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Green signalling effects in the market for energy-efficient residential buildings

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HIGHLIGHTS

- Energy efficiency (EE) levels are hypothesised to affect house transaction prices.
- We estimate a hedonic model using Energy Performance Certificates from Finland.
- A price premium is found for the most energy-efficient properties.
- The empirical results are suggestive of a green signalling effect.
- Demand for EE high performers appears to be segmented from lower tiers.

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ABSTRACT

Empirical evidence from recent studies suggests that the price premium on energy-efficient buildings is potentially higher than the pure capitalisation of energy savings but the empirical evidence on the size of the non-savings components is scant. This study aims to fill this research gap by investigating whether the mandatory energy efficiency ratings for residential properties imply benefits that go beyond energy savings. Using a sample of several thousand apartment transactions from Helsinki, Finland, we first test if higher ratings were significantly associated with higher prices. In addition to a large number of property and neighbourhood characteristics, this dataset contains information on building-level energy usage which allows us to distinguish between the cost savings effect of energy consumption and the value of more intangible factors associated with the energy label. The hedonic model yields a statistically significant 3.3% price premium for apartments in the top three energy-efficiency categories and 1.5% when a set of detailed neighbourhood characteristics are included. When maintenance costs containing energy usage costs are added, a robust and significant price premium of 1.3% persists whereas no differentiation is found for the medium and lower rating categories. These findings may be indicative of energy-efficient buildings having signalling value – and therefore an additional incentive to invest in such buildings – for 'green' consumers. However, a favourable energy rating did not appear to speed up the sales process in the analysed market.

1. Introduction

An emerging strand of literature into energy efficiency suggest that indirect and intangible benefits of energy efficiency improvements may play a previously underestimated role. For example, Gliedt and Hoicka [1] find that corporate social responsibility can act as an additional driver for energy performance improvements in the commercial real estate market. This finding is pertinent as expected cost savings alone are frequently not sufficient to trigger an investment decision [2]. The presence of notable and well-documented financial, institutional and behavioural barriers to invest in energy efficiency implies that such non-savings related incentives may be required to close the energy efficiency gap [1,3]. Therefore, Identifying and quantifying multiple benefits of energy efficiency are of increasing relevance in energy efficiency research [2].

One of the key sectors in the aims to curb energy consumption is the housing sector: Buildings are the largest source of

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greenhouse gas emissions in the world and represent the biggest sector of primary energy consumption, and housing units account for a major part of these emissions and consumption. Hence, from a welfare economic point of view the issue of providing adequate incentives for building and investing in energy efficient housing is of particular importance. The aim of this study is to investigate whether mechanisms that are similar to the corporate social responsibility factor reported by Gliedt and Hoicka [1] are present in the housing market. In particular, we test for the presence and value of a green signalling effect in addition to any cost savings.

Energy efficiency measures and the energy saving potential related to buildings as well as the valuation effects of these measures and savings have become a prominent research subject around the world. This strand of scientific literature includes studies on the effect of heating systems [4] and the building envelope [5–8] on the energy performance and value of housing, the influence of climatic conditions on energy saving measures and the energy demand of buildings [9–12], as well as the decision-making process that leads to energy performance improvements in the real estate sector [1].

The role of home efficiency rating systems in providing important information to consumers is highlighted by Wong-Parodi et al. [13]. Transparency about the energy efficiency status of a property enables consumers to make a more informed choice when acquiring a property. Nevertheless, the pricing of energy-efficient residential buildings has been a largely understudied topic relative to its obvious relevance for both the general economy and sustainable development. The reasons for this lack of empirical evidence are not clear, but the greater fragmentation of investors and lower fraction of professional or institutional investment compared to the commercial real estate market may be a contributing factor. Also, residential property markets are highly regulated and prone to market inefficiencies. Generally, the more inefficiently a market operates, the more difficult it will be to isolate a hedonic price signal of an individual characteristic. Moreover, green financial instruments are still not used widely in the residential sector, which makes capitalisation into the lump-sum house price the only channel for economic rewards of sustainability in many cases. As this poses a significant risk for any upfront investment in energy efficiency, 'green value' might not be readily observable in many housing markets. Kauffman and Garafola [14] point out that quantifying the savings from higher energy efficiency levels has been largely neglected by homeowners as all potential savings accrue only to them. This means that once the investment is made, it becomes akin to a sunk cost and no accurate measurements of the actual subsequent savings and benefits is usually undertaken. The authors conclude that a change is unlikely to occur unless a business model is developed by which an external party reaps part or all of the benefits of an energy efficiency upgrade and the affected parties will want to know their individual shares of costs and benefits.

Despite these complications, the early study of Dian and Miranowski [15] was one of the first to suggest a direct link between the level of energy efficiency and the value of a property. More recently, Wameling [16] reported higher selling prices for dwellings with lower primary energy demand in the German housing market, and Kahn and Kok [17] arrived at similar conclusions in their study of the Californian housing market. The results by Harjunen and Liski [18], in turn, indicate that the heating energy costs capitalise in prices in the Helsinki single-family housing market in Finland. Similar observations have been reported for Asian markets as well: Zheng and Kahn [19] and Zheng et al. [20] found significant price premia for green housing in China, and Deng et al. [21] observed substantial economic returns to green housing in Singapore.

The extant literature on potential additional drivers to invest in energy efficient housing is particularly scarce. In related studies, Banfi et al. [22], Burfurd et al. [23] and Fuerst et al. [24] published findings indicating that rental housing tenants are prepared to pay higher rent for buildings that have adopted energy-saving measures. Burfurd et al. [23] used laboratory experiments to show that information on the energy efficiency of a dwelling – either mandatory or voluntary – improves the market efficiency and increases investment in energy efficiency in the housing rental market, while the lack of information can give rise to an undesirable 'lemons market' outcome. Based on data for Stockholm in Sweden, Mandell and Wilhelmsson [25] concluded that there is a positive willingness to pay for environmental attributes and this willingness is greater for those households who state that they are environmentally aware. Popescu et al. [2], in turn, report evidence suggesting that the added value due to energy performance should be taken into consideration when the financial analysis within the energy audit is performed.

Given the importance of the topic and scarcity of research on it, there is a large demand for more research on other potential incentives for investment in energy efficient housing. This article aims to provide new knowledge on the issue – knowledge that also is of practical importance having policy implications. In particular, we aim to bring more information on the influence of energy ratings on the value and liquidity of housing, including new knowledge on the willingness to pay for being green and on signalling household's green values to the peers. Such willingness to pay and signal to the peers – that corresponds closely to the corporate social responsibility effect reported by Gliedt and Hoicka [1] – could act as an additional driver for investments on energy efficiency not only in the housing market, but in many other sectors too. In addition to investigating a different real estate sector, our analysis differs from that by Gliedt and Hoicka [1] with respect to the research methodology. While their results are based on survey data, our empirical analysis uses detailed data on the actual housing transactions.

We use a dataset for the Helsinki metropolitan area in Finland for the period 2009–2012 that includes the transaction price, energy rating, and a great number of other variables describing the quality and location for each transacted unit. The cold climate of the study area makes the case study interesting also because the cost savings from insulation and thus from heating energy may be substantial. A greater number of heating-degree days has been consistently linked to higher energy demand in the residential sector (e.g. [9,12]) which in turn means higher savings potential from more energy-efficient dwellings. While these climate-dependent factors affect primarily the passive energy efficiency of a building, in particular heat loss-reducing measures, there is also an array of active systems involved in the energy performance rating that are not likely to be subject to thermal variations to the same extent such as energy monitoring and automation systems or potentially also on-site renewable energy generation.

In addition to giving information regarding a market with higher requirements regarding insulation, the dataset is valuable because it contains information on the actual maintenance costs, including energy consumption, and on the time on market of each unit in our sample. Hence, the data present us with an opportunity to examine whether the energy rating has its own independent impact over the maintenance cost information on housing values and liquidity. While e.g. Brounen and Kok [50] showed that higher energy label induces a price premium and low-grade labels a price discount in the Netherlands, no study (to the best of our knowledge) has investigated whether the rating affects prices after the value of energy cost savings is taken into account in the estimated equation. That is, apparently there is no previous research giving information on the independent value of the energy efficiency rat-