The influence of consumer perception on purchase intention: Evidence from cross-border E-commerce platforms

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A B S T R A C T

In the context of the continuous development of Internet technology and international logistics, the impact of cross-border e-commerce is expanding. Cross-border e-commerce transactions are characterized by a wide variety of products, low prices, and short procurement times. As a result, consumers are increasingly intention to shop on cross-border e-commerce platforms. The number of consumers placing orders is also increasing. Simultaneously, consumer perception, trust and attitude play crucial roles in influencing consumers' shopping behavior on cross-border e-commerce platforms. This study employs structural equation and intermediary effect analysis to explore the mechanism through which various factors influence consumers' purchase intention. The authors examine the relationship between five components: consumer perception, trust, attitude, and purchase intention. The findings reveal the following: (1) The improvement of consumers' perceived value and subjective display intention positively influences their purchase intention. Conversely, a decrease in these factors hampers consumers' intention to buy. (2) When the level of shopping risk increases, consumers' purchase intention tends to decrease. Conversely, when the risk of shopping is reduced, consumers' intention to buy shows an increase. (3) Consumer trust and attitude play a significant mediating role in the relationship between independent variables and dependent variables. This study lays an important theoretical foundation for future research in this field. It expands the application scenarios of related research methods. Additionally, the conclusions of this study provide valuable references for managers of cross-border e-commerce enterprises in making informed management decisions.

1. Introduction

The Report on the Work of the Chinese Government was released on March 5th, 2023. The report explicitly emphasizes China's active pursuit of new forms of foreign trade. In the upcoming year, the establishment of 152 new cross-border e-commerce pilot zones is planned, along with support for a multitude of overseas warehouses. In 2022, China's cross-border e-commerce imports and exports

amounted to 2.11 trillion yuan, marking a significant 9.8 % year-on-year increase. This growth rate surpasses China's overall GDP growth rate of 3 %.

It is evident that the development of cross-border e-commerce in China is accelerating both in terms of speed and scale. This growth has led to an increase in the number of firms engaged in cross-border e-commerce trade in China. According to data released by China's Ministry of Commerce, as of June 2022, there were 33,900 firms involved in cross-border e-commerce in China. Moreover, the rapid expansion of cross-border e-commerce has effectively eliminated barriers between countries, transforming international trade into borderless trade. In the midst of significant changes in the global economy and trade, cross-border e-commerce platforms have played a pivotal role. These platforms offer a wide range of high-quality and affordable goods to customers worldwide. Notably, the global outbreak of Covid-19 has further fueled the surge in online commodity trading, leading to an increasing preference for cross-border e-commerce among consumers.

Indeed, consumers' purchase intention is influenced by various factors, and consumer perception, trust, and attitude have emerged as important factors in this regard [1]. Consumer perception plays a significant role in shaping consumers' satisfaction with shopping on cross-border e-commerce platforms. It encompasses several components, including perceived convenience, perceived value, subjective demonstration, consumption risk, and customer service quality. Previous studies have shown that consumer perception shows a certain impact on consumer trust and attitude [2]. Furthermore, consumer perception, in conjunction with consumer trust and attitude, could further influence consumers' purchase intention [3]. Consumer trust and attitude represent conscious activities undertaken by buyers and sellers in the process of establishing implicit contractual relationships. Consumers' purchase intention refers to the likelihood or probability of consumers intending to engage in a purchasing behavior [4]. However, previous research has primarily treated consumer perception as an independent variable when studying its impact on consumers' purchase intention. While it is true that consumer perception could directly influence purchase intention, it is important to recognize that consumer trust and attitude also play significant intermediary roles in this process. Nevertheless, the specific mechanisms through which consumer perception affects purchase intention, as well as the intermediary variables involved, have received limited attention in the existing literature.

To address these gaps, this study aims to delve deeper into the relationship among consumers' perception, trust, attitude, and purchase intention, focusing specifically on China's cross-border e-commerce platform. By employing structural equation modeling (SEM) and factor analysis methods, we conduct a systematic investigation based on relevant survey data. Through this analysis, we aim to uncover the variable relationships between consumer perception, trust, attitude, and purchase intention. The findings of this study have practical implications for cross-border e-commerce firms, providing valuable insights to inform their marketing decisions and enhance consumers' purchase intention.

The objectives of this study are as follows: (1) The influence mechanism of consumer perception on consumers' purchase intention is revealed. Consumer perception encompasses several key components, including consumer perceived convenience, consumer perceived value, consumption risk, customer service quality, and consumer subjective demonstration. These components have varying effects on consumers' purchase intention, operating at different levels. However, understanding the intricate process through which these components influence purchase intention can be challenging. Therefore, the primary objective of this study is to unravel the influence mechanism of the different components of consumer perception on consumers' purchase intention within the context of cross-border e-commerce trade. (2) The influence process of mediating variables is revealed. In this study, we focus on examining the mediating role of consumer trust and consumer attitude. However, it is important to note that the relationship between these 2 mediating variables is multifaceted and has not been extensively explored in previous research. Consequently, our objective is to provide a comprehensive summary of how consumer trust and attitude mediate the influence of consumer perception on consumers' purchase intention. (3) Relevant management suggestions are put forward. This study aims to examine the relationship between consumer perception, consumer trust, attitude, and consumer purchase intention specifically within the context of cross-border e-commerce platforms. By analyzing the interplay among these variables, we seek to uncover the underlying patterns and dynamics that influence consumers' purchase decisions in the cross-border e-commerce trade.

The possible contributions of this study are as follows: (1) This study conducts an in-depth examination of the impact of consumer perception on purchase intention, focusing on cross-border e-commerce platforms. The authors specifically divide consumer perception into five distinct dimensions: perceived convenience, perceived value, subjective demonstration, consumption risk, and customer service quality. By exploring the influence of these five dimensions on consumers' purchase intention, this study contributes to the existing research in this field, enriching its content and providing valuable insights. (2) Based on the existing literature, this study extends the research by introducing 2 additional mediating variables: consumer trust and attitude. Previous scholars have rarely utilized these variables to investigate similar issues. Hence, this study expands the research scope in this area and offers a more comprehensive understanding of the subject matter. By examining the influence of consumer perception on purchase intention, while considering the mediating roles of consumer trust and attitude, this study contributes to the existing body of knowledge and enhances the understanding of this phenomenon. (3) Regarding the research methodology, this study employs SEM and mediation effect analysis. These methods have been less commonly utilized by previous scholars in the investigation of similar issues. Therefore, this study not only contributes to the understanding of the specific research problem but also enriches the application of these research methods in the field. By employing SEM and mediation effect analysis, this study provides a rigorous and comprehensive approach to examining the relationships between variables and sheds light on the effectiveness of these methods in studying the phenomenon under investigation.

The arrangement of follow-up research in this study is as follows: (1) Related work. We would review the literature on the relationships among cross-border e-commerce consumer perception, trust, attitude and consumers' purchase intention. (2) Research hypothesis and theoretical model. In this part, we would put forward the relevant hypotheses and construct the theoretical model of this study. (3) Research design. In this part, we would determine and measure variables, introduce questionnaire delivery methods,

and conduct data descriptive statistics, reliability and validity analysis, and methods. (4) Results. We would conduct correlation analysis, model and hypothesis preliminary validation, model revision and partial hypothesis validation, model mediation effect test, and model test results. (5) Further discussions and research implications. This part includes further discussion and research implications. (6) Conclusions and research limitations. This section includes conclusions, research limitations and future research directions.

2. Related work

2.1. The relationship between consumer perception and consumers' purchase intention

Buyer's value theory is actually a theory that examines value from the customer's point of view. The theory regards customer value as the measurement in the minds of customers. The measurement is the value of products and services that customers perceive in the process of consumption. Consumers would also have a clear sense of cross-border e-commerce platforms. When shopping on cross-border e-commerce platforms, consumers would show a certain perception based on the entire purchase process. The formation of consumer perception is based on multiple dimensions [5]. With the vigorous development of the digital economy, cross-border e-commerce has developed rapidly. Cross-border e-commerce is influenced by government policies and international trade promotion. Consumers could learn more directly about related products through cross-border e-commerce platforms. Compared with offline transactions, the information transparency of cross-border e-commerce platforms is higher. Therefore, consumers could get a certain perception based on buyer evaluation and customer service quality [6]. On one hand, the Internet allows businesses to respond more efficiently to consumers. On the Internet platform, consumers could express their consumption needs more directly. At the same time, companies are also able to respond quickly and effectively to consumer demand. It could be seen that cross-border e-commerce trade channels effectively improve consumers' perceived usefulness and consumption interaction, and reduce consumption risks. It also effectively increases consumers' intention to buy [7]. Furthermore, based on the e-commerce marketing theory, it could be seen that cross-border e-commerce shows low technical requirements for the use of the Internet. In this way, consumers could get clear information about the target product through simple operations and feel high availability. It could enhance consumers' purchase intention [8]. On the other hand, related factors could also show a negative impact on consumer perception, thus inhibiting consumers' purchase intention. For example, the quality of customer service is low. The product is exaggerated. The product quality is poor. All of these situations could lead to negative perceptions among consumers. It would discourage consumers from buying something [9]. It could be seen that there is a significant correlation between consumer perception and consumer purchase intention.

2.2. The relationship among consumer perception, trust and attitude

Based on the theory of consumer behavior, consumer perception could affect consumers' trust and attitude. In other words, consumer perception, consumer trust and consumer attitude are all important factors affecting consumer behavior. In the consumption process of cross-border e-commerce platforms, consumers show a more comprehensive and direct perception of the shopping process [10]. For example, consumer reviews and word-of-mouth could affect consumers' trust in products and stores. Better reviews of the store would make consumers have a higher degree of trust in the target product. The consumer perception would enhance consumers' trust and strengthen their positive attitude [11]. At the same time, consumers could carry out real-time communication with customer service of cross-border e-commerce platforms. It also creates a good interactive atmosphere. The atmosphere shortens the space and psychological distance between consumers and businesses. It could also improve consumers' trust and positive attitude towards online merchants [12]. In addition, the greater the consumer perception of consumption risk, the lower the level of consumer trust. In particular, the more negative information consumers collect about cross-border e-commerce companies, the higher the perceived consumption risk. Higher consumption risks would inhibit consumers' trust in cross-border e-commerce platforms [13]. On the contrary, if consumers show a high degree of trust in cross-border e-commerce platform shopping, consumers' positive perception of cross-border e-commerce platform shopping would become stronger. In short, the impact of consumer perception on consumer trust and attitude is also relatively obvious.

2.3. The relationship among consumer trust, attitude and purchase intention

Consumers' trust and attitude would also affect consumers' purchase intention to a certain extent. When shopping on cross-border e-commerce platforms, the higher consumers' trust in stores and product quality, the more they would be stimulated to increase their purchase intention [14]. The situation would form a relatively strong cross-border e-commerce platform purchase intention. In other words, positive consumer attitudes increase consumers' intention to place orders on the platform. In addition, compared with offline shopping, cross-border e-commerce platforms display products in a more comprehensive and systematic way. It would be more convenient for consumers to fully grasp the details of the product. Moreover, the customer service staff of cross-border e-commerce platforms could respond in time [15]. Therefore, it is easier for consumers to establish a sense of trust on cross-border e-commerce platforms. The sense of trust is of great help in improving consumers' purchase intention [16]. In addition, consumers' attitudes toward shopping channels on cross-border e-commerce platforms would also affect consumers' overall purchase intentions. Overall, consumers who show a positive attitude toward cross-border e-commerce shopping channels are relatively satisfied with cross-border e-commerce platforms. However, consumers with negative attitudes show relatively low satisfaction with cross-border e-commerce platforms [17]. It could be seen that there is a significant correlation between consumer trust, attitude and purchase intention.

To sum up, scholars have conducted certain researches on the relationships among consumer perception, consumer trust, attitude and consumers' purchase intention. These studies have laid an important research foundation for the subsequent research of scholars. However, there are still some shortcomings in the researches of scholars: (1) Few scholars explored the influence mechanism of consumer perception on consumers' purchase intention based on the sales practice of cross-border e-commerce platforms. (2) Few scholars combined the 5 components of consumer perception to explore the influence process of consumer trust and attitude on consumers' purchase intention. (3) Few scholars take both consumer trust and attitude as mediating variables to study the influence process of consumer perception on consumers' purchase intention. In order to make up for these shortcomings, this study uses structural equation to conduct in-depth research on consumer trust and attitude as intermediary variables. We hope to comprehensively explore the impact of 5 components of consumer perception on consumer trust, attitude and consumers' purchase intention respectively.

3. Hypotheses and theoretical models

3.1. Hypotheses

3.1.1. The influence of consumer perception on consumers' purchase intention

Consumer perception shows a certain impact on consumers' purchase intention. Consumers' intention is influenced by many factors. Consumer perception is one of the influencing factors [18]. From the perspective of cross-border e-commerce marketing practice, the composition of consumer perception mainly includes consumer perceived value, consumer perceived convenience, consumption risk, customer service and consumer subjective demonstration [19]. These elements effect consumers' purchase intention in different degrees.

Consumer perceived convenience mainly refers to the convenience of consumers' execution of consumption actions in the process of shopping on cross-border e-commerce platform [20]. In the process of cross-border e-commerce consumption, limited by computer software operation, smart phone operation and foreign language, different consumers tend to show great differences in consumer perception of convenience [21]. For some consumers, the consumer perception of convenience in the process of cross-border e-commerce consumption is relatively strong. However, for consumers with weak operation capability, the result of consumers' perceived convenience is poor in the process of cross-border e-commerce consumption [22]. Therefore, poor perceived convenience of consumers would restrict consumers' trust and attitude towards consumption behaviors. In this way, it would restrain consumers' purchase intention. In addition, better consumer convenience is conducive to improve consumers' trust and attitude, as well as their purchase intention [23]. Based on the above analysis, we propose the following hypothesis.

H1a. Consumer perceived convenience shows a positive impact on consumer trust.

H1b. Consumer perceived convenience shows a positive impact on consumer attitude.

H1c. Consumer perceived convenience shows a positive impact on consumers' purchase intention.

Consumer perceived value also refers to consumer perception of consumption behavior or usefulness of products in cross-border e-commerce [24]. Consumer perceived value means that consumers recognize that the product is "valuable" and could meet their needs in information acquisition, interpersonal interaction, or entertainment. Perceived value is the main criterion for evaluating users' consumption behaviors, which would ultimately affect customers' behaviors [25]. When the perceived value of consumers is relatively strong, consumers show strong trust in the consumption behavior. At the same time, consumers would show a strong intention to buy products. In this way, it would definitely help to improve consumers' purchase intention [26]. On the contrary, when consumer perceived usefulness is weak, consumer trust or purchasing attitude towards the product would be reduced. It would also curb consumers' intention to buy. In other words, consumer perceived value is positively correlated with their trust, attitude and purchase intention [27]. Based on the above analysis, we propose the following hypothesis.

H2a. Consumer perceived value shows a positive impact on consumer trust.

H2b. Consumer perceived value shows a positive impact on consumer attitudes.

H2c. Consumer perceived value shows a positive impact on consumers' purchase intention.

Consumption risk mainly refers to all kinds of risks that consumers may encounter in the process of shopping on cross-border e-commerce platforms. These risks mainly include product quality risk, product price fluctuation risk, product efficacy risk, e-commerce payment risk and after-sales risk [28]. For example, consumers may buy low-quality products. Consumers may also find that the price of a product has been reduced for some time after purchasing it. Sellers may also exaggerate product functions and make false publicity [29]. Consumers may also experience poor after-sales service. These cases would affect consumer trust and shopping attitude to varying degrees. In addition, these consumption risks would further affect the overall purchase intention of consumers [30]. Based on the above analysis, we propose the following hypothesis.

H3a. Consumption risk shows a positive impact on consumer trust.

H3b. Consumption risk shows a positive impact on consumer attitude.

H3c. Consumption risk shows a positive impact on consumers' purchase intention.

Customer service quality refers to the interaction between consumers and sellers' customer service staff in the process of shopping

on cross-border e-commerce platforms [31]. Especially in the process of cross-border e-commerce transactions, consumers interact more frequently with customer service staff online [32]. At the same time, when answering consumers' questions, the pertinence, timeliness and effectiveness of customer service staff's answers would get consumers' trust and attitude towards sellers. If the overall service quality of customer service staff is high, it would improve the consumer trust and attitude, and enhance the purchase intention of consumers. Otherwise, consumers' confidence and attitude would be inhibited, as well as their purchase intention [33]. It could be seen that customer service quality shows an impact on consumer trust, attitude and purchase intention at different levels. Based on the above analysis, we propose the following hypothesis.

H4a. Customer service quality shows a positive impact on consumer trust.

H4b. Customer service quality shows a positive impact on consumer attitude.

H4c. Customer service quality shows a positive impact on consumers' purchase intention.

Subjective demonstration of consumers refers to the subjective display of consumers' shopping process or products after shopping in cross-border e-commerce [34]. The consumer subjective demonstration channels include face-to-face introductions and presentations on social media. Generally speaking, consumers would only conduct subjective demonstration when they are satisfied with the consumption process or product [35]. Therefore, consumers who could conduct subjective demonstration show more positive trust and attitude towards products and sellers. On the contrary, if consumers' enthusiasm for subjective demonstration is low, their enthusiasm for cross-border e-commerce shopping would be limited to some extent. Therefore, consumer subjective demonstration would also show an important impact on consumers' purchase intention [36]. Based on the above analysis, we propose the following hypothesis.

H5a. Consumer subjective demonstration shows a positive impact on consumer trust.

H5b. Consumer subjective demonstration shows a positive impact on consumer attitudes.

H5c. Consumer subjective demonstration shows a positive impact on consumers' purchase intention.

3.1.2. Influence of consumer trust and attitude on consumers' purchase intention

Consumer trust includes consumers' trust in sellers' reputation, product quality, product function, product transportation, and after-sales service [37]. Combined with relevant literature and practical survey results, it could be seen that the level of consumer trust would affect the overall purchase intention of consumers to varying degrees [38]. Generally speaking, a higher degree of consumer trust would strengthen consumers' purchase intention. On the contrary, a relatively low degree of consumer trust would inhibit consumers' purchase intention [39]. It shows that there is a positive correlation between consumer trust and consumers' purchase intention. Based on the above analysis, we propose the following hypothesis.

H6. Consumer trust shows a positive impact on consumers' purchase intention.

Consumer attitude includes consumers' attitudes towards purchasing behaviors, products, sellers and other consumption links during cross-border e-commerce. Consumer attitude is a kind of ideology [40]. The ideology would influence the concrete actions of consumers. Therefore, consumer attitudes would affect consumers' consumption ideas, behaviors and demands [41]. When the consumer attitude is more positive, the consumer attitude would improve the consumer's purchase intention. Otherwise, it would limit consumers' intention to buy. It could be seen that consumer attitude is one of the important factors affecting consumers' purchase intention. At the same time, there is a positive correlation between consumer attitude and consumers' purchase intention [42]. Based on the above analysis, we propose the following hypothesis.

H7. Consumer attitude shows a positive impact on consumers' purchase intention.

3.1.3. The mediating role of consumer trust and consumer attitude

Based on the above analysis, it could be seen that the 5 components of consumer perception in cross-border e-commerce show positive impact on consumers' purchase intention from different perspectives. However, the process is also influenced by many factors. Among them, consumer trust and consumer attitude are 2 important factors [43]. On one hand, all the 5 components of consumer perception show a certain positive impact on consumer trust and attitude. On the other hand, consumer trust and attitude also show certain positive effects on consumers' purchase intention [44]. It could be seen that both consumer trust and attitude in cross-border e-commerce could play a certain intermediary role in the process of consumer perception affecting consumers' purchase intention [45]. Meanwhile, based on the correlation analysis, it could be concluded that the mediating effects of consumer trust and attitude are both positive [46]. Based on the above analysis, we propose the following hypothesis.

H8a. Consumer trust plays a positive mediating role in the influence of perceived convenience on consumers' purchase intention.

H8b. Consumer trust plays a positive mediating role in the influence of consumer perceived value on consumers' purchase intention.

H8c. Consumer trust plays a positive mediating role in the influence of consumption risk on consumers' purchase intention.

H8d. Consumer trust plays a positive mediating role in the influence of customer service quality on consumers' purchase intention.

H8e. Consumer trust plays a positive mediating role in the influence of consumer subjective demonstration on consumers' purchase intention.

H9a. Consumer attitude plays a positive mediating role in the influence of perceived convenience on consumers' purchase intention.

H9b. Consumer attitude plays a positive mediating role in the influence of perceived value on consumers' purchase intention.

H9c. Consumer attitude plays a positive mediating role in the influence of consumption risk on consumers' purchase intention

H9d. Consumer attitude plays a positive mediating role in the influence of customer service quality on consumers' purchase intention.

H9e. Consumer attitude plays a positive mediating role in the influence of consumer subjective demonstration on consumers' purchase intention.

3.2. Theoretical models

On the basis of previous literature, we design a theoretical model of the influence of consumer perception on consumers' purchase intention during the cross-border e-commerce transactions. As shown in Fig. 1. In the theoretical model, consumers' perceived convenience shows a positive impact on consumers' purchase intention. We come up with hypotheses H1a, H1b, and H1c. Consumer perceived value shows a positive impact on consumer purchase intention. We come up with the hypothesis H2a, H2b, and H2c. Consumption risk shows a positive impact on consumers' purchase intention. We come up with hypotheses H3a, H3b, and H3c. Customer service quality shows a positive impact on consumers' purchase intention. We put forward the hypothesis H4a, H4b, and H4c. Consumers' subjective performance shows a positive impact on consumers' purchase intention. We propose the hypothesis H5a, H5b and H5c. Meanwhile, these 5 variables also show positive effects on consumer trust and consumer attitude respectively. In addition, consumer trust and attitude also show a positive impact on consumers' purchase intention. Therefore, we propose hypotheses H5 and H6. Meanwhile, consumer trust and attitude also play an important mediating role [47]. We put forward the hypothesis H8a, H8b, H8c, H8d, H9a, H9b, H9c, and H9d. Therefore, the theoretical model shows the relationship between all variables. Based on this theoretical model, we would continue to conduct follow-up research.
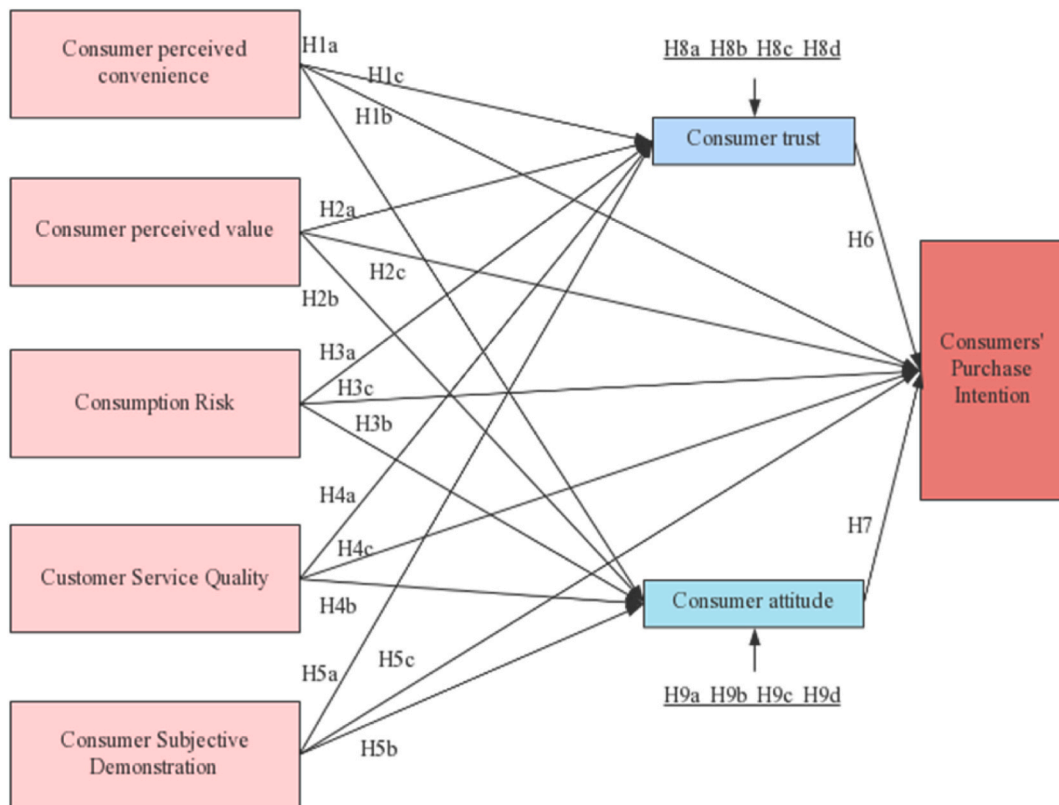

Fig. 1. Theoretical model.

4. Research design

4.1. Variables and their measures

4.1.1. Explained variable

Based on the above analysis and theoretical model, the explained variable in this study is determined as consumers' purchase intention (CPA). Combined with the practice of cross-border e-commerce consumption and related research literature, we determined the measurement index of consumers' purchase intention in cross-border e-commerce. Specific indicators to measure consumers' purchase intention include whether they shop on cross-border e-commerce platforms, whether they recommend cross-border e-commerce consumption methods to their friends, and whether they search products on cross-border e-commerce platforms. The details and references are shown in Table 1.

4.1.2. Explanatory variables

The explanatory variable of this study is consumer perception. Consumer perception mainly includes consumer perceived convenience (CFC), consumer perceived value (CFV), risk of consumption (CR), customer service quality (CSQ) and consumer subjective demonstration (CSD). Based on the study of relevant scholars and theoretical analysis, the measurement items of the above indicators and references are shown in Table 2.

4.1.3. Intermediate variables

Based on the previous literature review and theoretical analysis, we determined the mediating variables in the model as consumer trust (CC) and consumer attitude (CA). Based on the measurement of consumer trust and attitude by relevant scholars, we mainly measure consumer trust degree and specific attitude towards shopping on cross-border e-commerce platforms. The index determination of consumer trust and attitude in this study is based on relevant research literature. At present, most scholars believe that the indicators to measure consumer trust mainly include product quality, merchant trust, shopping information confidentiality and customer service personnel ability. At the same time, many scholars believe that consumer attitude could be measured by 3 indicators. The 3 indicators are consumers' liking for the interface of cross-border e-commerce platform, whether they objectively evaluate the store. In addition, their recognition of the shopping methods of cross-border e-commerce platform. Correlation measure analysis indexes and references are shown in Table 3.

Based on the determination of the variable indexes and items above, we further adopted 5-point Likert scale. In the survey questionnaire, 5 points are set for each question item above. The scores are 1,2,3,4,5. For each item of the survey, a score could be checked.

4.2. Questionnaire survey and descriptive statistics of data

4.2.1. Questionnaire pre-test

In order to improve the effectiveness of the questionnaire, we first used the questionnaire to conduct a small range of preliminary tests. For this test, we selected 30 consumers from different cross-border e-commerce platforms. The major shopping platforms include Amazon, JD.com, Tmall Global, Mia.com and AliExpress. A total of 30 questionnaires were sent out in this survey. At last, most of the questionnaires were effectively recovered.

(1) Pre-test reliability test

In order to test the reliability of the questionnaire, we conducted a pre-test reliability test on the survey results. In this study, Cronbach's α coefficient was used as the reliability test index of the pre-test questionnaire. Generally speaking, the larger the Cronbach's α coefficient is, the greater the internal consistency of the detection factor is. It also means that the reliability of the data is high. When the Cronbach's α coefficient is lower than 0.7, the data is not worth studying. However, when Cronbach's α coefficient is between 0.7 and 0.8, the data is acceptable. When Cronbach's α coefficient is greater than 0.8, the reliability of the data is the best. Furthermore, for the exclusion criteria, we further considered the deleted Cronbach's α coefficient. When the deleted Cronbach's α coefficient of the item is greater than the Cronbach's α coefficient of the dimension, it is considered that the item should be deleted [64].

Based on the data analysis of the pre-test questionnaire, the Cronbach's α coefficient for each dimension is found to be greater than 0.7. It indicates that the reliability of each item on the pre-measurement scale meets the basic standard. However, when CFV2 is removed, the α coefficient for this dimension significantly increased. It indicates that the item should be eliminated. Similarly, after

Table 1

Measurement indicators of consumers' purchase intention in cross-border e-commerce.

Variable	No.	Items	References
Consumers' purchase intention (CPA)	CPA1	I'd like to shop on cross-border e-commerce platforms.	Rowa [48]; Dolgopolova [49]
	CPA2	I could recommend cross-border e-commerce platform shopping to my friends.	
	CPA3	I'd like to search products on cross-border e-commerce platforms.	

Table 2
Measurement indicators of consumer perception.

Variables	No.	Items	References
Consumer perceived convenience (CFC)	CFC1	Sellers of cross-border e-commerce platforms could effectively answer questions.	Doniec [50]; Jarvenpaa [51]
	CFC2	Sellers of cross-border e-commerce platforms could provide personalized services.	
	CFC3	Cross-border e-commerce platforms deliver goods faster.	
	CFC4	The return mechanism of cross-border e-commerce platforms is perfect.	
Consumer perceived value (CFV)	CFV1	I could reduce the cost of shopping by shopping on cross-border e-commerce platforms.	Abdullah [52]; Envelope [53]
	CFV2	I shop efficiently on cross-border e-commerce platforms.	
	CFV3	The product information on the cross-border e-commerce platform is complete.	
	CFV4	Cross-border e-commerce platforms offer a wider variety of products.	
Consumption risk (CR)	CR1	There is a brushing behavior on cross-border e-commerce platforms.	Rosenfeld [54]; Ersoy [55]
	CR2	The consumption experience of cross-border e-commerce platforms is poor.	
	CR3	I am worried about the product quality of cross-border e-commerce platforms.	
	CR4	I doubt the credibility of cross-border e-commerce sellers.	
Customer service quality (CSQ)	CSQ1	Cross-border e-commerce platform customer service could provide all the seller's information.	Eoon [56]; Christian [57]
	CSQ2	The customer service staff of cross-border e-commerce platform could recommend suitable products for me.	
	CSQ3	Cross-border e-commerce platform customer service could provide consumers with better shopping experience.	
	CSQ4	The customer service staff of the cross-border e-commerce platform could provide all the information of the product.	
Consumer subjective demonstration (CSD)	CSD1	My friend recommended a certain cross-border e-commerce platform to me.	Clerides [58]; Vilnai [59]
	CSD2	I like to see product introductions on cross-border e-commerce platforms.	
	CSD3	I have recommended a certain cross-border e-commerce platform to my friends.	

Table 3
Measures of mediation variables.

Variables	No.	Items	References
Consumer trust (CC)	CC1	I recognize the quality of products sold on cross-border e-commerce platforms.	Nuojua [60]; Nurhetty [61]
	CC2	I recognize the trust of cross-border e-commerce platform merchants.	
	CC3	I recognize the confidentiality of shopping information on cross-border e-commerce platforms.	
	CC4	I recognize the ability of cross-border e-commerce platform customer service personnel.	
Consumer attitude (CA)	CA1	I like to browse the interface of cross-border e-commerce platforms.	Reynolds [62]; Slazus [63]
	CA2	I would objectively evaluate the shops on cross-border e-commerce platforms.	
	CA3	I think cross-border e-commerce platforms are a good way to shop.	

removing CR3, the α coefficient for this dimension also significantly increased. It means that the dimension should be eliminated as well.

(2) Pre-test validity test

In order to accurately test the effectiveness of the pre-test questionnaire, we conducted a front validity test. In our study, factor analysis method is used to analyze the KMO value and Bartlett's's spherical test of the factors involved. The KMO value measures the degree of correlation between variables and ranges from 0 to 1. A KMO value above 0.8 indicates good validity, suggesting a high level of correlation between the variables. A KMO value between 0.7 and 0.8 is also considered acceptable. If the KMO value falls between 0.6 and 0.7, it suggests mediocre validity, meaning that the validity is acceptable but not optimal. A KOM value below 0.6 indicates poor validity, and corrective measures are necessary to improve it. The significance probability (P value) obtained from the Bartlett's's sphericity test assesses whether the correlation matrix significantly differs from an identity matrix. A P value less than or equal to 0.01 indicates that the scale is suitable for factor analysis. In our study, we conducted the KMO sample measure and Bartlett's's sphericity test for the 7 factors included in our model. The results of these tests are presented in Table 4, providing the KMO values and significance probabilities obtained from the Bartlett's's sphericity test for each factor. Analyzing these test results would help us evaluate the validity of the measurement scale and determine its suitability for factor analysis.

Table 4
KMO value and Bartlett's sphericity test.

KMO value	0.811	
Bartlett's sphericity test	Approximate chi square	3092.449
	df	633
	Sig.	0.00

4.2.2. Questionnaire descriptive statistics

In this study, the questionnaires are primarily distributed to consumers of major cross-border e-commerce platforms, including Amazon, AliExpress, eBay, Dunhuang, JD.com, Tmall Global, Mia.com, Alibaba.com, Made-in-China, and Shopee. To ensure a wide geographical coverage, the respondents are distributed all over the world. The distribution and collection of the questionnaires are primarily conducted via email. With the permission of each platform, the researchers obtain the email information of buyers from these cross-border e-commerce platforms. It allows them to directly reach out to potential respondents and distribute the questionnaires electronically. At the same time, the respondents also reported having a minimum of 3 shopping experiences on cross-border e-commerce platforms every week. The types of products are purchased by the consumers include cosmetics, clothing, shoes, bags, daily necessities, books, digital products, and household products. Additionally, a total of 639 questionnaires are distributed, out of which 601 questionnaires are collected. After excluding invalid questionnaires, a total of 582 valid questionnaires are obtained. Consequently, the effective recovery rate of the questionnaire is calculated to be 91.08 %.

In addition, the collected questionnaires are carefully examined and the data is subjected to descriptive statistical analysis. The results of this analysis are presented in Table 5. Regarding the gender distribution of the respondents, it is found that female consumers constituted a relatively high proportion of 60.3 %, while male consumers accounted for a relatively lower proportion of 39.7 %. In terms of age distribution, consumers between the ages of 18 and 30 accounted for 35.4 % of the respondents. The highest proportion was observed among consumers aged 31 to 40, representing 43.6 % of the total. On the other hand, consumers aged 41 to 60 constituted the smallest proportion at 21.0 %. In terms of education level, consumers with a master's degree or above constitute the largest proportion, accounting for 44.8 % of the respondents. Conversely, consumers with a junior college degree or below represent the smallest proportion, making up 21.3 % of the total. In terms of monthly income, consumers with incomes between $801 and $1500 make up the largest share, at 48.3 %. At 24.7 %, consumers with incomes over $1500 make up the smallest share. The number of consumers with incomes below $800 is in the middle, at 27.0 %.

Furthermore, we need to address the question of why "Master degree or above" accounts for a significant proportion (44.8 %) of cross-border e-commerce platform consumers. Our investigation into the educational backgrounds of Chinese consumers using these platforms sheds light on this phenomenon. It is evident that the high representation of consumers with advanced degrees is justified, considering the purchasing behavior of Chinese consumers who engage in cross-border e-commerce. Specifically, these consumers exhibit a strong inclination towards purchasing luxury goods and international brands. Moreover, Chinese consumers tend to avoid purchasing ordinary low-priced products on cross-border e-commerce platforms, leading to higher average prices for the products they buy.This is primarily due to the fact that consumers with higher levels of education generally have higher incomes. Consequently, their demand for luxury goods is stronger compared to consumers with lower education levels. Conversely, consumers with lower education levels often have lower incomes and exhibit less interest in luxury goods. Therefore, it is reasonable to observe a higher proportion of Chinese consumers with higher education shopping on cross-border e-commerce platforms.

4.3. Reliability and validity analysis

4.3.1. Analysis of reliability

Based on the analysis presented above, we conduct a reliability analysis on the questionnaire to systematically verify the reliability of all the data collected. In this study, we employ Cronbach's α coefficient as a measure for assessing the reliability of the questionnaire. The results of the reliability test are summarized in Table 6.

Based on the data presented in Table 6, the reliability analysis of the entire questionnaire indicates that all the research variables have α reliability coefficients above 0.79. It suggests that the dimensions of all variables exhibit good reliability. Additionally, the overall α reliability coefficient of the questionnaire is 0.877, which exceeds the threshold of 0.8. Overall, the scales utilized in this study demonstrate high consistency and good reliability. Consequently, the research data collected in this study could be deemed suitable for subsequent empirical analysis.

4.3.2. Analysis of validity

The validity analysis of the survey data is conducted to assess the extent to which the measurement instruments used in the study

Table 5
Descriptive statistical analysis results of data.

Indicators	Category	Number	Ratio
Gender	Male	231	39.7 %
	Female	351	60.3 %
Age	18–30	206	35.4 %
	31–40	254	43.6 %
	41–60	122	21.0 %
Education	Junior college degree or below	124	21.3 %
	Undergraduate	197	33.9 %
	Master degree or above	261	44.8 %
Monthly income	Under $800	157	27.0 %
	$801 - $1500	281	48.3 %
	More than $1500	144	24.7 %

Table 6
Results of overall reliability analysis.

Variable	Cronbach's α coefficient	Variable	Cronbach's α coefficient
CFC	0.820	CC	0.791
CFV	0.817	CA	0.804
CR	0.833	CPA	0.812
CSQ	0.842	The overall	0.877
CSD	0.815		

accurately measure the intended constructs or variables. The results of the validity analysis, as presented in Table 7, indicate that the data exhibits good validity. The KMO values for all variables in the study are greater than 0.73. The KMO measure assesses the sampling adequacy for factor analysis, with values above 0.6 generally considered acceptable. In your case, the KMO values exceeding 0.73 suggest that the variables included in the analysis have a high degree of intercorrelation, indicating good suitability for factor analysis.

Furthermore, the significance probability levels of Bartlett's sphere test for all variables are less than 0.001. Bartlett's test examines whether the correlation matrix is significantly different from an identity matrix, and a significant result indicates that the variables are interrelated. The significance levels below 0.001 in your study suggest a strong relationship among the variables, indicating a good model fit.

Moreover, the explanatory power of each variable is above 65 %, indicating that the variables are capable of explaining a significant proportion of the total variance. Additionally, the factor loading quantities are greater than 0.67, indicating a strong aggregation effect of the scales used in the study.

Based on these results, it could be concluded that the survey data exhibits good validity. The high KMO values, significant Bartlett's test results, high explanatory power, and strong factor loadings indicate that the measurement instruments accurately capture the intended constructs. Therefore, we could proceed with the subsequent correlation analysis of each variable with confidence.

4.4. Methods

Based on the characteristics of the study object, this study employs empirical research methods, including correlation analysis, SEM, and the Bootstrap method.

Correlation analysis. Correlation analysis is used to investigate the relationship between the variables CFV, CFC, CR, CSQ and CSD. If the correlation coefficient between these variables is excessively high, it suggests a strong correlation, which would not meet the requirements of the correlation test. Therefore, the variables selected for this study may not be suitable for further research. In other words, a low correlation coefficient between the variables indicates a weaker correlation, making them suitable for further research.

Table 7
Validity analysis results.

Variable	Item	Mean value	Standard deviation	Load of factor	Variable explanatory degree	KMO value	Bartlett's test significance
CFC	CFC1	2.31	0.946	0.672	68.091	0.757	0.000
	CFC2	2.62	0.873	0.752			
	CFC3	3.75	1.042	0.878			
	CFC4	4.62	0.846	0.870			
CFV	CFV1	3.63	0.992	0.752	66.714	0.762	0.000
	CFV3	4.25	1.032	0.844			
	CFV4	3.65	0.835	0.836			
CR	CR1	3.36	0.848	0.742	69.003	0.799	0.000
	CR2	4.09	0.972	0.835			
	CR4	2.15	0.836	0.698			
CSQ	CSQ1	3.40	1.042	0.857	71.220	0.732	0.000
	CSQ2	4.62	0.976	0.768			
	CSQ3	2.43	0.855	0.834			
	CSQ4	3.49	0.942	0.815			
CSD	CSD1	4.12	0.875	0.862	65.439	0.784	0.000
	CSD2	2.47	0.847	0.841			
	CSD3	2.56	0.878	0.767			
CC	CC1	3.47	0.948	0.774	67.284	0.792	0.000
	CC2	4.62	0.932	0.684			
	CC3	4.34	1.005	0.831			
	CC4	2.17	0.982	0.893			
CA	CA1	3.23	0.873	0.731	71.835	0.788	0.000
	CA2	3.07	0.966	0.832			
	CA3	2.42	0.842	0.766			
CPA	CPA1	3.44	0.993	0.793	72.807	0.793	0.000
	CPA2	4.87	0.841	0.874			
	CPA3	2.37	0.936	0.882			

Conversely, a high correlation coefficient suggests a strong correlation, indicating that these variables may not be appropriate for subsequent research. It is important to note that this method has gained recognition among scholars [65]. Furthermore, this method aligns well with the fundamental characteristics of the research object.

The study employs SEM to test a total of 23 hypotheses pertaining to all variables. This approach allows for a systematic examination of these hypotheses. Supporting hypotheses are identified when they pass the test, while unsupported hypotheses are determined when they do not meet the criteria. Furthermore, the original structural model is refined by removing specific paths, ensuring the accuracy of the research results. The use of structural equations for hypothesis testing is widely recognized and accepted by scholars.

Bootstrap method. The study utilized the Bootstrap method to assess the mediation effect of the CC and CA variables. Only variables that exhibit a statistically significant mediating effect, as determined by the Bootstrap test, are considered to have mediating effects. Conversely, variables that do not pass the Bootstrap test could not be identified as mediating variables. The application of the Bootstrap method in this study has been widely acknowledged by scholars, given its high accuracy in producing reliable results. Moreover, this method is highly suitable for the research conducted in this study.

5. Results

5.1. Analysis of correlation

To examine the relationships between variables, the study utilizes the Pearson product-moment correlation analysis. The analysis primarily focuses on exploring the associations among variables, including consumer attitude, trust, and consumers' purchase intention. Additionally, the study investigates the correlations between consumer attitude, trust, and consumers' purchase intention. The findings of the correlation analysis are presented in Table 8.

The study utilized Pearson bilateral tests to analyze the relationships among variables. Although there are certain relationships observed among the 5 independent variables (CFV, CFC, CR, CSQ, and CSD), the correlation coefficients are relatively small, all below 0.603. According to the commonly accepted standard among scholars, a correlation coefficient below 0.8 suggests the absence of multicollinearity among variables. Therefore, in this study, there is no indication of multicollinearity among the independent variables. Consequently, there are no significant correlations between the variables that require further investigation.

Table 9 presents the data regarding the influence of independent variables on the intermediary variables CC (consumer attitude) and CA (consumer trust), as well as the correlations among independent variables, intermediary variables, and the dependent variable CPA (consumers' purchase intention). The findings reveal that, except for CFV, all variables are significantly correlated with the intermediary variable CC, indicating their influence on consumer attitude. Notably, CSD, CSQ, and trust exhibit a significant positive correlation with CC, suggesting a positive impact on consumer attitude. Conversely, CR shows a significant negative correlation with CC, indicating a negative effect on consumer attitude. Similarly, with respect to the influence on CA, all variables except CFV demonstrate a significant correlation with the intermediary variable. CR exhibits a negative relationship with CA, while the other independent variables positively influence consumer trust. Regarding the correlations among independent variables, intermediary variables, and CPA, the significance values of CFC and CSQ are both greater than 0.05, indicating no significant correlation between CFC, CSQ, and CPA. However, the other variables show correlations with CPA. CFV, CSD, CC, CA, and CPA exhibit a positive effect, indicating a positive influence on consumers' purchase intention. Additionally, there is a reverse effect between CR and CPA, suggesting a negative relationship between CR and consumers' purchase intention.

Table 8
Correlation analysis results among variables.

	CFV	CFC	CR	CSQ	CSD	CC	CA	CPA
CFV	1	0.035**	−0.027***	0.093**	0.062*	0.294***	0.247*	0.391**
		(0.027)	(0.192)	(0.000)	(0.004)	(0.002)	(0.035)	(0.000)
CFC	0.035**	1	−0.174*	0.571*	0.092** (0.572)	0.372*	0.532**	0.082**
	(0.027)		(0.000)	(0.000)		(0.000)	(0.000)	(0.084)
CR	−0.027***	−0.174*	1	−0.382*	−0.155***	−0.481**	−0.388***	−0.294***
	(0.192)	(0.000)		(0.000)	(0.396)	(0.000)	(0.000)	(0.000)
CSQ	0.093**	0.571*	−0.382*	1	0.082*	0.033***	0.041*	0.227**
	(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)	(0.102)
CSD	0.062*	0.092**	−0.155***	0.082*	1	0.602**	0.572*	0.425**
	(0.004)	(0.572)	(0.396)	(0.000)		(0.000)	(0.000)	(0.000)
CC	0.294***	0.372*	−0.481**	0.033***	0.602**	1	0.594***	0.274**
	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)		(0.000)	(0.000)
CA	0.247*	0.532**	−0.388***	0.041*	0.572*	0.594**	1	0.399*** (0.000)
	(0.035)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		
CPA	0.391**	0.082**	−0.294***	0.227**	0.425**	0.274**	0.399*** (0.000)	1
	(0.000)	(0.084)	(0.000)	(0.102)	(0.000)	(0.000)		

Note: ***, **, and * indicate significance at the levels of 1 %, 5 %, and 10 % respectively.

Table 9
Measurement results of model fit index.

Indicator name	Standard	Results	Effect of fitting
X^2/df	≦3.000	2.039	Good
NFI	>0.800	0.851	Good
CFI	>0.800	0.894	Good
GFI	>0.800	0.886	Good
RMR	≦0.080	0.062	Good
RMSEA	≦0.100	0.041	Good

5.2. Preliminary verification of model and hypothesis

To systematically examine the research hypotheses in this study, structural equation models are utilized for verification. The earlier analysis on data reliability and validity demonstrates that all variables in the study have achieved a favorable level of reliability and validity. Consequently, the obtained data is of good quality, enabling the subsequent structural equation analysis to be conducted.

In the preliminary testing phase, the first step involves evaluating the fit of the structural equation model. The measurement results should meet the standard requirements. Once the measurement results satisfy the standards, the data path measurement could be conducted. In this step, the Critical Ratio (C.R.) value should exceed 1.96, and the direction of the path coefficient should align with the assumed direction in previous research. Additionally, the path coefficient should not be zero and should reach a significant level of significance. Only when these conditions are fulfilled could the relevant research hypotheses be verified. If the conditions are not met, the structural equation model should be modified until the conditions are satisfied [66].

This study utilizes the structural equation model to construct the model, and the hypotheses in the original model are tested using AMOS 27 software. The structural equation model, presented in Fig. 2, is developed in accordance with the CPA theoretical model of cross-border e-commerce mentioned previously.

We make modifications to the original structural model by removing a specific path, thereby disrupting the nonconforming path while preserving the remaining path relationships. It leads to the creation of new models. The fit of these models is evaluated, and the resulting observation indices are obtained as indicators of fit. Detailed outcomes are presented in Table 9. The data results demonstrate that each index meets the required standards, indicating the possibility of further exploration.

In general, when the absolute value of the (C.R. exceeds 1.96 and the p-value associated with a path coefficient is less than 0.05, it indicates a significant relationship between variables. Table 10 presents the original path coefficients and their significance levels obtained from the data. The table displays the path relationships of CC←CFV, CA←CFV, CPA←CFC, CC←CR, and CPA←CI. However, the C.R. values for these path relationships are all below 1.96, and the corresponding p-values are greater than 0.05. It suggests that the relationships among these variables are not statistically significant, leading to the rejection of research hypotheses H2b, H2c, H1a,
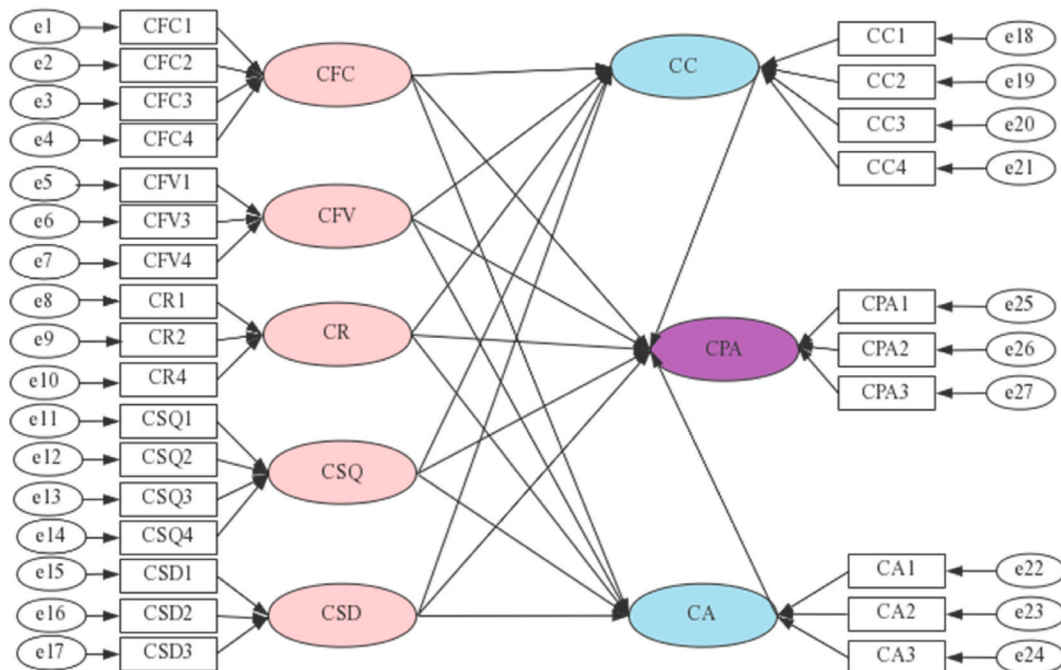

Fig. 2. Initial model of structural equation model.

Table 10
Path coefficient and significance level of preliminary validation of the model.

Path	Coefficient of normalization	Non standard coefficient	S. E.	C.R.	P
CPA←CFC	0.032	0.091	0.028	1.95	0.88
CC←CFC	0.162	0.093	0.020	2.33	***
CA←CFC	0.152	0.188	0.025	2.92	*
CPA←CFV	0.130	0.094	0.026	2.47	**
CC←CFV	0.052	0.197	0.024	1.03	0.062
CA←CFV	0.074	0.082	0.037	1.51	0.074
CPA←CR	−0.262	−0.271	0.042	−2.71	**
CC←CR	−0.241	−0.228	0.039	−1.63	0.092
CA←CR	−0.137	−0.291	0.021	−2.91	*
CPA←CI	0.072	0.236	0.022	1.11	0.181
CC←CSQ	0.084	0.188	0.036	2.83	**
CA←CSQ	0.154	0.192	0.034	3.02	***
CPA←CSD	0.190	0.201	0.037	2.99	*
CC←CSD	0.202	0.253	0.039	3.17	**
CA←CSD	0.271	0.276	0.030	2.83	*
CPA←CC	0.348	0.336	0.184	5.71	***
CPA←CA	0.395	0.451	0.192	6.22	***

Note: ***, **, and * indicate significance at the levels of 1 %, 5 %, and 10 % respectively.

H3b, and H4a. Therefore, it is necessary to eliminate these path relationships, make corrections to the model, and conduct a retest.

5.3. Model modification and partial hypothesis verification

After eliminating the invalidated path, we proceed to make additional modifications to the original structural model. It is important to note that the removal of the inconsistent path does not impact the relationships of the other paths, which remains unchanged. As a result, a new model is derived and subjects to verification. The fit of the model is assessed, and the resulting observation index results are displayed in Table 11. Based on the data presented in Table 11, all 6 indicators meet the prescribed standards. Consequently, we are able to proceed with further research.

Table 12 presents the path coefficients and their significance levels for the revised model. Notably, the absolute values of the C.R. values associate with the modified path coefficients between variables exceed 1.96. Furthermore, all the p-values corresponding to these path coefficients are less than 0.05. These results strongly suggest that the relationships between the modified variables are statistically significant. Consequently, the research hypotheses corresponding to these correlation paths are deemed valid. However, the deleted paths fail to meet the required criteria, thereby rendering their associated research hypotheses invalid.

5.4. Test of model mediation effect

To investigate the mediating effect of consumer trust and attitude in the model, the Bootstrap method is utilized in this study. The application of the Bootstrap method for testing mediation effects has been widely acknowledged by the scholarly community [67]. Furthermore, it is commonly believed that if the confidence interval derived from the test does not encompass 0, it signifies the presence of a mediating effect. Conversely, if the confidence interval includes 0, the mediation effect is considered to be non-existent [68].

5.4.1. Test of the mediating effect between CFC and CPA

The authors utilized the Bootstrap method to examine the mediating effect between CFC and CPA. The results of the test are presented in Table 13. The mediating effect between CFC, CC, and CPA is found to be 0.092. The corresponding Mackinnon PRODCLIN2 confidence interval for this mediation effect, with a 95 % confidence level, is [0.084, 0.097]. Importantly, the confidence interval does not include 0, indicating the presence of a mediating role for CC. Similarly, the mediating effect value between CFC, CA, and CPA is determined to be 0.098. The corresponding Mackinnon PRODCLIN2 confidence interval for this mediation effect, with a 95 % confidence level, is [0.082, 0.119]. Once again, the confidence interval does not include 0, suggesting the existence of a mediating

Table 11
Fitting degree of the optimized model.

Indicator name	Standard	Results	Effect of fitting
X^2/df	≦3.000	1.138	Good
NFI	>0.800	0.972	Good
CFI	>0.800	0.935	Good
GFI	>0.800	0.927	Good
RMR	≦0.080	0.043	Good
RMSEA	≦0.100	0.039	Good

Table 12

Path coefficient and significance level of the optimized model.

Path	Coefficient of normalization	Non standard coefficient	S. E.	C.R.	P
CC←CFC	0.271	0.203	0.030	3.81	*
CA←CFC	0.203	0.256	0.025	2.99	***
CPA←CFV	0.145	0.174	0.021	4.03	**
CPA←CR	−0.254	−0.247	0.024	−3.17	*
CA←CR	−0.271	−0.296	0.030	−3.62	*
CC←CSQ	0.102	0.304	0.029	3.14	**
CA←CSQ	0.114	0.288	0.032	3.75	**
CPA←CSD	0.279	0.311	0.024	5.36	**
CC←CSD	0.183	0.275	0.020	5.07	***
CA←CSD	0.209	0.202	0.036	3.92	**
CPA←CC	0.384	0.391	0.175	7.66	***
CPA←CA	0.372	0.372	0.174	6.73	***

Note: ***, **, and * indicate significance at the levels of 1 %, 5 %, and 10 % respectively.

Table 13

Mediating effect between CFC and CPA.

Path	Intermediate effect value	Mackinnon PRODCLIN2	
		Lower	Upper
CFC-CC-CPA	0.092	0.084	0.097
CFC-CA-CPA	0.098	0.082	0.119

effect for CA. Subsequently, the testing of mediation effects confirms hypotheses H8a and H9a.

5.4.2. Test of mediating effect between CR and CPA

We utilize the Bootstrap method to examine the mediating effect between CR and CPA. The results of the test are presented in Table 14. The mediating effect value for the CR-CA-CPA pathway is determined to be −0.091. The corresponding Mackinnon PRODCLIN2 confidence interval for this mediation effect, with a 95 % confidence level, is [−0.127, −0.063]. Importantly, the confidence interval does not include 0, indicating the presence of a mediating role for CA. Therefore, we could assume that hypothesis H9c is true.

5.4.3. Test of the mediating effect between CSQ and CPA

We utilize the Bootstrap method to examine the mediating effect between CSQ and CPA. The results of the test are presented in Table 15. The mediating effect value for the CSQ–CC–CPA pathway is determined to be 0.098. The corresponding Mackinnon PRODCLIN2 confidence interval for this mediation effect, with a 95 % confidence level, is [0.081, 0.107]. Importantly, the confidence interval does not include 0, indicating the presence of CC (Consumer Confidence) as a mediator. Similarly, the mediating effect value for the CSQ-CA-CPA pathway is found to be 0.116. The corresponding Mackinnon PRODCLIN2 confidence interval for this mediation effect, with a 95 % confidence level, is [0.026, 0.271]. Once again, the confidence interval does not include 0, implying the existence of a mediating role for CA. Therefore, we could conclude that hypotheses H8d and H9d are valid.

5.4.4. Test of the mediating effect between CSD and CPA

We utilize the Bootstrap method to examine the mediating effect between CSD and CPA. The results of the test are presented in Table 16. The mediating effect value for the CSD–CC–CPA pathway is determined to be 0.164. The corresponding Mackinnon PRODCLIN2 confidence interval for this mediation effect, with a 95 % confidence level, is [0.086, 0.239]. Importantly, the confidence interval does not include 0, indicating the presence of CC (Consumer Confidence) as a mediator. Similarly, the mediating effect value for the CSD-CA-CPA pathway was found to be 0.117. The corresponding Mackinnon PRODCLIN2 confidence interval for this mediation effect, with a 95 % confidence level, is [0.102, 0.298]. Once again, the confidence interval does not include 0, implying the existence of a mediating role for CA (Consumer Attitude). Therefore, we could conclude that research hypotheses H8e and H9e are valid.

Table 14

Mediating effect between CR and CPA.

Path	Intermediate effect value	Mackinnon PRODCLIN2	
		Lower	Upper
CR-CA-CPA	−0.091	−0.127	−0.063

Table 15
Mediating effect between CSQ and CPA.

Path	Intermediate effect value	Mackinnon PRODCLIN2	
		Lower	Upper
CSQ–CC–CPA	0.098	0.081	0.107
CSQ-CA-CPA	0.116	0.026	0.271

Table 16
Mediating effect between CSD and CPA.

Path	Intermediate effect value	Mackinnon PRODCLIN2	
		Lower	Upper
CSD–CC–CPA	0.164	0.086	0.239
CSD-CA-CPA	0.117	0.102	0.298

5.5. Model test results

Based on the analysis conducted, the results of hypothesis testing in this study are displayed in Table 17. Among them, H1a, H2b, H2c, H3b, H4a, H8b, H8c, and H9b do not pass the test. All other hypotheses are supported by the data. Furthermore, we have summarized the relationship model between the relevant variables, as illustrated in Fig. 3.

6. Further discussions and research implications

6.1. Further discussions

6.1.1. Relationships among the factors in the model

Based on the analysis and Fig. 3, it is evident that there are distinct differences in the relationships between various variables. The relationships could be broadly categorized into 3 types: positive correlation, negative correlation, and no correlation. Among the variables, the following combinations exhibit a positive correlation: CFV and CPA, CFC and CC, CFC and CA, CSQ and CC, CSQ and CA, CSD and CC, CSD and CA, CSD and CPA. On the other hand, the combinations of CR and CPA, as well as CR and CA, show a negative correlation. Finally, there is no correlation observed between the combinations of CFV and CC, CFV and CA, CFC and CPA, CR and CC, and CSQ and CPA.

In summary, within the group of positively correlated variables, CPA changes in the same direction as CFV and CSD. It means that as CFV and CSD improve, CPA also improves effectively. Conversely, when CFV and CSD decline, so does CPA. Therefore, managers of cross-border e-commerce enterprises should be aware that by enhancing consumers' perceived value and their subjective intention to demonstrate, the intention to purchase among consumers can be effectively increased.

Moreover, there is a similar trend observed between CC and CA with the changes in CFC, CSQ, and CSD. When CFC, CSQ, and CSD increase, CC and CA also increase. Conversely, when these variables decrease, CC and CA tend to decrease as well. It implies that managers of cross-border e-commerce enterprises could focus on improving consumer perception convenience, customer service quality, and consumer subjective demonstration to enhance consumer trust and attitude.

Furthermore, in the group of negatively correlated variables, there is an inverse relationship between CR and CPA. When CR

Table 17
Results of research hypothesis testing.

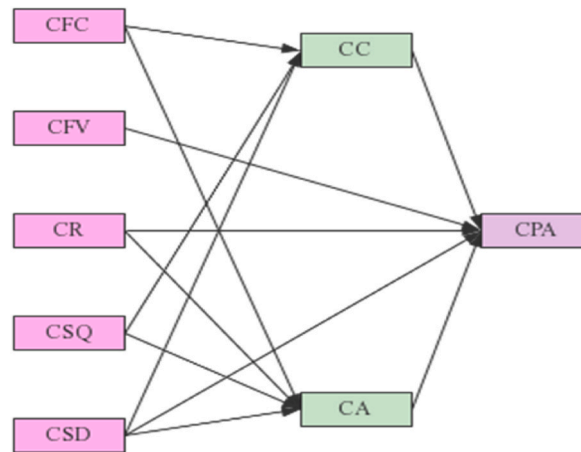| Hypothesis		Results of inspection	Hypothesis		Results of inspection
H1	H1a	No	H6		Yes
	H1b	Yes	H7		Yes
	H1c	Yes	H8	H8a	Yes
H2	H2a	Yes		H8b	No
	H2b	No		H8c	No
	H2c	No		H8d	Yes
H3	H3a	Yes		H8e	Yes
	H3b	No	H9	H9a	Yes
	H3c	Yes		H9b	No
H4	H4a	No		H9c	Yes
	H4b	Yes		H9d	Yes
	H4c	Yes		H9e	Yes
H5	H5a	Yes			
	H5b	Yes			
	H5c	Yes			

Fig. 3. Modified variable relationship model.

increases, CPA decreases, and vice versa. Therefore, relevant managers could effectively enhance consumers' purchase intention on cross-border e-commerce platforms by mitigating consumption risks.

6.1.2. Part of the theoretical assumptions don't align with actual cross-border e-commerce CPA

In the theoretical analysis, certain correlations are identified between variables such as CFV and CC, CFV and CA, CFC and CPA, CR and CC, CSQ and CPA. However, based on the survey data from cross-border e-commerce consumers, no correlation is found between these variables. This indicates a significant gap between the theoretical purchase intention of cross-border e-commerce consumers and the actual behavior observed in practice.

Therefore, it is crucial for cross-border e-commerce enterprises to place greater emphasis on monitoring and analyzing real transaction data in their daily management. By analyzing relevant transaction data, managers could gain a more accurate understanding of the transaction dynamics on cross-border e-commerce platforms. This, in turn, enables them to formulate more targeted management strategies and countermeasures. Relying solely on theoretical assumptions may not capture the complexities and nuances of consumer behavior in the real world, making the analysis of actual transaction data essential for effective decision-making.

To summarize, in the relationship group where CC acts as the mediating variable, CC demonstrates a positive mediating role in various variable relationships. Specifically, this includes the relationship groups of CFC and CPA, CSQ and CPA, and CSD and CPA. In the relationship group where CA acts as the mediating variable, CA exhibits a reverse mediating effect in the CR and CPA relationship group. However, CA plays a positive mediating role in other variable relationship groups, such as CFC and CPA, CSQ and CPA, and CSD and CPA. Therefore, managers of cross-border e-commerce enterprises should prioritize consumer trust and consumer attitude. They should leverage consumer trust and consumer attitudes effectively to enhance consumer purchase intentions.

6.1.3. Hypothesis testing

In this study, a total of 27 hypotheses are proposed. However, through empirical analysis of the research data, it is found that 8 of these hypotheses failed to pass the test. These hypotheses are H1a, H2b, H2c, H3b, H4a, H8b, H8c, and H9b, as indicated in Table 17. On the other hand, the remaining 19 hypotheses are supported by the empirical evidence, suggesting that they are plausible and have a basis in the data.

Based on the results of the empirical analysis, it is important to further explore the implications of the hypotheses that failed to pass the test. Understanding why these hypotheses do not receive empirical support could provide valuable insights for future research.

For the hypotheses that are supported by the empirical evidence, it would be beneficial to delve deeper into the underlying mechanisms and explore the practical implications for cross-border e-commerce enterprises. Understanding the relationships between variables and the mediating effects could help managers make informed decisions and develop effective strategies to enhance consumer purchase intentions.

In summary, while some hypotheses do not pass the empirical test, there are still valuable findings to be derived from the supported hypotheses. Exploring the underlying mechanisms, considering the limitations of the study, and utilizing actual data could contribute to a deeper understanding of consumer behavior in cross-border e-commerce and provide actionable insights for managers.

6.2. Research implications

6.2.1. Theoretical implications

(1) We extend the depth of the relevant research content. We aim to enhance the depth of research in this area by introducing 2 intermediary variables, namely consumer trust and attitude, when examining the impact of cross-border e-commerce consumer

perception on consumers' purchase intention. Previous studies have rarely explored the combination of these 2 variables in investigating this issue. Therefore, our study represents an innovative approach that expands the depth of research in this field. Furthermore, the research process and findings of our study provide a significant theoretical foundation for future investigations conducted by scholars in this field.

(2) We have enriched the application scenarios of relevant research methods. Our study has enriched the application scenarios of relevant research methods by employing SEM and mediation effect analysis to examine the impact of consumer perception on consumers' purchase intention. Previous studies have rarely utilized these methods to investigate this particular issue. Therefore, the application of these research methods in our study further expands their potential application scenarios and provides an important reference for future research in this area.

(3) We enrich the theoretical research on consumer intention management. Our study contributes to the theoretical research on consumer intention management by focusing on the purchase intention of consumers within the context of cross-border e-commerce platforms. We introduce factors such as consumer perception, consumer trust, and attitude into our study. Through these research processes and the resulting conclusions, we enhance the existing theoretical content related to consumer intention management to a significant extent. Consequently, our study provides a crucial theoretical foundation for future research in this field.

6.2.2. Practical implications

(1) This study offers valuable insights for cross-border e-commerce export traders and the management of cross-border e-commerce platforms. It specifically examines the consumption process within cross-border e-commerce firms, systematically and comprehensively investigating the purchase intention of cross-border e-commerce consumers and the relevant influencing factors. The study's conclusions provide significant references for cross-border e-commerce export firms to enhance their sales and customer service capabilities. Additionally, the findings also serve as important guidance for relevant cross-border e-commerce platforms in formulating management policies to a certain extent.

(2) The suggestions presented in this study serve as a valuable reference for relevant government and administrative departments in formulating management policies. Given the relatively recent development of the cross-border e-commerce industry, there are still certain deficiencies in government management policies pertaining to cross-border e-commerce. Therefore, the research conclusions and suggestions provided in this study offer new management ideas for government departments from various perspectives. These ideas encompass enhancing the product quality of cross-border e-commerce firms, optimizing their customer capabilities, and improving the marketing and promotional strategies of such firms. Consequently, the relevant government departments can strengthen their guidance and supervision in these areas, thereby addressing the shortcomings in current government policy management. Hence, the suggestions put forth in this study offer essential references for government management departments in formulating effective management policies.

(3) We offer valuable references for similar countries in managing the development of cross-border e-commerce trade. With the advancement of the global economy, particularly in the wake of the Covid-19 pandemic, the growth of global cross-border e-commerce trade has accelerated significantly. Alongside the thriving cross-border e-commerce trade in developed countries, many developing countries such as China, Russia, Brazil, India, South Africa, and others are also experiencing rapid progress in this domain. However, these countries encounter various obstacles in managing cross-border e-commerce trade. Drawing upon the research conclusions of this study, firms and governments in these developing countries could gain valuable insights and development experiences. These findings are instrumental in promoting the growth of cross-border e-commerce trade within these countries.

7. Conclusions, research limitations and future research directions

7.1. Conclusions

7.1.1. Managers of cross-border e-commerce enterprises could use consumer perception and subjective display to enhance purchase intention

As evident from the previous analysis, consumer perception and subjective display show a significant positive impact on consumers' purchase intention. When consumers' perceived value and subjective intention to display improve, their intention to buy also increases. Conversely, a decrease in perceived value and subjective intention to display leads to a decline in purchase intention. Hence, managers of cross-border e-commerce enterprises must recognize the crucial role of consumer perception and subjective display in their daily management. Additionally, managers could utilize consumer perception and subjective display as vital marketing tools. By enhancing consumers' perceived value and subjective intention to display, managers could effectively boost purchase intention on cross-border e-commerce platforms [64]. In summary, leveraging consumer perception and subjective display enables cross-border e-commerce enterprises to enhance their overall performance.

7.1.2. In cross-border e-commerce platforms, the impact of shopping risks on consumers' purchase intentions could not be ignored

Based on the above analysis, it is evident that shopping risk plays a crucial role in influencing consumers' purchase intention on cross-border e-commerce platforms. As shopping risk increases, consumers become less inclined to make purchases, while a reduction in shopping risk leads to an increase in consumers' intention to buy. Therefore, managers of cross-border e-commerce enterprises must prioritize strengthening their ability to control shopping risks. Additionally, these managers should implement adequate measures to

mitigate the shopping risks associated with their platforms. Only when the shopping risk is sufficiently low would consumers feel confident in making purchases on cross-border e-commerce platforms. Consequently, cross-border e-commerce enterprises need to address various risk factors, including product promotion risk, product transportation risk, product quality risk, product after-sales risk, and product payment risk. By effectively controlling and reducing these risks, consumers would be more willing to engage in shopping activities on cross-border e-commerce platforms.

7.1.3. In cross-border e-commerce platforms, consumer trust and attitude are also important factors affecting consumers' purchase intention

Based on the previous analysis, it is evident that consumer trust and attitude play a significant mediating role in the relationship between the independent variable and the dependent variable. Moreover, the mediating effect of these 2 factors is positive. Therefore, managers of cross-border e-commerce enterprises should prioritize consumer trust and attitude when aiming to improve consumers' purchase intention. By enhancing consumer trust and attitude, managers could effectively enhance the marketing efficiency of their cross-border e-commerce enterprises. It is important to note that the steady improvement of sales performance in cross-border e-commerce enterprises could only be truly guaranteed when the trust and attitude of consumers have reached a certain level. Thus, managers must focus on building and maintaining high levels of trust and positive attitudes among consumers to ensure long-term success.

7.2. Research limitations and future research directions

The study acknowledges certain limitations, which could serve as future research directions for scholars. These limitations include: (1) The study is constrained by the authors' research time, resulting in a relatively small number of control variables. This limitation prevents a comprehensive verification of the research conclusions across different application scenarios. (2) Due to the authors' research efforts, the study does not fully encompass various external factors, which may limit the robustness of the research findings. (3) The study focuses on only one independent variable due to the constraints of research length. However, there are numerous factors that influence CPA, leading to a certain degree of bias in the study. These limitations highlight the need for further improvement in future studies. Subsequent research should aim to address these deficiencies and enhance the overall quality of the findings.

7.2.1. We should consider incorporating additional control variables in future research

Due to the constraints of the study's length, the constructed model only includes independent variables, dependent variables, and mediating variables. However, several important control variables have not been included. To further enhance the depth of our investigation, it would be valuable to introduce various relevant control variables in future studies. These control variables may encompass factors such as the establishment time of cross-border e-commerce firms, sales volume, number of employees, target market conditions, product types, and frequency of business events, among others. By studying these control variables, we could bolster the comprehensiveness of our research on this issue.

7.2.2. We should add other external factors for research in the future

Due to the author's limited resources, this study did not consider external factors such as the cross-border e-commerce trade environment, trade convenience, logistics and transportation, and government policies. However, these factors play a significant role in shaping the development of cross-border e-commerce firms. Therefore, it is recommended to integrate these external factors into the model in future studies. By incorporating the study of relevant external conditions, the depth and comprehensiveness of the paper could be further enhanced.

7.2.3. It is important to select additional independent variables to explore their influence on CPA in cross-border e-commerce in the future research

While this study focused solely on consumer perception as the independent variable, there are indeed numerous other factors that could impact CPA. These factors include cross-border e-commerce platforms, cross-border logistics and transportation, product types, product quality, and target market, among others. By incorporating these variables as independent variables and investigating their influence mechanisms on CPA, future studies could provide a more comprehensive understanding of the factors shaping CPA in cross-border e-commerce. This approach would undoubtedly enrich the research perspective on the issue of CPA in cross-border e-commerce.

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Chenggang Wang: Writing – original draft. **Tiansen Liu:** Writing – original draft, Supervision. **Yue Zhu:** Software, Methodology, Investigation, Data curation, Conceptualization. **He Wang:** Writing – review & editing, Project administration, Formal analysis. **Xinyu Wang:** Data curation, Conceptualization. **Shunyao Zhao:** Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

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