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Are the Stated Preferences Different?
In-person Interviews Versus Web-based Surveys

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Abstract

This study examines whether the stated preferences from two survey modes (in-person interview versus web-based survey) are the same by applying a choice survey of air conditioners and refrigerators conducted in Shanghai of China. Results imply that there are significant differences across these two data collection methods in; (i) the number of socio-demographic characteristics of respondents; (ii) estimated utility parameters of indirect utility function; and (iii) estimated marginal willingness to pay values.

Keywords: stated preference; survey mode; in-person interview; web-based survey; willingness to pay

JEL Classification: C35, C81, Q51

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1. Introduction

Survey serves as an important role in research on consumers' behavior. Traditionally, most of survey tasks have been conducted by various methods such as in-person interview, telephone interview, and mail survey. However, since the late 1990s, the rapid development and spread of IT technology made web-based survey a popular alternative in the field of survey research. Different from those traditional methods, web-based survey has several features (e.g., low marginal costs, provision of more and more varied information to respondents, rapid collection of data, etc.) that make it commercially attractive and provide strong economic incentives for its development (Berren *et al.,* 2003). However, web survey is not a method without any drawbacks. As Couper noted in his study, coverage error and sampling error are two main problems in web-based surveys.[1] Therefore, comparison studies between web-based survey and other methods are worthy of serious research attention.

Upon reviewing the literature, the previous studies on comparisons among different data collection methods include Berrens *et al.* (2003) and Li *et al.* (2004) on telephone and Internet surveys, Hudson *et al.* (2004) on mail and Internet surveys, Cameron *et al.* (2002) on mail and telephone surveys, and Kirsch *et al.* (2001) on in-person and telephone interviews. Most of these studies mentioned that there is no evidence supporting various survey modes cause different results. However, limited to our knowledge, to date there is no published literature comparing between in-person interview and web-based survey.

The importance as well as the objective of studying this issue is that if web-based survey is found to be able to replace in-person interview as a primary survey mode in consumers' behavior research, researchers may have more flexibility into conducting a survey other than always considering the tradeoff between survey costs and other issues. Given this importance and objective, in this study, we apply the data from a Stated Choice (SC) survey recently conducted in China to compare the consistency of the stated preferences across in-person and web-based samples. [2]

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1) Coverage error is a function of the mismatch between the target population and the frame population, while sampling error arises from the fact that not all members of the frame population are measured. See Couper (2000) for more details on this issue.

2) Given the survey-based nature of stated preference studies, whether alternative survey modes may induce changes in respondent preferences is an important question (Li *et al.* 2004).

2. Survey issues

A survey aiming to evaluate Shanghai residents' preferences and awareness on China Energy Label was conducted at the beginning of November 2006 in Shanghai of China. Two professional marketing firms conducted the survey. One firm called Nikkei Research was in charge of in-person interview. 600 respondents who were randomly recruited on the street of two districts (i.e., business center district and residential district) completed the survey. Another firma called Searchina Research conducted web-based survey and also collected 600 valid samples. These two samples are used here for survey methodological comparison.

The questionnaires for both samples were with the same contents, which include (i) a number of questions revealing the respondents' environmental concern; (ii) choices of various air conditioners and refrigerators; and (iii) common socio-demographic characteristics. Given the nature of stated choice experiment, four alternatives of air conditioners (refrigerators) with six attributes were provided in each choice set of air conditioner (refrigerator). The four alternatives are new product A with foreign brands, second-hand product B with foreign brands, new product C with domestic brands, and second-hand product with domestic brands, respectively. The six attributes are price, hourly electricity consumption for air conditioner (daily electricity consumption for refrigerator), cooling space for air conditioner (volume for refrigerator), presence or absence of air cleaning function for air conditioner (noise reduction function for refrigerator), energy

Table 1. *Socio-demographic characteristics of in-person interview and web-based survey samples*

Socioeconomic characteristics	In-person	Web-based	t-statistics
Age (years)	43.89	28.38	22.11**
Gender (proportion of male)	50%	47%	0.98
High annual household income [a]	18%	36%	-7.21**
Middle annual household income [b]	38%	44%	-1.88
High education (proportion of at least college degree)	48%	88%	-16.33**
Household size (persons)	3.05	3.04	0.03
Employment (proportion of full-time employment)	58%	87%	-11.67**
Number of observations	600	600	

Notes: [a] Proportion of annual household income above 100,000 Chinese RMB. [b] Proportion of annual household income between 50,000 and 99,999 Chinese RMB. * and ** denote statistically significant at the 5% and 1% level, respectively.

efficiency ranks presented on energy label, and presence or absence a label indicating the electricity bill's difference comparing to a standard model.

Table 1 provides a brief summary of mean socio-demographic characteristics of both samples. For full details of the survey including questionnaire contents, choice experiment design, definitions of variables and the associated sample statistics, see Shen and Saijo（2007a, 2007b）.

3. Choice modeling

In choice modeling, the probability that individual q chooses alternative i from a choice set J that comprises of j alternatives, P_{iq}, can be estimated by a conditional logit model expressed in Eq.（1）:

$$P_{iq} = \exp(V_{iq}) / \sum_{j=1}^{J} \exp(V_{jq}) \tag{1}$$

where V_{iq} is the indirect utility function of individual q choosing alternative i or j. Then, making assumption for V_{iq} to be linear in parameters, the probability in Eq.（1）is given as:

$$P_{iq} = \exp(\beta' X_{iq}) / \sum_{j=1}^{J} \exp(\beta' X_{jq}) \tag{2}$$

where X_{iq} are explanatory variables of V_{iq}, normally including alternative-specific constants（ASCs）and the attributes of the alternative i, β' is the parameter vector of the matrix X_{iq}.

One of the values revealing the stated preferences from the choice model is marginal Willingness to Pay（WTP）value for various attributes. Since marginal WTP by definition is the income reduction needed to ensure the constant utility when an attribute is added to the marginal good, the marginal WTP for attribute l is given by:

$$WTP_l = -\beta_l / \beta_p \tag{3}$$

where β_p is the coefficient on price from Eq.（2）.

Table 2. *Estimation results of air conditioner*

Independent variables	In-person	Web-based	Pooled sample
Air conditioner A	3.6570**	2.4022**	3.1627**
Air conditioner B	0.7032**	0.7687**	0.7802**
Air conditioner C	3.8093**	2.4864**	3.3639**
Price（Chinese RMB）	-0.0006**	-0.0003**	-0.0005**
Electric power consumption（kw per hour）	-0.8156**	-0.7782**	-0.7371**
Cooling space（square meters）	0.0040	0.0128*	0.0083*
Air purifier function（=1 if has）	0.5050**	0.3498**	0.4010**
Energy efficiency rank（ranged from 1 to 5）	-0.2331**	-0.1277**	-0.1620**
Label indicating savings in electricity bills（=1 if has）	0.2127**	0.4753**	0.3080**
Log-likelihood	-5010.58	-5680.70	-10771.76
Pseudo R^2	0.293	0.198	0.240
Observations	3600	3600	7200

Notes: * and ** denote that the parameter is significantly different from zero at the 5% and 1% level, respectively. *t*-statistics and standard deviations are not reported to save space.

Table 3. *Estimation results of refrigerator*

Independent variables	In-person	Web-based	Pooled sample
Refrigerator A	3.1245**	2.5655**	2.8313**
Refrigerator B	0.6306**	0.8748**	0.7758**
Refrigerator C	3.5638**	2.8527**	3.1920**
Price（Chinese RMB）	-0.0004**	-0.0002**	-0.0003**
Electric power consumption（kw per day）	-1.0006**	-0.6663**	-0.8214**
Volume（liter）	0.0044**	0.0029**	0.0037**
Noise reduction function（=1 if has）	0.5099**	0.3661**	0.4326**
Energy efficiency rank（ranged from 1 to 5）	-0.2034**	-0.0774**	-0.1363**
Label indicating savings in electricity bills（=1 if has）	0.3080**	0.3611**	0.3337**
Log-likelihood	-5187.54	-5830.15	-11080.74
Pseudo R^2	0.268	0.177	0.218
Observations	3600	3600	7200

Notes: * and ** denote that the parameter is significantly different from zero at the 5% and 1% level, respectively. *t*-statistics and standard deviations are not reported to save space.

Table 4. *Marginal willingness to pay values*

Items	In-person	Web-based	*z* test
Air conditioner			
Electric power consumption	1285 [986,1585]	2172 [1503,2840]	-2.37 **
Cooling space	6 [-11,24]	38 [5,72]	-1.69
Air purifier function	796 [636,955]	993 [664,1322]	-1.06
Energy efficiency rank	367 [295,440]	319 [184,454]	0.62
Label indicating savings in electricity bills	335 [193,477]	1258 [903,1613]	-4.73 **
Refrigerator			
Electric power consumption	2366 [1877,2854]	2793 [1913,3673]	-0.83
Volume	10 [6,15]	12 [5,20]	-0.49
Noise reduction function	1206 [964,1447]	1535 [1086,1984]	-1.26
Energy efficiency rank	481 [343,620]	325 [102,547]	1.17
Label indicating savings in electricity bills	728 [508,948]	1514 [1057,1970]	-3.04 **

Notes: The WTP values are in Chinese RMB. 1RMB=0.132US$ in August 2007. Figures in braces are 95% confidence intervals generated by the delta method. ** denotes the estimated WTP values are significantly different at 1% level across two survey modes.

4. Results and Discussions

A brief summary of socio-demographic characteristics for in-person and web-based samples is provided in Table1. Based on the *t* test results shown in the fourth column of the table, we found that compared to those of in-person sample, respondents in web-based sample are relatively younger, with higher education level and household income, and more full-time employed in average. This evidence implies the possible coverage error often encountered in web-based survey.

The estimation results by conditional logit model for air conditioner and refrigerator are presented in Tables 2 and 3. Following Swait and Lourviere (1993), the likelihood ratio (LR) test statistics for examining the same utility parameters across two samples are 160.96 in air conditioner case and 126.10 in refrigerator case. These two values are larger than the chi-square value at the 1% significance level on 9 degree of freedom (21.67), indicating that the estimated utility parameters across two survey modes are not the same. Thus, different from the previous results, we found the evidence not supporting the equivalence in the parameters of indirect utility function for in-person and web-based samples.

Turning to the marginal WTP values for various attributes shown in Table 4, we found that three WTP values (i.e. the WTP values for reducing electric power consumption in air conditioner case and presence of a label indicating savings in electricity bills in both air conditioner and refrigerator cases) are statistically different across two survey modes based on the Normal (Z) test.

In summary, applying a stated choice experiment survey in China, we found a number of differences in the underlying stated preferences across in-person interview and web-based survey. We attribute these differences to the possible coverage error of web-based survey. The coverage error seems extremely serious in China, because unlike in many developed countries, the Internet users in China (perhaps as well as in other developing countries) are only a small sample with particular characteristics (e.g., young generation, high educated person, high income group, or full-time employed group such as in this study). In other words, the sample collected in China by web-based survey might not be able to represent the target population. Therefore, we call for special cautions in the coverage error issue when collecting survey data through a web-based survey in China.

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