

WHO ADOPTS AND WHERE? SPATIAL DIFFUSION OF RETROFIT TECHNOLOGIES UNDER SUPPLIER-OBLIGATION AND MARKET-LED INCENTIVES IN SCOTLAND

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EXECUTIVE SUMMARY

Decarbonising Scotland's housing stock depends on accelerating retrofit, yet uptake remains uneven across energy efficiency schemes and geographies. This study provides spatial econometric analysis of Scottish retrofit diffusion by scheme and technology. It combines 2012–2024 Energy Performance Certificate (EPC) records with small-area housing and socio-economic data. From EPC sequences we infer retrofit events for heat pumps (HP), solar photovoltaics (PV), and wall insulation (WI), attributed to either the supplier-obligation (ECO) or market-led incentive (FiT, RHI, Green Deal) schemes at small localities (Data Zone). Spatial dependence is strong but scheme and technology dependent. Our result show that EPC data can underpin fine-grained monitoring of retrofit diffusion and equity outcomes. Market-led schemes generate strong peer and installer spillovers for visible technologies such as PV, but adoption remains concentrated among higher-value, credit-accessible households. ECO achieves deeper penetration into deprived, low-value, and off-gas homes, though area batching can correspond to “shadowing” across adjacent communities. Policy design should sustain ECO-style obligation schemes while improving regional coordination and complement market-led diffusion with affordable finance and installer network seeding, ensuring that retrofit benefits extend to all Scottish households.



KEYWORDS

- Residential retrofit
- Energy performance certificate (EPC)
- Spatial econometrics
- Heat pumps
- Solar photovoltaics (PV)
- Wall insulation
- Energy company obligation (ECO)

RESEARCH RELEVANCE

- Retrofit adoption clusters geographically, but market-led schemes generate far stronger neighbourhood “hotspots” than the supplier-obligation scheme, especially for solar panels.
- The supplier-obligation scheme (ECO) reaches deeper into deprived, low-value, and off-gas homes, particularly for wall insulation and heat pumps.
- ECO's contractor-driven rollout can create “shadowing,” temporarily bypassing deprived areas neighbouring those already served.
- Market-led schemes mobilise strong peer effects and installer networks but remain concentrated among higher-value, credit-accessible households.
- Fuel type is a strong, practical targeting marker: heat pumps concentrate in electric and oil-heated homes, while ECO insulation reaches gas-heated and fuel-poor stock.

BIBLIOGRAPHIC INFORMATION

Mirzaie, S., & Radmard, H. (2026). Who adopts and Where? Spatial diffusion of retrofit technologies under supplier-obligation and market-led incentives in Scotland. *Energy Policy*, 215, Article 115329. Advance online publication. <https://doi.org/10.1016/j.enpol.2026.115329>

“Retrofit geography in Scotland is shaped more by delivery design than by climate: obligation-led schemes reach the households who need them most, market-led schemes spread fastest but not always fairest.”

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