***Maximising consumer ability to manage electricity demand***

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## Overview

Time-varying electricity charges can support integration of variable renewable generation by encouraging people to shift the timing of their electricity demand to match the timing of electricity supply. These rates may be a useful tool in supporting energy transition. However, some sociodemographic groups can face worse health and cost outcomes on time-varying rates. There is a need to understand the extent to which low energy efficiency homes limit the ability of residential customers to manage costs on time-varying electricity rates, especially since disadvantaged groups are more likely to live in energy inefficient homes. We examine the impact of switching to time-varying rates on households in low energy efficiency homes, and compare it to the experience of high efficiency households.

## Methods

Using a sample of several thousand residents in the Australian Capital Territory (ACT), we use two-way fixed effects to estimate the effect of switching to a time-of-use (TOU) rate on quarterly household bills, allowing for heterogeneous effects as a function of building Energy Efficiency Rating (EER). Coarsened Exact Matching weights are used to ensure the estimated impact of switching to TOU is not confounded by correlation of switching with any combination of observable household characteristics.

## Results

We find no evidence that low-EER households experience bill increases when switching to TOU, with regression coefficients negative though statistically insignificant our preferred specification. High-EER homes, on the other hand, do tend to face slightly higher bills after switching to TOU. We propose two explanations for the observation that the households with the most technical capacity to optimise energy bills in the presence of TOU seem to do so the least. Firstly, we show that high-EER homes use less energy and have lower bills (all else equal). Hence energy costs may be less salient, inducing less effort to choose the best billing option and optimise use for that option. Secondly, high-EER homes are more likely to have central heating controlled by a thermostat, while low-EER homes in the ACT typically have manually controlled heaters in certain rooms. Low-EER households may choose to turn heating in certain areas down or off, while high-EER households may be paying for the luxury of being able to “set and forget” their heating and cooling systems.

## Conclusions

These findings suggest that those living in low-EER homes are not disproportionately disadvantaged by the availability of TOU rates (at least, not the design of TOU rate used in the ACT). High-EER households appear to be less engaged in management of energy use, and faced slightly higher bills after switching to TOU. Future research should consider whether these findings regarding building energy efficiency are robust to other jurisdictions with different rate design, and should further investigate behavioural responses underlying the data. In particular, low-EER households engaging in greater behavioural response may be more likely face comfort impacts such as being too cold or too hot inside their dwellings.