

Article

Could Surplus Food in Blind Box Form Increase Consumers' Purchase Intention?

Chun Yang ¹, Xuqi Chen ², Jie Sun ³, Wei Wei ⁴, Wei Miao ⁴ and Chao Gu ^{3,*}

¹ School of Design, Jiangnan University, Wuxi 214122, China; 8202201014@jiangnan.edu.cn

² Department of Agricultural and Resource Economics, University of Tennessee, Knoxville, TN 37996, USA; xchen88@utk.edu

³ Department of Culture and Arts Management, Honam University, Gwangju 62399, Korea; 20208429@my.honam.ac.kr

⁴ School of Textile Garment and Design, Changshu Institute of Technology, Changshu 215500, China; doublewei@cslg.edu.cn (W.W.); weimiao@cslg.edu.cn (W.M.)

* Correspondence: cguamoy@my.honam.ac.kr

Abstract: Surplus foods are fresh raw material of food that has not been processed, and a large number of surplus foods are discarded and wasted every day. As a new business model, a surplus food blind box can attract consumers to purchase to reduce food waste. The main purpose of this study is to find out how to improve consumers' degree of cognition of surplus food blind box to improve the purchase intention. Therefore, this study analyzes the relevant factors affecting consumers' purchase intention of surplus food blind box, and through conceptualization and hypothesis verification, establishes a perceived model of consumers' purchase intention of surplus food blind box that can be used for future research. The results can be used by relevant practitioners, consumers, governments, and researchers to reduce food waste.

Keywords: surplus food; blind box; perceived risk; perceived value; purchase intention



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1. Introduction

1.1. Research Background

Approximately 1.6 billion tons of primary product equivalents of food waste are generated globally annually, of which 1.3 billion tons are edible, according to the Food and Agriculture Organization (FAO) of the United Nations. The annual food waste is equivalent to about 3.3 billion tons of CO₂ emitted into the atmosphere [1]. Moreover, the wastes of resources caused by food waste will also increase along with the population growth index, resulting in individual, family, collective economic losses, etc. [2]. Since China has a large agricultural and population base, the country faces resource shortages and increased food demand in addition to food waste (Table 1) [3]. Hence, reducing food waste could contribute to improving social sustainability, reducing poverty, and reducing the environmental impact of more than one billion tons of food waste that is disposed of in landfills each year [4]. However, the question remains as to how to reduce food waste.

Table 1. Current state of food waste in China.

| Measurements | Description |
|------------------------------|---|
| Food waste in China annually | Approximately 17 to 18 metric tons of food are wasted annually [5], which produces 54 metric tons of carbon dioxide equivalent emissions, consumes 24 metric tons of water, and occupies 23 million hectares of land [6]. |

Table 1. *Cont.*

| Measurements | Description |
|---|---|
| Food waste in Chinese households annually | About 5.5 metric tons of food are wasted annually, equivalent to 22% of total food production. For vegetables and fruits, this percentage is even higher [7]. |
| Amount of food wasted per Chinese per day | It is about 93 g per meal, about 279 g three times a day [8]. |

According to the Sustainable Development Goals (SDGs), adopted by UN member states in 2015, point 12 ‘Responsible Production and Consumption’. ‘Halve global food waste at retail and consumer levels by 12.3-2030, and reduce food losses in production and supply chains, including post-harvest losses, is particularly instructive for countries and organizations all around the world [9]. It is important to note that the continuous improvement of the food waste hierarchy (FWH) by different organizations and academics is providing a comprehensive framework. The potential actions that should be prioritized include preventing surpluses of food and extracting new value in the form of new edible and non-edible products [10,11]. Furthermore, it provides guidelines such as Redistribution of surplus food, Reuse of food for human consumption, and Recycling [12].

1.2. Research Motivation and Purpose

The Blind Box originated in Japan, where the IP Pan-entertainment industry is relatively developed. It refers to the same series of boxes, each containing an assortment of products with a different style or material combination [13]. The special feature of the product is that the outer packaging will not give consumers too many clues. Only after opening the package will consumers understand what or which product they have purchased. Blind boxes have become increasingly popular in recent years due to factors such as the trendy game economy. With the popularity of blind box products, more and more fields (including the food industry) have adopted the sales model of blind box products, attracting a large number of consumers.

In addition to reducing food waste, surplus food blind boxes may provide a solution to young people experiencing anxiety regarding takeout choices. As a form of novelty consumption, the surplus food blind box caters to young consumers’ curiosity, expectation, and “gambling” psychology to some extent [14]. There is no doubt that surplus food blind boxes can stimulate consumption among young consumers to a certain extent. Meanwhile, surplus food in blind boxes can effectively reduce food waste and ensure the maximum utilization of agricultural products as an innovative method of repurposing surplus food. Additionally, it contributes considerably to the reduction of carbon emissions and the enhancement of economic growth. Thus, the purpose of this study is to increase the purchase of blind boxes and learn why consumers purchase blind boxes. In the study, we analyze the relevant factors that affect consumers’ purchase intentions of surplus food blind boxes. The purpose of this study is to develop a perceived model of consumer surplus food blind boxes purchase intention, and providing relevant practitioners, consumers, governments, and researchers with a resource for future research while reducing food waste.

2. Relevant Studies

2.1. Perceived Value

A value is a reflection of the best capital cost optimization associated with purchase or production, resulting in a high-value (use-value) and attractive (premium-value) product or service for the customer [15]. Perceived value is the value of a product or service as perceived by consumers and may be viewed as a trade-off between perceived benefits and perceived expenses [16]. Consumers return to businesses or companies with a high perceived value [17]. Among Zeithaml’s value attributes, perceived value is increasingly

skewed toward “low price”, “any product I want”, “quality for the price I pay”, and “what I pay for” [18]. In other words, consumers are more inclined to evaluate a surplus food blind box based on its value rather than its price. This is one of the joys of blind boxing. Consumers may perceive high perceived value when they believe the products in the blind box are in line with or exceed their expectations or expectations set by the price. Additionally, numerous scholars have confirmed that value is a prerequisite for the intention to purchase [19,20].

2.2. Perceived Risk

In contrast to perceived value, perceived risk refers to the potential impact of a purchase on the consumer [21]. Consumers may consider the risks of surplus food blind boxes, such as whether the surplus food is still fresh or edible, whether it will not match the price, whether the combination of ingredients is as expected, etc. Especially in this time of COVID-19 pandemic, there could also be concerns about contamination through contagious routes, food preparation, packaging, or contact with delivery personnel [22]. This expected risk may affect consumers’ perceptions of value. As a result, the decision of the consumer is based on the balance between the perceived benefit and the perceived risk of the product or service. Therefore, if consumers perceive higher risks, the perceived value or purchase intention of surplus food blind boxes is likely to be lower [23].

2.3. Subjective Norm

It is common for people to follow social norms not only because they fear social pressure, but also because they provide information about what behaviors are considered appropriate or beneficial [24]. In TPB, subjective norms generally refer to a belief that a significant person or group of people will approve and support a particular course of action [25]. In this regard, subjective norms refer both to the perceived social pressure on one’s actions and to the individual’s motivation to conform to others’ views. In the context of food, subjective norms are primarily employed to infer the influence of others on consumers’ own purchasing decisions, or food waste behavior [26,27]. For surplus food blind boxes, the interaction between consumers, especially the frequent communication between young people, is important. For example, the big V sharing on Moments, Weibo, Tiktok, and Bilibili might provide a preliminary assessment of the value or risk of surplus food blind boxes, and it may also encourage purchase and use.

2.4. Perceived Food Quality

Food quality is the most important factor affecting customer satisfaction and a willingness to return to a full-service restaurant, including delivery, takeout, or surplus food blind boxes, etc. [28]. It represents the restaurant’s core characteristic, with a very tangible character. Food quality metrics include freshness, health, deliciousness, and appearance [29]. Consumers’ perceptions and evaluations of physical quality of surplus food blind boxes are influenced by the different quality indicators. For instance, the quality of blind box packaging, the ease of opening, the freshness of the contents, the health benefits, or the experience of the entire process. Therefore, perceived food quality might be an important antecedent factor influencing consumers’ purchase intentions for surplus food blind boxes.

2.5. Brand Image

The brand image is defined by the perception of the brand as reflected by the memories associated with the brand [30], to be recognized in the minds of consumers through the affinity, strength, and uniqueness of brand associations [31]. Thus, the more consumers trust and loyalty they have to a brand, the higher their perception of its image is. In particular, big brands that have been for a long time have a solid reputation among consumers. He and Song implemented a surplus bag (blind box equivalent) experiment in China, where they used public welfare promotion methods to enhance consumers’ willingness to purchase [32]. It should be noted that many big brands, such as IKEA [33] and Starbucks [34], have also

entered the “to good to go” app market, where they are selling surplus blind boxes. Surplus Food Blind Boxes of known brands are deemed less risky by consumers than it of unknown brands, and consumers’ perceptions and trust are also likely to be higher.

2.6. Perceived Playfulness

An individual’s perceived playfulness is defined as “the degree to which he or she finds an interaction enjoyable and intriguing and that he or she is interested in it” [35] and is generally used in human–computer interaction [36], blended learning scenarios [37], social networking sites [38], and less prevalent in the field of food. Nevertheless, in our opinion, a series of possible scenarios or actions, such as knowing, ordering, anticipating, unpacking, tasting, or evaluating, may make consumers feel excited and may facilitate a flow experience from surplus food blind boxes. In flow theory, a positive subjective experience is one of the primary reasons for performing an activity [35]. Therefore, if the experience perception of the surplus food blind boxes is high, the consumer’s various evaluations may be improved accordingly, which will affect their subsequent behavior.

2.7. Perceived Variety

The surplus food blind boxes may be prepared from a variety of raw materials, and different outlets use different cooking methods and are influenced by a variety of other factors. Therefore, we must understand how consumers perceive this aspect. This may be due to perceived variety. In general, category awareness is determined by the actual content of the selection aggregate and the characteristics of the classification scheme (e.g., the complexity of option attributes) [39]. In comparison to other studies, our definition of perceptual diversity may be more concrete and user-friendly. Therefore, perceptual diversity is defined as the perception of diversity in ingredients, practices, nutrition, etc. of the supplement food blind boxes perceived by consumers.

2.8. Convenience

Convenience is one of the most common reasons why consumers choose to make their purchases online [40]. The time and effort consumers invest in online shopping will affect their perception of convenience [41]. Due to the accelerated pace of the Internet, consumers are becoming less patient and spending less time choosing products and services than they did in the past.

Generally speaking, a variety of factors contribute to the convenience of a consumer in purchasing a product. Berry et al. deconstruct convenience as follows: Access convenience, Decision convenience, Transaction convenience, Benefit convenience and Postbenefit convenience [41]. In other words, it describes each aspect of the consumer’s entire consumption experience. It has also been confirmed numerous times [42,43]. Thus, convenience was chosen as the construct of this study. It is worth noting that Benefit convenience and Postbenefit convenience in the original text refer to the interaction with online salespersons or chatbots, which is inconsistent with the entire consumption process of plus food blind boxes in this study. Surplus food blind boxes are more inclined to consumers’ independent choices. Therefore, this construct has been excluded from the study.

2.9. Purchase Intention

An individual’s purchase intention is the tendency for that individual to take a particular action, and it is a strong predictor of that individual’s behavior [44]. Positive emotions can in general influence consumers’ positive perceptions or attitudes about the product or store, resulting in increased purchase intentions [45]. In contrast, the higher the perceived risk, the lower the purchase intention [46]. In this regard, the intent to purchase is the most important step for a product. Additionally, purchase intention is crucial in the food industry. Eberle et al. investigated purchasing intentions concerning organic foods [47]. The study by Liu et al. investigated whether food photographs in online reviews influence consumers’ purchase intentions [48]. In this study, we propose that food blind boxes may

be perceived as both positive and negative by consumers. Therefore, it is necessary to find out which factors have a greater effect on purchase intention.

3. Research Method and Hypothesis

3.1. Research Hypothesis and Model Construction

This study developed a model based on the discussion above. There are several factors, such as Subjective norm, Perceived food quality, Brand image, Perceived playfulness, Perceived variety, and Convenience, that impact Perceived value and Perceived risk, which in turn affects the research structure of Purchase intention (Figure 1). The following assumptions are made:

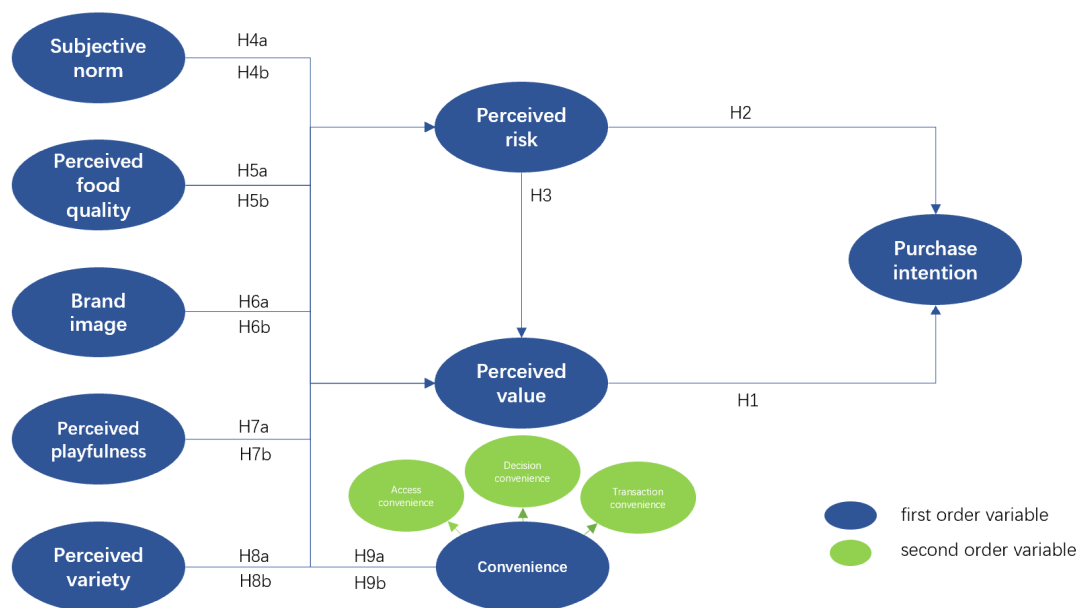


Figure 1. Research structure.

H1. Consumers' perceived value of surplus food blind boxes will positively affect their purchase intention.

H2. Consumers' perceived risk of surplus food blind boxes will negatively affect their purchase intention.

H3. Consumers' perceived risk of surplus food blind boxes will negatively affect their perceived value.

H4a. Consumers' subjective norms regarding surplus food blind boxes will negatively affect their perceived risk.

H4b. Consumers' subjective norms regarding surplus food blind boxes will positively influence their perceived value.

H5a. Consumers' perceived food quality of surplus food blind boxes will have a negative effect on their perceived risk.

H5b. Consumers' perceived food quality of surplus food blind boxes will influence their perceived value.

H6a. Consumerism's brand image of surplus food blind boxes will negatively impact consumer perceived risk.

H6b. A consumer's perception of the brand image of surplus food blind boxes will positively affect its perceived value.

H7a. Consumers' perceived playfulness towards surplus food blind boxes will negatively affect their perceived risk.

H7b. Consumers' perceptions of perceived playfulness of surplus food blind boxes will have a positive effect on its perceived value.

H8a. *Consumer's perceived variety of surplus food blind boxes negatively impacts their perceived risk.*

H8b. *Consumers' perceived variety of surplus food blind boxes will positively influence their perceived value.*

H9a. *Consumers' convenience to surplus food blind boxes will negatively affect their perceived risk.*

H9b. *Consumers' convenience with surplus food blind boxes will positively influence their perceived value.*

3.2. Design of Questionnaires

In this study, questionnaire items are designed in accordance with the research topic and referencing relevant literature. Reference sources for variable codes, questions, and scales are provided in Table 2.

Table 2. Variables, definitions, and references.

| Attributes | Variables | Operating Definition | Request References |
|--------------|------------------------------|--|--------------------|
| first-order | Subjective norm (SN) | Social pressures that encourage or discourage individuals to make an action with the surplus food blind box | [49] |
| | Perceived food quality (PQ) | Consumers' judgment of quality of the surplus food blind box based on cues | [29] |
| | Brand image (BI) | Brand image is related to the consumers' use of the brand to reflect their symbolic meaning of consumption and identity in self-expression | [50] |
| | Perceived playfulness (PP) | perceived playfulness as the degree to which the consumer believes that enjoyment could be derived when shopping for the surplus food blind box | [51] |
| | Perceived variety (PVAR) | The pursuit and experience of diverse types of food in consumer's shopping for the surplus food blind box | [52] |
| | Convenience (CON) | Consumers' perceptions of their time and effort with regards to purchasing the surplus food blind box | [43] |
| | Perceived risk (PR) | Perceived risk is defined as a potential consumer' perception about the possible uncertain negative outcomes from shopping for the surplus food blind box | [53] |
| | Perceived value (PVAL) | Consumer's overall assessment of the utility of the surplus food blind box | [29] |
| | Purchase intention (PI) | Consumer's intention to purchase the surplus food blind box | [54] |
| Second-order | Access convenience (AC) | Access convenience refers to the degree of ease and comfort for the consumer to arrive at the trading venue | [43] |
| | Decision convenience (DC) | Decision convenience relates to the time and effort utilized by consumers in making purchase decisions and deciding between products, brands, or service providers | [43] |
| | Transaction convenience (TC) | Transaction convenience refers to the time and effort the consumers spend to finalize a purchase | [43] |

3.3. Design of Questionnaires

An online survey has been distributed to consumers who experienced surplus food blind boxes between January and February 2022 (the survey will be administered at the beginning of the research). All questions, except basic information, are rated on a Likert scale of 1 to 7 (strongly disagree to strongly agree). The survey instructions for the study are presented to respondents via the URL link within the questionnaire. The participants voluntarily respond to questions, and they have the option of withdrawing at any time. In

accordance with this, all participants agree to complete the questionnaire on a voluntary and informed basis.

Ultimately, 750 samples were collected in this study. After excluding invalid samples (logical errors or too many identical options), the remaining number of samples is only 735. There are 33 items in the questionnaire, and 735 valid samples fit Jackson's proposal. In the maximum likelihood approach, the ratio of estimated parameters to the number of samples (p/n) should exceed 1:10 [55]. Therefore, it is used in subsequent data analysis. Based on the data collected from the valid questionnaire, a statistical analysis was conducted. The distribution of various demographic variables is shown in Table 3.

Table 3. Demographic characteristics of the respondents.

| Sample | Category | Number | Percentage (%) |
|-----------------|---------------------------------|--------|----------------|
| Gender | male | 410 | 55.8% |
| | Female | 325 | 44.2% |
| Age | 19–29 | 342 | 46.5% |
| | 30–39 | 297 | 40.4% |
| | 40–49 | 75 | 10.2% |
| | above 50 | 21 | 2.9% |
| Marriage Status | Married | 553 | 75.2% |
| | unmarried | 182 | 24.8% |
| Monthly Income | Below 4000 | 74 | 10.1% |
| | 4001–8000 | 148 | 20.1% |
| | 8001–16,000 | 335 | 45.6% |
| | 16,001–30,000 | 134 | 18.2% |
| | 30,001 or more | 44 | 6.0% |
| Education | Junior high school or below | 3 | 0.4% |
| | high school or secondary school | 27 | 3.7% |
| | Undergraduate or college | 641 | 87.2% |
| | Institute including above | 64 | 8.7% |
| Occupation | civil servant | 69 | 9.4% |
| | clerk | 353 | 48.0% |
| | Worker | 108 | 14.7% |
| | public service agency | 79 | 10.7% |
| | student | 50 | 6.8% |
| | self-employed | 76 | 10.3% |
| Area | East area | 412 | 56.1% |
| | Central Region | 131 | 17.8% |
| | Western Region | 153 | 20.8% |
| | North-west region | 39 | 5.3% |

4. Research Analysis and Results

4.1. Reliability Analysis

In this questionnaire, Cronbach's alpha coefficient is used, as is the correction term total correlation coefficient (CITC), which consists of two coefficients and three criteria for testing. As shown in Table 4 below, all constructs of CITC are above 0.4. After removing the item, the reliability coefficient did not increase significantly and the Cronbach's alpha coefficient was higher than 0.6 [56]. Therefore, the internal consistency between the questionnaire and scale in this study is high [57,58], which allows further analysis.

4.2. Exploratory Factor Analysis

In this study, SPSS 26.0 was used to perform an exploratory factor analysis to test the single-facetness of each feature. The results are shown in Table 5. By using principal component analysis, we can extract new factors with eigenvalues greater than 1 for each dimension. According to the results, the KMO values of each dimension are greater than

0.70 and the Bartlett sphericity test is less than 0.05, which indicates a suitable model for exploratory factor analysis [59,60]. Each facet contributes to the extraction of new factors, and only one new factor with an eigenvalue greater than 1 is extracted [61], suggesting that the construct has generally good validity [62].

Table 4. Results of reliability analysis.

| Construct | Item | Mean | Std. Deviation | CITC | Cronbach's α If Item Deleted | Cronbach's α |
|-----------|-------|-------|----------------|-------|-------------------------------------|---------------------|
| SN | SN1 | 3.478 | 1.053 | 0.706 | 0.762 | 0.835 |
| | SN2 | 3.579 | 1.118 | 0.695 | 0.774 | |
| | SN3 | 3.513 | 1.046 | 0.689 | 0.778 | |
| PP | PP1 | 3.565 | 1.151 | 0.715 | 0.692 | 0.814 |
| | PP2 | 3.379 | 1.156 | 0.654 | 0.755 | |
| | PP3 | 3.744 | 1.123 | 0.627 | 0.783 | |
| PQ | PQ1 | 3.576 | 1.091 | 0.470 | 0.702 | 0.714 |
| | PQ2 | 3.433 | 1.059 | 0.547 | 0.607 | |
| | PQ3 | 3.493 | 1.062 | 0.585 | 0.560 | |
| BI | BI1 | 3.161 | 1.151 | 0.554 | - | 0.713 |
| | BI2 | 3.460 | 1.108 | 0.554 | - | |
| PVAR | PVAR1 | 3.893 | 1.004 | 0.615 | 0.737 | 0.793 |
| | PVAR2 | 3.891 | 1.003 | 0.568 | 0.761 | |
| | PVAR3 | 3.995 | 0.912 | 0.565 | 0.761 | |
| | PVAR4 | 3.985 | 0.918 | 0.672 | 0.709 | |
| DC | DC1 | 3.561 | 0.939 | 0.448 | 0.591 | 0.657 |
| | DC2 | 3.542 | 1.172 | 0.463 | 0.580 | |
| | DC3 | 3.571 | 1.010 | 0.507 | 0.511 | |
| AC | AC1 | 3.556 | 1.020 | 0.539 | 0.674 | 0.736 |
| | AC2 | 3.502 | 1.068 | 0.546 | 0.666 | |
| | AC3 | 3.472 | 1.109 | 0.597 | 0.605 | |
| TC | TC1 | 3.976 | 0.965 | 0.521 | 0.575 | 0.689 |
| | TC2 | 3.954 | 0.904 | 0.495 | 0.608 | |
| | TC3 | 4.108 | 0.871 | 0.499 | 0.605 | |
| PR | PR1 | 3.084 | 1.194 | 0.687 | 0.751 | 0.824 |
| | PR2 | 3.352 | 1.218 | 0.684 | 0.754 | |
| | PR3 | 3.334 | 1.163 | 0.670 | 0.768 | |
| PVAL | PVAL1 | 3.565 | 0.925 | 0.546 | 0.677 | 0.740 |
| | PVAL2 | 3.452 | 1.058 | 0.566 | 0.656 | |
| | PVAL3 | 3.652 | 0.998 | 0.587 | 0.627 | |
| PI | PI1 | 3.725 | 1.039 | 0.730 | 0.787 | 0.852 |
| | PI2 | 3.845 | 1.052 | 0.735 | 0.781 | |
| | PI3 | 3.774 | 1.031 | 0.703 | 0.812 | |

Table 5. EFA.

| Construct | KMO | Bartlett Sphere Test | Item | Component Matrix | Communalities | Eigenvalue | Total Variation Explaine% |
|-----------|-------|----------------------|------|------------------|---------------|------------|---------------------------|
| SN | 0.726 | 0 | SN1 | 0.873 | 0.762 | 2.258 | 75.255 |
| | | | SN2 | 0.886 | 0.751 | | |
| | | | SN3 | 0.863 | 0.745 | | |
| PP | 0.703 | 0 | PP1 | 0.883 | 0.780 | 2.187 | 72.910 |
| | | | PP2 | 0.848 | 0.719 | | |
| | | | PP3 | 0.829 | 0.688 | | |

Table 5. Cont.

| Construct | KMO | Bartlett Sphere Test | Item | Component Matrix | Communalities | Eigenvalue | Total Variation Explaine% |
|-----------|-------|-------------------------|-------|---------------------|---------------|------------|------------------------------|
| PQ | 0.660 | 0 | PQ1 | 0.745 | 0.555 | 1.913 | 63.771 |
| | | | PQ2 | 0.812 | 0.659 | | |
| | | | PQ3 | 0.836 | 0.699 | | |
| BI | 0.500 | 0 | BI1 | 0.882 | 0.777 | 1.554 | 77.707 |
| | | | BI2 | 0.882 | 0.777 | | |
| PVAR | 0.789 | 0 | PVAR1 | 0.796 | 0.634 | 2.479 | 61.987 |
| | | | PVAR2 | 0.758 | 0.575 | | |
| | | | PVAR3 | 0.756 | 0.572 | | |
| | | | PVAR4 | 0.836 | 0.698 | | |
| DC | 0.655 | 0 | DC1 | 0.754 | 0.568 | 1.791 | 59.697 |
| | | | DC2 | 0.764 | 0.583 | | |
| | | | DC3 | 0.800 | 0.640 | | |
| AC | 0.680 | 0 | AC1 | 0.794 | 0.630 | 1.964 | 65.460 |
| | | | AC2 | 0.798 | 0.637 | | |
| | | | AC3 | 0.835 | 0.697 | | |
| TC | 0.669 | 0 | TC1 | 0.799 | 0.638 | 1.852 | 61.733 |
| | | | TC2 | 0.777 | 0.604 | | |
| | | | TC3 | 0.781 | 0.609 | | |
| PR | 0.721 | 0 | PR1 | 0.864 | 0.747 | 2.221 | 74.027 |
| | | | PR2 | 0.863 | 0.744 | | |
| | | | PR3 | 0.854 | 0.729 | | |
| PVAL | 0.686 | 0 | PVAL1 | 0.797 | 0.636 | 1.976 | 65.862 |
| | | | PVAL2 | 0.811 | 0.658 | | |
| | | | PVAL3 | 0.826 | 0.682 | | |
| PI | 0.731 | 0 | PI1 | 0.883 | 0.780 | 2.316 | 77.195 |
| | | | PI2 | 0.886 | 0.785 | | |
| | | | PI3 | 0.867 | 0.751 | | |

4.3. Confirmatory Factor Analysis

4.3.1. First-Order Confirmatory Factor Analysis

Figure 2 illustrates that all latent variables are correlated, confirming the path analysis premise. Additionally, all fitted values for this model meet the recommended criteria. As shown in Table 6, the first-order confirmatory factor analysis (CFA) model provides an adequate fit to the data [63]. Table 5. Convergent validity results of measurement model.

Table 6. Adaptation indices of the first-order CFA model.

| Common Indices | χ^2 | df | χ^2/df | GFI | AGFI | CFI | NFI | RMSEA | SRMR |
|--------------------|----------|-----|--------------------|-------|-------|-------|-------|-------|-------|
| Judgement criteria | | | <3 | >0.9 | >0.9 | >0.9 | >0.9 | <0.08 | <0.08 |
| Value | 755.646 | 440 | 1.717 | 0.941 | 0.924 | 0.972 | 0.935 | 0.031 | 0.032 |

Table 7 indicates the results of the convergent validity test. For a first-order CFA model, each item has a factor loading greater than 0.5. This ratio of coefficient estimates to standard errors is significant, with $t > 1.96$, $p < 0.05$ fitting the measurement criteria. Each construct has a combined reliability (CR) greater than 0.6 [64], and the extracted mean variance (AVE) is greater than 0.36 [65]. As can be seen from the above analysis, the questionnaire data has good convergent validity.

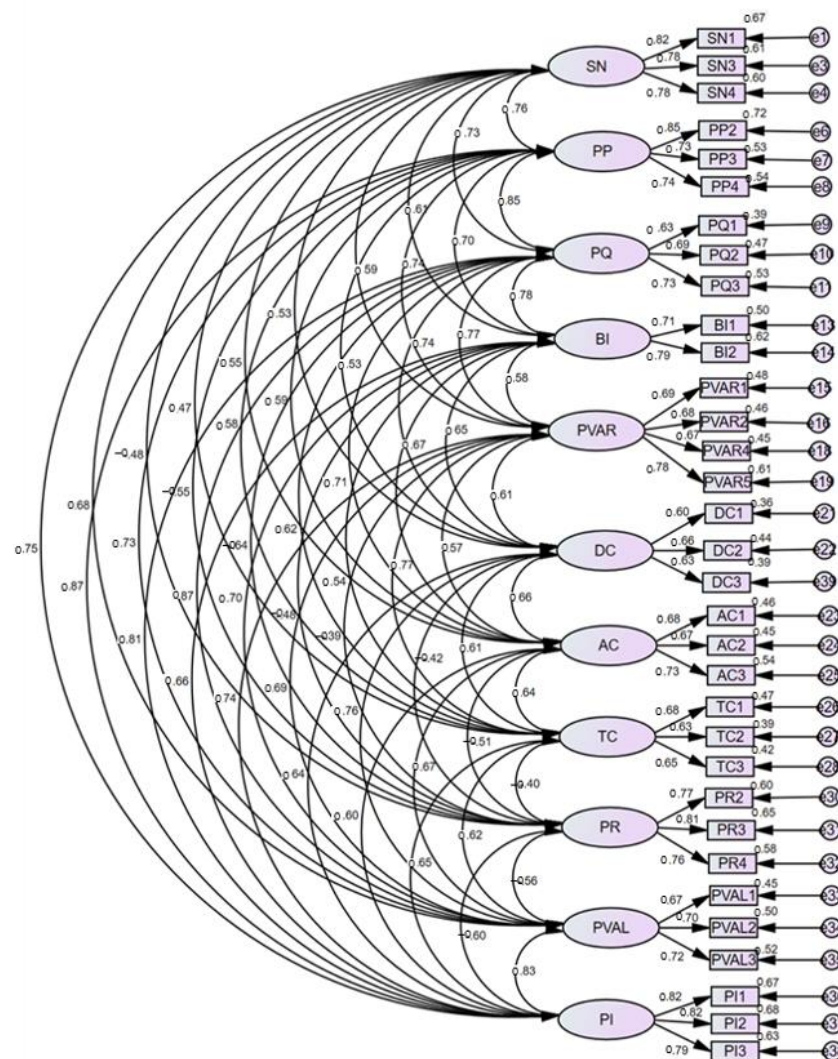


Figure 2. First-order CFA model.

Table 7. CFA validity of convergence.

| Item | Factor Loading | SMC | t | S.E. | Sig. | CR | AVE |
|-------|----------------|-------|--------|-------|-------|-------|-------|
| SN1 | 0.818 | 0.668 | 25.363 | 0.020 | 0.001 | 0.836 | 0.629 |
| SN2 | 0.784 | 0.615 | 23.909 | 0.018 | 0.001 | | |
| SN3 | 0.777 | 0.603 | 23.603 | 0.021 | 0.001 | | |
| PP1 | 0.848 | 0.719 | 27.276 | 0.015 | 0.001 | 0.816 | 0.598 |
| PP2 | 0.730 | 0.533 | 22.048 | 0.020 | 0.001 | | |
| PP3 | 0.737 | 0.543 | 22.340 | 0.023 | 0.001 | | |
| PQ1 | 0.627 | 0.393 | 17.849 | 0.027 | 0.001 | 0.721 | 0.464 |
| PQ2 | 0.686 | 0.470 | 19.939 | 0.022 | 0.002 | | |
| PQ3 | 0.726 | 0.527 | 21.411 | 0.023 | 0.001 | | |
| BI1 | 0.705 | 0.497 | 19.445 | 0.024 | 0.001 | 0.715 | 0.558 |
| BI2 | 0.786 | 0.617 | 21.754 | 0.026 | 0.001 | | |
| PVAR1 | 0.691 | 0.477 | 19.998 | 0.026 | 0.002 | 0.797 | 0.497 |
| PVAR2 | 0.676 | 0.457 | 19.457 | 0.027 | 0.002 | | |
| PVAR3 | 0.667 | 0.445 | 19.120 | 0.030 | 0.001 | | |
| PVAR4 | 0.780 | 0.609 | 23.585 | 0.022 | 0.002 | | |

Table 7. Cont.

| Item | Factor Loading | SMC | t | S.E. | Sig. | CR | AVE |
|-------|----------------|-------|--------|-------|-------|-------|-------|
| DC1 | 0.597 | 0.368 | 15.538 | 0.035 | 0.001 | 0.662 | 0.395 |
| DC2 | 0.661 | 0.437 | 17.431 | 0.032 | 0.001 | | |
| DC3 | 0.626 | 0.392 | 16.400 | 0.033 | 0.001 | | |
| AC1 | 0.679 | 0.462 | 18.687 | 0.026 | 0.001 | 0.737 | 0.484 |
| AC2 | 0.673 | 0.454 | 18.488 | 0.026 | 0.001 | | |
| AC3 | 0.733 | 0.537 | 20.500 | 0.026 | 0.001 | | |
| TC1 | 0.684 | 0.468 | 18.434 | 0.031 | 0.001 | 0.690 | 0.427 |
| TC2 | 0.627 | 0.393 | 16.641 | 0.033 | 0.001 | | |
| TC3 | 0.647 | 0.419 | 17.264 | 0.031 | 0.001 | | |
| PR1 | 0.772 | 0.595 | 22.839 | 0.021 | 0.001 | 0.824 | 0.610 |
| PR2 | 0.808 | 0.652 | 24.241 | 0.019 | 0.001 | | |
| PR3 | 0.763 | 0.582 | 22.509 | 0.021 | 0.001 | | |
| PVAL1 | 0.669 | 0.448 | 19.074 | 0.029 | 0.001 | 0.741 | 0.489 |
| PVAL2 | 0.704 | 0.496 | 20.362 | 0.028 | 0.001 | | |
| PVAL3 | 0.723 | 0.523 | 21.069 | 0.023 | 0.001 | | |
| PI1 | 0.818 | 0.670 | 26.160 | 0.018 | 0.002 | 0.853 | 0.658 |
| PI2 | 0.824 | 0.680 | 26.454 | 0.016 | 0.001 | | |
| PI3 | 0.792 | 0.627 | 24.923 | 0.020 | 0.001 | | |

According to Fornell and Larcker [63], when the square root of AVE for each facet exceeds the correlation coefficient between facets, then the model is discriminately valid. The results show that all values on the diagonal of this study are greater than all values outside the diagonal. The results of this study suggest that each construct of this study has good discriminant validity (see Table 8).

Table 8. Discriminant validity.

| | SN | PP | PQ | BI | PVAR | DC | AC | TC | PR | PVAL | PI |
|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|-------|
| SN | 0.793 | | | | | | | | | | |
| PP | 0.625 | 0.773 | | | | | | | | | |
| PQ | 0.571 | 0.664 | 0.681 | | | | | | | | |
| BI | 0.467 | 0.535 | 0.559 | 0.747 | | | | | | | |
| PVAR | 0.481 | 0.601 | 0.594 | 0.439 | 0.705 | | | | | | |
| DC | 0.393 | 0.396 | 0.519 | 0.450 | 0.444 | 0.628 | | | | | |
| AC | 0.429 | 0.453 | 0.515 | 0.493 | 0.437 | 0.461 | 0.696 | | | | |
| TC | 0.360 | 0.432 | 0.447 | 0.375 | 0.572 | 0.410 | 0.459 | 0.653 | | | |
| PR | −0.398 | −0.447 | −0.495 | −0.363 | −0.322 | −0.310 | −0.392 | −0.305 | 0.781 | | |
| PVAL | 0.538 | 0.570 | 0.635 | 0.513 | 0.535 | 0.536 | 0.495 | 0.445 | −0.437 | 0.699 | |
| PI | 0.630 | 0.734 | 0.640 | 0.508 | 0.608 | 0.482 | 0.479 | 0.501 | −0.503 | 0.662 | 0.811 |

4.3.2. Second-Order Confirmatory Factor Analysis

According to Berry et al. [41] and our discussion in Section 2.8, Convenience is subdivided into three categories: Access convenience, Decision convenience, and Transaction convenience. It is theoretically possible to derive the second-order Con from the three constructs. As the first-order CFA results indicate a high correlation between the constructs, it is reasonable to use the oblique second-order CFA to test the model relationship. Figure 3 illustrates that there is a significant correlation between Con, DC, AC, and TC.

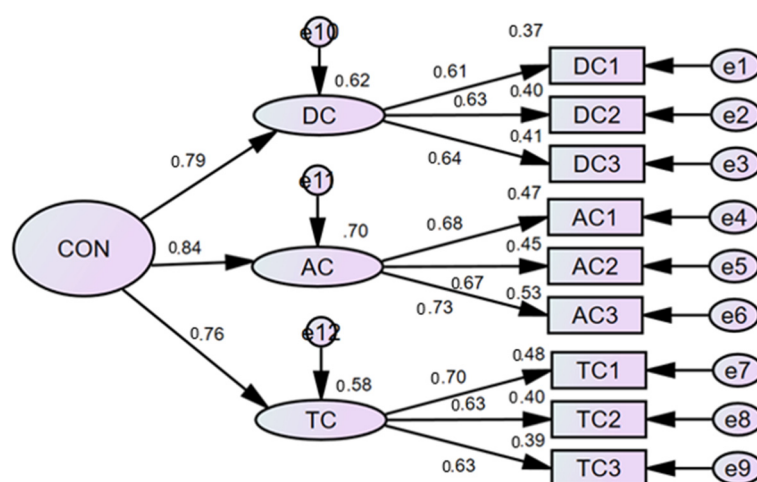


Figure 3. Second-order CFA model.

The model fitting indicators are shown in Table 9. All of them meet the recommended standards. This indicates that the second-order CFA model is well fitted. Hence, Con is a suitable subject to participate in model building as a second-order construct of DC, AC, and TC.

Table 9. Adaptability of second-order CFA model.

| Common Indices | χ^2 | df | χ^2/df | GFI | AGFI | CFI | NFI | RMSEA | SRMR |
|--------------------|----------|----|-------------|-------|-------|-------|-------|-------|-------|
| Judgement criteria | | | <3 | >0.9 | >0.9 | >0.9 | >0.9 | <0.08 | <0.08 |
| Value | 69.560 | 24 | 2.898 | 0.979 | 0.960 | 0.971 | 0.957 | 0.035 | 0.051 |

4.3.3. Results of the Structural Equation Model

Based on the research of Jackson et al. [66], Kline [67], Schumacker [68], Hu and Bentler [69], and other scholars, this study selected multiple indicators ($ML\chi^2$, DF, χ^2/DF , RMSEA, SRMR, AGFI, CFI, NFI, GFI) for analyzing structural model fit. The research constructs should be measured based on the research hypothesis and model as shown in Table 10. All standard model fit evaluation indicators simultaneously satisfy the independent level of recommended fit as well as the combination rule, indicating that the structural models are well fitted to the data, and the theoretical framework assumed by the study is consistent with the actual survey results. Figure 4 illustrates the path coefficients.

Table 10. Adaptability of SEM.

| Common Indices | χ^2 | df | χ^2/df | GFI | AGFI | CFI | NFI | RMSEA | SRMR |
|--------------------|----------|-----|-------------|-------|-------|-------|-------|-------|-------|
| Judgement criteria | | | <3 | >0.9 | >0.9 | >0.9 | >0.9 | <0.08 | <0.08 |
| Value | 938.453 | 462 | 2.031 | 0.924 | 0.908 | 0.957 | 0.919 | 0.038 | 0.037 |

A path effect in the model was tested based on the research of Liao and Hu [70], with “* $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$ ” as the test standard. As shown in Table 11, when PR is the dependent variable, PVAR has a direct positive impact on PR ($p = 0.038$, $\beta = 0.406$). If PVAR is used as the dependent variable, CON ($p = 0.010$, $\beta = 0.517$), PP ($p = 0.016$, $\beta = 0.416$), and SN ($p = 0.087$, $\beta = 0.121$), have a direct positive effect on PVAL. The total positive effects of CON, PP, and SN on PVAL are CON ($p = 0.011$, $\beta = 0.576$), PP ($p = 0.014$, $\beta = 0.419$), and SN ($p = 0.087$, $\beta = 0.121$). When PI is used as the dependent variable, CON ($p = 0.008$, $\beta = 0.534$), PP ($p = 0.016$, $\beta = 0.386$), and SN ($p = 0.088$, $\beta = 0.108$) have indirect positive effects on PI, and PVAL ($p = 0.001$, $\beta = 0.891$) has a direct positive effect on PI.

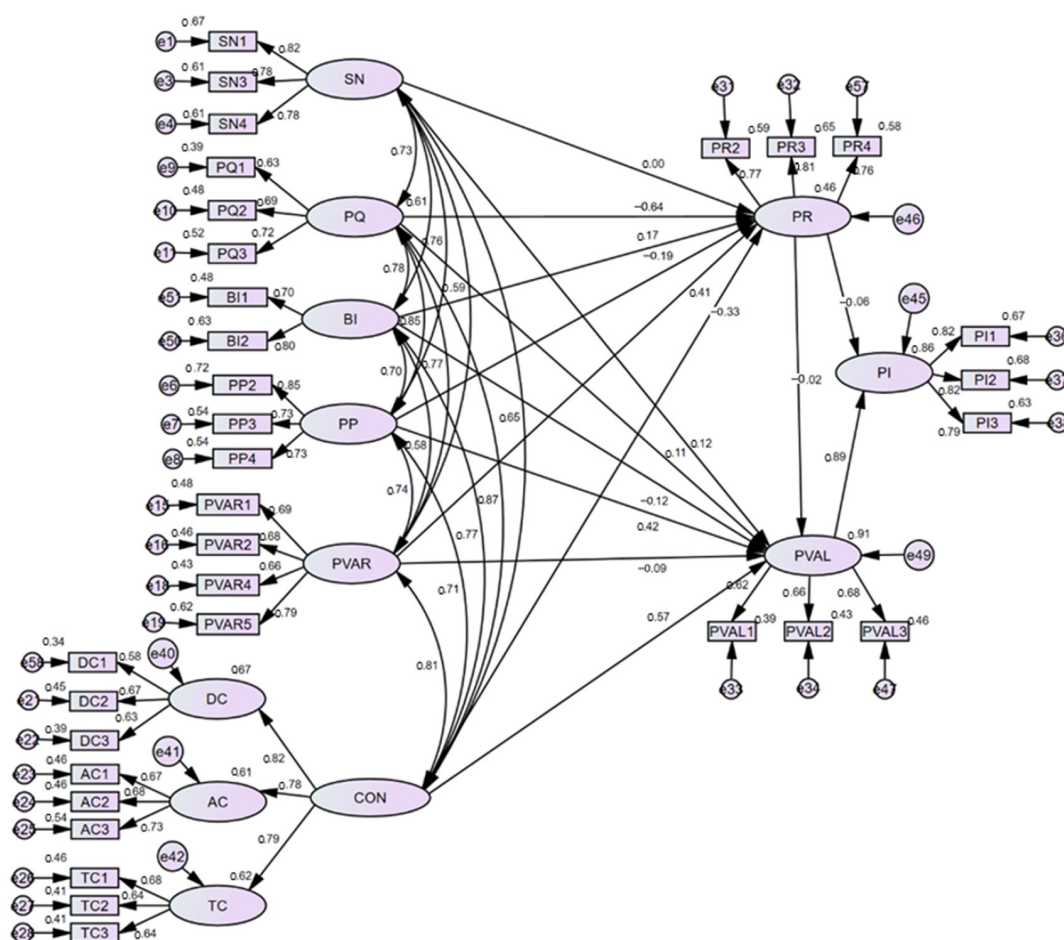


Figure 4. Structural equation model.

Table 11. Direct and indirect effects.

| DV | IV | Direct Effect | | Indirect Effect | | Total Effect | |
|------|------|---------------|----------|-----------------|----------|--------------|----------|
| | | β | B-C Sig. | β | B-C Sig. | β | B-C Sig. |
| BI | PR | 0.167 | 0.246 | - | - | 0.167 | 0.246 |
| CON | | -0.327 | 0.263 | - | - | -0.327 | 0.263 |
| PVAR | | 0.406 | 0.038 | - | - | 0.406 | 0.038 |
| PQ | | -0.636 | 0.103 | - | - | -0.636 | 0.103 |
| PP | | -0.193 | 0.316 | - | - | -0.193 | 0.316 |
| SN | | 0.001 | 0.892 | - | - | 0.001 | 0.892 |
| BI | PVAL | -0.119 | 0.329 | -0.003 | 0.584 | -0.122 | 0.285 |
| CON | | 0.571 | 0.010 | 0.005 | 0.530 | 0.576 | 0.011 |
| PVAR | | -0.090 | 0.547 | -0.006 | 0.725 | -0.096 | 0.477 |
| PQ | | 0.109 | 0.616 | 0.010 | 0.771 | 0.119 | 0.644 |
| PP | | 0.416 | 0.016 | 0.003 | 0.492 | 0.419 | 0.014 |
| SN | | 0.121 | 0.087 | 0.000 | 0.876 | 0.121 | 0.087 |
| PR | | -0.016 | 0.773 | - | - | -0.016 | 0.773 |
| BI | PI | - | - | -0.119 | 0.228 | -0.119 | 0.228 |
| CON | | - | - | 0.534 | 0.008 | 0.534 | 0.008 |
| PVAR | | - | - | -0.111 | 0.331 | -0.111 | 0.331 |
| PQ | | - | - | 0.146 | 0.487 | 0.146 | 0.487 |
| PP | | - | - | 0.386 | 0.016 | 0.386 | 0.016 |
| SN | | - | - | 0.108 | 0.088 | 0.108 | 0.088 |
| PR | | -0.063 | -0.308 | -0.014 | 0.771 | -0.077 | 0.199 |
| PVAL | | 0.891 | 0.001 | - | - | 0.891 | 0.001 |

4.4. Discussions

These validation and verification results provided some key findings that are discussed below: Firstly, we confirmed that PVAL has a positive effect on PI. Multiple studies have demonstrated this influence relationship [71–74]. Creating value is at the core of consumer perception and driving force. Regarding surplus food blind boxes, cost performance, nutritional matching, and customer satisfaction may be aspects of perceived value. This positive perception also drives consumers' consumption intentions and desire to consume in the future. We were surprised to discover that PR had no effect on PI and PVAL with the current model. This was contrary to our hypothesis. The following is a discussion of the intrinsic impact on perceived value and perceived risk.

According to this study, SN had a positive effect on PVAL, no effect on PR, and an indirect effect on PI. SN represents the influence of others on the consumer [25]. Generally, asking another's opinion is an indication that you have concerns or hope for a positive result. Based on the analysis results, most people have positive opinions regarding the purchase of surplus food blind boxes. It demonstrates that, at present, surplus food blind boxes enjoy a good reputation. For these people, surplus food blind boxes pose little risk. Perhaps this is due to the government's increased control over ingredients and supply chains [75], and consumers' inexperience with surplus food blind boxes. It also illustrates that food choices are often negotiated and managed by a group rather than an individual [76]. This also implies that consumer choice or preference is influenced by other people's experience or brand reputation [77].

The results of this study indicate that PQ and BI have no effect on PVAL, PR, and PI, which is contrary to expectations. One explanation could be that the surplus food blind boxes are a specific type of takeaway food. First of all, the raw materials are daily surplus food, which is declared in advance. Furthermore, the randomness of ingredients and cooking styles also reduces consumer expectations. It can also be viewed as another way of saying consumers know what they will find in surplus food blind boxes. For example, sushi or bakery products (since they select those items), but the selection is random [78]. Currently, there are relatively few big brands in China, and the lack of brand effect of surplus food blind boxes may also contribute to the lack of significance of BI.

In this study, PP was shown to have a positive effect on PVAL, no effect on PR, and an indirect effect on PI. As demonstrated in the previous paragraph, consumers do not care about food quality and brand. PP has made it clear that customers are more interested in the overall purchase and experience than the food. On China's largest video site, Bilibili, different bloggers often share videos of blind box purchases and unboxings, including surplus food blind boxes [79]. This is a factor that may influence consumers' purchasing decisions. Perceived playfulness is related to consumers' hedonic value [38], and also directly impacts consumers' participation [80] and happiness [81]. We have been emphasizing the characteristics of surplus food blind boxes in takeout, which make them more interesting than regular takeout. Consumers' expectations, luck, and disappointment all have lottery-like fun, and they also enjoy it.

CON was seen in this study to have a positive effect on PVAL, no effect on PR, and an indirect effect on PI. The intent of our adoption of CON was to believe that the ordering process for surplus food blind boxes is the same as purchasing general takeaway food. Thus, the entire experience of browsing, selecting, communicating, ordering, and evaluating is essential. As can be seen from the results, the analysis of data shows that consumers pay attention to CON. In addition, we have once again demonstrated that convenience is an important aspect of service [82]. Consumers expect the store to offer more convenient services at different stages of the purchase process, as demonstrated by the multidimensional convenience method (DC, AC, TC), including active services (eye-catching advertisements or layouts, offers, etc., in the app) or passive services (blind box matching, purchase path after consumers click, etc.).

In this study, PVAR was found to have no effect on PVAL, a positive effect on PR, and no effect on PI. While PVAR is inconsistent with our expectations, PVAR has become a

positive influence factor for PR. In other words, the more ingredients consumers perceive in the surplus food blind boxes, the greater the perceived risk and anxiety, and the more difficult it is for them to perceive value. As discussed above, consumers are generally confident in the food safety of surplus food blind boxes. Consumer anxiety may be elevated if the blind-box dishes they receive exceed their knowledge of types or practices.

5. Conclusions and Suggestions

The Food Blind Box is a new form of food delivery influenced by the triple factors of environment, economy, and society. It does not only promote the real economy in the post-epidemic era, but also adheres to the concept of environmental protection and has a certain social impact. Therefore, it is critical to promote it vigorously since it is fundamental to the innovation of gastronomy. Consumer perceived value, risk, food quality, brand, playfulness, convenience, variety, and subjective norm for this novel delivery method are examined in this study. Results indicate that some perceptions (interesting, convenience, and subjective norm) are associated with consumer purchase intentions. In addition, we recognize that this is a new form of takeaway, which may result in certain risks. However, its connection with consumers' consumption intentions remains unclear and needs to be clarified through further analysis. In addition to providing ideas for related industries, including manufacturers who wish to create new varieties of food blind boxes, this study could also provide basic insight into how to increase consumer willingness to purchase new products.

5.1. Theoretical Implications

This study has important theoretical implications. The researcher examines the factors that influence consumers' purchase intentions for surplus food blind boxes. Further, by conceptualizing and verifying hypotheses, we constructed a perceived model of consumers' intentions to purchase surplus food blind boxes that can continue to be used in future studies (Figure 5), and extend related theories.

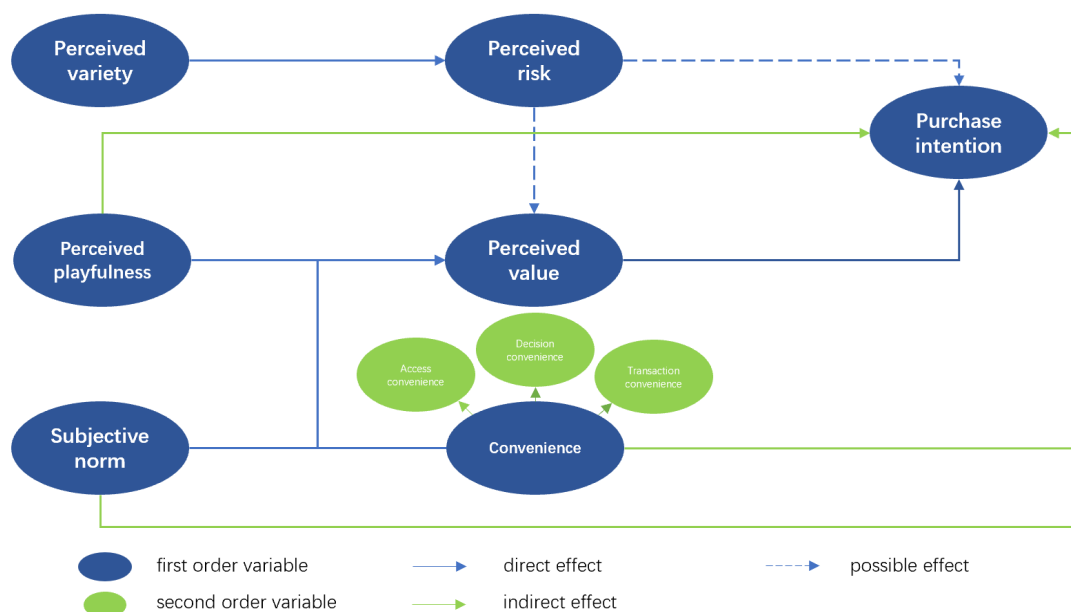


Figure 5. Perceived model of consumer surplus food blind boxes.

SEM has been used to verify and screen model constructs and confirm the impact of SN, PP, and CON on PVAL and PI within this context. The study confirms the impact of PVAR on PR as well. Although PVAR and PR are not related to other dimensions in this study, PVAR's influence on PR is shown, suggesting that there may be some connection between risk and value or intention. As an example, a complete mediation may be generated by

some unknown factor. The relationship between the rest of the presets and PR is unclear, suggesting that we have overestimated the concerns of consumers regarding surplus food blind boxes.

In addition, this study is consistent with the concept of value recreation of secondary innovation in food. Apart from applying to existing restaurants, it can also be utilized to develop a blind box model for fruits and vegetables. There is a special policy in China called Poverty Alleviation Economy or Farmers and Agriculture Supporting Economy. We believe that the blind food box model can also be applied in support of farmers in less developed areas. It has the potential to contribute to society, economy, and the environment in combination with live streaming and other forms of selling.

5.2. Practical Implications

According to our model (Figure 5), the following recommendations should be taken into consideration:

1. Increasing the reputation of surplus food blind boxes (SN). For instance, promoting the amount of carbon dioxide that is reduced per serving and offering reduced prices can attract more customers with a variety of different attributes while making them possible repeat customers.
2. Making blind boxes more interesting (PP), for example, by developing different styles of blind boxes (while preserving the mysterious characteristics of the blind box). The box may look similar, however, there are likely to be additional surprises within. It is also possible to add a QR code to the blind box, so the consumers can scan it and view the condition of the surplus food materials or the cooking process, which is not only entertaining, but also makes them feel more at ease. Maintain a consistent experience (CON) along the entire purchase path, focusing particularly on communication details and smoothness that stimulate consumers' feelings, such as improving menu logic, simplifying purchase steps, etc.
3. Pay attention to the combination of ingredients (PVAR). Although there are relatively few combinations of surplus food, we can develop a number of combinations of surplus food that will best suit the tastes of consumers.

5.3. Limitations and Future Research

The following limitations of this study may suggest future research directions:

1. This paper does not demonstrate the existence of a direct relationship between PR, PV, and PI, but there may be some unknown complete mediation, which is worth investigating.
2. PVAL can be divided in order to study the different dimensions of surplus food blind boxes.
3. Separate the population into distinct subpopulations and conduct differential research and analysis.
4. The present study is a quantitative study using structural equation modeling as the research and analysis method. In the future, qualitative research can be added to elaborate the deeper meaning that quantitative data cannot convey.
5. In this study, Chinese samples were used as research subjects. Research in the future may also establish a comparison of Chinese and foreign data, which will broaden the research horizon and expand the research findings.

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