Willingness to pay with reference-dependent preferences: A comparative analysis of attribute-based and alternative-based approach

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Selected Paper prepared for presentation at the 2024 Agricultural & Applied Economics Association Annual Meeting, New Orleans, LA; July 28-30, 2024

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Abstract

Consumer preferences and choices are influenced by reference-dependent preferences. However, few study using experimental auctions to elicit willingness to pay (WTP) have considered reference-dependent preferences. This study fills this gap by examining WTP estimation with reference-dependent preferences in a second price auction setting. We use table grapes as the target products and estimate the WTP for important attributes. Two models, the attribute-based model and the alternative-based model, are estimated to evaluate the impact of reference points on consumer preferences and the valuations of different attributes. In the attribute-based model, individuals compare the attributes of the target product with their favored attribute categories; and in the alternative-based model, individuals compare the attributes of target product with their reference product. Compared to the traditional hedonic price model, which does not account for reference-dependent preferences, the results reveal that the inclusion of reference points had varying effects on WTP estimation for different attributes, and a departure from the reference point led to a shift in WTP. Moreover, consumers exhibit varying levels of aversion to loss for different attributes, highlighting the attribute-specific influence of reference points on WTP estimation.

Keywords: reference dependent preference, reference point, willingness to pay estimation

1. Introduction

Reference-dependent consumer preference and choice have been the focus of marketing and behavioral decision research for decades. In decision making, consumers often compare things of interest to a certain reference level when making judgements and choices (Amaldoss and He, 2018; Dhar et al., 1999; Karle et al., 2015; Kim et al., 2020; Neuman and Neuman, 2008). Reference-dependent preference indicates that an individual derives utility from both consumption of a good or service (consumption utility) and its comparison with a reference point (gain-loss utility) (Amaldoss and He, 2018; Wang et al., 2021). An individual's perception of gains or losses is influenced by reference points. Notably, the negative impact of a loss is often greater than the positive impact of an equal gain. This concept was first developed as a theory by Tversky and Kahneman (1991) and is closely related to their model of prospect theory (Tversky and Kahneman, 1978).

While these behavioral theories are well established, economists have only recently begun to test them empirically across various contexts, employing diverse methods to incorporate reference-dependent preferences into empirical models (Meyer and Johnson, 1995; Neumann and Böckenholt, 2014). Similar to other consumer decisions, consumer willingness to pay (WTP) for a product/service or product attributes can be largely affected by the reference points. When considering a possible reference point, price is the most frequently studied factor (Wang et al., 2021). For example, Mazumdar (2005) was one of the first few literatures compared the model fit between the traditional and reference dependent models on reference prices. Similarly, Caputo et al., (2020) studied the reference price effects using a discrete choice experiment. Besides, when considering the use of product attributes as reference points, Bansal et al. (2021) studied the consumer WTP for electric vehicles and examined the effects of attribute level reference

point on WTP estimates using discrete choice experiments. They used internal combustion engine vehicles of different attributes combinations as reference points and found that accounting for consumer reference-dependent preference would yield more realistic WTP estimates. However, their study could not test consumer loss aversion since electric vehicles were either superior for an attribute or vice versa. Mao et al. (2020) also used the status quo at the attribute level of allowing wetland deterioration as the reference option and studied the consumer WTP for wetland management policies using a discrete choice experiment. They concluded that the reference dependence model provides more accurate choice prediction. However, they estimated one loss aversion parameter for all attributes, thus unable to imply how consumer evaluation the departure from the reference point and its impact on WTP estimation.

The WTP estimation with reference-dependent preferences beyond choice-based approaches and models remains limited in the existing literature (Bansal et al., 2021; Wang et al., 2021). To our knowledge, no research has been explored on how reference dependence influence consumer WTP estimates for products in the experiment auction settings. The objective of this paper is to fill this knowledge gap. In this paper, we developed a novel model that extended hedonic price methods to incorporate reference dependence with loss aversion in the experimental auction settings. We aim to examine the impact of reference points on consumer WTP estimations.

Experimental auction settings are appropriate to study the effects of reference dependence on consumer WTP estimation. In the field of consumer behavior, reference points are usually shaped by consumers' past experiences or previous choices (Foutz, 2004). These can be classified as internal reference points since they are typically based on memory, and they are relatively stable (Bell and Bucklin, 1999). In experimental auctions, when participants evaluating

the dollar value for the auctioned product, they might be more sensitive to and aware of their favorite or most recent purchases, which could serve as their reference points.

Specifically, we conducted a Vickrey second-price auction (hereinafter, referred to as 2nd price auction) in which all bids are sealed and the highest bidder wins the auction but pays the second-highest bid (Vickrey, 1961; Lusk and Shogren, 2007). Due to the non-hypothetical nature of experimental auctions, participants are confronted with real economic consequences of their actions. Since the 2nd price auction sets the market price to be independent from what s/he bids, people have the incentive to truthfully reveal their preference and WTP (overcoming the hypothetical bias). More specifically, bidders are motivated to bid on exactly what they are willing to pay to maximize their chance of winning while minimizing the risk of overpaying. Consequently, experimental auctions are regarded as a more reliable method than stated preference methods such as hypothetical choice experiments and contingent valuation surveys. Researchers often employ experimental auctions to evaluate the validity of hypothetical methods (Fox et al. 1998; List et al.,1998; List and Shogren 1998).

We selected eight table grape varieties to be bid on in the experimental auction and compared consumer WTP estimates for three marketable attributes with and without considering participants' reference points for table grapes. We chose table grapes for two reasons. First, table grapes are significant economic commodities that can be purchased in many marketplaces. We informed participants in the experimental auction that they could imagine themselves purchasing these table grapes at the marketplaces and consider how much they would be willing to spend. Second, five of the eight table grape varieties were newly developed cold hardy table grape varieties and were unavailable in the local marketplace at the time of the study. This presents a

scenario of estimating demand for novel products and the determine consumer preferences for their attributes.

We extended the hedonic price model to incorporate reference effect and applied loss aversion estimates at the attributes level. We construct comparisons between the target table grape with participants' reference points in two ways, which are served as the examination of structural heterogeneity involves the use of different decision rules (Wang et al., 2021). While preference heterogeneity such as individual preference differences has been extensively studied, structural heterogeneity has received limited attention so far. The literature documents two referencing strategies, namely attribute-based and alternative-based referencing. Attribute-based referencing involves constructing reference points for each attribute and comparing the product's attributes with the corresponding referenced attributes (Scheibehenne et al., 2015; Tereyagoglu et al., 2017). Alternative-based referencing involves constructing a reference alternative for a product and comparing the product's attributes with the corresponding alternative's attributes (Chernev, 2003; Hardie et al., 1993).

Our findings suggest that compared to the traditional hedonic price model results where does not account for reference-dependent preferences, the model incorporating reference points suggests that reference points had varying effects on WTP estimation for different attributes, and a departure from the reference point led to a shift in WTP. Moreover, consumers exhibit varying levels of aversion to loss for different attributes, highlighting the attribute-specific influence of reference points on WTP estimation. Omitting reference points in estimation, especially for those attributes that consumers are most likely to have strong loss aversion, could lead to biased estimation of consumer WTP.

This paper's contributions to the existing literature are three-fold. First, we extend the empirical model beyond the widely used choice-based models and add evidence on the impact of reference of reference points in experiment auction settings. Second, we explore the structural heterogeneity of reference points by comparing the approaches of formulating reference points with two models, the attributes-based model and alternative model. Third, our empirical findings shed light on the importance of considering attribute-specific reference points when estimating WTP for products/services to develop effective marketing/pricing/segmentation strategies.

2. Model setup

Given the experimental auction data, which provides a point estimate of each individual's WTP, this study first estimates the consumer WTP for three marketable attributes of table grapes using the hedonic price model, and then expands on it by incorporating reference points to examine their impacts on WTP estimation. The linear hedonic price model is given by:

$$WTP_{ij} = \alpha_z A_{iz} + \beta_j D_j + \varepsilon_{ij}$$

where WTP_{ij} is the bid of table grape sample i for participant j, A_{iz} is a bundle of z attributes for each table grape samples i, we further control for D_j, a vector of participants' socio-demographic characteristics and their table grape purchasing behavior, and ε_{ij} is a random error term cluster at the individual level. Thus, the marginal price of attribute z is given by the parameter α_z.

Drawing insights from the prospective theory and reference dependence preference (Tversky and Kahneman, 1991), we developed a theoretical model to incorporate reference points. We denote consumers' reference points for table grapes as C_{zj}, which represses the reference point as a bundle of z attribute for participant j. Assume that consumers preference and

WTP are affected by both their preference for different attributes and the comparison with the reference points, resulting in a gain or loss. Moreover, to examine whether consumers exhibit loss aversion in regard to the reference points, given the effect of the reference points on WTP may vary across different attributes, we assume different loss aversion parameters λ_Z for different attributes z. Thus, the extended model incorporating the reference points and accounting for loss aversion is:

$$WTP_{ij} = \alpha_z{}' A_{iz} + \gamma_z{}'((A_{iz} - C_{iz})_{if\ A_{iz}>C_{iz}} + \lambda_Z(A_{iz} - C_{iz})_{if\ A_{iz}<C_{iz}}) + \beta_j{}' D_j + \varepsilon_{ij}{}'$$

where λ_Z $(\lambda_Z > 0)$ represents the level of loss aversion. $\lambda_Z > 1$ indicates loss averse and $\lambda_Z < 1$ indicates loss seeking.

When constructing the difference variable $A_{iz} - C_{iz}$ between the objective attribute and reference points, we employed two approaches. First, we consider an attribute-based model (Scheibehenne et al., 2015). In this model, we assume that individuals compare the attributes of the target product with their favored attribute categories. Therefore, the difference was defined as a binary variable, indicating whether the objective attribute level aligns with their preferred attribute level. In addition, we adopt an alternative-based model (Hardie et al., 1993). In this model, we assume that individuals compare the target product with their reference product and its attributes. By considering their referenced product attribute levels, individuals can perceive a gain if the target product's attribute is superior to that of their reference product, or a loss if it is inferior. Therefore, the difference variable took a value of 1 if individuals perceived a gain, -1 if they perceived a loss, and 0 if there was no difference between the target product and their reference product's attribute levels.

3. Experiment setup and data collection

We conducted a 2nd price auction to investigate consumer preferences and WTP for eight cultivars of 16-ounce table grapes in XX in September 2022. We recruited 101 participants through various social media. Participants had to be at least 18 years old and produce purchasers to be eligible for the experiment. It is worth noting that the recruitment did not specify that it was designed for table grapes, to avoid excluding consumers who do not prefer table grapes and might refuse to participate. All participants were compensated $40 for an hour-long session, while auction winners received the 16-ounce table grapes they won and a payment of $40 minus the market price (which was determined in the auction) of the table grapes. We held eight sessions over two days, with an average of 15 participants per session. We dropped two participants whose bids were outliers. Thus, the final sample consists of 99 participants and 792 bids on eight grape samples. We have obtained Institutional Review Board Approval for our study.

During the hour-long session, we began by introducing participants to the 2nd price auction with concrete examples and practices questions, to help them understand why bidding their true WTP is the optimal option. Additionally, we conducted a quiz to test their knowledge and ensure their comprehension of the auction procedures. Each participant received eight coded plastic containers containing two berries from each table grape sample for them to taste before bidding. At the same time, eight coded packages of 16-ounces samples were displayed on a large table so that participants could walk around and examine while tasting and bidding. To avoid order effect, we prepared two versions of questionnaires that randomized the order of the eight table grape samples and participants could also start their evaluation from any sample. Participants needed to write down their bids for each of the16-ounce table grape samples. Within each session, after all participants submitted their bids, the moderator sorted the bids from highest to

lowest and determined the market price and the highest bidder for each sample. The winner purchased the sample they won at the market price.

After the bidding procedure, participants answered a survey about their preferred attributes for table grapes, including berry color, taste, and seed character, as well as their reference product for table grapes and their attributes. Regarding participant's favorite attributes for table grapes, we asked participants to select their favorite categories for each attribute. Take berry color as an example, participant need to select their preferred categories from the options "Black," "Red," "Green," or "Does not matter." It is worth noting that participants were allowed to select multiple options if applicable. Regarding participants' referenced table grape variety, we asked participants to specify which one they use as a reference product when making table grape purchases, either their favorite variety or the most recently purchased variety. Then, participants indicated the specific table grape variety they used as their reference product and identified the attribute categories for the chosen reference grape variety. We also collected participants' table grape purchasing behaviors and demographic background.

4. Results

4.1 Summary statistics of participants

Table 1 presents descriptive statistics of participants' socio-demographic background information and their table grape purchasing behaviors. In our sample, the average age of participants was 51 to 60 years old. Approximately 77% of participants were female. Around 35% of participants held a collage diploma or higher educational qualification. The majority of participants were married, and their household sizes varied from 1 to 5 people. Around 14% of participants had children under 12 years old. Regarding income, slightly more than half of

participants reported an annual income of over $100,000, and 67% had either a full-time or part-time job. Additionally, about 19% of participants were members of environmental groups. In terms of table grape purchasing behaviors, most of participants reported consuming and purchasing table grapes more frequently than once a month. When purchasing table grapes, slightly over half of participants expressed a preference for a 16ozs size over a larger size.

4.2 Summary statistics of the reference points

Table 2 displays the statistics of eight table grape samples' attributes used in the 2nd price auction and the attributes of participants' reference table grape. Comparing eight table grape samples to the reference points of 99 participants for table grapes leads to 792 pairs in our dataset. This means each of the eight table grape samples is compared to the reference points of 99 participants. We conducted the comparison in two approaches. First, we compared the attributes of eight table grape samples to participants' favorite attribute categories (i.e., attribute-based reference points). Second, we compared each of the eight table grape samples to the attributes of participants' reference table grape variety (i.e., alternative-based reference points).

Of the eight table grape samples analyzed, two were black, three were red, and three were green. When examining participants' favorite color of table grapes, it was found that the majority of participants favored red table grapes the most (86.9%), followed by green table grapes (58.6%), and black table grapes (47.5%). Using the attribute-based approach, it was observed that 33.6% of the pairs had a mismatch between the color of the table grape sample and their preferred color categories. In contrast, when we asked participants about their reference table grape, 62.6% of participants indicated it was a red table grape variety, 32.3% was a green table grape variety, and only 5.5% was a black table grape variety. Using the alternative-based approach, 3.7% of pairs perceived a gain as participants preferred the color of the sample grapes

compared to their reference grape, while 29.4% perceived a loss. If the color of table grape sample and participants' reference table grape both matched their favorite color categories, or both mismatched, they did not perceive a gain or loss. The mean value of the difference variable, which takes values of -1, 0, and 1, was -0.258.

Of the eight table grape samples analyzed, three had a balanced taste, four were sweet, and one was sour. Regarding participants' favorite tastes, the majority of participants favored the sweet taste the most (46.5%), followed by the balanced taste (39.4%), and the sour taste (14.1%). Since these percentages add up to 100%, this means participants have excluded preferences for table grape tastes (i.e., a person who prefers sweet tastes does not like either the balanced or sour tastes). Using the attribute-based approach, 60.2% of the pairs had a mismatch between the taste of the sample table grape and participants' preferred taste. On the other hand, using alternative-based approach, 47.5% of participants indicated their referenced table grape was a balanced taste table grape variety, 42.4% was a sweet taste table grape variety, and only 1.01% was a sour taste table grape variety. Using the alternative-based approach, 30% of the pairs perceived a gain, while 43.2% perceived a loss. Similarly, if the tastes of table grape sample and participants' reference table grape both matched their favorite taste category, or both mismatched, there is neither a gain nor loss. The mean value of the difference variable was -0.132.

Regarding table grape samples' seed character, one table grape sample was seeded, three had seed traces, and four were seedless. In terms of participants' favorite seed character for table grapes, the majority of participants favored seedless table grapes (82.8%), followed by table grapes with seed trace (47.5%), and only a small proportion indicate they also prefer seeded table grapes (8.1%). Using the attribute-based approach, it was observed that 39.8% of the pairs had a mismatch between the seed character of table grape sample and participants' preferred seed

character categories. In contrast, when we asked participants about their reference table grape, 77.8% indicated it was a seedless table grape variety, 19.2% was a seed trace table grape variety, and only 3% was a seeded table grape variety. Using the alternative-based approach, 7.2% of pairs perceived a gain, while 33.5% perceived a loss. The mean value of the difference variable was -0.262.

4.3 Hedonic price model estimation results

Table 3 presents the estimation results from the hedonic price model. The estimated coefficients obtained from this model can be interpreted as the WTP for specific attributes of table grapes. In all three specifications, the coefficients for berry color, taste, and seed character remained consistent and statistically significant after controlling for additional participants' socio-demographic characteristics and grape purchasing behaviors (Column 2), as well as accounting for individual heterogeneity (Column 3). These findings are not surprising, as these attributes are known to be important factors influencing consumer preferences and their valuation for different table grape varieties. It is noteworthy that most socio-demographic factors were insignificant, suggesting that consumer preferences for these attributes are not strongly influenced by demographic characteristics. However, an exception was observed for participants who belonged to an environmental group. The results indicate that they were significantly more willing to pay an additional $0.6 for 16-ounce table grapes.

The constant term represents the participants' WTP for the base group of table grapes with black berry color, balanced taste, and seedless characteristics. The negative coefficients for berry color indicate significantly lower WTPs for red and green table grapes. Specifically, participants were willing to pay $0.456 less for red table grapes and $0.4 less for green table grapes compared to black table grapes. Besides, the negative coefficients for tastes reveal significantly

lower WTPs for table grapes with sweet and sour tastes. Participants were willing to pay $0.415 less for table grapes with a sweet taste and displayed an even stronger dislike to table grapes with a sour taste, indicating a preference for table grapes with a balanced taste. Moreover, the presence of seeds also significantly impacted participants' WTP for table grapes. Compared to table grapes with seeds, table grapes with seed traces were associated with a $0.494 higher WTP. Participants were willing to pay an even higher premium of $0.575 for seedless table grapes.

4.4 Attribute-based reference dependent model estimation results

Table 4 presents the effects of reference points on WTP estimation using the attribute-based model. Comparing the WTP estimation results in Table 4 to those in Table 3, we observed minimal impact for berry color, while significant changes in the estimated WTPs for taste and seed character after including the difference between table grape sample attributes and attribute-based reference points in the model. Accordingly, the coefficient of the difference variable for color was insignificant, while the coefficients of the taste and seed character were negative and statistically significant. This suggests that the inclusion of reference points had a substantial impact on the estimation of WTP for taste and seed character attributes. Specifically, participants would pay less for table grape's taste and seed character if its taste or seed character did not match their favorite taste or seed character categories for table grapes.

One potential reason for the ambient effect for berry color could be that most people think color does not matter, as reported in Table 2. The percentages of participants' favorite color for all three colors added up to about 193%, which means that at least 93% of participants prefer any of the two colors or they prefer all three colors. Taken together, these results provide evidence that consumer valuation of WTP is not solely based on the attributes of the product, but also taking into account the comparison to their reference points. Moreover, the changes in the

magnitude of the estimated WTPs and the difference variable varied across different attributes, highlighting the attribute-specific influence of reference points on WTP estimation.

4.5 Alternative-based reference dependent model estimation results

Table 5 presents the effects of reference points on WTP using the alternative-based model. Unlike the attribute-based model, the alternative-based model allows both gain and loss, enabling the estimation of consumers' loss aversion. Building on the insights from previous research, we assume that the loss aversion parameters vary across different attributes and estimate participants' loss aversion at the attribute level.

Comparing the WTP estimation results in Table 5 to those in Table 3, we observed that the inclusion of reference points had minimal impact on the WTP estimation for berry color, while resulting in significant changes for tastes and seed character. More importantly, the coefficients for seed character became insignificant. Given that 77.8% of participants reported their reference table grapes were seedless and 82.8% of participants chose seedless grapes as their favorite seed character, the insignificance of the coefficients for seed character does not suggest that the presence of seeds is not a significant factor affecting consumer WTP. Instead, it indicates that the departure from the reference point has a greater impact.

In addition, estimated loss aversion parameters greater than one indicated the degree to which consumers were averse to losses compared to gains. The loss aversion parameter was found to be highest for seed character, followed by taste. This suggests that consumers were particularly sensitive to potential losses associated with the seed character and exhibited a moderate level of aversion to losses in taste. It is interesting to note that participants tend to be loss seeking for berry color though the effect was insignificant.

5. Conclusions

Understanding how reference points influence consumers preference and valuations is valuable for improving empirical value elicitation mechanisms. In this paper, we examined consumer WTP estimations with reference dependent preferences for table grapes, considering three important marketable attributes: berry color, taste, and seed character. We employed two different models: the attribute-based model, which assumes individuals compare the target product to their favorite product attributes, and the alternative-based model, which assumes individuals compare the target product to a reference product.

The results indicate the inclusion of reference points improved the WTP estimation. And reference points had varying effects on WTP estimation for different attributes, highlighting the importance of considering attribute-specific reference points. For berry color, we found the effect was limited, indicating that consumers do not have strong preferences for any of the berry colors and are thus less influenced by reference points. We also found that consumer preferences for taste and seed character were more sensitive to the inclusion of reference points. As most people prefer table grapes with a balanced taste and seedless character and used as their reference attributes, a departure from these reference points led to a decrease in WTP. Moreover, the estimation results from the alternative-based model indicate that consumers also exhibited varying levels of loss aversion for different attributes. Consumers exhibit the highest level of loss aversion for seed character, followed by taste. In addition, we did not find significant differences in WTP among individuals with different socio-demographic backgrounds. However, individuals with a stronger environmental consciousness exhibited a higher valuation of table grapes in general.

One limitation of our study is that we did not consider the possibility of participants having multiple reference products in the alternative-based model. This could potentially influence their comparisons and valuations. Another limitation is that participants may consider other fresh fruits as reference points when evaluating WTP for table grapes, which could introduce additional variability in their preferences and valuations. Further research in this area could extend the investigation of reference-dependent preferences on WTP estimation to other products categories and explore potential variations across consumer segments. Additionally, delving into the use of external reference points, which are based on all available information in evaluation contexts and are often stimulus-based and may change spontaneously under different situations, would enhance the understanding of consumer reference dependent preferences. Lastly, understanding the dynamics of reference points is also fruitful for gaining insights into how these preferences evolve over time.

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Tables

Table 1. Summary statistics of the participants in the experimental auction (*N*=99)

		Frequency	Percentage
Age			
	1 = 18-30 years old	10	10.10%
	2 = 31-40 years old	17	17.17%
	3 = 41-50 years old	18	18.18%
	4 = 51-60 years old	19	19.19%
	5 = 61-70 years old	26	26.26%
	6 = Older than 70 years old	9	9.09%
Gender			
	1 = Female	76	76.77%
	0 = Male	23	23.23%
Education			
	1 = Collage diploma and higher	35	35.35&
	0 = Other	64	64.65%
Marital status			
	1 = Married	68	68.69%
	0 = Other	31	31.31%
Household size			
	1 people	31	31.31%
	2 people	41	42.41%
	3 people	11	11.11%
	4 people	14	14.14%
	5 people	2	2.02%
Presence of children under 12 years old at home			
	1 = Yes	14	14.14%

	0 = No	85	85.86%
Income			
	1 = $50,000 or under	19	19.19%
	2 = $50,001 - $100,000	29	29.29%
	3 = Over $100,000	51	51.52%
Employment status			
	1 = Full time/Part time	66	66.67%
	0 = Other	33	33.33%
Environmental group membership			
	1=Yes	19	19.19%
	0=No	80	80.81%
Frequency of fresh grape consumption			
	1 = Once a week or more	30	30.30%
	2 = Once a month or more	46	46.46%
	3 = Less than once a month	23	23.23%
Frequency of fresh grape purchasing			
	1 = Once a week or more	20	20.20%
	2 = Once a month or more	53	53.54%
	3 = Once every half year or more	24	24.24%
	4 = Less than once every half year	2	2.02%
Weight of fresh grape when purchase			
	1 = 16ozs	53	53.54%
	2= More than 16ozs	46	46.46%

Table 2. Summary of eight table grape samples in the experimental auction and reference points

		Objective measures		Favorite attribute		Reference product	
		Frequency	Percentage	Mean	SD	Mean	SD
Berry color							
	Black	2	25.00%	0.475	0.500	0.051	0.219
	Red	3	37.50%	0.869	0.338	0.626	0.484
	Green	3	37.50%	0.586	0.493	0.323	0.468
	Gain (1 = Yes)					0.037	0.188
	Loss (1 = Yes)			0.336	0.473	0.294	0.456
	Difference			-0.336	0.473	-0.258	0.514
Taste							
	Balanced	3	37.50%	0.394	0.489	0.475	0.500
	Sweet	4	50.00%	0.465	0.500	0.424	0.495
	Sour	1	12.50%	0.141	0.349	0.101	0.302
	Gain (1 = Yes)					0.300	0.458
	Loss (1 = Yes)			0.602	0.490	0.432	0.496
	Difference			-0.602	0.490	-0.132	0.845
Seed character							
	Seeded	1	12.50%	0.081	0.273	0.030	0.171
	Seed trace	3	37.50%	0.475	0.500	0.192	0.394
	Seedless	4	50%	0.828	0.377	0.778	0.416
	Gain (1 = Yes)					0.072	0.259
	Loss (1 = Yes)			0.398	0.490	0.335	0.472
	Difference			-0.398	0.490	-0.262	0.581

Table 3. Willingness to pay estimation using hedonic price model

		(1)	(2)	(3)
Berry color	Red	-0.456***	-0.456***	-0.456***
		(0.157)	(0.157)	(0.157)
	Green	-0.400***	-0.400***	-0.400***
		(0.147)	(0.147)	(0.147)
Taste	Sweet	-0.415***	-0.415***	-0.415***
		(0.111)	(0.111)	(0.111)
	Sour	-1.013***	-1.013***	-1.013***
		(0.215)	(0.215)	(0.215)
Seed character	Seed trace	0.494**	0.494**	0.494**
		(0.192)	(0.192)	(0.192)
	Seedless	0.575***	0.575***	0.575***
		(0.147)	(0.147)	(0.147)
Constant		2.365***	2.108***	2.363***
		(0.245)	(0.662)	(0.184)
Demographic controls		NO	YES	NO
Individual fixed effect		NO	NO	YES
Observation		792	792	792

Note: The table shows the means and standard deviations of participants' willingness to pay for certain attributes of table grapes. The base group is the table grape that is black in color, has a balanced taste, and is seeded. Column 1 presents the estimation results without controls; Column 2 displays the results while controlling for participants' socio-demographic characteristics and grape purchasing behaviors; and Column 3 additionally controls for individual fixed effects. $p<0.1$, $p<0.05$, $p<0.01$ indicate significance at 10%, 5%, and 1%, respectively.

Table 4. Attribute-based model: Effects of reference points on willingness to pay estimation

		(1)	(2)	(3)
Berry color	Red	-0.475***	-0.476***	-0.485***
		(0.160)	(0.160)	(0.161)
	Green	-0.406***	-0.406***	-0.408***
		(0.145)	(0.145)	(0.145)
	difference – berry color	0.048	0.050	0.074
		(0.106)	(0.107)	(0.111)
Taste	Sweet	-0.436***	-0.436***	-0.436***
		(0.110)	(0.110)	(0.110)
	Sour	-0.940***	-0.939***	-0.937***
		(0.213)	(0.213)	(0.213)
	difference - taste	0.289***	0.292***	0.301***
		(0.084)	(0.084)	(0.084)
Seed character	Seed trace	0.365*	0.372*	0.378*
		(0.194)	(0.194)	(0.194)
	Seedless	0.330**	0.344**	0.356**
		(0.165)	(0.165)	(0.165)
	difference - seed	0.328***	0.309***	0.293***
		(0.105)	(0.105)	0.293***
Constant		2.864***	2.561***	2.854***
		(0.268)	(0.672)	(0.218)
Demographic controls		NO	YES	NO
Individual fixed effect		NO	NO	YES
Observation in pairs		792	792	792

Note: The table shows the means and standard deviations of participants' willingness to pay for certain attributes of table grapes. The base group is the table grape that is black in color, has a balanced taste, and is seeded. $p<0.1$, $p<0.05$, $p<0.01$ indicate significance at 10%, 5%, and 1%, respectively.

Table 5. Effects of Reference points on willingness to pay estimation using alternative-based model

		(1)	(2)	(3)
Berry color	Red	-0.482***	-0.482***	-0.498***
		(0.164)	(0.164)	(0.164)
	Green	-0.414***	-0.415***	-0.420***
		(0.148)	(0.147)	(0.148)
	Loss aversion - berry color	2.181***	1.528***	1.344***
		(0.176)	(0.183)	(0.222)
Taste	Sweet	-0.355***	-0.356***	-0.352***
		(0.116)	(0.116)	(0.116)
	Sour	-0.917***	-0.917***	-0.896***
		(0.223)	(0.223)	(0.223)
	Loss aversion - taste	1.299***	2.171***	2.178***
		(0.420)	(0.421)	(0.442)
Seed character	Seed trace	0.300	0.315	0.339*
		(0.199)	(0.198)	(0.199)
	Seedless	0.187	0.215	0.243
		(0.177)	(0.176)	(0.178)
	Loss aversion - seed character	5.332***	3.565***	3.144***
		(0.420)	(0.421)	(0.442)
Constant		2.903***	2.484***	2.815***
		(0.277)	(0.669)	(0.245)
Demographic controls		NO	YES	NO
Individual fixed effect		NO	NO	YES
Observation in pairs		792	792	792

Note: The table shows the means and standard deviations of participants' willingness to pay for certain attributes of table grapes. The base group is the table grape that is black in color, has a balanced taste, and is seeded. $p<0.1$, $p<0.05$, $p<0.01$ indicate significance at 10%, 5%, and 1%, respectively.