Distributing Pollution Rights in Cap-and-Trade Programs in the United States

Researchers:

Meredith Fowlie

Jeffrey Perloff

Sector(s): Environment & Energy

Location: Southern California, United States of America

Sample: 376 firms

Target group: Large enterprises

Outcome of interest: Pollution Climate change mitigation

Intervention type: Audits Pricing and fees

Données: Download from Dataverse

Research Papers: "Distributing Pollution Rights in Cap-and-Trade Programs: Are Outcomes Independ...

Partner organization(s): South Coast Air Quality Management District

Cap-and-trade programs are commonly discussed as a cost-effective tool to reduce industrial pollution emissions, but many questions remain about how to design these programs most effectively. Researchers evaluated a cap-and-trade program in the United States to determine if the initial allocation of permits among firms affected how much firms decided to pollute. Evidence was consistent with, but not proof of, the economic theory that firms make decisions to reduce emissions based on their abatement costs and not the initial distribution of permits.

Policy issue

Cap-and-trade programs can potentially reduce industrial pollution while minimizing costs to businesses. A government can set a hard cap on the total quantity of emissions and allow firms to buy and sell permits to pollute based on their willingness to pay. Firms that emit below a set target can sell emission permits to firms that do not meet targets. One reason why cap-and-trade programs appeal to policymakers is that theoretically, the initial distribution of pollution permits should play no role in determining how firms reduce emissions, meaning that permits can be distributed for political or other reasons without compromising the effectiveness of the program. This is what economists call the "independence theory." Yet there is speculation that the independence theory may not hold in situations when firms face broker costs, regulatory uncertainty, and other real-world problems. Researchers studied a unique design feature of a cap-and-trade program in the United States to evaluate if the initial allocation of permits to firms affected how much they decided to pollute.

Context of the evaluation

The South Coast Air Quality Management District (SCAQMD) covers 10,740 square miles of Southern California, including all of Orange County. In 1991, concentrations of ground-level ozone, the main component of smog, exceeded state standards on 184 days.

In 1994, regulators introduced the Regional Clean Air Incentives Market (RECLAIM) to decrease emissions and improve the air quality of the region. This cap-and-trade program limited the total quantity of nitrogen oxide emissions permitted by all firms in the program. Nitrogen oxide contributes to high levels of ground-level ozone and is linked with adverse effects on the respiratory system. Levels for individual firms were based on historical emissions data and firms' technological capacity to reduce emissions. If a firm reduced emissions below its permit allocation, it could sell excess permits to other firms. The total number of permits decreased each year to meet the target of reducing emissions by 75 percent by 2003.



A factory emits pollutants and emissions in California, USA.

Photo credit: Robert V Schwemmer, Shutterstock.com

Details of the intervention

The design of the program allowed researchers to study how the initial allocation of permits impacted firms' emissions levels. Due to concerns that firms might plan inadequately and run out of permits before the end of the year, regulators randomly assigned them to one of two staggered twelve-month compliance cycles. For firms assigned to cycle 1, permits were valid from January 1-December 31 and for those assigned to cycle 2, permits were valid from July 1-June 30. When a cycle ended and a new one began, old permits expired and a reduced number of new permits were issued to all firms. Therefore, in the first half of each year, firms in cycle 1 received fewer permits in total than firms in cycle 2. If the independence theory held, firms should have adjusted to the overall cap of permits and traded between the two groups, meaning that firms in cycle 1 would not emit less due to the fact that they received fewer permits. If the theory did not hold, firms assigned to cycle 1 would emit less than those assigned to cycle 2 in the first half of the year. Researchers studied if the random assignment to the two cycles generated differences in emissions between firms.

Results and policy lessons

Findings were consistent with the independence theory. Firms receiving more permits did emit more pollution, but this correlation does not imply a causal effect. Firms that were already likely to emit more received more permits based on historical emissions. On average, firms in cycle 2 were allocated 15 percent more permits in the first six months of each year than firms in cycle 1. This difference in allocation did not lead to a detectable difference in firm-level emissions, though standard errors were too large to rule out all economically significant positive effects of permit allocations on emissions. This provides support, but not proof, to the theory that firms' emissions are independent of the initial allocation of emissions permits in cap-and-trade programs.

Fowlie, Meredith, and Jeffrey Perloff, 2013. â€œDistributing Pollution Rights in Cap-and-Trade Programs: Are Outcomes Independent of Allocation?â€ Review of Economics and Statistics, 95(5): 1640â€“1652