Costs, Benefits, and Incidence of Environmental Policy in the Twenty First Century

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AERE Summer Conference Keynote

Short History

- **1960s: environmental concerns**
  - Rachel Carson's *Silent Spring*
  - 'Earthrise' photo of Earth from space
  - Oil spill off Santa Barbara
  - Fire on Cuyahoga River
  - Limits to Growth report: pollution to increase exponentially

- **1970s policy responses**
  - Environmental Protection Agency
  - Clean Air Act
  - Clean Water Act
  - Safe Drinking Water Act
  - National Environmental Policy Act

Goals today

- **Four hypotheses describing last 50 years.**
  - H1 (trends): Air/water pollution declining, greenhouse gases not
  - H2 (causes): Environmental policy caused much of those declines
  - H3 (consequences): Gains from air, drinking water; surface water unclear
  - H4 (incidence): Market-based, command-and-control: comparable incidence
- **Hypotheses, not theses (H, not T)**

Goals today

- **Highlight recent advances on classic questions.**
  - Administrative data
  - Statistical cost-benefit
  - Understudied policies
  - Pollution transport
  - Micro-macro models
  - Incidence focus
- **Frame a common research agenda**

Notes

- Imbalanced coverage (papers, countries)
- Mostly skip natural resources

Overview

- Intro
- **H1 (trends): Air/water pollution declining, greenhouse gases not**
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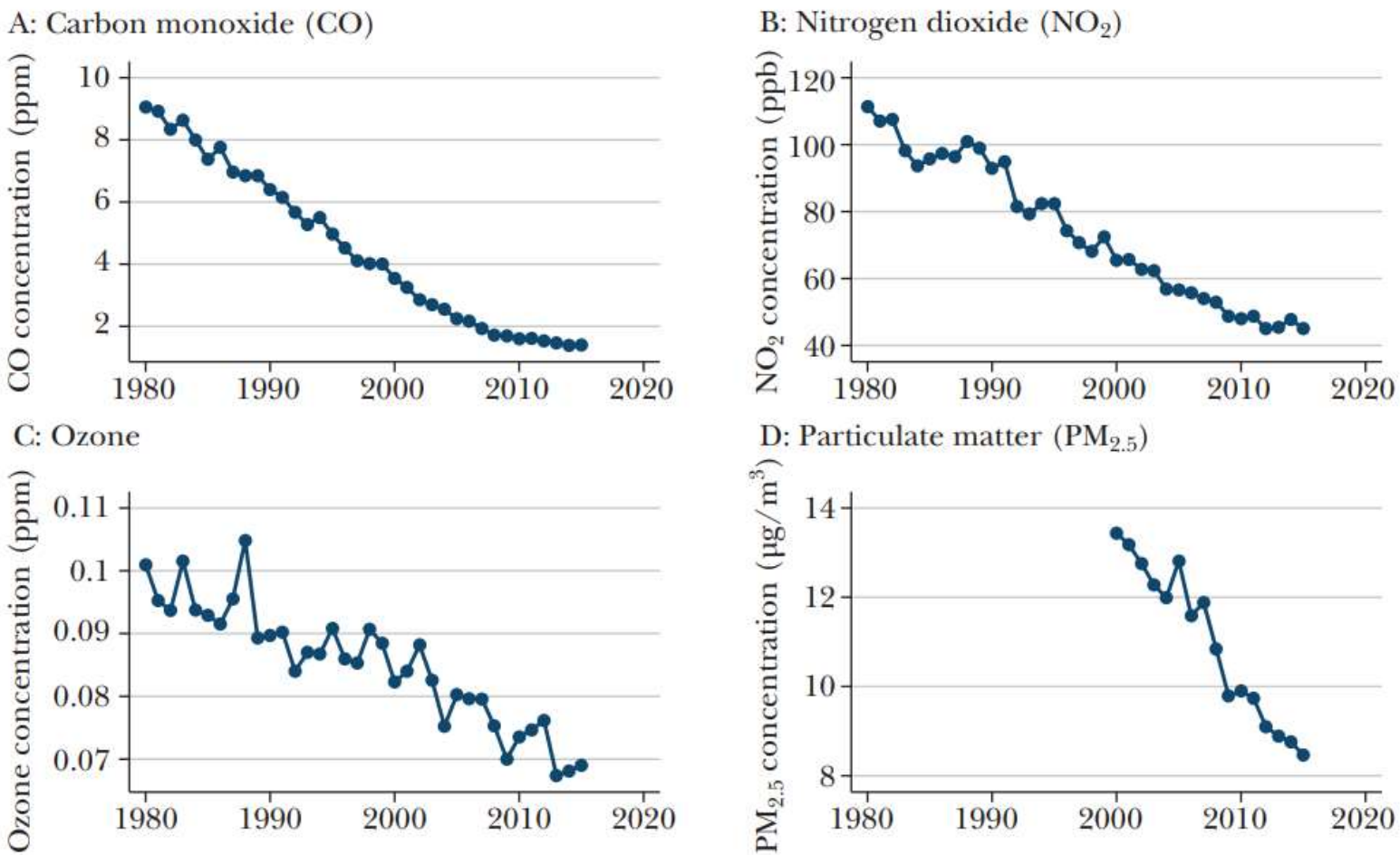
- Conclusions

H1 (trends)

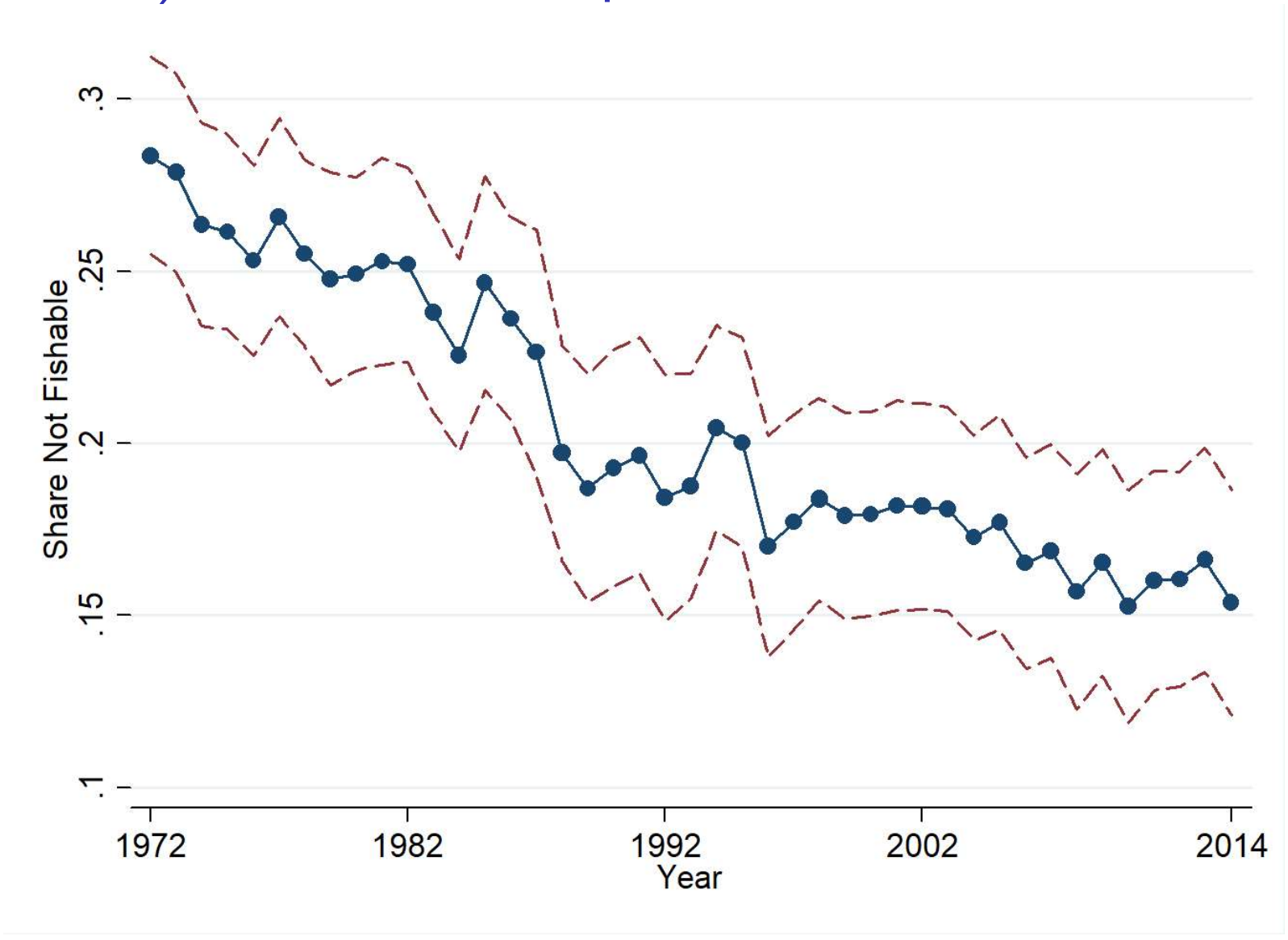
- Is this economics?
  - Measuring environmental goods necessary to analyze preferences and policy

H1 (trends): Air pollution



Source: Currie and Walker (2019 JEP, "What Do Economists Have to Say about the Clean Air Act...")

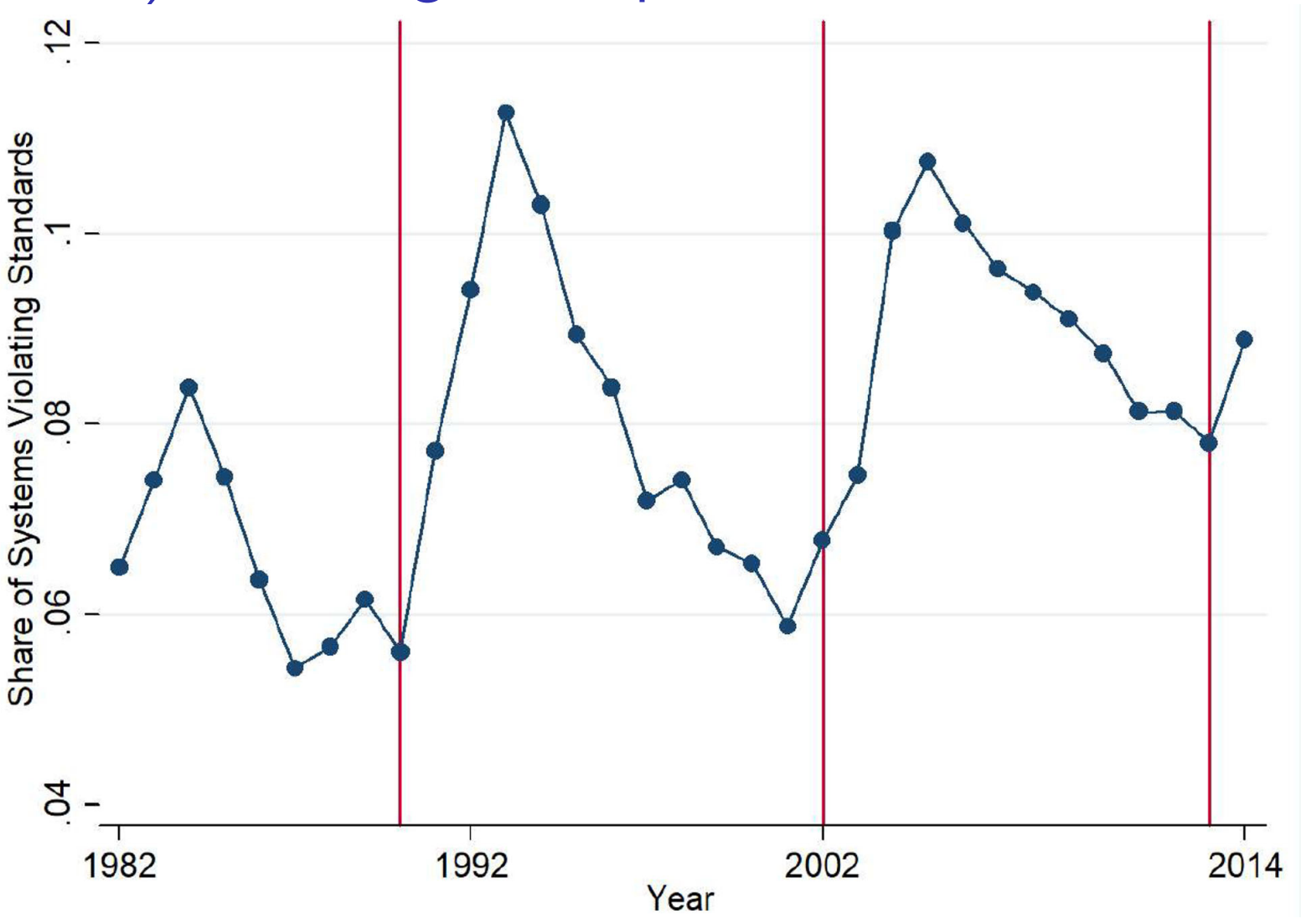
H1 (trends): Surface water pollution



Advance: administrative data

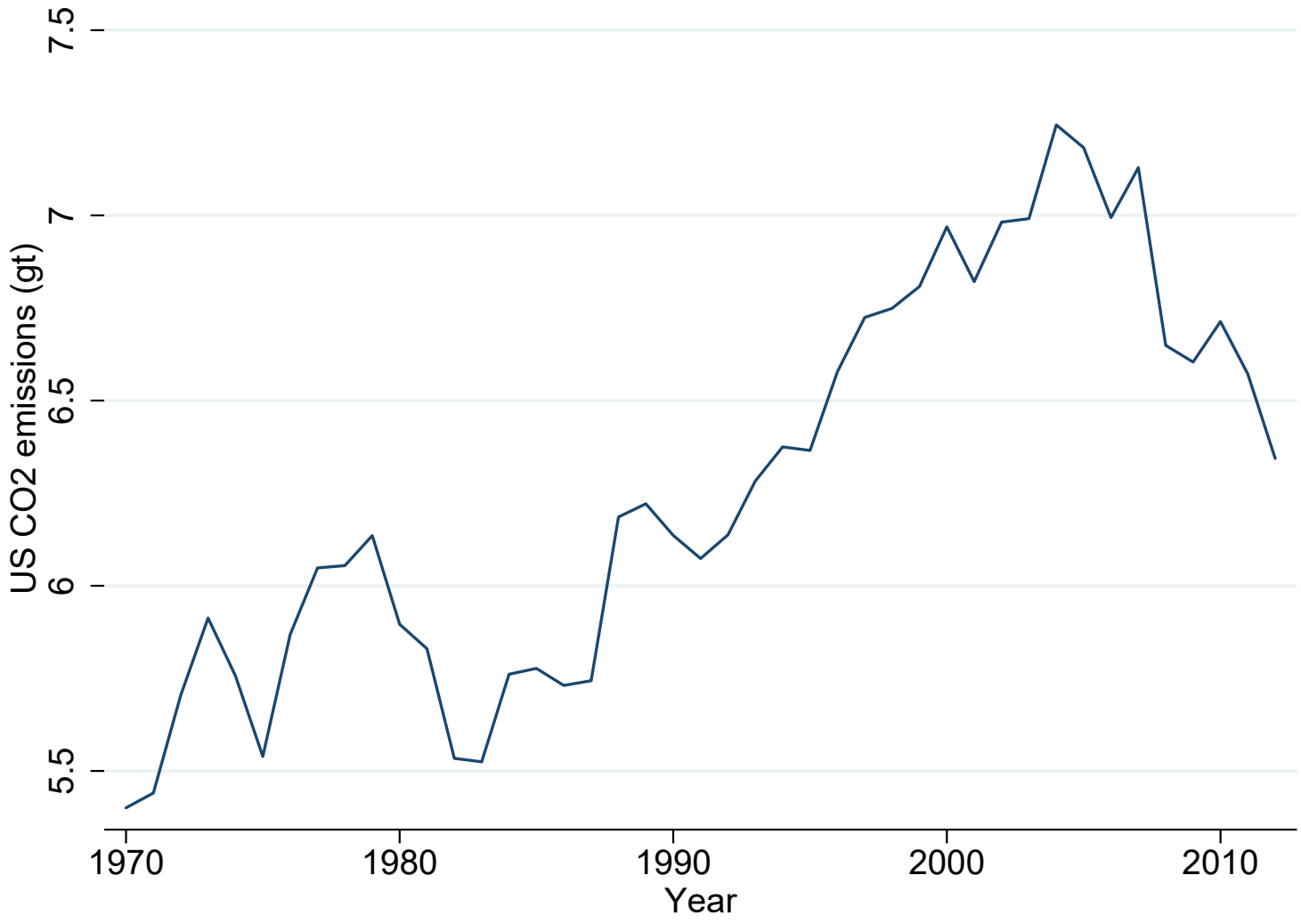
Source: Keiser and Shapiro (2019 JEP, "Burning Waters to Crystal Springs")

H1 (trends): Drinking water pollution



Source: Allaire, Wu, and Lall (2018 PNAS, "National Trends in Drinking Water Violations").

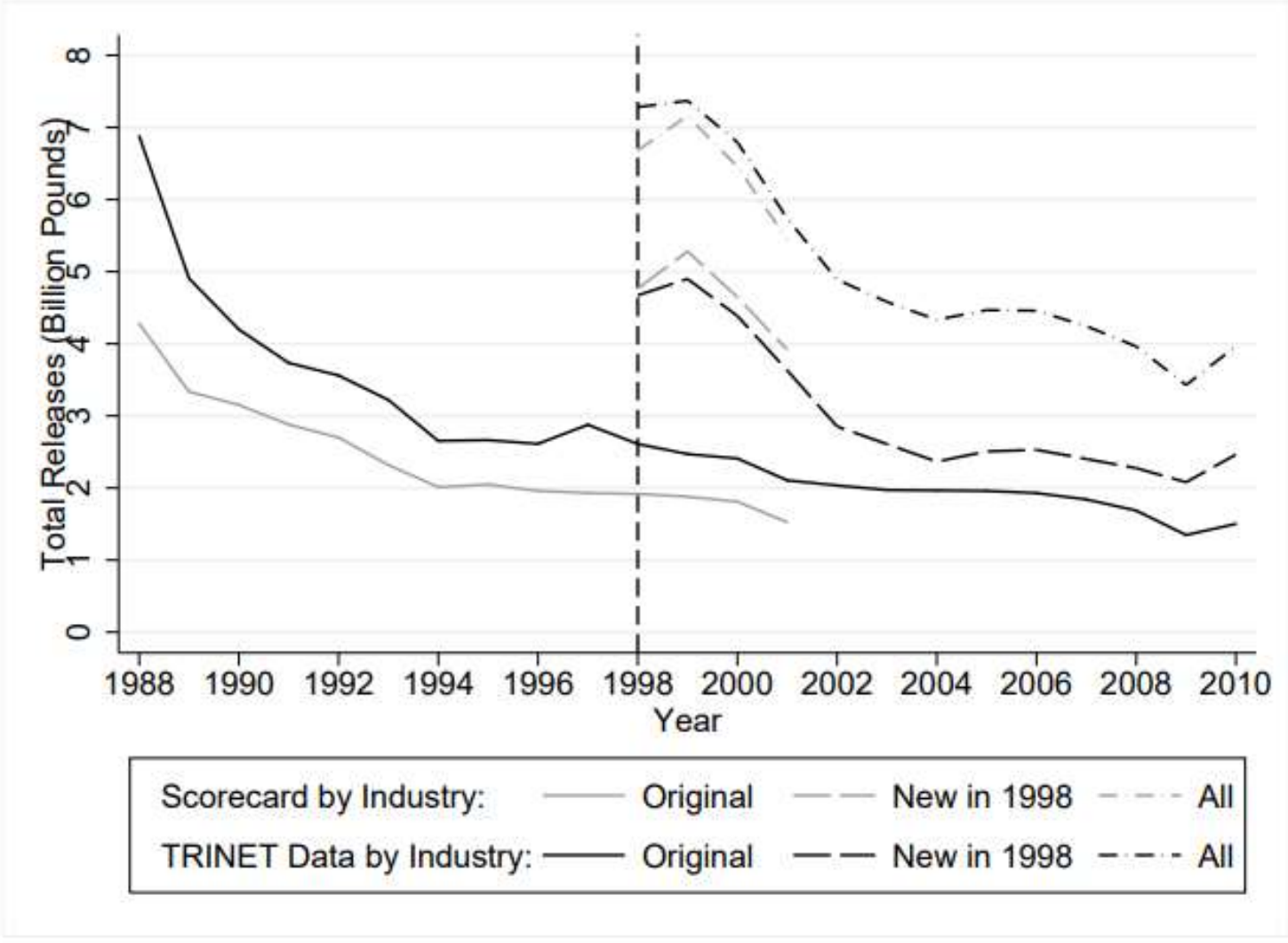
H1 (trends): CO2 emissions



Source: EDGARv4.2 via World Bank databank.

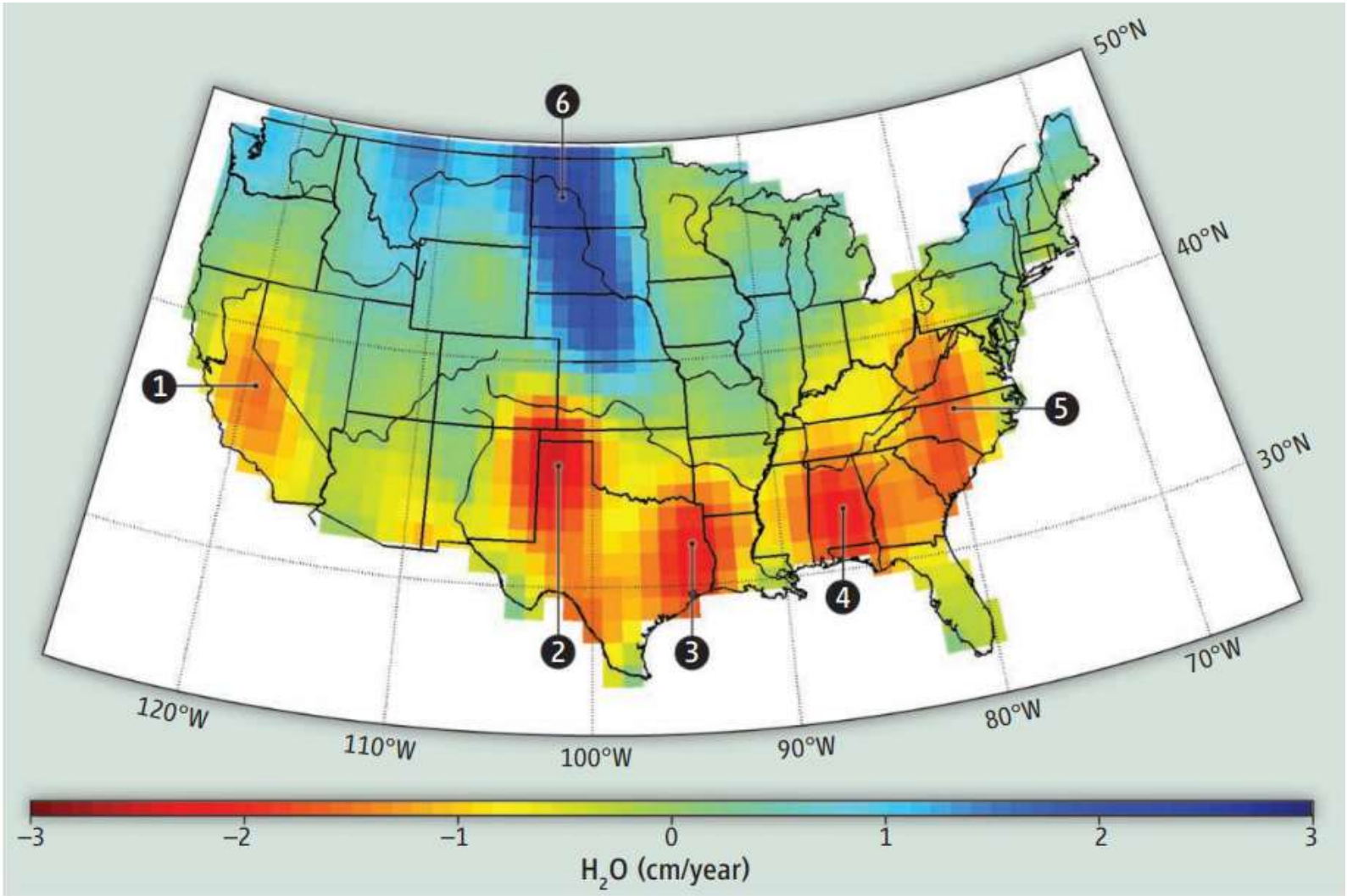
H1 (trends): Toxic pollution?

Figure 2: Total TRI Releases 1988-2010



Source: Schlenker and Scorse (2017, "Being a Top 10 Worst Polluter").

H1 (trends): Groundwater



Source: Famiglietti and Rodell (2013 Science, "Water in the balance").

H1 (trends): Synopsis

- Synopsis: decent evidence
- But, many pollutants not here:
  - Toxic air, water, land
  - Unregulated drinking water pollutants
  - Radioactivity
  - Other resources

H1 (trends): Synopsis

Why these patterns?

- One interpretation: air/water have salient local effects on well-being
- Common pool resources including GHG less salient; diffuse benefits
- H2 tries to answer this question

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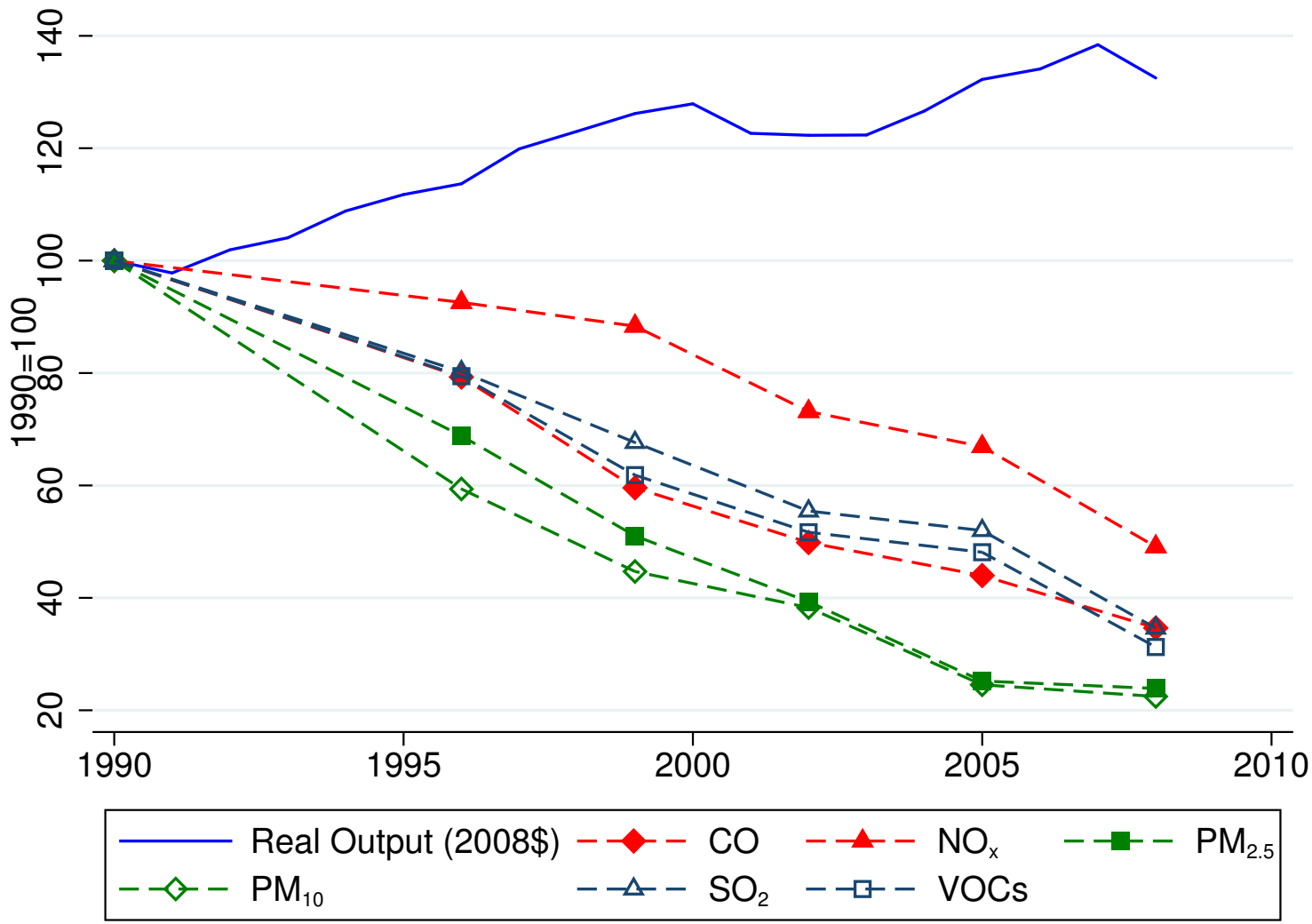
H2 (causes): General

- Straw man?
- No, other possible causes:
  - Trade/outsourcing
  - Productivity growth/innovation
  - Sectoral shifts ("structural transformation")
  - Changing consumption preferences (warm glow or cross-good)
  - Improved or changed property rights, Coasian bargaining
- Micro-macro
  - Micro approach: analyze one policy in isolation
  - Micro-macro approach: analyze a policy in context of time series
  - Micro-macro methods: general equilibrium, diff-in-diff, ...

H2 (causes): Manufacturing air pollution



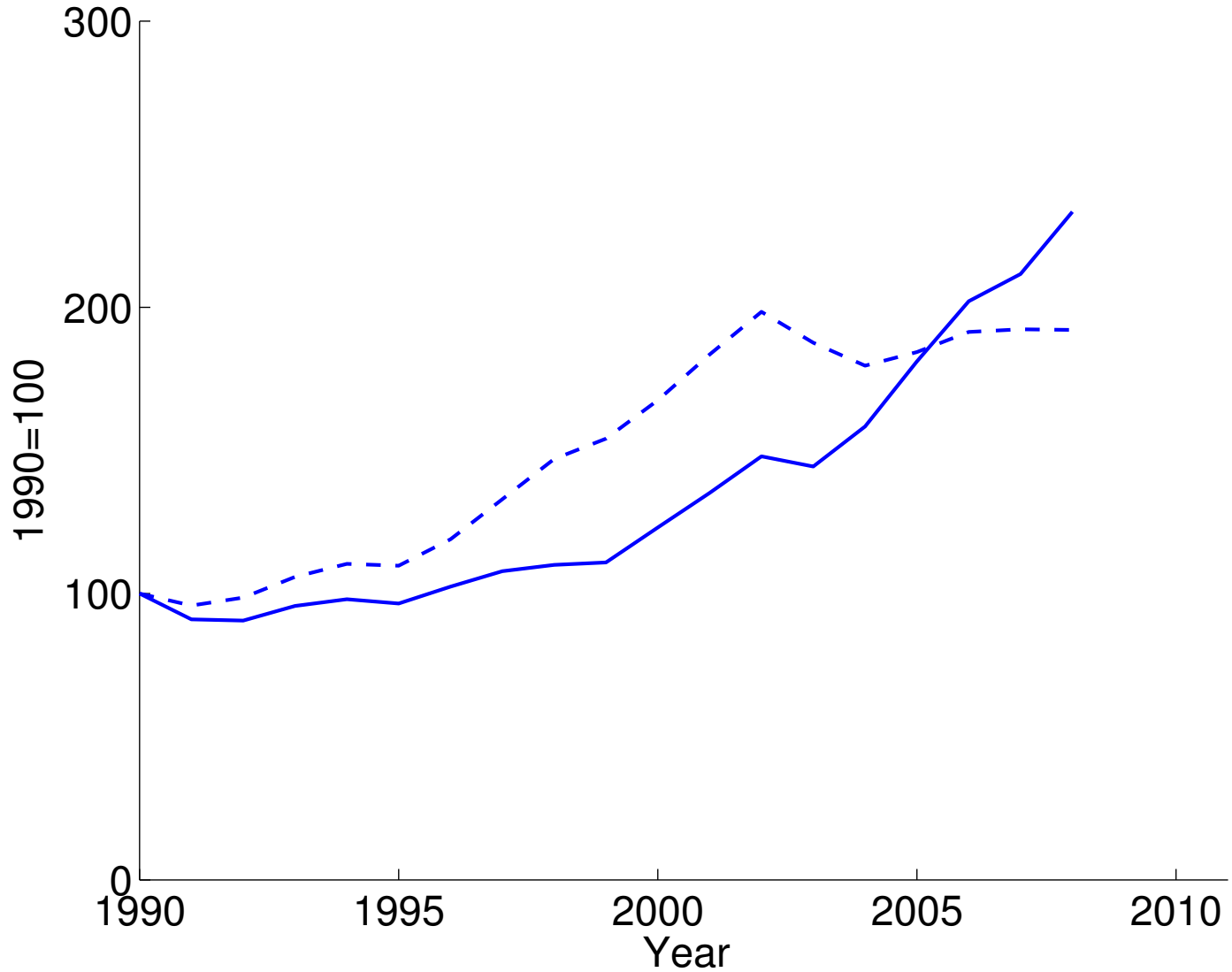
Note: For manufacturing only. Source: Shapiro and Walker (2018 AER, "Why is Pollution from U.S. Manufacturing Declining?"). Advance: micro-macro.

H2 (causes): Manufacturing air pollution

Air pollution from manufacturing. Shapiro and Walker (2018 AER) general approach:

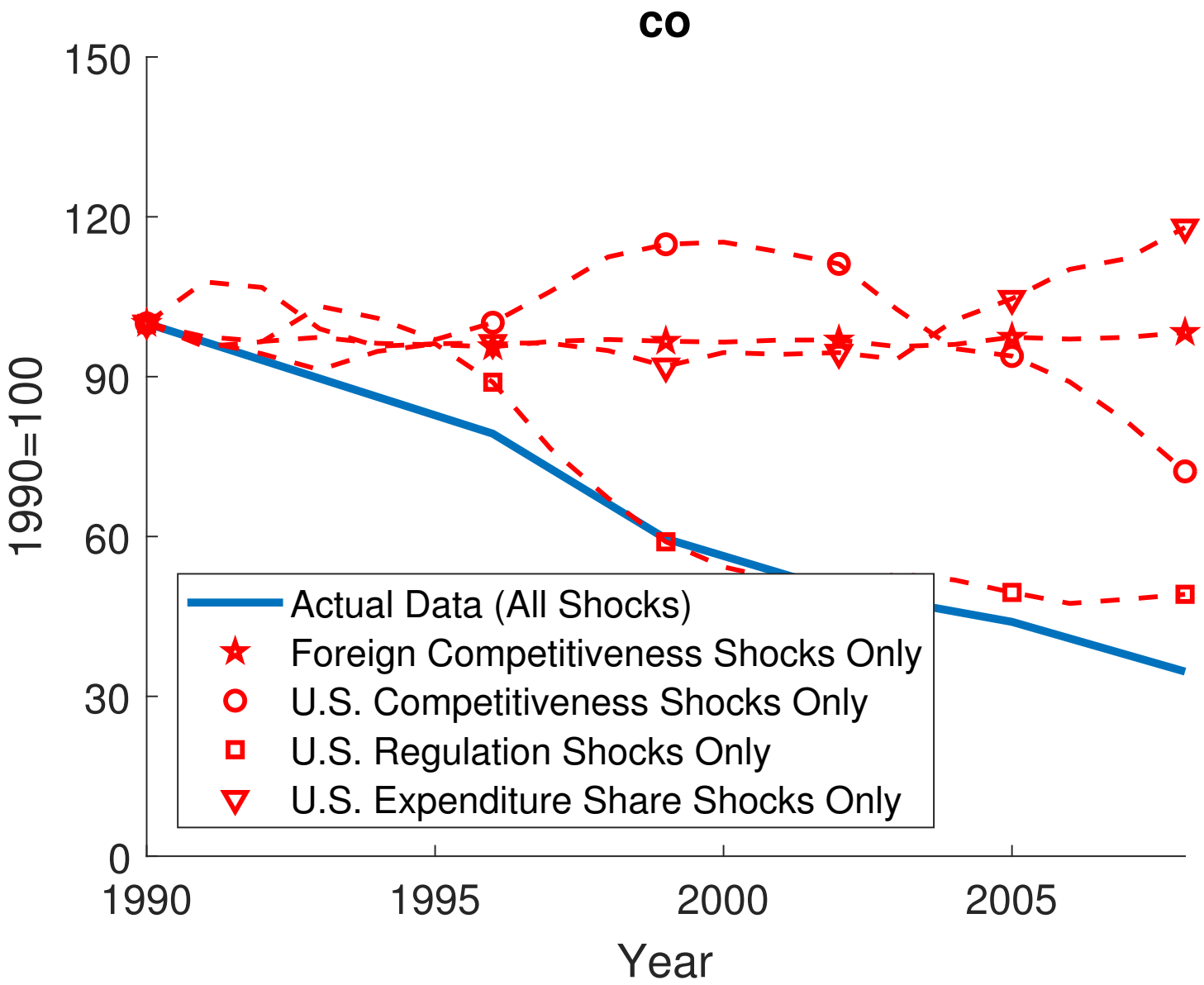
- Firm-level model of trade and environment
  - Representative consumer: CES utility across varieties
  - Firms: Heterogeneous, monopolistic competition, environmental policy
  - Pollution: Cobb-Douglas
  - Markets clear
- Estimate parameters
  - Pollution-output FOC from microdata, using Clean Air Act quasi-experiment
- Find values of trade costs, environmental policy, productivity to rationalize historical aggregate data
- Counterfactual: how would pollution have changed if paths of trade costs / environmental policy / productivity had been different?

H2 (causes): Manufacturing air pollution



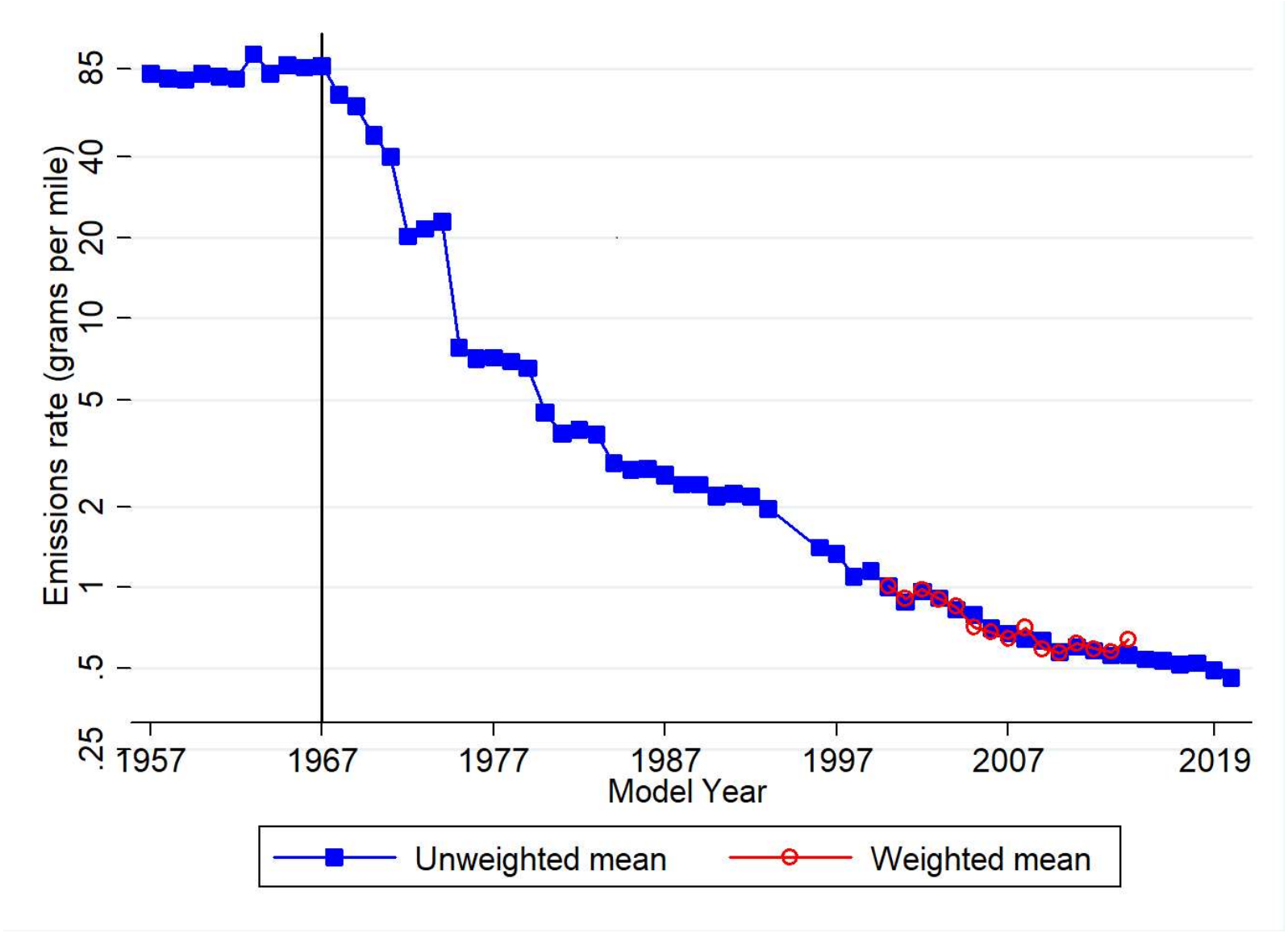
Note: Solid line=dirty industries, dashed line=clean industries. For manufacturing NOx only. Source: Shapiro and Walker (2018 AER).

H2 (causes): Manufacturing air pollution



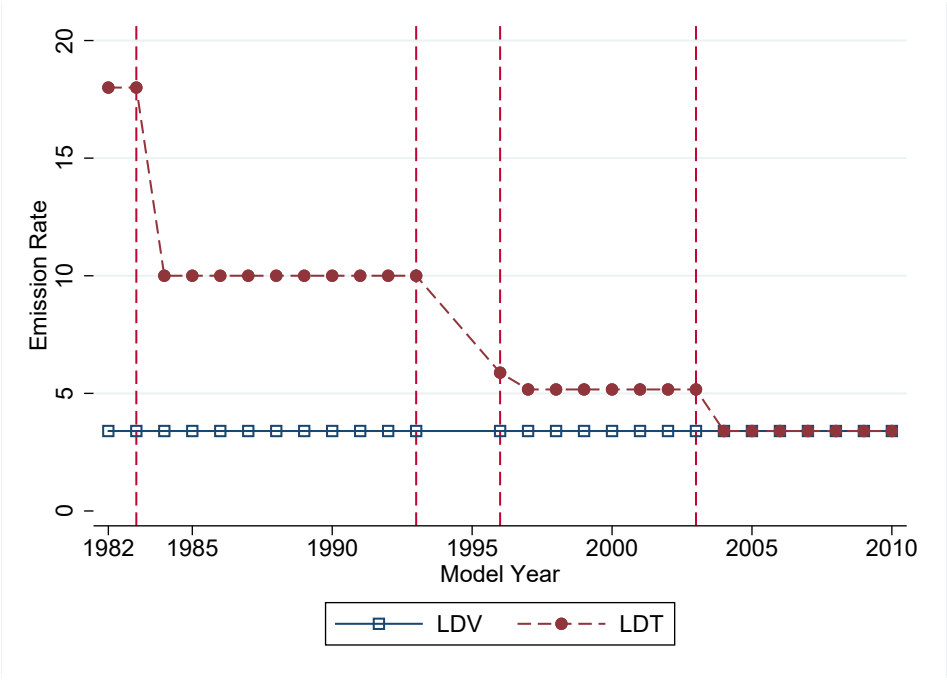
Note: For manufacturing only. Source: Shapiro and Walker (2018 AER)

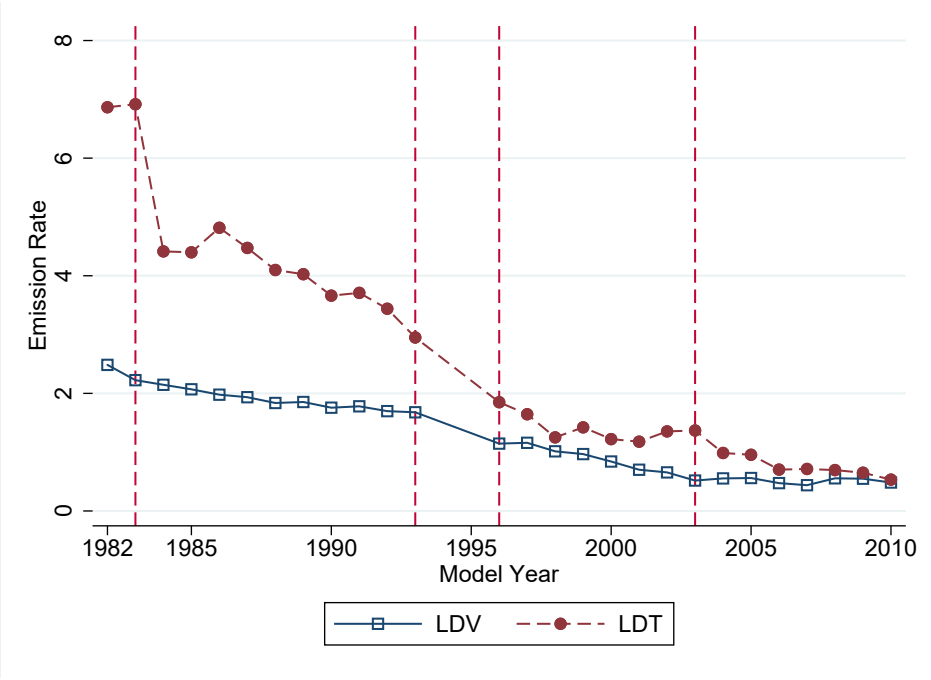
H2 (causes): Passenger vehicle air pollution



Source: Jacobsen et al. (2021, "Regulating Untaxable Externalities"). Advance: administrative data, overlooked policies.

H2 (causes): Passenger vehicle air pollution





Source: Jacobsen et al (2021).

H2 (causes): Other pollutants

- Surface water?
- Drinking water?
- Toxic pollution?
- Resources?

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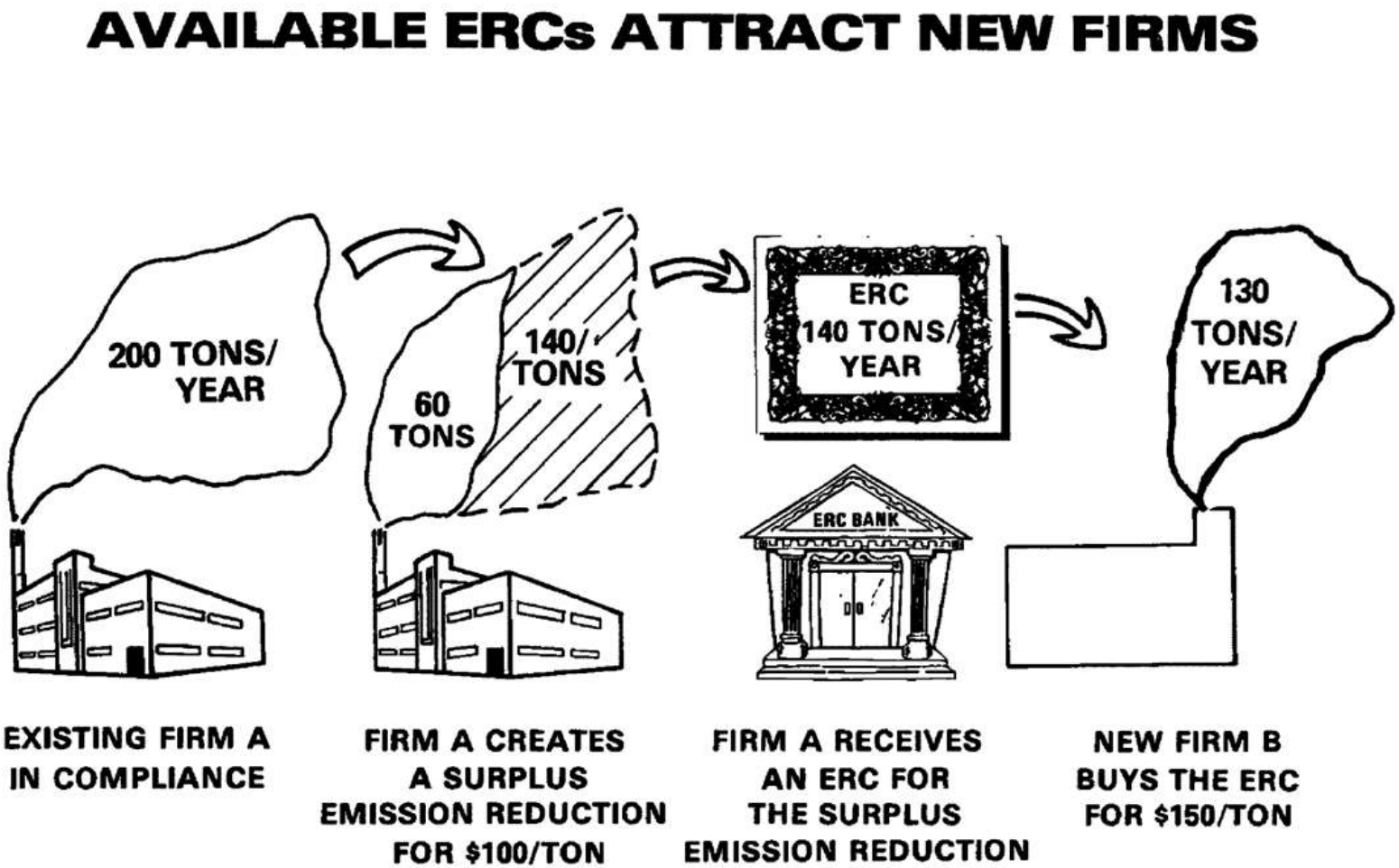
H3 (consequences): Air pollution



Source: Shapiro and Walker (2020, "Is Air Pollution Regulation Too Stringent?") Advance: understudied policies

H3 (consequences): Air pollution

The State of Texas

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Certificate Number:

2697

Number of Credits:

21.8 tpy VOC

Emission Reduction Credit Certificate

This certifies that
Scan-Pac Mfg., Inc.
31502 Sugar Bend Drive
Magnolia, Texas 77355

is the owner of 21.8 tons per year of volatile organic compound (VOC) emission reduction credits established under the laws of the State of Texas, transferable only on the books of the Texas Commission on Environmental Quality, by the holder hereof in person or by duly authorized Attorney, upon surrender of this certificate.

The owner of this certificate is entitled to utilize the emission credits evidenced herein for all purpose authorized by the laws and regulations of the State of Texas and is subject to all limitations prescribed by the laws and regulations of the State of Texas. This certificate may be used for credit in the following counties:

Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller

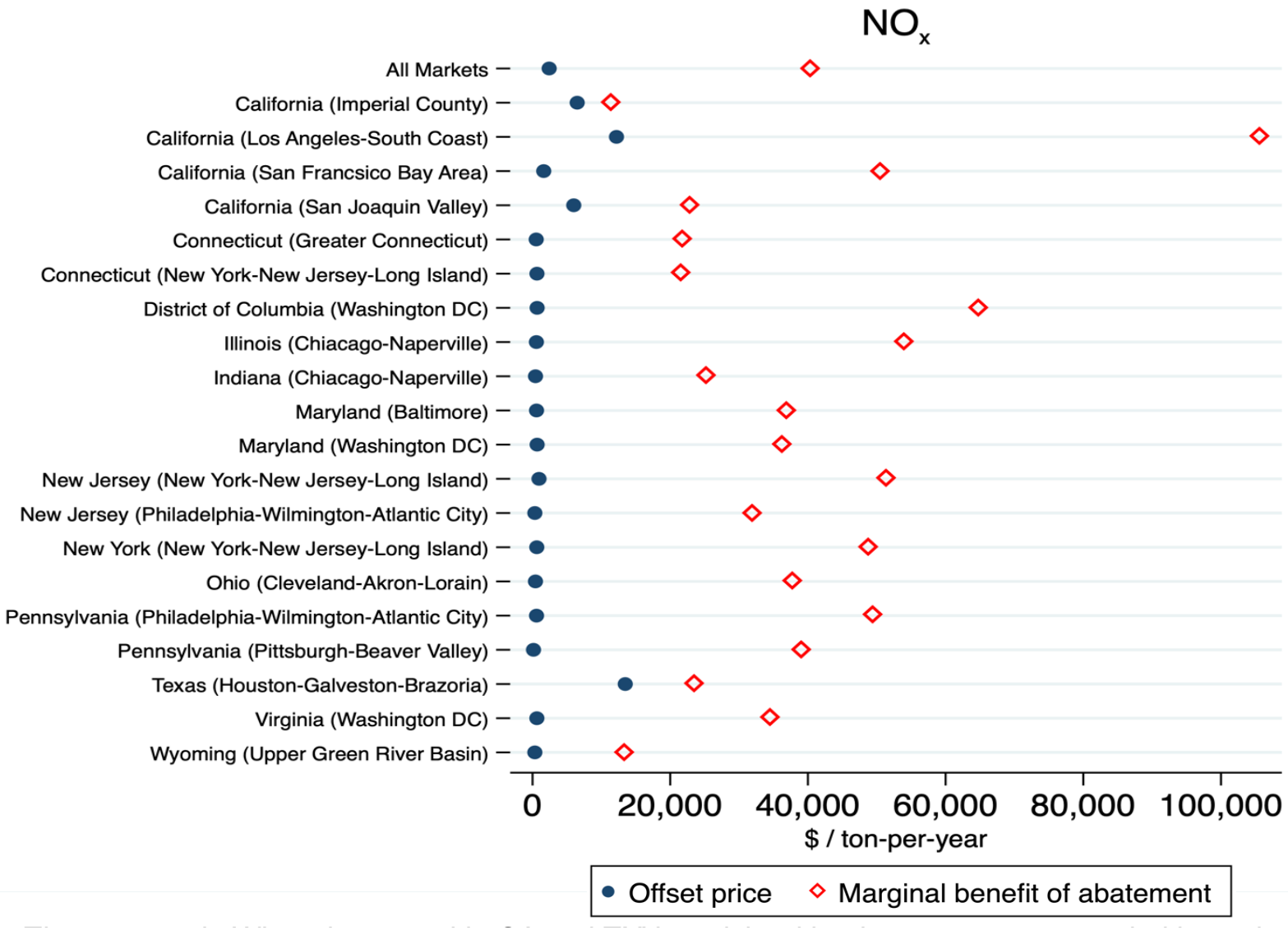
Effective Date of the Emission Reduction: May 15, 2013

Regulated Entity Number: RN100219989

Generator Certificate: Original

County of Generation: Montgomery

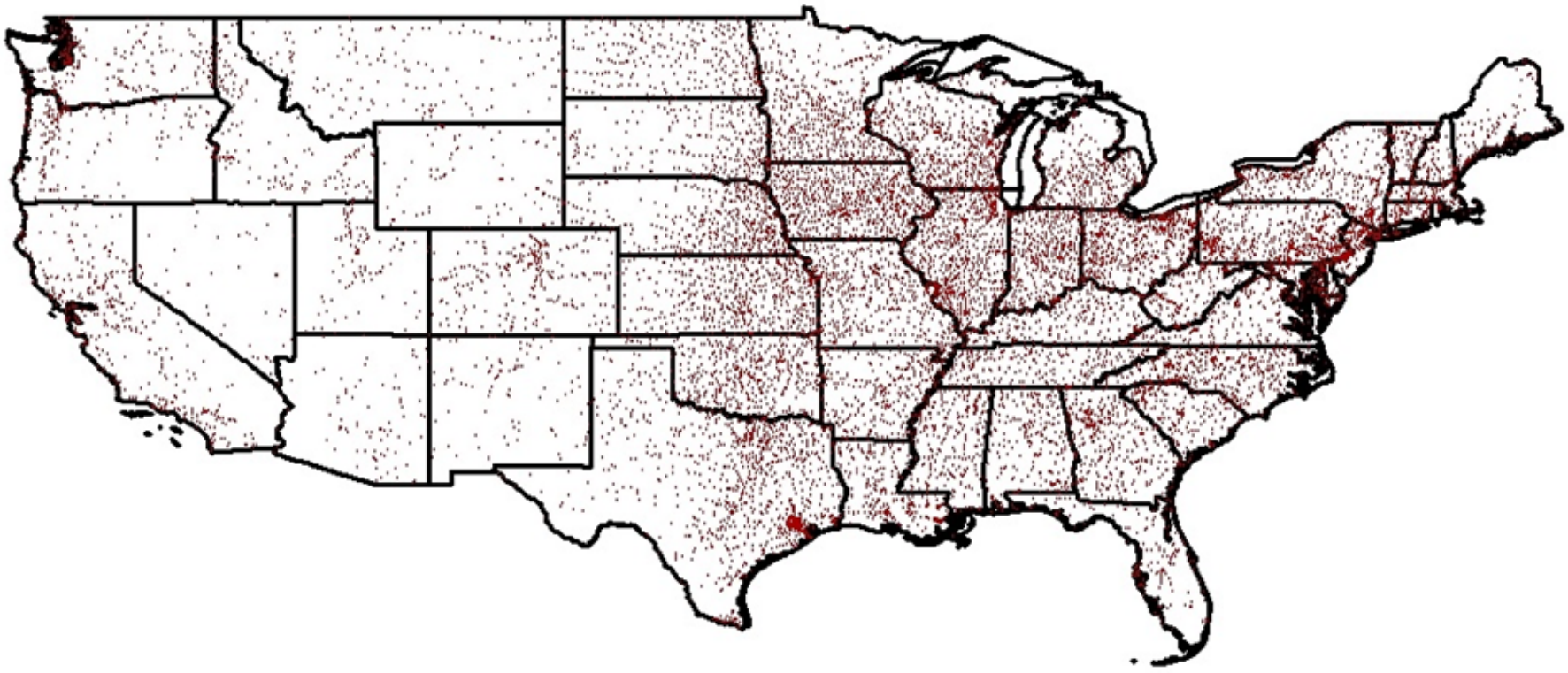
H3 (consequences): Air pollution



H3 (consequences): Surface water

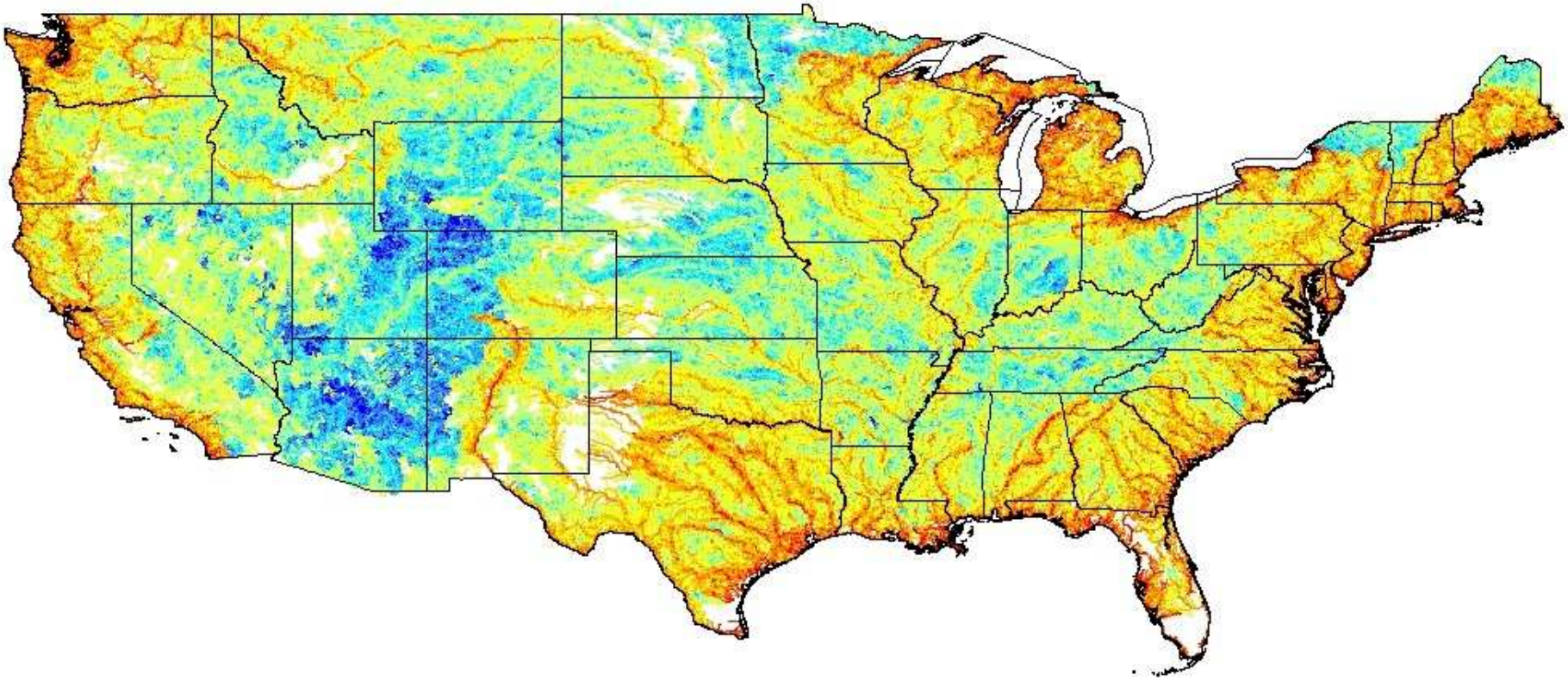
Source: Keiser and Shapiro (2019 QJE, "Consequences of the Clean Water Act"). Advance: understudied policies

H3 (consequences): Surface water



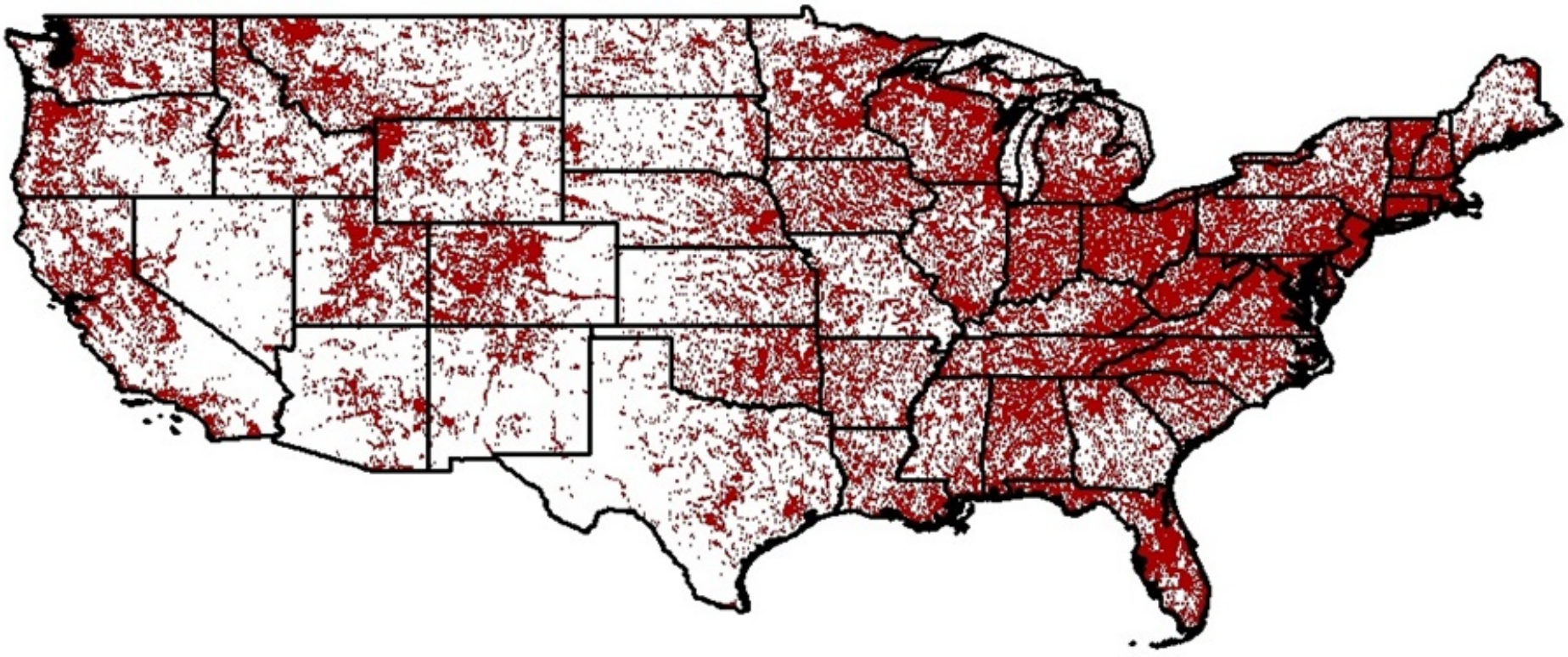
Advance: administrative data

H3 (consequences): Surface water

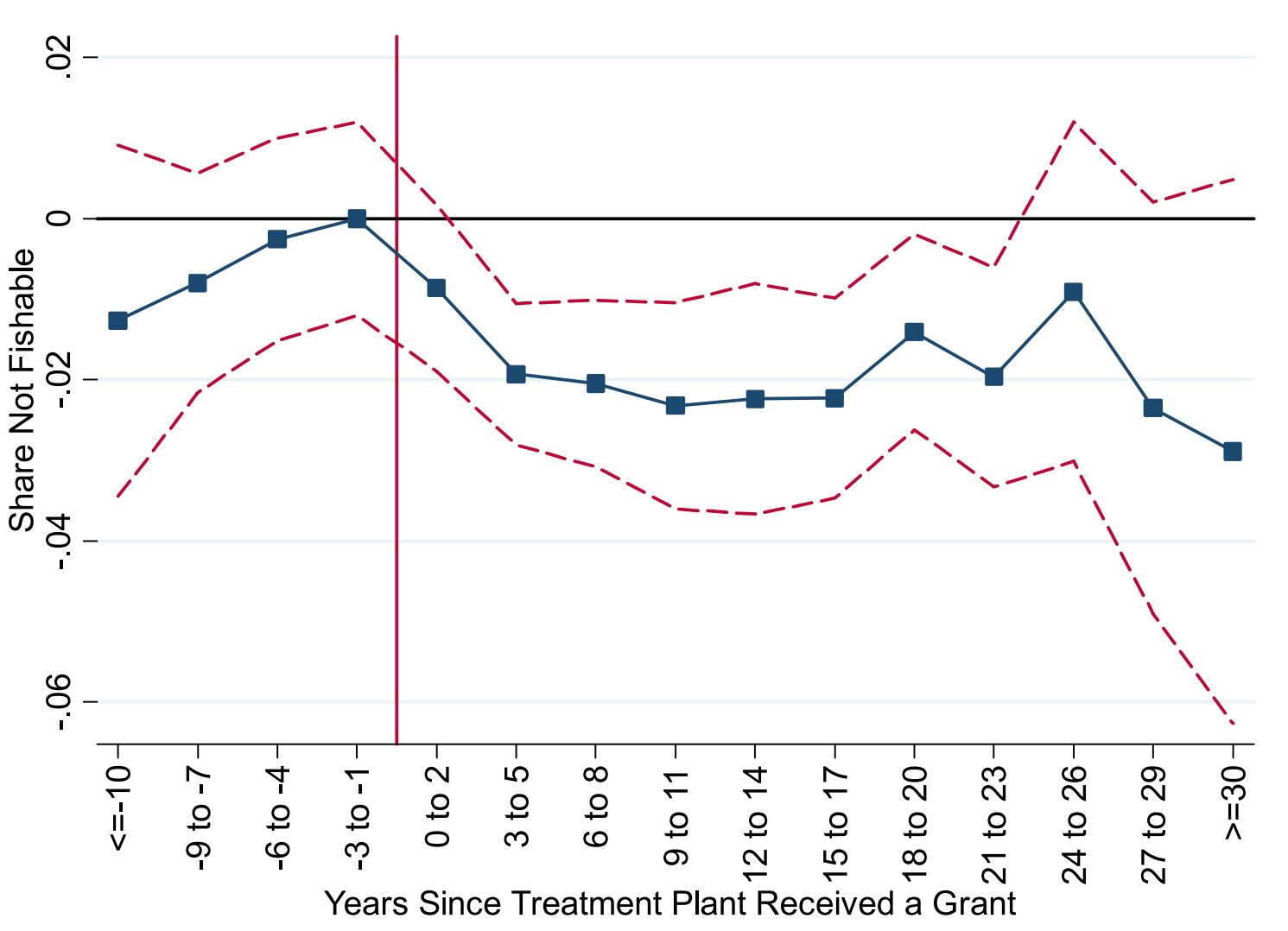


Advance: pollution transport

H3 (consequences): Surface water



H3 (consequences): Surface water



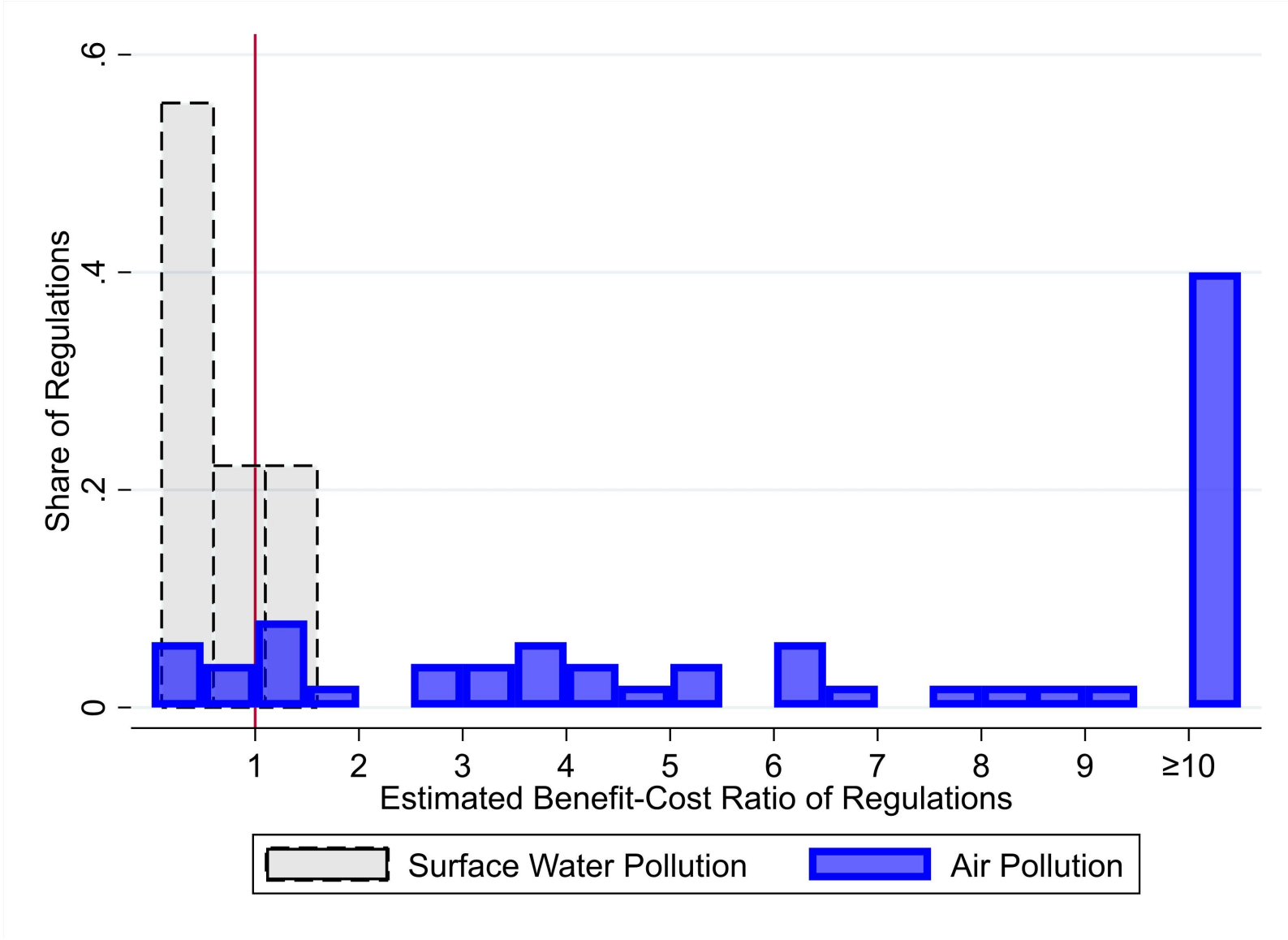
H3 (consequences): Surface water

	(1)	(2)	(3)	(4)
Ratio: Change in Home	0.06	0.26	0.22	0.24
Values / Costs	(0.03)	(0.36)	(0.36)	(0.41)
p-value: Ratio = 0	[0.05]	[0.46]	[0.55]	[0.56]
p-Value: Ratio = 1	[0.00]	[0.04]	[0.03]	[0.06]
Change in Value of Housing ($Bn)	15.92	89.25	73.7	91.97
Costs ($Bn)				
Capital: Fed.	86.24	102.26	102.26	114.16
Capital: Local	35.81	41.81	41.81	48.00
Variable	166.1	197.36	197.36	222.81
Total	288.15	341.44	341.44	384.97
Max Distance Homes to River (Miles)	1	25	25	25
Include Rental Units			Yes	Yes
Include Non-Metro Areas				Yes

H3 (consequences): Surface water

- Cleaning surface water improved health, though not large relative to costs (Flynn and Marcus 2021)
- Recreational demand value may exceed hedonic estimates (Kuwayama, Olmstead, and Zheng 2020)

H3 (consequences): Air v. Surface water



Source: Keiser and Shapiro (2019 JEP).

H3 (consequences): Drinking water

- Large benefits from early 20th century chlorination, filtration (Cutler & Miller 2005 Demography; Alsan and Goldin 2019 JPE)
- Evidence of contemporary healthy benefits (Austin 2019; Marcus 2021 AEJ:AE)

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- Conclusions

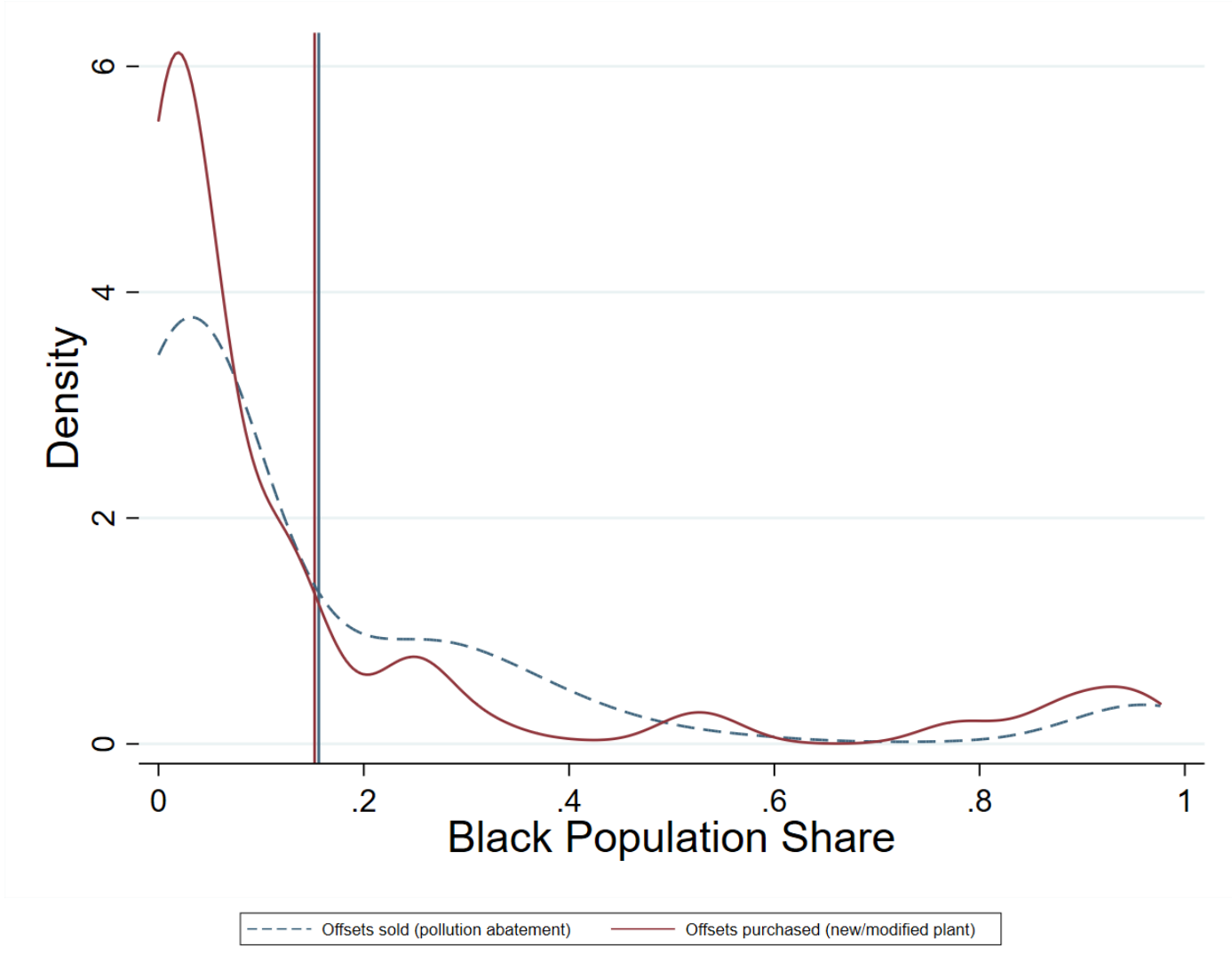
H4 (incidence): General

- Environmental markets (cap and trade, pollution taxes, hybrids)
  - Maximize pollution reduction for given cost (cost effective)
  - Revenues can decrease other taxes or increase public investment
  - Alternative to "command and control" standards
- Environmental justice
  - Inclusive, participatory, respectful, fair treatment of all groups
  - Equitable environment
  - Concern: higher pollution levels in low-income, communities of color
- Environmental justice and caution about environmental markets
  - Markets do not guarantee a distribution of pollution
  - Washington's 1631 Carbon Tax, California's cap-and-trade renewal
  - Mary Nichols appointment to EPA

H4 (incidence): General

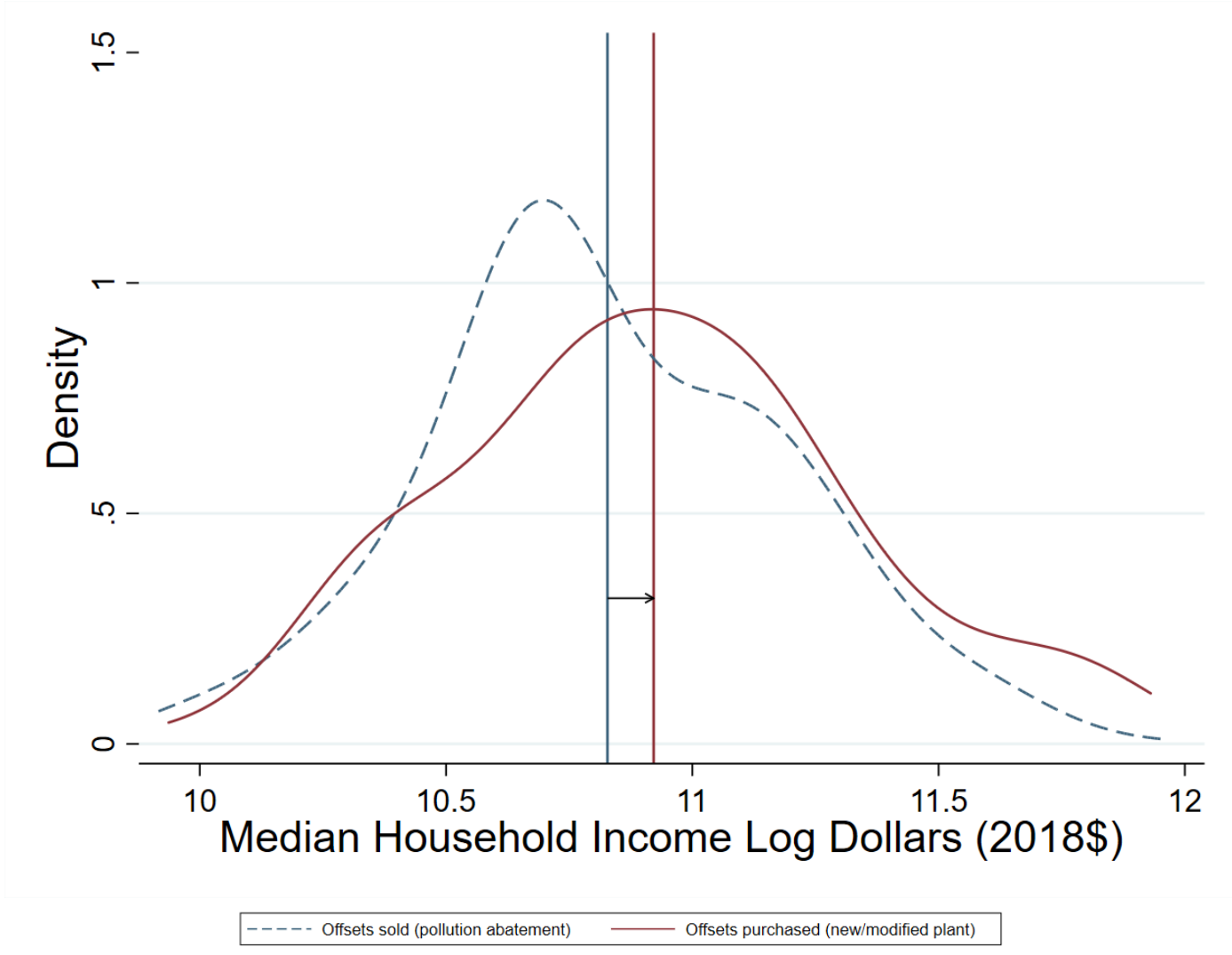
- Southern California NOx (Fowlie, Holland, Mansur 2012 AER)
  - RECLAIM market decreased NOx emissions 20 percent
  - Similar emissions for different demographics
- Southern California NOx (Grainger and Ruangmas (2018 ERE)
  - Look at ambient (via Hysplit), not just emissions
  - Some evidence high-income, white communities benefit more
- California CO2 (Hernandez-Cortes & Meng 2021)
  - Also look at ambient (via Hysplit), not just emissions
  - AB 32 decreased pollution gaps between high-pollution ("disadvantaged") and other communities
- Advances: incidence; pollution transport

H4 (incidence): Air offset markets



Source: Shapiro and Walker (2021 AEAPP, "Where is Pollution Moving?").

H4 (incidence): Air offset markets



Source: Shapiro and Walker (AEAPP 2021).

Overview

- Intro
- H1: Air/water pollution declining, greenhouse gases not
- H2: Environmental policy caused much of those declines
- H3: Large welfare gains from air, drinking water; surface water less clear
- H4: Market-based, command-and-control: comparable incidence
- **Conclusions**

Conclusions

- **Four hypotheses describing last 50 years.**
  - H1 (trends): Air/water pollution declining, greenhouse gases not
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- **Recent advances on classic questions.**
  - Administrative data
  - Statistical cost-benefit
  - Understudied policies
  - Pollution transport
  - Micro-macro models
  - Incidence focus

Conclusions

Two open questions:

- answers for natural resources?
- political economy: why greenhouse gases so different?