

# Pollution, agricultural productivity, and development: Evidence from coal in plants in India\*

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## **Abstract**

abstract

*Keywords:*

*JEL Codes:*

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\*thanks to...

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# 1 Introduction

## 2 Data and methods

### 2.1 Data

SHRUGS: Asher et al. (2021) Ag productivity: Gangopadhyay et al. (2022) PM estimates: Hammer et al. (2020)

### 2.2 Methodology

## 3 Results

## 4 Conclusion

Figure 1: Coal plants in India from 1990 to 2010

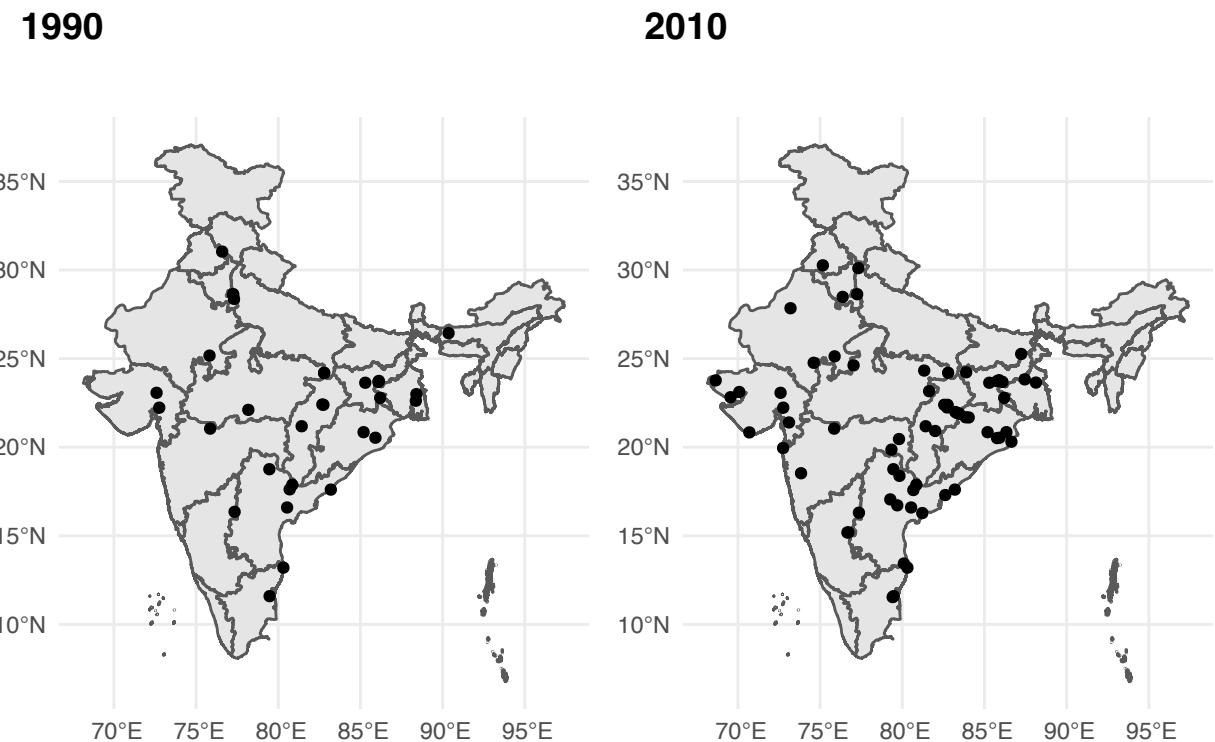


Figure 2: Wind direction (2010-01-01)

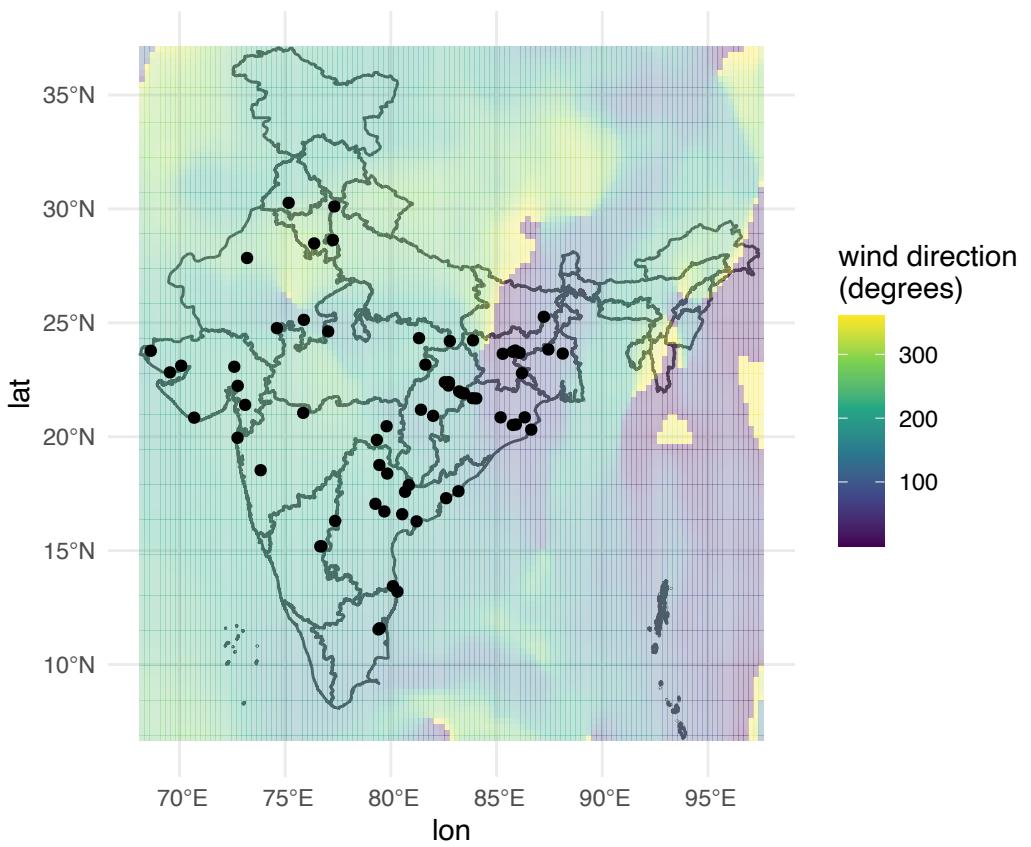


Table 1: Wind direction and particulate matter

	1998-2015		2002-2013	
	(1)	(2)	(3)	(4)
wind	0.045*** (0.004)	0.040*** (0.006)	0.063*** (0.005)	0.037*** (0.007)
<b>fixed effects:</b>				
village	Yes	Yes	Yes	Yes
month	Yes	Yes	Yes	Yes
<b>varying slopes:</b>				
month (village)	No	Yes	No	Yes
observations	22,345,092	22,345,092	14,896,728	14,896,728

Note: Standard errors are in parentheses and are clustered at the village level.

\* p<0.10 \*\* p<0.05 \*\*\* p<0.01

Table 2: Wind direction and agricultural productivity

	all		monsoon	winter
	(1)	(2)	(3)	(4)
wind	-0.003*** (0.0002)	-0.003*** (0.0002)	-0.002*** (0.0002)	-0.003*** (0.0003)
rain (z)		0.029*** (0.0004)	0.082*** (0.002)	0.016*** (0.0004)
sub-sample	all	all	monsoon	winter
<b>fixed effects:</b>				
village-season	Yes	Yes	No	No
year	Yes	Yes	Yes	Yes
village	No	No	Yes	Yes
observations	2,391,533	2,375,337	1,259,123	1,116,214

Note: Standard errors are in parentheses and are clustered at the village level.

\* p<0.10 \*\* p<0.05 \*\*\* p<0.01

Table 3: Wind direction and agricultural productivity

	all		monsoon	winter
	(1)	(2)	(3)	(4)
pm25	-0.021*** (0.001)	-0.020*** (0.002)	-0.013*** (0.001)	-0.024*** (0.003)
rain (z)		0.004** (0.002)	0.086*** (0.002)	-0.016*** (0.004)
sub-sample	all	all	monsoon	winter
<b>fixed effects:</b>				
village-season	Yes	Yes	No	No
year	Yes	Yes	Yes	Yes
village	No	No	Yes	Yes
observations	2,391,533	2,375,337	1,259,123	1,116,214
<b>first stage:</b>				
wind	0.143*** (0.003)	0.126*** (0.003)	0.155*** (0.003)	0.105*** (0.004)
rain (z)		-1.23*** (0.010)	0.301*** (0.015)	-1.36*** (0.009)

Note: Standard errors are in parentheses and are clustered at the village level.

\* p<0.10 \*\* p<0.05 \*\*\* p<0.01

Table 4: Wind direction and labor allocation

	(1)	(2)	(3)
wind	-0.028* (0.015)	-0.035** (0.015)	-0.027* (0.015)
controls	No	Yes	Yes
<b>fixed effects:</b>			
district	Yes	Yes	Yes
year	Yes	Yes	Yes
<b>varying slopes:</b>			
year (district)	No	No	Yes
observations	899,045	898,856	898,856

Note: Standard errors are in parentheses and are clustered at the village level.

\* p<0.10 \*\* p<0.05 \*\*\* p<0.01

## References

- Asher, Sam, Tobias Lunt, Ryu Matsuura, and Paul Novosad. 2021. “Development Research at High Geographic Resolution: An Analysis of Night Lights, Firms, and Poverty in India using the SHRUG Open Data Platform.” *The World Bank Economic Review*.
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- Hammer, Melanie S, Aaron van Donkelaar, Chi Li, Alexei Lyapustin, Andrew M Sayer, N Christina Hsu, Robert C Levy, et al. 2020. “Global Estimates and Long-Term Trends of Fine Particulate Matter Concentrations (1998–2018).” *Environmental Science & Technology* 54 (13): 7879–90.

## **Appendix A**

Table A1: Particulate matter and agricultural productivity

	all		monsoon	winter
	(1)	(2)	(3)	(4)
particulate matter (PM 2.5, '000s)	0.045 (0.031)	0.501*** (0.031)	2.05*** (0.099)	0.472*** (0.037)
rain (z)		0.030*** (0.0004)	0.083*** (0.002)	0.017*** (0.0004)
sub-sample	all	all	monsoon	winter
<b>fixed effects:</b>				
village-season	Yes	Yes	No	No
year	Yes	Yes	Yes	Yes
village	No	No	Yes	Yes
observations	2,391,533	2,375,337	1,259,123	1,116,214

Note: Standard errors are in parentheses and are clustered at the village level.

\* p<0.10 \*\* p<0.05 \*\*\* p<0.01