Energy Policy 92 (2016) 20–33

Contents lists available at ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

Energy performance ratings and house prices in Wales: An empirical study

Franz Fuerst [a], Pat McAllister [b], Anupam Nanda [b], Pete Wyatt [b,*]

[a] Department of Land Economy University of Cambridge, United Kingdom
[b] School of Real Estate & Planning University of Reading, United Kingdom

ARTICLE INFO

Article history:
Received 21 July 2015
Received in revised form
13 January 2016
Accepted 19 January 2016

Keywords:
Energy performance certificate
Dwellings
Prices
Wales

ABSTRACT

This paper investigates the effect of Energy Performance Certificate (EPC) ratings on residential prices in Wales. Drawing on a sample of approximately 192,000 transactions, the capitalisation of energy efficiency ratings into house prices is investigated using two approaches. The first adopts a cross-sectional framework to investigate the effect of EPC rating on price. The second approach applies a repeat-sales methodology to investigate the impact of EPC rating on house price appreciation. Statistically significant positive price premiums are estimated for dwellings in EPC bands A/B (12.8%) and C (3.5%) compared to houses in band D. For dwellings in band E (−3.6%) and F (−6.5%) there are statistically significant discounts. Such effects may not be the result of energy performance alone. In addition to energy cost differences, the price effect may be due to additional benefits of energy efficient features. An analysis of the private rental segment reveals that, in contrast to the general market, low-EPC rated dwellings were not traded at a significant discount. This suggests different implicit prices of potential energy savings for landlords and owner-occupiers.

1. Introduction

In most developed economies, voluntary and mandatory environmental certification schemes have been introduced in the commercial and the residential property sectors. These schemes are a market-based mechanism designed to inform consumers about the environmental performance of a product. This information is then expected to influence consumer behaviour, increase demand for less environmentally harmful products, produce changes in the relative supply of energy efficient products and, ultimately, reduce environmental impacts. Market prices are important in that they send demand signals from consumers to suppliers about what, where and when to produce. In particular, price premiums provide an economic incentive for producers to innovate and incur any additional production costs associated with improved energy performance. A key issue is the extent to which, within the purchase decision and associated price determination, consumers are willing to pay a premium for good environmental performance. The focus of this paper is on the price effects of energy performance in the residential property sector. If a price premium can be attributed to energy efficiency in the housing market, then, depending on the trade-off with additional costs, it may provide residential developers with evidence to justify the supply of more energy efficient dwellings and incentives for existing owners to improve the environmental performance of their homes and investments.

In 2008 the measurement of energy use in new and existing buildings in the UK became obligatory following the implementation of the European Union's Energy Performance of Buildings Directive. This required all buildings at the point of construction completion, sale or rent (or every ten years) to be issued with certificates that provide information about their energy performance. These Energy Performance Certificates or EPCs are asset ratings intended to inform potential purchasers about the intrinsic energy performance of a building and its associated services. The residential property market is by far the richest real estate sector in terms of transaction volume and, with seven years of recorded EPCs, there is sufficient scope to introduce a variety of statistical methods to control for price determinants other than energy performance. Using Wales as a case study area for the first time, in this paper we use a large sample of relatively homogeneous residential dwellings to investigate whether EPCs influence transaction prices and price growth rates. Because the data set included repeat sales we were able to exercise a greater degree of control for potential bias from dwelling-specific fixed effects. Furthermore, a distinction was drawn between purchasers who acquire dwellings for their own occupation and those who acquire

* Corresponding author.
E-mail addresses: ff274@cam.ac.uk (F. Fuerst), p.m.mcallister@reading.ac.uk (P. McAllister), a.nanda@reading.ac.uk (A. Nanda), p.wyatt@reading.ac.uk (P. Wyatt).

http://dx.doi.org/10.1016/j.enpol.2016.01.024
0301-4215/

for investment reasons – 'buy-to-let' landlords who lease dwellings to tenants – in order to investigate whether there was a significant difference in energy efficiency price premium between the two groups. This distinction is important because in 2013 buy-to-let landlords owned 19% of all dwellings in the UK compared to 11% a decade earlier[1]. This growing category of investors may value energy efficiency differently as, under typical lease arrangements, tenants usually pay energy bills. The empirical research includes a series of robustness checks to try to control for potential omitted variable bias due to dwellings that may have been improved or may be in very good or very poor condition.

The remainder of the paper is structured as follows. The next section reviews previous studies of the price impact of environmental performance labels on residential dwelling prices. Section 3 describes the data set and modelling approach used in this study. Essentially it examines the capitalisation of energy efficiency ratings into house prices using two approaches. The first adopts a cross-sectional framework to investigate the effect of EPC band (and EPC rating) on a large sample of dwelling transactions. The second approach is based on a repeat-sales methodology to examine the impact of EPC band and rating on house price appreciation. Section 4 presents the results and Section 5 provides some discussion of the findings before concluding comments in the final section.

2. Literature review

Following the energy crises of the 1970s, some of the earliest relevant literature investigated the relationship between energy efficiency and residential prices (see Laquatra et al., 2002 for a review). A body of US work from the 1980s broadly identified a positive relationship between energy efficiency and residential sale prices (see Halvorsen and Pollakowski (1981), Johnson and Kaserman (1983), Quigley (1984), Laquatra (1986), Dinan and Miranowski (1989), Quigley and Rubinfeld (1989). However, in the last decade, growing concern about climate change has stimulated another wave of research on energy performance and residential sale prices. Given the rapid growth of research in this area, below we review the work most closely related to this study.

In a largely overlooked initial study, the Australian Bureau of Statistics (2008) examined residential sales in the Australian Capital Territory for the years 2005 (2385 transactions) and 2006 (2719 transactions). For the 2005 sample, it found an approximately 1% price premium for every 0.5 increase in the Energy Efficiency Rating (EER), which ranges from 0 to 5. For the 2006 sample, there was an approximately 2% premium for every 0.5 increase in EER. For the pooled sample, relative to a zero rating, premiums of 1.6% (EER 1), 3% (EER 2), 5.9% (EER 3), 6.3% ((EER 4) and 6.1% (EER 5) were found; the marginal addition to the premium declining as rating increased. The explanatory power of model was high and there was a large range of controls for the quality of the dwellings.

Kahn and Kok (2014) conducted a hedonic pricing analysis of all single-family home sales in California between 2007 and 2012. Using a sample of matched dwellings based on the likelihood of having a green label and the local area weather condition, they found a 2% premium for green labels. While the perennial difficulty of measuring unobserved non-financial benefits of green label still remains, this study shows a robust positive association based on several alternative specifications. However, the results are based on comparing a relatively small 'treated' sample with a substantially larger 'non-treated' sample.

With an interesting focus on presale (dwellings bought from developers) and resale (dwellings sold by owners) prices, Deng and Wu (2014) compared a sample of 13,224 dwellings in 62 Green Mark developments with 55,983 dwellings in 1375 non-Green Mark developments in Singapore between 2000 and 2010. They applied a range of approaches including hedonic methods (supplemented by PSM) and difference-in-difference (DID) methods to investigate the price effects of the Green Mark certification. Similar to Deng et al. (2012), overall they estimate an average price premium of about 4–5%. In terms of the different levels of award, the estimated premium for the Platinum rating was 11%; the comparable figures for Gold and Certified ratings were 5% and 1.6% respectively. Premiums for resales were found to be substantially higher. Using a smaller sample of repeat transactions, a DID approach estimated price appreciation premium for Green Mark dwellings of 2–3%. They infer from the results that developers are capturing a small part of the green premium. However, without details of costs of achieving certification, similar to most previous studies, they were unable to assess whether the price premium compensated developers for additional costs.

In Europe, based on a sample of 31,993 residential sale prices in the Netherlands in 2008–9 for dwellings with (voluntary) EPC ratings, Brounen and Kok (2011) identified premiums of 10%, 5.5% and 2.5% for A, B and C respectively, compared to D-rated dwellings. For dwellings rated E, F and G, there were respective discounts of 0.5%, 2.5% and 5%. The data set contained a broad range of control variables including dwelling size, insulation quality, central heating and level of maintenance. Using a composite sustainability metric based on 36 variables to provide a sustainability score for each dwelling, Feige et al. (2013) drew upon rental prices of a sample of 2453 residential apartments in Switzerland. Their results revealed that some sustainability-related features had significantly positive effects, others had no effect on price and some had a negative effect. Importantly in the context of this paper they found an unexpected negative relationship between energy efficiency and price. This was attributed to Swiss residential lease structures where landlords tend to recover the estimated cost of energy from tenants in advance. Hence, less energy efficient buildings may have appeared to have a higher rent since the energy cost is 'bundled' with rent.

Kholodilin and Michelsen (2014) investigated the residential rental market in Berlin and found that energy efficiency savings are generally capitalised into prices and rents and that buyers are able to anticipate energy and house price movements. Another finding relevant to this paper is the significantly lower implicit prices of energy efficiency of rental dwellings compared to owner-occupied dwellings. The authors explain this difference as a sign of the market power of tenants or as a result of the split incentive problem. Similarly, Cajias and Piazolo (2013) find higher total returns and higher rents for energy-efficient dwellings in their study of the German housing market between 2008 and 2010. They estimate that a one percent energy saving raises rents by 0.08% and the market value of a dwelling by 0.45%. Hyland et al. (2013) analysed the impact of energy efficiency ratings in Ireland on residential asking prices and rental rates based on a rich data set of Building Energy Ratings (the Irish equivalent of the EPC) as well as property and price information. They found asking price premiums relative to D-rated dwellings for A (9%), B (5%) and C (1.7%). There was no significant discount for E-rated dwellings and a discount of approximately 11% for F/G. Rental premiums were 1.8% for A and B rated dwellings compared to D and no significant price effect on C-rated dwellings. There were rental discounts for E (1.9%) and F/G (3.2%) rated dwellings. The analysis does not appear to control for age of buildings and as a result there may be a risk of

[1] Department for Communities and Local Government (2015) Table 101: Dwelling stock by tenure, https://www.gov.uk/government/statistical-data-sets/live-tables-on-dwelling-stock-including-vacants, accessed 22 October 2015