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Consumer Willingness to Pay for Ecolabels in China

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August, 2014

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CONSUMER WILLINGNESS TO PAY FOR ECOLABELS IN CHINA

Haitao Yin and Rui Zhao

EXECUTIVE SUMMARY

Ecolabels are becoming popular in China. It is hoped that environmental benefits can be achieved by changing consumer purchasing behavior and that using ecolabels can be a part of this behavior change. It is not clear whether this outcome will be achieved in China although ecolabeling appears to be an effective environmental instrument in developed countries.

This study aimed to understand whether Chinese consumers are willing to pay for ecolabels and how their willingness to pay (WTP) is determined. Knowledge of this area is important because consumer response is a critical link in the effectiveness of ecolabels.

Accordingly, the study found that Chinese consumers are willing to pay more for products that are labeled as having greater energy efficiency (Energy Efficiency Label) or for products that use more environmentally friendly production processes (Environmental Label). Likewise, when more information is provided to consumers on the public benefits of using energy-saving products, consumers show a higher WTP for energy efficiency labels. This demonstrates that education and communication are important in increasing the effectiveness of ecolabels.

This study also determined that it does not matter whether the labels are issued by the Chinese government or by a nongovernmental organization (NGO), although there was evidence that a label issued by the government might work better than the one issued by an NGO. Moreover, the coexistence of multiple labels on the same product waters down the effectiveness of all the labels. Therefore, it is important to avoid attaching too many labels on a product as this leads to confusion.

Lastly, when the estimation was calibrated, consumer WTP for ecolabels significantly decreased. This demonstrates that we should be cautious about generalizing our first observation. Which model, baseline model, or calibrated model we should trust is influenced by how similar the respondents view themselves in relation to their neighbors.

1.0 INTRODUCTION

Faced with mounting environmental challenges and the failure of traditional regulatory instruments to address environmental issues, China has been seeking innovative policies to combat environmental pollution (Zissis and Bajoria 2008). One approach is to empower concerned stakeholders such that firms would be pressured to be more environmentally friendly and to provide them with information relating to environmental performance; stakeholders cannot act if they do not have the relevant information on products/production processes. This approach has been applauded as the third wave of environmental management (Tietenberg 1998) and can take two forms: (1) the direct disclosure of corporate environmental footprints such as the US toxic release inventory (Konar and Cohen 1997); and (2) ecolabeling, which is often awarded through a certification process that guarantees the environmental friendliness of a product or its production process.

The popularity of environmental information disclosure is supported by the increasing environmental awareness of the general population. This research report focuses on the use of ecolabels in China. The premise of ecolabels is that they can overcome the environmental information asymmetry between consumers and firms and can further benefit the environment if consumers penalize bad environmental practices and reward good environmental practice by changing their purchasing behavior. In China, many types of ecolabel have been developed, such as the China Environmental Labelling, the China

Energy Efficiency Label, China Energy Conservation Certification, China Water Conservation Certification, and many others. However, our observations prevent us from being optimistic about the future of ecolabels, particularly their potential as a tool for environmental protection.

First, some types of ecolabel are not popular. The China Environmental Labelling has been in place for more than 20 years, but only 4,220 firms are actively promoting this at present. Second, the consumer response to ecolabeling has been uneven; it has been reported that consumers buy textile products that have an ecolabel even if they cost 20%–30% more than non-ecolabel textiles (Huang 2003). By contrast, some consumers do not want to pay extra for plastic bags that are certified to be 100% biodegradable (Ge and Wu 2009). Third, fake labeling—the practice of labeling an appliance with a better energy efficiency level than it actually possesses—is common in China. This is an issue that came to public attention when Mr. Zhou, the chairperson of Hisense, one of largest home appliance producers in China, publicly criticized the Energy Efficiency Label, saying that it does not reflect true levels of energy savings. This public controversy has further reduced the ability of ecolabels to change consumer behavior.

The goal of this study is to assess the potential of using ecolabels as a strategy for environmental protection in China. We focus on consumer responses to ecolabels because the usefulness of ecolabels, to a large extent, depends on how consumers respond to them. More specifically, we develop a choice experiment to study how consumers' WTP for ecolabels varies according to (1) the issuing organization, (2) the provision of complementary information, (3) the type of ecolabel, (4) the coexistence of multiple ecolabels, and (5) consumer trust in ecolabels.

This study has important policy implications, including the following: First, it could help the Chinese government assess the potential of ecolabels as a policy tool for environmental protection. Second, it would help the Chinese government to improve the design of the ecolabeling system in order to increase its effectiveness and maximize its benefits. For example, this study can provide useful information on which type of organization should be relied on to issue ecolabels, e.g., consumers may treat both ISO 14001 (certified by NGOs) and China Environmental Labelling (issued by the Chinese government) as proof of corporate environmental excellence in production but attach different WTP to them because of the issuing organizations. This is particularly important, particularly when considering how certain events, such as the scandal on medical capsules used to package drugs containing excessive quantities of chromium in 2012 and the issue on toxic milk powder¹ in 2008, have led to a crisis of trust in the Government of China. This study is also useful to the Chinese government when deciding whether to develop different ecolabels for different environmental aspects of the same product. Many ecolabels, including China Environmental Labelling, China Energy Conversation Certification, and China Water Certification, have already been developed. Because certification costs money, it would make sense to ask whether some labels should be developed at all if they do not bring additional benefits. Third, this study provides useful information that can help the government in developing social interventions to increase the usefulness of ecolabels in protecting the environment.

Section 2 briefly introduces the development of ecolabels in China and reviews the related literature. Section 3 further details our research questions and how we developed a choice experiment to answer these questions. Section 4 presents our results. Section 5 concludes the paper with a summary of key findings and a discussion of future research.

2.0 RESEARCH BACKGROUND

2.1 A Brief History of the Development of the Ecolabel in China

Ecolabels were first used in 1993 alongside the publication of the *Notice of Developing Environmental Certifications in China* by the National Environmental Protection Agency (NEPA) of China. In 2003, the Zhonghuan United Certification Center (ZUCC), which is also the Environmental Certification Center at NEPA, became the only government agency with the authority to issue environmental labeling in

¹http://www.legaldaily.com.cn/zt/content/2012-12/12/content_4046349.htm?node=41168;
<http://gcontent.oeeee.com/a/f5/af5d5ef24881f3c3/Blog/7cb/08eb06.html> (Retrieved 25 May, 2014)

China. According to the data from NEPA, only 4,220 firms currently promote China Environmental Labelling from ZUCC.²

There are two different energy labels in China. China Energy Conservation Certification is managed by the China Certification Center for Energy Conservation Products, which is administered by the State Bureau of Quality and Technical Supervision. It applies to lighting, tools, refrigerators, and industrial machinery. The second energy label is the China Energy Efficiency Label, which has been developed by the China National Institution of Standardization and applies to domestic electronic appliances.

In addition to government agencies, international and domestic environmental NGOs and industrial associations also actively initiate and promote environmental certification in China. For example, the China Quality Certification Centre, a member of the Global Ecolabel Network, is an NGO that engages in organic food certification, good agricultural practice certification, and resource conservation certification, among others. The ISO 14001 certification, promoted by the International Organization for Standardization, is growing rapidly in China, with 104,735 certificates issued by 2013.

According to the benefits that they promise, ecolabels can be split into two types. First, some ecolabels promise not only environmental benefits but also private benefits for consumers in the form of cost savings or positive health impacts (Type I label). Examples of this kind of ecolabel include the China Energy Conservation Certification, the China Energy Efficiency Label, the US Energy Star, and labels for organic food. Second, some ecolabels primarily point to public benefits. Consumers receive no direct private benefits from consuming this type of labeled product (Type II label). Examples include the China Environmental Labelling and the ISO 14001 certification. These labels indicate that the production process is environmentally friendly, resulting in less waste and pollution.

2.2 Review of Literature

A large body of literature has investigated consumer WTP for ecolabels. Studies have confirmed consumer WTP for Type I labels. For example, Shen and Saijo (2009) conducted a hypothetical choice experiment in Shanghai, China to examine whether the presence of an China Energy Efficiency Label influences consumer choice of air conditioners and refrigerators. They found that consumers were well aware of the labels and tended to pay more attention to products with such labels. WTP is more pronounced for refrigerators than for air conditioners. Ward et al. (2011) examined how the Energy Star label affects consumer preferences for refrigerators in the US and found that consumers are, on average, willing to pay an extra USD 249.82– USD 349.30 for a refrigerator that has been awarded this label. They provided evidence that respondent WTP was motivated by both private energy cost savings and public environmental benefits.

Results are mixed regarding the Type II label. A number of researchers have found that consumers are willing to pay more for certified products (Irland 1993; Forsyth, Haley, and Kozak 1999; Volsky, Ozanne, and Fontenot 1999; Jensen et al. 2004). For example, Volsky, Ozanne, and Fontenot (1999) developed a conceptual model to capture the effects of perceptions, awareness, and price on consumer willingness to purchase and pay an additional price for environmentally certified wood products; they found positive correlations between WTP and environmental consciousness, certification involvement, and the perceived importance of certification.

Drawing data from a survey of over 1,600 Pennsylvania and Tennessee residents, Jensen et al. (2004) found that the market would pay additional USD 3.74, USD15.94, and USD 45.07 for environmentally certified shelves, chairs, and tables respectively. Teisl, Roe, and Hicks (2002) provided market-based evidence that consumers respond to ecolabels, and the dolphin-safe label increased the market share of canned tuna. Bjorner, Hansen, and Russell (2004) found that the Nordic Swan label has had a significant effect on consumer brand choices of toilet paper, corresponding to a marginal WTP for the certified environmental label of 13%–18% of the price. Information on environmental performance also has had an effect on consumer choice of detergent.

²http://datacenter.mep.gov.cn/main/template-view.action?templateId_=8ae5e48d26724a8d012672cf8b560022 (Retrieved 25 May, 2014)

However, some researchers have reached conclusions that are the opposite of those stated above. Harrison (1999) reported on a program that had begun in the mid-1990s in Eastern Canada by Scott Paper to introduce a new line of ecolabeled products. The ecolabel stressed the high recycled content of the paper, which competed with the company's existing non-ecolabeled line. The firm discontinued production of the ecolabeled product line after sales declined significantly. Using aggregate monthly time-series data, Blamey and Bennett (2001) found that there seems to be a no-label effect on consumer WTP for canned seafood and substitute meat products. Borin, Cerf, and Krishnan (2011) found that consumer willingness to buy does not increase significantly with the provision of positive environmental information, as compared to no information. These studies do not touch upon the different features of ecolabeling and how this could affect consumer WTP.

As more and more ecolabels appear on the market, scholars have recently paid attention to the impacts of ecolabel coexistence. Multiple labels from different organizations coexist for the same product. In China, the China Energy Conservation Certification and the China Energy Efficiency Label both indicate energy savings; and ISO 14001 and China Environmental Labelling both emphasize the environmental friendliness of the production process. Scholars have considered the impacts of this phenomenon. Bottega and De Freitas (2009) found that if an NGO can advertise and convince consumers to pay for the environmental enhancements provided by labeled products, the need for government regulations aimed at substandard products may cease as that market dries up. Harbaugh, Maxwell, and Rousillon (2011) assumed that firms' qualities and the stringency of labels are exogenous. They found that when consumers are unsure of the environmental standard conveyed by a given ecolabel, label competition can produce confusion in consumers that undermines the value of labeling. Fischer and Lyon (2011) considered a situation in which both an NGO and an industrial association offer similar ecolabels. They found that the environmental benefits may be smaller in the presence of both labels than with the NGO label alone; label competition is more likely to produce negative environmental effects. However, to our best knowledge, no empirical research has been done to study the impact of label coexistence on customer response.

We believe that our study will contribute to the existing literature in the following ways. First, although consumer WTP for Type I and Type II labels has been addressed independently, existing studies have not compared WTP for these two different labels. Furthermore, we have not seen any research that studies how consumer WTP for Type I and Type II labels differ from each other when they are presented to consumers separately, as opposed to when they are presented to consumers together. Our second contribution hinges on the Chinese context. Although the importance of issuing organizations has been touched on in the US context, for example, Wessells, Donath, and Johanston (1999), the level of trust in different organizations may be very different in China from the West. Recent reports in China about labels that do not reflect true levels of energy efficiency have further damaged consumer trust in the existing energy-labeling system.³ Furthermore, the effectiveness of various social intervention tools in changing consumer behavior may be different in China from the West. For example, social or peer pressure may be more effective than environmental awareness in China due to a culture of fear surrounding an individual's loss of face (Zhang, Cao, and Nicholas 2011).

3.0 RESEARCH DESIGN

3.1 Research Questions

This study uses a choice-experiment approach and investigates the factors that affect Chinese consumer additional WTP for ecolabeled products. More specifically, we attempt to answer the following questions:

- Research question 1: How consumer WTP differs between the Type I label and the Type II label. We compare consumer WTP for the same product when it has a Type I label only or a Type II label only. We are interested in knowing whether and how much consumers would be willing to pay when the ecolabel only indicates public benefit (Type II label). We are also interested in knowing whether and how

³<http://sn.people.com.cn/n/2012/1017/c340887-17596410-2.html> (Retrieved 25 May, 2014)

much consumers would be willing to pay beyond their private benefits when the ecolabel indicates both public and private benefits (Type I label).

- Research question 2: For the Type I label, we study how consumer WTP could be changed if additional information is presented to highlight the public benefits of this type of label.
- Research question 3: How consumer WTP depends on the issuing organization, that is, government agency versus NGOs. WTP could be different because consumers may trust one type of organization more than others.
- Research question 4: How consumer WTP changes when multiple labels that indicate different eco attributes coexist for the same product. For example, consumer WTP for the Type II label may be different when it is presented to consumers independently versus when it is presented to consumers together with the Type I label.
- Research question 5: How consumer WTP varies among consumers with different characteristics. Consumer characteristics include gender, age, education, income, and behavioral preference. Gender is important because female adults in households often take responsibility for daily purchases. We are also interested in studying how consumer WTP differs across environmental attitudes, sensitivity to social pressure, self-regulation, and trust in different organizations.

3.2 Research Design

We used choice experiments to study consumer WTP for ecolabels and how this WTP varies with attributes and consumer characteristics.

3.2.1 Attributes and levels in the choice experiments

We focused on one specific home appliance—the air conditioner—in our choice experiments. Based on field observations regarding air conditioners sold in supermarkets, and based on interviews with salespersons, we decided to use the following attributes and associated levels.

Specifications for an air-conditioning unit of capacity 1 HP. A capacity of 1 HP cools an area of about 10–20 square meters (m²). Horsepower (HP) is a commonly used measurement of capacity in China. A capacity of 1 HP corresponds to nominal output power of 2,324 watts (W). In practice, air conditioners that has nominal output power ranging from 2,200–2,600 W are all considered to be 1 HP.

Brand: Midea, Haier, Gree, and others

Price: CNY 2,000; CNY 3,000; CNY 4,000; CNY 5,000; CNY 6,000; CNY 7,000

Labeled “Quiet Model”: Yes / No

Energy label: Government Level 1 label; Government Level 2 label; Government Level 3 label; NGO Level 1 label; NGO Level 2 label; NGO Level 3 label.

Environmental label: Government environmental label; NGO environmental label; no environmental label.

Note: An energy label is currently mandatory in China, while an environmental label is voluntary. Thus, a no “no energy label” is set as a level under the attribute of “Energy Label.”

Specifications for an air-conditioning unit of capacity 2 HP. A capacity of 2 HP cools an area of about 20–30 m². All the attributes and their levels are the same for 1 HP except for the prices of the air-conditioning units. The prices are CNY 5,000, CNY 6,000, CNY 7,000, CNY 8,000, CNY 9,000, and CNY 10,000.

With these attributes and their associated levels, the procedure introduced in the study of Kuhfeld (2010) was used to construct the choice sets used in this study. A total of 144 choice sets were created for each survey scenario. Each choice set includes two alternative air conditioners and an option of “do not want to buy either of the two air conditioners.”

Four Scenarios. In order to answer our research questions, we developed four survey scenarios and implemented the survey with split samples. Scenario 1 is the baseline scenario. The survey questions were designed as follows.

Scenario 1 (Energy Label Only): We would like you to compare two hypothetical air conditioners along with the option of “do not want to purchase either of the two air conditioners.” You will be presented with four choice sets. The two air conditioners are basically the same but have some differences,⁴ which are described in the table. Please make your choice between the two models as if they are the only two available. Of course, you could choose not to buy either of them.

Please treat each of these four choice sets independently, that is, for each set, imagine that the two hypothetical options presented to you are the only ones available.

Attributes	Model X	Model Y
Brand		
Price	 CNY 5,000	 CNY 7,000
Labeled as quiet model	 No	 Yes
Energy label	Issued by Government	Issued by NGO
	High energy efficiency label	Medium energy efficiency label

Please Mark Your Choice in the Following Table:

	Model X	Model Y	No Purchase
YOUR CHOICE			

We presented four different choice sets to each of the respondents. Before presenting the second choice set, the interviewers recited the following “Independence Reminder” in their own language: “Please treat each of these four sets independently, that is, for each set, imagine that the two hypothetical options presented to you are the only ones available.”

Scenario 2 (Energy Label Only with Additional Environmental Information): This was implemented in a separate sample. Scenario 2 was exactly the same as Scenario 1 except that the respondents were presented with the following information before the presentation of choice sets.

We are now witnessing a deteriorating environment (e.g., melting glaciers due to rising temperatures, climate anomalies, frequently occurring heavy smog, etc.) which has raised widespread concern all over the country. Studies have illustrated that climate change is due to the increasing greenhouse gases in the atmosphere. Power plants are one of the most important sources of greenhouse gases and heavy smog because they are burning coal. Purchasing energy-saving home appliances would help save electricity and alleviate these already serious environmental problems.

⁴ We gave a brief description of these differences in the survey. Please see the appended survey questionnaire for details.

Scenario 3 (Environmental Label Only): This was implemented in a separate sample. It took the same form as Scenario 1 except that “Energy Label” and related information was replaced with “Environmental Label” and related information.

Scenario 4 (Both Energy and Environmental Labels): This was implemented in a separate sample. It took the same form as Scenario 1 except that “Energy Label” and related information was complemented with “Environmental Label” and related information.

Research questions and scenarios. Research question 1 was addressed by comparing Scenario 1 with Scenario 3. Research question 2 was answered by comparing Scenario 1 with Scenario 2. Research question 3 was answered in all four scenarios. Research question 4 was addressed by comparing Scenario 1 with Scenario 4, as well as by comparing Scenario 3 with Scenario 4. Research question 5 was answered by integrating customer characteristics with an analysis of product attributes.

Bias correction. Respondents may overstate their WTP in stated preference surveys, including choice experiments (Ready, Champ, and Lawton 2010). We used the approach recommended by Bernheim et al. (2013) and implemented it by asking the following question:

Please indicate how you think a typical resident in your neighborhood would choose in the earlier choice?

☐ Model X ☐ Model Y ☐ No Purchase

We gave this question the label “neighbor correction” in the analysis. This follow-up “neighbor correction” question was presented only after the third and fourth choice questions and its purpose was to reduce the burden on the respondents.

The survey. A pilot test was performed in late January 2014 and the survey instruments were further refined. The survey was implemented in late March and early August 2014. The respondents were selected at random at airports and railroad stations.⁵

Before surveying the respondents, we asked them whether they had bought an air conditioner in the previous year or were planning to buy an air conditioner in the following year. Only those respondents who answered “Yes” were interviewed because we wanted to make sure our respondents had a certain level of familiarity with air conditioners.

4.0 FINDINGS AND DISCUSSIONS

4.1 Sample of Survey Respondents

Table 1 compares the samples we interviewed in Scenarios 1–4 based on some observed demographic information. The four split samples look similar in terms of the distribution of age, family size, amount of electricity bill, gender, education, household income, and residence type. We further performed ANOVA analysis and found the p-value to be all above the conventional level of significance of 5%. This analysis confirms that the four split samples can be treated as being randomly drawn from the same population.

Table 2 compares the samples we interviewed in Scenarios 1–4 based on the interviewee’s stated confidence in ecolabels, familiarity with ecolabels, trust in government and nonprofit organizations, attitude toward environmental protection, level of self-regulation, and susceptibility to peer influence. The ANOVA analysis indicates that the respondents in these four split samples are not significantly different in terms of attitudes and perceptions, except for levels of familiarity with the China Energy Efficiency Label.

⁵ The original plan was to interview shoppers at a home appliance supermarket. But we found that with the increasing popularity of online shopping, fewer people shop for home appliances in supermarkets these days in China. In order to obtain a sizable survey pool in a relatively short period of time, we decided to randomly select respondents at airports and railroad stations, where people have free time and are more likely to participate in a survey.

Table 1. Descriptive statistics of respondents' demographic information

Variable		Scenario 1		Scenario 2		Scenario 3		Scenario 4		ANOVA	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	F	Prob > F
Age		33.42	8.42	34.53	10.31	35.31	9.70	36.31	9.99	2.53	0.06
	Family size	3.57	1.20	3.73	1.22	3.68	1.27	3.59	1.34	0.60	0.61
	Electricity bill	164.69	182.73	164.94	143.65	173.02	175.32	176.73	309.39	0.13	0.94
Gender		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	F	Prob > F
	Male	114	70.37%	122	72.62%	116	70.73%	110	71.43%	0.08	0.97
	Female	48	29.63%	46	27.38%	48	29.27%	44	28.57%		
Education	Primary School and below	17	10.49%	10	5.95%	19	11.59%	17	11.04%	1.15	0.33
	High School	22	13.58%	25	14.88%	27	16.46%	21	13.64%		
	Junior College	33	20.37%	42	25.00%	39	23.78%	37	24.03%		
	University	69	42.59%	67	39.88%	63	38.41%	54	35.06%		
	Masters Program and above	21	12.96%	24	14.29%	16	9.76%	25	16.23%		
Household income (CNY)	3,000 and below	2	1.23%	5	2.99%	2	1.22%	5	3.25%	0.32	0.81
	3,000– 6,000	23	14.20%	25	14.97%	19	11.59%	23	14.94%		
	6,000– 9,000	19	11.73%	24	14.37%	34	20.73%	24	15.58%		
	9,000– 12,000	36	22.22%	31	18.56%	32	19.51%	24	15.58%		
	12,000– 15,000	26	16.05%	33	19.76%	23	14.02%	22	14.29%		
	15,000 and above	56	34.57%	49	29.34%	54	32.93%	56	36.36%		
Residence type	Principle residence	152	94.41%	157	93.45%	158	96.34%	146	94.81%	0.48	0.70
	Rental	9	5.59%	11	6.55%	6	3.66%	8	5.19%		

Note: SD = standard deviation

Table 2. Descriptive statistics of respondents' perception and attitude

Variable		Scenario 1		Scenario 2		Scenario 3		Scenario 4		ANOVA	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	F	Prob > F
Confidence in Ecolabels	Distinguish between environmentally friendly and harmful products	2.98	1.47	3.00	1.62	2.95	1.64	2.96	1.49	0.03	0.99
	Unsure about which ecolabels are reliable	2.81	1.37	2.96	1.49	2.84	1.54	2.90	1.43	0.33	0.80
Familiarity	Credibility of ecolabels	2.57	1.23	2.54	1.30	2.52	1.34	2.41	1.14	0.48	0.70
	Phenomenon of fake labelling	2.14	1.16	2.12	1.25	2.20	1.30	2.14	1.17	0.11	0.95
	China Environmental Labelling	2.46	1.12	2.43	1.26	2.32	1.30	2.42	1.28	0.40	0.75
	ISO 14001 certification	2.52	1.34	2.77	1.48	2.54	1.45	2.55	1.40	1.15	0.33
Trust	China Energy Efficiency Label	2.87	1.28	2.98	1.37	2.52	1.35	2.91	1.42	3.63	0.01
	Trust in Government	2.79	1.07	2.84	1.18	2.75	1.20	2.67	1.07	0.60	0.61
	Trust in NGOs	2.48	1.00	2.52	1.08	2.36	1.03	2.43	1.03	0.77	0.51
Environmental attitudes		4.13	0.81	4.09	0.85	4.11	0.85	4.11	0.76	0.06	0.98
Self-regulation		3.64	0.68	3.73	0.73	3.74	0.69	3.78	0.71	1.02	0.38
Peer influence		2.72	0.93	2.82	1.04	2.72	0.93	2.86	0.98	0.85	0.47

These observations suggest that the differences between Scenarios 1–4, which will be demonstrated in the following analyses, are not likely to be driven by the sample difference in all the above considered dimensions, except for familiarity with the China Energy Efficiency Label. The differences could be attributed to two sources. First, the designed difference between these scenarios; and second, the observed difference in familiarity with the China Energy Efficiency Label.

4.2 Analysis of WTP for Ecolabels

Tables 3 and Table 4 present the results of the conditional logistic analyses of the choice data for Scenarios 1–4 separately. For each of the four scenarios, two columns show two types of analyses. The column marked *Own Choice* is our baseline analysis, which uses the interviewee's own choice as a dependent variable and shows the results when the respondents make a choice for themselves. We call this the *Baseline Model* hereafter. The column marked *Neighbor Choice* shows where the respondents guess what decision their neighbors might make and use their neighbor's possible choice as a dependent variable. This is labeled *Calibrated Model* hereafter. Table 3 shows analyses of air conditioners with 1 HP, and Table 4 addresses analyses of air conditioners with 2 HP. Air conditioners with different capacities are often used for different purposes and have significantly different prices; we therefore treat them as different products in this study.

The independent variables included in the regressions are listed below.

- Model X and Model Y are alternative specific constants for the air conditioner options. Model X is coded as 1 if the air conditioner that an interviewee examined is listed in the first column as Model X in a choice set, and 0 otherwise. Model Y is similarly defined.
- Midea, Gree, and Haier are the three most popular brands of air conditioner in China. They are included as dummy variables to capture the brand-specific impact on consumer utility. For example, Midea is coded as 1 if the air conditioner that an interviewee examined in a choice set bears a brand of Midea, and 0 otherwise. The omitted category is Other Brands.
- Price is the price of the air conditioner that an interviewee examined in a choice set. The price is given in '000 CNY.
- Quiet Model is a dummy variable equal to 1 if the noise level of an air conditioner is below 35dB, and 0 otherwise.
- GOV Efficiency Level One, GOV Efficiency Level Two, GOV Efficiency Level Three, NGO Efficiency Level One, NGO Efficiency Level Two, GOV Environmental Label, and NGO Environmental Label are all dummy variables that indicate the use of ecolabels. For example, GOV Efficiency Level One indicates that the air conditioner has a Level One Energy Efficiency Label.

Table 3. Conditional logistic analysis of choice data of 1HP model

	Scenario 1			Scenario 2			Scenario 3			Scenario 4		
	Own Choice (Base)	Calibrated with Neighbor Choice	Own Choice (Base)	Calibrated with Neighbor Choice	Own Choice (Base)	Calibrated with Neighbor Choice	Own Choice (Base)	Calibrated with Neighbor Choice	Own Choice (Base)	Calibrated with Neighbor Choice	Own Choice (Base)	Calibrated with Neighbor Choice
ASC Model_X	1.95*** (0.40)	2.86*** (0.59)	0.55 (0.42)	2.03*** (0.59)	0.44 (0.35)	1.63*** (0.52)	0.77* (0.42)	1.01* (0.59)				
ASC Model_Y	1.77*** (0.40)	2.88*** (0.60)	0.57 (0.42)	1.95*** (0.59)	0.41 (0.35)	1.62*** (0.51)	0.71* (0.42)	1.13* (0.60)				
Midea	0.29 (0.24)	0.38 (0.36)	1.06*** (0.26)	1.18*** (0.38)	0.84*** (0.25)	0.47 (0.36)	0.93*** (0.26)	0.78** (0.36)				
Gree	1.05*** (0.25)	1.37*** (0.38)	1.47*** (0.27)	1.42*** (0.38)	1.36*** (0.25)	1.90*** (0.38)	1.32*** (0.26)	1.61*** (0.38)				
Haier	0.39 (0.24)	0.74** (0.35)	0.77*** (0.26)	0.35 (0.36)	0.67*** (0.25)	0.55 (0.36)	0.42 (0.26)	0.70* (0.36)				
Price	-0.27*** (0.05)	-0.40*** (0.08)	-0.15*** (0.05)	-0.24*** (0.08)	-0.19*** (0.05)	-0.29*** (0.08)	-0.24*** (0.05)	-0.25*** (0.08)				
Quiet model	0.68*** (0.17)	0.43 (0.26)	0.54*** (0.18)	-0.15 (0.26)	0.57*** (0.17)	0.06 (0.25)	1.02*** (0.19)	0.54** (0.25)				
Gov Efficiency Level One	0.71** (0.30)	-0.26 (0.43)	0.63** (0.31)	0.34 (0.44)			0.41 (0.31)	0.50 (0.44)				
Gov Efficiency Level Two	0.15 (0.29)	-0.23 (0.43)	0.57* (0.31)	-0.20 (0.44)			-0.12 (0.31)	0.29 (0.44)				
Gov Efficiency Level Three	0.06 (0.30)	-0.50 (0.46)	0.40 (0.31)	-0.04 (0.44)			-0.48 (0.32)	-0.38 (0.45)				
NGO Efficiency Level One	0.73** (0.30)	0.14 (0.44)	0.79** (0.32)	0.00 (0.44)			0.28 (0.31)	0.62 (0.45)				
NGO Efficiency Level Three	-0.19 (0.30)	-1.26*** (0.47)	0.14 (0.31)	-0.52 (0.44)			-0.30 (0.31)	-0.27 (0.44)				
Gov Environmental Label					0.77*** (0.21)	0.66** (0.31)	0.48** (0.22)	0.25 (0.31)				
Gov Environmental Label					0.37* (0.21)	0.09 (0.30)	-0.10 (0.22)	-0.24 (0.31)				
Observations	1008	504	924	462	996	498	960	480				

Notes: (1) Values in () are the absolute value of z-statistics; (2) * significant at 10%, ** significant at 5%, *** significant at 1%

Table 4. Conditional logistic analysis of choice data of 2HP model

	Scenario 1			Scenario 2			Scenario 3			Scenario 4		
	Own Choice (Base)	Calibrated with Neighbor Choice		Own Choice (Base)	Calibrated with Neighbor Choice		Own Choice (Base)	Calibrated with Neighbor Choice		Own Choice (Base)	Calibrated with Neighbor Choice	
ASC Model_X	2.01*** (0.53)	2.97*** (0.76)		2.10*** (0.47)	2.54*** (0.68)		0.46 (0.47)	1.56** (0.67)		1.65*** (0.54)	1.74** (0.78)	
ASC Model_Y	2.04*** (0.53)	3.13*** (0.77)		1.86*** (0.47)	2.33*** (0.68)		0.25 (0.47)	1.45** (0.67)		1.62*** (0.54)	1.48* (0.79)	
Midea	1.40*** (0.28)	0.92** (0.39)		0.40* (0.23)	0.51 (0.33)		0.95*** (0.25)	1.08*** (0.36)		0.42 (0.27)	1.21*** (0.40)	
Gree	1.86*** (0.29)	1.57*** (0.40)		1.04*** (0.24)	1.13*** (0.34)		1.24*** (0.25)	1.08*** (0.36)		1.11*** (0.27)	1.24*** (0.39)	
Haier	1.02*** (0.27)	0.89** (0.39)		0.31 (0.23)	-0.06 (0.32)		0.44* (0.25)	0.44 (0.36)		0.75*** (0.26)	1.09*** (0.39)	
Price	-0.30*** (0.06)	-0.42*** (0.08)		-0.21*** (0.05)	-0.22*** (0.07)		-0.12** (0.05)	-0.23*** (0.08)		-0.25*** (0.06)	-0.24*** (0.08)	
Quiet model	1.02*** (0.20)	0.67** (0.27)		0.58*** (0.16)	0.51** (0.23)		0.79*** (0.18)	0.80*** (0.25)		0.75*** (0.19)	0.45* (0.27)	
Gov Efficiency Level One	0.05 (0.32)	0.42 (0.46)		-0.05 (0.28)	0.17 (0.40)					0.30 (0.32)	0.50 (0.46)	
Gov Efficiency Level Two	-0.45 (0.33)	-0.14 (0.47)		0.15 (0.28)	-0.09 (0.40)					0.09 (0.32)	-0.40 (0.47)	
Gov Efficiency Level Three	-0.05 (0.32)	-0.17 (0.47)		-0.93*** (0.30)	-0.93** (0.44)					-0.52 (0.33)	-0.08 (0.46)	
NGO Efficiency Level One	0.23 (0.33)	0.41 (0.47)		0.22 (0.28)	-0.03 (0.39)					0.45 (0.33)	0.71 (0.47)	
NGO Efficiency Level Three	-0.60* (0.33)	0.13 (0.46)		-0.49* (0.28)	-0.74* (0.40)					-0.52 (0.33)	-0.15 (0.46)	
Gov Environmental Label							0.63*** (0.22)	0.41 (0.31)		0.12 (0.23)	0.12 (0.33)	
Gov Environmental Label							0.12 (0.22)	0.19 (0.31)		0.17 (0.23)	0.67** (0.34)	
Observations	936	468		1,092	546		972	486		864	432	

Notes: (1) Values in () are the absolute value of z-statistics; (2) * significant at 10%, ** significant at 5%, *** significant at 1%

All the variables have the expected signs. The coefficients on price are negative and statistically significant, which shows that higher prices would reduce the likelihood of a consumer purchasing an air conditioner. The coefficients on Gree are positive and statistically significant in all the regressions. Furthermore, they are consistently higher than the coefficients for Midea and Haier. This suggests that Gree is now the most influential brand in the Chinese market for air conditioners. The coefficients on the *Quiet Model* are consistently positive and statistically significant in almost all specifications (except for the situation when respondents are asked to anticipate what kind of air conditioner their neighbors would buy if they were purchasing an air conditioner with HP 1), suggesting that this is an important attribute that consumers truly value in the market.

Table 5 shows the WTP for this attribute. Two observations are clear. First, the amount of WTP, although it fluctuates across different specifications, is around CNY 3,000. The WTP for HP 1 air conditioners is not significantly lower than—sometimes even higher than—HP 2 air conditioners. This may be due to the fact that HP 1 air conditioners are often used in bedrooms, while HP 2 air conditioners are often used to cool living rooms and public spaces. Therefore, consumers value quiet operation more in HP 1 air conditioners. Second, when calibrated with neighbor choice, the WTP for a quiet air conditioner is significant lower, sometimes even losing statistical significance. This tells us that the respondents feel that their neighbors do not care about noise levels as much as they do.

We now turn our attention to WTP for ecolabels, which is of central interest to this study. In the regression analysis, we omit the category of NGO Efficiency Label Two, and therefore take it as the reference when analyzing energy efficiency labeling. In the regression analysis, we omit *No Environmental Label*, and therefore take it as the reference when analyzing environmental labeling. We follow the order of the research questions given in Section 3.1 when discussing the results. As a general pattern, for each of the research questions, we first discussed the baseline model for the analysis of HP 1 air conditioners and then looked at how the observations would change if we instead investigated the calibrated model and HP 2 air conditioner.

4.2.1 Research question 1

When presented separately to consumers, both the Energy Efficiency Label (as an example of a Type I label) and the Environmental Label (as an example of a Type II label) could significantly affect the likelihood of a consumer purchasing an air-conditioning unit. This is suggested by the statistically significant coefficients on Government and NGO Energy Efficiency Level One in regression analyses 1 and 3 (Table 3) and the statistically significant coefficients of Government Environmental Label in regression analysis 5 (Table 3).

WTP. Let us now look at WTP. Tables 6 and 7 show the calculated WTP for the Energy Efficiency Label and the Environmental Label, respectively. We focus on the first column as an example of interpretation. Table 6 suggests that the WTP for an air conditioner with a capacity of 1 HP would increase by CNY 2,645 if it bears an Energy Efficiency Level One Label awarded by the government, instead of an Energy Efficiency Level Two Label awarded by an NGO.

Table 6 suggests that WTP for an air conditioner with a capacity of 1 HP would increase by CNY 4,152 if it bears an environmental label awarded by the Government, as compared to an air conditioner that has no environmental label attached.

Comparing the magnitude of the marginal willingness to pay (MWTP) for the Energy Efficiency Label and the Environmental Label conveys little information because the reference group for the Government Environmental Label is *No label at all*, while the reference group for government and NGO Energy Efficiency Level One is NGO Energy Efficiency Level Three. This design difference stems from the fact that energy efficiency labeling is mandatory in China, while displaying environmental labels is currently voluntary.

Table 5. Marginal willingness to pay (MWTP) for quiet model

MWTP for Quiet Model		Base				Calibrated with Neighbor Choice			
Capacity		Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Quiet model	1HP	2,518.61***	3,552.47***	3,075.37***	4,265.73***	1,083.96*	-605.34	200.82	2,181.94**
	2HP	3,435.17***	2,719.78***	6,436.58**	2,990.85***	1,584.69**	2,281.69**	3,469.05***	1,881.00*

Notes: (1) The level of significance was calculated using Krinsky and Robb's method; (2) * significant at 10%; ** significant at 5%; *** significant at 1%

Table 6. MWTP for an energy efficiency label, by type of label

MWTP for Energy Efficiency Label		Capacity		Base		Calibrated with Neighbor Choice	
				Scenario 1	Scenario 2	Scenario 1	Scenario 2
GOV Efficiency Level One	1 HP			2,644.98**	4,128.14*	-655.63	1,393.87
	2 HP			173.54	-233.59	1,004.29	739.95
GOV Efficiency Level Two	1 HP			563.91	3,762.71*	-593.55	-832.46
	2 HP			-1,534.98	724.28	-337.35	-400.53
GOV Efficiency Level Three	1 HP			213.87	2,605.44	-1,264.00	-180.80
	2 HP			-183.97	-4,385.14***	-406.31	-4,148.21**
NGO Efficiency Level One	1 HP			2,727.12**	5,187.46**	341.76	14.23
	2 HP			781.15	1,024.36	977.66	-148.62
NGO Efficiency Level Three	1 HP			-708.47	913.61	-3,191.55***	-2,144.38
	2 HP			-2,033.27*	-2,309.79**	308.39	-3,289.08*

Note: The level of significance was calculated using Krinsky and Robb's method.

Table 7. MWTP for an environmental label, by label coexistence

MWTP for Environmental Label		Capacity		Base		Calibrated with Neighbor Choice	
				Scenario 3	Scenario 4	Scenario 3	Scenario 4
GOV Environmental Label	1HP			4,151.96***	1,986.04**	2,298.15**	999.46
	2HP			5,171.02**	489.11	1,766.35	517.11
NGO Environmental Label	1HP			2,020.81*	-426.33	310.13	-986.01
	2HP			993.48	661.86	832.80	2,795.26**

Notes: (1) The level of significance was calculated using Krinsky and Robb's method; (2) * significant at 10%; ** significant at 5%; *** significant at 1%

Discussion: Calibrated model. When the model is calibrated with neighbor choice, the statistically significant results that we find in the baseline model disappear when analyzing Energy Efficiency Labels. This indicates that the respondents do not think that their neighbors are willing to pay more for energy-efficient air conditioners. When looking at the Environmental Label, the coefficient for the Government Environmental Label still remains significant but the magnitude of WTP is cut in half.

It is an open question which model (i.e., baseline model or calibrated model) is more likely to solicit the true value of WTP. It is argued that the calibrated model could help correct the overstatement of WTP in stated preference studies (Bernheim et al. 2013). However, it is hard to tell which statement, stated own preference or stated neighbor preference, is closer to what the respondents really think.

Discussion: Efficient choice. It is interesting to compare stated WTP with electricity savings from using more energy efficient air conditioners. This could be used as an indication whether respondents are making efficient choices in the stated preference survey. According to Sun, Yin, and Wang (2014), an air conditioner with a Level One energy efficiency label can only save CNY 200–300 on average across a 10-year life cycle,⁶ as compared to a Level Two energy efficiency label. A test shows that consumers are willing to pay CNY 2,081 more for a Level One GOV Energy Efficiency Label, compared to a Level Two Gov Energy Efficiency Label. This is a lot higher than the bill savings that using Level One air conditioners could possibly achieve. This suggests that consumers are willing to pay for higher energy efficiency not only for the private benefits it promises, but also for the public benefits it could bring to society.

Discussion: HP 2 air conditioners. Where HP 2 air conditioners are concerned, it seems that consumers are not willing to pay more for higher energy efficiency. The most plausible explanation for this is that HP 2 air conditioners are often used in living rooms, meaning they are not used a lot (people go to work during the day and spend more time in their bedrooms at night), or they are used in public spaces where saving electricity might be less of a priority than purchasing cost savings.

4.2.2 Research question 2

Table 6 presents consumer WTP for different types of energy efficiency labels, taking NGO Energy Efficiency Level Two as a reference. Table 6 also compares the values of WTP between Scenarios 1 and 2.

When we look at the line for Government Efficiency Level One, it is clear that consumer additional WTP would increase if we highlight the public environmental benefit of using energy-saving air conditioners before presenting respondents with the choice set. The additional WTP for Government Efficiency Level One is CNY 4,128 in Scenario 2, while it is only CNY 2,645 in Scenario 1. This observation also holds when we look at the line for NGO Efficiency Level One, and Government Efficiency Level Two.

As we mentioned earlier, the respondents in the four scenarios do not differ a great deal from one another except for their degrees of familiarity with the China Energy Efficiency Label. So the observed difference between Scenarios 1 and 2 is created by the design difference between the two scenarios, or the inherent difference in the interviewee background knowledge between the two scenarios. Because the answer to this research question hinges upon the comparison between Scenarios 1 and 2, we performed an ANOVA test to see if the respondents in Scenarios 1 and 2 have different levels of familiarity with the China Energy Efficiency Label. The p-value is 0.47, showing that respondents in Scenarios 1 and 2 have the same level of familiarity with energy efficiency. Therefore, higher WTP in Scenario 2 is likely to have been caused by the presentation of information on the public environmental benefits of using energy saving air conditioners.

Calibrated model. In spite of the larger coefficient as well as a higher level of significance in scenario 2, WTP still shows no difference from zero when calibrated with neighbor choice.

Discussion: HP 2 air conditioners. In the second scenario, where HP 2 air conditioners are concerned, respondents show no willingness to pay more for air conditioners with higher energy efficiency.

⁶ For details of how this life cycle cost is calculated, please see [Sun, Yin, and Wang \(2014\)](#).

4.2.3 Research question 3

Research question 3 concerns whether consumer WTP for ecolabels could be different depending on the issuing organizations (Government or NGOs).

In order to answer this question, we ran a series of tests to investigate whether the WTP for Government Efficiency Level One is significantly different from NGO Efficiency Level One, and similarly for other labels that signify the same level of energy efficiency but are issued by different organizations. The results are reported in Table 8. The t-values from these tests are well above the conventional threshold significance level of 10% except for one occasion (baseline model in the analysis of Scenario 2). This shows that the type of issuing organization would not significantly affect consumer WTP for energy efficiency labels in China.

When environmental labels are concerned, consumers do show a statistically higher WTP for government-issued labels (see Table 2 for a higher level of trust in the Government compared to NGOs).

4.2.4 Research question 4

Research question 4 concerns how consumer WTP changes when multiple ecolabels that indicate different attributes coexist for the same product. This requires us to compare Scenarios 1 and 4, as well as Scenarios 3 and 4. In Scenarios 1 and 3, the Energy Efficiency Label and the Environmental Label were presented separately, while they were presented together in the choice set in Scenario 4.

Table 7 compares Scenarios 3 and 4, while Table 9 compares Scenarios 1 and 4. We observed that presenting multiple ecolabels reduced the magnitude of WTP for a Level One Energy Efficiency Label to a point that is not significantly different from zero, although WTP is significantly positive when energy efficiency labels are presented independently.

When we looked at environmental labels, we made a similar observation. The magnitude of WTP for a Government Environmental Label and its level of significance decreased. The WTP for an NGO Environmental Label loses its statistical significance. This suggests label confusion, as has been described in the literature. When presented with multiple labels, consumers may feel confused, and accordingly lose interest in paying for any label that competes for their goodwill.

We again noticed that the respondents sampled in different scenarios showed different levels of familiarity with the China Energy Efficiency Label. This would likely affect the comparison between Scenarios 1 and 4, but not the comparison between Scenarios 3 and 4. The reason for this is that the former comparison concerns energy efficiency labels, while the latter comparison concerns environmental labels. We then ran an ANOVA to test whether the respondents in Scenario 1 had a different level of trust from Scenario 4. The p-value from this test was 0.80, which indicates that the difference can be viewed from random sampling. This makes us more confident with our conclusion regarding label confusion.

4.2.5 Research question 5

We are also interested in understanding what social interventions could change consumer WTP for ecolabels. For this purpose, we added cross terms between selected indicators for socioeconomic characteristics, personal attitudes, and price in the regression analyses. The variables that we tried included gender, age, environmental attitude, self discipline, peer influence, trust, and familiarity with ecolabels. No interesting results were revealed in a robust and consistent manner. We therefore did not include the regression analyses here.

Table 8. Consumer WTP, by type of label and by type of issuing organization

WTP difference	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
	Capacity	Own Choice (Base)	Calibrated with Neighbor Choice	Own Choice (Base)	Calibrated with Neighbor Choice	Own Choice (Base)	Calibrated with Neighbor Choice	Own Choice (Base)
GOV Efficiency Level One NGO Efficiency Level One	1HP	- 82.14	- 997.40	- 1,059.31	1,379.64			550.40
	2HP	- 607.61	26.63	- 1,257.94	888.57			-587.73
GOV Efficiency Level Two NGO Efficiency Level Two	1HP	563.91	- 593.55	3,762.71*	- 832.46			-489.67
	2HP	-1,534.98	- 337.35	724.28	-400.53			351.77
GOV Environmental label NGO Environmental label	1HP					2,131.15**	1,988.02*	2,412.37**
	2HP					4,177.54**	933.55	-172.75

Notes: (1) The level of significance was calculated using Krinsky and Robb's method; (2) * significant at 10%; ** significant at 5%; *** significant at 1%

Table 9. MWTP for an energy efficiency label, by label coexistence

MWTP for Energy Efficiency Label	Capacity	Base		Calibrated with Neighbor Choice	
		Scenario 1	Scenario 4	Scenario 1	Scenario 4
GOV Efficiency Level One	1 HP	2,644.98**	1,705.70	-655.63	2,038.49
	2 HP	173.54	1,186.22	1,004.29	2,104.01
GOV Efficiency Level Two	1 HP	563.91	-489.67	-593.55	1,180.83
	2 HP	-1,534.98	351.77	-337.35	-1,687.85
GOV Efficiency Level Three	1 HP	213.87	-1,992.63	-1,264.00	-1,532.10
	2 HP	-183.97	-2,087.08	-406.31	-323.85
NGO Efficiency Level One	1 HP	2,727.12**	1,155.30	341.76	2,541.24
	2 HP	781.15	1,773.95	977.66	2,968.79
NGO Efficiency Level Three	1 HP	-708.47	-1,264.99	-3,191.55***	-1,095.29
	2 HP	-2,033.27*	-2,056.18*	308.39	-635.67

Notes: (1) The level of significance was calculated using Krinsky and Robb's method; (2) * significant at 10%; ** significant at 5%; *** significant at 1%

5.0 CONCLUSIONS

Ecolabels are becoming popular in China. It is hoped that environmental benefits can be achieved by changing consumer purchasing behavior and that the use of ecolabels can be a part of this behavior change. It is not clear whether this outcome will be achieved in China, although ecolabeling appears to be an effective environmental instrument in developed countries. This study aims to understand whether Chinese consumers are willing to pay for ecolabels and how their WTP is determined. Knowledge of this area is important because consumer response is a critical link in the effectiveness of ecolabels.

We made the following observations. First, Chinese consumers are willing to pay more for products that are labeled as having greater energy efficiency (Energy Efficiency Label) or for products that use more environmentally friendly production processes (Environmental Label). The latter finding is encouraging since environmental labels, in our survey design, are described to signify only public environmental benefits, excluding private benefits that could come from other labels, e.g., the China Energy Efficiency Label.

Second, when more information is provided to consumers on the public benefits of using energy saving products, consumers show a higher WTP for energy efficiency labels. This demonstrates that education and communication are important in increasing the effectiveness of ecolabels.

Third, it does not matter whether the labels are issued by the Chinese Government or by an NGO, but we do have limited evidence that a label issued by the Government might work better than one issued by an NGO.

Fourth, the coexistence of multiple labels on the same product waters down the effectiveness of all the labels. Therefore, it is important to avoid attaching too many labels to a product as this leads to confusion.

Fifth, when the estimation is calibrated using the method that is recommended by Bernheim et al. (2013), consumer WTP for ecolabels significantly decreased. This demonstrates that we should be cautious about generalizing our first observation. Which model, baseline model, or calibrated model we should trust is influenced by how similar the respondents view themselves in relation to their neighbors.

Many successful environmental instruments have failed when they have been transplanted from developed countries to China. One notable example is the sulfur dioxide (SO₂) cap and trade system. China has tried to establish a SO₂ cap and trade system for more than 10 years but it still hasn't made it off the drawing board. The use of ecolabels has been attempted in China; however, its effectiveness is widely questioned. The successful implementation of ecolabels in China requires rigorous study; this research offers a modest contribution to achieve this goal. Future research should explore more methods to correct the possible overstatement of WTP in stated preference surveys, for example, using the approach outlined in Ready, Champ, and Lawton (2010). Another important way of complementing the findings of this study would be to verify our main conclusions by using revealed preference data.

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Appendix 1. Survey instrument for label study

Introduction

Hello, I am a researcher from the Shanghai Jiao Tong University. We are conducting research to better understand consumers' decision-making processes when purchasing home appliances.

This study is sponsored by a nonprofit research organization. The collected data will be used only for scientific research. Rest assured that your name will remain completely confidential. This interview will take about 15 minutes.

Did your household buy an air conditioner last year or early this year?

☐ YES ☐ NO

Does your household intend to purchase an air conditioner this year or next year?

☐ YES ☐ NO

NOTE: If the above questions are answered NO, please end the survey. If either of the above questions are answered YES, please enter the following part.

Section 1: Choice experiment

Please indicate the capacity of the air conditioner you would consider purchasing.

☐ 1 HP ☐ 2 HP

We develop the following four scenarios, each of which will be implemented in a split sample. Each interviewee will be randomly presented with only one of these scenarios.

Scenario 1 (Energy Label Only)

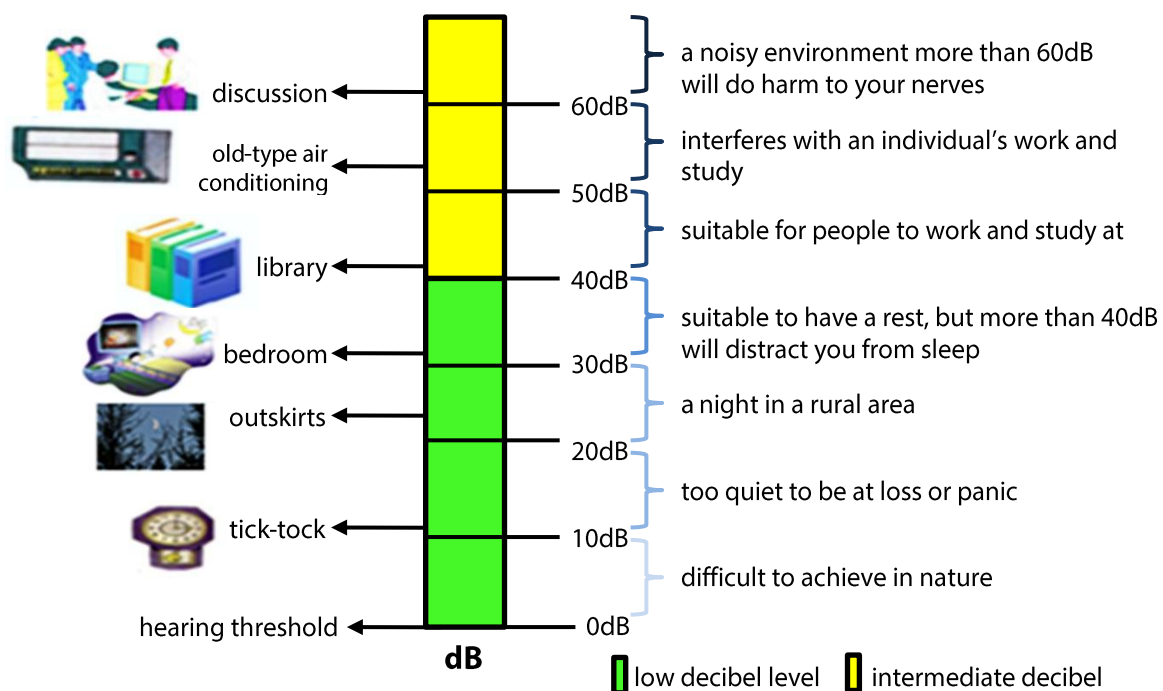
We would like you to compare two hypothetical air conditioners along with the option of “do not purchase either of the two air conditioners.” You will be presented with four choice sets. The two provided air conditioners are all the same except for the differences featured in the table. Please make your choice among the two models, as if they were the only two available. Of course, you could choose not to buy either of them.

Please treat each of these four choice sets independently, that is, for each set, imagine that the two hypothetical options presented to you are the only ones available.

We will give you a brief introduction to the following aspects of the table.

Haier, Gree, and Midea are the three leading brands in the market. You could choose one of them or other brands. All the other brands will be briefed as “others” in the following choices.

When the noise level is under 35 decibels (dB), the air conditioner is often classified as a quiet model, but not if the noise level is above 35 dB. In the choice sets, you will see an attribute that is named as “quiet model or not” and with two levels “Yes” and “No.” In order to help you understand what different levels of noise mean, the following images provide examples of noise levels at different decibels.



The energy label indicates the level of energy efficiency for air conditioners. Three levels are available on the market: low, medium and high. High means the most energy efficient, low means the least energy efficient and medium is in the middle. Air conditioners displaying a high energy efficiency label consume at least 11.5% less electricity than models with a medium energy efficiency label, and 34.6% less electricity than ones with a low energy efficiency label. Energy labels can be awarded by either the government or an environmental NGO. Friends of Nature is the first environmental NGO in China and it is committed to promoting public participation in environmental protection, such as launching the *26 Degrees Campaign* to save air conditioner energy consumption alongside other NGOs (2004) and publishing the *Annual Report on Environment Development of China* in collaboration with China Social Sciences Academic Press (from 2006).

Attributes	Model X	Model Y
Brand	Haier 海尔	Midea 美的
Price	CNY 5,000	CNY 7,000
Labeled as quiet model	No	Yes
Energy label	Issued by Government	Issued by NGO
	High energy efficiency label	Medium energy efficiency label

Please Mark Your Choice in the Following Table:

	Model X	Model Y	No Purchase
YOUR CHOICE			

Note to the interviewer:

Before presenting the second choice set, you should say this “Independence Reminder” in your own language. Please treat each of these four sets independently, that is, for each set, imagine that the two hypothetical options presented to you are the only ones available.

1. If the interviewee chooses X, continue with questions i & iii.
If the interviewee chooses Y, continue with questions ii & iii.
If the interviewee chooses No Purchase, continue with question iv.

i) In the choice set, you chose to spend money to buy one of the two air conditioners. If this were a real market decision, how sure are you that you would choose X instead of Y?

Strongly uncertain				Strongly certain
1	2	3	4	5

ii) In the choice set, you chose to spend money to buy one of the two air conditioners. If this were a real market decision, how sure are you that you would choose Y instead of X?

Strongly uncertain				Strongly certain
1	2	3	4	5

iii) In the choice set, you chose to spend money to buy one of the two air conditioners. If this were a real market decision, how sure are you that you would choose X or Y instead of No Purchase?

Strongly uncertain				Strongly certain
1	2	3	4	5

iv) In the choice set, you chose No Purchase. If this were a real market decision, how sure are you that you would choose No Purchase instead of X or Y?

Strongly uncertain				Strongly certain
1	2	3	4	5

2. Please indicate how you think a typical resident in your neighborhood would choose in the earlier choice.
☐ Model X ☐ Model Y ☐ No Purchase

Note: These two follow-up questions are presented only after the third- and fourth-choice question presented to each interviewee.

3. Please indicate which attribute affected you the most when you made your earlier choice.
☐ Brand ☐ Price ☐ Noise ☐ Energy Label
4. When you look at Energy Label in your earlier choice, do you think about saving money on electricity bills?
☐ YES ☐ NO
5. When you look at Energy Label in your earlier choice, do you think about reducing carbon emissions?
☐ YES ☐ NO

Scenario 2 (Energy Label Only With Additional Environmental Information)

Scenario 2 will be implemented in a separate sample.

Scenario 2 is exactly the same as Scenario 1 except that the respondents will be presented with the following information after the introduction of Energy Label and before the presence of choice sets.

We are now witnessing a deteriorating environment (e.g., melting glaciers due to rising temperatures, climate anomalies, and frequently occurring heavy smog), which has raised widespread concern all over the country. Studies have illustrated that climate change is due to the increasing greenhouse gases in the atmosphere. Power plants are one of the most important sources of greenhouse gas and heavy smog because they burn coal. Purchasing energy-saving home appliances would help save electricity and alleviate these already serious environmental problems.

Scenario 3 (Environmental Label Only)

Scenario 3 will be implemented in a separate sample.

Scenario 3 is exactly the same as Scenario 1 except that Energy Label and related information will be **replaced with** Environmental Labels and related information as follows.

An environmental label indicates that the production of an air conditioner is organized in an environmentally friendly manner, for example, less waste water and waste air emissions. **It has nothing to do with your cost and the health impact of using the air conditioners.** An environmental label can be awarded by either the government or an environmental NGO. Friends of Nature is the first environmental NGO in China and it is committed to promoting public participation in environmental protection, such as launching the *26 Degrees Campaign* to save air conditioner energy consumption alongside other NGOs (2004), and publishing the *Annual Report on Environment Development of China* in collaboration with China Social Sciences Academic Press (from 2006).

Attributes	Model X	Model Y
Brand		
Price	 CNY 5,000	 CNY 7,000
Labeled as quiet model	 No	 Yes
Environmental label	Government label	NGO label

Please Mark Your Choice in the Following Table:

	Model X	Model Y	No Purchase
YOUR CHOICE			

Scenario 4 (Both Energy and Environmental Labels):

Scenario 4 will be implemented in a separate sample.

Scenario 4 is exactly the same as Scenario 1 except that Energy Label and related information will be **complemented with** Environmental Label and related information as follows.

The environmental label indicates that the production of an air conditioner is organized in an environmentally friendly manner, for example, less waste water and waste air emissions. An environmental label can be awarded by either the government or an environmental NGO.

The energy label indicates the level of energy efficiency for air conditioners. Three levels are available on the market: low, medium, and high. High means the most energy efficient, low means the least energy efficient, and medium is in the middle. Air conditioners with a high energy efficiency label consume at least 11.5% less electricity than models with medium energy efficiency labels, and 34.6% less electricity than the ones with low energy efficiency labels. An energy label can be awarded by either the government or an environmental NGO. Friends of Nature is the first environmental NGO in China and it is committed to promoting public participation in environmental protection, such as launching the *26 Degrese Campaign* to save air conditioner energy consumption alongside other NGOs (2004), and publishing the *Annual Report on Environment Development of China* in collaboration with China Social Sciences Academic Press (from 2006).

Attributes	Model X	Model Y
Brand		
Price	 CNY 5,000	 CNY 7,000
Labeled as quiet model	 No	 Yes
Energy label	Issued by Government	Issued by NGO
	High energy efficiency label	Medium energy efficiency label
Environmental label	Government label	NGO label

Please Mark Your Choice in the Following Table:

	Model X	Model Y	No Purchase
YOUR CHOICE			

Section 2: Consumer Attitudes and Behavior

1. How much do you agree or disagree with each of these statements regarding your confidence in ecolabels? (Please select one response for each row.)

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
[1]	I cannot distinguish between environmentally friendly and harmful products.	1	2	3	4	5
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
[2]	I am unsure about which ecolabels are reliable and which are not.	1	2	3	4	5
[3]	Ecolabels lack credibility.	1	2	3	4	5
[4]	Fake labeling is a common phenomenon.	1	2	3	4	5

2. How much do you agree or disagree with each of these statements? (Please select one response for each row.)

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	Environmental Attitudes					
[1]	The whole pollution issue has never upset me too much since I feel it is somewhat overrated.	1	2	3	4	5
[2]	I rarely ever worry about the effects of pollution on myself and my family.	1	2	3	4	5
[3]	I am really not willing to go out of my way to do much to help the environment.	1	2	3	4	5
[4]	To preserve people's jobs in this country, we must accept higher degrees of pollution in the future.	1	2	3	4	5
[5]	It is acceptable for an industrial society like ours to produce a certain degree of pollution.	1	2	3	4	5
	Self-Regulation					
[6]	I am good at resisting temptation.	1	2	3	4	5
[7]	I have a hard time breaking bad habits.	1	2	3	4	5
[8]	I refuse things that are bad for me.	1	2	3	4	5
[9]	Pleasure and fun sometimes keep me from getting work done.	1	2	3	4	5
[10]	I have trouble staying concentrated.	1	2	3	4	5
	Peer Influence					
[11]	If I don't have a lot of experience with a product, I often ask my friends/relatives about it.	1	2	3	4	5
[12]	I often get information about a product from friends/relatives before I buy.	1	2	3	4	5
[13]	If my friends/relatives have chosen ecolabeled products, I'd like to buy them too.	1	2	3	4	5
[14]	I like to know what products and brands make a good impression on my friends/relatives.	1	2	3	4	5
[15]	It is important that my friends/relatives like the products and brands I buy.	1	2	3	4	5

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	Trust					
[16]	Government can be relied upon to keep its promises.	1	2	3	4	5
[17]	NGOs can be relied upon to keep their promises.	1	2	3	4	5
[18]	I can count on the government to respond to my requests.	1	2	3	4	5
[19]	I can count on NGOs to respond to my requests.	1	2	3	4	5
[20]	Government puts public interests first.	1	2	3	4	5
[21]	NGOs put public interests first.	1	2	3	4	5
	Familiarity					
[22]	I am very familiar with China Environmental Labelling.	1	2	3	4	5
[23]	I am very familiar with ISO 14001 certification.	1	2	3	4	5
[24]	I am very familiar with the China Energy Efficiency Label.	1	2	3	4	5

Section 3: Social Demographics

- Gender: ☐ Male ☐ Female
- Size of household:
- The year you were born:
- Please indicate the highest education you received:
 - ☐ Primary School and below
 - ☐ High School
 - ☐ College/University
 - ☐ Master Program and above
- Please indicate what range best describes your monthly household income:
 - ☐ CNY 3,000 and below
 - ☐ CNY 3,000 to CNY 6,000
 - ☐ CNY 6,000 to CNY 9,000
 - ☐ CNY 9,000 to CNY 12,000
 - ☐ CNY 12,000 to CNY 15,000
 - ☐ CNY 15,000 and above
- Monthly electricity bill:
- Please indicate the type of house in which you plan to install the new air conditioner:
 - ☐ Principle residence
 - ☐ Rental estate
- The air conditioner that you currently have:
 - ☐ Brand
 - ☐ Energy efficiency label
 - ☐ Environmental label
- Your contact information:
 - ☐ Phonenumber
 - ☐ E-mailaddress

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