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ECONOMIC ANALYSIS OF RENOVATION BEHAVIOR OF SINGLE FAMILY HOUSE OWNERS IN SWITZERLAND

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OVERVIEW

The Swiss residential building sector consumes an important share of the end use energy consumption. Thus, improvements of energy efficiency in this sector could have an important impact on the country's total energy consumption. Also, it contributes considerably to the CO2-emission objectives for sustainable development. The overall energy efficiency of a building is identified mainly by the insulation characteristics of the building envelope (façade, roof, windows and basement). Measures improving energy efficiency of buildings yield two kinds of benefits: Firstly, they reduce the energy consumption of buildings and, as a consequence, costs. Secondly they generate comfort benefits, namely, improved thermal comfort and enhanced protection against external noise.

In this paper we investigate the decisions process of Swiss single family house owners when investing in retrofits of the envelope of their houses. We aim to shed light on the impact of different policy measures as well as social-psychological aspects on renovation decisions. The goals of the paper are 1) to identify the most relevant elements when deciding for an energy (in)efficient retrofit and 2) to analyze the impact of different policy measures on the retrofitting decision.

Jakob and Jochem [1] identify a large energy-saving potential in the building sector, which is not completely exploited yet: only 1 to 2% of the existing building envelopes undergo maintenance or renovation each year. Just 30% to 50% of them consider a thermal insulation. Jakob and Madlener (2004) find that energy-efficiency retrofitting has a high potential for energy savings, especially an improved insulation of walls, floor, roof, (façade) and windows. Renovation is a key factor towards energy-efficient buildings [3]. However, life expectancy of the above mentioned construction components span from 15-50 years, which implies long renovation cycles. Also, the results presented in [4] suggest that the benefits of the energy-saving attributes are significantly valued by the consumers. These benefits include both individual energy savings and environmental benefits as well as comfort benefits, namely, thermal comfort, air quality and noise protection. Although it is important to consider energy efficiency aspects when renovating a building, it seems that market failures, market barriers, bounded rationality and high transaction costs (e.g. search and information costs) play an important role. Therefore, in order to identify effective policy measures to induce more investment in buildings' energy efficiency, it is important to have detailed information on the factors that influence the homeowners' investment decision and on their willingness to pay for the resulting improvements. The goal of this paper is to shed some light on these elements.

METHODS

The paper analyzes the probability of choosing different types of retrofit measures and estimates the marginal willingness to pay (WTP) for energy-saving characteristics. In principle, both revealed and stated preference methods could be used for this purpose. In this paper, we present the results of a survey based on the stated preference method with a choice

experiment, initially developed by Louviere and Hensher [5]. The data are collected during April 2010 through an online survey in five Swiss cantons. The goal is to reach a sample of at least 400 respondents with a total of 2400 observations (6 choice tasks per respondent). The survey collects information on the characteristics of the buildings, the motivation for energy efficient renovations and characteristics of the owners. The attributes considered in the choice experiment are: investment costs, subsidies for energy efficient renovations, improvement in comfort, annual energy savings, and time horizon for which savings on energy bill can be realized. Some of the attributes (investment costs, energy savings) are related to the characteristics of the houses of the respondents.

With reference to the random utility theory, the utility of a renovation depends on observable (deterministic) components and on a random element. Observable components include the attributes of the retrofit (X) and individual characteristics (H). The random component ε captures the influence of unobserved factors. Thus, the utility (U) of different retrofits for retrofit j and household i is a function of:

$$U_{ij} = X_{ij}\beta_j + H_i\alpha_j + \varepsilon_{ij}$$

The underlying assumption is that households evaluate the characteristics of different renovations alternatives (investment costs, energy savings, etc.) and then choose the one which leads to the highest utility. Using discrete choice models, we aim to analyze the impact of a change of a certain attribute on the probability that a certain type of renovation is chosen.

RESULTS

The descriptive statistic of the collected data will provide an insight into the current renovation behavior of house owners. In particular, it will be possible to identify market barriers and other reasons for not renovating the house. The results of the econometric model will provide information on the attributes of a renovation, the characteristics of buildings as well as of house owners, that have an important impact on the probability of choosing a certain type of renovation. In addition, it will be possible to identify trade-offs between attributes and estimate the WTP for a comfort improvement.

CONCLUSION

The paper will provide insights into 1) the decision making process 2) the importance of economic considerations (e.g. return on investment, discount rates, (personal) expectation of future energy prices) and last but not least 3) the importance attributed to social-psychological aspects (such as energy and environmental awareness). Also, we will recommend policy measures that could possibly overcome market barriers of energy efficient renovation measures. Potential policy measures are: granting financial resources or improvement of communication and information for single family house owners.

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