Environmental Justice? Activist Judges, Water Quality and Infant Mortality in India

Sandeep Bhupatiraju
World Bank

Daniel Chen
DeJure, IAST, TSE

Shareen Joshi
Georgetown University

Peter Neis
TSE

Shashank Singh
University of Chicago

September 12, 2023

Motivation and Overview

Polluted water kills more than 1 million people a year (WHO and UNICEF, 2021)

Executive and legislative policies inconsistently effective

Courts have an increasingly active role in environmental conservation

Motivation and Overview

Polluted water kills more than 1 million people a year (WHO and UNICEF, 2021)

Executive and legislative policies inconsistently effective

Courts have an increasingly active role in environmental conservation

This paper: Can judges enforce environmental justice?

- India: high toxicity, high water stress, ineffective policies, active courts ▸ Indian Context

Motivation and Overview

Polluted water kills more than 1 million people a year (WHO and UNICEF, 2021)

Executive and legislative policies inconsistently effective

Courts have an increasingly active role in environmental conservation

This paper: Can judges enforce environmental justice?

- India: high toxicity, high water stress, ineffective policies, active courts ▸ Indian Context

Findings:

1. Pro-environmental rulings lead to **temporary reductions** in peak toxicity levels
2. But **no** decrease in neonatal and infant mortality rates in subsequent months
3. Several years post-decision, pollution and mortality rates **exceed** pre-decision levels

Motivation and Overview

Polluted water kills more than 1 million people a year (WHO and UNICEF, 2021)

Executive and legislative policies inconsistently effective

Courts have an increasingly active role in environmental conservation

This paper: Can judges enforce environmental justice?

- India: high toxicity, high water stress, ineffective policies, active courts ▸ Indian Context

Findings:

1. Pro-environmental rulings lead to **temporary reductions** in peak toxicity levels
2. But **no** decrease in neonatal and infant mortality rates in subsequent months
3. Several years post-decision, pollution and mortality rates **exceed** pre-decision levels

⇒ Potentially limited effects of judicial environmental policies in high pollution settings such as India.

Estimate Impact of Green Rulings on River Pollution and Infant Mortality

Original dataset merged at the district-year level, 1987-2019

- New dataset of 978 pollution cases from Indian courts (SC, HCs and Green Tribunal)
- New dataset on river pollution indicators (CPCB and WRIS)
- Demographic data (infant mortality) from population surveys (NFHS2 and NFHS4)

Estimate Impact of Green Rulings on River Pollution and Infant Mortality

Original dataset merged at the district-year level, 1987-2019

- New dataset of 978 pollution cases from Indian courts (SC, HCs and Green Tribunal)
- New dataset on river pollution indicators (CPCB and WRIS)
- Demographic data (infant mortality) from population surveys (NFHS2 and NFHS4)

Instrumental variable framework

- Green judgments likely to be endogenous
- Instrument: Writing style of judges (in past cases)

Estimate Impact of Green Rulings on River Pollution and Infant Mortality

Original dataset merged at the district-year level, 1987-2019

- New dataset of 978 pollution cases from Indian courts (SC, HCs and Green Tribunal)
- New dataset on river pollution indicators (CPCB and WRIS)
- Demographic data (infant mortality) from population surveys (NFHS2 and NFHS4)

Instrumental variable framework

- Green judgments likely to be endogenous
- Instrument: Writing style of judges (in past cases)

Caveat: We examine the impact of green rulings, conditional on the presence of environmental cases

Contribution to the literature

Role of policies in regulating water quality at scale - sewage systems (Alsan and Goldin 2019), piped water systems (Galiani, Gertler, and Schargrodsky 2005; Ashraf, Glaeser, Holland, et al. 2021), disinfection programs (Bhalotra et al. 2021), regulatory systems (Zhang and Xu 2016), judicial policies (Do, Joshi, and Stolper 2018; Zhang, Yu, and Kong 2019)

$\Rightarrow$ First nationwide analysis of the impacts of judicial policies on surface water toxicity in a high pollution setting

Contribution to the literature

Role of policies in regulating water quality at scale - sewage systems (Alsan and Goldin 2019), piped water systems (Galiani, Gertler, and Schargrodsky 2005; Ashraf, Glaeser, Holland, et al. 2021), disinfection programs (Bhalotra et al. 2021), regulatory systems (Zhang and Xu 2016), judicial policies (Do, Joshi, and Stolper 2018; Zhang, Yu, and Kong 2019)

$\Rightarrow$ First nationwide analysis of the impacts of judicial policies on surface water toxicity in a high pollution setting

Exploit random assignment of judges for causal estimation - "judge leniency", e.g., Aizer and Doyle Jr 2015; Arnold, Dobbie, and Yang 2018; ...

$\Rightarrow$ New instrument: judges' overall writing styles using NLP

Contribution to the literature

Role of policies in regulating water quality at scale - sewage systems (Alsan and Goldin 2019), piped water systems (Galiani, Gertler, and Schargrodsky 2005; Ashraf, Glaeser, Holland, et al. 2021), disinfection programs (Bhalotra et al. 2021), regulatory systems (Zhang and Xu 2016), judicial policies (Do, Joshi, and Stolper 2018; Zhang, Yu, and Kong 2019)

⇒ First nationwide analysis of the impacts of judicial policies on surface water toxicity in a high pollution setting

Exploit random assignment of judges for causal estimation - "judge leniency", e.g., Aizer and Doyle Jr 2015; Arnold, Dobbie, and Yang 2018; ...

⇒ New instrument: judges' overall writing styles using NLP

Role of courts in sustainable economic development - Djankov et al. 2003; Visaria 2009; Papaioannou and Karatza 2018; Chemin 2020; Rao 2021; Behrer et al. 2021; ...

⇒ Expand to the complex realm of water; study recent innovations within the judiciary (public interest litigation; creation of separate environmental courts)

Outline

Three Data Sources

Universe of orders from Supreme Court, High Court and Green Tribunal

- Plain text of orders web-scraped from Indian Kanoon
- Extract judges for each order + comprehensive history of rulings of judges

Three Data Sources

Universe of orders from Supreme Court, High Court and Green Tribunal

- Plain text of orders web-scraped from Indian Kanoon
- Extract judges for each order + comprehensive history of rulings of judges

Identify court orders related to River Pollution: 1987 - 2020, 978 cases

- Hand-coded each ruling as pro- / against environment
- Location + geographic scope of ruling

Three Data Sources

Universe of orders from Supreme Court, High Court and Green Tribunal

- Plain text of orders web-scraped from Indian Kanoon
- Extract judges for each order + comprehensive history of rulings of judges

Identify court orders related to River Pollution: 1987 - 2020, 978 cases

- Hand-coded each ruling as pro- / against environment
- Location + geographic scope of ruling

River Pollution: district-year, 1986-2019

- Biological-oxygen-demand (BOD) $\rightarrow$ industrial pollution
- Chemical-oxygen-demand (COD) $\rightarrow$ industrial pollution
- Fecal Coliform (FCOLI) $\rightarrow$ domestic pollution

Three Data Sources

Universe of orders from Supreme Court, High Court and Green Tribunal

- Plain text of orders web-scraped from Indian Kanoon
- Extract judges for each order + comprehensive history of rulings of judges

Identify court orders related to River Pollution: 1987 - 2020, 978 cases

- Hand-coded each ruling as pro- / against environment
- Location + geographic scope of ruling

River Pollution: district-year, 1986-2019

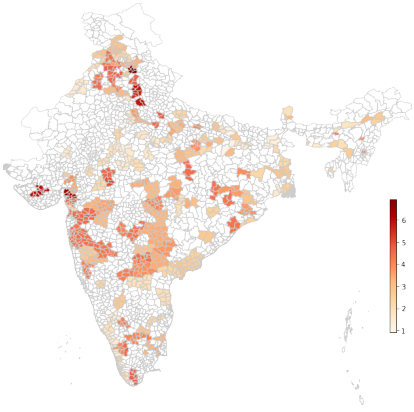
- Biological-oxygen-demand (BOD) $\rightarrow$ industrial pollution
- Chemical-oxygen-demand (COD) $\rightarrow$ industrial pollution
- Fecal Coliform (FCOLI) $\rightarrow$ domestic pollution

Infant mortality: district-month, 1986-2016

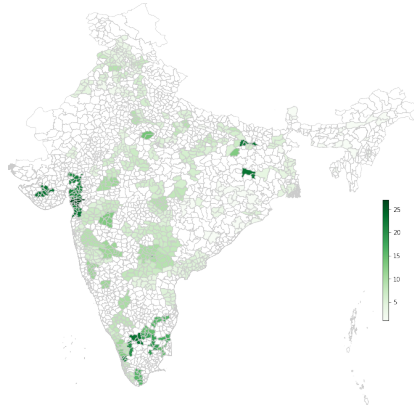
- Died $<$ 1Y: infant died during first year?
- Died $<$ 1M: infant died during first month?
- Died $<$ 1Y$|$1M: infant died during first year, cond. on surviving first month?

Maps of Available Data

A: Max log(BOD mg/l) / District



B: River Pollution Cases / District



- Order Characteristics over Time
- Orders per State
- Appeals per State
- Impact per State
- Summary Case Data
- Summary Pollution + Mortality Data
- Summary Merged Data

Impact of Green Judgments on River pollution

Basic model:

$$Y_{dt} = \beta_1 + \beta_2 FracGreenVerdicts_{dt} + \beta_3 \mathbb{1}\{|C_{dt}| > 0\} + X'_{dt}\theta + \epsilon_{dt} \quad (1)$$

Y_{dt}: Pollution or mortality in district d at time t
$FracGreenVerdicts_{dt}$: Fraction of water pollution cases that are pro-environment
$|C_{dt}|$: Number of water pollution cases in district d at time t
X_{dt}: Controls, including district and year fixed effects.

Impact of Green Judgments on River pollution

Basic model:

$$Y_{dt} = \beta_1 + \beta_2 FracGreenVerdicts_{dt} + \beta_3 \mathbb{1}\{|C_{dt}| > 0\} + X'_{dt}\theta + \epsilon_{dt} \tag{1}$$

Y_{dt}: Pollution or mortality in district d at time t
$FracGreenVerdicts_{dt}$: Fraction of water pollution cases that are pro-environment
$|C_{dt}|$: Number of water pollution cases in district d at time t
X_{dt}: Controls, including district and year fixed effects.

Where:

$$FracGreenVerdicts_{dt} = \begin{cases} \frac{1}{|C_{dt}|} \sum_{c \in C_{dt}} Green_c & if\ |C_{dt}| > 0 \\ 0 & if\ |C_{dt}| = 0. \end{cases} \tag{2}$$

Concern: rulings may be endogenous to outcomes

Second stage:

$$Y_{dt} = \beta_1 + \beta_2 \widehat{FracGreenVerdicts}_{dt} + \beta_3 \mathbb{1}\{|C_{dt}| > 0\} + X'_{dt}\theta + \epsilon_{dt} \tag{3}$$

$\widehat{FracGreenVerdicts}_{dt}$: predicted value of the fraction of green cases in district d at time t.

Concern: rulings may be endogenous to outcomes

Second stage:

$$Y_{dt} = \beta_1 + \beta_2 \widehat{FracGreenVerdicts}_{dt} + \beta_3 \mathbb{1}\{|C_{dt}| > 0\} + X'_{dt}\theta + \epsilon_{dt} \quad (3)$$

$\widehat{FracGreenVerdicts}_{dt}$: predicted value of the fraction of green cases in district d at time t.

First stage:

$$FracGreenVerdicts_{dt} = \hat{\alpha}_1 D2V_{1dt} + ... + \hat{\alpha}_{25} D2V_{25dt} + \hat{\beta}_3 \mathbb{1}\{|C_{dt}| > 0\} + X'_{dt}\hat{\theta} + \eta_{dt} \quad (4)$$

$D2V_{idt}$: Numeric representations of writing styles of judges

Concern: rulings may be endogenous to outcomes

Second stage:

$$Y_{dt} = \beta_1 + \beta_2 \widehat{FracGreenVerdicts}_{dt} + \beta_3 \mathbb{1}\{|C_{dt}| > 0\} + X'_{dt}\theta + \epsilon_{dt} \quad (3)$$

$\widehat{FracGreenVerdicts}_{dt}$: predicted value of the fraction of green cases in district d at time t.

First stage:

$$FracGreenVerdicts_{dt} = \hat{\alpha}_1 D2V_{1dt} + ... + \hat{\alpha}_{25} D2V_{25dt} + \hat{\beta}_3 \mathbb{1}\{|C_{dt}| > 0\} + X'_{dt}\hat{\theta} + \eta_{dt} \quad (4)$$

$D2V_{idt}$: Numeric representations of writing styles of judges

Assumption: cases are randomly assigned to judges in courts (Ash et al. 2021)

Construction of instruments: past writing style

1. $\sim$ 7 million orders to train Doc2Vec algorithm
   $\Rightarrow$ Each order represented as 25-dimensional vector

Construction of instruments: past writing style

1. $\sim$ 7 million orders to train Doc2Vec algorithm
   $\Rightarrow$ Each order represented as 25-dimensional vector

2. For each judge with a water toxicity order, we identify all other orders and average over their vectors
   $\Rightarrow$ A 25-dimensional vector for each judge

Construction of instruments: past writing style

1. $\sim$ 7 million orders to train Doc2Vec algorithm
   $\Rightarrow$ Each order represented as 25-dimensional vector

2. For each judge with a water toxicity order, we identify all other orders and average over their vectors
   $\Rightarrow$ A 25-dimensional vector for each judge

3. If bench of judges: average over the vectors of judges on bench

Construction of instruments: past writing style

1. $\sim$ 7 million orders to train Doc2Vec algorithm
   $\Rightarrow$ Each order represented as 25-dimensional vector

2. For each judge with a water toxicity order, we identify all other orders and average over their vectors
   $\Rightarrow$ A 25-dimensional vector for each judge

3. If bench of judges: average over the vectors of judges on bench

4. Average over vectors of all orders in a district-year

▸ Visualization of the Instrument ▸ Judge randomization check ▸ Randomization check Maharashtra ▸ Random Assignment

Contemporaneous Impacts on Water Pollution (Yearly)

	(1) ln(COD)	(2) ln(BOD)	(3) ln(TCOLI)	(4) ln(Conductivity)	(5) ln(Temperature)
Fraction of Green Orders	-0.130	-0.241**	-0.0421	-0.0694	-0.0209
	(0.124)	(0.103)	(0.520)	(0.144)	(0.0247)
Dummy for Presence of an Order	0.241*	0.0619	0.159	-0.0711	0.0000132
	(0.131)	(0.118)	(0.494)	(0.143)	(0.0377)
District-years with no orders	Dummied	Dummied	Dummied	Dummied	Dummied
Year and District FEs	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes
Clustering	IOC	IOC	IOC	IOC	IOC
Eff First Stage F	7.816	8.856	9.015	7.895	8.401
N	3053	5649	5057	5475	5541

▸ Build Up ▸ First Stage ▸ 3-year MA ▸ AR CIs ▸ 3-year MA & AR CIs ▸ Neighboring Districts ▸ State Level ▸ No Cities

Contemporaneous Impacts on Water Pollution (Yearly)

- All estimates negative, but only BOD significantly reduced

	(1) ln(COD)	(2) ln(BOD)	(3) ln(TCOLI)	(4) ln(Conductivity)	(5) ln(Temperature)
Fraction of Green Orders	-0.130	-0.241**	-0.0421	-0.0694	-0.0209
	(0.124)	(0.103)	(0.520)	(0.144)	(0.0247)
Dummy for Presence of an Order	0.241*	0.0619	0.159	-0.0711	0.0000132
	(0.131)	(0.118)	(0.494)	(0.143)	(0.0377)
District-years with no orders	Dummied	Dummied	Dummied	Dummied	Dummied
Year and District FEs	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes
Clustering	IOC	IOC	IOC	IOC	IOC
Eff First Stage F	7.816	8.856	9.015	7.895	8.401
N	3053	5649	5057	5475	5541

▸ Build Up ▸ First Stage ▸ 3-year MA ▸ AR CIs ▸ 3-year MA & AR CIs ▸ Neighboring Districts ▸ State Level ▸ No Cities

Contemporaneous Impacts on Water Pollution (Yearly)

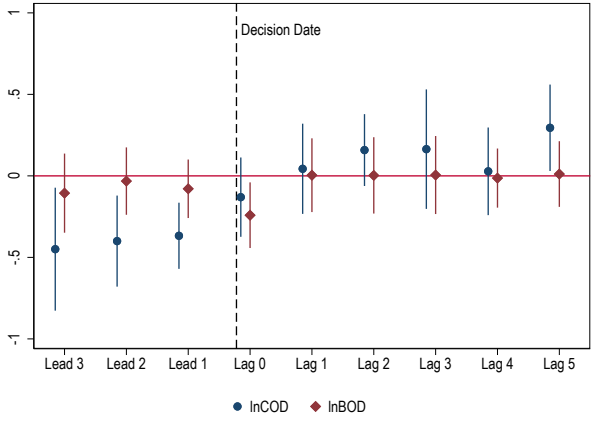
- All estimates negative, but only BOD significantly reduced
- If fraction of green cases ↗ 1 p.p. ⇒ BOD ↘ by 0.21%

	(1) ln(COD)	(2) ln(BOD)	(3) ln(TCOLI)	(4) ln(Conductivity)	(5) ln(Temperature)
Fraction of Green Orders	-0.130	-0.241**	-0.0421	-0.0694	-0.0209
	(0.124)	(0.103)	(0.520)	(0.144)	(0.0247)
Dummy for Presence of an Order	0.241*	0.0619	0.159	-0.0711	0.0000132
	(0.131)	(0.118)	(0.494)	(0.143)	(0.0377)
District-years with no orders	Dummied	Dummied	Dummied	Dummied	Dummied
Year and District FEs	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes
Clustering	IOC	IOC	IOC	IOC	IOC
Eff First Stage F	7.816	8.856	9.015	7.895	8.401
N	3053	5649	5057	5475	5541

▸ Build Up ▸ First Stage ▸ 3-year MA ▸ AR CIs ▸ 3-year MA & AR CIs ▸ Neighboring Districts ▸ State Level ▸ No Cities

Dynamic Impacts of Green Orders on Pollution

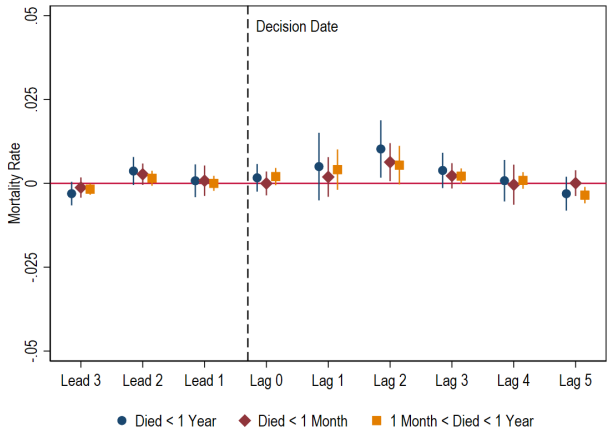
- Pollution *decreases* prior to / right after decision, then back to normal
- Potential *increase* in long-term



▸ Figure with AR CIs ▸ Filing Dates ▸ Filing Dates with AR CIs ▸ Common Support BOD & COD ▸ Common Support all Pollutants

Impact on Infant Mortality (aggregated)

- No effect prior to / at time of decision
- Infant mortality *increased* several years after decision



Monthly Table | Selection | Yearly Table | Monthly Figure | Yearly Figure | Monthly Table AR | Monthly Figure AR

Summary and Conclusion

- Research question: **Can judges enforce environmental justice?**

Summary and Conclusion

- Research question: **Can judges enforce environmental justice?**
- Novel dataset from India
  - 978 judicial court cases that cite the Water Act of 1974
  - Water pollution indicators
  - Infant mortality from two population surveys

Summary and Conclusion

- Research question: **Can judges enforce environmental justice?**
- Novel dataset from India
  - 978 judicial court cases that cite the Water Act of 1974
  - Water pollution indicators
  - Infant mortality from two population surveys
- Instrumental variables framework
  - Random judge assignment
  - Numeric representation of writing style from past cases

Summary and Conclusion

- Research question: **Can judges enforce environmental justice?**
- Novel dataset from India
  - 978 judicial court cases that cite the Water Act of 1974
  - Water pollution indicators
  - Infant mortality from two population surveys
- Instrumental variables framework
  - Random judge assignment
  - Numeric representation of writing style from past cases
- Results
  - Judicial policies lead to **temporary reductions** in peak toxicity levels
  - **No** decrease in neonatal and infant mortality rates in subsequent months
  - Several years post-decision, pollution and mortality rates **exceed** pre-decision levels

Summary and Conclusion

- Research question: **Can judges enforce environmental justice?**
- Novel dataset from India
  - 978 judicial court cases that cite the Water Act of 1974
  - Water pollution indicators
  - Infant mortality from two population surveys
- Instrumental variables framework
  - Random judge assignment
  - Numeric representation of writing style from past cases
- Results
  - Judicial policies lead to **temporary reductions** in peak toxicity levels
  - **No** decrease in neonatal and infant mortality rates in subsequent months
  - Several years post-decision, pollution and mortality rates **exceed** pre-decision levels
- Conclusion: **Judiciaries can lower short-term pollution, but maybe it takes more to truly clean water?**

Comments & Suggestions?
shareen.joshi@georgetown.edu

Indian Environmental Governance: Shared Responsibility, Weak Accountability

- **Central government:** policy and regulatory formulations
- **State governments:** implementation and enforcement

Indian Environmental Governance: Shared Responsibility, Weak Accountability

- **Central government:** policy and regulatory formulations
- **State governments:** implementation and enforcement

- 200+ laws, some more important than others
- **Water Act of 1974**: Central and State Pollution Control Boards (PCBs)
- **Pollution Control Boards**: issue and revoke consents to operate, monitor polluting activities
  - Persistent challenges of coordination, budgeting, staffing (World Bank, 2013)

Indian Environmental Governance: Shared Responsibility, Weak Accountability

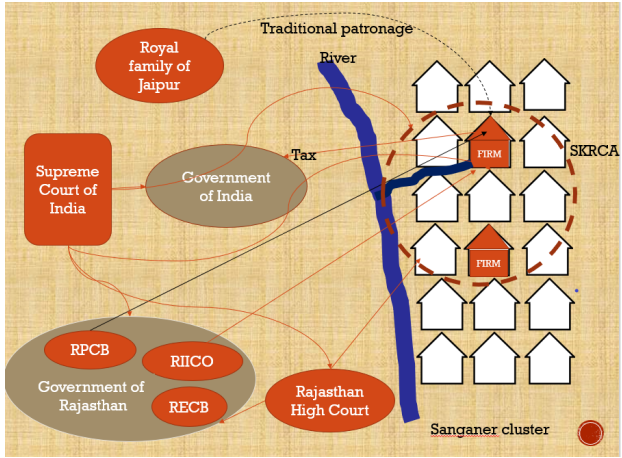
- **Central government:** policy and regulatory formulations
- **State governments:** implementation and enforcement

- 200+ laws, some more important than others
- **Water Act of 1974**: Central and State Pollution Control Boards (PCBs)
- **Pollution Control Boards**: issue and revoke consents to operate, monitor polluting activities
  - Persistent challenges of coordination, budgeting, staffing (World Bank, 2013)

- India's **judiciary** has taken activist stance towards environmental conservation

Back

A Small Firm Typically Faces Many Regulators

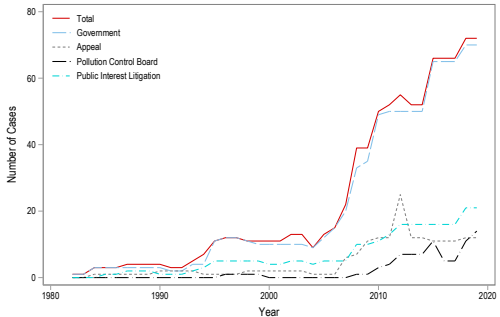


Details about Green Orders

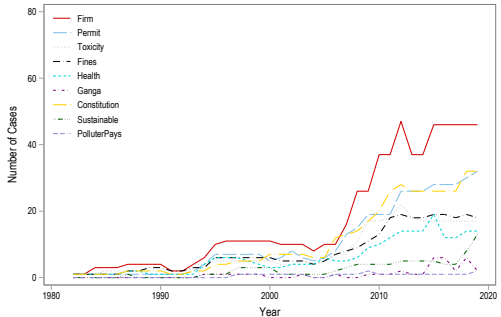
- The average order in our sample has a green score of 0.35 (the range is -2 to 2).
- 21 percent of cases are constitutional cases
- 81 percent feature the government as the respondent
- The average number of judges on an order is 1.6
  - We found judges for 966 of the 978 orders
  - 489 orders had 1 judge, 431 orders had 2 judges, and 37 had 3+

Varieties of Orders

A. Order overview

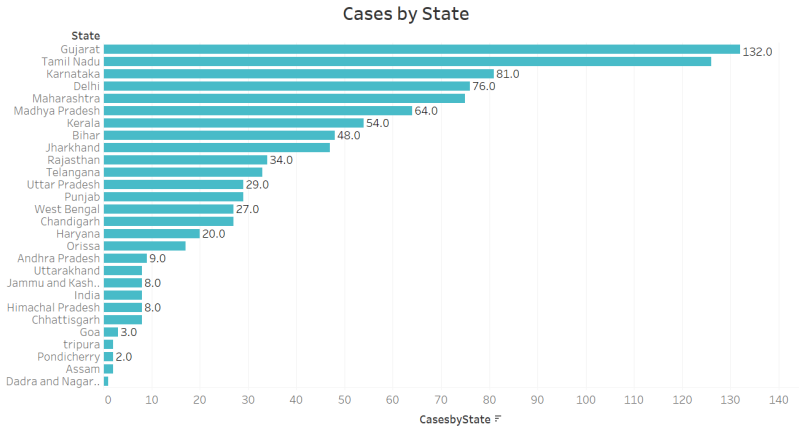


B. Keywords



Back

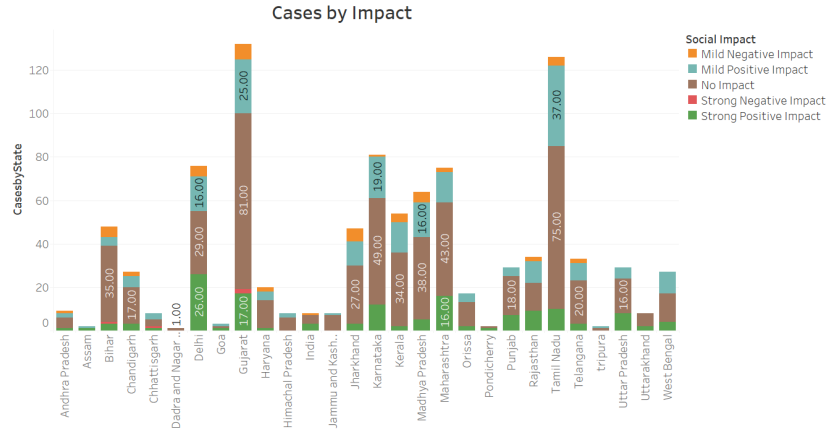
Distribution of Orders Across States



CasesbyState for each State. The marks are labeled by CasesbyState.

Back

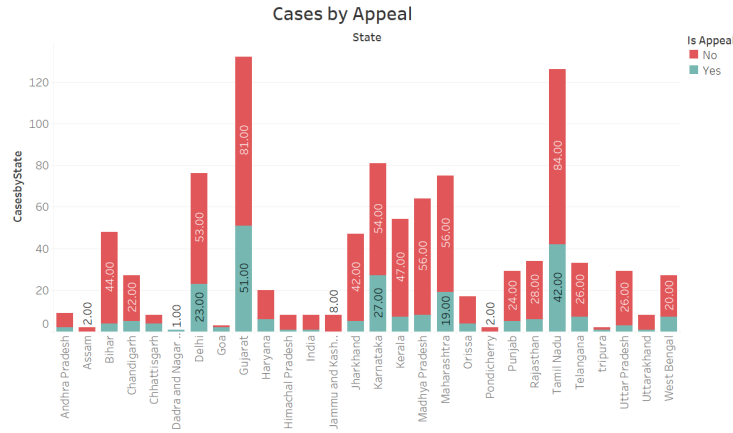
Distribution of Orders by Impact



CasesbyState for each State. Color shows details about Social Impact. The marks are labeled by CasesbyState.

Back

Distribution of Orders by Type



CasesbyState for each State. Color shows details about Is Appeal.

Back

Summary Statistics

	N	Mean	SD	Min	Max
Pollution (Monitor-Year)					
Max BOD (mg/l)	23,413	9.57	38	0	1820
Max COD (mg/l)	6,089	39.95	63	0	1750
Max Total Coliform (mpn/100 ml)/106	19,628	7	322	0	23,000
Max Temperature (°C)	24,623	29	6	0	269
Max Conductivity (µmhos/cm)	22,843	2,281	9440	0	513,000
Case Level Data - Pollution					
Appeal	516	0.25	0	0	1
Constitutional	516	0.21	0	0	1
Government is Respondent	516	0.82	0	0	1
Government is Petitioner	516	0.14	0	0	1
Number of Judges	516	2	1	0	3
Environmental Impact (Median Coding)	516	0.34	1	-2	2
Maximum Forest Cover	286	24.04	15	4	66
Total Forest Cover	286	70,997.99	354796	161	2198364
Maximum Nightlights	176	16.16	17	1	63
Total Caliberated Nightlights	176	4,048.10	16031	3	88983
Case Level Data - Mortality					
Appeal	777	0.25	0	0	1
Constitutional	777	0.22	0	0	1
Government is Respondent	777	0.86	0	0	1
Government is Petitioner	777	0.11	0	0	1
Number of Judges	777	2	1	0	3
Environmental Impact (Median Coding)	777	0.35	1	-2	2
Maximum Forest Cover	557	25.42	15	1	72
Total Forest Cover	557	65,954.68	295902	119	2737216
Maximum Nightlights	331	23.07	23	0	63
Total Caliberated Nightlights	331	12,542.39	32648	1	261839
Judge Level Data (Pollution Sample)					
Male	302	0.97	0	0	1
Graduate Level Education	302	0.39	0	0	1
Post-Graduate Level Education	302	0.13	0	0	1

Case Data - Summary Statistics

District-Year Level Data - Orders	N	Mean	SD	Min	Max
Order Present	6270	0.16	0.37	0.0	1.0
Number of Green Orders	6270	0.24	0.75	0.0	13.0
Fraction of Green Orders	6270	0.04	0.18	0.0	1.0
Average Number of Judges / Order	6270	0.29	0.72	0.0	3.0
Share of Appeal Cases	6270	0.03	0.16	0.0	1.0
Share of Constitutional Cases	6270	0.05	0.22	0.0	1.0
Share of Cases w/ Government as Petitioner	6270	0.02	0.12	0.0	1.0
Share of Cases w/ Government as Respondent	6270	0.14	0.34	0.0	1.0

Back

Pollution and Mortality Data - Summary Statistics

District-Year Level Data - Pollution Sample	N	Mean	SD	Min	Max
Max BOD (mg/l)	5650	12.53	33.86	0.0	1,025.0
Max COD (mg/l)	3053	55.65	80.25	1.1	1,750.0
Max Total Coliform (mpn/100 ml)/10^6	5057	15.09	514.20	0.0	23,000.0
Max Temperature (°C)	5614	29.69	6.29	0.0	269.0
Max Conductivity (µmhos/cm)/10^3	5476	1.94	7.33	0.0	81.8
District-Year Level Data - Mortality Sample					
Infants dying aged $<$ 1 Year (%)	15982	0.05	0.04	0.0	0.4
Infants dying aged $<$ 1 Month (%)	15982	0.04	0.03	0.0	0.3
Infants dying, cond. survived first month (%)	15982	0.02	0.02	0.0	0.3

Back

Case Data Merged with Pollution and Mortality

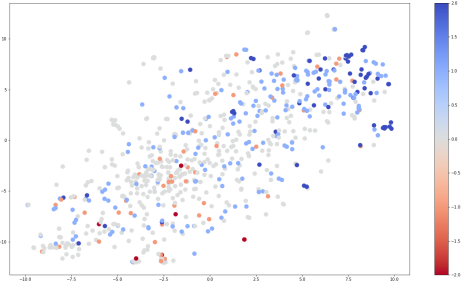
Case Data - Pollution Merge	N	Mean	SD	Min	Max
Appeal	516	0.25	0.44	0.0	1.0
Constitutional	516	0.21	0.40	0.0	1.0
Government is Respondent	516	0.82	0.38	0.0	1.0
Government is Petitioner	516	0.14	0.34	0.0	1.0
Number of Judges	516	1.68	0.76	0.0	3.0

Case Data - Mortality Merge					
Appeal	777	0.25	0.43	0.0	1.0
Constitutional	777	0.22	0.42	0.0	1.0
Government is Respondent	777	0.86	0.35	0.0	1.0
Government is Petitioner	777	0.11	0.32	0.0	1.0
Number of Judges	777	1.75	0.76	0.0	3.0

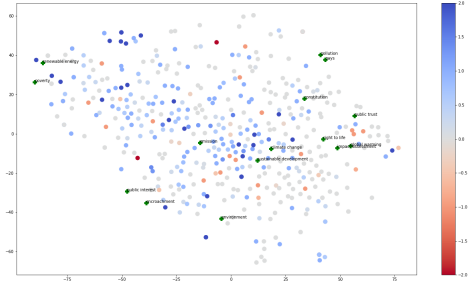
Back

Writing Style Variations

A. Case-Level



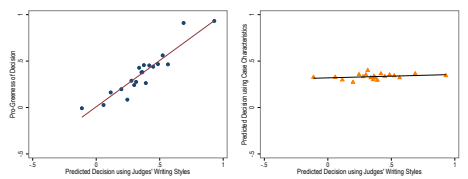
B. Judge-Level



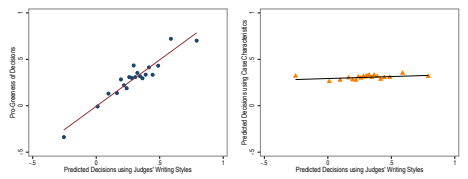
Back

Judge randomization check

A. Order-Level

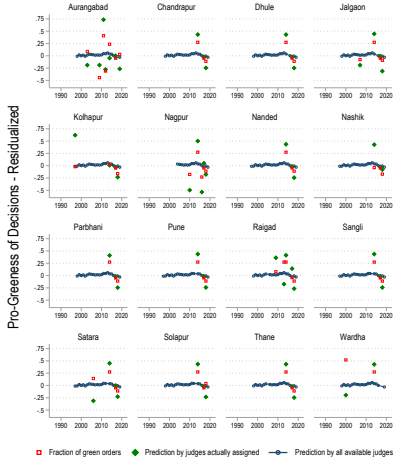


B. District-Year-Level: With Orders



Back

Randomization Check - Maharashtra



Back

Key assumption: Judges are randomly assigned

- Pipeline of justice:
  - A petitioner files a case against a respondent
  - Both have legal representation through advocates
  - The case is assigned to a judge by the Chief Justice based on the roster system
  - There is a public “not before me” list

Key assumption: Judges are randomly assigned

- Pipeline of justice:
  - A petitioner files a case against a respondent
  - Both have legal representation through advocates
  - The case is assigned to a judge by the Chief Justice based on the roster system
  - There is a public “not before me” list

- Two previous papers:
  - No in-group bias based on caste, religion and gender (Ash et al. 2021)
  - Detailed analysis of names and networks at the Patna high court finds no evidence of ”matching” on the basis of caste, religion or gender (Bhupatiraju et al. 2021)

Key assumption: Judges are randomly assigned

- Pipeline of justice:
  - A petitioner files a case against a respondent
  - Both have legal representation through advocates
  - The case is assigned to a judge by the Chief Justice based on the roster system
  - There is a public “not before me” list

- Two previous papers:
  - No in-group bias based on caste, religion and gender (Ash et al. 2021)
  - Detailed analysis of names and networks at the Patna high court finds no evidence of ”matching” on the basis of caste, religion or gender (Bhupatiraju et al. 2021)

- We do not see the same judge appear in our data more than 3 times!

Back

First Stage, Judge Level

Panel A: Judge Level	Median Coded Environmental Impact			
	(1)	(2)	(3)	(4)
Judge has a Post Graduate Degree	0.0842	0.262*	0.187**	0.175**
	(0.111)	(0.143)	(0.0873)	(0.0890)
Other Instruments	25 D2V vectors			
Assigned districts	One	All	All	All
District + year FEs	-	-	Yes	Yes
Case-level controls	-	-	-	Yes
Eff First Stage F	2.535	4.047	2.595	2.683
N	764	3313	3313	3313

First Stage, Order Level

Panel B: Order Level	Median Coded Environmental Impact			
	(1)	(2)	(3)	(4)
Majority Judges have a Post Graduate Degree	0.184*	0.402	0.185*	0.194*
	(0.104)	(0.254)	(0.0969)	(0.0997)
Other Instruments		25 D2V vectors		
Assigned districts	One	All	All	All
District + year FEs	-	-	Yes	Yes
Case-level controls	-	-	-	Yes
Eff First Stage F	1.639	3.709	4.960	5.122
N	518	2795	2795	2795

First Stage, Order Level

Panel C: Order Level	Green Order			
	(1)	(2)	(3)	(4)
JudgePostGrad	0.133*	0.285**	0.157***	0.157***
	(0.0716)	(0.132)	(0.0558)	(0.0567)
Other Instruments	25 D2V vectors			
Assigned districts	One	All	All	All
District + year FEs	-	-	Yes	Yes
Case-level controls	-	-	-	Yes
Eff First Stage F	1.505	4.575	6.583	5.560
N	518	2795	2795	2795

First Stage, District-Year Merged with BOD

Panel D: District-Year Merged with BOD	Fraction of Green Orders			
	(1)	(2)	(3)	(4)
Majority Judges have a Post Graduate Degree	0.276***	0.276***	0.268***	0.284***
	(0.0928)	(0.0915)	(0.0861)	(0.0861)
Dummy for Presence of an Order		0.126**	0.129**	0.0753
		(0.0627)	(0.0600)	(0.0736)
Other Instruments		25 D2V vectors		
Assigned districts	All	All	All	All
District + year FEs	-	-	Yes	Yes
Case-level controls	-	-	-	Yes
District-years with no orders	Dropped	Dummied	Dummied	Dummied
Eff First Stage F	6.567	10.24	8.413	8.856
N	859	5649	5649	5649

First Stage, District-Year-Month Merged with Mortality

Panel E: District-Year-Month Merged with Mortality	Fraction of Green Orders			
	(1)	(2)	(3)	(4)
Majority Judges have a Post Graduate Degree	0.229**	0.229**	0.229**	0.219**
	(0.113)	(0.112)	(0.111)	(0.111)
Order Dummy		0.181	0.180	0.0152
		(0.124)	(0.123)	(0.141)
Other Instruments		25 D2V vectors		
Assigned districts	All	All	All	All
District + Year + Month FEs	-	-	Yes	Yes
Case-level controls	-	-	-	Yes
District-years with no orders	Dropped	Dummied	Dummied	Dummied
Eff First Stage F	3.491	5.484	5.566	6.243
N	1931	260876	260876	260876

Back

Impact on all Pollutants - 3-year MA

	(1) ln(COD)	(2) ln(BOD)	(3) ln(TCOLI)	(4) ln(Conductivity)	(5) ln(Temperature)
Fraction of Green Orders	-0.130	-0.241**	-0.0421	-0.0694	-0.0209
	(0.124)	(0.103)	(0.520)	(0.144)	(0.0247)
Dummy for Presence of an Order	0.241*	0.0619	0.159	-0.0711	0.0000132
	(0.131)	(0.118)	(0.494)	(0.143)	(0.0377)
District-years with no orders	Dummied	Dummied	Dummied	Dummied	Dummied
Year and District FEs	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes
Clustering	IOC	IOC	IOC	IOC	IOC
Eff First Stage F	7.816	8.856	9.015	7.895	8.401
N	3053	5649	5057	5475	5541

Back

Contemporaneous Impact on Biological-Oxygen-Demand (BOD)

	Log of Yearly Maximum BOD per District (mg/l)							
	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV	(7) OLS	(8) IV
Fraction of Green Orders	0.177	0.209	0.177	0.209	-0.183***	-0.270**	-0.162**	-0.241**
	(0.127)	(0.175)	(0.127)	(0.175)	(0.0709)	(0.106)	(0.0706)	(0.103)
Dummy for Presence of an Order			0.202***	0.194**	0.0814*	0.107*	0.0366	0.0619
			(0.0710)	(0.0763)	(0.0473)	(0.0556)	(0.113)	(0.118)
District-years with no orders	Dropped	Dropped	Dummied	Dummied	Dummied	Dummied	Dummied	Dummied
Year and District FEs					Yes	Yes	Yes	Yes
Covariates							Yes	Yes
Clustering	IOC	IOC	IOC	IOC	IOC	IOC	IOC	IOC
Eff. First Stage F		6.567		10.24		.		8.856
N	859	859	5649	5649	5649	5649	5649	5649

Impact on BOD - AR CIs

	Log of Yearly Maximum BOD per District (mg/l)							
	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV	(7) OLS	(8) IV
Fraction of Green Orders	0.177	0.209	0.177	0.209	-0.183	-0.270	-0.162	-0.241
	[-0.0719; 0.425]	[-0.234; 0.580]	[-0.0714; 0.425]	[-0.228; 0.574]	[-0.322; -0.0438]	[-0.437; -0.102]	[-0.300; -0.0231]	[-0.494; -0.0701]
Dummy for Presence of an Order			0.202	0.194	0.0814	0.107	0.0366	0.0619
District-years with no orders	Dropped	Dropped	Dummied	Dummied	Dummied	Dummied	Dummied	Dummied
Year and District FEs					Yes	Yes	Yes	Yes
Covariates							Yes	Yes
Clustering	IOC	IOC	IOC	IOC	IOC	IOC	IOC	IOC
Eff. First Stage F		6.567		10.24		.		8.856
N	859	859	5649	5649	5649	5649	5649	5649

Back

Contemporaneous Impacts on Water Pollution (Yearly) - AR CIs

	(1) ln(COD)	(2) ln(BOD)	(3) ln(TCOLI)	(4) ln(Conductivity)	(5) ln(Temperature)
Fraction of Green Orders	-0.130	-0.241	-0.0421	-0.0694	-0.0209
	[-0.465; 0.235]	[-0.494; -0.0701]	[-1.028; 0.814]	[-0.255; 0.291]	[-0.0964; 0.0207]
Dummy for Presence of an Order	0.241	0.0619	0.159	-0.0711	0.0000132
District-years with no orders	Dummied	Dummied	Dummied	Dummied	Dummied
Year and District FEs	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes
Clustering	IOC	IOC	IOC	IOC	IOC
Eff First Stage F	7.816	8.856	9.015	7.895	8.401
N	3053	5649	5057	5475	5541

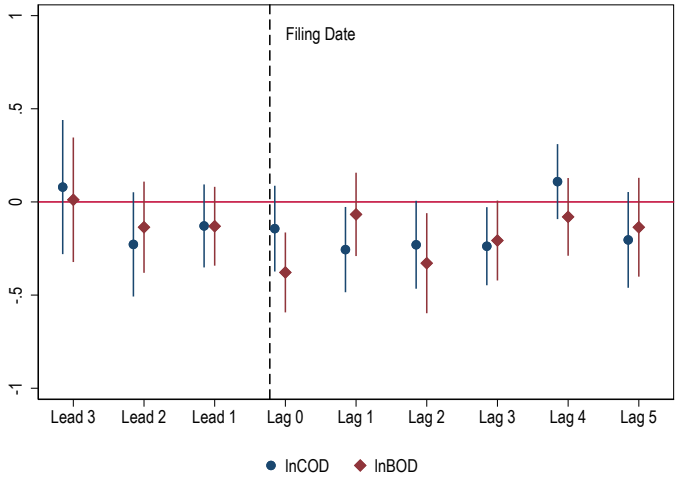
Back

Impact on all Pollutants - 3-year MA - AR CIs

	(1) ln(COD)	(2) ln(BOD)	(3) ln(TCOLI)	(4) ln(Conductivity)	(5) ln(Temperature)
Fraction of Green Orders	-0.158	-0.183	-0.0511	0.0406	-0.0333
	[-0.268; 0.0404]	[-0.450; -0.00469]	[-0.940; 0.632]	[-0.0876; 0.370]	[-0.101; 0.0142]
Dummy for Presence of an Order	0.168	0.0667	0.290	-0.0446	0.00317
District-years with no orders	Dummied	Dummied	Dummied	Dummied	Dummied
Year and District FEs	Yes	Yes	Yes	Yes	Yes
Case Controls	Yes	Yes	Yes	Yes	Yes
District Controls	-	-	-	-	-
Clustering	IOC	IOC	IOC	IOC	IOC
Eff First Stage F	7.331	7.910	8.189	7.908	7.897
N	5742	6254	5888	6237	6185

Back

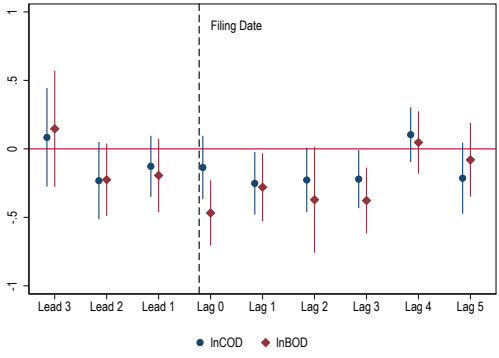
Pre-Trends Pollutants



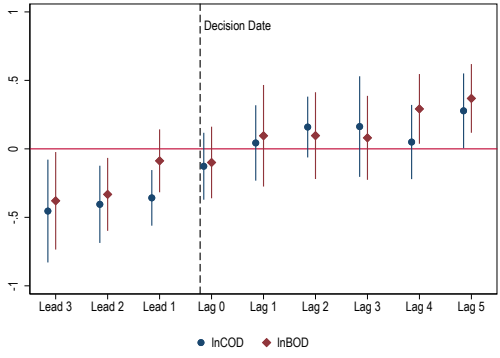
Back

Dynamic Impacts on Pollution - Common Support I

A. Filing: Common Support BOD + COD



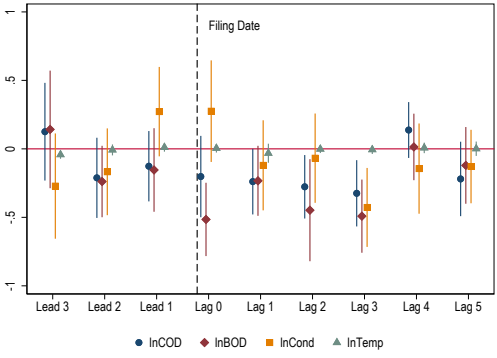
B. Decision: Common Support BOD + COD



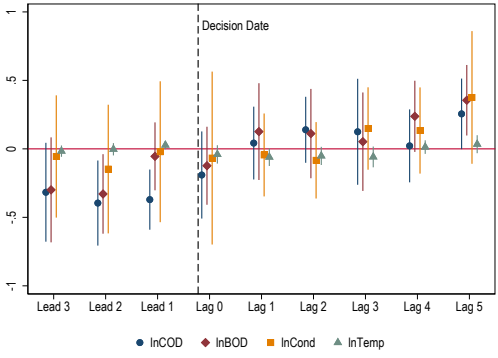
Back

Dynamic Impacts on Pollution - Common Support II

A. Filing: Common Support All Indicators



B. Decision: Common Support All Indicators



Back

Impact on Neighboring Districts

	(1) ln(COD)	(2) ln(BOD)	(3) ln(TCOLI)	(4) ln(Conductivity)	(5) ln(Temperature)
Neighboring Fraction of Green Orders	-0.242*	-0.0911	-0.131	-0.0808	0.00163
	(0.129)	(0.0865)	(0.428)	(0.112)	(0.0194)
Order Dummy	0.224**	0.0240	0.190	-0.124	-0.0316
	(0.110)	(0.0990)	(0.384)	(0.127)	(0.0200)
District-years with no orders	Dummied	Dummied	Dummied	Dummied	Dummied
Year and District FEs	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes
Clustering	IOC	IOC	IOC	IOC	IOC
Eff First Stage F	11.80	14.09	13.38	13.67	14.09
N	3053	5649	5057	5475	5541

Back

Impact on State Level

	(1) ln(COD)	(2) ln(BOD)	(3) ln(TCOLI)	(4) ln(Conductivity)	(5) ln(Temperature)
Fraction of Green Orders per State	-0.168	-0.226**	0.113	-0.0441	-0.00502
	(0.119)	(0.113)	(0.514)	(0.125)	(0.0213)
Order in State	0.0173	0.0630	0.0164	-0.0358	0.00205
	(0.0584)	(0.0478)	(0.184)	(0.0482)	(0.00886)
Order in District	0.171**	0.0723	0.238	0.0449	-0.000642
	(0.0793)	(0.0585)	(0.245)	(0.0763)	(0.0154)
District-years with no orders	Dummied	Dummied	Dummied	Dummied	Dummied
Year and District FEs	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes
Clustering	IOC	IOC	IOC	IOC	IOC
Eff First Stage F	21.81	14.15	14.93	13.80	13.86
N	3049	5619	5055	5446	5510

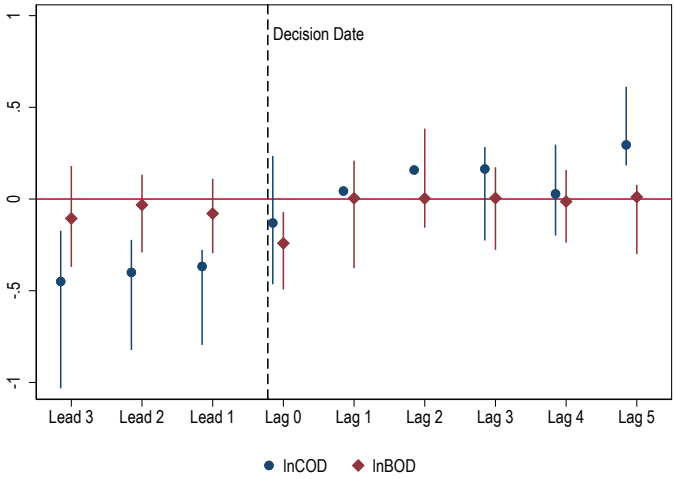
Back

Impact on Neighboring Districts, no Cities

	(1) ln(COD)	(2) ln(BOD)	(3) ln(TCOLI)	(4) ln(Conductivity)	(5) ln(Temperature)
Neighboring Fraction of Green Orders	-0.273**	-0.0155	-0.120	-0.0683	-0.0159
	(0.124)	(0.0991)	(0.409)	(0.0955)	(0.0205)
Order Dummy	0.227*	0.00257	0.0457	-0.192	-0.0291
	(0.118)	(0.105)	(0.421)	(0.132)	(0.0215)
District-years with no orders	Dummied	Dummied	Dummied	Dummied	Dummied
Year and District FEs	Yes	Yes	Yes	Yes	Yes
Case Controls	Yes	Yes	Yes	Yes	Yes
District Controls	-	-	-	-	-
Clustering	IOC	IOC	IOC	IOC	IOC
Eff First Stage F	10.15	11.54	11.17	12.00	11.45
N	2908	5383	4810	5219	5282

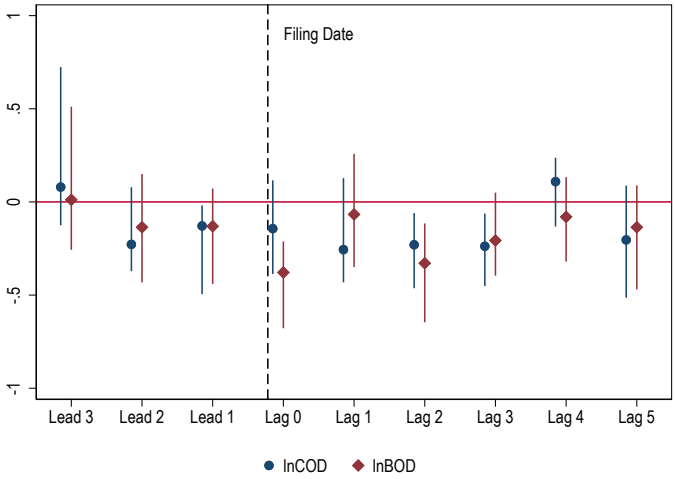
Back

Dynamic Impacts on Pollution - AR CIs



Back

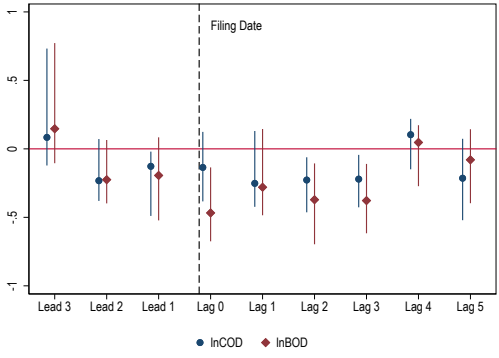
Pre-Trends Pollutants - AR CIs



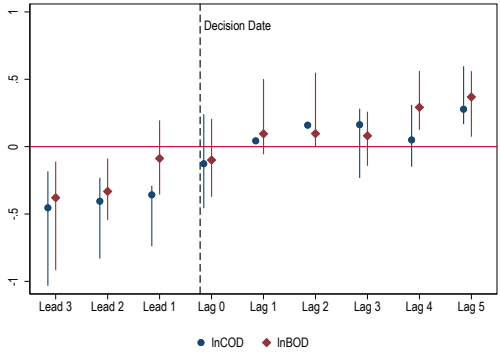
Back

Dynamic Impacts on Pollution - Common Support I - AR CIs

A. Filing: Common Support BOD + COD



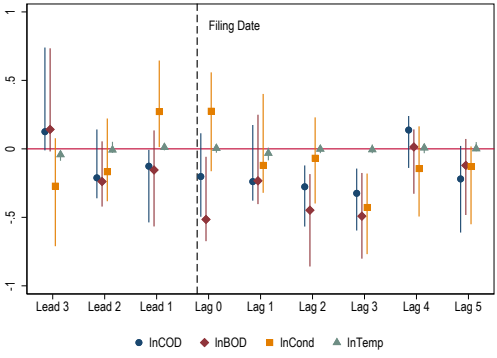
B. Decision: Common Support BOD + COD



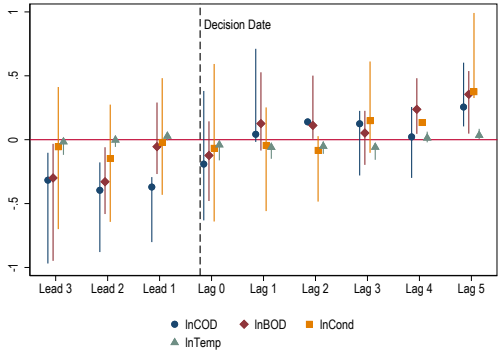
Back

Dynamic Impacts on Pollution - Common Support II - AR CIs

A. Filing: Common Support All Indicators



B. Decision: Common Support All Indicators



Back

Contemporaneous Impacts on Infant Mortality (Monthly)

	Baseline Regressions			With Air Pollution Controls		
	(1) Died<1Y	(2) Died<1M	(3) Died<1Y |1M	(4) Died<1Y	(5) Died<1M	(6) Died<1Y |1M
Fraction of Green Orders	0.00198	-0.000875	0.00504	-0.000556	-0.00663	0.00873**
	(0.00619)	(0.00633)	(0.00350)	(0.00800)	(0.00751)	(0.00363)
Order Dummy	-0.0112*	-0.00827	-0.00338	-0.00613	-0.00387	-0.00217
	(0.00590)	(0.00522)	(0.00251)	(0.00776)	(0.00763)	(0.00239)
District-year-months with no orders	Dummied	Dummied	Dummied	Dummied	Dummied	Dummied
Month, Year and District FEs	Yes	Yes	Yes	Yes	Yes	Yes
Case Controls	Yes	Yes	Yes	Yes	Yes	Yes
District Controls	-	-	-	PM2.5	PM2.5	PM2.5
Clustering	IOC	IOC	IOC	IOC	IOC	IOC
Eff First Stage F	6.17	6.17	6.15	5.86	5.86	5.84
N	188,298	188,298	188,183	101,096	101,096	101,029

Back

Impact on Mortality - Sample Selection with Air Pollution Control

	Full Sample			Only if PM2.5 Available			Including PM2.5		
	(1) Died<1Y	(2) Died<1M	(3) Died<1Y |1M	(4) Died<1Y	(5) Died<1M	(6) Died<1Y |1M	(7) Died<1Y	(8) Died<1M	(9) Died<1Y |1M
Fraction of Green Orders	0.00198	-0.000875	0.00504	-0.000563	-0.00661	0.00870**	-0.000556	-0.00663	0.00873**
	(0.00619)	(0.00633)	(0.00350)	(0.00800)	(0.00751)	(0.00364)	(0.00800)	(0.00751)	(0.00363)
Order Dummy	-0.0112*	-0.00827	-0.00338	-0.00611	-0.00390	-0.00212	-0.00613	-0.00387	-0.00217
	(0.00590)	(0.00522)	(0.00251)	(0.00776)	(0.00762)	(0.00239)	(0.00776)	(0.00763)	(0.00239)
District-years with no cases	Dummied	Dummied	Dummied	Dummied	Dummied	Dummied	Dummied	Dummied	Dummied
Year and District FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Case Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District Controls	-	-	-	-	-	-	PM2.5	PM2.5	PM2.5
Clustering	IOC	IOC	IOC	IOC	IOC	IOC	IOC	IOC	IOC
Eff First Stage F	6.173	6.173	6.154	5.862	5.862	5.837	5.862	5.862	5.837
N	188298	188298	188183	101096	101096	101029	101096	101096	101029

Back

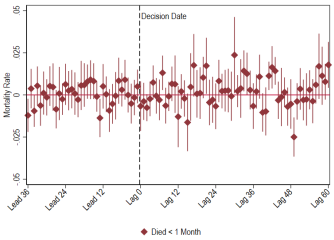
Contemporaneous Impacts on Infant Mortality (Yearly)

	Baseline Regressions			With Air Pollution Controls			With Air Pollution + Shrug Controls		
	(1) Died<1Y	(2) Died<1M	(3) Died<1Y |1M	(4) Died<1Y	(5) Died<1M	(6) Died<1Y |1M	(7) Died<1Y	(8) Died<1M	(9) Died<1Y |1M
Fraction of Green Orders	0.000607	-0.000351	0.00103	0.00106	-0.000127	0.00128	-0.00107	-0.00139	0.000313
	(0.00307)	(0.00266)	(0.00123)	(0.00334)	(0.00281)	(0.00121)	(0.00386)	(0.00296)	(0.00160)
Order Dummy	0.00461*	0.00321	0.00148	0.00490*	0.00334	0.00165	0.00458	0.00390	0.000708
	(0.00279)	(0.00253)	(0.00118)	(0.00290)	(0.00259)	(0.00116)	(0.00310)	(0.00269)	(0.00132)
District-years with no orders	Dummied	Dummied	Dummied	Dummied	Dummied	Dummied	Dummied	Dummied	Dummied
Year and District FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Case Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District Controls	-	-	-	PM2.5	PM2.5	PM2.5	PM2.5 + Shrug	PM2.5 + Shrug	PM2.5 + Shrug
Clustering	IOC	IOC	IOC	IOC	IOC	IOC	IOC	IOC	IOC
Eff First Stage F	7.360	7.360	7.360	7.373	7.373	7.373	6.788	6.788	6.788
N	8482	8482	8482	8482	8482	8482	6776	6776	6776

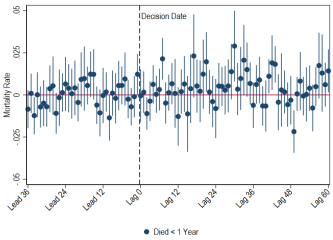
Back

Dynamic Impacts on Monthly Mortality

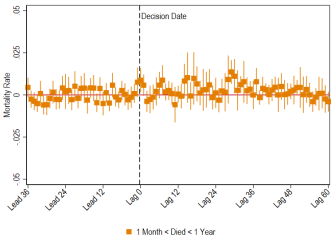
A. Died < 1 Year



B. Died < 1 Month



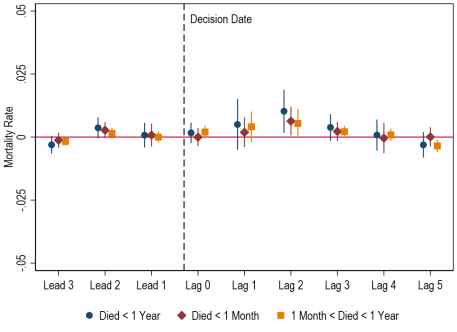
C. 1 Month < Died < 1 Year



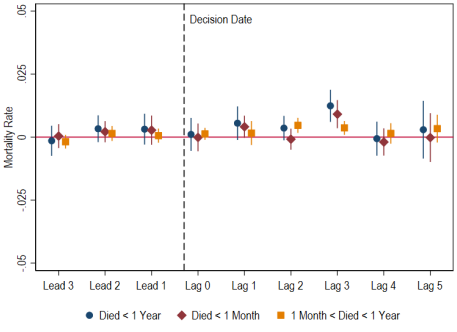
Back

Dynamic Impacts on Yearly Mortality

D. Monthly Aggregated



E. Yearly



Back

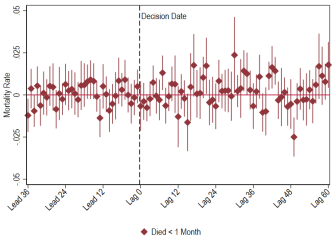
Contemporaneous Impacts on Infant Mortality (Monthly) - AR CIs

	Baseline Regressions			With Air Pollution Controls		
	(1) Died<1Y	(2) Died<1M	(3) Died<1Y |1M	(4) Died<1Y	(5) Died<1M	(6) Died<1Y |1M
Fraction of Green Orders	0.00198	-0.000875	0.00504	-0.000556	-0.00663	0.00873
	[.; .]	[-0.0135; 0.00857]	[0.00269; 0.0161]	[-0.0119; 0.0118]	[.; .]	[0.00782; 0.0193]
Order Dummy	-0.0112	-0.00827	-0.00338	-0.00613	-0.00387	-0.00217
District-year-months with no orders	Dummied	Dummied	Dummied	Dummied	Dummied	Dummied
Month, Year and District FEs	Yes	Yes	Yes	Yes	Yes	Yes
Case Controls	Yes	Yes	Yes	Yes	Yes	Yes
District Controls	-	-	-	PM2.5	PM2.5	PM2.5
Clustering	IOC	IOC	IOC	IOC	IOC	IOC
Eff First Stage F	6.17	6.17	6.15	5.86	5.86	5.84
N	188,298	188,298	188,183	101,096	101,096	101,029

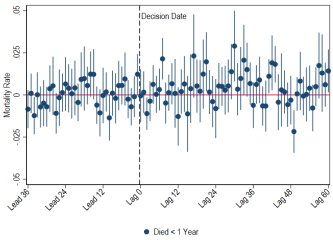
Back

Dynamic Impacts on Monthly Mortality - AR CIs

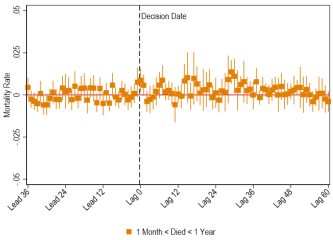
A. Died < 1 Year



B. Died < 1 Month



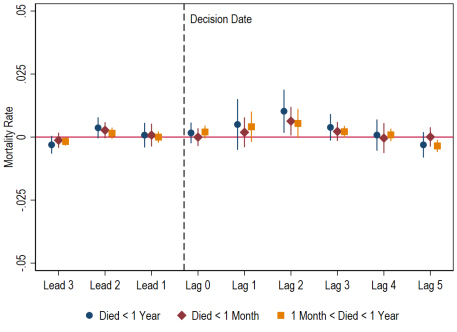
C. 1 Month < Died < 1 Year



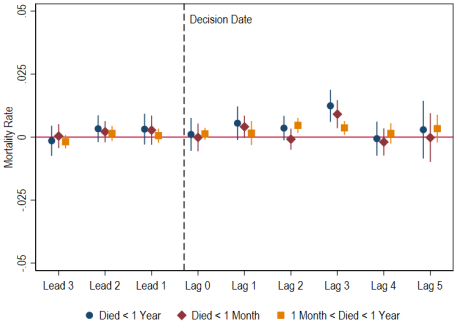
Back

Dynamic Impacts on Yearly Mortality - AR CIs

D. Monthly Aggregated



E. Yearly



Back