Retrospective Analysis of Federal Regulation

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Topics

- Importance of issue
- Scope/Definitions
- Literature
- Rationales for ex ante-ex post differences
- Complexities of retrospective comparisons

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Importance of Issue

- Over- (under-) estimation of benefits could lead to regulations that are too stringent (insufficiently protective)
- Systematic errors can mislead the public, undermine agency integrity
- Retrospective analysis could point to reforms in analytic approaches
- Also possibly identify targets for reform of existing regulations

Scope and Definitions

- Costs or benefits?
- Ex post only or ex post vs ex ante?
- Breadth of benefits/costs considered
- Types of discrepancies
- Defining ‘accurate’

Table 1: A Taxonomy of Costs of Environmental Regulation

Cost category	Counted in RIA?
DIRECT COSTS	
Private Sector Compliance Expenditures	
Capital	Yes
Operating and maintenance	Yes
Public Sector Compliance Expenditures	
Capital	Yes
Operating and maintenance	Yes
Government Administration of Environmental Statutes and Regulations	
Monitoring	Rarely
Enforcement	Rarely
Other Direct Costs (including negative costs)	
Legal and Other Transactional	Sometimes
Shifted Management Focus	No
Disrupted Production	No
Waiting time	Sometimes
Intermedia pollutant effects	Sometimes
Other Natural resource effects	Sometimes
Changes in maintenance requirements of other equipnent	Sometimes
Worker Health	Sometimes
Stimulation of innovation in clean technologies	No
INDIRECT COSTS	
General Equilibrium Effects	
Product Substitution	No
Discouraged Investment	No
Retarded Innovation	No
Transition Costs	
Unemployment	Sometimes
Plant closures	Sometimes

Source: Adapted from Harrington, Morgenstern and Nelson (2000).

Table 2. Cost estimation: Some hypothetical cases

	Ex ante Estimate	Alternative *ex post* outcomes				
		1	2	3	4	5
Number of plants	100	100	150	100	100	200
Emissions, pre-reg.	100	100	100	50	100	50
Emissions, Post-reg.	25	25	25	25	50	25
Cost per plant	$200k	$100k	$200k	$200k	$200k	$100k
Aggregate cost	$20M	$10M	$30M	$20M	$20M	$20M
Emission reductions	7500	7500	11250	2500	5000	5000
Cost per emission unit	$2666	$1333	$2666	$8000	$4000	$4000

Source: Harrington, Morgenstern, Nelson, 2000.

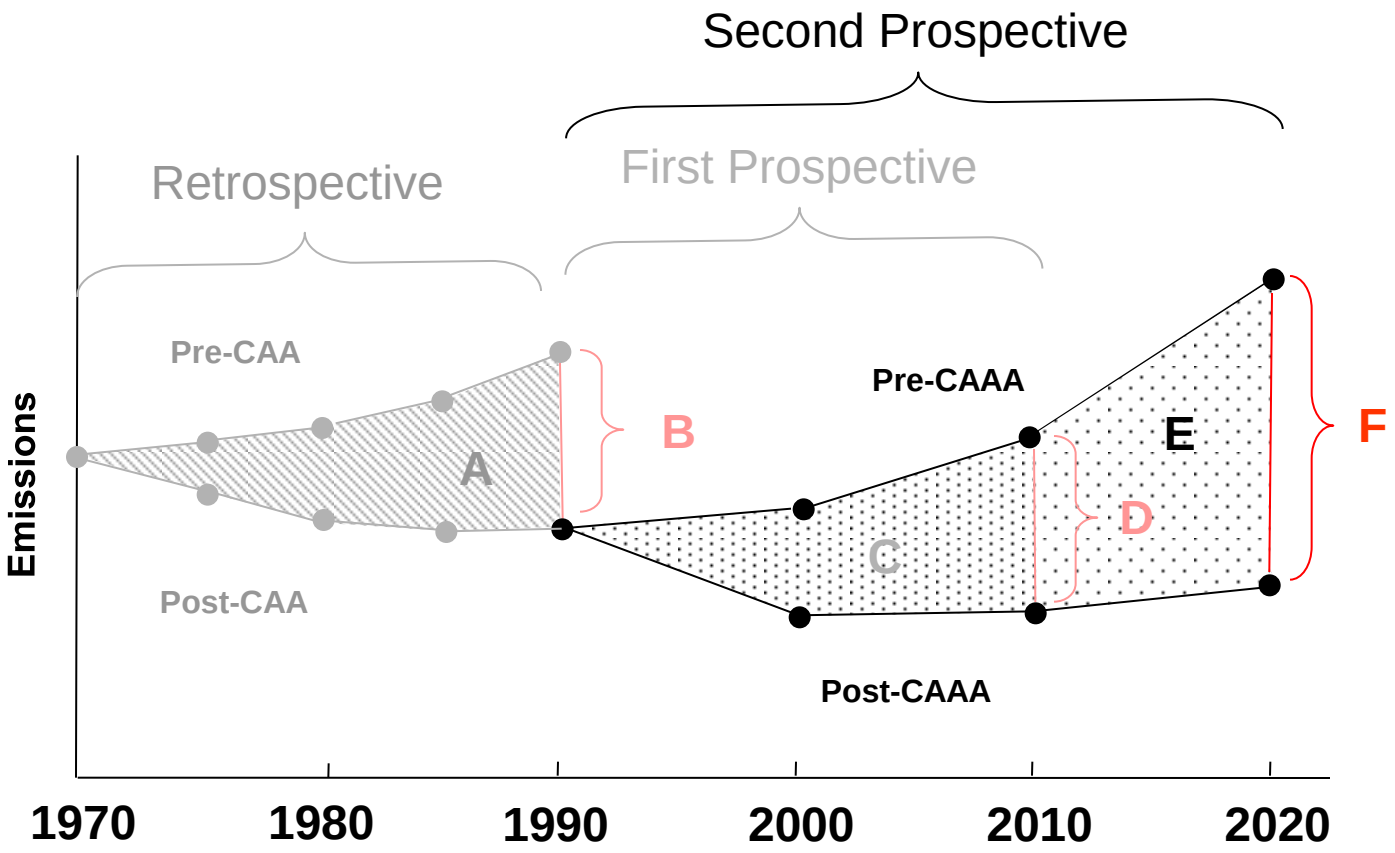
Government Ex Post Studies

- Recent actions
  - 812 studies: (1997-) highly aggregated rather than rule specific; results heavily model dependent, based on arbitrary baseline; no accounting for trends away from manufacturing
  - GPRA (1993): often focus on inspections, audits vs economically relevant metrics
  - OMB calls for more validation studies since at least 2004
  - E.O.s 13563 (2011),13610 (2012): jury still out
  - EPA/NCEE studies (2012-)

1990 Clean Air Act, Section 812

- EPA "… shall conduct a comprehensive analysis of the impact of this Act on the public health, economy, and environment of the United States."
- Retrospective + biennial Prospectives
- Review by outside experts
  - Advisory Council on Clean Air Compliance Analysis

812 Scenarios -- Schematic



Recent Studies (1)

- 2000: Harrington, Morgenstern, Nelson examined gov't cost estimates of EPA, OSHA + other rules
- Broad search for academic, gov't analyses…"plenty of studies out there…"
- Economic incentive rules relatively more common
- 'Accurate' defined as +/- 25% ('demanding' per OMB)
  - Total costs overestimated 14/28
  - Total costs underestimated 3/28
  - Total costs 'accurate' 11/28
  - Total costs uniformly overestimated for EI rules
  - **Importantly, overestimates = underestimates for per ton emission reduction costs**

Recent Studies (2)

- 2005: OMB expanded HMN sample by including rules from NHTSA, DOE, NRC (still l.t. 10% of total))
- Adopted same ‘accuracy’ metrics
  - Total costs overestimated 16/40
  - Total costs underestimated 12/40
  - Total costs ‘accurate’ 12/40
  - NHTSA most accurate, EPA second
- Also examined emission reductions or other metrics of (physical) benefits…found overestimates 50% more likely than underestimates, suggesting net benefits overestimated more often than not

Recent Studies (3)

- 2006: Harrington re-examined OMB results
- Found 27 other cases, including 16 add'l pesticide rules, plus 11 others from EPA (4), DOE (5), OSHA (2)
- With or without pesticide rules, the new cases were mostly accurate or underestimates of B/C ratios
- Overall, Harrington sees no bias in B/C

Recent Studies (4)

- EPA conducts five new retrospective case studies (2012), using range of methods
- ‘While…[results]…suggestive of overestimation of costs ex ante, we do not consider the current evidence to be conclusive’
- ‘Ex post analysis more challenging than anticipated’

Possible Reasons for Ex Ante-Ex Post Differences (1)

- Technological innovation
  - Cost savings typical but not universal: SO2, CFC vs occup lead exposure
  - Time delays reduce costs too
- Uncounted cost reductions achieved during regulatory review and comment periods
  - APA notice/comment introduces potential biases, e.g., strong industry representation (more than enviros)
  - Final rule provisions not always studied

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Possible Reasons for Ex Ante-Ex Post Differences (2)

- Quantity errors
  - Mis-estimation of baseline emissions (+/-)
  - Mis-estimation of other events, e.g., rail deregulation
  - Under-compliance
  - Inability to predict effectiveness (OSHA)
- Estimating maxima rather than means
  - Gov't uses old data
  - Both strategic behavior and ignorance can affect industry information
  - Laws often require 'best', e.g., BPT, BAT, etc
- Asymmetric correction of estimation errors

Analytical Issues in Ex Ante-Ex Post Comparisons (1)

- For EI rules, both P and Q readily observed ex post. Baseline hypothetical
- For non EI rules, only Q readily observed ex post. Measuring P can be challenging. Baseline hypothetical
- Even more hypotheticals for ex ante analyses
- For all rules, absence of relevant control groups seen as major barrier to developing credible baseline
- Joint cost issues

Institutional Issues in Ex Ante-Ex Post Comparisons (2)

- Business confidential information
- Paperwork Reduction Act
- Limited funding for independent researchers
- Limited incentives for agencies to self-evaluate

New RFF Research (1)

- Goals:
  - To expand literature, engage broader community
  - Employ rigorous metrics, using range of approaches
  - Avoid selection bias in rules studied
  - Focus on both costs and (physical) benefits

New RFF Research (2)

- Strategy
  - Conduct in-house studies:
    - food safety
    - industrial water pollution
    - municipal water pollution
    - air toxics
  - Focus
    - Random not convenience sample of rules
    - Publicly available micro-data
    - Measure both costs and (physical) benefits
    - Credible counterfactual using quasi-experimental approach when possible

Quasi-experimental studies

- Greenstone (2002), List et al (2003), Greenstone, List and Syverson (2011),Walker (2013), use county attainment/non-attainment as measure of regulatory stringency (TSP, SO_2, O_3, and CO)
- Various impact metrics: value of shipments, investment, employment, TFP, 'reallocative cost of job loss' (Walker)
- All use reduced form models, comparing results for attainment vs non-attainment areas
- All find losses from Clean Air Act
- Clever studies but outcomes are really measures of shifts in economic activity, not net impacts

Comparison Metrics (1)

	Retrospective Outcomes	Comparison with Prospective Analyses	Baseline		
			Before-After	Credible Counterfactual	Natural Experiment
Air Toxics Regulations	Toxic emissions reduction (by selected constituent)	Yes	Yes	Yes	No
	Toxic emissions reduction aggregated by toxicity	Yes	Yes	Yes	No
Clean Water Act State Revolving Fund (conventional pollutants)	Effluent reduction by selected constituent	Yes	Yes	Yes	Yes
	Flow	Yes	Yes	Yes	Yes
	Specified water quality measures	Yes	No	Yes	Yes
	Compliance cost	Yes	Yes	Yes	Yes

Comparison Metrics (2)

	Retrospective Outcomes	Comparison with Prospective Analyses	Baseline		
			Before-After	Credible Counterfactual	Natural Experiment
Foodborne Illness & Food Safety Regulations	Cases of illness by selected pathogens (lab confirmed)	Yes	Yes	Yes	No
	Total cases of illness by selected pathogens (not lab confirmed, based on Monte Carlo analysis)	Yes	Yes	Yes	No
Industrial Toxic Discharges and Effluent Guidelines	Effluent reduction by selected constituent	Yes	Yes	Yes	Yes
	Flow (gallons per year)	Yes	Yes	Yes	Yes
	Compliance cost	Yes	Yes	Yes	No

Example: Industrial Water Pollution

- Future rules for coal bed methane, shale gas extraction, dental amalgam
- New analysis to examine outcomes of all 24 existing rules, including conventionals, toxics over 30 yrs
- Key metrics
  - Historical pattern of discharges
  - Difference in historical patterns for 14 industries re-regulated vs 10 not tightened (baseline issues)
  - Ex ante-ex post comparisons in both costs and discharges using both plant-level Census info and discharge monitoring data

New RFF Research (3)

- Support non-RFF researchers via competitive process
  - Renewable Fuel Standard (Aaron Smith, Cynthia Lin, Gabriel Lade)
  - Phase II SO2 Reductions (Maureen Cropper, Nick Muller, Ron Chan, Benjamin Chupp)
  - Appliance Efficiency Standards (Margaret Taylor, Anna Spurlock)
  - Endangered Species (Eric Nelson, Derric Pennington, John Withey, Joshua Lawler)

Thank you

Early Literature

- 1980: PHB, K expenditures for EPA rules based on sectoral data
  - 4/5 overestimates (vs industry data)
  - 3/5 overestimates (vs GPA data)
- 1995: OTA, ‘total costs’ of OSHA rules
  - 8/8 overestimated (industry and EPA data)
- 1997: Hodges, total costs of EPA and OSHA rules
  - 12/12 overestimated, (industry and EPA data) 11 of them more than double

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Recent Studies (5)

- SAB recommendations:
  - EPA to develop conceptual framework to use consistently in case studies
  - EPA to consider ways to build routine effort to organize ex post data collection
  - EPA to do more, but shorter qualitative analyses of randomly selected regs, focusing more on qualitative factors
  - EPA to focus on drivers influencing accuracy of ex ante, rather than magnitude of differences ex ante v ex post