RESEARCH INSIGHTS

How Does Exposure to High Concentrations of Air Pollution Affect Daily Labor Supply, and Do These Effects Differ Across the Income Distribution?

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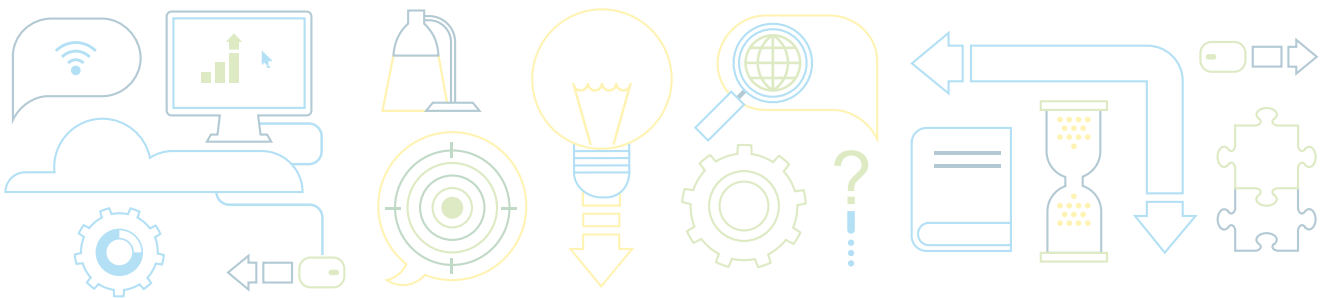
- **On days with high pollution, workers reduce their labor supply, with high-income workers decreasing hours worked more than low-income workers.**
- **Workers partially compensate for lost hours of work on high-pollution days by increasing labor supply on subsequent days, and this intertemporal adjustment is more pronounced among high-income workers.**
- **When high pollution persists across days, the response to contemporaneous pollution decreases, with low-income workers reducing their response quicker than high-income workers.**

CONTEXT

Air pollution negatively impacts many dimensions of well-being. Understanding how workers adjust their labor supply in response to pollution is crucial, especially in urban areas with high pollution levels. This research aims to uncover whether these adjustments differ across income groups, shedding light on potential inequalities the impacts of air pollution and in workers' ability to adapt to environmental shocks or degradation.

PROJECT

The study utilizes high-frequency data on fine particulate matter (PM2.5) air pollution and detailed labor supply information from Mexico City. By analyzing daily variations in pollution and corresponding labor supply responses, the research identifies patterns in how workers adjust their hours worked in response to pollution shocks, with a focus on differences across income levels.



RESULTS

We find negative, non-linear effects of air pollution on labor supply. In particular, workers reduce their labor supply by 0.16 hours for each hour with PM2.5 concentration above the WHO's interim target 1 (IT1) threshold (the WHO's least ambitious target) on average. On a day above the WHO IT1 threshold, a locality would typically experience around 3 hours of pollution above the IT1 threshold. A back-of-the-envelope calculation implies that workers reduce their labor supply by approximately 7.5%, or almost half an hour, on high pollution days. We find a larger impact of an hour with pollution above the IT1 threshold in the peak pollution season. During this period, a highly polluted day will typically have around 5 hours of fine particulate matter above the IT1 threshold. This implies a reduction of hours worked of around 25% on high pollution days. **However, workers compensate for lost hours of work on high pollution days by increasing labor supply on subsequent days.**

Key Concept

AVOIDANCE BEHAVIOR

Actions taken to minimize exposure to harmful conditions, such as air pollution.

The reduction in hours worked in response to high pollution is not uniform across income groups. High-income workers decrease their hours of work on high-pollution days significantly more than low-income workers, suggesting that low-income workers may have less flexible labor supply. Other factors such as job status and gender also matter, but income is the primary determinant of labor supply adjustments in response to air pollution.

Finally, on consecutive days of high pollution, workers decrease their response to contemporaneous pollution, with low-income workers reducing their response quicker than high-income workers. This pattern of effects is consistent with avoidance behavior.

POLICY IMPLICATIONS

The study focused on Mexico City, but the results speak more generally to developing countries. Mexico City experiences high levels of fine particulate matter and has a labor market with high levels of informality and self-employment and high inequality in income and productivity.

The research underscores the need for policies that address both environmental and economic disparities. The results have three specific policy implications. First, the strong nonlinear relationship of PM 2.5 with labor supply indicates that policies should focus on reducing peak levels of particulate matter to deliver the largest benefits.

Second, our results suggest that low-income workers are less able to adjust labor supply as avoidance behavior than high-income workers. This implies that the costs of air pollution are unequally distributed across workers. This may lead to higher exposure to air pollution for low-income workers than high-income workers, which could contribute to some of the health inequalities associated with air pollution documented in the literature.

Third, our results have implications for how workers will respond to higher pollution environments. The larger impact of pollution on labor supply in the peak season suggests that workers will respond to larger pollution shocks with larger reductions in labor supply. Workers' compensation for lost labor supply on high-pollution days and the diminishing effects of pollution on consecutive days of high pollution suggest that there are limits to

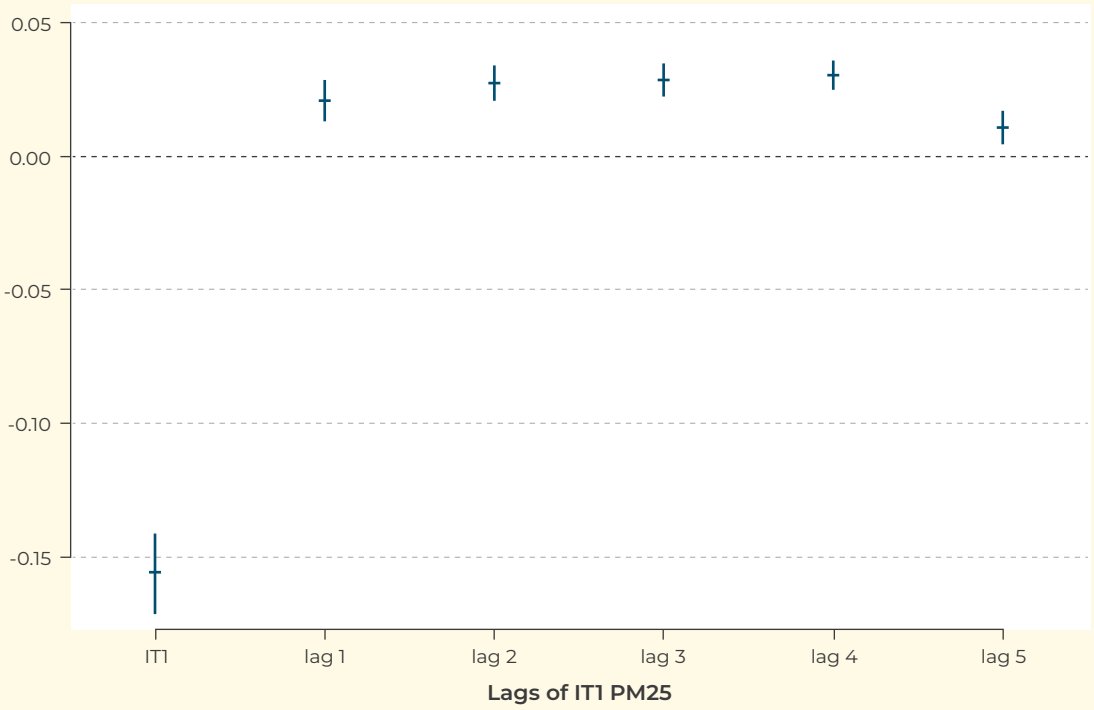
Key Concept

PM2.5

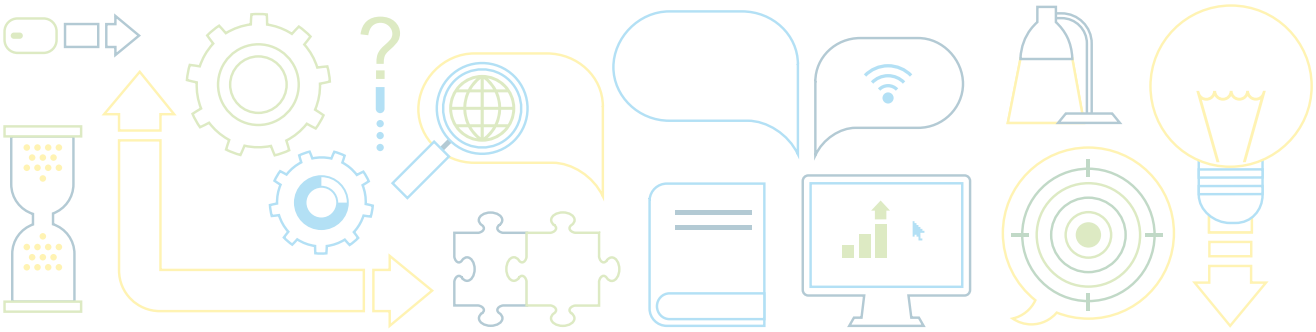
Fine particulate matter with a diameter of 2.5 micrometers or less, capable of penetrating deep into the lungs and causing severe health risks.

avoidance behavior. Workers eventually return to the workplace despite persistent high pollution. Further, if pollution were to increase so that levels of pollution that are now extreme were to become more frequent, our nonlinear results suggest that workers may shift their labor supply responses to a new, higher level of pollution and work their usual hours in the new, more polluted environment.

FIGURE 1. Dynamic Adjustments to Labor Supply Due to High Pollution



Notes: Impact of same-day and previous days' (i.e., lagged) PM 2.5 on daily hours worked.



FULL STUDY

Hoffmann, Bridget, and Juan Pablo Rud. 2024. "The Unequal Effects of Pollution on Labor Supply." *Econometrica* 92 (4): 1063–96. https://doi.org/10.3982/ECTA20484.

This study was also published as an IDB Working Paper.

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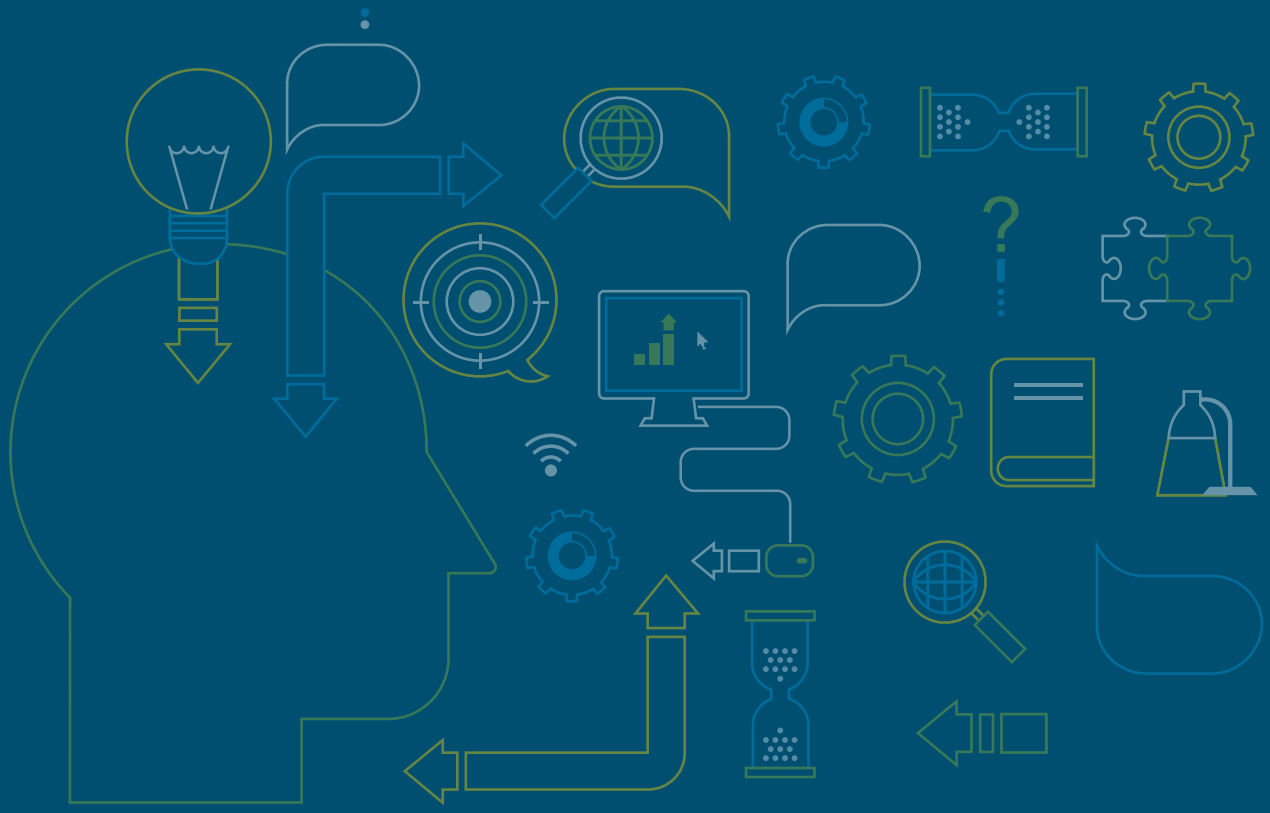

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