

IMPACT OF ENERGY LABELS ON SELECTING HOUSES OF CONSUMERS: VALIDATION BY LOGISTIC REGRESSION ANALYSIS

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Overview

Energy labels express the energy efficiency level of houses and help consumers' decision makings. Many studies have verified that energy labels promote consumers' select of pro-environmental products (e.g., Grankvist et al, 2004, Bjerregaard and Møller, 2019). The energy labels are set to be displayed mandatorily in Japanese real estate advertisements soon. Effective energy labelling methods and designs need to be studied before the government mandates energy labelling.

This study aims to examine whether providing information on energy efficiencies of houses for consumers in some way such as energy labels affects their decision makings. Furthermore, by clarifying the effects of different information methods (framing), we intend to make specific suggestions on the design of energy labels.

Methods

Experiment participants were extracted from a survey panel of an Internet research firm by two-stage random sampling. We randomly classified the subjects, using the control experiment method, into four groups: control group with no information disclosed, treatment group 1 with only text information, treatment group 2 with only label information, and treatment group 3 with both information. In addition, in order to identify differences in framing effects between buyers and prospective buyers of houses, we further classified each group into two, making a total of eight groups.

The preliminary survey was conducted from March 18 to 24, 2022, and the experiment from March 25 to 30, 2022. The sample size was 206 for each group, a total of 1,648. The main survey asked 19 questions, including a question about what is important to respondents when purchasing a house.

The experiment was that 12 photos were displayed on the screen as candidates for houses that match the subjects' desired location, and subjects were asked to select the most desirable house from these photos. For the house they chose from the 12 photos, the subjects in each group select one of three options varying in energy efficiency level, price, etc. These steps are very similar search of consumers for houses, and we set up this experiment based on Sussman et al. (2021).

Through above experiment, we verified what kind of framing would encourage subject to choose energy efficient houses. This also allows us to measure difference in effects of information framing between buyers and prospective buyers of houses. This study applied logistic regression analysis to a dataset obtained from the experiment as follows.

$$Y^* = \beta_0 + \sum_{i=1}^m \beta_i X_i + \varepsilon$$

$$Y = \begin{cases} 1 & (Y^* > 0) \\ 0 & (Y^* \leq 0) \end{cases}$$

where the dependent variable Y^* means whether select an energy-saving house or not. Concretely, $Y=1$: subject selected the most energy-saving house from three options varying energy efficiency level, while $Y=0$: means that did not select energy-saving house. β is a regression coefficient, X_i ($i = 1, \dots, m$) is the i th independent variable, and ε is a random error term.

Results

The results of analysis showed two important implications: one indicated the importance of disclosing information on energy efficiency of houses, another suggested necessity of devising information disclosure to supplement inexperience.

Table 1 shows the result of logistic regression analysis, and the framing of information were verified to important be since all treatment group are statistically significant. These are also very higher odds ratio than other variables. The fact, all treatment group were accepted at a significance level of 1% based on the control group proves the significance of information disclosure.

Moreover, buyer dummy was statistically significant, this means that presumed to be the result of the purchaser's actual experience such as the running cost of a detached house and the indoor temperature. From this, it was suggested that it is important to consider the display of advertisements such as running costs. As for the method of information disclosure, it is important to disclose it in a way that is accompanied by the understanding of consumers.

Table 1 The result of logistic regression analysis

	Coef.	Std. Err.	z	Odds Ratio
Treatment 1	1.7934 ***	1.1447	9.4200	6.0096
Treatment 2	1.4683 ***	0.8285	7.6900	4.3417
Treatment 3	1.7962 ***	1.1461	9.4400	6.0264
Buyer dummy	0.2827 *	0.2204	1.7000	1.3267
Emphasis on insulation	0.3678 ***	0.1887	2.8200	1.4446
Knowledge of insulation	0.1128 **	0.0492	2.5700	1.1194
Knowledge of environment	0.0849 *	0.0513	1.8000	1.0886
Interest in environment	0.2629 **	0.1455	2.3500	1.3007
Pro_environment	0.2554 ***	0.1259	2.6200	1.2910
Education	0.0522	0.1125	0.4900	1.0536
Men dummy	0.0010	0.1469	0.0100	1.0011
Age	0.0083	0.0109	0.7600	1.0083
Married dummy	0.0364	0.1968	0.1900	1.0371
Childdummy	-0.0699	0.1760	-0.3700	0.9324
Family size	0.0584	0.1409	0.4400	1.0601
Household income	0.0530	0.0460	1.2200	1.0544
Detached house dummy	-0.1690	0.1402	-1.0200	0.8445
cons	-4.5726 ***	0.0067	-7.1000	0.0103
Number of obs		1,471		
Log likelihood		-876.7505		
Pseudo R2		0.0923		

Note: Superscripts ***, **, * denote significance at the level of 1%, 5%, 10%, respectively.

Conclusions

From results of the experiment, it was confirmed that disclosing energy efficiency information of houses in some way in real estate advertisements is effective in encouraging consumers to choose energy-efficient houses. It was also suggested that when disclosing information about energy efficiency of houses, it is also important to present it in a way that would be better understood by consumers depending on their respective situations.

Mandatory disclosure of residential energy efficiency information, which has been postponed in Japan, would be necessary as soon as possible. Prior to legally mandating the disclosure of information on energy efficiency, it would be necessary to introduce some kind of system to encourage the disclosure of information.

References

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