A Structural Equation Modeling Study on the Influence of Gender on Promotional Framework Effect

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Abstract— With the rapid development of e-commerce, more and more large-scale promotional festivals have begun to appear, and the influence of promotional methods on consumer responses has also attracted more and more attention from researchers. Based on Prospect theory, this paper establishes a Structural Equation Modeling (SEM) and combines eye movement experiments to study the impact of consumer gender and promotion framework effects on consumer perceived value. The results of the research show that consumers' perceived value of loss-reducing promotion methods is significantly higher than that of profit-obtaining promotion, and there is no significant difference in the preferences of men and women for these two promotion methods. Therefore, gender does not affect consumers' choice of promotion methods. The analysis results of eye tracking data further support these conclusions. We recommend that merchants choose to reduce loss promotion as much as possible to increase consumers' perceived value and increase purchase intention, and there is no need to choose different promotion methods according to the gender of consumers.

Keywords-perceived value; Prospect theory; gender; Structural Equation Modeling; sales promotion

1 INTRODUCTION

In recent years, with the popular shopping festivals such as "6. 18" and "11. 11", companies have become more and more aware of the important role of sales promotion. According to whether the promotion is to reduce the price paid or to obtain additional income, it can be divided into two types: loss reduction promotion and profit-obtaining promotion [2]. For example, the most widely used price-reduction promotions and the promotion of gifts provided by enterprises belong to the loss-reducing promotion and the profit-obtaining promotion respectively. When designing promotional activities, companies need to carefully consider which promotional methods to construct, because the framework will affect consumers' preferences for different promotional methods. However, in the existing research, there is no unified conclusion about the comparison of the pros and cons of the two promotion methods. Based on this, many scholars have discussed the role of different adjustment factors such as discount level [3] and social distance [4]. However, further research is still needed on the influence of consumer gender on the promotion framework effect. Based on the above research background and current situation, this article constructs a structural equation model (SEM) for the impact of gender and promotion framework effects on consumers' perceived value, and

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collects eye movement and questionnaire data for empirical analysis through an eye movement experiment.

2 LITERATURE REVIEW AND RESEARCH HYPOTHESES

2.1 Promotional Framework and Prospect Theory

Promotion refers to a marketing technique that stimulates consumer demand by providing additional rewards or value within a certain period of time [1]. According to whether the promotion is to reduce the price paid or to obtain additional income, it can be divided into two types: loss reduction promotion and income promotion [2]. Promotions with the same level of profit but different expressions will have a framing effect, which will change consumers' decision-making preferences. For example, Yi-Fen, zhizhi and Risheng [3] found that different price levels have a moderating effect on the promotion framework. The research of Koo and Suk [4] shows that social distance regulates consumers' preference for promotion frameworks. In summary, there is a large amount of literature researching the influence of the adjustment factors of the promotion framework, but less research pays attention to the influence of consumer gender, so this article further explores the influence of consumer gender to reduce loss promotion and gain-profit promotion.

In the prospect theory, the person who is the subject of the behavior can be divided into two stages in the decision-making process. The first stage is to collect and sort out the events and their processes, results, etc., to form a general perception of the events; and the first The second stage is the stage of evaluating and responding to events and making decisions. Therefore, the value function and decision weight jointly determine the prospect value of the alternative, namely:

$$V = \sum_{i=1}^{n} \omega(p_i) v(\Delta x_i) \tag{1}$$

Among them, V is the prospect value, $w(p_i)$ is the decision weight function, which is usually a monotonically increasing function of the probability value; $v(\Delta x_i)$ is the value function, which is the value reflection of the decision maker's subjective feelings, and Δx is the decision-making the difference between the reference points of the scheme, the positive and negative of Δx respectively represent the gain and loss.

The calculation formula of the value function given by Tverskv and Kahneman is:

$$v(\Delta) = \begin{cases} v(\Delta)^{\alpha}, (\Delta\chi \geq 0) \\ -\theta(-\Delta\chi)^{\beta}, (\Delta\chi < 0) \end{cases} \tag{2}$$

In the formula, $\Delta\chi$ is the difference between the decision plan phase and the reference point. When Δx is a positive value, it means gain, and when $\Delta\chi$ is a negative value, it means loss. α, β are the risk attitude coefficient, the value range of the two are $0 < \alpha, \beta < 1$. θ is the loss avoidance coefficient. When $\theta > 1$, the decision maker is sensitive to loss.

The expression of the decision weight function given by Tversky& Kahneman to express gains and losses is as follows:

$$\omega(p)=\begin{cases}\dfrac{p^{\gamma}}{\left(p^{\gamma}+(1-p)^{\gamma}\right)^{1/\gamma}}, (\Delta\chi \geq 0)\\ \dfrac{p^{\delta}}{\left(p^{\delta}+(1-p)^{\delta}\right)^{1/\delta}}, (\Delta\chi < 0)\end{cases} \quad (3)$$

$\omega(p)$ is the probability weight function of the non-linear case, $\gamma$is the risk-return attitude coefficient, $\delta$is the risk-loss attitude coefficient, and their value ranges are $0<\gamma<1$, $0<\delta<1$. In the study of Tversdian and Kahneman, the value of γ is 0. 61, the value of δ is 0. 72.

2.2 Perceived Value

Perceived value can be defined as the overall evaluation of the utility of a product or service after a consumer compares the perceived gain and perceived effort [5]. Consumers believe that promotional activities are increases in product value or decreases in price [6]. The availability of promotional activities helps to form a positive perception by increasing the value of the product. Promotions can be divided into two types: loss reduction and gain; their impact may be different. According to the prospect theory proposed by Kahnman and Tversky [7], people are generally loss-averse. Therefore, people should prefer the loss-reducing promotion more than the profit-obtaining promotion. So we put forward the hypothesis that for consumers the perceived value of loss-reducing promotions is higher than that of gaining promotions.

H1: The perceived value of loss-reducing promotions is higher than that of gaining promotions

2.3 The role of Gender

There are still some differences in current research on the influence of gender on decision-making under the framework effect. Kahneman and Tversky [7], the earliest proponents of framing effect, believe that framing effect is an irrational decision-making caused by the way of information processing, which is universal and will not be affected by the gender of the decision maker. Levin et al [8] used the inter-subject design to investigate the framing effect and its influencing factors and found that gender did not have a significant impact on the framing effect. However, Huang and Wang [9] found that the framing effect is gender-specific by adjusting the framing effect to gender under different task types, and the framing effect of different task domains will be different according to the different gender roles. Previous studies have found that compared with men, women are more ethical, sensitive, have more delicate emotions and stronger emotional expression skills. while men are more confident, self-esteem, more task-oriented and instrumental behavior. Carpenter and Moore [10] studied the gender differences in perceiving the pleasure brought by non-comparable promotions and found that women perceive more pleasure. Similarly, Tifferet and Herstein [11] found that women have higher levels of hedonic consumption. Chandon Wansink and Laurent [12] found that profit-obtaining promotion is more enjoyable than loss-reducing promotion. Based on the above research, we propose the following hypotheses:

H2: Gender has a moderating effect on the relationship between promotion frame effect and perceived value

H3.1: For men, the perceived value of loss-reducing promotions is higher than that of gaining promotions.

H3.2: For women, the perceived value of gaining promotions is higher than that of reducing losses.

2.4 Consumer Perception and Attention Distribution

Recent years, eye tracking technology has been widely used in research on consumer behavior and has provided many valuable insights for this. Previous studies on eye movement and motivation process have proved that people always tend to look at their favorite options, and will look at their final choice more frequently and for a longer period of time. For example, Duerrschmid and Danner [13] studied the relationship between gaze behavior and food choices, and the results showed that the more visual attention a product receives, the stronger the probability of consumers choosing it. In the same year, Fenko and Nicolaas,Galetzka [14] measured the relationship between the duration of fixation and the number of fixations and consumer choices and showed that the higher the degree of attention to food health labels, the healthier the subsequent choices of food for consumers Therefore, this article selects the number of fixations and the length of fixation to study the impact of casual emotions and promotion frameworks on consumer response. Based on Hypothesis 2 and Hypothesis 3, we propose the following hypotheses:

H4: Men's attention to loss-reducing promotions is longer than profit-reducing promotions.

H5: Men pay more attention to loss-reducing promotions than profit-reducing promotions.

H6: Women pay more attention to gaining promotion than reducing loss promotion.

H7: Women pay more attention to gaining promotions than reducing losses.

In summary, the research model of this article is shown as Figure 1:

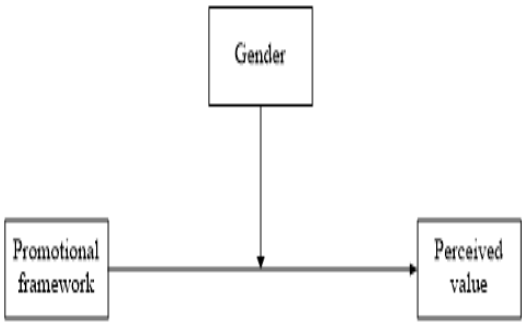

Figure 1. Theoretical model

3 EXPERIMENTAL DESIGN

This experiment uses 2 (promotional framework: loss-reducing promotion, profit-obtaining promotion) *2 (gender: male, female) test room experiment design. The loss-reducing promotion here refers to the price reduction promotion, and the profit-making promotion refers to the gift promotion. the discount in this article is unified at 20%.

According to the 2020 CNNIC report, people aged 18-25 account for 60% of online consumers in China. They are the main force of online consumption. Therefore, the survey results of college students can reflect general consumption. In this experiment, 56 college students and graduate students are selected to participate in this experiment, with an average age of 23.48±1.75. All subjects had normal vision or normal vision correction. Participants were randomly assigned to different groups of experiments. The experimental equipment used in this study is the iView ETG eye tracker from SMI, Germany. The web page was displayed on the computer screen in front of the participant, and the distance from the participant's eyeball was 60 cm.

Taking into account the average consumption level of college students, this article chooses a T-shirt as the stimulus, and sets the price at RMB 100. The purchase webpage is designed based on a well-known webpage, with slight adjustments to conceal its name and related information. The two web pages only have different promotion methods, and there is no difference in other content (see Figure. 2 and 3 for experimental materials). The experiment process is as follows: when the subject enters the experiment, a "+" appears in the center of the screen for 500ms, and then the experiment instruction is presented: Imagine that you now want to buy a T-shirt. You stumbled upon a T-shirt promotion webpage while browsing the web. The webpage will be displayed after 20s. The presentation time of the experiment instruction is 20s. Then it automatically jumped to the promotion webpage, and the webpage was presented without time limit. After the subjects browsed the promotion webpage, they could press the "space bar" to jump to the next page. The last is the Likert 7-point scale for the measurement of perceived value. The measurement of the participants' perceived value (α=0. 07) is adapted from Dodds [6]. The three topics are “I think it’s worthwhile to buy the product under this promotion method” ; “This promotion is very economical to purchase this product” ; “this promotion is very attractive to me ”.

4 DATA ANALYSIS

In this study, StructuralEquation Modeling (SEM), combined with the analysis of eye movement data, was used to support it. All data in this study are analyzed using spss26.0.

4.1Manipulability Test of Experiment

In this study, structural equation modeling (Structural Equation Modeling, SEM), combined with the analysis of eye movement data, was used to support it. All data in this study are analyzed using spss. The manipulative test of the two promotion methods shows that the loss-reducing promotion (M1=4.86) brings higher perceived savings to consumers than the profit-obtaining promotion (M2=4.01, F=34.852, $p<0.05$). Profit-obtaining promotion (M2=4.76) brings higher perceived gain than loss-reducing promotion (M1=4.33, F=9.653, $p<0.05$). In summary, this article has successfully manipulated the promotion methods.

4.2Analysis of eye movement data

In order to better analyze the difference of the participants' attention to the promotion information when browsing the web, we defined the following two areas of interest (AOI): the price reduction promotion is defined as AOI1, and the gift promotion is defined as AOI2. As shown in Figure 2 and Figure 3. This experiment analyzes the gaze duration (in seconds) and

the number of gazes on the region of interest to study the differences in information processing of each participant. Among them, the gaze duration measures the duration of all gazes in the AOI (area of interest).

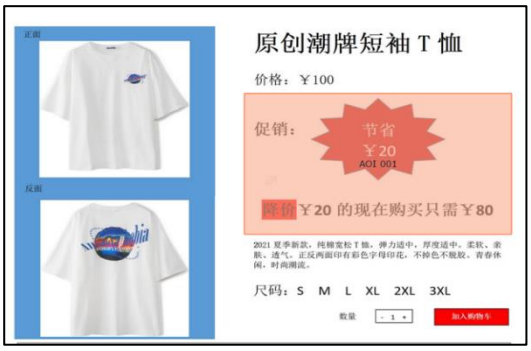

Figure 2. Loss reduction promotion (AOI1)

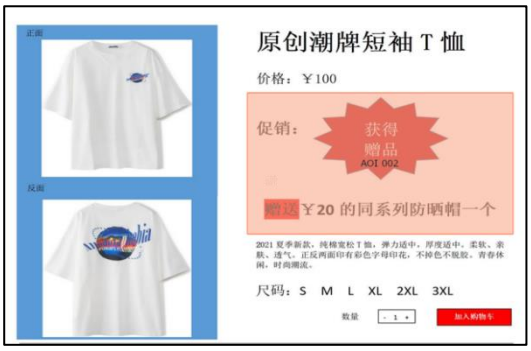

Figure 3. profit-receiving promotion (AOI2)

Analyzing the gaze length of men and women who are interested in loss-reducing promotion, it is found that the difference between the gaze time of men (Mmale=6.343) and the gaze time of women (Mfemale=7.084) is not significant (F=0.362, P=0.554>0.05); At the same time, the gaze duration of men and women on the region of interest for profit-receiving promotions is analyzed, and it is found that the gaze duration of men (Mmale=3.847) and the gaze duration of women (MFemale=3.75) are not significantly different (F=0.007, P=0.935>0.05) (see Figure 4). Therefore, the H4 and H6 are not valid. A two-way analysis of variance was carried out with the length of fixation as the dependent variable and gender and promotion method as the independent variables. The results are shown in Table 1. The main effect of promotion framework information is significant (F=12.273, P=0.001<0.01), the main effect of gender is not significant (F=0.152, P=0.699>0.05), and the interaction between promotion methods and gender is not significant (F=0.251, P=0.619>0.05). Therefore, the gender of the consumer does not affect the length of time consumers pay attention to the promotion method.

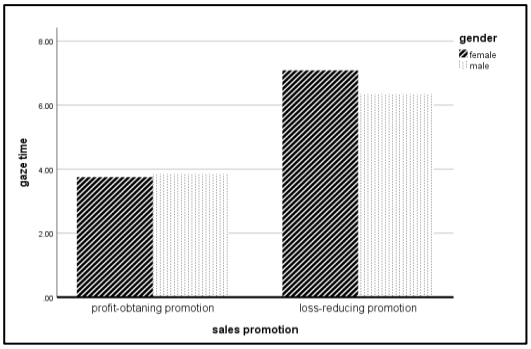

Figure 4. the gaze length

TABLE 1. THE RESULTS FOR TWO FACTORS VARIANCE ANALYSIS OF AVERAGE FIXATION TIME FOR SALES PROMOTION

Variable	Dependent variable	F	Sig.
Sales promotion	Gaze time	12. 273	0. 001
Gender		0. 152	0. 699
Sales promotion*gender		0. 251	0. 619

Analyzing the number of gazes that men and women are interested in loss-reducing promotion, it is found that there is no significant difference between the number of gazes of men (Mmale=5.624) and the length of gaze of women (Mfemale=5.512, F=0.009, P=0.927>0.05); At the same time, the gaze duration of men and women in the region of interest for profit-receiving promotion is analyzed, and it is found that the gaze duration of men (Mmale=3.294) and the gaze duration of women (Mfemale=3.717) are not significantly different (F =0.167, P=0 678>0.05) (see Figure 5). Therefore, the H5 and H7 are not valid.

A two-way analysis of variance was performed with the number of fixations as the dependent variable and gender and promotion method as the independent variables. The results are shown in Table 2. The main effect of promotion framework information is significant (F=6.725, P=0.013<0.05), the main effect of gender is not significant (F=0.113, P=0.739>0.05), and the interaction between promotion methods and gender is not significant (F=0.038, P=0.846>0.05). Therefore, the gender of the consumer does not affect the number of consumers' attention to the promotion method.

TABLE 2. THE RESULTS FOR TWO FACTORS VARIANCE ANALYSIS OF AVERAGE FIXATION NUMBERS FOR SALES PROMOTION

Variable	Dependent variable	F	Sig.
Sales promotion	the number of fixations	6. 725	0. 013
Gender		0. 113	0. 739
Sales promotion*gender		0. 038	0. 846

In order to understand the individual's gaze more intuitively, we give a comparative analysis of the heat map of the promotion methods under each emotion, as shown in Figure 6. The results of the hot zone map show that consumers pay more attention to the loss-reducing promotion

than the profit-making promotion. However, there is no significant difference in the degree of attention paid by male and female consumers to a certain promotion method.

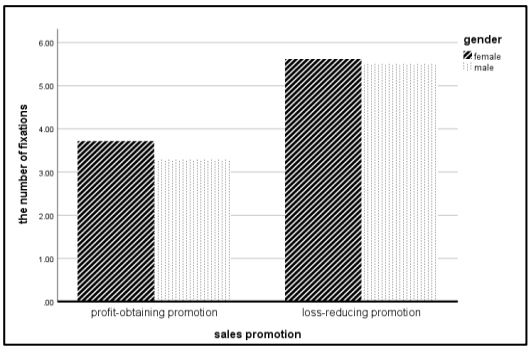

Figure 5. the number of fixations

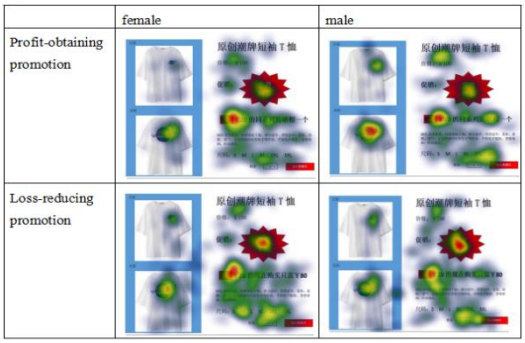

Figure 6. Heat map

4.3Structural equation model analysis

The gender is divided into two groups: male and female, then we verify the regulation effect through the structural equation model. The display results are shown in figure 7. The results show that gender has no moderating effect on the relationship between promotion frame effect and consumer perceived value ($p>0.05$).

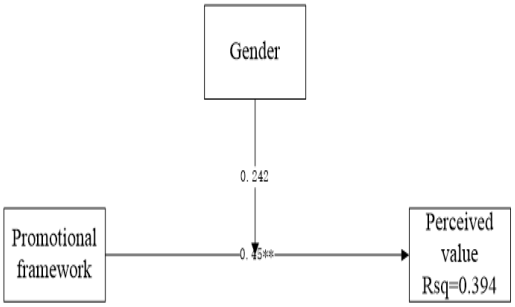

Figure 7. Structural equation model analysis results

For individuals of different genders, there is no significant difference in their preferences for different promotion ways (see figure 8). For the loss-reducing promotion framework, there is no significant difference between the perceived value of men (Mmale=4.30) and the perceived value of women (Mfemale=4.36, F=0.710, P=0.558>0.05); for the gaining promotion framework, The perceived value of men (Mmale=2.86) and women's perceived value (Mfemale=3.13) are not significantly different (F=0.659, P=0.426>0.05). Therefore, the H3.1 and H3.2 are not valid.

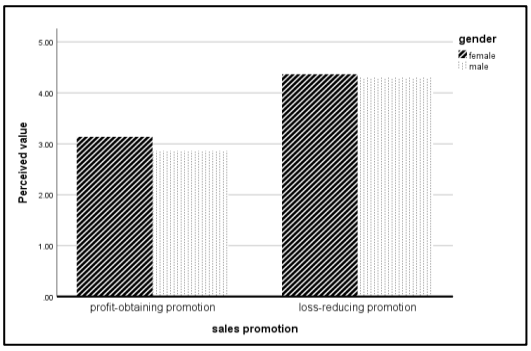

Figure 8. Perceived value of men and women under different promotion methods

5 CONCLUSION AND DISCUSSION

This paper analyzes the eye movement experiment and examines the role of consumer gender in gaining profit promotion and loss-reducing promotion on consumer's perceived price. The results of the study show that gender does not have a moderating effect on the impact of promotional frameworks on consumers' perceived value. In general, regardless of male or female consumers, the perceived value of loss-reducing promotions is significantly higher than that of gaining promotions. and there is no significant difference between male and female consumers in the perceived value of loss-reducing promotions. Similarly, there is no significant difference between the two in terms of the perceived value of profitable promotions. Specifically, participants' attention to loss-reducing promotions, that is, the length of their gazes and the number of gazes, is significantly higher than that of profit-reducing promotions. However, there is no significant difference in the degree of attention paid by male and female consumers to a specific promotion method of the two. For example, there is no significant difference between the gaze duration and the number of gazes between male and female participants in the loss-reducing promotion. Similarly, there is no significant difference between the gaze duration and the number of gazes between male and female participants in the profit-reducing promotion. It can be seen that when companies or merchants are faced with a choice between price reduction promotions and gift promotions, price reduction promotions bring higher perceived value to consumers and therefore will bring better promotional effects. At the same time, when men and women face the same promotion method, there is no significant difference in the perceived value of the two, that is, gender will not affect consumers' promotion preferences. Therefore, companies may not need to segment consumer gender, but only need to increase consumers' attention to promotion methods as much as possible in order to obtain better promotion effects.

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