



*Research article*

## **The moderating effect of pro-environmental self-identity in the relationship between abnormally-shaped foods and purchase intention**

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**Abstract:** The assumption that consumers reject food that deviates physically from the norm contributes to global food waste because food retailers generally do not offer abnormally shaped food. This study empirically examines how food shape abnormality affects purchase intentions and how pro-environmental self-identity might moderate the food shape abnormality-purchase intention relationship for consumers in Taiwan. A representative sample of 400 Taiwanese consumers indicated their purchase intentions for two fruits and two vegetables with varying levels of food shape abnormality (normal, moderately abnormal, and extremely abnormal). The results demonstrate that food shape influences purchase intentions; consumers are more likely to purchase normally shaped fruits and vegetables than moderately or extremely abnormally shaped food. Pro-environmental self-identity also drive purchase intentions, such that participants with high levels of pro-environmental self-identity express higher purchase intentions toward abnormally shaped food. Results show that pro-environmental self-identity has a higher and positive impact on purchase intention for extremely abnormal food compared to moderately abnormal and normal food. Government entities and food industry actors should take these findings into account to develop effective communication strategies.

**Keywords:** abnormally-shaped food; pro-environmental self-identity; purchase intention; moderating effect; Taiwan

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## 1. Introduction

Food waste has been received much attention and become a popular media topic as a consequence of its relationship with sustainability. Gustavsson et al. (2011) [1] reported that the resources used for food production such as usage of energy, chemicals, water, land, and greenhouse gas emissions have been used uselessly when food is wasted. They also indicated that between 30% and 50 % of the world's annual food production or approximately two billion tons per year never reaches consumers. In developing countries, as much as 40% of food is wasted at post-harvest and processing levels, because of the poor infrastructure, low levels of technology, and insufficient investments in food production systems. However, in developed countries, the majority of food waste occurs at the early stages in the food supply chain (e.g., production and processing). One major reason for this is that food is sorted out due to rigorous quality standards set up by large-scale distributors concerning weight, size, shape and appearance [2]. Abnormality-shaped foods might not look good, but they are just as edible and nutritious as normal veggies.

Although there has been a limited research examining abnormally-shaped foods on consumers' purchase intentions [3], research to date seems to have given insufficient attention to exploring the intervening role of pro-environmental self-identity in the link between abnormally-shaped foods and purchase intentions. Moreover, a throughout review of research literature suggested that such kind of investigation has never been conducted in Taiwan. Given the fact that Taiwan is currently facing an increasing of food waste at the retail and consumption stages, understanding factors affecting consumers' purchase intentions for abnormally-shaped foods has become more important than ever before. By comprehending the underlying possible effect of pro-environmental self-identity in the relationship between abnormally-shaped foods and consumers' purchase intentions, supermarkets can be in a better position to reduce the volume and quantity of food waste resulting from the abandoned abnormally-shaped foods.

Therefore, the purpose of this study is to investigate the moderating effect of consumers' pro-environmental self-identities in the relationship between abnormally-shaped foods and purchase intentions in Taiwan. The objectives of this study are as follows: (1) to examine the impact of food shape abnormality on consumers' purchase intentions and the potential moderation by pro-environmental self-identity; (2) to provide recommendations for managers and practitioners that would build marketing strategies in increasing consumers' consumption of abnormality-shaped foods to reduce the food waste.

## 2. Conceptual background

### 2.1. Food shape abnormality and purchase intentions

Many studies have showed that food' visual appearance, including its color, physical form, presentation mode, and shape, determines consumers' initial sensory impressions and activated inferences about expected quality such that they also influence consumers' preferences and purchase intentions [4–6]. A common practice in the retail food industry to exclude fresh foods that do not match to a particular visual appearance standard is based on the belief that consumers associate food abnormalities with lower product quality and therefore refuse purchasing such products [3]. Loebnitz et al. (2015) [7] in their Danish study found that food shape abnormalities influence consumers' purchase intentions, but only if the food deviates extremely from the norm; no differences in purchase

intentions emerge for moderately abnormal food.

Loebnitz and Grunert (2015) [3] examined how food shape abnormality affects purchase intentions for consumers in China. The results also designate that food shape influences purchase intentions and consumers are more likely to purchase normally shaped fruits and vegetables than moderately or extremely shaped food. We dispute that consumers have higher purchase intentions for normally shaped food, compared with moderately or extremely abnormally shaped food. Therefore, the study proposes the following hypothesis: H<sub>1</sub>: Food abnormality affects consumers' purchase intentions, such that purchase intentions are lower for (a) moderately and (b) extremely abnormally shaped food than for normally shaped food.

## 2.2. *Effects of self-identity on purchase intentions*

Two theoretical models describe consumers' pro-environmental behaviors. Cost-benefit model assume people choose the option with the highest profits and lowest costs. Normative model forecasts that values and moral considerations are the major determinants of pro-environmental behavior. Both models show that self-identity, or a person's self-concept, presents a distinctive predictor of pro-environmental behavior.

Self-identity has been identified as an important individual characteristic that influences consumer food choices and consumption [8–11] as well as environmental behavior [12–14].

Purchasing abnormally shaped food may be considered as pro-environmental behavior given that it may help reduce food waste if such products were sold instead of being discarded [3].

Loebnitz et al. (2015) [7] surveyed a sample of 964 Danish consumers and found that pro-environmental self-identities drive purchase intentions, such that participants with high levels of this trait express significantly higher purchase intentions for abnormally shaped food. Thus, increasing pro-environmental self-identities might encourage more consumers to purchase abnormally shaped fruits and vegetables.

In the present study, it is proposed that a pro-environmental self-identity is highly relevant for explaining purchase intentions for abnormally shaped food. When people see themselves as pro-environmental, green consumers or strong environmental concerns, they express stronger intentions to purchase abnormally shaped food products than others [3,7,11,14]. Moreover, food abnormality relates to food waste issues, with their negative effects for the environment.

Therefore, consumers with a strong pro-environmental self-identity should be more likely to purchase abnormally shaped food products, unlike those with a weak pro-environmental self-identity. On the basis of the preceding, the following hypothesis is proposed: H<sub>2</sub>: Consumers with stronger pro-environmental self-identities express higher purchase intentions toward abnormal food products.

Finally, it is hypothesized that consumers that have higher pro-environmental self-identity are more likely to perceive abnormal food products as food waste issue and would purchase accordingly. In other words, when consumers that have higher pro-environmental self-identity are faced abnormal food products, which are perceived as food waste for not buying, they would show a relatively higher purchase intention. Loebnitz et al. (2015) [7] revealed that among participants with a strong pro-environmental self-identity, significant differences exist base on problem awareness for their purchase intentions toward moderately and extremely abnormal food. For both levels of pro-environmental self-identity, participants who were more awareness of food waste as a problem indicated greater intentions to purchase moderately and extremely abnormal food, compared to those

who were not aware of it. An interaction effect between food shape abnormality and pro-environmental self-identity is expected. Therefore, the study hypothesizes: H<sub>3a</sub>: Pro-environmental self-identity moderates the relationship between food abnormality of a product and purchase intention. H<sub>3b</sub>: Pro-environmental self-identity has a higher and positive impact on purchase intention in extremely abnormal food compared to moderately abnormal and normal food.

### 3. Method

#### 3.1. Participants and procedure

A 3 (food shape abnormality: normal, moderately abnormal, extremely abnormal) × 2 (pro-environmental self-identity: strong, weak) between and within-subjects design was used. A convenient sampling was used to recruit participants. 400 participants were randomly selected from groups of an online Social Media LINE and were randomly assigned to one of the three conditions of fruits and vegetables being normal, moderately abnormal, and extremely abnormal. Depending on their assigned condition, participants were asked to express their purchase intentions toward normal (n = 104), moderately abnormal (n = 70) and extremely abnormal (n = 226) food items. The sample consisted of 145 males (36.2%) and 255 females (63.8%). The majority of participants (65.0%) were age above 50. Approximately 73.5% reported having a bachelor degree.

#### 3.2. Stimuli development

We used the same test products as Leobnitz and Grunert (2015) [3], who varied images of an apple, lemon, carrot, and eggplant according to three levels of shape abnormality (normal, moderate abnormal, extreme abnormal) (Figure1). Each condition (normal, moderate abnormal, extreme abnormal) was available for each of the four products, resulting in a total of 12 images. To verify the distinctions among the normal, moderate abnormal, and extreme abnormal food products, we subjected all the images to a manipulation check in the study before collecting the dependent variable.

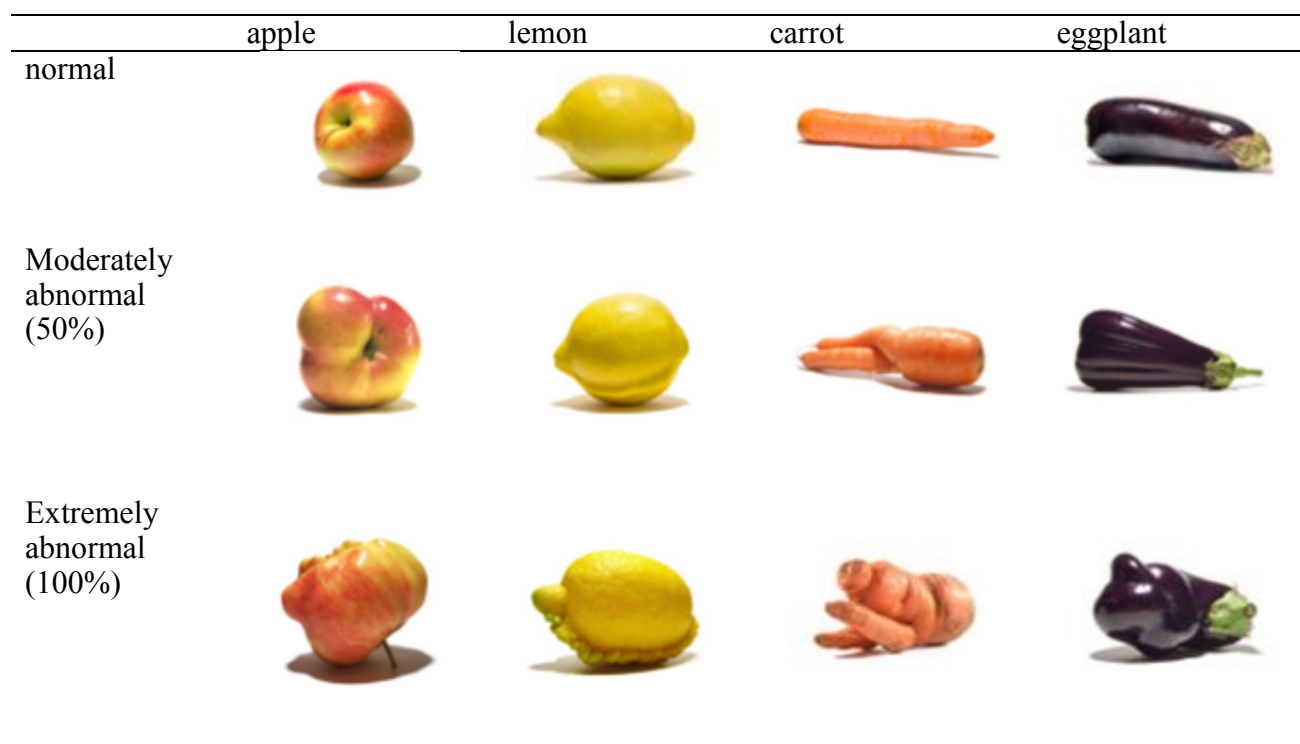
#### 3.3. Measures

All measures were developed in English and translated into Chinese. Back-translation served to control the quality of the translation.

#### 3.4. Pro-environmental self-identity

Pro-environmental self-identity scale was adopted and modified from the scale used by Loebnitz et al. (2015) [7]. Pro-environmental self-identity was measured on a seven-point scale (1 = extremely disagree, 7 = extremely agree) by asking respondents the following items: “I think of myself as an environmentally friendly consumer”, “I think as myself as someone who is very concerned with environmental issues”, “I would be embarrassed to be seen as having an environmentally friendly lifestyle”(reversed), and “I would not want my family or friends to think of me as someone who is concerned about environmental issues” (reversed). The Cronbach’s alpha is .87 indicating reliable measures.

Participants were categorized as strong ( $n = 206$ ) or weak ( $n = 194$ ) based on means of their pro-environmental self-identity. Finally, we collected demographic information and debriefed the participants.



**Figure 1.** Experimental stimuli.

### 3.5. Purchase intention

Purchase intention was measured by asking respondents to indicate their intentions to purchase the food items depicted (“How likely would you be to purchase these food items?” 1 = “very unlikely”, 7 = “very likely”).

## 4. Results

### 4.1. Manipulation check

Because the study used the food shape to manipulate food abnormality, it was necessary to determine that the different shapes had the intended effect of inducing either normal, moderately abnormal, and extremely abnormal food shapes. Therefore, the study asked participants to indicate, for each picture presented to them, how normal (abnormal) the depicted food appeared, on a two-point scale (1 = “normal”, 2 = “abnormal”). Results of Chi-square analyses indicated that a significant difference exists between the level of abnormality for participants who were assigned to normal pictures and those who were assigned to abnormal ones (50% and 100%) ( $\chi^2 = 122.26$ ,  $P < 0.001$ ). Thus, the manipulation was successful.

#### 4.2. Respondent profile

The sample consisted of 243 males (35.9%) and 433 females (64.1%). The majority of participants (73.4%) were age from 21 to 50. Approximately 46% reported having a bachelor degree.

#### 4.3. Hypotheses testing

Research hypotheses were tested using two-way analysis of variance analysis (ANOVA). Table 1 shows the means and standard deviations of purchase intentions for each of six assigned conditions. Table 2 shows results of the ANOVA analysis. Results indicated a significant main effect for food abnormality ( $F = 43.32, P < 0.001$ ). The participants' purchase intentions differed with the degree of food shape abnormality. Post comparisons revealed significant differences exist between three levels. Significant differences were found between normal ( $M = 4.88, SD = 1.43$ ) and moderately abnormal ( $M = 3.70, SD = 1.89$ ) ( $P < 0.001$ ), as well as between abnormal ( $M = 4.88, SD = 1.43$ ) and extremely abnormal ( $M = 3.00, SD = 1.87$ ) food products ( $P < 0.05$ ). Significant differences were also existed between moderately abnormal ( $M = 3.70, SD = 1.89$ ) and extremely abnormal ( $M = 3.00, SD = 1.87$ ) food products ( $P < 0.05$ ). Thus, participants expressed the highest purchase intentions for normally shaped food, and purchase intentions decreased with greater abnormality in food shapes. Therefore, these results support H1.

**Table 1.** Means and standard deviations of purchase intention

Shape	Pro-environmental self-identity <sup>a</sup>	Mean	Std. Deviation	N
Normal	Low	4.81	1.33	64
	High	5.00	1.58	40
	Total	4.88	1.43	104
Moderately abnormal	Low	3.51	1.61	41
	High	3.97	2.22	29
	Total	3.70	1.89	70
Extremely abnormal	Low	2.66	1.69	89
	High	3.22	1.95	137
	Total	3.00	1.87	226
Total	Low	3.55	1.82	194
	High	3.67	2.04	206
	Total	3.61	1.93	400

Notes: <sup>a</sup> Pro-environmental Self-Identity is measured on a seven-point Likert scale (1 = extremely disagree, 7 = extremely agree).

**Table 2.** Tests of between-subjects effects-dependent variable: purchase intention.

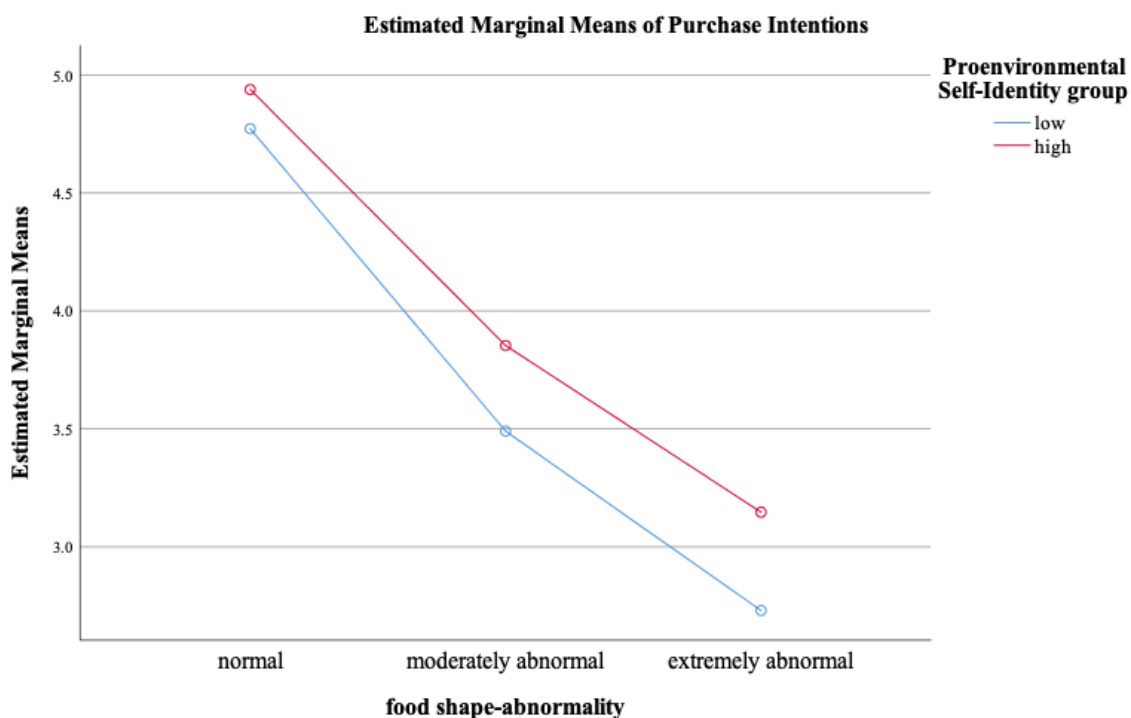
Source	Type III Sum of Squares	df	Mean Square	F	P value
Corrected Model	274.660 <sup>a</sup>	5	54.932	17.678	0.000
Intercept	4549.115	1	4549.115	1464.007	0.000
Food shape abnormality	263.003	2	131.501	42.320	0.000
Pro-environmental self-identity	12.137	1	12.137	3.906	0.049
Food shape abnormality <sup>b</sup>	2.298	2	1.149	0.370	0.691
Pro-environmental self-identity					
Error	1224.278	394	3.107		
Total	6719.000	400			
Corrected Total	1498.938	399			

Notes: <sup>a</sup>:  $R^2 = 0.183$  (Adjusted  $R^2 = 0.173$ ); <sup>b</sup>: Computed using  $\alpha = 0.05$ .

Hypothesis 2 states that consumers with stronger pro-environmental self-identities express higher purchase intentions toward abnormal food products. The hypothesis was also supported considering the fact that a significant main effect for pro-environmental self-identity ( $F = 3.91$ ,  $P < 0.05$ ) was shown (Table 2). Participants with strong pro-environmental self-identity had higher mean of purchase intention ( $M = 3.67$ ,  $SD = 2.04$ ), compared with those with weak pro-environmental self-identity who had an average purchase intention of 3.55 ( $SD = 1.82$ ) ( $P < 0.05$ ). Purchase intentions decreased with greater abnormality in food shapes for both weak and strong levels of pro-environmental self-identity. Both groups expressed the highest purchase intentions for normally shaped food, and purchase intentions decreased with greater abnormality in food shapes. However, no significant differences in purchase intentions were found between two groups for normal and moderately abnormal food products. Significant difference was only found between two levels for extremely abnormal food products. For participants with weak pro-environmental self-identity, participants' purchase intentions differed with the degree of food shape abnormality. Significant differences were found between normal ( $M = 4.81$ ,  $SD = 1.33$ ) and moderately abnormal ( $M = 3.51$ ,  $SD = 1.61$ ) ( $P < 0.05$ ), as well as between normal ( $M = 4.81$ ,  $SD = 1.33$ ) and extremely abnormal ( $M = 2.66$ ,  $SD = 1.69$ ) food products ( $P < 0.05$ ). Significant differences were also existed between moderately abnormal ( $M = 3.51$ ,  $SD = 1.61$ ) and extremely abnormal ( $M = 2.66$ ,  $SD = 1.69$ ) food products ( $P < 0.05$ ). Thus, participants expressed the highest purchase intentions for normally shaped food, and purchase intentions decreased with greater abnormality in food shapes. However, for participants with strong pro-environmental self-identity, participants' purchase intentions were significantly different between normal ( $M = 5.00$ ,  $SD = 1.58$ ) and moderately abnormal ( $M = 3.97$ ,  $SD = 2.22$ ) ( $P < 0.05$ ), as well as between normal ( $M = 5.00$ ,  $SD = 1.58$ ) and extremely abnormal ( $M = 3.22$ ,  $SD = 1.95$ ) food products ( $P < 0.05$ ). There was no significant different between moderately abnormal ( $M = 3.97$ ,  $SD = 2.22$ ) and extremely abnormal ( $M = 3.22$ ,  $SD = 1.95$ ) food products ( $P > 0.05$ ).

Finally, hypothesis 3, which states that pro-environmental self-identity moderates the relationship between food abnormality of a product and purchase intention. Yet we observed no significant interaction effect between food shape abnormality and pro-environmental self-identity ( $F = .370$ ,  $P > 0.05$ ). Hypothesis 3 is not supported. However, from Figure 2, it can be seen that those with weak pro-environmental self-identity led to a higher drop in purchase intention compared to those with strong pro-environmental self-identity. Hypothesis 3a states that pro-environmental self-identity has a higher and positive impact on purchase intention for extremely abnormal food compared to moderately

abnormal and normal food. This was confirmed with a significant difference in means of purchase intention for extremely abnormal food ( $M = 3.22$ ,  $SD = 1.95$ ), compared with those with weak pro-environmental self-identity who had an average purchase intention of 2.66 ( $SD = 1.69$ ) ( $P < 0.05$ ). Furthermore, Figure 2 shows the difference in purchase intention is highest for extremely abnormal food between two groups, which confirms hypothesis H3a.



**Figure 2.** Effect of food shape abnormality and pro-environmental self-identity on purchase intention.

## 5. Discussion

This study is distinctive in making a contribution to the ugly vegetables and fruits literature. First and foremost, this study has identified a research niche area that has yet to be examined empirically. A careful review of Taiwanese empirical literature suggested that quite some studies have focused on the visual design [15], business model [16] and risk perception [17] of ugly vegetables and fruits. However, no studies to date in Taiwan seemed to have squarely focused on assessing the moderating effect of pro-environmental self-identity in the relationship between abnormally-shaped food and consumers' purchase intentions. This study has closed this research gap by testing such a proposition and the findings have enriched the understanding of the underlying cause behind a known relationship.

Secondly, some of the study's findings were partially in line with conclusions drawn from past studies. Consistent with prior findings [3,7], the results of this study support the assumption that food shape influences Taiwanese consumers' purchase intentions. In line with hypothesis 1, purchase intentions decrease when the food deviates from the norm; consumers are more likely to purchase normally shaped fruits and vegetables than moderately or extremely abnormal food.

In the study by Loebnitz et al. (2015) [7], the findings indicate no significant differences in purchasing intentions between normal and moderately abnormal products. However, the findings in this study suggest that moderate incongruity effect holds for all types of physical appearance, namely



food shape. Thus, consumers offer more positive evaluations of moderately incongruent product designs compared to congruent designs.

Consistent with our expectations, pro-environmental self-identity had significant influences on consumers' purchase intentions toward abnormal food. Pro-environmental self-identity contributes directly to higher purchase intentions for abnormal food.

Findings also indicate that pro-environmental self-identity has a higher and positive impact on purchase intention for extremely abnormal food compared to moderately abnormal and normal food. Thus, pro-environmental self-identity can drive consumers' purchase intentions toward abnormal food. Pro-environmental self-identity is a good predictor of pro-environmental behaviors was confirmed. Although these findings do not contribute to new knowledge as they are well documented in empirical literature, they are nevertheless reliable evidence underscoring the trustworthiness of this study.

## 6. Conclusion

Similar to results in Western counterparts, this study indicates that Taiwanese consumers have the highest purchase intentions for normally shaped food compared to any food shape abnormality. Therefore, it is easy to understand that food retailers exclude food that deviates from the norm as our findings support their assumption that consumers request picture perfect food. However, this practice has been identified as main determinant of global food waste. In particular with regard to food waste, changing consumer behavior has been identified as an effective strategy to foster sustainable change [3].

The present findings have several managerial implications. Our results demonstrate a positive relationship between pro-environmental self-identity and purchase intentions for abnormal food, which means there are some Taiwanese consumers who will buy abnormally shaped food; with the increasing self-identity about the environment, this segment is growing. Retailers may be well advised to rethink their policy of excluding food with shape abnormalities, because an increasing share of consumers is willing to buy them.

By doing their social responsibilities for environmental concern, more enterprises are willing to launch contributions of unsold or unattractive perishable goods to nongovernmental groups. More restaurants are encouraged to use unattractive but otherwise wholesome produce. These all help to prevent fruits and vegetables that fail to meet the strict aesthetic standards demanded by vendors from ending up on the trash heap. Communication campaigns and education programs are need to continuously increase environmental concern among Taiwanese consumers to fight against food waste resulting from tossing natural food shape-abnormalities.

This study has some limitations and several additional areas of research appear warranted. First, one major limitation of this study arises from the use of convenience sampling in data collection. This is by no means effective in overcoming the drawback of non-probability sampling. Because of this, any attempt to generalize the findings in this study to the larger population must be handled with caution. Second, food shape abnormality is just one criterion for separating foods; additional studies should examine whether other criteria that retailers use to meet consumer demands for cosmetically perfect food, such as color, size, or texture, influence consumers' purchase intentions. Third, this study used unpriced purchase intention score which may be a poor indicator of actual purchase behavior. Intuitively, consumers might not be willing to pay the same price for abnormal food. Therefore, future studies should clarify the trade-offs between purchase intentions and willingness to pay to reduce food waste.

Future studies might address how educational or communication strategies affect purchase intentions of abnormally shaped food. Does enhancing consumers' pro-environmental self-identity actually increase willingness to purchase abnormal food? In addition, abnormally-shaped vegetables could be perceived as infested with some insects or disease, and thus impact consumers' purchase intentions. Yet in some vegetable-specific examples (e.g., Coeur de Boeuf tomato, ginseng), consumers might prefer shape abnormalities or normally-shaped vegetables purely because of aesthetic or evolutionary explanation as beautiful might suggest healthiness. These alternative explanations warrant additional research. In this sense, researchers could consider other constructs that might explain consumers' aversion to vegetable shape-abnormality.

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### Conflicts of interest

The authors declare no conflict of interest, financial or otherwise.

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