

# *Capitalization of Residential Energy Efficiency*

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## **Overview**

The uncertainty regarding the financial return of energy efficiency (EE) investments may be a reason for households not to undertake profitable investments in energy efficiency. Therefore, it is important to identify the market value of energy efficiency in the housing sector. Previous literature provides some empirical evidence on the impact of energy efficiency on sale prices in the building sector. However, the most common methodological drawback of the evidence provided by the available literature is the potential bias that may arise due to the omission of unobserved dwelling characteristics that are correlated with the energy efficiency.

This study uses transaction data for a large sample of Dutch dwellings to examine the capitalization of energy efficiency in the housing market. Using the exogenous variation in energy efficiency generated by 1973-74 oil crisis and by the evolution of building codes as instruments, we find that if energy efficiency increases by 50 percent, the transaction price increases by around 10 percent for an average dwelling. Our findings indicate that the valuation of energy efficiency does not vary significantly by the disclosure of Energy Performance Certificate (EPC). We also show that the label, itself, is not significantly associated with a price premium after controlling for the energy efficiency level. Finally, we document that the estimated value of energy efficiency varies over time, which might be a consequence of fluctuations in house prices, increased energy costs, and the introduction of energy performance certificates.

The remainder of this paper is organized as follows. The next section describes the empirical model and the data. In section three, we present the methodology and the results. Section four provides a brief conclusion.

## **Methods**

In this study, using a large representative dataset from the Netherlands, we propose an instrumental variable approach in order to identify the capitalization of energy efficiency in the housing market. Our analysis benefits from a continuous measure of energy efficiency provided by Energy Performance Certificates, which enables us to estimate the elasticity of home prices with respect to its energy efficiency. As well as including detailed dwelling characteristics in the hedonic model, we use an instrumental variable approach to solve the issue of a potential omitted variable bias. We exploit the 1973-74 oil crisis, which created an exogenous discontinuity in the energy efficiency levels of the dwellings constructed before and after this date, and the evolution of building codes as instruments for energy efficiency.

Furthermore, in order to investigate whether the value of energy efficiency increases when information transparency is higher through disclosure of an Energy Performance Certificate, we create a common energy efficiency measure for certified and non-certified dwellings, which is based on their actual energy consumption. We also use a regression discontinuity approach to test whether the label (classification) itself has a market value. Finally, in order to examine the over-time variation in the market value of energy efficiency, we estimate the hedonic model for each year separately from 2003 to 2011.

## Results

Our results indicate that the OLS estimates are biased downwards: using an IV approach, we find that as the energy efficiency level increases by 50 percent, the market value of the dwelling increases by around 11 percent for an average dwelling in the Dutch housing market.

We find that the market value of a percentage change in actual gas consumption is close to the value of the energy efficiency change that is estimated based on the energy efficiency indicator provided by Energy Performance Certificate. Our findings do not provide any evidence suggesting a higher capitalization rate for dwellings that are transacted with Energy Performance Certificate.

Our results do not indicate a significant change in the transaction price at the threshold energy efficiency level that is used to assign the dwellings into different label classes. This implies that, after controlling for the continuous energy efficiency level, the labeling itself does not lead to a significant change in buyer's valuation of the dwelling.

We document that the value of energy efficiency has doubled from 2003 to 2011, which might be partly explained by the increase of energy prices, the relative decrease in house prices after 2008 and the general impact of policies and campaigns indicating the importance of energy efficiency.

## Conclusions

Our findings suggest that, regardless of the provision of energy label, energy efficiency is significantly capitalized in the housing market. This implies that, in addition to the immediate financial benefits from lower energy expenses, energy efficiency improvements lead to higher transaction prices at the time of sale. Our results do not provide any significant evidence for intangible effects of energy labels on sale prices. For policy makers, the results of this paper may help in refining energy performance certification programs in a way that stresses the financial benefits of energy efficiency. Furthermore, as also mentioned by Allcott and Greenstone (2012), information campaigns might have a substantial role in the diffusion of energy efficiency investments. Therefore, the benefits that households and investors can derive (in terms of higher transaction prices) need to be highlighted in the public awareness campaigns.

## References

Allcott, H. and M. Greenstone (2012). Is there an energy efficiency gap? *Journal of Economic Perspectives* 26(1), 3–28.