

Beyond the meter: The behavioral gap in household gas use - Evidence from Dutch administrative and smart meter data

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Extended Abstract

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Abstract Summary

Household gas consumption exhibits substantial heterogeneity, which complicates the design and targeting of policies for the low-carbon energy transition. Despite decades of research, a large share of variation in residential energy use remains unexplained. This paper examines whether improved data, specifically high-frequency smart meter data, can reduce this unexplained variation.

We combine nationwide Dutch administrative data with monthly smart meter readings covering millions of households, creating one of the first large-scale comparisons of these data sources within a unified empirical framework. We estimate cross-sectional and panel models and introduce a novel decomposition separating space heating from non-heating gas use. Explanatory power is compared across datasets and model specifications.

We find systematic differences between data sources: administrative data overestimates gas consumption for approximately 94% of households by an average of 140 m³ annually. However, contrary to expectations, higher-frequency smart meter data yields only marginal improvements in explanatory power. Across specifications, models explain only 40-45% of the variation in gas use, with panel models reaching at most 4-49%. Increasing data granularity and decomposing consumption do not substantially reduce unexplained heterogeneity.

These findings suggest that a large share of household gas consumption is driven by unobserved behavioral and contextual factors, such as occupancy patterns and heating practices, that are not captured in existing datasets. As a result, more granular data alone does not improve causal understanding.

The results have important implications for research and policy. They challenge the assumption that better data automatically leads to better models, and highlight the limits of observability in residential energy demand. For policymakers, this implies that targeting

interventions based on observable characteristics remains inherently uncertain, and that incorporating behavioral heterogeneity is crucial for effective demand-side policies.