



CARBON PRICING AND POWER SECTOR DECARBONIZATION: EVIDENCE FROM THE UK

BACKGROUND AND RESEARCH AIM



In order to mitigate climate change, every country across the globe must reduce their greenhouse gas emissions. Economists widely regard carbon pricing as the most efficient method for achieving emission reductions. However, there is a limited availability of evidence demonstrating the actual impact of current carbon taxes or markets. In 2013, the UK implemented the Carbon Price Support (CPS) as a carbon tax specifically targeting its power sector.

Over the years, the tax rate witnessed a significant rise, increasing from €5.9 per ton of CO₂ in 2013 to €26 in 2017. Since then, the power sector in the UK has undergone a remarkable transformation. From 2012 to 2017, the proportion of coal in electricity generation dropped significantly from 40% to 7%, resulting in a 57% reduction in emissions from the power sector. However, the exact contribution of the Carbon Price Support (CPS) to this rapid decarbonization remains unclear. Contributing to this knowledge gap, this study estimates the causal impact of the CPS on UK power sector emissions.

RESEARCH METHODS

The synthetic control method, a statistical method used to evaluate the effect of an intervention in comparative case studies, was applied to compare the evolution of UK power sector emissions to that of a weighted combination of European countries having similar characteristics.

The synthetic UK comprised of: Ireland (49.2%), Slovakia (25.6%), the Netherlands (13.7%), Finland (5.8%), and the Czech Republic (5.7%). These countries were subject to comparable environmental policies established at the European level, notably including the EU carbon market (ETS) and regulations on industrial emissions. Assuming that no other power sector-specific policies were implemented in the UK during the relevant period, this methodology allows for the isolation of the specific impact of the CPS.

FINDINGS



The study found that the introduction of the CPS to the UK power sector reduced carbon emissions by 20.5% - 26% on average per year between 2013 and 2017. This range, however, depends on the assumed impact of three other UK-specific policies; a subsidy encouraging biomass conversion for coal plants, support to renewable investments, and a capacity market -, and how much the CPS might have increased emissions in other European countries via trade spillovers and its effect on ETS prices. The upper bound assumes that biomass conversion is a consequence of the CPS, and that the other policies and trade spillovers are negligible over 2013-2017. The lower bound separately estimates the effect of biomass conversion, and that, relatively small, of other policies and spillovers.

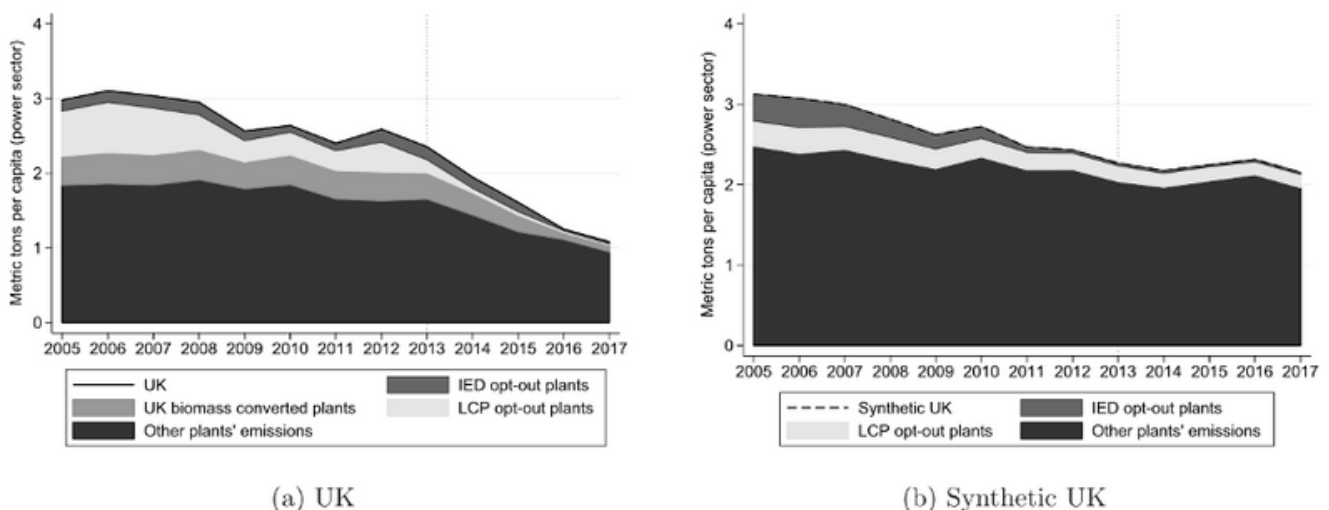


Figure 1. Per capita CO₂e emissions by source, UK and synthetic UK.

The CPS operated via three channels: UK power plants at risk of closure due to European air quality regulations had a higher probability to effectively close; other coal-fired plants closed; and surviving power plants decreased their emissions, likely via a fuel switch from coal- to gas-fired generation.

IMPLICATIONS FOR PRACTICE AND FUTHER RESEARCH



The CPS played a crucial role in facilitating the rapid decarbonization of the UK power sector. Several factors contributed to achieving substantial emissions reduction while minimizing potential leakage. These factors should be considered when assessing the generalizability of the results. Firstly, the UK possessed a significant capacity for fuel switching, enabling a smooth transition to cleaner energy sources. Secondly, limited interconnection played a role in containing any potential leakage in the form of electricity imports from other countries. Lastly, the regulatory context discouraged investments in polluting forms of energy generation, further supporting the effectiveness of the CPS.

Several countries meet these criteria and could be good candidates to replicate the UK experience: many European countries have sufficient idle gas capacity to eliminate coal via fuel switching; regional carbon pricing can be a solution to avoid carbon leakage for strongly interconnected countries; and increasingly stringent environmental regulations make coal less competitive in several other countries, such that a moderate price signal may be sufficient to drive high-emitting plants out of the market.

ACADEMIC REFERENCE

Leroutier, M. (2022). Carbon pricing and power sector decarbonization: Evidence from the UK. *Journal of Environmental Economics and Management*, 111, 102580.