RESEARCH BRIEF

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When the Wind Blows, Air Pollutants Travel across Chinese Cities

Pollution Control Policies Must Be Coordinated among Cities and Provinces to Effectively Reduce Urban Air Pollution

BY XIAOGUANG CHEN , EFD CHINA, DRB 15-15, NOVEMBER 2015

We use city-level data from the daily air pollution index and meteorological data on wind movement to see whether air pollution in China spills over from one city to another. We find that (i): a city's average air pollution is expected to increase by 0.40-0.51 units (in the Air Pollution Index) if the average pollution in surrounding cities increases by one unit; (ii) an increase in gasoline price can improve air quality by discouraging driving; and (iii) high levels of precipitation and strong winds can mitigate air pollution, while the effects of temperature on air quality vary by time of day. Our findings suggest that pollution control policies must be coordinated among cities and provinces to effectively reduce urban air pollution, with the added benefit of reducing greenhouse gas emissions.

China's air quality is notoriously poor. In 2011, pollution levels exceeded the World Health Organization air quality guidelines on more than 250 days in many Chinese cities. International media reports that air quality in China has reached levels that are "hazardous to human health." To find solutions to China's air pollution problems, numerous efforts have been made to identify key sources of air pollution in Chinese cities. However, existing findings about factors contributing to urban air pollution in China are mixed. Some studies have shown that industrial pollution and traffic emissions were the major sources of urban air pollution, while other studies said that neighboring cities can have a large influence on a city's air quality.

In this study, we develop a new model and consider factors from both local and neighboring sources to examine whether air pollution spills over between Chinese cities, and to determine the importance of various local and neighboring factors in influencing air pollution concentrations in Chinese cities. We have two interesting findings. First, we find strong evidence of spillover effects of urban air pollution in China. Specifically, a one-unit increase in air pollution in surrounding cities will raise a city's air pollution by about 0.40-0.51 units in the Air Pollution Index, holding other factors the same. Second, we find that an increase in gasoline price can effectively reduce urban air pollution, by reducing

Key Points

- A city's air quality can be affected by the movement of the wind from surrounding cities.
- Pollution control policies should be coordinated among cities/provinces to improve urban air quality.
- An increase in gasoline prices can effectively improve air quality by encouraging people to drive less.
- The same policies that can reduce pollution in Chinese cities can produce global benefits by reducing greenhouse gas emissions.

fuel consumption. The first finding suggests that pollution control policies must be coordinated among cities and provinces to effectively reduce urban air pollution. The second finding suggests that increasing fuel prices may also help curb urban air pollution.

Conclusions

At present, the strategy adopted by many Chinese cities to improve air quality is to relocate large-scale and heavily polluting factories to suburbs and to neighboring provinces. For instance, to host the 2008 Olympic Games, China relocated several large and heavily polluting firms to Beijing's neighboring cities as one of a series of actions to improve Beijing's air quality. However, a recent study showed that relocating polluting firms is a poor pollution reduction strategy, because Beijing's neighboring cities/provinces contributed significantly to Beijing's air pollution after the Olympic Games. In line with this study, our findings suggest that, to move China's environmental policy forward, it is important to identify where air pollution comes from.

ABOUT THIS BRIEF

This brief is based on "When the Wind Blows: Spatial Spillover Effects of Urban Air Pollution." Environment for Development Discussion Paper Series 15-15 (2015) by Xiaoguang Chen. Published by University of Gothenburg, Sweden and Resources for the Future, Washington, DC. The DRB series is associated with the EfD Discussion Paper series.

FURTHER READING

Chen, Y., A. Ebenstein, M. Greenstone, and H. Li (2013). "Evidence on the Impact of Sustained Exposure to Air Pollution on Life Expectancy from China's Huai River Policy." *Proceedings of the National Academy of Sciences* 110(32): 12936-12941.

Streets, D.G., J.S. Fu, C.J. Jang, J. Hao, K. He, X. Tang, Y. Zhang, Z. Wang, Z. Li, Q. Zhang, L. Wang, B. Wang, and C. Yu (2007). "Air Quality during the 2008 Beijing Olympic Games." *Atmospheric Environment* 41(3): 480-492.

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