



THE INFLUENCING FACTORS OF CUSTOMER SATISFACTION OF O2O FOOD TAKEOUT PLATFORMS – A SOCIAL INSTITUTIONAL ENVIRONMENT PERSPECTIVE



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ABSTRACT

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Online-to-offline (O2O) takeout platforms have become an important way of food consumption in modern life. However, some problems, such as unlicensed operation and poor service, have been exposed. Therefore, it is very important to identify the factors that affect customer trust and satisfaction. However, there are very few studies on consumer satisfaction of takeout platforms in the existing literature. This paper builds a model according to the development of the O2O takeout industry and verifies it by questionnaires and web crawler data. Finally, SPSS data analysis software is used to analyze the variables. The results show that internal mechanisms and social environments affect the trust of users regarding O2O platforms. Also, with the improvement of users' trust, their perceived level of risk will decline, and their satisfaction will increase. Finally, suggestions of optimizing the platform mechanisms and improving service quality and attitude are advised.

Contribution/Originality: Existing studies focus on to takeout merchants without considering the impact of third-party platforms and social environments. In this study, the operation mechanisms and the social institutional environments of the third-party platforms are investigated based on the theory of institutional trust.

1. INTRODUCTION

This paper takes Meituan and Eleme, the leading enterprises in the O2O food takeout industry, as the research objects and analyzes the important factors affecting users' trust and satisfaction based on the platform's mechanism and social system environment and characteristics. In recent years, under the double catalysis of the rapid development of mobile internet and policy support, O2O food delivery has undoubtedly become the main melody of the future development of the catering industry. Therefore, based on the current situation of China's economic

development, this paper discusses the O2O food takeout model. After carefully reading relevant literature on the O2O food takeout industry and institutional trust, the research theme of this paper will focus on the aspects outlined below. Scholars have extensively explored the influencing factors of consumer satisfaction in B2C, B2B and C2C business situations. However, due to the short length of time that the O2O model has been in existence, the research scope is relatively small, and the discussion focusing on the food takeout industry is not sufficient and mostly focuses on the takeout business level. Therefore, based on the theory of institutional trust and regional systems, this paper mainly analyzes consumer trust and satisfaction from the perspective of third-party platforms and social system environments. The mechanisms are discussed and the important influencing factors of customer trust and satisfaction in O2O food takeout mode are proposed.

Considering the insufficiency of enterprise development to strategically enhance customer satisfaction, according to the analysis of the empirical research, this study is dedicated to O2O food delivery platforms and offers suggestions on how to improve customer satisfaction and guide enterprises to make better use of the advantage of the O2O business model to achieve more rapid progress. Second, for consumers, the improvement of product and service quality of takeaway platforms and merchants will bring them more satisfactory consumption experiences.

Although the takeout industry is developing in full force, due to imperfect platform mechanisms and the existence of the vacuum zone of government supervision, a series of problems such as food safety and hygiene, takeout price, distribution service, after-sales rights protection, and automatic renewal of membership occur frequently. Inferior quality and evasion of responsibility have become the labels of platforms and businesses. It has seriously damaged the trust and satisfaction of consumers on outsourcing platforms and merchants. Based on the development status of the industry mentioned above, taking the users of the Meituan and Eleme platforms as the research objects, this paper intends to explore the following two questions through institutional trust theory and regional formal system theory: (1) Does the internal operation mechanism of the platform have an impact on customer trust and satisfaction? (2) Can the social institutional environment indirectly influence customer trust and satisfaction by constraining corporate behavior?

2. PROPOSED RESEARCH HYPOTHESIS AND MODEL FRAMEWORK

2.1. Basic Theoretical Model

This study is based on the research results of Pavlou (2002). In the online transaction model based on institutional trust, transaction intention and actual transaction behavior are studied as dependent variables, but the psychology and behavior of customers after the occurrence of actual transactions are not studied. Therefore, in order to further expand the follow-up research, this study takes consumer satisfaction after transactions as the main focus. As an important indicator of consumption experience, customer satisfaction is of immeasurable significance to the development of enterprises. After reading through the literature, it was found that customers' overall perception and evaluation of products or services plays an important role in both traditional offline transactions and transactions where online third-party platforms serve as guarantors. In both cases, customers' decisions on whether to make a repeat purchase will be greatly affected. Many studies have confirmed that customer satisfaction and trust are the direction indicators for the prediction of repeat purchase intention. Therefore, customer satisfaction does not only measure the previous transaction experience, but also predicts the probability of repeat purchase behavior in the future. Therefore, this study replaces the transaction intention and actual transaction behavior of the original model with customer satisfaction to study consumers' consumption experience.

Combined with the characteristics of the O2O food takeout industry, this paper abandoned the traditional mature customer satisfaction models – the Sweden Customer Satisfaction Barometer (SCSB), American Customer Satisfaction Index (ACSI), European Customer Satisfaction Index (ECSI) and the Chinese Customer Satisfaction Index (CCSI) – which are not suitable for the internet background, and chose the online transaction model based on

institutional trust proposed by Pavlou (2002), which takes user trust and risk perception as intermediary variables, as the theoretical basis. In the context of the internet, transaction processes and consumer psychology have undergone significant changes, and customer trust and risk perception have important reference values in consumer psychology and behavior. Against the background that both parties of an online transaction are unknown to each other, when customers perceive the transaction scene as trustworthy and risk free, it can promote the transaction and result in a positive evaluation. Considering that O2O catering is an ecosystem composed of platforms, merchants, riders and consumers, and platforms and merchants are the main service providers in this transaction chain, this study introduces trust in platforms and store owners and perceived risk as intermediary variables into the research model. Meyer initiated the academic circle to think about the interaction between institutional environment and corporate behavior. The institutional basis view holds that corporate behavioral decisions and strategic choices are the results of interactions with institutional environments. Enterprises are embedded in the social institutional environment, and their behaviors will be guided and constrained by government systems. Only by complying with the provisions of the formal systems and adopting generally acceptable business behaviors can enterprises be more easily supported by the government and favored by consumers. The reason why market regulation can play an effective role is that enterprises perceive that violating regulations will bring unbearable costs. In the online trading model based on institutional trust, the platform's internal operation guarantee mechanisms include a feedback evaluation system, a payment guarantee system, a branch certification mechanism and a price mechanism. According to the actual operation status of O2O food delivery platforms, their business behavior will also be affected by the regional formal systems, government regulations, platform image and social influence, among other social system environments. When consumers have a takeout experience, they will interact directly with the platform frequently, and the platform behavior will have an impact on consumers' consumption experience, trust and satisfaction. Therefore, social system and environmental factors will have an impact on customer trust and satisfaction by acting on enterprise behavior. As a result, important social institutional environment factors, such as the regional formal system, government regulations, platform image and social influence, are included into the research model to explore their role in establishing and maintaining customer satisfaction, and to make up for the defect of ignoring social institutional environment in the original institutional theoretical model.

This paper explores the factors affecting satisfaction from the perspective of platform operation mechanism and social system environment. As the main providers in the transaction chain, merchants and riders also have a significant impact on customer satisfaction. For example, Subramani, Vignesh, Mukundan, and Kumar (2015) showed that product quality, delivery service and personalized service have a significant influence on customer satisfaction. In order to obtain more accurate empirical results, the factors of product quality, delivery service and personalized service that have an important impact on customer satisfaction are added into the model as control variables.

In this study, Meituan and Eleme are the two leading O2O food takeout platforms used as the research subjects. This study attempts to explain the key factors affecting customers' trust and satisfaction of O2O distribution platforms, including the platform's operating system and social institutional environment. See Figure 1 for the specific research model. The differences between the model studied in this paper and the model used by Pavlou (2002) are as follows: First, the influence factors at the social system and environment level are added in this paper to enrich the hypothesis relationship of the model; and second, since product quality, delivery service and personalized service affect customer satisfaction to a large extent and is directly related to the behavior of takeaway merchants, this study mainly focuses on the influence of the platforms' internal mechanisms and social system environments.

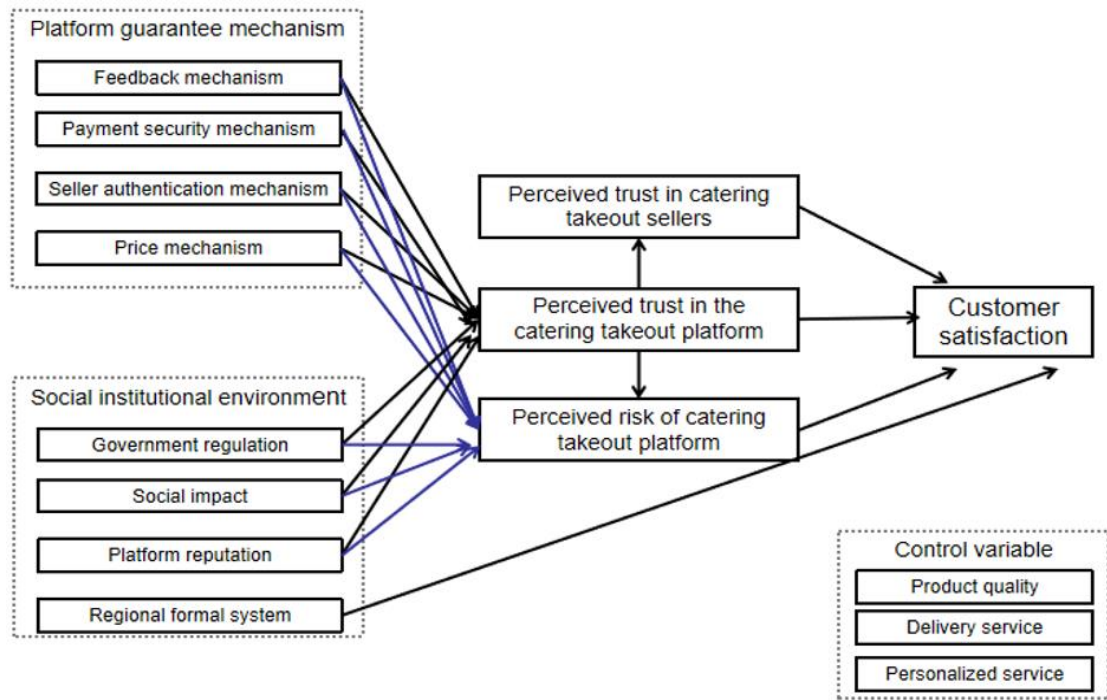


Figure 1. Research model in this paper.

2.2. Definition of Variables in the Model

This section focuses on the studies related to trust and satisfaction of food delivery platforms in the O2O economic environment by reading the references, and defines the variables involved in combination with the characteristics of this study to define the research content more clearly.

2.2.1. The Dependent Variable

Customer satisfaction levels are used as the measurement index of customer satisfaction. The difference between expectation value and actual perception will produce different levels of satisfaction. The actual perception values that are below, equal to, and higher than the expectation values correspond to the results of dissatisfaction, satisfaction, and quite satisfied, respectively.

2.2.2. The Independent Variable

2.2.2.1. Definition of Internal Operation Mechanism Factors of the Platform

In this paper, the actual usage scenarios of users are taken as the reference standard, and it is believed that the differences of trading systems and trading processes stipulated by different platforms will affect the users' perception regarding platform trust and risk level. Therefore, the following mechanism variables are measured to obtain users' perception of them.

(1) Feedback mechanism: The feedback guarantee mechanism provided by O2O food takeout platforms can ensure that consumers make specific comments on sellers and riders, such as written reviews of the service and their overall experience satisfaction rating, which is the main way for consumers to protect their legitimate rights and interests.

(2) Payment security guarantee mechanism: The diversified payment channels provided by O2O food takeout platforms bring convenience but also inevitably have potential unknown risks. No one will actively use services that pose potential threats, so the perceived security of the payment system is the key to determining whether transactions are completed securely and consumers continue to use the platform.

(3) Owner authentication mechanism: For O2O food takeout platforms, offline merchants are organizations that provide products and services for platform users, and the food and service they provide will directly affect consumer satisfaction. In order to ensure the taste and hygiene of takeout food, O2O food takeout platforms need to conduct qualification certification and reviews of online businesses.

(4) Price mechanism: Food price and delivery cost constitute the direct cost of ordering takeout food. As consumers' ability to obtain information is greatly improved, it is easy to obtain the price tag of homogenized products and delivery on various platforms. In addition, enterprises increasingly rely on various marketing activities and discounts to attract consumers' attention and preference in the homogeneous competition with rival products. Therefore, reasonable and attractive food prices, delivery fees and discounts have a significant impact on consumers' purchasing behavior and post-purchase experience.

2.2.2.2. Definition of Influencing Factors of Social System Environment

In addition to the internal mechanisms of the platforms affecting consumers' trust, regional formal system, government supervision, social influence, platform reputation and other social institutional environment will also have an impact on consumers' trust in the platform, thus affecting consumers' satisfaction.

(1) Regional formal system: Among the tools used in this study to describe the formal institutional environment of provinces and cities in China, the marketization index and five sub-indexes contain the main reference data.

(2) Government supervision: Relevant national departments have the right to supervise enterprises' business activities according to law. The reason why market supervision can play an effective role is that enterprises want to avoid illegal behaviors because they perceive that violations of rules will bring unbearable costs.

(3) Social influence: As a member of a social group, an individual's behavior, attitude and choices are often influenced by others in the social group. The evaluation of O2O food delivery platform by friends, family and other social channels will affect users' judgment and attitude towards the safety of the platform.

(4) Platform reputation: The social image is the spokesperson of the enterprise's products and services. Users will judge the service quality of the platform based on whether it has a good social reputation, which has a potential effect on the psychology and attitude of customers before consumption.

2.2.3. Definition of Mediation Variables

(1) Trust in the platform: The platform is a bridge between consumers and unfamiliar merchants, and there are frequent interactions with consumers in the transaction process. Platform trust refers to the degree of consumers' subjective trust in the behavior and services of the platform, while the opposite is the degree of risk that consumers believe they may face when using the platform. Consumer satisfaction is mainly affected by both.

(2) Trust in store owners: The merchants who enter the platform are the ones who communicate directly with users, and the products, services and service attitudes they provide determine the satisfaction of consumers and whether the transaction can continue.

(3) Perceived risk: Online shopping is more likely to result in dissatisfied customers than traditional shopping. Professor Bauer proposed that online shoppers' subjective judgment of bad results and degree of loss is the perceived risk.

2.2.4. Definition of Control Variables

(1) Product quality: Customer requirements are the core focus of restaurants. Food providers are concerned about ingredients, taste, quantity, price, and all aspects of reservation experience that will directly affect consumer satisfaction.

(2) Delivery service: The difference in consumption is the main difference between traditional restaurants and the O2O food takeout industry. Therefore, under the mode of business logistics, distribution become an influence of consumer experience, distribution method, speed, cost, and the riders' attitude, all of which will have an effect on customer satisfaction to different degrees.

(3) Personalized service: In today's era of pursuing individuality, people are increasingly pursuing novel and different things. Therefore, in order to continuously improve customer satisfaction, businesses now need to provide different products and services for different customers.

Table 1 lists the specific variables involved in this paper.

Table 1. Summary of all variables.

Variables Name	Definition	Reference Source	Variable Type
Customer satisfaction	Consumers' satisfaction with the food delivery platform and the merchant's entire service process.	Oliver (1999); Kim and Cardozo (1965)	Explained variable
Feedback mechanism	To ensure the smoothness and timely response of customer feedback.	Kim and Ferrin (2008)	Explanatory variable
Payment security mechanism	The degree of safety of consumers' payment information.	Paul and Pavlou (2004)	Explanatory variable
Store owner authentication mechanism	The degree to which the platform verifies and certifies merchants before allowing them to conduct business on the platform.	Kim and Ferrin (2008)	Explanatory variable
Price mechanism	Recognition of reasonable pricing of food delivery platforms.	Chen (2007)	Explanatory variable
Regional formal system	The degree of development of market environment in each province.	Mayer (2013)	Explanatory variable
Government regulations	Consumers' perception of the degree of government supervision and support for food delivery platforms.	Kamal and Chen (2016)	Explanatory variable
Social influence	The extent to which opinions and recommendations from friends influence consumer behavior and psychology.	Cox and Rich (1964)	Explanatory variable
Platform reputation	Consumers' recognition of the reputation of food delivery platforms.	Kim, Ferrin, and Rao (2010)	Explanatory variable
Trust in the platform	The degree to which consumers trust the platform based on direct experience and the interaction process in the presence of risks and uncertainties.	Hoffman and Peralta (1999)	Intervening variable
Trust in the store owner	The willingness of consumers to trust merchants not to act maliciously.	Hoffman and Peralta (1999)	Intervening variable
Perceived risk of using the platform	Consumers make subjective judgments about the possibility of adverse consequences caused by using food delivery platform services.	Paul and Pavlou (2004)	Intervening variable
Product quality	Consumers' recognition of food provided by food delivery platforms.	Subramani et al. (2015)	Control variable
Shipping service	Consumers' recognition of the distribution method, speed and cost of food delivery platforms.	Subramani et al. (2015)	Control variable
Personalized service	Consumers' recognition of the food delivery platform to meet their specific needs.	Verma, Sharma, and Sheth (2016)	Control variable

2.3. Research Hypothesis

From the above description of the research model, it can be seen that the platform operation guarantee mechanism and social institutional environment play an effective role in consumer satisfaction by influencing consumers' perception of platform trust, platform risk and the transmission effect of merchants' trust.

2.3.1. The Relationship Between the Perception of Platform Operation Mechanism and Consumers' Trust in the Platform

The completeness of the online transaction channel system is the key to driving consumers to use it. Kamal and Chen (2016) believe that the primary means to enhance interpersonal mutual trust in the context of the sharing economy is to strengthen the implementation of platform mechanisms, such as background checks and identity authentication. Hoffman, Novak, and Peralta (1999) explored the psychology of consumers engaged in e-commerce transactions and examined whether the security level of the personal information management system of e-commerce websites is completely secure (e.g., if credit card information is at risk of disclosure) has a positive effect on the trust level of consumers and whether transactions can be carried out smoothly and result in repeat purchases. Ensuring the security of funds and personal information is a prerequisite for consumers to continue using e-commerce platforms. Also, the entry threshold of platform merchants and food hygiene and safety issues are always the most concerning issues for consumers. Some studies found that the protection system built by the platforms can prevent threats to consumer rights and interests to the maximum extent by acting on the merchant side behaviors, thus promoting the level of trust. Others believe that the evaluation feedback mechanism is the main way for consumers to score and give feedback based on the transaction against the background that both parties involved in the transaction are strangers to each other, and it is a bridge for both parties to build a trust relationship. To sum up, this study selects four important mechanisms of O2O takeout platforms and puts forward the following hypotheses based on previous research results:

H1a: The feedback mechanism has a positive impact on consumers' perception and trust of O2O food delivery platforms.

H1b: The payment security mechanism has a positive impact on consumers' perception and trust of O2O food delivery platforms.

H1c: The store owner authentication mechanism has a positive impact on consumers' perception and trust of O2O food delivery platforms.

H1d: The price mechanism has a positive impact on consumers' perception and trust of O2O food delivery platforms.

2.3.2. The Relationship Between the Perception of the Platform Operation Mechanism and Consumers' Perception of Platform Risk

By establishing a two-stage consumer decision-making model, the first step to weaken the perceived uncertainty of consumers is to make them subconsciously believe that their rights and interests will not be threatened and establish a sound supervision mechanism on the platform that plays a self-evident role in protecting their rights and interests. Auditing and certification can be regarded as gatekeepers for quality assurance. Some scholars have pointed out that if the relevant mechanism is tough enough to permanently exclude merchants with past violations from joining the platform, consumers will view the platform as trying to win the trust of consumers. Fang et al. (2014) found that if online users think the third-party platform system is perfect, the platform will effectively protect users and thus avoid potential risks in the e-commerce environment. The feedback mechanism is the bridge of the two sides. When using a platform with an efficient unobstructed feedback mechanism, this can increase the consumers inference that the platform can fulfill its specific obligations and solve the problem of probability, increase the consumers' trust level and lower their level of perceived risk. To sum up, the following hypotheses are proposed in this study:

H2a: The feedback mechanism has a negative effect on consumers' perceived risks of O2O food delivery platforms.

H2b: Payment security mechanism has a negative effect on consumers' perceived risk of O2O food delivery platforms.

H2c: Store owner authentication mechanism has a negative effect on consumers' perceived risk of O2O food delivery platforms.

H2d: Price mechanism authentication mechanism has a negative effect on consumers' perceived risk of O2O food delivery platforms.

2.3.3. The Relationship Between Social System Environment Perception and Consumers' Trust in the Platform

O2O food takeout platforms, as a means to eliminate information asymmetry between supply and demand and promote the connection between supply and demand, will inevitably be restricted and affected by social factors in the interaction with users. These factors cannot be ignored and include the local institutional environment in which the platform is located, the normative requirements and supervision mode of the government, word of mouth regarding the platform, and the social influence of consumers. Some experts and scholars have studied various institutional environment factors regarding the impact of corporate social responsibility in developed countries relative to emerging countries and their market-oriented institutional environments, and the diversity between countries and the uniqueness of the institutional environments on the influence mechanism. The influence of institutional environment on enterprise operation and management in emerging economies has gradually become a new research direction. Formal institutional environments can promote or change enterprises' social responsibility activities. Campbell (2006) believed that enterprises perform better in an institutional environment, with strong government supervision of enterprises and strict corporate social responsibility supervision by non-profit organizations. Regional formal institutional environments will encourage enterprises to actively undertake social responsibilities and create a good brand image that consumers feel they can trust. Based on the above, the following hypothesis is proposed in this study:

H3: Regional formal systems have a positive impact on consumers' satisfaction with O2O food delivery platforms.

With the iteration of social platform functions and the rise of the usage rate, social activities have gradually deepened their subtle influence on life, and social influence has become a new trend gaining academic attention. Word of mouth marketing and social network marketing occupy an unshakable position in online sales. Whether social factors have a substantial impact on the transaction process and the final conclusion of the transaction, the degree of impact and the mechanism of action are the focus of scholars. The significance of reputation is that it can guide traders to abide by the contract. Online reputation is a signal light of whether the service provider has high-quality products and services and operates honestly and with integrity. Shao, Zhang, Li, and Guo (2019) took transactions of P2P online lending platforms, mobile payment platforms and sharing platforms as objects, and respectively confirmed that the reputation of the fundraiser has a significant positive effect on investors' trust, and platform reputation on consumers' trust. To sum up, the following hypotheses are proposed in this study:

H4a: Government regulation has a positive impact on consumers' trust of O2O food takeout platforms.

H4b: Social influence has a positive impact on consumers' trust of O2O food delivery platforms.

H4c: Platform reputation has a positive impact on consumers' trust of O2O food delivery platforms.

2.3.4. Relationship Between Perceived Social System Environment and Consumers' Perceived Risks to the Platform

The link between risk and trust is complex, with one mechanism generally acting against the other. Also, institutional trust could help users to resolve their concerns about uncertainty in the transaction process and improve their sense of security. To sum up, the following hypotheses are proposed in this study:

H5a: Government regulation has a negative impact on consumers' perceived risk of O2O food delivery platforms.

H5b: Social impact has a negative impact on the perceived risk of consumers on O2O food delivery platforms.

H5c: Platform reputation has a negative impact on consumers' perceived risk of O2O food delivery platforms.

2.3.5. The Relationship Between Consumers' Perceived Trust and the Platform, Perceived Risk, and Trust of Store Owners

Pavlou (2002) conducted a study and found that the existence of risk concerns is an important fuse for consumers to refuse to conduct transactions. Users' perception of platform reputation and expected risks will significantly affect their business trends and transaction amount. Weber (2020) believes that trusted third-party platforms have a great ability to ensure the security of transactions between strangers and eliminate potential

unknown risks. In the sharing economy module, some scholars studied the Airbnb platform and believed that users' trust in the host could be transferred to the platform. Taking the Didi Chuxing platform as the research object, trust transfer and transmission effect exist between users of the platform and service providers. Based on the above research, this study proposes the following hypotheses:

H6: Consumers' trust in O2O food delivery platforms has a negative impact on their perceived risks of using the platforms.

H7: Consumers' trust in O2O food takeout platforms has a positive impact on their trust in store owners.

2.3.6. The Relationship Between Consumers' Perceived Trust in the Platform, Perceived Risk, Perceived Trust in the Store Owner and Satisfaction

Consumers' expected risks of using platforms will affect their satisfaction with the service or product. If the risk degree is relatively high, it may affect their intention to continue trading and have corresponding negative effects on trading cooperation. In the current study, trust between vendors and users is a key factor affecting customer satisfaction. Consumer trust will have a great influence on satisfaction and continued use, and now consumer satisfaction of O2O food delivery platforms is the key to platform development. In summary, the following hypotheses are proposed:

H8: Consumers' trust in O2O food delivery platforms has a positive impact on their satisfaction.

H9: Consumers' trust in O2O food takeout platforms has a positive impact on their satisfaction.

H10: Consumers' perceived risks when using O2O food delivery platforms have a negative impact on their satisfaction.

3. RESEARCH METHODS AND DATA COLLECTION

3.1. Research Methods

Based on the current situation of O2O food takeout economic development and platform characteristics in China, this paper comprehensively explores the relationship between the operation mechanism of third-party platforms, social system environments, and customer trust and satisfaction by using three research methods, namely a questionnaire survey, web crawler and mathematical statistics. Among them, the questionnaire survey method and the web crawler method complement each other rather than verify each other. Web crawler data regarding the satisfaction level with takeouts using formal data regression analysis to explore the formal system by constraining enterprise behavior and the indirect impact on customer satisfaction.

(1) Questionnaire survey: This was used as a statistical investigation to collect the data. Based on the existing literature, a survey was developed with a clear focus on platforms of O2O food delivery, user perception, and social institutional environment satisfaction to gain a more comprehensive understanding of users' satisfaction status and reasons based on the platform's internal operation mechanism and social system environment.

(2) Web crawler: web crawler is a technology that can automatically capture web page data by writing relevant computer language. With the help of web crawler tools and by switching city positioning, this paper collected user experience data, such as user comments and store satisfaction scores, of consumers in various provinces and cities in China on the Meituan and Eleme takeout websites in order to explore whether regional formal systems can affect customer satisfaction by constraining enterprise business behavior.

(3) Mathematical statistics: SPSS software was used to carry out a statistical analysis of the questionnaire survey, and the user perception of data was collected by the crawler and newly written formal institutional environment indexes of data for quantitative analysis were explored. The data were found to be statistically significant.

3.2. Data Collection

3.2.1. Questionnaire Survey

According to the research model and hypotheses proposed in this paper, the questionnaire items were designed and adjusted as necessary. The screening question "Have you ever used an O2O takeout platform?" is set. Target groups of people who use third-party food takeout platforms were created, and people with no experience of O2O platforms will jump straight to the end of the questionnaire. The questionnaire focused on collecting basic information, including the usage of platforms, the platform mechanism and social system environment perception data. A five-point Likert scale was used to measure the responses for each item. The questionnaires were released on June 28, 2021, through WeChat social channels. The collection of questionnaires was completed on July 28, 2021, and a total of 437 questionnaires were collected within 30 days. After excluding the questionnaires with missing data and those who had never used third-party food delivery platforms, a total of 405 valid questionnaires were obtained.

3.2.2. Web Crawler

In the implementation of the web crawler method, this study takes Meituan and Eleme O2O food delivery platforms as the main objects, and extracts the data related to the delivery businesses and consumer experiences by analyzing the webpage source codes of the two platforms, respectively. The Meituan and Eleme platforms select 1502 stores in capital cities of 31 provinces (cities to capture user review data and store data, and a total of 54,757 valid store satisfaction scores were captured). The following is the data capture process for Eleme and Meituan:

1) Data capture process of Eleme's takeout platform:

The anti-crawl mechanism of Eleme's platform is not very strict, and the store interface and comment data can be captured through its H5 interface. Taking the corresponding the cookie value into account, each time a change occurs in the position of longitude or latitude location, we can obtain corresponding data. Then, according to the data format for parsing, we can get the desired information.

2) Data capture process of Meituan's takeout platform:

Meituan has a tougher anti-crawl mechanism than Eleme and doesn't have specific sales figures for its H5 platform. Therefore, the middleman agent mode is the man-in-the-middle attack (MIMA). A dump is adopted to collect app data. By default, Meituan uses Transmission Control Protocol (TCP) to transmit data. Therefore, iptables is used to mask the TCP address of Meituan and make it go through the Hypertext Transfer Protocol (HTTP) channel. Mitmproxy is used to intercept and process data with Python files. After capturing the comment data, sentiment analysis and word segmentation analysis are required for each comment. Emotion analysis is achieved by using the Natural Language Processing (NLP) interface of Baidu's artificial intelligence platform. We create a Baidu AI account, create an application, and call the interface to analyze the emotional tendency of each comment text. The return value of 0 is a negative evaluation, 1 is a neutral evaluation, and 2 is a positive evaluation. Word segmentation analysis is completed using the Jieba library, which also considers the parts of speech after the segmentation results come out. Non-entity words (mood words, adverbs) and single-character words are removed to get the results. Word frequency statistics are completed with the Collections library. In addition, this paper adopts the latest report prepared by Fang et al. (2014) to measure the institutional environment of various provinces and cities in China, which describes the score ranking of a specific aspect of marketization by introducing many sub-indicators. Through the quantitative analysis of marketization index and five sub-indexes, this paper provides data samples at the institutional level.

4. EMPIRICAL ANALYSIS

4.1. Descriptive Analysis

4.1.1. Descriptive Analysis of Questionnaire Samples

Through WeChat social channels, the questionnaires were put on the website of Wenjuanxing, and a total of 405 valid questionnaires were obtained after a month. As shown in Table 2, the demographic characteristics of the respondents are statistically analyzed in terms of gender, age, educational background, frequency of O2O takeout platform use, occupation, and monthly disposable income.

Table 2. Statistical analysis of the characteristics of the questionnaire survey sample.

Respondent Characteristics	Number	Percentage	
Gender	Male	215	53.09%
	Female	190	46.91%
Age	Under the age of 18	52	12.84%
	18 to 24	76	18.77%
	25 to 30	119	29.38%
	31 to 40	87	21.48%
	Above 40 years old	71	17.53%
Record of formal schooling	High school and below	86	21.23%
	Specialized subject	67	16.54%
	Undergraduate course	206	50.86%
	Master's degree or above	46	11.36%
Use frequency	Never	103	25.43%
	1-5 times per month	169	41.73%
	6-10 times per month	73	18.02%
	More than 10 times per month	60	14.81%
Profession	Student	53	13.09%
	Office worker	233	57.53%
	Freelance	119	29.38%
Monthly disposable income	Less than 2000 yuan	52	12.84%
	2001-4000 yuan	142	35.06%
	4001-8000 yuan	88	21.73%
	8001-12000 yuan	57	14.07%
	12000-16000 yuan	42	10.37%
	More than 16000 yuan	24	5.93%

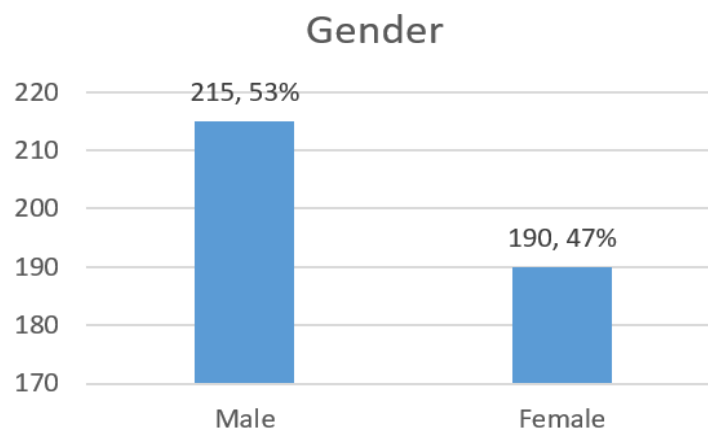


Figure 2. Gender of users.

(1) User gender analysis

As shown in Figure 2, there are 215 males and 190 females, accounting for 53% and 47% respectively. The proportion of males and females is relatively balanced, indicating that there is no significant gender difference among users of third-party delivery platforms.

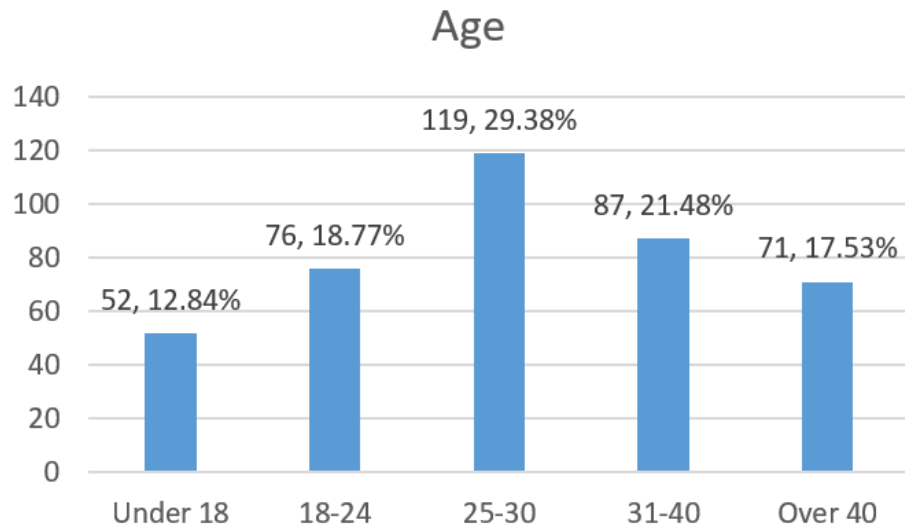


Figure 3. User age.

(2) User age analysis

Statistical results of the ages of respondents are shown in Figure 3. Users under the age of 40 account for 82.47%, among which respondents aged 25–30 account for the highest proportion. This reflects that current O2O takeout platform users are characterized by youth, which is in line with the current social situation where the lazy economy prevails.

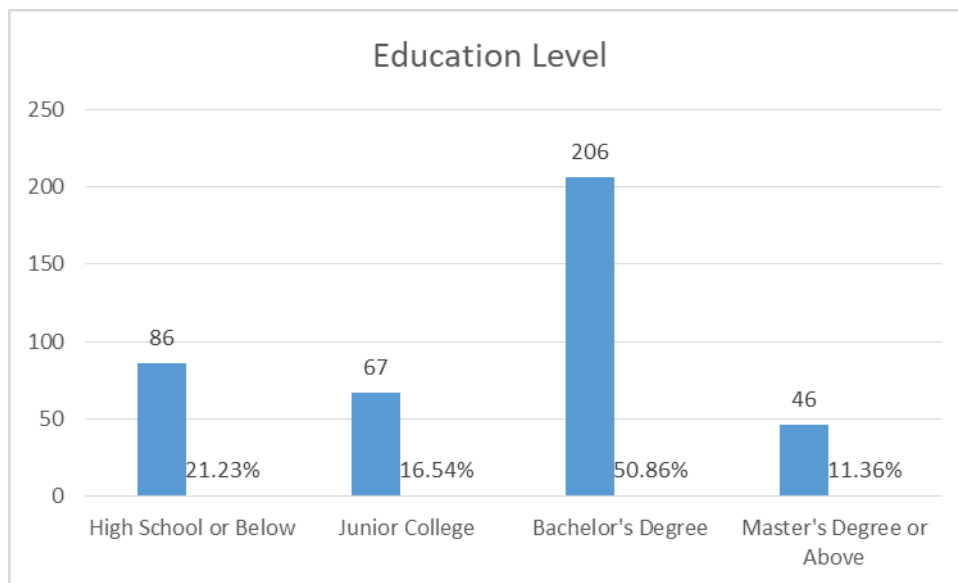


Figure 4. User education level.

(3) Education level analysis

By analyzing the educational structure (see Figure 4), it can be seen that the proportion of users with a bachelor's degree, high school or below, junior college, and master's degree or above decreases successively. Since the questionnaires were distributed and collected randomly, and the use of takeout ordering platforms does not have high requirements for an educational background, the results of the structural analysis in this part also conform to social laws.

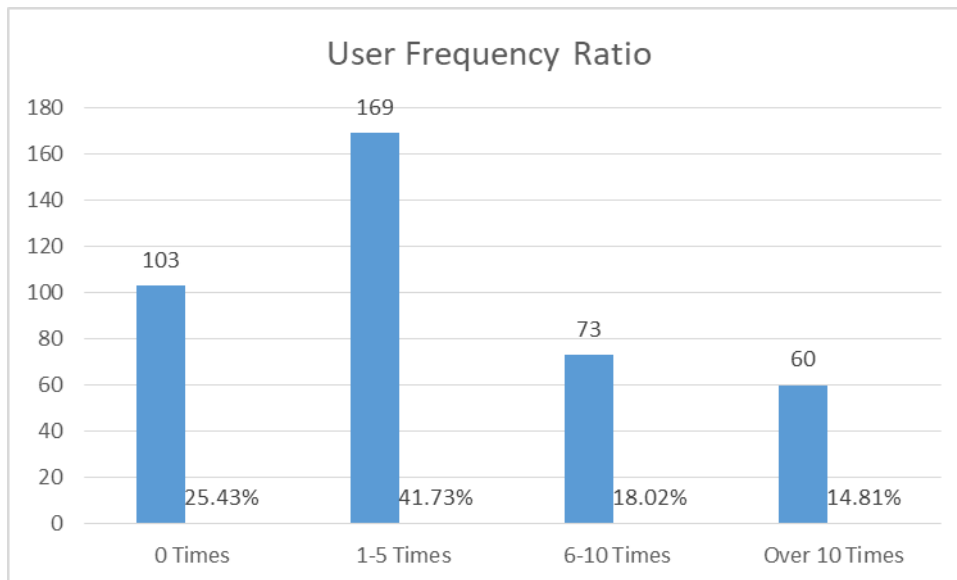


Figure 5. User frequency ratio comparison.

(4) Frequency ratio analysis

As can be seen from the analysis of usage frequency of respondents in Figure 5, 74.57% of respondents use an O2O food delivery platform at least once a month. Among them, people who use O2O services 1–5 times a month accounted for the highest proportion, reaching 41.73%.

(5) Descriptive statistics of other issues

Table 3 shows the descriptive statistical analysis results of issues related to the platform operation mechanism and social system environment perception, and the scores of all indicators are at an ideal level.

Table 3. Descriptive statistics of other problems.

		Certify1	Certify2	Certify3	Certify4	Feedback1	Feedback2	Feedback3	Feedback4
N	Effective	405	405	405	405	405	405	405	405
	Missing	0	0	0	0	0	0	0	0
	Mean	3.716	3.756	3.756	3.783	3.914	3.960	4.007	4.044
	Maximum	5	5	5	5	5	5	5	5
	Minimum	1	1	1	1	1	1	1	1
		Price1	Price2	Price3	Price4	PaySafe1	PaySafe2	PaySafe3	PaySafe4
N	Effective	405	405	405	405	405	405	405	405
	Missing	0	0	0	0	0	0	0	0
	Mean	3.728	3.795	3.812	3.822	3.731	3.699	3.822	3.802
	Maximum	5	5	5	5	5	5	5	5
			Govern1	Govern2	Govern3	Govern4	Friends1	Friends2	Friends3
N	Effective	405	405	405	405	405	405	405	405
	Missing	0	0	0	0	0	0	0	0
	Mean	3.842	3.825	3.911	3.874	3.864	3.899	3.891	3.921
	Maximum	5	5	5	5	5	5	5	5
	Minimum	1	1	1	1	1	1	1	1
		Reputation1	Reputation2	Reputation3	Reputation4	Delivery1	Delivery2	Delivery3	Delivery4
N	Effective	405	405	405	405	405	405	405	405
	Missing	0	0	0	0	0	0	0	0
	Mean	3.938	3.938	4.057	4.010	3.763	3.812	3.835	3.746
	Maximum	5	5	5	5	5	5	5	5
	Minimum	1	1	1	1	1	1	1	1
		Quality 1	Quality 2	Quality 3	Quality 4	Service1	Service2	Service3	
N	Effective	405	405	405	405	405	405	405	
	Missing	0	0	0	0	0	0	0	
	Mean	3.696	3.733	3.793	3.773	3.815	3.852	3.914	
	Maximum	5	5	5	5	5	5	5	
	Minimum	1	1	1	1	1	1	1	

Table 3. Descriptive statistics of other problems...continued.

		TrustP1	TrustP2	TrustP3	TrustP4	RiskP1	RiskP2	RiskP3
N	Effective	405	405	405	405	405	405	405
	Missing	0	0	0	0	0	0	0
Mean		3.780	3.775	3.822	3.798	1.960	1.933	1.943
Maximum		5	5	5	5	5	5	5
Minimum		1	1	1	1	1	1	1
		Trust1	Trust2	Trust3	Trust4	TrustS1	TrustS2	TrustS3
N	Effective	405	405	405	405	405	405	405
	Missing	0	0	0	0	0	0	0
Mean		3.810	3.926	3.928	3.938	3.857	3.886	3.872
Maximum		5	5	5	5	5	5	5
Minimum		1	1	1	1	1	1	1
		Satisfy1	Satisfy2	Satisfy3	Satisfy4			
N	Effective	405	405	405	405			
	Missing	0	0	0	0			
Mean		3.956	4.030	4.114	3.995			
Maximum		5	5	5	5			

4.1.2. Descriptive Analysis of Web Crawler Data and Official Regional System Data

In terms of the measurement of regional formal institutions, the total market index (MIA), the relationship between government and market (MIZ), the development of the non-state economy (MIF), the degree of product market development (MIC), the degree of development of factor markets (MIY), the development of market intermediary organizations and the legal environment (MIS) are the indexes that effectively reflect the official institutional environment status and score ranking of each province and region in the report. Table 4 shows the satisfaction data of takeaway stores in each province and the score data of regional official systems.

Table 4. Description of the statistics.

	N	Minimum	Maximum	Mean	Standard Deviation
Total market index (MIA)	31	1.02	9.97	6.7210	2.13295
The relationship between government and market (MIZ)	31	4.92	8.60	5.5481	2.46172
The development of non-state economy (MIF)	31	3.20	10.83	7.7110	2.10533
Product market development degree (MIC)	31	3.35	9.73	7.7761	1.37775
The degree of development of factor markets (MIY)	31	11.	12.16	5.9403	2.68697
The development of market intermediary organizations and the legal environment (MIS)	31	1.10	14.74	6.3100	3.82929
Store satisfaction score	31	4.07	4.66	4.3383	1.5381

4.2. Reliability and Validity Analysis of the Questionnaires

4.2.1. Overall Reliability Analysis of the Questionnaire

Reliability analysis is the process of measuring the same object with the same means to verify the stability of the result. In this study, Cronbach's α was used to determine the reliability of the data. Generally speaking, the value range of this coefficient is $[0,1]$. The closer the value is to 1, the more reliable the measurement is. When the reliability coefficient is less than 0.5, the questionnaire data need to be collected again. In this paper, 405 valid questionnaires and 57 questions were tested, as shown in Table 5 and Table 6, respectively. The reliability values of the overall scale and each item were 0.849 and greater than 0.5, respectively. The coefficient results show that the scale and each item performed well regarding consistency.

Table 5. Reliability statistics.

Cronbach's Alpha	Number
0.849	57

Table 6. Reliability analysis table.

Variables	Number of multi-items	Cronbach's Alpha
Store owner authentication mechanism	4	0.921
Feedback mechanism	4	0.888
Price mechanism	4	0.912
Payment security mechanism	4	0.909
Government regulation	4	0.902
Social influence	4	0.905
Platform reputation	4	0.894
Shipping service	4	0.920
Product quality	4	0.913
Personalized service	3	0.867
Perceived trust in the platform	4	0.911
Perceived risk of using the platform	3	0.845
Trust tendency	4	0.904
Perceived trust in the store owner	3	0.859
Customer satisfaction	4	0.850

4.2.2. Overall Validity Analysis of the Questionnaire

Validity analysis can be divided into two dimensions: content validity and structure validity. Since the questionnaire is established on the basis of research results, content validity passed the test, so this paper only needs to use SPSS software to test the structure validity of the questionnaire. The results of the overall test of the questionnaire and detailed analysis of each variable are shown in Table 7 and Table 8. The Kaiser–Meyer–Olkin (KMO) value is 0.857 and the Bartlett test sig. value is 0.000, which is in line with the optimal objective condition ≤ 0.001 , indicating that the questionnaire data is suitable for factor analysis.

Table 7. Applicability test of factor analysis of sample data.

KMO and Bartlett tests		
Sample enough KMO measurements		8.571
Bartlett test	The approximate chi-square	15556.464
	df	1596
	Sig.	0.000

Table 8. Applicability test of factor analysis of each variable.

Variables	KOM Value	Bartlett's sphericity test		
		Approximate chi-square	df	Sig.
Store owner authentication mechanism	0.859	1191.834	6	0.000
Feedback mechanism	0.840	886.772	6	0.000
Price mechanism	0.854	1090.211	6	0.000
Payment security mechanism	0.838	1080.180	6	0.000
Government regulation	0.851	992.429	6	0.000
Social influence	0.852	1020.445	6	0.000
Platform reputation	0.839	940.692	6	0.000
Shipping service	0.853	1187.088	6	0.000
Product quality	0.852	1097.437	6	0.000
Personalized service	0.726	596.266	3	0.000
Perceived trust in the platform	0.851	1084.791	6	0.000
Perceived risk of using the platform	0.728	501.663	3	0.000
Trust tendency	0.848	1025.559	6	0.000
Perceived trust in the store owner	0.728	560.907	3	0.000
Customer satisfaction	0.812	673.793	6	0.000

4.3. Correlation Analysis

Correlation analysis is a statistical method to analyze the causality and closeness between variables, which is the basis of multiple regression analysis. The degree of correlation between variables and the direction of action are usually described by Pearson's correlation coefficient. The questionnaire in this paper involves a total of 15 questions regarding platform operation mechanisms and social system environments, and there are between three and five sub-questions under each question. Therefore, the mean score of the 15 questions needs to be counted before verification of correlation. The correlation analysis results among the variables are shown in Table 9.

4.3.1. Correlation Analysis Between Variables and Trust in the Platform

At the 0.01 level, the store owner authentication mechanism ($P = 0.01 < 0.01$), feedback mechanism ($P = 0.007 < 0.01$), price mechanism ($P = 0 < 0.01$), payment security mechanism ($P = 0 < 0.01$), government supervision ($P = 0 < 0.01$), trust of store owners ($P = 0 < 0.01$), perceived risk of using the platform ($P = 0 < 0.01$), customer satisfaction ($P = 0 < 0.01$), delivery service ($P = 0 < 0.01$), product quality ($P = 0 < 0.01$), personalized service ($P = 0.001 < 0.01$) and trust in the platform are significant. At the level of 0.05, platform reputation ($P = 0.048 < 0.05$) and platform trust are significant. The remaining variables showed no significant correlation.

(1) The correlation values between the store owner certification mechanism, feedback mechanism, price mechanism, payment security guarantee mechanism, government supervision, store owner trust, distribution service, product quality, personalized service and trust in the platform are 0.166, 0.134, 0.210, 0.299, 0.247, 0.222, 0.228 and 0.182, respectively. The correlation values are all greater than 0, that is to say, with the improvement of these indicators, the level of trust in the platform will also increase.

(2) The correlation value between customer satisfaction and trust in the platform is 0.434, which is a medium correlation; the value of correlation is greater than 0, which means that the level of customer satisfaction will also increase with the level of trust in the platform.

(3) The correlation value between perceived risk and trust in the platform is -0.277, showing a weak correlation; the correlation value is less than 0, which means that the trust level of the platform will decrease with the increase of this index.

4.3.2. Correlation Analysis Between Variables and the Perceived Risk of the Platform

At the 0.01 level, the store owner authentication mechanism ($P = 0 < 0.01$), feedback mechanism ($P = 0 < 0.01$), price mechanism ($P = 0 < 0.01$), payment security mechanism ($P = 0 < 0.01$), government supervision ($P = 0 < 0.01$), social influence ($P = 0.002 < 0.01$), platform reputation ($P = 0 < 0.01$), trust in the store owner ($P = 0 < 0.01$), customer satisfaction ($P = 0 < 0.01$), distribution service ($P = 0.002 < 0.01$), product quality ($P = 0 < 0.01$), personalized service ($P = 0 < 0.01$) and perceived risk of using the platform are significant. There is no significant correlation between trust tendency and perceived risk of using the platform.

(1) The correlation values between the store owner authentication mechanism, feedback mechanism, price mechanism, payment security guarantee mechanism, social influence, platform reputation, store owner trust, delivery service, product quality, personalized service and perceived risk of using the platform are -0.198, -0.186, -0.298, -0.298, -0.154, -0.20, respectively, with -0.277, -0.215, -0.174, -0.236 being weak correlations. The correlation value is less than 0, which means that the perceived risk level of using the platform decreases with the increase of these indicators.

(2) The correlation coefficients between government regulation, trust in the platform, customer satisfaction and perceived risk of using the platform are -0.520, -0.551 and -0.490, which are moderate correlations. The correlation value is less than 0, that is to say, the perceived risk level of the platform decreases when these three indicators increase.

Table 9. Pearson's phase relational number of variables (N = 405).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 Store owner authentication mechanism	1														
2 Feedback mechanism	0.056	1													
3 Price mechanism	0.071	0.054	1												
4 Payment security mechanism	1.121*	0.077	1.071*	1											
5 Government supervision	1.022*	0.008	1.863**	1.931**	1										
6 Social influence	1.191*	0.061	1.312**	0.028	0.015	1									
7 Platform reputation	0.049	0.095	0.087	0.083	0.081	1.994**	1								
8 Delivery service	0.028	0.002	0.994*	1.283**	2.001**	0.072	0.065	1							
9 Product quality	1.073*	0.024	0.051	0.052	1.292**	0.079	0.004	1.982**	1						
10 Personalized service	0.036	0.03	0.091	0.07	2.63**	0	0.002	2.17**	1.42**	1					
11 Trust in the platform	1.66**	1.34**	2.10**	2.29**	2.47**	0.087	0.99*	2.28**	1.82**	1.65**	1				
12 Trust in the store owner	0.007	1.32**	1.06*	1.45**	1.86**	0.043	0.088	1.02*	1.07*	1.74**	2.22**	1			
13 Perceived risks of using the platform	- 1.98**	- 1.86**	- 2.98**	- 2.98**	- 5.20**	- 1.54**	- 2.08**	- 2.15**	- 1.74**	- 2.36**	- 5.51**	- 2.77**	1		
14 Trust tendency	0.98*	0.014	0.053	0.026	0.043	0.043	0.079	0.035	0.046	0.029	0.081	0.044	0.006	1	
15 Customer satisfaction	1.64**	0.086	1.61**	1.93**	4.21**	0.066	1.23*	3.55**	3.69**	3.41**	4.34**	2.99**	- 4.90**	0.032	1

Note: ** At level 0.05 (two-tailed), the correlation was significant.

* At level 0.10 (two-tailed), the correlation was significant.

4.3.3. Correlation Analysis Between Variables and Customer Satisfaction

At the 0.01 level, the store owner authentication mechanism ($P = 0.001 < 0.01$), price mechanism ($P = 0.001 < 0.01$), payment security mechanism ($P = 0 < 0.01$), government supervision ($P = 0 < 0.01$), platform reputation ($P = 0.013 < 0.01$), trust in platform ($P = 0 < 0.01$), trust in the store owner ($P = 0 < 0.01$), perceived risk of using the platform ($P = 0 < 0.01$), distribution service ($P = 0 < 0.01$), product quality ($P = 0 < 0.01$), personalized service ($P = 0 < 0.01$) and customer satisfaction were significant. The other variables showed no significant correlation with customer satisfaction.

- (1) Store owner authentication mechanism, price mechanism, payment security guarantee mechanism, platform reputation, store owner trust, distribution service, product quality, personalized service and customer satisfaction were 0.164, 0.161, 0.193, 0.123, 0.299, 0.355, 0.369, 0.341, respectively, showing weak correlations. The correlation value is greater than 0, which means that when these indicators improve, customer satisfaction also improves.
- (2) The correlation values between government regulation, platform trust and customer satisfaction are 0.421 and 0.434, which are medium correlations. The correlation value is greater than 0, so when these two indicators improve, customer satisfaction also improves.
- (3) The correlation value between the perceived risk of using the platform and customer satisfaction is -0.490, which is a medium correlation. The correlation value is less than 0, that is to say, the customer satisfaction level decreases while the perceived risk level of the platform increases.

Generally, if Pearson's coefficient is ≤ 0.9 , the data has passed detection. Through the above data analysis, it was found that the correlations between variables can provide favorable evidence for the establishment of the hypotheses in this paper.

4.4. Regression Analysis

Correlation analysis of the relationship between the variables can only show a link between two variables; therefore, there is a need to carry out a further regression analysis to verify hypothesis reasoning for the proposed causal relationship between variables and the positive and negative effects. The test path "platform internal operating mechanism, social institutional environment, customer trust, customer satisfaction" is feasible. Regression analysis was adopted to verify the research model and hypotheses based on the influence of personalized service on customer satisfaction on e-commerce platforms, so this paper adopted the same method for verification analysis.

4.4.1. Regression Analysis Between the Platform's Internal Operating Mechanism, Social Institutional Environment and Trust in the Platform

Firstly, seven variables within the platform operation mechanism and social system environment are taken as independent variables, and trust in the platform is taken as the dependent variable to conduct a linear regression analysis to test the validity of relevant assumptions. This will explain the explanatory power of the two variables, and the closer it is to 1, the better the model effect is. The Durbin-Watson test is used to investigate autocorrelation problems. If the D-W value fluctuates around 2, it can be determined that there are no autocorrelation problems. The R^2 value in Table 10 is 0.148, indicating the overall fit and significance of the regression equation. D-W value is 1.769, indicating that the equation has no autocorrelation. According to the ANOVA in Table 11, the F-test statistic is 9.864 and the Sig. value is 0.000 (< 0.05), indicating that each factor has a significant regression effect on platform trust.

Table 10. Model summary.

Model	R	R ²	Adjusted R ²	Standard estimation error	Durbin-Watson
1	0.385	0.148	0.133	1.02981	1.769

Table 11. Analysis of variance.

Model		Sum of squares	df	The mean square	F	Sig.
1	Return value	73.222	7	10.460	9.864	0.00
	Residual	421.021	397	1.061		
	Total	494.244	404			

The regression coefficients between platform operating mechanism, social institutional environment and trust in the platform can be seen in Table 12. According to the tolerance value and variance inflation factor in the table, which are both greater than 0.1 and less than 10, the multicollinearity problem can be excluded. It can be seen from the impact regression model that the above seven variables have a 13.3% impact on the change of customers' trust in the platform. The regression coefficients of the store owner authentication mechanism, feedback mechanism, price mechanism, payment security guarantee mechanism and government supervision have t-test Sig. values of 0.022, 0.027, 0.004, 0.001 and 0.000, respectively, which are all less than 0.05, showing significance and thus indicating that these variables will have an impact on the trust that people have in the platform. At the same time, the store authentication mechanism, feedback mechanism, price mechanism, security mechanism of payment and government regulation of the five variables have regression coefficient B (beta) values greater than zero, so these five factors have a positive influence on the platform's trustworthiness. When the authentication mechanism, feedback mechanism, price mechanism, security mechanism of payment and government supervision levels are higher, the higher the level of customer trust in the platform.

Table 12. Summary of multiple linear regression on platform trust (N = 405).

Dependent Variable	Independent Variables	Non-standardized Coefficient		Standardized Coefficient	t	Sig.	Collinearity Statistics	
		B	Standard Error	Trial Version			Tolerance	VIF
Trust in the platform	(Constant)	7.661	4.102		1.869	0.621		
	Store owner authentication mechanism	1.052	0.460	1.082	2.299	0.223	9.641	1.037
	Feedback mechanism	1.181	0.532	1.043	2.219	0.273	9.803	1.020
	The price mechanism	1.393	0.481	1.391	2.901	0.041	9.390	1.065
	Payment security mechanism	1.534	0.471	1.553	3.258	0.013	9.422	1.061
	The government regulation	1.871	0.503	1.791	3.713	0.004	9.233	1.084
	Social influence	0.452	0.522	0.412	8.563	3.932	9.322	1.073
	Platform reputation	0.401	0.534	0.361	7.582	4.493	9.424	1.062

(1) The P-value between the store owner authentication mechanism and trust in the platform is 0.022 (< 0.05), indicating a significant relationship between the two; the regression coefficient B-value is 0.105 (> 0), indicating that, assuming H1c is established, the store owner authentication mechanism will have a positive effect on customers' trust in the platform. $Y = 0.766 + 0.105 \times [\text{store owner authentication mechanism}]$ is the regression equation between the two. When the store owner authentication mechanism increases by one unit, customers' trust in the platform will increase by 0.105 units.

(2) The P-value between the feedback mechanism and trust in the platform is 0.027 (< 0.05), and the regression coefficient B-value is 0.118 (> 0), indicating that, if H1a is established, the feedback mechanism will have a positive effect on customers' trust in the platform. $Y = 0.766 + 0.118 \times [\text{feedback mechanism}]$ is the regression equation between the two. Every unit increase in feedback mechanism will increase trust in the platform by 0.118 units.

(3) The P-value between the price mechanism and trust in the platform is 0.004 (< 0.05), indicating a significant relationship between the two; the regression coefficient B-value is 0.139 (> 0), indicating that hypothesis H1d is valid and the price mechanism will have a positive effect on customers' trust in the platform. $Y = 0.766 + 0.139 \times [\text{price mechanism}]$ is the regression equation between the two. If the price mechanism increases by one unit, customers' trust in the platform will increase by 0.139 units.

(4) The P-value and B-value between the payment security mechanism and trust in the platform are 0.001 (< 0.05) and 0.153 (> 0), respectively. There is a significant regression relationship between the two, indicating that assuming the establishment of H1b, the payment security mechanism will have a positive impact on customer trust in the platform. $Y = 0.766 + 0.153 \times [\text{payment security mechanism}]$ is the regression equation between the two. When one unit of payment security mechanism is added, customers' trust in the platform will increase by 0.153 units.

(5) The P-value between government regulation and trust in the platform is 0.000 (< 0.05), indicating a significant relationship between the two. The regression coefficient B-value is 0.187 (> 0), indicating that if H4a is established, government supervision will have a positive impact on customers' trust in the platform. $Y = 0.766 + 0.187 \times [\text{government regulation}]$ is the regression equation between the two. If one unit of government regulation is added, customers' trust in the platform will increase by 0.187 units.

(6) The P-value between social influence and trust in the platform is 0.393 (> 0.05), indicating that there is no significant linear regression relationship between the two. Therefore, H4b is not true.

(7) The P-value between platform reputation and platform trust is 0.449 (> 0.05), indicating that there is no significant linear regression relationship between the two. Therefore, H4c is also not true.

4.4.2. Regression Analysis Between the Platform's Internal Operating Mechanism, Social Institutional Environment and the Perceived Risks of the Platform

The perceived risk of the platform is taken as the dependent variable, and the seven factors of platform operation mechanism, social system environment and trust in the platform are taken as independent variables to conduct linear regression analysis to test whether the relevant assumptions are valid. Table 13 shows an R² of 0.527, an adjusted R² of 0.518, and a D–W value of 2.086. The variables between the equations are significant and there is no autocorrelation phenomenon. Tables 5–17 ANOVAs shows that the F test statistic is 55.183 and the Sig. value is 0.000 (< 0.05), indicating that each factor has a significant regression effect on the platform's perceived risk.

Table 13. Model summary.

Model	R	R ²	Adjusted R ²	Standard estimation error	Durbin–Watson
2	0.7262	0.5271	0.5182	6.371	2.086

Table 14. Analysis of variance.

Model		Sum of squares	df	Mean square	F	Sig.
2	Return value	179.185	8	22.398	55.183	0.000
	Residual	160.732	396	4.062		
	Total	339.916	404			

Table 15 shows the regression coefficients between the platform operation mechanism, social institutional environment, trust in the platform and perceived risk of the platform. According to the tolerance value and variance inflation factor in the table, which are both greater than 0.1 and less than 10, it can be concluded that there is no multicollinearity. According to impact regression model 2, the above eight variables have an impact of 51.8% on the change of customers' trust in the platform. The regression coefficients of feedback mechanism, price mechanism, payment security guarantee mechanism, government regulation, social influence, platform reputation and trust in the platform have t-test Sig. values of 0.002, 0.002, 0.004, 0.000, 0.032, 0.008, and 0.000, respectively, which are all less than 0.05, indicating that these variables will have an impact on customers' perceived risk of the platform. At the same time, the seven variable regression coefficient B-values are less than zero, so it will have a negative impact on the perceived risk of the platform, namely feedback mechanism, payment mechanism, security mechanism, government regulation, social influence and platform reputation. The higher the level of trust in the platform, the lower the level of customers' perceived risk.

Table 15. Summary of multiple linear regression of perceived risk (N = 405).

Dependent variable	Independent variables	Non-standardized coefficient		Standardized coefficient	t	Sig.	Collinearity Statistics	
		B	Standard error	Trial version			Tolerance	VIF
Perceived risk	(Constant)	6.243	2.551		24.515	0.000		
	Store authentication mechanism	- 0.481	0.293	- 0.591	1.670	0.960	9.523	1.051
	Feedback mechanism	- 1.032	0.333	- 1.082	3.089	0.020	9.681	1.033
	Price mechanism	- 0.922	0.301	- 1.112	3.078	0.020	9.193	1.088
	Payment security mechanism	- 0.851	0.293	- 1.044	2.888	0.040	9.184	1.090
	Government regulation	- 3.252	0.322	- 3.763	10.262	0.000	8.923	1.122
	Social influence	- 0.704	0.324	- 0.772	2.154	0.320	9.304	1.075
	Platform reputation	- 0.882	0.333	- 0.953	2.663	0.080	9.402	1.063
Trust in the platform	- 3.074	0.311	- 3.712	9.901	0.000	8.521	1.174	

(1) The P-value between the feedback mechanism and the perceived risk of the platform is 0.002 (< 0.05), indicating a significant relationship between the two. The regression coefficient B-value is -0.103 (< 0), indicating that hypothesis H2a is true and the feedback mechanism will have a negative impact on customers' perceived risk of the platform. $Y = 6.243 - 0.103 \times [\text{feedback mechanism}]$ is the regression equation between the two. When adding a unit of feedback mechanism, customers' perceived risk of the platform will decrease by 0.103 units.

(2) The P-value between the payment security mechanism and perceived risk of the platform is 0.004 (< 0.05), indicating a significant relationship between the two. The regression coefficient B-value is -0.085 (< 0), indicating that hypothesis H2b is true and the payment security mechanism will have a negative impact on customers' perceived risk of the platform. $Y = 6.243 - 0.085 \times [\text{payment security mechanism}]$ is the regression equation between the two. When the payment security mechanism increases by one unit, customers' perceived risk of the platform will decrease by 0.085 units.

(3) The P-value between the price mechanism and the perceived risk of the platform is 0.002 (< 0.05), indicating a significant relationship between the two. The regression coefficient B-value is -0.092 (< 0), indicating that hypothesis H2d is true and the price mechanism will have a negative impact on customers' perceived risk of the platform. $Y = 6.243 - 0.092 \times [\text{price mechanism}]$ is the regression equation between the two. When one unit is added to the price mechanism, customers' perceived risk to the platform will decrease by 0.092 units.

(4) The P-value between government regulation and perceived risk of the platform is 0.000 (< 0.05), indicating a significant relationship between the two. The regression coefficient B-value is -0.325 (< 0), indicating that if H5a

is true, government regulation will have a negative impact on customers' perceived risk of the platform. $Y = 6.243 - 0.325 \times [\text{government regulation}]$ is the regression equation between the two. If one unit of government regulation is added, customers' perceived risk to the platform will decrease by 0.325 units.

(5) The P-value between social influence and perceived risk of the platform is 0.032 (< 0.05), indicating a significant relationship between the two. The regression coefficient B-value is -0.070 (< 0), indicating that hypothesis H5b is true, and social influence will have a negative impact on customers' perceived risk of the platform. $Y = 6.243 - 0.070 \times [\text{social influence}]$ is the regression equation between the two. When social influence increases by one unit, customers' perceived risk of the platform will decrease by 0.070 units.

(6) The P-value between platform reputation and perceived risk is 0.008 (< 0.05), indicating a significant relationship between the two. The regression coefficient B-value is -0.088 (< 0), indicating that hypothesis H5c is true, that platform reputation has a negative impact on customers' perceived risk. $Y = 6.243 - 0.088 \times [\text{platform reputation}]$ is the regression equation between the two. When the platform reputation increases by one unit, customers' perceived risk of the platform will decrease by 0.088 units.

(7) The P-value between customers' trust in the platform and perceived risk of the platform was 0.000 (< 0.05), indicating a significant relationship between the two. The regression coefficient B-value is -0.307 (< 0), indicating that hypothesis H6 is valid, that trust in the platform will have a negative impact on customers' perceived risk to the platform. $Y = 6.243 - 0.307 \times [\text{trust in the platform}]$ is the regression equation between the two. When trust in the platform increases by one unit, customers' perceived risk to the platform will decrease by 0.307 units.

(8) The P-value between store owner certification mechanism and perceived risk of platform is 0.096 (> 0.05), indicating that there is no significant relationship between the two. So, H2c is not true.

4.4.3. Regression Analysis Between Trust in the Platform and Trust in the Store Owner

The linear regression method is used to test the validity of relevant assumptions with trust in the platform and trust in the store as the independent variable and the dependent variable, respectively. Table 16 lists the results. The possibility of multicollinearity can be ruled out according to the tolerance value and variance inflation factor value. The significant relationship between the trust in the platform and the trust of store owners can be concluded from the P-value of 0.000 (< 0.05) and the regression coefficient B-value of 0.205 (> 0), indicating that customers' trust in the platform will have a positive influence on the trust in store owners. $Y = 3.095 + 0.205 \times [\text{store group trust}]$ is the regression equation between the two. When the trust in the platform increases by one unit, the customers' trust in the store owner will increase by 0.205 units. In addition, customers' trust in the platform can affect their trust in the store owner by 4.7%. Therefore, H7 is true.

Table 16. Summary of simple linear regression of store group trust (N = 405).

Dependent variable	Independent variables	Non-standardized coefficient		Standardized coefficient	t	Sig.	Collinearity statistics	
		B	Standard error	Trial version			Tolerance	VIF
Trust in the store owner	(Constant)	3.095	1.784		17.418	0.000		
	Trust in the platform	2.052	0.452	2.222	4.568	0.000	1.000	1.000

4.4.4. Regression Analysis Between Trust in the Platform, Trust in the Store Owner, Perceived Risk of the Platform and Customer Satisfaction

Trust in the platform, trust in the store owner and perceived risk of the platform are taken as independent variables; distribution service, product quality and personalized service are taken as control variables; and customer

satisfaction is taken as the dependent variable to test the validity of relevant assumptions. First, in order to improve the reliability of the test results of the relationships between variables, three control variables including distribution service, product quality and personalized service were added to obtain Model 4. Then, on the basis of considering control variables, three independent variables, namely trust in the platform, trust in the store owner and perceived risk of the platform, are added to obtain Model 5 (see Table 17 for details). The R^2 value increased from 0.197 to 0.314 and the adjusted R^2 value increased from 0.191 to 0.303, indicating that the fit of the model became better, and the D–W value was 1.874, indicating that there was no autocorrelation problem. The ANOVA results in Table 18 show that the F test statistic is 30.329 and the Sig. value is 0.000 (< 0.05), indicating that each factor has a significant regression effect on customer satisfaction.

Table 17. Model summary.

Model	R	R^2	Adjusted R^2	Standard estimation error	Durbin–Watson
4	4.443	1.972	1.912	1.22746	1.766
5	5.601	3.141	3.032	1.13919	1.874

Table 18. Analysis of variance.

Model		Sum of squares	df	Mean square	F	Sig.
4	Return value	148.488	3	49.496	32.852	0.000
	Residual	604.169	401	1.507		
	Total	752.657	404			
5	Return value	236.154	6	39.359	30.329	0.000
	residual	516.503	398	1.298		
	Total	752.657	404			

The regression coefficients between trusts in the platform, trust in store owners, perceived risk of the platform and customer satisfaction can be seen in Table 19. The tolerance values and variance inflation factors in the table are greater than 0.1 and less than 10, respectively, so there is no multicollinearity problem. According to the impact regression in model 5, the above three variables have a 30.3% impact on customer satisfaction. According to the data analysis in the table, the regression coefficients of these three independent variables have Sig values of 0.000, 0.000 and 0.034, respectively, which are all less than 0.05, indicating that these variables have an impact on customer satisfaction. At the same time, the regression coefficient B-value of the two variables of trust in the platform and trust in the store owner are greater than 0, indicating that these two factors have a positive impact on customer satisfaction, that is, the higher the level of trust in the platform and store owner, the higher the level of customer satisfaction. The regression coefficient B-value of the perceived risk variable of the platform is less than 0, indicating that this factor has a negative impact on customer satisfaction, that is, the higher the perceived risk level, the lower the customer satisfaction level.

Table 19. Summary of multiple linear regression of customer satisfaction (N = 405).

Model 5		Non-standardized coefficient		Standardized coefficient	t	Sig.	Collinearity statistics	
		B	Standard error	Trial version			Tolerance	VIF
	(Constant)	- 2.912	4.984		- 5.85	5.590		
Independent variables	Trust in the platform	2.543	0.622	2.063	4.071	0.000	6.752	1.482
	Trust in the shop owner group	2.203	0.583	1.654	3.782	0.000	9.033	1.107
	Perceived risk	- 1.632	0.771	- 1.101	2.133	0.340	6.502	1.539
Control variables	Shipping service	2.861	0.533	2.360	5.372	0.000	8.914	1.122
	Product quality	1.473	0.531	1.213	2.797	0.050	9.291	1.077
	Personalized service	1.282	0.562	1.004	2.274	0.240	8.993	1.112

(1) The P-value between platform trust and customer satisfaction is 0.000 (< 0.05), indicating a significant relationship between the two. The regression coefficient B-value is 0.254 (> 0), indicating that hypothesis H8 is true and platform trust has a positive impact on customer satisfaction. $Y = 0.254 \times [\text{trust in the platform}]$ is the regression equation between the two. An increase of one unit of trust in the platform will increase customer satisfaction by 0.254 units.

(2) The P-value between store owner trust and customer satisfaction is 0.000 (< 0.05), indicating a significant relationship between the two. The regression coefficient B-value is 0.220 (> 0), indicating that hypothesis H9 is true and store trust has a positive effect on customer satisfaction. $Y = 0.220 \times [\text{trust in store group}]$ is the regression equation between the two. When trust in store owners increases by one unit, customer satisfaction will increase by 0.220 units.

(3) The P-value between perceived platform risk and customer satisfaction was 0.034 (< 0.05), indicating a significant relationship between the two. The regression coefficient B-value is -0.163 (< 0), indicating that hypothesis H10 is true and the perceived risk to the platform will have a negative impact on customer satisfaction. $Y = -0.163 \times [\text{perceived risk}]$ is the regression equation between the two. When the perceived risk of the platform increases by one unit, customer satisfaction will decrease by 0.163 units.

4.4.5. Regression Analysis Between Regional Formal System and Customer Satisfaction

Finally, the sub-index of each province's marketization index is taken as the independent variable, and the store satisfaction score of each province is taken as the dependent variable to study whether the regional formal system has an impact on customer satisfaction.

Table 20. Influence of regional formal system on customer satisfaction.

Dependent variable	Independent variables	Non-standardized coefficient		Standardized coefficient	t	Sig.	Total of linear statistics	
		B	Standard error	Trial version			Tolerance	VIF
Customer satisfaction	The relationship between government and market	0.321	0.100	5.092	3.186	0.030	1.000	1.000
	The development of non-state economy (MIF)	0.303	0.120	4.083	2.410	0.230	1.000	1.000
	Product market development degree (MIC)	0.502	0.190	4.472	2.694	0.120	1.000	1.000
	The degree of development of factor markets (MIY)	0.153	0.100	2.644	1.473	1.520	1.000	1.000
	The development of market intermediary organization and the legal environment (MIS)	0.162	0.070	4.072	2.399	0.230	1.000	1.000

According to the summary analysis of the regression results in Table 20, 0.234, 0.138, 0.173, 0.037 and 0.137 correspond to the adjusted R^2 values for MIZ, MIF, MIC, MIY and MIS, respectively. It shows that the above five sub-indexes can explain the reasons for the changes in customer satisfaction by 22.3%, 23.4%, 13.8%, 17.3%, 3.7% and 13.7%, respectively. Among them, the regression coefficients of explanatory variables MIZ, MIF, MIC and MIS all show a significant relationship at the level of 5%, and the B-values of these four index regression coefficients are all greater than 0, indicating that they play a positive effect on customer satisfaction. At the 5% level, the coefficient value of MIY is 0.152, indicating that it is not significant and that the development degree of the factor market has no significant impact on customer satisfaction. Therefore, hypothesis H3, which posits that the regional formal system has a positive impact on consumers' satisfaction with O2O food takeout platforms, is confirmed.

4.5. Robustness Test

4.5.1. Robustness Test of Replacement Variables

The robustness test is a process that verifies the reliability of regression results obtained by existing analysis indexes and methods and changes a specific parameter in the model to observe whether the analysis results change accordingly. Starting with the variables, this paper replaced its five sub-indicators with a market index to test whether the regional formal system has an impact on customer satisfaction to verify the correctness of the selection of the above indicators. The results of the linear analysis are shown in Table 21. The marketization index presents a significant value at the 5% level and a B-value of 0.036 (> 0), indicating that the direction of influence between the regional formal system and customer satisfaction has not changed after the replacement of the index. Hypothesis H3 is still valid, indicating that the original conclusion has certain robustness.

Table 21. Influence of the regional formal system on customer satisfaction.

Dependent variable	Independent variables	Non-standardized coefficient		Standardized coefficient	t	Sig.	Collinearity statistics	
		B	Standard error	Trial version			Tolerance	VIF
Customer satisfaction	Total market index (MIA)	0.362	0.120	4.994	3.098	0.040	1.000	1.000

Table 22. Parallel line test.

Model	-2 Logarithmic Likelihood	Chi-Square	df	Significance
Null hypothesis	1132.469			
Generalized	1121.720	10.749	18	9.051

4.5.2. Robustness Test of the Replacement Regression Model

Starting from the regression model, this paper replaced the previous linear multiple regression model with the ordered multiple Logit regression model in order to prevent deviation of the conclusion and to test the correctness of the conclusion of the relationship between trust in the platform, trust in the store, the perceived risk of the platform and customer satisfaction. It can be seen from Table 22 that the P-value of the parallel line test results of the ordered regression model is 0.905 (> 0.05), and the results pass the test. Therefore, the numerical significance of the results in Table 5–22 can be further discussed.

The regression coefficients of trust in the platform, trust in the store, perceived risk of the platform and customer satisfaction can be seen in Table 23. According to the data analysis in the table, the regression coefficients of these three independent variables have significance values of 0.000, 0.000 and 0.017, respectively. The regression coefficient B-values of trust in the platform and store owner are both greater than 0, indicating that these variables have a positive impact on customer satisfaction, that is, the higher the level of trust in the platform and store owner, the higher the level of customer satisfaction.

The regression coefficient B-value of the perceived risk variable of the platform is less than 0, indicating that this factor has a negative impact on customer satisfaction. After the replacement of the regression model, the influence direction of trust in the platform, trust in the store owner, perceived risk of the platform and customer satisfaction did not change, and hypotheses H8, H9 and H10 were still valid, indicating that the original conclusion had certain robustness.

Table 23. Parameter estimates.

		Estimate	Standard Error	Wald	Df	Significance	95% Confidence Interval	
							Lower Limit	Ceiling
Threshold value	[Customer Satisfaction = 1.000]	2.819	8.132	12.007	1	0.010	1.224	4.413
	[Customer satisfaction = 2.000]	4.185	8.271	25.597	1	0.000	2.563	5.806
	[Customer satisfaction = 3.000]	5.400	8.433	41.019	1	0.000	3.748	7.053
	[Customer satisfaction = 4.000]	6.663	8.591	60.160	1	0.000	4.979	8.347

Table 23. Parameter estimates...continued.

		Estimate	Standard error	Wald	df	Significance	95% Confidence interval	
							Lower limit	Ceiling
Control variable	Shipping service	4.192	0.864	23.551	1	0.000	2.502	5.881
	Product quality	1.913	0.843	5.176	1	0.230	0.264	3.552
	Personalized service	1.911	0.902	4.506	1	0.340	0.152	3.681
Independent variables	Perceived risk	- 2.933	1.234	5.668	1	0.170	- 5.354	- 0.522
	Trust in the platform	3.802	1.000	14.476	1	0.000	1.841	5.764
	Trust in the store owner	3.641	0.941	14.875	1	0.000	1.793	5.492

5. CONCLUSIONS

In this study, a questionnaire survey and web crawler technology were used to deeply analyze the factors affecting consumer satisfaction with O2O food delivery platforms. On the basis of collecting, sorting and analyzing the research results in the related fields, the theoretical model of this exploration was successfully built. Then correlation and regression analysis were used to complete data processing and hypothesis verification. According to the discussion of the empirical analysis, the following conclusions are drawn:

The operating mechanisms of O2O food delivery platforms have a positive impact on users' platform trust and a negative impact on users' perception of platform risk, and there is a transmission effect between the internal operating mechanisms of the platform – customer trust – customer satisfaction. First of all, the platform's strict control over the qualification certification of sellers can absorb high-quality and model merchants to enter the platform, effectively reduce consumers' concerns about illegal workshops entering the platform and improve their trust in O2O food takeout platforms. Second, the payment security mechanism is related to the protection of consumers' property and information rights and protection from infringement. The platform can improve the security of payment from the technical level and effectively protect customers' information from disclosure and property from threats, which can effectively reduce users' concerns about property and information loss. Third, the feedback mechanism is related to whether users' dissatisfaction and confusion regarding the platform and merchants can be solved smoothly and in a timely manner. By building a perfect evaluation module and a timely reply mechanism for merchants, effective communication between the platform and merchants can be ensured to solve consumers' problems. Finally, the price mechanism is related to whether users use the platform and whether transactions can be completed. The fairness, rationality and stability of the pricing of food, packaging, delivery and other services on the platform can improve trust and promote transactions.

The social system environment of the platform has a positive impact on consumers' perception of the platform's trustworthiness and a negative impact on perceived platform risk. There is a transmission effect between social system environment, enterprise behavior, customer trust and customer satisfaction. The O2O meal delivery platform enterprise as part of a social group, its operation and management action is bound to be affected by provinces, cities, the impact from environmental systems, and pressure from exogenous promotion. Enterprises will follow government policy for the iteration and upgrade of services. Therefore, consumers' trust and satisfaction with platform enterprises will be greatly improved, while consumers' perceived risks of platform enterprises will be alleviated. At the same time, individuals' subjective judgment will be influenced by external voices. The endorsement effect of good platform reputation and word of mouth of enterprises is obvious to all. It potentially gives consumers a signal that they are trustworthy when using the platform services, thus reversing their negative perception of trust and risk regarding the platform. Merchants working together to provide services, in the minds of consumers, brings community and interests together, so if the platform can be trusted to operate at a consistently high level, customers will transfer their feelings towards the platform to the merchant side, and takeout stores will gain consumers' trust, and their satisfaction will change positively. Through data analysis and hypothesis testing, the feasibility of the transmission path of "platform internal operation mechanism, social system environment -- customer trust -- customer satisfaction" can be obtained. Users' trust in the platform, store owners' trust and perceived risk of the platform will affect customer satisfaction in both positive and negative directions. According to the above transmission path, this paper believes that customer satisfaction can be improved by improving the platform's internal operation mechanism and social system environs.

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