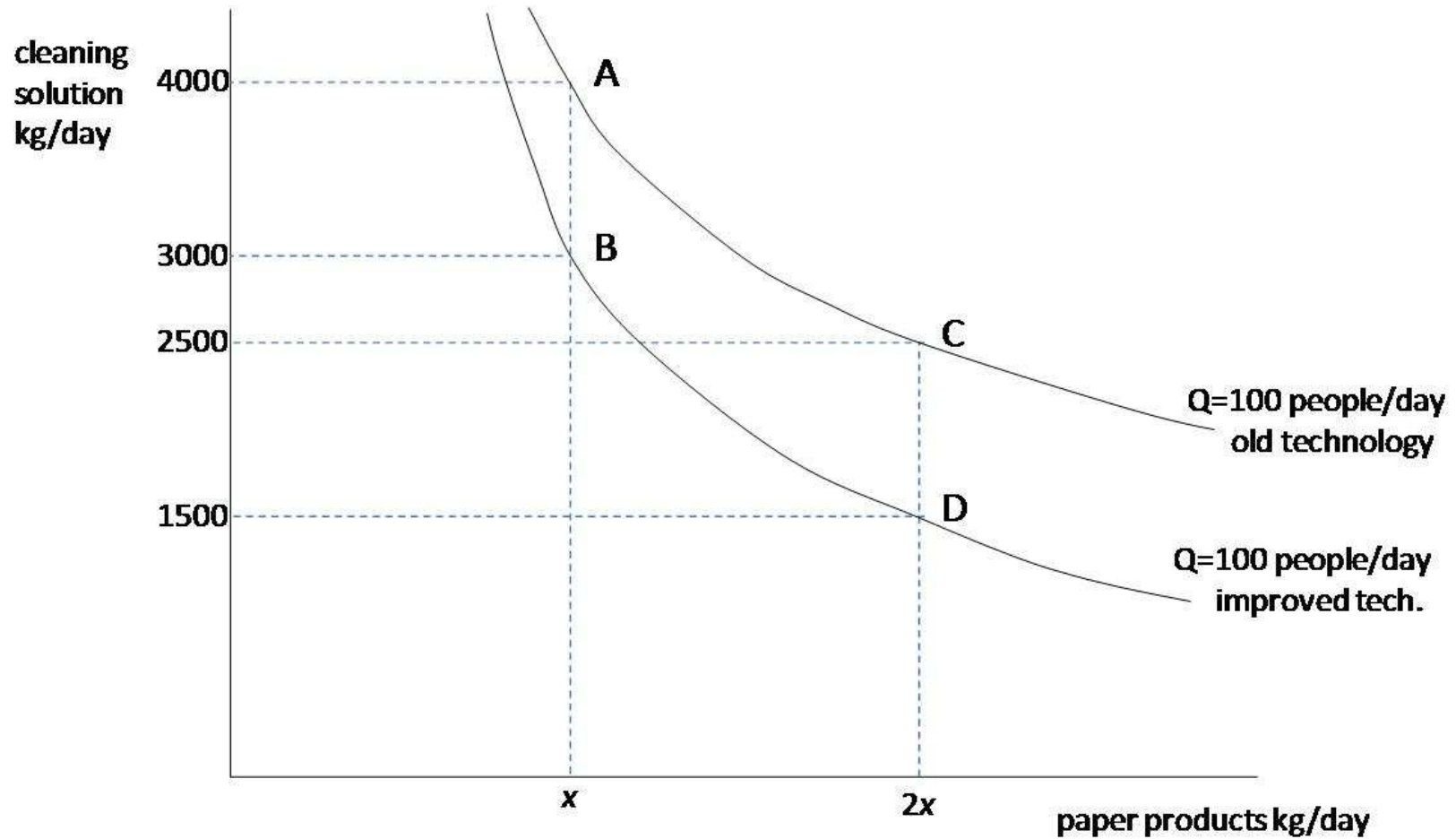
Porter Examples

- Raytheon forced to eliminate CFCs used for cleaning printed circuit boards – increased average quality and lowered operating costs
- Hitachi required to increase recyclability – fewer components and easier assembly
- Ciba-Geigy required to meet new wastewater standards – changes in production process increased yields and reduced waste disposal costs
- 3M required to reduce use of solvents – switch to water-based solutions reduced input costs for solvents

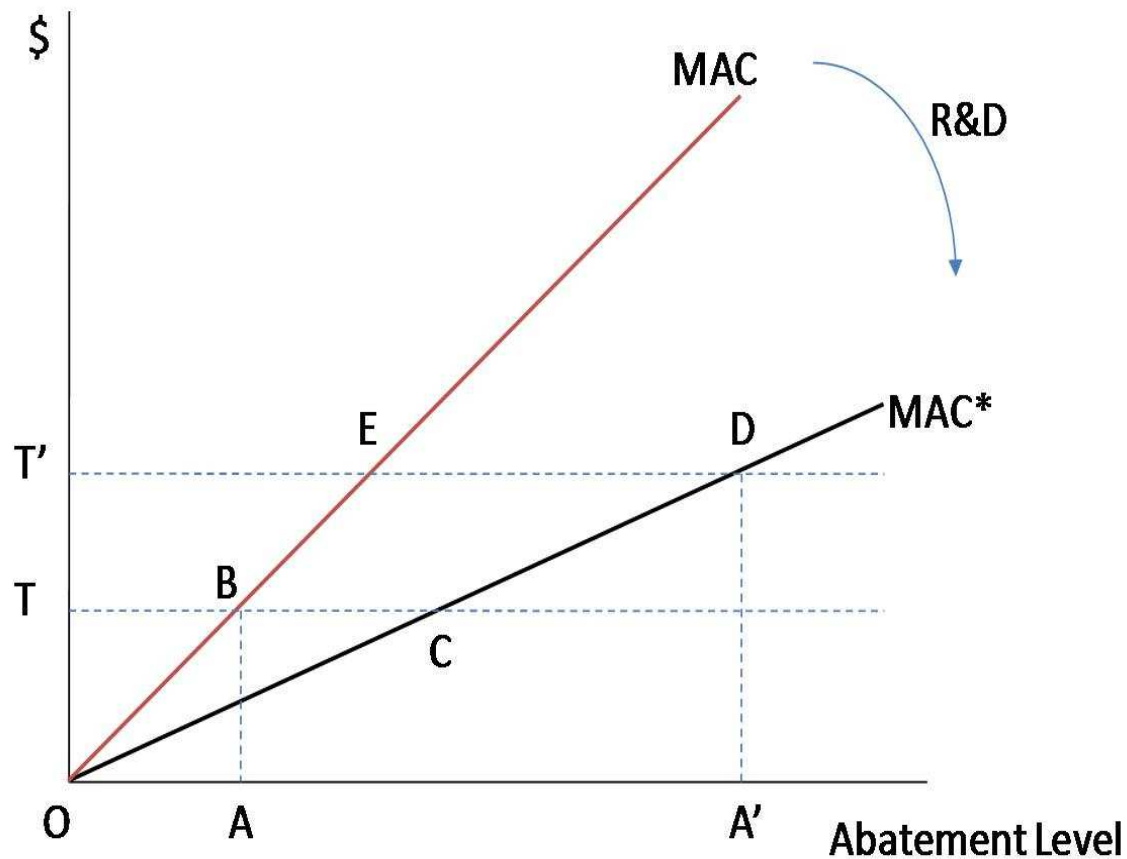
Criticism of Porter

- Porter claim (paraphrased): “Regulations to increase water cost induce innovation and reduce costs for firms.”
- Example: Hotel conference center

Example: Hotel Conference Center



Regulation and Innovation



- Suppose a polluting firm operates in a perfectly competitive market and maximizes profits
- Suppose the firm could invest to reduce its marginal abatement cost (R&D to develop new pollution abatement technology)

Regulation and Innovation

- As a starting point, suppose there is an effluent charge of T and abatement is A
- Suppose area OBC is less than the R&D cost, so it is not in the firm's interest to invest in R&D (move from B to C is not profitable)
 - ▷ Two parts: abatement A at lower cost, move to C so avoid charge on additional emissions
- Suppose regulators can “encourage innovation” by increasing regulatory stringency
- What happens when regulators increase the effluent charge to T' ?

Regulation and Innovation

- If new technology wasn't worth investing in before, it may be worth investing in after environmental standards are raised
- But the increase in the stringency of environmental regulations unambiguously makes the polluting firm worse off

Regulation and Innovation

- When might the results of this model be overturned
 1. Strategic behavior (esp. between firms and regulating agency or in the context of international trade)
 - ▷ In most models of this form, just as likely that weak environmental regs promote international competitiveness
 2. Overlooked profitable innovation opportunities

Criticism of Porter

- Palmer, Oates, and Portney (2005)
 - ▷ Porter sees the private sector as systematically overlooking profitable opportunities for innovation
 - ▷ Porter envisions a regulatory authority that is in a position to correct this “market failure”
 - ▷ “What Porter and van der Linde have in mind is a failure of private decision makers to respond to *private* profit opportunities.”
 - ▷ Their vision suggests “enlightened regulators provide the needed incentives for cost-saving and quality-improving innovations that competition apparently fails to provide.”
 - ▷ “We find this view hard to swallow, and suspect that most regulated firms would share our difficulty.”

Rebuttal of Porter by Palmer, Oates, and Portney

- Acknowledge that firms are not “ever-vigilantly perched on their efficiency frontiers”
- But
 - ▷ “The major empirical evidence [Porter and van der Linde] advance in support of their position is a series of case studies. With literally hundreds of thousands of firms subject to environmental regulation in the United States alone, it would be hard *not* to find instances where regulation has seemingly worked to a polluting firm’s advantage ... It would be an easy matter for us to assemble a matching list where firms have found their costs increased and profits reduced as a result of (even enlightened) environmental regulations, not to mention cases where regulation has pushed firms over the brink into bankruptcy.”

Discussion of Reinhardt (1999)

- Managers should make environmental investments for the same reasons they make other investments, because they expect them to deliver positive returns or to reduce risks.
 - ▷ “Treating environmental issues like other business issues can lead to more creative problem solving as well as better bottom-line results.”
- When does it pay to be green?
 1. Differentiating products (higher costs but also higher prices)
 2. Joint action with competitors (set private standards, shape regulations)
 3. Reduce costs (reduce waste generation, cut energy use, redesign wasteful processes)
 - ▷ “managers should look for [these opportunities] as long as the search doesn’t cost much in terms of their time or other resources”
 4. Manage risk (accidents, boycotts, lawsuits)
 5. Redefining markets (Anderson on carpets, Xerox disposal)

Costs by Country

Pollution-Control Expenditures (PACs) as a Percentage of Gross Domestic Product (GDP), Selected OECD Countries, 1990 and 2000

Country	PAC as Percentage of GDP	
	1990	2000
Austria	1.1	1.3 ^a
Canada	0.7	0.6 ^a
France	0.6	0.9
Iceland	0.2	0.3
Japan	0.3	0.6 ^a
Mexico	0.3	0.2
Norway	0.4	0.3
Spain	0.6	0.6 ^a
United States	0.6	0.7 ^b

^a1999.

^b1994.

Source: Organization for Economic Cooperation and Development, "Pollution Abatement and Control Expenditure in OECD Countries," ENV/EPO/SE(2003)1, Paris, 17 July 2003, p. 33.

In Perspective

- US GDP about \$20 trillion
- US Federal Taxes about \$3 trillion
- Total State Taxes about \$1 trillion
- Environmental Regulation about \$0.2 trillion

Costs by Industry

Pollution Abatement Expenditures for Selected U.S. Industries, 1991 (millions of 2008 U.S. dollars)

Industry	Pollution abatement capital expenditures (PACE)	PACE as a percentage of capital expenditures	Abatement gross annual cost (GAC)	GAC as percentage of value of shipments
All industries	11,620	7.47	27,339	0.62
Industries with high abatement costs				
Paper and allied products	1,939	13.68	2,571	1.27
Chemical and allied products	3,249	12.91	6,364	1.38
Petroleum and coal products	2,300	24.81	4,480	1.80
Primary metal industries	1,058	11.45	3,150	1.51
Industries with moderate abatement costs				
Furniture and fixtures	38	3.29	214	0.34
Fabricated metal products	278	4.35	1,325	0.54
Electric, electronic equipment	368	2.88	1,310	0.42
Industries with low abatement costs				
Printing and publishing	58	0.73	359	0.15
Rubber, miscellaneous plastics products	128	1.95	694	0.44
Machinery, except electrical	202	1.75	903	0.24

Source

: Jaffe et al. (1995) as reported in Kolstad (2000, Table 2.3)

Costs by Plant

Costs per Year of a Typical Plywood Veneer Plant to Install Maximum Available Control Technology (MACT) for Hazardous Air Pollutants (HAPs)

Cost Item	Costs per Year (\$)
Investment costs:	
Purchase	1,100,000
Installation	320,000
Annual costs:*	
Capital costs	120,000
Labor:	
Operating	154,000
Maintenance	68,000
Supplies	28,000
Power	17,000
Testing, monitoring, and reporting	43,000
Total annual costs	430,000

*Annualized at 7 percent with a 15-year assumed equipment life.

Source: Adapted from U.S. EPA, *Economic Impact Analysis of the Plywood and Composite Wood Products*, NESHAP Final Report, Office of Air Quality, November 2002.

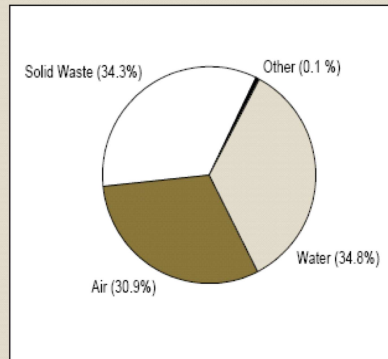
Categories of Abatement Expenditures

Pollution Abatement Costs 2005 (millions of dollars)		
	Capital Expenditures	Operating Costs
Treatment/capture	\$3,113	\$10,763
Recycling	\$373	\$1,748
Disposal	\$318	\$4,567
Prevention	\$2,104	\$3,599
Total	\$5,908	\$20,677

- 2005 Pollution Abatement Costs and Expenditures
 - ▷ www.census.gov/prod/2008pubs/ma200-05.pdf

Categories of Abatement Expenditures

Shares of Current-Dollar Pollution Abatement and Control Expenditures by Type, 1994

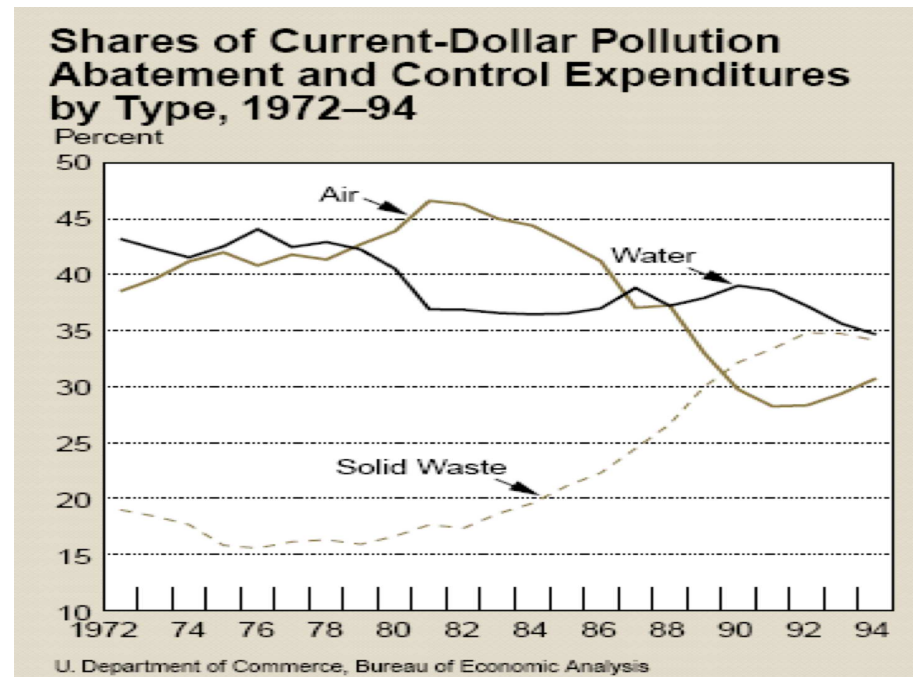


U.S. Department of Commerce, Bureau of Economic Analysis

	Millions 2008\$
Pollution abatement and control	176,247
Air	54,399
Water	61,325
Solid waste	60,387
Other (noise, radiation, pesticide)	136

Source: U.S. Department of Commerce Bureau of Economic Analysis

Categories of Abatement Expenditures



- The PACE survey was conducted annually from 1973 to 1994 with the exclusion of 1987.
- The survey was reinstated for 1999 with periodicity of 2-5 years.
- The survey was last conducted for the 2005 survey year.
- The scope and methodology of the PACE survey were changed significantly after 1994.