



On the quality and impact of residential energy performance certificates



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ABSTRACT

This paper addresses quality and impact issues concerning Energy Performance Certificates (EPC) by means of a dataset based upon the Swedish EPCs for single-family houses. Assuming that the quality of the certificates plays an important role for their impact, we examine to what extent various characteristics of the firms and experts issuing the certificates are influencing their assessments of energy consumption and energy conservation. Exploiting the information on biased assessments, we also investigate the relationship between the transaction price of a house and its EPC label. Doing so, we distinguish the attributes that can be observed by visiting the house and those that a buyer only can inform herself about through the EPC.

Applying regression analyses we find that firm and expert characteristics matter quite a lot implying that the EPC-quality could be improved considerably by increasing the inter-rater reliability. The results also show that the price impact of the energy label is related to information that the buyers can obtain by visiting the house rather than to information uniquely provided by the EPCs. Hence, the EPCs per se are unlikely to stimulate energy conservation through the price mechanism.

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1. Introduction

In line with the 2002 Energy Performance of Building Directive (Directive 2002/91/EC) and the recast reinforced in 2010 (Directive 2010/31/EU), most European countries are currently using energy certification as a tool to communicate the energy performance of buildings to tenants and prospective as well as current property owners. The underlying rationale for implementing the energy certification system is the presumption that the stock of buildings has a largely untapped energy conservation potential that can be realized by providing residents and property owners with better information on their use of energy and advice on ways to reduce it. Whether the expected benefits outweigh the administrative and legal work involved to design, implement and operate such an information system across European countries is, to our knowledge, an open question. By investigating issues related to the quality and impact of energy performance certificates, EPCs, for single-family homes, this paper sheds some more light on the benefit side of that question.

Following e.g. Backhaus et al. [1], we assume that the quality of the EPCs plays an important role for their impact and examine to what extent the expert assessments are influenced by the characteristics of the firms and experts that are providing them. Doing so, we correct for the possible influence caused by resident characteristics and some housing attributes that are not taken into account by the certificates.

Another issue addressed concerns the possible impact of the EPCs on the selling price. The residential price impact studies that have been undertaken so far seem to point in different directions. For example, Kjaerby [2] concludes that the EPC impact on energy consumption is negligible while a study commissioned by the EU Commission states that an analysis of property transactions in a number of EU countries “overwhelmingly points to energy efficiency being rewarded by the market”, see page 12 in Bio Intelligence Service et al. [3].

We will analyze both issues by means of a database that has been constructed by matching the Swedish EPCs for single-family houses sold in 2009 and 2010 with additional information about the houses and the residents. The database makes it possible to quantify several characteristic traits of “EPC-firms” and their experts and to describe the energy efficiency in terms of its constituting components rather than as a rating index. Specifically, we will address the following questions.

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Are the EPC-assessments of energy consumption and conservation potential related to firm and expert characteristics like the number of employed experts and the number of certificates the responsible expert has issued?

To what extent is the transaction price of a house influenced by the EPC-assessments of energy consumption and conservation, i.e. by the only energy efficiency components impossible to gain knowledge about without access to an EPC?

As far as we know, no other study has related the quality of the EPC-information to the characteristics and experience of the assessors. Wahlström [4] is the only price impact study we have found that makes a proper distinction between the information uniquely provided by the EPCs and the information that potential buyers of a house can obtain by visiting it. We will use the same database but exploit the results concerning the impact of firm and expert characteristics by delimiting our price impact analysis to the observations estimated as least biased.

The rest of the paper is organized as follows. Section two provides a short overview of earlier literature and section three presents our database. Our conceptual framework is described in section four and the regression models and results in section five. Section six summarizes the results and provides some suggestions of how the energy performance certificates can be improved.

2. Short literature overview

As a part of a European project on consumer response to energy labels in buildings, Backhaus et al. [1] provide recommendations to improve the impact of EPCs. One major proposal is to improve the quality and accuracy by means of improved education for the EPC assessors. The report shows that the trust in the EPC increases with the availability of recommendations to use them and points to the important role the real estate agents have in this respect. In line with that, Klar [5] indicates that the real estate agents are more likely to promote the EPCs among homebuyers the higher their quality and comparability. Two other studies underline the importance of accuracy and reproducibility. Majcen et al. [6] reports systematic differences between energy consumption predicted by the energy label and the actual consumption, and the Buildings Performance Institute Europe [7] estimates that reproducibility related problems are major reasons for inaccuracies.

The cost of energy is a main reason for assuming that the energy related information provided by an EPS will influence the transaction price of a single family house – the less energy a family expects to consume the more of their budget can be used for other purposes. As suggested by Mandell and Wilhelmsson [8], strong environmental concerns might also influence the purchasing decision. Whatever reasons families have for including energy efficiency aspects when buying new homes, knowledge about the impact can mainly be gained in two ways.

One option is to use questionnaires or interviews and ask a sample of residents if their purchasing decision was influenced by the EPC or if their energy consumption has been influenced by the EPC. The alternative to this so called a stated-preference approach is to rely on revealed preferences and try to disentangle the influence of the EPC on observed changes in energy consumption or to analyze if the observed transaction price can be related to the energy performance as described by the EPC.

Amecke [9] follows the first alternative and uses a survey to a sample of German households to find out to what extent the EPCs helped them to incorporate energy efficiency into their home purchase decisions. The results show that about 80% of the households were aware of the EPC but that less than half of them trusted the information. As perhaps a consequence of the low level of trust, the EPC was rated as having low relevance in comparison with other

sources of information such as for example visits to the house, information from the selling party or from friends. Furthermore, energy efficiency was considered to be much less important as purchasing criteria than attributes like for example the location and the price.

Murphy [10] and Watts et al. [11] present similar conclusions. Murphy's study is based upon a survey comparing two samples of Dutch households one of which received an EPC during the property transaction and one that did not. Though the main focus is on the adoption of energy conservation measures after the purchase, the results also show that only 10% of the households having an EPC stated that it influenced their decision to buy the property. Based upon a questionnaire survey among English homeowners, Watts et al. [11] finds that almost 95% stated that the EPC had no or a minor influence on the sales price.

Using a revealed preference approach, Kjaerby [2] compares the actual energy consumption for heating between a set of Danish single-family homes that have EPC and a control group that have not. After controlling for the influence from confounding variables, like for example house size and household income, no significant difference in energy consumption is found.

As opposed to these results, most studies relating the actual sales price to different explanatory variables seem to conclude that there is a price premium on "green housing". The definition of green housing may vary, but it does not matter for the conclusion since the observed energy consumption is the decisive variable in all kinds of energy labelling or rating schemes, see Pérez-Lombard et al. [12]. The most comprehensive study, Bio Intelligence Service et al. [3], analyses the price premium for energy efficient housing in five European countries by relating the sales price to energy efficiency and housing attributes like number of bedrooms and location. The premium related to energy efficiency was found to be clear and positive in all countries and regions but Oxford (UK). In for example the Flanders, Belgium the sales price will increase with 4% if the energy efficiency is increased one level on the seven-level scale. Analyzing all single-family house sales in California during five years, Kahn and Kok [13] concludes that houses with a green certification label have a price premium of about 2–4%. Fuerst et al. [14] [15] draw similar conclusions by relating the sales price to the energy efficiency ratings for a large number of dwellings in England and Wales, respectively. Interestingly, the study for Wales indicates that there are no significant discounts for rental dwellings having below average energy performance.

One drawback of the reviewed price impact studies is that they do not consider the underlying components used to define energy efficiency. Hence, it is unclear if the estimated price premium is caused by components that a potential buyer can observe by himself or by components that are uniquely provided by the EPCs. Most people who are considering buying a house will visit it before signing a contract and by so doing, they will probably get information about some, if not all, of its characteristics. Hence the price premium might be caused by the observed characteristics rather than by the certificate's energy efficiency measure which can be looked upon as an index that, fully or partly are based upon the same characteristics. Using a dataset for Sweden, Wahlström [4] includes both "observable" and "non-observable" variables from the EPCs when analyzing their price premium. According to the results, significant price effects are related to the observable energy related attributes but there is no price premium related to the non-observables, i.e. to the EPC label per se.

3. The data

We will use a dataset that is based upon the energy performance certificates, EPCs for all Swedish single-family houses sold in 2009 and 2010. The certificates are issued by accredited assessors

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