

EMPIRICAL STUDY ON CONSUMER UNDERSTANDING AND SATISFACTION FOR SUBSIDIZED HOME INSULATION PERFORMANCE

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Overview

It is generally known that Japanese houses have shorter lives than those in foreign countries. Although there are many unoccupied houses, about 800,000 new ones are built in a year. The existing houses market has not grown in Japan, because majority of government hospitable subsidies are provided to new houses. For example, the Japanese government provides same or more amount subsidies for insulation costs of new houses compared to insulation repair costs of existing houses. The subsidies are provided through the "housing eco-points system". The housing eco-points system had been enacted from 2010 to 2012. The consumers who built new houses and those improved the insulation performance of their existing houses applied to the subsidy and were able to get monetary support with up to 300,000 Japanese Yen. One of the policy goals of the subsidies is to improve residential energy efficiency and reduce CO₂ emissions of houses. To investigate the consumer awareness and satisfaction for the eco-points system and provide with additional knowledge on energy efficiency policy, this study conducted an internet survey for consumers who had used the housing eco-points system, presuming that evaluation and consciousness of consumers for the insulation would have changed after the usage of the system. Basic assumption of this study is that it might be important to support measures for existing houses, rather than new houses, because the improvement of living comfort and awareness on energy saving would be higher in the former than latter. The number of the effective answers was 1,007, in which 50.3% (507 samples) was new houses and 49.7% (500 samples) was existing houses. A recovery rate of this investigation was 80.3%.

This paper is organized as follows: Section 1 gives a brief overview of this study. Section 2 summarizes previous studies of subsidy schemes for energy saving, such as the housing eco-points system in Japan. Section 3 describes the data of questionnaire survey and analysis method used in this study. Section 4 provides with the logistic regression analysis results. Section 5 concludes this study and addresses an desirable scheme of subsidy system in the future.

Methods

Questionnaire survey, Logistic regression analysis

Results

As a result of examining survey samples, this study found that people who lived in existing houses that required insulation repair significantly acknowledge effects of the insulation. They noticed that "dew condensation had disappeared" and that "the expenses for lighting and fuel went down." Because people living in existing houses experienced changes in the insulation performance in the same house, they easily recognized that insulation performance improved. Further, it became clear that people who repaired the insulation in their homes recognized more about energy saving due to the higher level of understanding of subsidized insulation performance.

The logistic regression analysis is based on the following equation.

$$Y = \beta_0 + \sum \beta_i X_i + \varepsilon,$$

where Y is binary variable to show, e.g., satisfaction or no satisfaction, and X_i ($i=1, \dots, n$) is the i -th explanatory variable, e.g., understanding on energy efficiency policy.

From a result of the logistic analysis (Model#1), however, it was revealed that the satisfaction of people who used the subsidy for new houses was 2.01 times higher than people who used it for existing houses. This is partly attributed to the higher monetary incentive for new houses. In addition, respondents who realized the insulation performance had higher rates of satisfaction, at 1.59 times, compared to those of respondents who did not recognize the effects (Table 1).

From the results of the logistic analysis (Model#2), this study found that receiving subsidy without knowing the condition had a negative influence on energy saving,. On the other hand, "Understanding of insulation", "Felt attention to the environment" and "Understanding energy conservation standards" had a positive influence on energy saving. In addition, "applying by oneself" had a positive influence on energy saving too. Moreover, the factor of respondents with "realized that the utility expenses became cheap" urges them to consider energy conservation as an economic factor (Table 2).

Table 1 : Dependent variable = Satisfied dummy

| Variable | B | Standard error | Wald | Significance probability | Exp(B) | 95% confidence interval of EXP(B) | |
|--|--------|----------------|-------|--------------------------|--------|-----------------------------------|--------|
| | | | | | | Lower | Upper |
| Gender dummy | -0.112 | 0.247 | 0.207 | 0.649 | 0.894 | 0.551 | 1.449 |
| Age | 0.006 | 0.012 | 0.212 | 0.645 | 1.006 | 0.982 | 1.031 |
| Educational qualification | -0.134 | 0.233 | 0.333 | 0.564 | 0.874 | 0.554 | 1.380 |
| Married dummy | 0.418 | 0.399 | 1.097 | 0.295 | 1.519 | 0.695 | 3.321 |
| Number of Living in children | -0.027 | 0.124 | 0.048 | 0.826 | 0.973 | 0.763 | 1.241 |
| New construction dummy | 0.698 | 0.268 | 6.811 | 0.009 | 2.010 | 1.190 | 3.397 |
| House detached dummy | -0.405 | 0.369 | 1.209 | 0.272 | 0.667 | 0.324 | 1.373 |
| Previous dummy | 0.453 | 0.222 | 4.159 | 0.041 | 1.573 | 1.018 | 2.431 |
| Applying by oneself dummy | 0.457 | 0.233 | 3.844 | 0.050 | 1.580 | 1.000 | 2.496 |
| Without knowing the subsidy condition | 0.246 | 0.392 | 0.394 | 0.530 | 1.279 | 0.593 | 2.760 |
| Think about energy saving | 0.143 | 0.285 | 0.254 | 0.615 | 1.154 | 0.661 | 2.016 |
| Understanding of insulation | 1.284 | 0.417 | 9.472 | 0.002 | 3.611 | 1.594 | 8.181 |
| Understanding energy conservation standards | 2.171 | 1.025 | 4.484 | 0.034 | 8.763 | 1.175 | 65.334 |
| Felt attention to the environment | 0.026 | 0.388 | 0.005 | 0.946 | 1.026 | 0.480 | 2.194 |
| Impact of improving air environment | 0.999 | 0.632 | 2.494 | 0.114 | 2.714 | 0.786 | 9.373 |
| Feeling that utility expenses became cheaper | 0.055 | 0.419 | 0.017 | 0.895 | 1.057 | 0.465 | 2.404 |
| Feeling that no longer a disease | 0.021 | 1.121 | 0.000 | 0.985 | 1.021 | 0.114 | 9.188 |
| Realize became comfortable | 0.648 | 0.427 | 2.301 | 0.129 | 1.912 | 0.827 | 4.417 |
| Feeling the dew is gone | -0.001 | 0.336 | 0.000 | 0.997 | 0.999 | 0.517 | 1.930 |
| constant | 0.897 | 0.764 | 1.376 | 0.241 | 2.451 | | |

Table 2 : Dependent variable = Think about energy saving

| Variable | B | Standard error | Wald | Significance probability | Exp(B) | 95% confidence interval of EXP(B) | |
|--|--------|----------------|--------|--------------------------|--------|-----------------------------------|-------|
| | | | | | | Lower | Upper |
| Gender dummy | -0.066 | 0.170 | 0.148 | 0.701 | 0.937 | 0.671 | 1.308 |
| Age | 0.003 | 0.008 | 0.117 | 0.732 | 1.003 | 0.987 | 1.019 |
| Educational qualification | 0.029 | 0.163 | 0.032 | 0.859 | 1.029 | 0.747 | 1.418 |
| Married dummy | 0.220 | 0.301 | 0.536 | 0.464 | 1.246 | 0.691 | 2.246 |
| Number of Living in children | 0.043 | 0.088 | 0.243 | 0.622 | 1.044 | 0.879 | 1.240 |
| New construction dummy | 0.068 | 0.180 | 0.143 | 0.705 | 1.070 | 0.753 | 1.522 |
| House detached dummy | -0.316 | 0.208 | 2.307 | 0.129 | 0.729 | 0.485 | 1.096 |
| Previous dummy | -0.190 | 0.156 | 1.479 | 0.224 | 0.827 | 0.609 | 1.123 |
| Applying by oneself dummy | 0.386 | 0.159 | 5.861 | 0.015 | 1.471 | 1.076 | 2.010 |
| Without knowing the subsidy condition | -0.900 | 0.347 | 6.712 | 0.010 | 0.407 | 0.206 | 0.803 |
| Satisfied dummy | 0.090 | 0.282 | 0.101 | 0.751 | 1.094 | 0.630 | 1.900 |
| Understanding of insulation | 0.532 | 0.181 | 8.634 | 0.003 | 1.703 | 1.194 | 2.429 |
| Understanding energy conservation standards | 0.459 | 0.238 | 3.740 | 0.053 | 1.583 | 0.994 | 2.522 |
| Felt attention to the environment | 1.088 | 0.201 | 29.215 | 0.000 | 2.969 | 2.001 | 4.405 |
| Impact of improving air environment | 0.006 | 0.252 | 0.001 | 0.981 | 1.006 | 0.614 | 1.648 |
| Feeling that utility expenses became cheaper | 0.460 | 0.217 | 4.513 | 0.034 | 1.585 | 1.036 | 2.423 |
| Feeling that no longer a disease | 0.393 | 0.523 | 0.567 | 0.452 | 1.482 | 0.532 | 4.129 |
| Realize became comfortable | 0.131 | 0.225 | 0.338 | 0.561 | 1.140 | 0.733 | 1.772 |
| Feeling the dew is gone | 0.054 | 0.209 | 0.067 | 0.796 | 1.056 | 0.700 | 1.591 |
| constant | -1.825 | 0.570 | 10.255 | 0.001 | 0.161 | | |

Conclusions

This study presented that changes in the level of understanding and satisfaction on subsidized insulation performance were higher for people who live in new houses than existing houses. When the government provides existing houses with more subsidies, it is expected that they promote consumer understandings for insulation performance and awareness on opportunities for energy savings. Thus, the enhanced subsidy policy of insulation for existing houses contribute not only to reduce the CO₂ emission from houses but also to increase energy saving understanding among all consumers.

In addition, this study found that respondents who understood insulation performance had a higher rates of satisfaction. They have become to think more about energy saving after they received subsidy. Therefore, it is important to consider how to provide appropriate information to consumers when the government carries out the subsidy policy of energy saving.

References

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