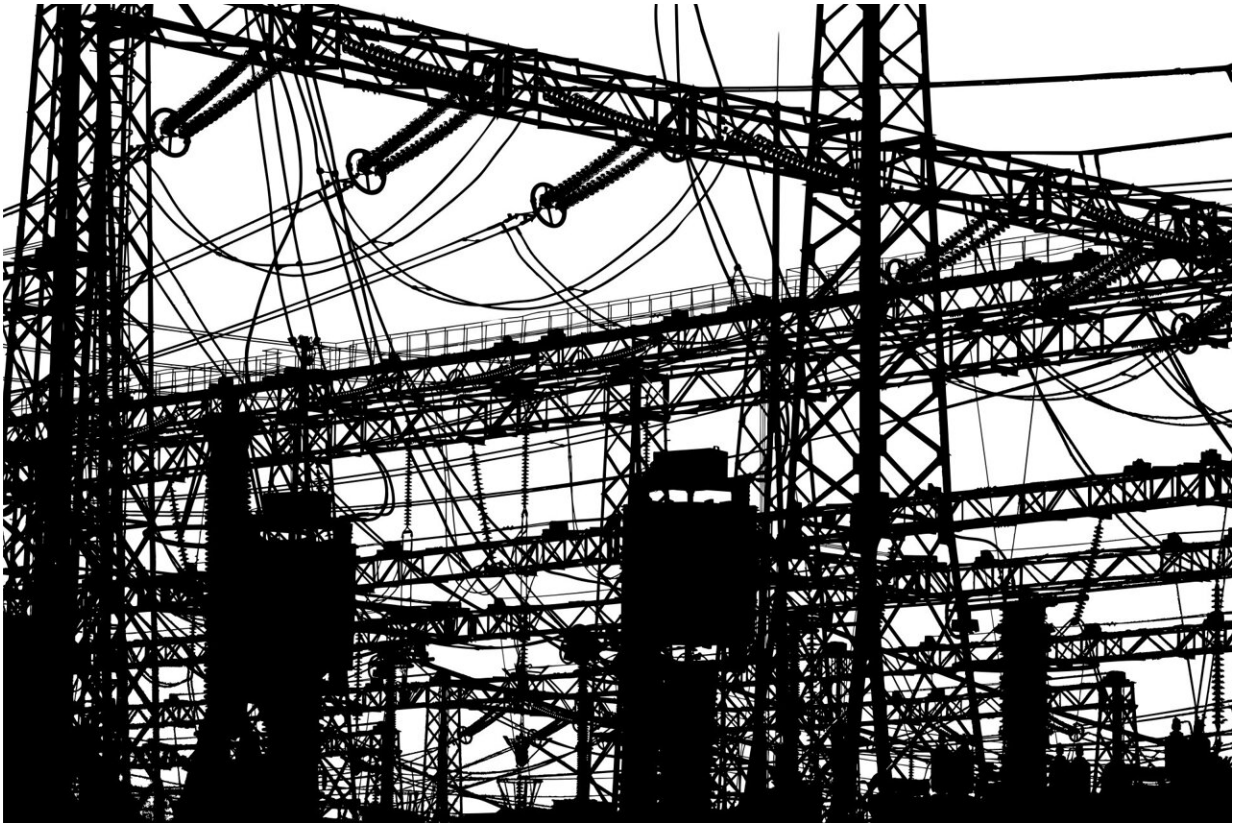


New study looks at effects of Clean Air Act on power plants

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The Clean Air Acts of 1970 and 1963 changed America's energy industry.

A new study by researchers at Carnegie Mellon University and the University of Montreal found that the legislation helped lead to large and persistent declines in output and productivity for U.S. fossil-fuel power plants that opened before 1963.

The effects on plants that opened after 1963 were small. The 1963 version of the Clean Air Act signaled that [environmental regulations](#) were on the horizon, which affected changes in plant design, locations and other behaviors that lowered the [economic costs](#) of the later Clean Air Act, the study suggests.

The study was published in the *National Bureau of Economic Research*.

"Landmark policies like the Clean Air Act, which is the centerpiece of local air pollution regulation in the United States and a model for environmental policy worldwide, have fundamentally changed major sectors of the U.S. economy," said Edson Severnini, associate professor of economics and [public policy](#) at CMU's Heinz College of Information Systems and Public Policy, who coauthored the study. "Our study provides the first causal estimates of the impacts of the legislation that account for anticipatory behavior."

Government regulation permeates all aspects of the modern economy, affecting a range of outcomes. The Clean Air Act emerged after an extended period of incremental policy change, during which polluting plants may have preemptively adjusted behavior because the legislation's passage was largely foreseeable in the years leading up to its enactment. Anticipatory behavior makes it difficult to estimate the full effects of regulations like the Clean Air Act, Severnini said.

In this study, researchers used annual plant-level data for most fossil fuel-fired power plants in the United States from 1938 to 1994. The Federal Power Commission, later renamed the Federal Energy Regulatory

Commission, began publishing detailed plant-level information in 1948. The initial volume included retrospective data beginning in 1938. For this study, researchers digitized the data for 1938 to 1981 and used similar data collected by the FERC for 1982 to 1994.

The newly available data allowed the researchers to account for both anticipatory behavior by electric utilities in the years preceding the Clean Air Act's passage and reallocative effects of the act across plants. The researchers also used the geographic and temporal variation in environmental regulation built into the legislation, which designated counties to be in attainment or out of attainment based on standards set forth by the National Ambient Air Quality Standards. They compared the changes in outcomes of plants located in counties in attainment to those in counties that were out of attainment, before and after enforcement went into effect.

The study found that county nonattainment designations under the Clean Air Act had negative effects on output and productivity, but only for plants built before 1963. The productivity losses incurred by plants built before 1963 were economically large and persistent, suggesting that these plants could not adapt to environmental regulation even in the long run. In contrast, the legislation's effects on plants that opened between 1963 and 1971 were small and statistically insignificant.

The timing of these patterns aligns with the passage of the original Clean Air Act in 1963, which gave the federal government the authority to control air pollution and signaled coming environmental regulations, the study concluded. Plants that opened after that key year were largely unaffected by subsequent regulatory requirements.

"Our findings point to anticipation playing a key role in the eventual costs of complying with the CAA," said Karen Clay, professor of economics and public policy at CMU's Heinz College, who coauthored

the study. "Firms may have been able to acquire information during the process leading up to the passage of the Clean Air Act of 1970 and preemptively take actions to reduce the costs of regulatory compliance."

The study also found that the aggregate productivity losses of the Clean Air Act borne by the power sector were mitigated substantially by the reallocation of output from older, less efficient power plants to newer plants. In particular, approximately half of the aggregate long-run losses were offset by the relocation of production across [plants](#).

"The historical U.S. experience highlights the challenge for environmental policy design in developing countries, where policymakers often must balance the need to curb extreme levels of air pollution with the objective of promoting widespread access to affordable energy services," said Akshaya Jha, assistant professor of economics and public [policy](#) at CMU's Heinz College, who coauthored the study.

More information: Karen Clay et al, Impacts of the Clean Air Act on the Power Sector from 1938-1994: Anticipation and Adaptation, *National Bureau of Economic Research* (2021). [DOI: 10.3386/w28962](https://doi.org/10.3386/w28962)

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