

# Mobilising the public to fight poverty using anti-poverty labels in online food markets: Evidence from a real experimental auction

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## Abstract

In an emerging economy like China where the domestic income inequality has dramatically increased between middle-class urban consumers and poor rural farmers, food grown by poor farmers with poverty alleviation labels may receive price premiums from consumers with multiple incentives. To reveal consumers' willingness-to-pay (WTP) for anti-poverty labelled food, we implement a non-hypothetical Becker–DeGroot–Marschak auction online experiment for apples with real shoppers. Results show that consumers are willing to pay 3.66 RMB extra for each kilogram of apples with anti-poverty labels, indicating the opportunities for using voluntary public food consumption to supplement the government's anti-poverty responsibilities. Consumers who are more empathic, who believe that anti-poverty products have higher quality, who have donated money within the past year, and who are not involve with anti-poverty related production or selling processes are willing to pay more. Additionally, three different information treatments (a beneficiary description, an appreciation certificate and a government promotion document) were found to increase consumers' WTP for anti-poverty products. Treatment effects are different among consumers with different demographic characters and perspectives about the anti-poverty label.

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Lastly, anti-poverty labels can attract consumers for trial purchase but are not sufficient to lead consumers to make repeat purchases.

**KEY WORDS**

altruistic behaviour, anti-poverty label, BDM auction, online food market

**JEL CLASSIFICATION**

C93; D12; Q18; Q21u

## 1 | INTRODUCTION

Poverty is one of the main concerns of modern society, which can attribute to health problems, cause mental and behavioural illnesses, handicap education systems, and even elevate crime rates (Almas, 2012; Burdett et al., 2003). Unlike developed economies, most poor people in developing countries live in rural areas, making agriculture-focused anti-poverty efforts more effective (FAO, 2018). In addition to such efforts from governments and non-government organisations, public participation in consuming foods produced by the poor can generate broad impacts (Chiputwa et al., 2015). Studies have found that consumers in developed countries are willing to pay premiums for food that help poor producers in less developed exporting countries, that is, through fair trade labels (Dragusanu et al., 2014). With the rapid economic growth and the resulting widened income disparity in emerging countries, there likely exists a considerable number of new middle-class consumers who also want to help poor farmers through consuming food they produced. This effect is seldom explored, with only a few studies starting to emerge (Wang et al., 2021; Zhou et al., 2021).

Numerous studies exist about ethical food consumptions including foods that are labelled as organic, green, local, and with animal welfare (Connolly & Klaiber, 2014; Ortega et al., 2017; Yu et al., 2014), but they are different from anti-poverty. Those claims often have hidden health or taste benefits (Lagerkvist & Hess, 2011; Liu et al., 2013; Massey et al., 2018), whereas anti-poverty is purely altruistic, similar to fair trade as studied by De Pelsmacker et al. (2005), and Dragusanu et al. (2014). However, the fair-trade claim still differs from the anti-poverty label. First, the fair-trade label requires fair working conditions, including a guaranteed salary and health and safety measures provided by large firms (Dragusanu et al., 2014). The anti-poverty label emphasises that products' places of origin must be in impoverished areas. Second, fair-trade products are mostly produced in developing countries and consumed by consumers in developed countries, whereas anti-poverty labels benefit domestic producers.

The emerging popularity of anti-poverty labels in China has given us an opportunity to collect empirical evidence. A call has been made by the Chinese government on all citizens to help fight poverty by consuming anti-poverty products, and the online market was emphasised as an important channel (GOSC, 2019). Since agricultural products are usually perishable, e-commerce can quickly pass demand to producers so as to establish an efficient and stable anti-poverty mechanism (Hu, 2019). Major Chinese e-commerce giants such as Jingdong (JD) and Alibaba have provided special features to help anti-poverty products on their platforms. Online sales from poor areas in China achieved 65.98 billion RMB in 2018, an 18% increase from a year before (CAITEC, 2019), while the amount of agricultural products sold online grows very fast (Wang et al., 2019; Zheng et al., 2020), for example, JD.com sales in the first half of 2019 were 669% higher than in the first half of 2016 (JD, 2019). Compared to traditional offline markets, descriptions about anti-poverty can be better shown online, and the e-commerce

platform's 'Favourites' and 'Shopping Carts' features make consumers' repeated purchases from the same vendor very convenient (Huyghe et al., 2017), both of which are important for anti-poverty support. In 2018, the Sichuan provincial government instituted the Sichuan anti-poverty trademark, to mitigate the information asymmetry, the first in China. This provides a good opportunity to study consumers' willingness-to-pay (WTP) for premiums of online products with this anti-poverty trademark helping domestic farmers. Our empirical objectives are to explore: (1) whether there exists consumer WTP for anti-poverty claims on food to support poor domestic farmers through online shopping and what factors may influence such WTP; (2) what type of promotional treatment can motivate consumers to increase their WTP to support the poor farmers and what factors can influence such WTP gains, if any, brought by alternative types of promotional information; and (3) whether consumers are willing to pay premiums for both the initial trial purchase and repeated purchases and what factors influence this motivation.

Because anti-poverty consumption is a private contribution to public welfare, it may be driven by altruism and other reasons. The warm glow (Andreoni, 1989) indicates that besides altruism, people also have other reasons, such as the 'selfish' joy of giving regardless of the actual public impact, and such joy can partly be explained as prestige or self-respect (Benabou & Tirole, 2006; Harbaugh, 1998). Ethical consumption literature has also found similar evidence supporting the warm glow theory that consumers buy ethical products for self-identity and to reflect their own values (O'Connor et al., 2017). Besides individual reasons, personal behaviour is also affected by social environment (Wood & Hayes, 2012), of which an important component is government influence (Nyborg, 2003). In China, the government plays an important role in promoting anti-poverty products, which could have a potential impact on consumer preference.

Recent studies on consumer preferences for food attributes often use hypothetical contingent valuation and choice experiment methods (Jin et al., 2017; Lin et al., 2019; Ortega et al., 2015; Wang et al., 2018), which are subject to hypothetical bias (Liebe et al., 2019; Wu et al., 2016). Frontier studies use non-hypothetical experiments to avoid this problem when real products are available, and one popular method is the Becker–DeGroot–Marschak (BDM) auction (Becker et al., 1964; Katare et al., 2020; Oparinde et al., 2016; Shi et al., 2013; Shi et al., 2018). Early auction experiments were conducted in labs or classrooms with recruited convenience samples (Hoffman et al., 1993) such as college students. However, the weakness of such studies is that the sample is not representative of real shopping decision-makers regarding food valuation research, causing biased results (Belot et al., 2015). Newer efforts have begun to move valuation studies to environments such as grocery stores, in which not only are samples recruited from real shoppers at the point of purchase, but the decision environment is also more realistic (Harrison & List, 2004; Lusk et al., 2001). However, such offline experiments have not targeted shoppers or shopping environments for e-commerce. On the other hand, although literature has used online tools studying food attribute preferences (Hoefkens et al., 2012; Hoek et al., 2017; Lusk et al., 2018), non-hypothetical online preference valuation experiments are quite limited. The few examples include Liebe et al. (2019), who conducted a real choice experiment online, Lemken et al. (2017), who used a second-price Vickrey auction online, and Iweala et al. (2019) and Marescotti et al. (2021) who used an online non-hypothetical BDM auction when the participants were recruited from the public instead of online store shoppers. Other online auction studies mainly use observed web auction data like eBay with limited consumer characteristics (Schamel, 2007; Teuber & Herrmann, 2012), which can hardly apply randomised control treatments. We use a web survey application of a non-hypothetical auction experiment to analyse consumer preferences, where real shoppers are recruited from online stores as our sample population.

The contribution of this study has three parts. First, we use a non-hypothetical online auction experiment, recruiting real shoppers as the sample to avoid hypothetical bias.

Additionally, alternative non-financial motivations of ethical consumption are examined using randomised treatments. Furthermore, we apply these advanced methods to examine online consumer anti-poverty consumption behaviour for domestic poor farmers in emerging economies.

## 2 | METHODOLOGY

Fresh apples grown in the poor mountainous region in the Sichuan province were selected as the food item. Apples are a commonly consumed fruit in China (Blanke, 2011). Different from other products, apples are a representative of a frequently consumed food, for which repeat purchasing is as important as price premiums in the context of supporting poor producers. Furthermore, it is adapted to large growing regions, has minimum processing, is relatively easy to store and transport, and has high volumes of online transactions as fresh produce (AliResearch, 2015).

### 2.1 | Online non-hypothetical experiment

To simulate an online shopping environment with real shoppers, instead of survey companies, we use a real online auction, in which participants were recruited from online stores that sell agricultural products. A recruiting message was sent to all customers of selected online stores selling similar products and to all followers of the stores' public blogs for them to opt in voluntarily. In this framed online experiment, our target population entered the experiment through a shopping environment and were ready to make consumption decisions, because they have already developed their heuristics to purchase the product. A convenient click of a button led to a website for the experiment and survey. The experiment and survey were designed in oTree using Python and HTML code, and links were established online using Heroku (Chen et al., 2016).

We provided incentives to increase the response rate, including 1 kg of conventional apples and a 10 RMB participant fee in exchange for the survey response time of about 20–30 min. To alleviate 'house money' effects brought by endowments, we made extra effort for the participants to feel as though they had earned the money and apples instead of being endowed. They needed to complete the practice auction exercise and pass a comprehension test to get their rewards. We also emphasised that they would keep the money and conventional apples even if they lose the auction and fail to purchase the other package of apples. To alleviate problems brought by lack of control over participants and potentially fraudulent responses, the experiment was carefully designed. We have taken measures to avoid common online survey problems including duplicated or fraudulent submissions (Reips, 2000). The survey specified that only one submission per household was permitted, and technical measures were also imposed on the site to make sure devices could not submit the survey more than once. Additionally, we required our cooperated vendors to check participants' delivery addresses and delete samples with identical addresses, although still allowing their incentives to be delivered. A between-subjects design was used, so that participants were randomly assigned to different treatment groups, using the *itertools* module in Python. We also removed those who spent too little or too much time—that is, less than 5 min or longer than 40 min—from the sample, although still allowing their money and products to be delivered. To convince participants to trust this real food auction experiment with compensation, we provided a formal letter with official seals of the university that gave detailed information of our research group, research purpose and contact information. The letter also ensured participant anonymity and confidentiality.

## 2.2 | BDM mechanism

Many popular auction methods usually require multiple bidders at the same time, which is harder to establish in the field (Alphonse & Alfnes, 2017). The BDM mechanism was chosen because it can be implemented on an individual basis (Becker et al., 1964), which is more similar to the online shopping scenario where participants can do the experiment at a time of their choosing. The BDM mechanism is a simple version of the second price auction, in which the competitor's bid is replaced by a randomly drawn price, done by the random module in Python. The BDM mechanism is widely used in studies to evaluate a consumer's WTP (Mastenbroek et al., 2020; Oparinde et al., 2016; Shi et al., 2018). In our case, we used an endow-and-upgrade design, where participants were endowed with conventional apples,  $A$ , and could offer a bid,  $b$ , to upgrade  $A$  to one of three other types of apples. At the same time, a random price,  $p$ , is drawn from a pre-specified uniform distribution.<sup>1</sup> If  $b \geq p$ , then the participant would win the auction and exchange their endowed apples,  $A$ , with the upgraded apples by paying price  $p$ ; otherwise, they would keep their money and original apples  $A$ . In the scenario of a win, the utility level for the consumer is  $\mu(1, e - p - v_A)$ , where  $e$  is the total value of endowment, including the participant's own wealth and the endowed apples  $A$ , and  $v_A$  is the value of the original apples. In the case of a loss, the utility level for consumer is  $\mu(0, e)$ . Consumer's WTP for a certain apple attribute should equal the price that induces no difference between the two utility levels:

$$\mu(1, e - wtp - v_A) = \mu(0, e) \quad (1)$$

Under the BDM auction rule, a rational consumer's optimal bid solves  $\mu(1, e - b^* - v_A) = \mu(0, e)$ , where  $b^* = wtp$ , under which they will receive the utility gain of  $\mu(1, e - p - v_A) - \mu(1, e - wtp - v_A)$  if it is a gain or zero otherwise.

## 2.3 | Experiment design and procedure

Though there has been some concern that the BDM auction is difficult to understand (Cason & Plott, 2014), our target populations are Chinese online food buyers, who are mostly young and more educated. Thus, their bid results are more reliable, and can better reflect the true value of auctioned products (Lee et al., 2020).

Our experimental products are apples in one-kilogram packs. Four types of apples are used in the experiment: conventional apples, anti-poverty labelled<sup>2</sup> apples, green food labelled<sup>3</sup> apples, and apples with both anti-poverty and green food labels. The sequence of bidding was randomly

<sup>1</sup>Following Lusk et al. (2001), the random price distribution is unknown to the participants, so that their bids are independent of the predetermined price. Since anti-poverty products are still an emerging market, we consulted experts and selected sellers to identify the average price as 8 RMB per kilogram, thus we decided the distribution to be uniform distribution ranging from 0 to 10 RMB. Nevertheless, the distribution only affects the bidding results of whether they will win the apples or not, not their bidding offer, which is what we need for this research.

<sup>2</sup>'Sichuan anti-poverty' is used as the anti-poverty label. It is an existing collective trademark proposed by Sichuan Province. The anti-poverty products using trademarks need to come from the administrative areas under the jurisdiction of 88 counties in Sichuan Province, and 72 poor villages and counties (cities, districts). Poor households, enclave parks, and legal entities in the production, processing and service of anti-poverty products shall provide a copy of the roster of labour and the social security payment list. The number of poor labourers who have been employed within the defined scope need to be more than 30%. Website link: <http://www.sc.gov.cn/10462/12771/2018/8/1/10456144.shtml>.

<sup>3</sup>'Green food' stands for edible produce and processed foods produced with sound environmental and technical standards with whole range quality control, non-pollution, safety and special logo. Website link: <http://www.greenfood.agri.cn/ywzn/lssp/jsbz/>. The green food label is popular in China and especially for food sold online (Jiang et al., 2019).



decided to avoid order effects. Because conventional apples were given as endowments, only the latter three types of labelled apples were offered for upgrade bidding. As shown in Figure A1 (online) the experiment uses a combination of between and within design for alternative information treatments to access both design methods' advantages (Charness et al., 2012).

Three treatments were implemented in the experiment. One treatment was designed to increase trust, which was named the beneficiary description, in which a paragraph of anti-poverty apple programme information was shown. This included a partial list of names from the benefiting household and the last page of the contract signed by the marketing company enterprise, government agency and the farming household. The second treatment was intended to increase self-satisfaction, named the appreciation certification, which is a printed certificate to thank the consumer for buying the product and for making a contribution to the anti-poverty programme. Participants who bought apples with anti-poverty labels in the following rounds could receive the actual certificate with the apples. The third treatment was a paragraph from the government's promotion calling on citizens to buy anti-poverty products, named the government's promotion document. See Figures A2–A4 (online) for details of each treatment.

Each participant was asked to separately bid for an upgrade from the endowed conventional apples for each of the three sets of labelled apples. These three bidding games were played before and after reading the treatment information, but they were told that only one of the six bids would be binding, chosen randomly by the computer (by the random module in Python). Participants can see the results right after completing the six bids. Either the labelled apples won or the endowed conventional apples would be delivered to their address with the corresponding price charged. The payment was calculated by sending the difference between the compensation fee and the bidding price.

Before the focal experiment began, participants first needed to read the experiment instructions and 'bottled water' pre-experiment to fully understand the BDM auction rules. They were also told that if they wanted to exchange the endowed products, it was their best strategy to bid exactly what they were willing to pay. Higher bids would cost them more money than desired, while lower bids may erase opportunities to exchange the products. After the pre-experiment, three simple questions were also used to test participants' understanding of the experiment rules. Pictures of different types of apples with labels are displayed as they are sold online, just without price information (Figure A5, online).

The details of the auction process are given in the Online Appendix. Besides demographics and perception variables, literature has shown that personality traits such as empathy (Andreoni et al., 2018) and past-prosocial experiences (Aknin et al., 2018) can also influence prosocial behaviour or ethical consumption. Questions about these factors were asked after the auction experiment and used for heterogeneous analysis.

## 2.4 | Econometric models

In our experiment, in addition to the anti-poverty labelled and the green food labelled apples, we have another type of apple with both labels where the effects of these two labels on auction bids are confounded. To rule out confounding effects, we calculated the average bid for the anti-poverty label as the average of the bid for the anti-poverty label alone and the residual bid for this label. The residual bid is defined as removing the bid for the green food label from the bid for both labels together.

$$bid_i = \frac{1}{2} [bid_{anti-poverty\ alone} + residual\ bid_{anti-poverty}], \quad (2)$$

where  $residual\ bid_{anti-poverty} = bid_{both\ labels} - bid_{green\ food\ alone}$

This measurement is smaller than the bid for anti-poverty alone and more conservative to avoid upward bias of the WTP for anti-poverty.

Firstly, an ordinary least squares regression was used to examine factors influencing participants' before-treatment WTP for the anti-poverty label only. The before-treatment average bids for anti-poverty label in a simple linear regression are specified as:

$$bid_i = X_i\beta_i + \varepsilon_i, \quad (3)$$

where  $bid_i$  is the average bid for anti-poverty label for participant  $i$ , and  $X_i$  is a vector of demographic, perceptions and experience variables for participant  $i$  including gender, age, education level, whether they have children or not, occupation, income level, and perceptions and experience about poverty.

Next, because participants made another round of bids for the same three types of apples after they were randomly assigned into three groups with different information treatments, our data has a panel structure. We have two observations from each participant for the same products, before and after the information treatment. A fixed-effect model is applied where individual-specific effect is controlled as in the following:

$$Bid_{it} = T_{it}\beta + \mu_i + \varepsilon_{it}, t = 1, 2 \quad (4)$$

where  $Bid$  is each participant's bidding price or WTP for one type of labelled apples studied in this model; the index  $i = 1, \dots, I$  denotes the participant  $i$ ; the index  $t = 1$  and 2 identifies before and after the information treatment;  $T_{it}$  is the treatment dummy variable,  $T_{i2} = 1, T_{i1} = 0$ ; and  $\mu_i$  specifies the unknown intercept for each participant and  $\varepsilon_{it}$  is the error term. Our key interest is on the coefficient,  $\beta$ , which represents the treatment effect on WTP.

Then, we add interaction terms between the treatment and demographic-related variables in  $x_i$  to the regression, in order to identify causes of the heterogeneous treatment effects, which can be defined as:

$$Bid_{it} = T_{it}\beta + x_iT_{it}\gamma + \mu_i + \varepsilon_{it}, t = 1, 2 \quad (5)$$

Finally, we used a bivariate ordered probit regression to find out whether the average bids for anti-poverty labels are related to individuals' willingness for an initial trial or repeat purchases of anti-poverty products, and to explore influencing factors. The initial purchase intention of anti-poverty products was measured by the degree of agreement with a five-point scale question: 'Compared with other agricultural products, if I see poverty alleviation agricultural products, it's more likely for me to make a trial purchase'. Similarly, repeat purchase intentions were obtained by asking, 'Compared with other agricultural products, if I am satisfied with the anti-poverty agricultural products I purchased, it is more likely for me to make repeated purchases'. Thus, two latent variables  $p_{1i}^*$  and  $p_{2i}^*$  representing the subjective values that participant  $i$  assigned for the trial purchase and the repeat purchase. Only when their subjective values for the product are higher than certain preset reservations values will they agree to purchase it on a trial or repeated basis at a corresponding degree. They can be determined by:

$$\begin{aligned} p_{1i}^* &= \alpha_1 bid_i + X_{1i}\beta_1 + \xi_{1i} \\ p_{2i}^* &= \alpha_2 bid_i + X_{2i}\beta_2 + \gamma p_{1i}^* + \xi_{2i} \end{aligned} \quad (6)$$

where  $\alpha_1$  and  $\alpha_2$  are parameters of average bids for anti-poverty label before treatment,  $\beta_1$  and  $\beta_2$  are vectors of influencing factors' parameters, and  $\gamma$  is an unknown scalar.

The probability for the observed  $p_{1i} = j$  and  $p_{2i} = k$

$$\Pr(p_{1i} = j, p_{2i} = k) = \Pr(c_{1j-1} < p_{1i}^* \leq c_{1j}, c_{2k-1} < p_{2i}^* \leq c_{2k}) \quad (7)$$

where  $p_1$  and  $p_2$  are two observed categorical variables,  $c_{1m}$  and  $c_{2m}$ ,  $m = 1, \dots, 4$ , are the reservation values, and

$$p_{1i} = \begin{cases} 1 & \text{if } p_{1i}^* \leq c_{11} \\ 2 & \text{if } c_{11} < p_{1i}^* \leq c_{12} \\ 5 & \text{if } c_{14} \leq p_{1i}^* \end{cases} \quad p_{2i} = \begin{cases} 1 & \text{if } p_{2i}^* \leq c_{21} \\ 2 & \text{if } c_{21} < p_{2i}^* \leq c_{22} \\ 5 & \text{if } c_{24} \leq p_{2i}^* \end{cases} \quad (8)$$

### 3 | DATA

We have partnered with a food vendor in Sichuan to supply and deliver the four types of apples, the certificates, and participants' remaining money according to the experiment results. Those apples are of the same species and grown in the same area. The only difference is whether they are anti-poverty labelled and/or green labelled or not.

Participants who attend the experiment must come from Beijing, Sichuan or Zhejiang province. Three provinces are chosen based on our research targets. The Sichuan province is where the experiment's apples are produced. The Zhejiang province is the e-commerce business centre, while Beijing is the most important economic urban centre in China. Sichuan was chosen as the apple production area rather than other areas for two reasons. First, apple production in Sichuan is usually in poor mountainous areas where poor growers are easy to identify. Another reason is that Sichuan province has an official Sichuan anti-poverty label which is certified with clearly defined requirements. To recruit representative online food consumer samples, we also cooperated with six online food sellers to recruit their shoppers through multiple channels, such as their social media accounts. Besides living in Beijing, Sichuan or Zhejiang province, qualified participants also need to have previous online food purchasing experience, consume apples, and be able to understand the BDM auction process. The experiment was conducted online in November 2019, and 557 valid samples were obtained.

Table 1 shows the description of demographic variables of all samples and randomly assigned treatment groups. About one third of the participants come from each of Beijing, Sichuan and Zhejiang provinces. Males account for 43.09% of the respondents. The average age of respondents is 29.35, with the standard deviation of 8.61. With regard to education and work, 94.97% of the respondents have received their senior high school diplomas; 35.91% of the participants are employed by the industry, while 24.78% are full-time students and 21.01% are employed by government or related organisations. Nearly a third of the respondents have children under 18 years old; 85.30% of participants live in urban areas, and 38.42% of them are people who migrated from rural areas to urban areas. The average annual personal income is about 84,580 RMB, with the standard deviation of 9.17. Monthly apple consumption is 6.49 kilograms. In summary, the data samples tended towards more females, younger, and more educated people. This consistently resembles the Chinese online food consumer population of which 54% are female, average 31 years old (BCG & AliResearch, 2016), and only 4% have no college education (iResearch, 2017). Furthermore, because the samples are randomly assigned to the three treatment groups, the statistics in each group are very similar to each other and to the whole sample average, as reported above.<sup>4</sup>

<sup>4</sup>We have done the balance test between groups in Table A1 (online); results show that demographic variables do not have significant difference among the three groups at the 0.05 significance level.



TABLE 1 Variable descriptive statistics

Independent variables	Population	All	Treat. 1	Treat. 2	Treat. 3
Province					
Sichuan province	-	32.32%	34.74%	28.80%	33.33%
Beijing	-	33.21%	31.05%	35.87%	32.79%
Zhejiang province	-	34.47%	34.21%	35.33%	33.88%
Demographic					
Male	46.00%	43.09%	44.21%	45.65%	39.34%
Age (years)	31.00	29.35 (8.61)	30.13 (10.26)	28.70 (7.15)	29.20 (8.05)
Education					
Senior high school and below	4%	5.03%	6.84%	4.35%	3.83%
Associate degree	-	9.87%	11.05%	10.33%	8.20%
Bachelor's degree and up	-	85.10%	82.11%	85.33%	87.98%
Occupation					
Full-time student	-	24.78%	27.89%	23.37%	22.95%
Government staff	-	21.01%	20.00%	22.83%	20.22%
Enterprise employee	-	35.91%	34.74%	36.96%	36.07%
Self-employed	-	5.57%	3.68%	7.61%	5.46%
Other	-	12.75%	13.68%	9.24%	15.30%
Household					
Have children		29.62%	27.89%	30.98%	30.05%
Urban resident	-	85.30%	84.74%	82.61%	88.52%
Migrant		38.42%	36.32%	42.93%	36.07%
Income (thousands RMB)		84.58 (9.17)	85.88 (10.63)	77.55 (7.69)	90.29 (8.89)
Monthly apple consumption (kg)		6.49 (10.11)	6.27 (9.89)	6.61 (10.05)	6.58 (10.45)
Personal traits					
I assume people have only the best intentions.		96.05%	98.42%	95.65%	93.99%
Empathy		3.81 (0.63)	3.80 (0.65)	3.85 (0.65)	3.77 (0.61)
Perceptions towards anti-poverty agricultural products					
Price: prices are generally lower		71.81%	71.05%	72.28%	72.13%
Service quality: service quality is generally high		77.92%	76.32%	80.43%	77.05%
Product quality: product quality is generally high		81.87%	81.58%	82.61%	81.42%
Sellers benefit: a marketing trick to increase seller' profit, poor households do not benefit much.		45.96%	48.42%	44.57%	44.81%
Perceptions towards certified poor households					
Fake poverty: most are not poor, no need to help		19.03%	17.89%	17.39%	21.86%

TABLE 1 (Continued)

Independent variables	Population	All	Treat. 1	Treat. 2	Treat. 3
Lazy poverty: poverty is mostly because of laziness, no need to help		16.16%	12.63%	19.02%	16.94%
Charity related experience					
Has donated money within the past year		75.04%	73.16%	76.63%	75.41%
Anti-poverty related experience					
General consumer		90.48%	92.63%	89.67%	89.07%
Certified poor households		10.23%	7.37%	14.13%	9.29%
Has heard place of products' origin before		94.97%	93.68%	96.20%	95.08%
Has heard of poverty areas before		95.51%	94.74%	95.11%	96.72%
Has heard of agricultural anti-poverty products before		86.54%	85.26%	88.04%	86.34%
Number of observations		557	190	184	183

Note: (1) Numbers in parentheses are standard deviations. (2) Migrate consumers are those who migrate from rural to urban areas. (3) General consumers are consumers that are not involve with any anti-poverty production or selling related process.

4 | RESULTS

In the following subsections, we will first show the mean bids across treatments, then examine consumers' heterogeneous preferences for anti-poverty labels. We will also test the significance of the different information treatments and analyse the heterogeneity of treatment effects among consumers. Finally, we will present the results for the consumers' willingness to make trial and repeat purchases of anti-poverty products.

4.1 | Consumers' personal traits, perceptions and purchase intention

Consumers' personal traits and perceptions of anti-poverty agricultural products and certified poor households are measured using Likert scale questions, where 1 through 5 represents strongly disagree, disagree, neutral, agree, and strongly agree, respectively. Except empathy test score variables, we convert the Likert 5-scale answers into 0–1 dummies, where responses of 3, 4 and 5 were defined as 1's, signalling agreement to statements, while answers of 1 and 2 were defined as 0's, signalling disagrees. The empathy test score is the average score of four aspects, including empathy concern, perspective taking, fantasy, personal distress (Davis, 1980). This averaged around 3.81, showing a general sense of agreement. On average, 96% agree with the statement 'I assume that people have only the best intentions' (see Table 1).

For variables related to perceptions towards anti-poverty agricultural products and certified poor households, results show that 72% of consumers agree with the statement that anti-poverty products generally have a lower price, 78% can accept that the anti-poverty label implies high service quality from the sellers, and 82% believe that anti-poverty products generally have higher product quality. Less than half the participants responded with a 3 or higher for the idea that anti-poverty products benefit sellers' rather than poor producers' households. Only an average of 19% of participants agreed that most government-certified poor households are not actually poor, showing scepticism about the poverty identification system. These numbers are 17–18% for the first two treatment groups and

21.9% for the last group. There are also 16.2% who agree with the idea that laziness is the reason for being poor. Again, these numbers are also different across the three groups, at 12.6%, 19% and 16.9%, respectively. Overall, online food shoppers have positive attitudes towards anti-poverty labelled farm products, which provides a good background for consumer-supported anti-poverty.

Almost 75% have donated money within the past year. For anti-poverty related knowledge and experience, 90% of participants are general consumers who are not engaged in anti-poverty related production or selling processes; 10% have experienced living or growing up in poverty, as defined by the government. Most of them have heard of the location of apple production before the experiment, showing familiarity with the production place; 95.5% have heard about poverty areas before; and 86.5% have heard of agricultural anti-poverty products.

Figure 1 shows descriptive results of consumers' willingness to make trial and repeat purchases for anti-poverty products. In general, consumers tend to be more likely to make both trial and repeat purchases for anti-poverty products compared with the base (non-labelled) product. A five-point Likert scale shows that less than 10% of participants disagree with the statement that anti-poverty labels can increase their likelihood to make a trial purchase, and only 0.54% of participants strongly disagree with it. No one expressed strong disagreement with the statement that anti-poverty labels could increase the likelihood of repeat purchases; 84% of surveyed consumers agreed or strongly agreed with the statements.

## 4.2 | Overall bidding results

Table 2 shows the results of auction bids across different treatments. On average, the bids to upgrade the conventional apples to anti-poverty apples by all 557 participants before any information treatment is 6.48 RMB with a standard deviation of 3.03, among which only 15 observations showed bid values of zero. This result shows a widespread willingness of consumers to help the poor.<sup>5</sup> Considering the popularity of online food shopping in China, these small individual contributions can easily add up to a big impact. Similarly, a 6.61 RMB price premium is revealed for the green food label before the information treatment, which is similar with Yu et al. (2014) and Zhou et al. (2017). The bids for upgrading the conventional apples to those with both anti-poverty and green food labels is 7.46 RMB on average, which is only slightly higher than those with either the anti-poverty label or green food label separately. This indicates a large overlap between these two labels. Their WTP for each of the labels when appearing together is likely to be lower than when the corresponding label appears alone.

Across all three different information treatments, the corresponding bids for the upgrade all increased. The highest bid increase is 0.46 RMB from the government promotion document treatment (Treatment 3). Increases of bids after reading the beneficiary description (Treatment 1) and appreciation certificates (Treatment 2) are 0.39 RMB and 0.42 RMB, respectively. Bids to upgrade from endowed conventional apples to apples with combined green food and anti-poverty labels have risen by 0.30 RMB, 0.26 RMB and 0.24 RMB after treatments 1, 2 and 3. The overall average bid for the anti-poverty label is 3.66 RMB before reading the information, while it increased from 3.51 RMB to 3.77 RMB in treatment group 1 and from 3.76 RMB to 4.05 RMB in treatment group 2. The greatest bid increase for the anti-poverty label also occurred with treatment 3, rising from 3.72 RMB to 4.04 RMB.

<sup>5</sup>Wang et al. (2021) uses the contingent valuation method; results show that the WTP premium for apples from poverty-stricken areas is 3.72 RMB/kg. Their value is lower than ours. This can be caused by the different label we used. The anti-poverty label we use is an existing collective trademark proposed by Sichuan Province, which needs formal certification, and its requirements are also more strictly than products from poverty-stricken areas.

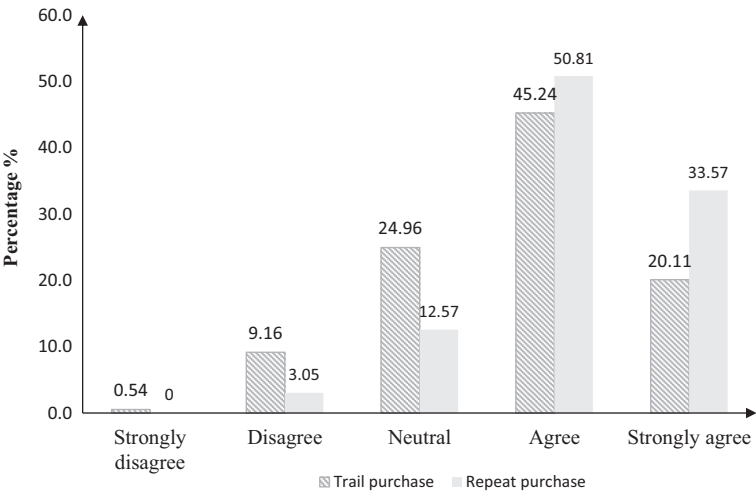


FIGURE 1 Willingness to make trial and repeat purchases for anti-poverty products

TABLE 2 Mean bid results

	All	Treatment 1		Treatment 2		Treatment 3	
	Before	Before	After	Before	After	Before	After
Bid for anti-poverty label	6.48 (3.03)	6.34 (3.19)	6.73 (3.08)	6.74 (2.95)	7.16 (2.81)	6.36 (2.94)	6.82 (2.92)
Bid for green food label	6.61 (2.91)	6.63 (3.02)	6.80 (2.92)	6.82 (2.84)	6.93 (2.84)	6.39 (2.86)	6.44 (2.78)
Bid for green food and anti-poverty label	7.46 (2.78)	7.31 (2.93)	7.61 (2.79)	7.60 (2.73)	7.86 (2.70)	7.46 (2.67)	7.70 (2.68)
Average bid for anti-poverty label	3.66 (1.73)	3.51 (1.84)	3.77 (1.81)	3.76 (1.63)	4.05 (1.68)	3.72 (1.69)	4.04 (1.83)
Number of observations	557	190	190	184	184	183	183

Note: Numbers in parentheses are standard deviations. Full summary statistics of bids before reading information are shown in Table A2 (online).

### 4.3 | Heterogeneity preference for the anti-poverty attribute

Table 3 shows the linear regression model results with heteroscedasticity robust standard errors, which reveal consumers' heterogeneous preferences for anti-poverty labels and identify characteristics of consumers who are willing to pay more. All samples' average bids for the anti-poverty label before information treatment are used. Estimation results show that more empathetic consumers will bid more, indicating empathy as a motivation behind anti-poverty behaviour. This is consistent with literature that finds a positive relationship between empathy and charity donation (Andreoni et al., 2018). Keeping other variables constant, people who think that anti-poverty products generally are higher quality are willing to pay 0.52 RMB more than those who do not, which implies that product quality is one important factor to maintain efficiency in the anti-poverty product market. As expected, participants who have donated money within the past year are willing to pay 0.37 RMB more, indicating a positive effect of the giving experience. A literature review by Aknin et al. (2018) describes this as a positive feedback loop, where prosocial behaviour can generate happy feelings, then such feelings go on to reinforce prosocial behaviour.

TABLE 3 Heterogeneity analysis for anti-poverty attribute using OLS

Variables	Before treatment bids
Empathy	0.23* (0.13)
Quality indication	0.52** (0.24)
Has money donation experience	0.37** (0.18)
General consumer	0.43* (0.25)
Government staff	−0.35* (0.20)
Self-employed	−0.76** (0.39)
Number of observations	557
R-squared	0.09

Note: Heteroscedasticity robust standard errors reported in parentheses. The complete set of estimation results are shown in Table A4 in the Online Appendix.

\*\*  $p < 0.05$ , \*  $p < 0.1$ .

Compared with those who have joined the production or selling process of anti-poverty products as employees, general consumers bid 0.43 RMB more, likely because the latter have no direct way to help poor farmers. Compared with participants who are enterprise employees, people who are government staff and self-employed have 0.35 and 0.76 RMB lower WTP, suggesting that they are more money sensitive. Besides, government staff get anti-poverty products from their working units more frequently than others, and local governments have been encouraged to purchase anti-poverty products as their staffs' holiday gifts.

#### 4.4 | Treatment effects

Figure 2 presents kernel density plots, which show probability density functions (pdf) of the average bid values of the anti-poverty attribute before and after treatments. These pdf plots show that each of the treatments tend to increase the bid values for anti-poverty. The mean and median before and after the information treatments were also significantly different (see Table A3 in the Online Appendix). For the beneficiary description information group, the anti-poverty label average bid ranges from −1.25 to 7.85 RMB before treatment, and from −1 to 8.5 RMB after. For the appreciation certificate treatment group, the pdf curves become more differentiated for the medium after treatment. For the government's promotion document information treatment group, more weights are moved from the 0 to 4 RMB range to the 5 to 8 RMB range.

Regarding the data as a two-period panel (before and after treatment), Table 4 reports results from the fixed effects model.<sup>6</sup> The first three columns show results without interaction terms among factors, which represent average effects. Average effect results show strong evidence that all three types of information have positive impacts on participants' average bids for anti-poverty, which illustrates different non-monetary motivations behind their anti-poverty

<sup>6</sup>As a robustness test, we add a fixed effects model of green label average bid (in Table A5, online). Results show their WTP did not have significant changes after information; no experimenter demand effect or order effect is found.

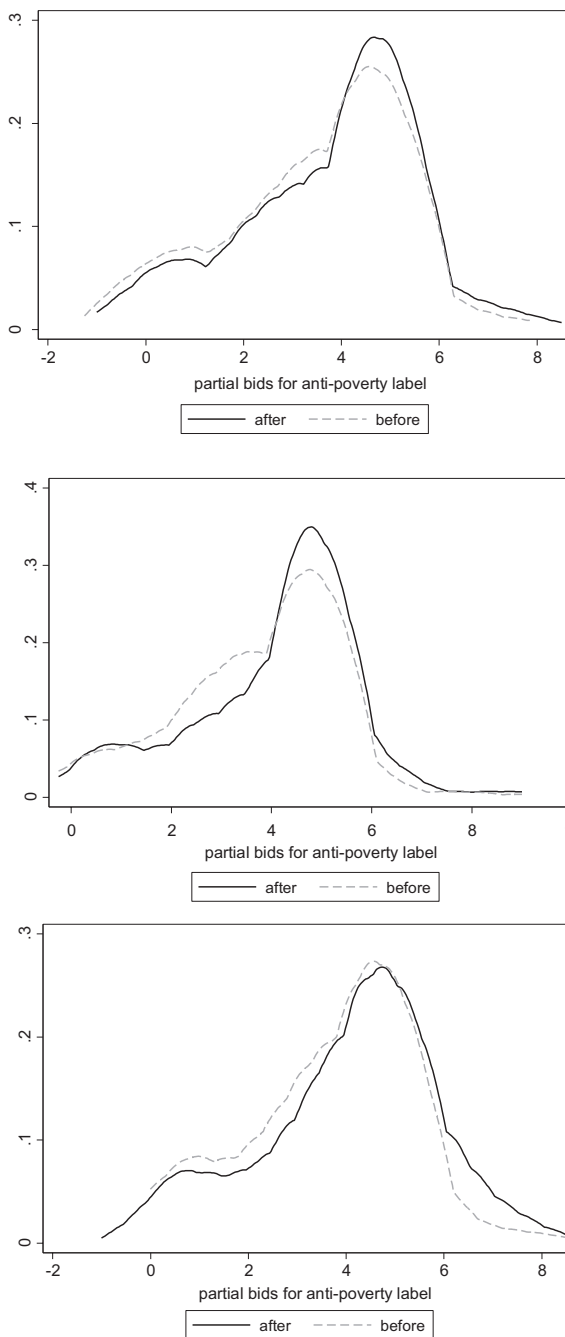


consumption behaviour. The greatest change comes from the government promotion treatment with an average increase of 0.33 RMB, which highlights the government's role in developing trust in anti-poverty consumption. Instead of compulsory donations, having the government remind consumers of their civil responsibilities is also effective in increasing prosocial behaviour. Knowing the village specific anti-poverty programme information (treatment 1) raised 0.26 RMB in consumers' WTP, which is consistent with the literature because such information draws contributors closer to the receivers and builds trust. The promise of appreciation certification encouraged consumers to bid 0.29 RMB more, which is in line with Grant and Gino (2010) in that gratitude expression strengthens helpers' feelings of self-efficacy and social worth, and thus motivating their prosocial behaviour. No significant differences among the additional WTPs induced by the three types of treatments are found through *T*-tests (see Table A6 in the Online Appendix).

To further investigate how the WTP change differed between information treatments, we add interaction terms to test factors causing heterogeneity of individual anti-poverty label average bids, shown in the last three columns of Table 4. Choice of interaction term variables was based on preliminary results of stepwise regression, which are available on request. After reading the beneficiary description information, participants who think certified poor households are not actually poor opted to pay 0.64 RMB less for the anti-poverty label than who those believe the households are actually poor, confirming the effect of trust for prosocial behaviour (e.g., Sargeant & Lee, 2004). In China, village administrators have been found to falsely identify households as poor in order to receive a bigger budget allocation from upper level governments, which induces doubt about the authenticity of certified poor households (Gao, 2019). In our case, nearly one fifth of participants have this doubt (shown in Table 1), which has diminished the effect of the beneficiary description treatment. For participants who have donation experience within the past year, their WTP change induced by the beneficiary description is 0.43 RMB lower, suggesting this information has a smaller effect for experienced charity donors. This could be because they are frequent donors whose motivation is less sensitive to the receivers' authenticity. Consumers who come from the Zhejiang province tend to increase their bid by 0.44 RMB after reading information, keeping other interactive variables constant.

For consumers who think that the anti-poverty label is a ploy by sellers to generate more profit rather than to reward poor households, the appreciation certificate is less effective, as these people's WTP increase was 0.47 RMB lower than others who are less sceptical. WTP increase induced by the certificate is also 0.43 RMB lower for consumers who think that anti-poverty products' prices are generally lower than those who do not think so. Some may assume that poor farmers' production costs are lower, so a small price markup translates to relatively greater assistance. For participants who have migrated from rural to urban areas, their WTP increase tends to be 0.37 RMB lower for appreciation certificate treatment than non-migrants. This may be due to the fact that the migrants may still focus on improving their own livelihood in cities and are less motivated by a certificate to donate charity.

Interestingly, migrants' WTP increase was 0.53 RMB greater than the increase of non-migrants with the government's promotion document treatment. Older consumers respond to the government's promotion information treatment more positively, with an additional 0.03 RMB increase. However, this treatment was less effective for the self-employed, with WTP change being 0.72 RMB lower than those in other professions. Participants who think certified poor households are not actually poor tend to pay 0.30 RMB less for the anti-poverty label after reading government's promotion information than others. WTP change caused by the government's promotion treatment was also lower for consumers who consume greater amounts of apples, decreasing by 0.02 RMB with each additional kilogram of apples consumed in a month.



(a) Beneficiary Description

(b) Appreciation certificate

(c) Government's promotion document

FIGURE 2 Kernel density graph of anti-poverty average bids before and after treatment 1, 2, 3

#### 4.5 | Willingness to make trial and repeat purchases

Table 5 shows the results of bivariate ordered probit model of the decisions to buy and repeat purchase anti-poverty apples. A likelihood ratio test rejected the null hypothesis of independent equations. All the 'cuts' coefficients are significant, indicating that consumers clearly show

TABLE 4 Results of fixed effects model

Variables	Without interactions			With interactions		
	Treatment 1	Treatment 2	Treatment 3	Treatment 1	Treatment 2	Treatment 3
Beneficiary description (T1)	0.26*** (0.08)			0.55*** (0.14)		
Appreciation certificate (T2)		0.29*** (0.11)			0.97*** (0.25)	
Government's promotion (T3)			0.33*** (0.09)			-0.72** (0.34)
Fake poverty*T1				-0.64*** (0.24)		
Has donation experience*T1				-0.43** (0.17)		
Zhejiang province*T1				0.44** (0.18)		
Low price*T2					-0.43* (0.23)	
Sellers' benefit*T2					-0.47** (0.20)	
Migrate*T2					-0.37* (0.21)	
Age*T3						0.03*** (0.01)
Monthly apple consumption*T3						-0.02** (0.01)
Self-employed *T3						-0.72*** (0.21)
Migrate*T3						0.53*** (0.18)
Fake poverty*T3						-0.30* (0.17)

(Continues)

TABLE 4 (Continued)

Variables	Without interactions			With interactions		
	Treatment 1	Treatment 2	Treatment 3	Treatment 1	Treatment 2	Treatment 3
Has donation experience*T3						
Constant	3.51*** (0.04)	3.76*** (0.05)	3.72*** (0.04)	3.51*** (0.04)	3.76*** (0.05)	3.72*** (0.04)
R-squared	0.05	0.04	0.07	0.15	0.10	0.20
Number of observations	380	368	366	380	368	366

Note: Robust standard errors in parentheses. The lowest value for age is 18 years old, and for monthly apple consumption is 0.25 kg.

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

TABLE 5 Results of bivariate ordered probit model

Variables	Trial purchase		Repeat purchase	
	COEF.	SE	COEF.	SE
Anti-poverty average bid	0.06**	(0.03)	0.01	(0.03)
People have the best intentions	0.71***	(0.25)	-0.08	(0.26)
Empathy	0.71***	(0.09)	0.86***	(0.09)
Price	0.36***	(0.12)	0.07	(0.12)
Product quality	0.57***	(0.16)	0.27*	(0.16)
Sellers benefit	-0.49***	(0.11)	-0.18	(0.11)
Monthly apple consumption amount	0.01**	(0.01)	-0.00	(0.01)
Has heard of agricultural anti-poverty products before	0.14	(0.15)	0.28*	(0.15)
Age	0.04***	(0.01)	0.01*	(0.01)
Zhejiang province	-0.29**	(0.13)	-0.23*	(0.13)
Beijing	-0.24*	(0.13)	-0.31**	(0.13)
Cut1 <sup>a</sup>	2.26***	(0.59)	1.54***	(0.58)
Cut2	3.75***	(0.57)	2.54***	(0.58)
Cut3	4.92***	(0.58)	4.28***	(0.59)
Cut4	6.59***	(0.60)	-	-
$\gamma$	0.64***	(0.06)		
Wald Chi <sup>2</sup> (29)	240.52			
Observations	557			

Note: The complete set of estimation results are shown in Table A7 in the Online Appendix.

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

<sup>a</sup>The cuts are parameters of the cutoff points in the bivariate Ordered Probit Model in Equation (7),  $c_{ij}$ .

different levels of willingness to try and to repeat the anti-poverty product purchase. The likelihood of making a trial purchase is positively correlated with average bids for the anti-poverty label, as expected, but repeat purchases have no significant relationship with it. Those who are willing to pay more for the anti-poverty label show a strong interest in making a trial purchase of anti-poverty products (outside the experiment). However, it should be noted that the anti-poverty label has a bigger effect in the short term. Consumers' long-term anti-poverty support may not come from those who have higher WTPs. Cultivating and sustaining such consumer support requires more effort.

Results also suggest that generalised trust, which is identified by asking 'I assume that people have only the best intentions', has a significantly positive relationship with ethical consumption. This supplements Grebitus et al. (2015), who found that trust may influence sustainable food preferences but without robust results. Besides, consumers who are older or more empathic or think that anti-poverty products generally are higher quality are shown to be more likely to make both trial and repeat purchases. Consumers who came from the Beijing and Zhejiang provinces are less likely to make both trial and repeat purchases of anti-poverty products than the Sichuan province, which may reflect Sichuan's certification of the anti-poverty trademark. Consumers who agree more with statements that lower prices correlated with anti-poverty products are more likely to make trial purchases. Their agreement with the statements had no correlation to the likelihood of repeat purchases. These dichotomised results again confirm that attracting consumers to initially support anti-poverty is different than motivating consumers to continue such behaviour. Although



public donations for occasional disasters have been common in China, regular charities for non-disastrous causes run by non-government organisations are not as common. This may mean that the public is not used to making regular donations to charity. People who think that anti-poverty products benefit sellers rather than poor farmers are less likely to make trial purchases. Participants who have heard of agricultural anti-poverty products before are more likely to make repeat purchases, indicating the importance of publicising anti-poverty products.

## 5 | CONCLUSION AND DISCUSSION

We contribute to the literature by investigating whether consumers are willing to engage in domestic poverty alleviation through online food purchasing and by evaluating the effects of alternative non-financial interventions on their WTPs. A non-hypothetical online auction experiment was implemented with recruited real shoppers.

Four main conclusions are found. Firstly, our results suggest consumers are willing to pay premiums for purely altruistic food attributes, which is consistent with existing studies (De Pelsmacker et al., 2005; Dragusanu et al., 2014). Specifically, we applied online real auction which avoids hypothetical bias to estimate the consumers' WTP for the anti-poverty and green food labels.<sup>7</sup> We also found that consumers' WTP for products with both green food and anti-poverty labels combined is only 0.98 RMB higher than products with the anti-poverty label alone and 0.85 RMB higher than those with the green food label alone, a substitution effect between the two labels. Secondly, results suggest that those consumers who think that anti-poverty products generally are of higher quality, right or wrong, are willing to pay higher premiums for the anti-poverty attribute. This suggests, at least to some consumers, agricultural products grown from poor mountainous regions are not discriminated against but considered highly. Thirdly, our results supplement existing ethical food consumption literature by identifying three efficient non-financial treatments that can increase consumers' WTP for anti-poverty products by similar levels. These treatments involved providing specific beneficiary description information, issuing appreciation certificates, and offering government promotion documents for anti-poverty programmes. However, different treatment effects were found among consumers, showing that different consumers should be targeted with different interventions. Fourthly, compared with existing literature, our results also explore the ethical food label effect on repeat purchase intentions. We found that the WTPs for anti-poverty labels are significantly positively correlated with consumers' willingness to make trial purchases of anti-poverty products but have no significant relationship with repeat purchase willingness.

Based on our main conclusions, we draw some implications relevant to China and other developing countries who are also engaged in poverty alleviation. First, there are potential market opportunities for food with such attributes and the consumers' willingness to support the poor. Recruiting altruistic consumers could help governments relieve poverty. The market and the government complement each other, where the public can support anti-poverty programmes through market mechanisms and the government can invest more in infrastructure and aid sustainable production. This is of critical importance for emerging countries, including China and India. They no longer receive anti-poverty support from the United Nations, thus their governments face a significant financial challenge in poverty alleviation. These countries also have a fast-growing group of medium-income consumers with increasing purchasing power.

<sup>7</sup>Although no hypothetical bias is expected from this real auction experiment, we still tried to compare our WTP estimates to market observations, only for the green food label because the anti-poverty label is too new to yield good data. Our WTP is higher than that in Jiang et al. (2019), which is reasonable because the market-based estimation reflects the lower bound of WTP whereas the auction solicits the highest WTP (Griffith & Nesheim, 2013).

This result also has implications for policy-makers who hope to increase the income of poor rural households. For example, introducing anti-poverty certifications to the market can benefit consumers by reducing information asymmetry. Qualified poor farmers and the processors/marketers of their products could take advantages of this label as the cost is almost zero by adding such a label to their products. Secondly, anti-poverty labels may not only help poor farmers earn a higher unit profit, but they can also profit from selling a larger volume. For online food sellers, our results identified consumers who are willing to pay more for anti-poverty labels. Marketing promotions targeting those groups could have better results. Those consumers tend to be more empathetic, believe that anti-poverty products' have higher quality, are not involve with anti-poverty related production or selling processes and have donated money within the past year. Thirdly, the substitution effect between anti-poverty label and green food label has implications for farmers because for qualified poor farmers, putting on the anti-poverty label has almost zero cost but using the green food label involves production restrictions and increased cost; therefore, anti-poverty label certification could be a potential good choice when available. They could adopt the green food label in the presence of anti-poverty label only if the average additional production cost is lower than the small additional premium of 0.98 RMB. Fourthly, considering the high frequency of food purchasing, attracting people to only make trial consumptions is not sustainable for poverty alleviation. Instead, more attention should be paid towards guiding consumers to make repeat purchases of anti-poverty products. Compared with the short-term effect from trial purchases, the anti-poverty label has weaker effects on supporting repeated purchased in the long run. To retain consumers and sustain the effect of the anti-poverty label, additional efforts must be made.

This paper has several limitations, the first being that the calculated average bids used in this paper could under-estimate the anti-poverty WTPs because the evidence shows that the anti-poverty and green labels can be used interchangeably. Our conservative assumption of anti-poverty only receives the residual bid when it appears together with green food. Second, though efforts were made to make participants view the conventional apples and 10 RMB as earnings rather than endowment, we have to admit that the house money effect still exists since consumers do not pay with their money from their pockets (Corgnet et al., 2014; Jacquemet et al., 2009). Thirdly, whether or not price premiums of the anti-poverty label were consistent across different types of agricultural products was not tested. Future research can address these limitations to improve our understanding of these relationships.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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