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Does energy efficiency matter to real estate-consumers? Survey evidence on willingness to pay from a cost-optimal analysis in the context of a developing country

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ABSTRACT

In most countries, energy efficiency at the residential level has been largely delegated to the dynamics of real-estate markets after setting a minimum level. This regulatory definition is in certain cases supplemented by energy performance certificates, such as in the case of the European Union. This approach is based on the understanding that avoided energy-consumption costs positively affect the willingness to pay for them, thus leading to higher prices capable of offsetting production costs and thereby encouraging developers. The case of the private housing market in Santiago de Chile was selected as a reference for a developing country in which energy performance certificates, although they exist as an instrument, are not required to be applied in property transactions. However, unlike most of the research performed in developed countries, it is difficult to analyse price formation using methods based on observed preferences in areas in which there are few energy-certified buildings. Using the technique of contingent valuation, such as the method based on stated preferences, enables one to overcome this difficulty. This article investigates willingness to pay for improvements in the energy efficiency of buyers for new homes based on a representative investment/operation cost analysis. This approach has been addressed to open the debate on the convenience of modifying the national construction code and rethinking the energy certification scheme as well as an exploratory study to undercover further research lines to support the aforementioned discussion. The results suggests that there is a number of potential home buyers ready to pay for energy efficiency when they are informed on the cost savings associated to structural modifications and the cost of providing such improvements and such willingness to pay is not monolithic across the respondents, but seems to be influenced by the education level plausibly associated to the purchase power.

Introduction

In most countries, energy efficiency at the residential level has been largely delegated to the dynamics of real-estate markets after setting a minimum level. This regulatory definition, which can be viewed from a prescriptive perspective (in relation to demands due to the building element, for example, in terms of the thermal transmittance of walls or ceilings) or from a performance perspective (associated with performance indicators, such as heating demand or consumption), is in certain cases supplemented by the mandatory inclusion of energy certificates (Pérez-Lombard, Ortiz, González, & Maestre, 2009). Such certificates typically assume the form of a rating (e.g., using letters), which appears on labels.

However, the liberalized market does not deliver an optimum for the energy efficiency of homes. In fact, there is an energy efficiency gap that slows the diffusion of energy efficient products below the socially optimal rate. Gillingham and Palmer (2014) have stressed some causes for such gap: [1] the information is imperfect for some of the actors participating in the market rendering an information asymmetry between buyers and sellers (i.e. in some cases, such as in the new housing, the sellers may have better information regarding energy efficiency than buyers do); [2] investment decisions and savings are made by different agents, buyers or tenants, and therefore are subject to their perception of the impacts of energy efficiency, and the decision of one may affect very differently the other; [3] in general more efficient technologies imply a higher upfront cost that compassed with credit limitations

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results in a lower consumption of such technologies, especially when "green credits" are not present such as the case of Chile; [4] the users of the dwellings have a learning curve for the use of the dwelling and the elements of energy efficiency, generating changes in the assumptions foreseen in the evaluation ex before; and [5] government regulations in the energy market results in prices that differ from marginal costs. Additionally, to the said causes coming from the neoclassical theory, Gillingham, Newell, and Palmer (2009) point out other coming from the behavioural economics: [1] non-standard preferences, [2] non-standard beliefs and [3] non-standard decision makings. In such logic energy labelling policy can help to reduce the gap in some of its causes: [1] reduce information asymmetry by providing relevant information of possible energy savings and environmental protection to consumers; [2] standardize the format in which energy efficiency information is presented reducing in that way the framing choice bias (i.e. non-standard decision making); and [3] when accompanied by a communication strategy, it may help to train consumers on the benefits of energy efficiency. Allcott and Taubinsky (2015) review some plausible benefits for information provision: [1] biased beliefs (i.e. consumers know that efficient homes use less energy but they mis-estimate the cost savings); [2] exogenous inattention to energy as a "shrouded" add-on cost; [3] costly information acquirement (i.e. consumers incurs a cost to learn on energy efficiency and when they have not access to such information assume the same efficiency for different homes); and [4] noisy and costly thinking (i.e. consumers have a broad idea of the true value of energy efficiency, but thinking allows a more precise quantification).

In this line, the European Energy Performance of Buildings Directive (Official Journal of the European Union, 2003, 2010) introduced universal energy labels termed Energy Performance Certificates (EPCs) in the European property market. This policy aims to provide property transactions with energy transparency to encourage more informed buying or leasing decisions. Thus, the policy supports the construction of buildings with higher energy-efficiency standards through indirect promotion. The policy is based on the understanding that avoided energy-consumption costs positively affect the willingness to pay (WTP) for such costs, thus leading to higher prices capable of offsetting production costs and thereby encouraging developers.

Consequently, according to market logic, it is expected that housing developments with higher levels of energy efficiency receive a market premium with the understanding that the marginal benefits are equivalent to the marginal costs for thermal envelope improvements and/or more efficient systems. The pioneering research of Dinan and Miranowsky (1989) revealed that improvements in energy efficiency applied in the real-estate market in Des Moines, Iowa, equalled a reduction in energy consumption of 1 USD (while maintaining the house at a comfortable temperature of 18 °C), which represented a market premium of 11.63 USD in price. In recent years, subsequent studies have addressed the impact of energy labelling on real-estate prices, such as Energy Star certification (Bruegge, Carrión-Flores, & Pope, 2015; Kahn & Kok, 2013), the previously mentioned EPCs (de Ayala, Galarraga, & Spadaro, 2016; Fuerst, McAllister, Nanda, & Wyatt, 2013a, 2013b, 2016; Gelegenis et al., 2014; Marmolejo-Duarte, 2016) and others (Fuerst & Shimizu, 2016), by identifying different levels in the market premiums associated with better-rated homes. A study by Bio Intelligence Service et al. (2013) describes the empirical foundation of the EPC programme and the pricing system. The study was commissioned by the European Community for the purpose of an overall assessment of the EPBD. The study reveals that the effect of each of the EPC label levels (expressed in letters) on the price offer varies. The effect ranges from 0.4% in Oxford to 11% in Vienna; it is 4.3% in Marseille, 3.2% in Lille and 2.9% in Brussels. Other studies have not found a linear or continuous relationship between the EPC rating and prices. Hyland, Lyons, and Lyons (2013) found for Ireland that the impact of one EPC level on a two-bedroom apartment equalled an increase of 2.3%, while for three-bedroom and four- to five-bedroom homes, the increase was lower: 1.7% and 1.6%, respectively. A study on 300,000 homes in England found that the EPC's greatest impact was on row houses and that the effect on apartments was higher than on isolated houses (Fuerst, McAllister, Nanda, & Wyatt, 2015). This finding might suggest that the potential savings in energy consumption is more important for less expensive housing occupied by persons of lower income.

However, unlike most of the research performed in the previously noted developed countries, it is difficult to analyse price formation using methods based on observed preferences (as in the econometric models used in these studies) in areas in which there are few energy-certified buildings.[1] Using the technique of contingent valuation, despite the controversies related to the "hypothetical-bias" further discussed, such as the method based on stated preferences, enables one to overcome this difficulty in environments in which the associated public policy is recent (Marmolejo-Duarte, García-Hoohghuis, & García-Masiá, 2017). The case of the private housing market in Santiago de Chile[2] was selected as a reference for a developing country in which energy performance certificates, although they exist as an instrument, are not required to be applied in property transactions. Interestingly, less than 1% of new completed private homes do exhibit energy certificates, which in turns opens the question on whether such astonishing absences is produced by buyers' unwillingness to make an extra payment for efficient houses.

This article investigates WTP for improvements in the energy efficiency of buyers for new homes in comparison to a representative investment/operation cost analysis from the real-estate market of Santiago de Chile. This approach has been addressed to open the debate on the convenience of modifying the national construction code and rethinking the energy certification scheme as well as an exploratory study to undercover further research lines to support the aforementioned discussion. Both processes have now been indefinitely postponed because of the uncertainty related to the lack of knowledge about the demand preferences to compensate the additional costs from energy efficient improvements. In this sense, given that [1] WTP was evaluated in real consumers who were seeking to buy houses; and [2] improvements in energy efficiency were proposed based on a cost-optimal approximation applied to representative cases of the real estate market and considering all economic factors, it is expected that these results can identify a potential demand for homes with high energy-performance standards in the Santiago real-estate supply. While this demand would be associated with certain niche markets for higher-priced homes, it may indicate a need for a real-estate product that - at least in mass production - is currently lacking.

Finally, it is worth nothing that this unexplored topic is relevant for the Latin-American region, since Chile has become a benchmark for such region in terms of the early adoption of regulations that affect the energy performance of dwellings. In addition, the country has been experiencing accelerated urbanisation and a real-estate boom for more than a decade, which other countries, such as Peru and Colombia, are now experiencing.

Public policies on the energy efficiency of homes in Chile

The housing market in Chile has a low government presence, which was defined by López-Morales, Gasic Klett, and Meza (2012) as "pro-business urban planning," and according to Savage, Warde, and Ward (2003), "It implies not only that the State is active in the production of favourable market conditions but also that the market operates within

[1] The study of Costa, Fuerst, Robinson, and da Silva (2018) represents one of the few exceptions for the case of developing countries, but applied to the voluntary LEED certification for office buildings in Sao Paulo (the largest urban agglomeration in Latin America.

[2] Santiago, as the capital city of the country, has a great importance, since it concentrates – at the same time – the 45% of the population (CChC, 2017) and 57% of the housing supply from the national real estate market (Rioseco & Tesser, 2017). It typically corresponds to a warm temperate climate with long dry season from 8 to 7 months (Csb according to the Köppen-Geiger classification), which can also be defined as a Mediterranean climate (Encinas & Aguirre, 2017).