

Tax Exemptions for Drop-In Biofuels and Transport Decarbonisation: Evidence from Sweden

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Extended Abstract

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Abstract Summary

Fiscal incentives for pure and high-blended biofuels have been used across Europe to support renewable transport fuels, yet causal evidence on their effectiveness remains limited. This paper examines whether tax exemptions for such fuels complement broader decarbonisation instruments by supporting renewable fuel uptake in vehicle fleets that are difficult to electrify: particularly heavy commercial, utility, and public transport applications dependent on drop-in fuels such as hydrotreated vegetable oil (HVO).

Sweden provides the empirical setting. It introduced a carbon-tax exemption for pure and high-blended biofuels in 2003, added an energy-tax exemption in 2008, and extended the scheme to HVO in 2016. The 2016 extension is treated as the primary treatment event of interest, given HVO's direct substitutability for fossil diesel across existing heavy vehicle fleets.

The empirical strategy combines two components. First, a synthetic control method (SCM) is applied to annual panel data on per-capita CO₂ emissions from road transport for a set of OECD and EU member states over 2004–2020, constructing a weighted counterfactual for Sweden from donor-pool countries without materially equivalent tax incentives. Second, an LLM-assisted coding procedure structured around a human-written codebook operationalising treatment status is used. It is applied to a corpus of tax legislation, Commission communications, and national biofuel policy documents to classify each candidate country-year as treated, untreated, or ambiguously treated. Reliability is assessed through manual verification of a random sample of classifications. This procedure enables reproducible donor-pool construction in a heterogeneous policy environment.

Preliminary estimates suggest a reduction in per-capita transport CO₂ emissions concentrated in the period following HVO eligibility in 2016. Methodologically, the paper demonstrates how LLM-assisted policy coding can support ex post evaluation in settings where treatment variation is embedded in complex legal texts across jurisdictions rather than in standard quantitative datasets.

Presenting Author Biography

David Fornborg is a PhD student at KTH Royal Institute of Technology with a background in economics and political science. His research focuses on energy systems, scenario analysis, and energy and climate policy, with particular interest in transport and industrial transitions.