The Value of Environmental Monitoring: Evidence from the Housing Market

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Air Pollution – A Daunting Issue

- Governments allocate significant resources in environmental regulations.
- Firms incur significant expenditures to comply with these regulations.
- The exorbitant costs may induce firms to circumvent regulations.

Lack of Air Quality Monitoring Stations

12% Indian cities have air quality stations, 47% people unmonitored: Report

Only 12% of India's 4,041 census cities have air quality monitoring stations with just 200 of them monitoring all 6 key pollutants

Environmental Think Tank Centre For Science And Environment (CSE), Which Conducted The Analysis, Said Nearly 47 Per Cent Of The Country's Population Remains Outside The Maximum Radius Of The Air Quality Monitoring Grid.

Press Trust of India | New Delhi
5 min read Last Updated : Jul 06 2023 | 10:09 PM IST

BBC Register

Is the UK doing enough to monitor air pollution?

16 October 2023 Share

Matt Wall
Tech reporter

Ella Adoo-Kissi-Debrah lived 25 metres from the South Circular Road in south-east London

Ella Adoo-Kissi-Debrah was just nine-years-old when she suffered a fatal asthma attack on 15 February 2013.

Fast forward to 2020, and she became the first person in the UK to have air pollution listed as a contributing cause of their death.

Ella's mother Rosamund had long campaigned for a second inquest after becoming convinced that pollution from heavy traffic near where they lived in Lewisham, south-east London. was a factor.

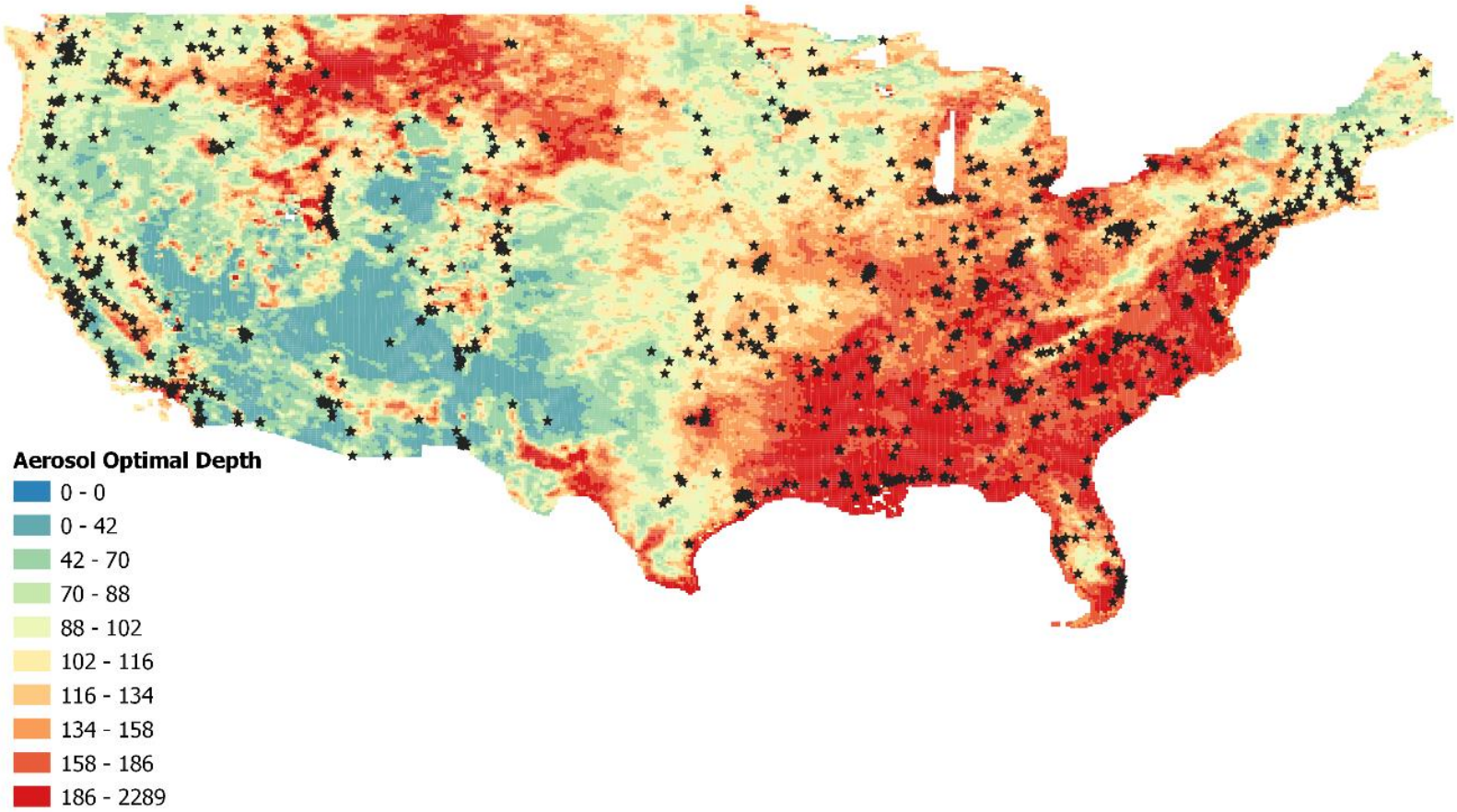
Research Question

Q: Is monitoring station an effective environmental regulatory tool?

Q: Does monitoring station create value?

- This paper examines the effects of monitoring station establishments on
  - Property Values
  - Facility-level Industrial Emissions
  - Air Quality

Geographical Distribution of PM Monitoring Stations



Baseline Specification – Difference-in-Differences

$$Ln(Price)_{it} = \beta After_t \times \mathbb{I}[\text{Distance}_i < 5\text{km}] + X_{it}\phi + \lambda_z + \theta_{mt} + \varepsilon_{it}$$

- $Treated = \text{Distance} < 5\text{km}$

  $Control = \text{Distance 5-10km}$
- X_{it} = Property and Transaction Controls + Distance between property and station
- λ_z = Zip Code Fixed Effects
- θ_{mt} = Monitoring Station × Year-Month Fixed Effects
- Sample Period = −3 years to +3 years
- Standard errors are clustered at the zip-code level.

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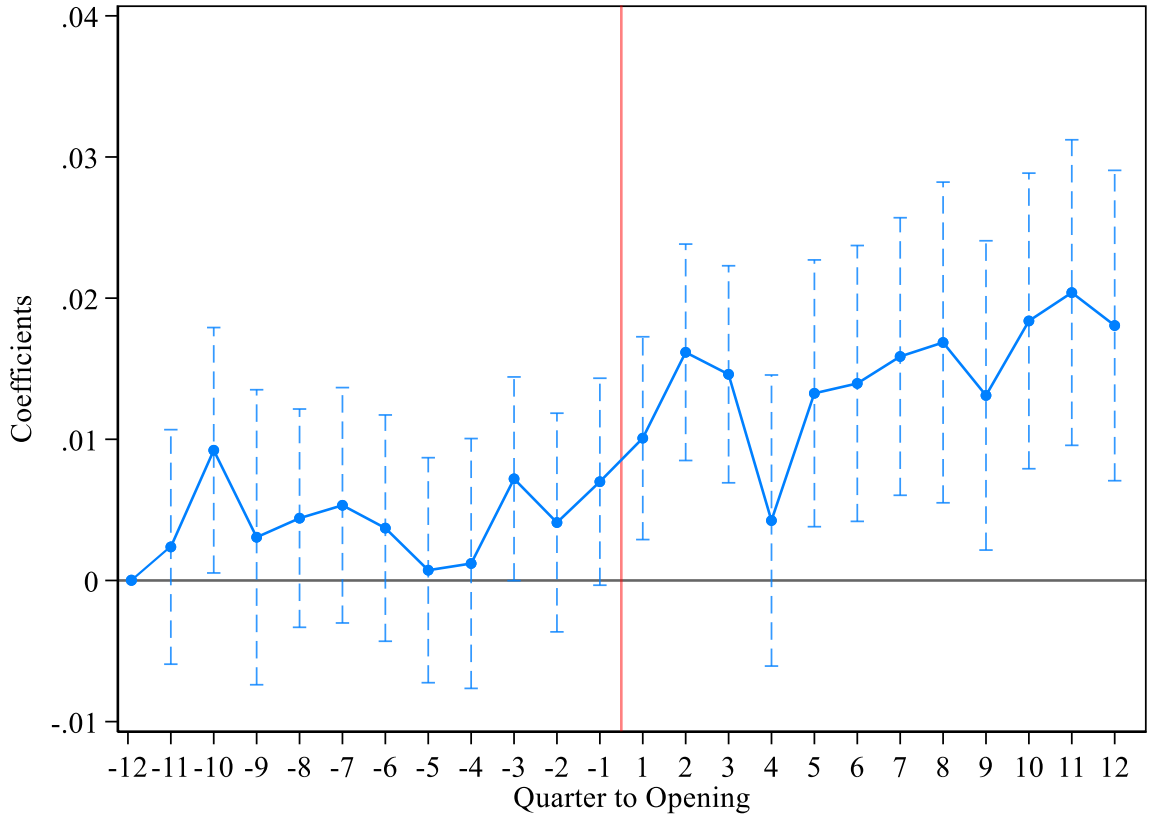
Compare changes in prices of houses within 5km of the monitoring station to houses within 5-10km of the **same monitoring station transacted in the same year-month** after the monitoring station opened

Baseline Results – House prices increase by 1.1%

	(1)	(2)	(3)	(4)	(5)
After × Dist. < 5km	0.011***	0.010***	0.009***	0.010***	0.039**
	(0.003)	(0.002)	(0.002)	(0.002)	(0.018)
Observations	3,822,505	3,816,505	3,810,188	3,795,293	107,298
Adj R-squared	0.816	0.825	0.826	0.835	0.957
Neighborhood FE	Z	Z	Z	Z	Z
Time FE	M × YM	M × YM × PT	M × YM × PT × R	M × YM × PT × R × I	M × YM × (All Prop. & Trans. Controls)
Prop. & Trans. Controls	Y	Y	Y	Y	N
Distance Bin FE	Y	Y	Y	Y	Y

Dynamic Effect – Parallel Trend Before Station's Opening



More Robustness – Results remain consistent

Consistent results when:	
✓ Alternative Specifications	• County-YearMonth FE, Zipcode-YearMonth FE, Monitor-YearMonth-PropAttributes FE …… • Stacked DID
✓ Alternative Comparison Group	• Properties within 10-20km • Distance Decay of Price Effects
✓ Alternative Sampling Periods	[-3, +5], [-3, +1], [-5, +5], [-5, +3]
✓ County-level environmental policy shock?	Remove *nonattainment* counties
✓ More pollution in control areas?	Remove controls with an increase in number of facilities or emissions after treatment
Insignificant price effect when:	
✓ Placebo (Treatment Timing)	3 years preceding the actual opening date
✓ Placebo (Treatment Group)	Properties within 5-10km as Treatment Group

Two Possible Mechanisms

1. **Improved Air Quality Channel**
   - Monitoring stations serve as environmental conveyance tools.
2. **Information Channel**
   - Air quality data provides new information about the air quality in the area.

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     If Information Channel is solely at play, we should see:
     - No effect in areas where actual air pollution = perceived air pollution
     - Positive effects in areas where actual air pollution < perceived air pollution
     - Negative effects in areas where actual air pollution > perceived air pollution

Two Possible Mechanisms – Improved Air Quality Channel

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Firm-level Emissions Decrease After Station's Opening

$$Ln(Emissions)_{idt} = \beta After_t \times \mathbb{I}[\text{Distance}_i < 5\text{km}] + \gamma_i + \theta_{dmt} + \varepsilon_{idt}$$

	(1) Total Release	(2) Air Release	(3) Water Release	(4) Land Release
Panel A: Industry × Monitor × Year Fixed Effects				
After × Dist. < 5km	-0.467***	-0.473**	0.025	-0.213*
	(0.178)	(0.182)	(0.062)	(0.117)
Observations	7,724	7,724	7,724	7,724
Adj R-squared	0.863	0.868	0.890	0.686
Fixed Effects	F, Ind × M × Y	F, Ind × M × Y	F, Ind × M × Y	F, Ind × M × Y

Aggregate No. of Facilities Decreases After Station's Opening

On the extensive margin……

	(1) No. of Facilities	(2) Total Release	(3) Air Release	(4) Water Release	(5) Land Release
After × Dist. < 5km	-0.026**	-0.361***	-0.342***	0.021	-0.190
	(0.012)	(0.100)	(0.096)	(0.082)	(0.120)
Observations	10,574	10,574	10,574	10,574	10,574
Adj R-squared	0.700	0.450	0.469	0.303	0.092
Fixed Effects	M × Y	M × Y	M × Y	M × Y	M × Y

Aerosol Concentration from Satellite Decreases After Station's Opening

$$Ln(aerosol)_{gt} = \beta After_t \times \mathbb{I}[Monitoring\ Station]_g + \gamma_g + \theta_t + X_{gt}\phi + \varepsilon_{gt}$$

	(1) [-3, +3]	(2) [-3, +5]	(3) [-3, +10]	(4) Full Sample
Panel A: Time Fixed Effects				
After × Treated	-0.031**	-0.037***	-0.051***	-0.075***
	(0.013)	(0.012)	(0.013)	(0.014)
Observations	198,602,271	198,700,740	198,964,006	200,500,560
Adj R-squared	0.274	0.274	0.274	0.274
Fixed Effects	G, T, W	G, T, W	G, T, W	G, T, W

Conclusion

1. **Regulatory monitoring stations serve as effective compliance enforcement tool**
   - Increase house prices by 1.1% → ~$52 billion
   - Reduce industrial emissions and improve air quality
2. **Policy Implications**
   - Regulatory monitoring brings monetary value to local communities
     - Annual cost of operating PM monitors ≈ $58 million