Matthew Collins and John Curtis

EVIDENCE, DRIVERS AND SOURCES OF DISTORTIONS IN THE DISTRIBUTION OF BUILDING ENERGY RATINGS PRIOR TO AND AFTER ENERGY EFFICIENT RETROFITTING

Matthew Collins: Economic and Social Research Institute, Whitaker Square, Sir John Rogerson's Quay, Dublin 2
Sustainable Energy Authority of Ireland, Wilton Park House, Wilton Place, Dublin 2
Phone: +353(1)863-2083, Email: matthew.collins@esri.ie
John Curtis: Economic and Social Research Institute, Whitaker Square, Sir John Rogerson's Quay, Dublin 2
Trinity College Dublin, College Green, Dublin 2
Phone: +353(1)863-2111, Email: john.curtis@esri.ie

Overview

Energy performance certificates provide a standardised ranking of the energy performance of homes, in turn providing a measure of and raising the awareness of the energy efficiency of homes. The Irish Building Energy Rating (BER) ranks homes on a 15-point alphanumeric scale ranging from A1 to G, with A1 representing the most efficient homes. The Sustainable Energy Authority of Ireland administers a grant aid scheme to incentivise home owners to improve the energy efficiency of their home. This scheme, known as the Better Energy Homes (BEH) scheme requires homes to perform a BER assessment which includes both a pre- and post-works energy rating. The data gained from these assessments provide evidence of perverse incentive in assessing a home's BER. Bunching in the post-works distribution of BERs is found to exist to the more efficient side of discrete grade thresholds, but this is not found in the pre-works distribution, where no returns to energy efficiency are present. In addition, drivers of distortion in the market for contractors and sources of distortions in the assessment procedure are examined from a policy perspective.

Methods

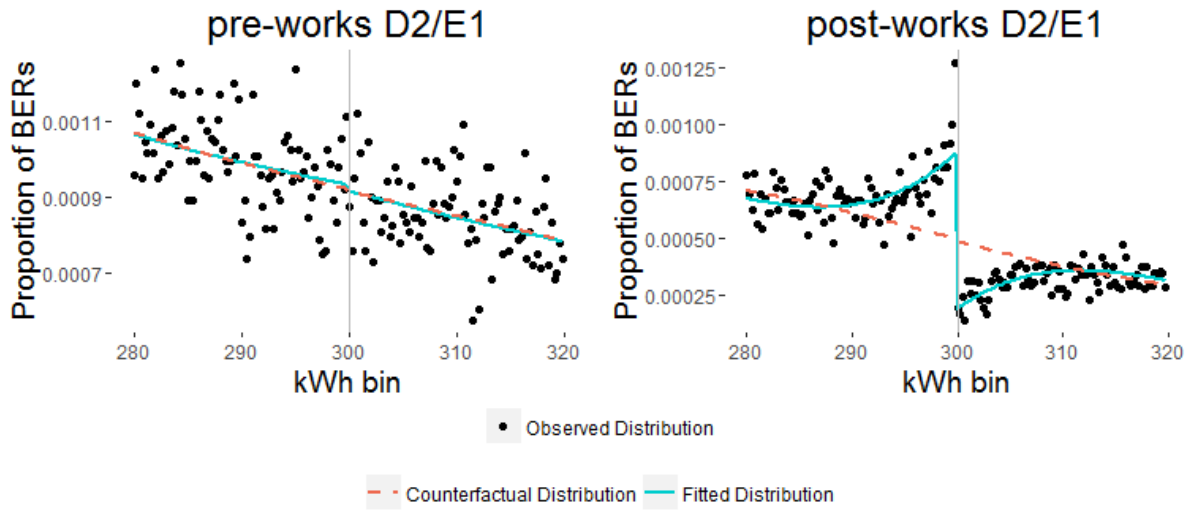
A regression discontinuity design is used to quantify the significance of bunching at each grade threshold across the distribution. A pooled polynomial regression, i.e. one that includes estimates on either side of the threshold, with a binary variable categorising observations on either side of each threshold is estimated and the significance of the difference in intercepts on either side of the threshold is examined. The number of distorted assessments is then calculated at each grade threshold where significant evidence of bunching is found. A counterfactual distribution is estimated by excluding the area to either side of the grade threshold where distorted assessments occur. This is compared to both the observed and a fitted distribution of assessments. An example of this is provided in fig. 1, which details the observed, fitted and counterfactual distributions used to assess both the pre- and post-works distribution surrounding a grade threshold.

To examine drivers of bunching, we look to the market for contractors. We estimate the proportion of distorted assessments in each county and a gini coefficient representing the polarisation of the market for contractors in each county, based on the number of assessments performed in each by individual contractors. Less polarised markets are considered more competitive and correlations between the level of bunching and gini coefficients are examined. Sources of distortions are examined visually. The proportional distribution of recorded values of certain parameters of assessment are plotted by bin number and examined for discontinuities surrounding grade thresholds.

Results

We find evidence of bunching of post-works BER assessments on the more energy efficient side of eight of the fifteen grade thresholds but find no evidence of bunching on the more efficient side of grade thresholds in the pre-works distribution. Bunching in the post-works distribution is found across most sub-groups of the sample, indicating that adjustment may have been a systemic issue as opposed to being isolated to certain groups of assessments. We examine the absolute intensity of bunching, finding that between 3.1% and 4.7% of BER assessments within the Better Energy Homes grant scheme may have been distorted to appear more efficient. We also find that bunching is relatively stronger at thresholds where the letter grade changes, e.g. the C3/D1 and D2/E1 thresholds, as opposed to thresholds where the letter grade does not change, e.g. C2/C3 or D1/D2.

Fig. 1: Observed, fitted and counterfactual distributions surrounding the D2/E1 grade threshold



We do not find evidence of systemic bunching, with no patterns of correlation found between market polarisation and bunching at any grade threshold or even between grade thresholds by county. The proportion of lighting classed as low-energy in a home is found to possess noticeable distortions around grade thresholds, with assessments just to the more efficient side of each threshold found to possess higher levels of low-energy lighting than other bins.

Conclusions

The findings of this research provide evidence of perverse incentive as a result of the use of a discrete energy labelling scheme. The implications of this research are quite clear in that between 3.1–4.7% of assessments represent a significant proportion of the sample and in the interest of accuracy and consumer protection, the results of this analysis may be used to inform the auditing process. Analysis here suggests that adjustments are mostly achieved via the low energy lighting parameter. It is possible that assessors are adjusting this parameter in order to misrepresent a property's BER grade. While it has not been assessed within this paper the mislabelling of energy ratings potentially adds a substantial premium to property owners, which will be paid by unsuspecting customers seeking to either purchase or rent such properties.