Energy efficiency policy in an n-th best world: Assessing the implementation gap

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Overview

The energy efficiency gap, a concept highlighting discrepancies between actual and optimal investment levels in energy-efficient technologies, has been a focal point of economic and environmental policy research. This study develops a dynamic model of home energy retrofitting to capture the cumulative inefficiencies arising from multiple frictions, including CO_2 externalities, health-related consequences, credit constraints, landlord-tenant dilemmas, multi-family housing dynamics, present bias, and status quo bias. Focusing on the French context, the analysis reveals that rental and multi-family frictions contribute to deadweight losses exceeding those from CO_2 externalities alone. The findings challenge prior conclusions, showing that energy efficiency subsidies generate net social benefits, while the benefit-cost ratio of regulatory interventions is negative due to ancillary costs. Despite blending subsidies, taxes, and regulations, the current French policy framework addresses only half of the energy efficiency gap, underscoring the need for targeted policies tailored to low-income households, multi-family buildings, and rental properties.

Methods

A dynamic home energy retrofit model was developed to incorporate a range of market and behavioral frictions. The model explicitly simulates the cumulative effects of CO_2 externalities, health costs, and investment barriers such as credit rationing and split incentives. Behavioral anomalies, including present bias and status quo bias, were also integrated to provide a holistic welfare assessment. Policy instruments analyzed include subsidies, taxes, and regulatory measures, with their impacts evaluated through cost-benefit analysis. The study uses France as a case study to explore the implications of different policy portfolios on energy efficiency outcomes.

Results

The analysis highlights the outsized role of non-CO_2-related frictions in exacerbating the energy efficiency gap. Rental and multi-family frictions generate higher deadweight losses compared to CO_2 externalities. The findings show that subsidies for energy efficiency improvements yield significant net social benefits, contrary to prior literature. However, regulatory interventions have a negative benefit-cost balance due to associated ancillary costs. The current French policy portfolio, which combines subsidies, taxes, and regulations, addresses only 50% of the energy efficiency gap. Enhanced targeting of policies to specific groups—low-income families, multi-family housing, and rental properties—could significantly improve efficiency outcomes.

Conclusions

This study underscores the importance of addressing a wide range of market and behavioral frictions in closing the energy efficiency gap. While energy efficiency subsidies generate positive welfare outcomes, regulatory measures require careful consideration due to ancillary costs. The French policy framework needs refinement to more effectively target vulnerable groups and maximize its impact. Broader implications highlight the need for comprehensive approaches that integrate subsidies, tailored incentives, and improved policy design to address energy efficiency gaps in other national contexts.