

Opening the Brown Box: Production Responses to Environmental Regulation
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● Key Takeaways

- ▶ Reduction in emissions could be more effectively targeted by mandating usage of specific energy input rather than imposing caps on emissions
- ▶ There is a need for coordinated decarbonization

Setup

- The CPCB created a Comprehensive Environmental Pollution Index (CEPI)
- This followed an effort by CPCB to reduce toxic emissions for industrial clusters
- Clusters with CEPI 60 - 70 (> 70) were classified as severely (critically) polluted
 - ▶ These areas were continuously monitored
 - ▶ Firms were required to give action plans to reduce pollution
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Empirical Strategy

- Difference-in-discontinuity design
 - ▶ Use the discontinuities around the CEPI cut-offs
 - ▶ Time-series variation in the discontinuities across the two regions, before and after 2009

$$Y_{ki(jcs)t} = \beta_1 Post_t \times CEPI_c^{[60,70)} + \beta_2 Post_t \times CEPI_c^{[70,100]} + \beta_3 CEPI_c + \beta_4 Post_t + \gamma_i + \kappa_{jst} + \epsilon_{kijcst}$$

- k :product; i : firm; j :industry; c :city; s :state; t :year

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- Firms respond to regulations, even when targeted, along multiple dimensions.
- This paper uncovers various ways firms respond to environmental regulations and the potential consequences of various broad economic impacts.
- Understanding these might allow policymakers to make a more informed decision and move toward an optimum policy design.

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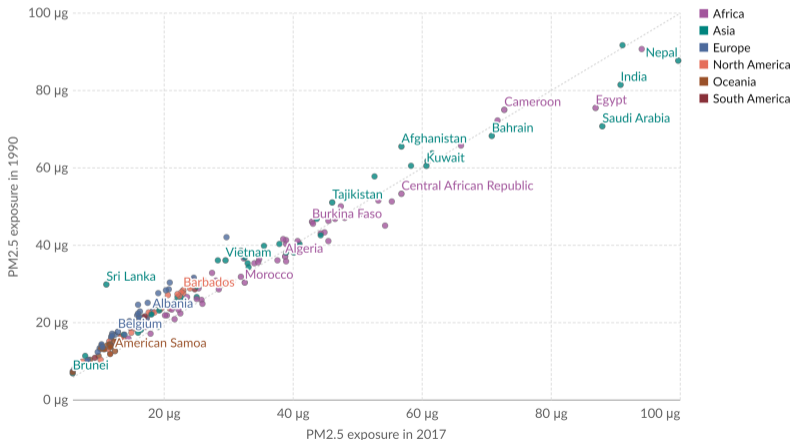
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Particulate matter exposure in 1990 vs. 2017

Population-weighted average level of exposure to concentrations of suspended particles measuring less than 2.5 microns in diameter. Exposure is measured in micrograms per cubic metre ($\mu\text{g}/\text{m}^3$).

Our World
in Data



Data source: Brauer et al. (2017) via World Bank

OurWorldInData.org/outdoor-air-pollution.LCC.BY

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 - ▶ Some results are not obvious to follow
- I think it will be very helpful for the readers to have a conceptual framework that clears ideas.

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- Lack of impact in profit or productivity could imply that the firms in the treated segment were inefficient compared to the control groups.
 - ▶ If they were relatively more inefficient, why were they not driven out?
- Or it could imply some form of inherent advantages of (some of) these firms that allow them to shield themselves from regulation

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 - ▶ It is also not clear why input mix is a better tool at disposal than abatement
- ② Firms in HPI increase the quantity of product but reduces product variety vis-a-vis LPI
 - ▶ The economics of What drives the quantity vs. product variety choice needs to be highlighted

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 - ▶ It would be good to see the overall effect on firm creation
 - ▶ Could have different implications for policymakers

Other Comments

- It'll be good to have some more clarification on the institutional details
 - ▶ Are the groups subject to regulation identified only in the year 2009?
 - ▶ What happens as a cluster worsens or improves?
- The energy usage of an input is a self reported item in prowess, this could result in a selection bias
- The dynamic trend product margin shows pre-trend, some explanation would be helpful
- Since there are a large number of hypothesis being tested, it'll be good to correct the errors for multiple hypothesis testing ([List, Shaikh, Shu 2019](#))
- Heterogeneity could be checked across firms, not just industry
 - ▶ Heterogeneity across characteristics other than pollution like size would be informative to understand the impact on the cost

In Conclusion...

- Very interesting work on an important topic.
- Very impressive effort on data collection.
- A bit more to streamline the results and provide an economic framework will help a lot.
- Recommend everyone to read the paper.