

# What is the effect of weather on household electricity consumption? Empirical evidence from Ireland

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**Abstract** We explore the links between weather variables and residential electricity consumption using high-resolution smart metering data. While weather factors have been used for grid-level electricity demand estimations, the impact of different weather conditions on individual households has not been fully addressed. The deployment of smart meters enables us to analyse weather effects in different periods of the day using hourly panel datasets, which would previously have been impossible. To conduct the analysis, fixed-effects models are employed on half-hourly electricity consumption data from 3827 Irish household meters. We demonstrate that temperature has robust and relatively flat effects on electricity demand across all periods, whereas rain and sunshine duration show greater potential to affect individual behaviour and daily routines. The models show that the most sensitive periods differ for each weather variable. We also test the responses to weather factors for weekends and workdays. Weather sensitivities vary with the day of the week, which might be caused by different household patterns over the course of the week. The methodology employed in this study could be instructive for improving understanding behavioural response in household energy consumption. By using only weather indicators, this approach can be quicker and simpler than traditional methods —such as surveys or questionnaires— in identifying the periods when households are more responsive.

**Keywords** Weather effects; residential electricity consumption; fixed-effects models; smart metering data

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