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## Logistics service quality, consumer trust, and product judgments in cross-border e-commerce

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**Abstract:** In emerging markets, cross-border e-commerce (CBEC) depends on consumer trust and product judgments under conditions of logistics complexity, information asymmetry, and cross-border flow uncertainty. This research investigates the collective impact of platform attributes (information, system, and e-service/logistics service quality), value perceptions (price competitiveness, product uniqueness), and national psychological factors (affinity, ethnocentrism, animosity) on trust, product assessments, and cross-border purchasing flows involving U.S. and Chinese products purchased by Vietnamese consumers. Two online surveys were administered to CBEC users assessing U.S. (N = 1,041) and Chinese (N = 1,013) products. Using PLS-SEM and artificial neural networks, the results show that platform quality affects purchasing behavior mainly through trust and product evaluations rather than direct transactional mechanisms. For Chinese products, information quality and logistics-related e-service quality play a more prominent role, reflecting differences in logistics service execution. Price competitiveness and product uniqueness emerge as key value-driven determinants of product evaluations. Affinity strengthens trust and product evaluations, whereas ethnocentrism weakens them; animosity is largely insignificant in routine CBEC logistics flows. Trust is more influential for U.S. goods, while perceived value is more critical for Chinese goods. The study frames CBEC platforms as digital logistics systems coordinating information and service flows, and provides implications for cross-border logistics and platform design in emerging economies.

### 1 Introduction

In emerging nations, cross-border e-commerce (CBEC) has evolved into a vital conduit transforming consumer access to global items, facilitating cross-border flows of goods, information, and transactions through digital platforms. In Vietnam, CBEC represented approximately 37% of overall e-commerce transactions in 2023, with projections indicating sustained growth until 2025, driven by enhanced logistics capability and platform dependability. Vietnamese consumers are progressively acquiring American products, which are perceived as premium quality, via Amazon and eBay, while Chinese goods, known for affordability and diversity, are purchased through platforms such as Alibaba and TaoBao [1]. Considering that China is Vietnam's foremost import partner [2] and the United States its primary export destination [3], the competition between items from these two nations in Vietnam's digital marketplace is both fierce and strategically important. This context positions CBEC not merely as a retail channel but as a digitally mediated logistics system coordinating material and information flows across borders.

Despite increasing involvement in CBEC, current research presents contradictory findings about the impact of attitudinal elements on product assessments. Social identity theory, via categories such as ethnocentrism, elucidates national bias towards foreign products [4], whereas contemporary research uncovers contextual subtleties [5]. Numerous research indicate that consumer ethnocentrism and antagonism adversely influence evaluations of foreign products and intentions to purchase [6,7]. Nevertheless, alternative studies indicate more intricate or inconsistent patterns. Hostility indirectly diminishes purchase intention by decreasing perceived product quality [8], but an absence of a significant association between animosity and brand image [6]. These mixed results suggest that attitudinal effects may depend on platform-mediated information flows and logistics service execution rather than operate as direct drivers of behavior. Moreover, most prior studies rely on linear modeling approaches, which may overlook complex and non-linear decision mechanisms inherent in digital commerce environments, particularly those shaped by logistics uncertainty and information asymmetry.

Accordingly, this study investigates the determinants of Vietnamese consumers' trust and product evaluations toward U.S. and Chinese products in CBEC, integrating emotional, cultural, and platform quality dimensions. Social identity theory is employed to explain consumer bias, while the S-O-R framework and the Information Systems Success model are combined to capture how platform quality and logistics-related service flows influence trust and satisfaction.

This study contributes by: (1) offering a comparative analysis of U.S. and Chinese products within Vietnam's CBEC market from a logistics flow perspective; (2) clarifying inconsistent findings regarding attitudinal factors; (3) advancing methodological rigor by integrating PLS-SEM and Artificial Neural Networks to capture both linear and non-linear relationships; and (4) providing practical insights for the design of CBEC platforms as digital logistics systems.

## 2 Theoretical framework and hypothesis development

### 2.1 Theoretical background

Understanding cross-border consumer behavior requires a solid grounding in interdisciplinary theoretical frameworks that account for the psychological, sociocultural, and technological forces shaping decision-making in digital commerce. This study draws upon three foundational theories: Social identity theory, the Stimulus-Organism-Response (S-O-R) framework, and the Information system success model; to build an integrated conceptual foundation for investigating how Vietnamese consumers evaluate and engage with U.S. and Chinese products in CBEC settings. Social identity theory posits that individuals derive part of their self-concept from their membership in social groups, often leading to preferential attitudes toward in-group symbols and skepticism toward out-group representations. In the context of CBEC, this framework helps explain how national origin cues may activate identity-based preferences or resistance. Constructs such as consumer ethnocentrism, a belief that buying domestic products is morally preferable, are key manifestations of this theory in consumption settings, along with consumer affinity and animosity, which reflect emotional alignment or opposition toward countries [4].

The S-O-R model conceptualizes consumer behavior as a chain of influence whereby external stimuli, such as website interface, brand origin, or product pricing, affect internal states like emotion, perception, or cognitive appraisal, which in turn guide behavioral outcomes. This model provides a useful lens for interpreting how the design and presentation of CBEC platforms elicit psychological responses that may shape trust and purchase-related judgments [3]. Platform functionality and user-centered design drive satisfaction and behavioral intentions, according to the information system success model. This approach emphasises information, system, and service quality as major determinants of consumers' evaluative responses to digital storefronts without physical inspection or interpersonal interaction [9].

### 2.2 Consumer affinity, national identification, and their effects on trust and product evaluation

Consumer affinity is a positive view of a foreign country based on personal experiences, cultural adoration, and affective connection with its ideals. Affinity reinforces a consumer's sense of belonging and admiration for a national group in cross-border consumption [10]. This psychological alignment affects trust and product evaluations, especially when sellers or products are far away. According to social identification theory, consumers choose foreign products from countries they identify with because they symbolically validate their aspirational or cultural in-group affiliation. Norwegian, Japanese, and Southeast Asian samples showed that national affiliation increased product-related trust [11]. Besides trust, affinity has been connected to greater product ratings, with customers evaluating goods from favorite countries higher in quality, design, and value alignment. These theoretical and empirical grounds suggest the following hypotheses:

**H1a.** Consumer affinity positively influences consumer trust in cross-border e-commerce platforms.

**H1b.** Consumer affinity positively influences product judgments of foreign goods.

### 2.3 Consumer ethnocentrism, national identity, and their impact on trust and product evaluation

Consumer ethnocentrism is the view that buying foreign goods is immoral and bad for the domestic economy. Based on Social identity theory, this concept shows a protective orientation toward the national in-group, sometimes manifested as loyalty to home products and resistance to foreign alternatives [12]. Nationalism and patriotism increase these sentiments, dividing local and imported goods perceptions. Ethnocentrism makes customers distrust foreign brands' quality, relevance, and compatibility with national values [10]. Given Vietnam's nationalist identity and fast globalizing market, the following hypotheses are proposed:

**H2a.** Consumer ethnocentrism negatively influences consumer trust in cross-border e-commerce.

**H2b.** Consumer ethnocentrism negatively influences product judgments of foreign goods.

### 2.4 Consumer animosity, intergroup hostility, and their influence on trust and product evaluation

Consumer hostility is deep-seated hatred of a foreign country, usually caused by political, historical, or economic strife. Unlike situational discontent, enmity is long-lasting and typically arises from unresolved intergroup conflicts like territorial disputes or colonial histories, which form consumer rejection to hostile nation products [13]. A psychological

response to perceived intergroup threat, animosity reinforces national in-group loyalty and generates enmity toward out-groups. This causes consumers to emotionally oppose products from the hated country, often leading to purchase hesitancy or rejection. Apart from product rejection, antagonism lowers consumer trust. Hostile customers question product integrity, ethical sourcing, and safety, especially when national identity is at stake [14]. Anger creates cognitive distance that hinders trust building. Anger may affect trust and evaluation in CBEC as an emotional and cognitive filter. These hypotheses are proposed:

**H3a.** Consumer animosity negatively influences consumer trust in cross-border e-commerce.

**H3b.** Consumer animosity negatively influences product judgments of foreign goods.

## **2.5 Information quality, digital content assurance, and their role in trust and product evaluation**

Online content correctness and completeness are crucial to user experience in digital commerce, especially in CBEC, where there is no physical product interaction. Information quality, the extent to which system-generated information is timely, relevant, accurate, and complete [9], affects consumer perceptions of product credibility and platform reliability. Product descriptions, pricing clarity, return procedures, and visual content indicate authenticity and value in CBEC. High information quality decreases uncertainty and enables confident decision-making, especially in foreign transactions where cultural, legal, and logistical unfamiliarities increase risk [15]. Customers that receive clear, consistent, and personalized information are more likely to trust the platform and vendor. According to the information system success model, information quality influences system utilization, user happiness, and behavioral intention [9]. CBEC increases trust and product assessments as customers use existing information to infer quality, performance, and suitability [16]. Thus, information quality builds trust and enables evaluation in CBEC platforms. Well-designed products satisfy utilitarian and emotional demands, encouraging positive customer behavior across cultures and nations.

**H4a.** Information quality positively influences consumer trust in cross-border e-commerce.

**H4b.** Information quality positively influences product judgments of foreign goods.

## **2.6 System quality, platform stability, and their effects on trust and product evaluation**

In CBEC, system quality refers to the technical performance and user-friendliness of a digital platform, including features such as usability, reliability, responsiveness, and adaptability. Fast page loads, smooth navigation, and platform stability improve user experience with high system quality. Technical fluency promotes professionalism and operational reliability, which build. System failures (errors, crashes, or slow response) signify inefficiency and increase transactional uncertainty, lowering consumer confidence [13]. Behaviorally, intuitive solutions reduce cognitive stress and search costs, letting consumers focus on product evaluation rather than technical navigation [17]. This increases product value since system quality indicates the seller's dependability and reputation. In CBEC contexts with physical and cultural distance, system quality provides operability and communicates the supplier's legitimacy and service commitment [18]. Overall, system quality is crucial to CBEC consumer trust and product perceptions. These hypotheses are proposed:

**H5a.** System quality positively influences consumer trust in cross-border e-commerce.

**H5b.** System quality positively influences product judgments of foreign goods.

## **2.7 E-service quality, relational signals, and their influence on trust and product evaluation**

CBEC defines e-service quality as consumers' perceptions of online assistance, transaction ease, delivery speed, and post-sale support. It shows how platforms and vendors meet consumers' timeliness, reliability, and care requirements. This study defines e-service quality as (1) functional support, (2) logistical efficacy, and (3) post-purchase service. High service quality builds satisfaction, loyalty, and trust, especially when cultural or physical distance hinders direct verification [19]. E-commerce studies suggest that quick and personalized services increase product value perceptions, which affects behavioral intent. Service experiences boost trust. Service quality signals care and dedication in CBEC, where seller unfamiliarity is significant). E-service quality builds consumer trust and improves product assessments, especially in high-context emerging countries like Vietnam. The following hypotheses are proposed:

**H6a.** E-service quality positively influences consumer trust in cross-border e-commerce.

**H6b.** E-service quality positively influences product judgments of foreign goods.

## **2.8 Price competitiveness, perceived value, and its role in shaping product judgments**

Price competitiveness in CBEC means consumers think a product is cheaper than alternatives, especially after shipping, tariffs, and foreign exchange discrepancies. It shows a supplier's capacity to attract price-sensitive consumers in global digital markets with attractive value propositions. Foreign vendors can undercut domestic competitors in CBEC transactions due to structural cost advantages such favorable tax regimes, lower labor costs, and economies of scale. Utility-maximizing behavior and strong price sensitivity make these pricing advantages especially attractive in growing markets like Vietnam. Consumers feel good about buying a product and getting a good deal. Consumers make better product decisions and are happier with purchases when pricing is fair [13]. Competitive pricing boosts product appeal,

consumer trust in the transaction process, and brand favorability, especially in CBEC where physical inspection is not possible. The following hypothesis is proposed:

**H7.** Price competitiveness positively influences product judgments of foreign goods.

**2.9 Product uniqueness, symbolic value, and its impact on product evaluation**

Consumers are drawn to CBEC by more than price or convenience. They increasingly seek unique things not available domestically. Psychological research shows that uniqueness drives purchase behavior. This is especially true in civilizations that emphasize individuality and expression [20]. This feature motivates consumers to prefer rare or novel things that help them stand out. This increases brand loyalty and international platform exploration [21,22]. This behavioral trend is even more apparent in CBEC scenarios when a product's perceived uniqueness matches the consumer's aspirations or self-image. Uniqueness boosts a product's hedonic and symbolic utility, according to perceived value theory. Thus, CBEC platforms with unique products tend to receive better reviews and increase purchase motivation. Given this, the following theory is proposed:

**H8.** Product uniqueness positively influences product judgments of foreign goods.

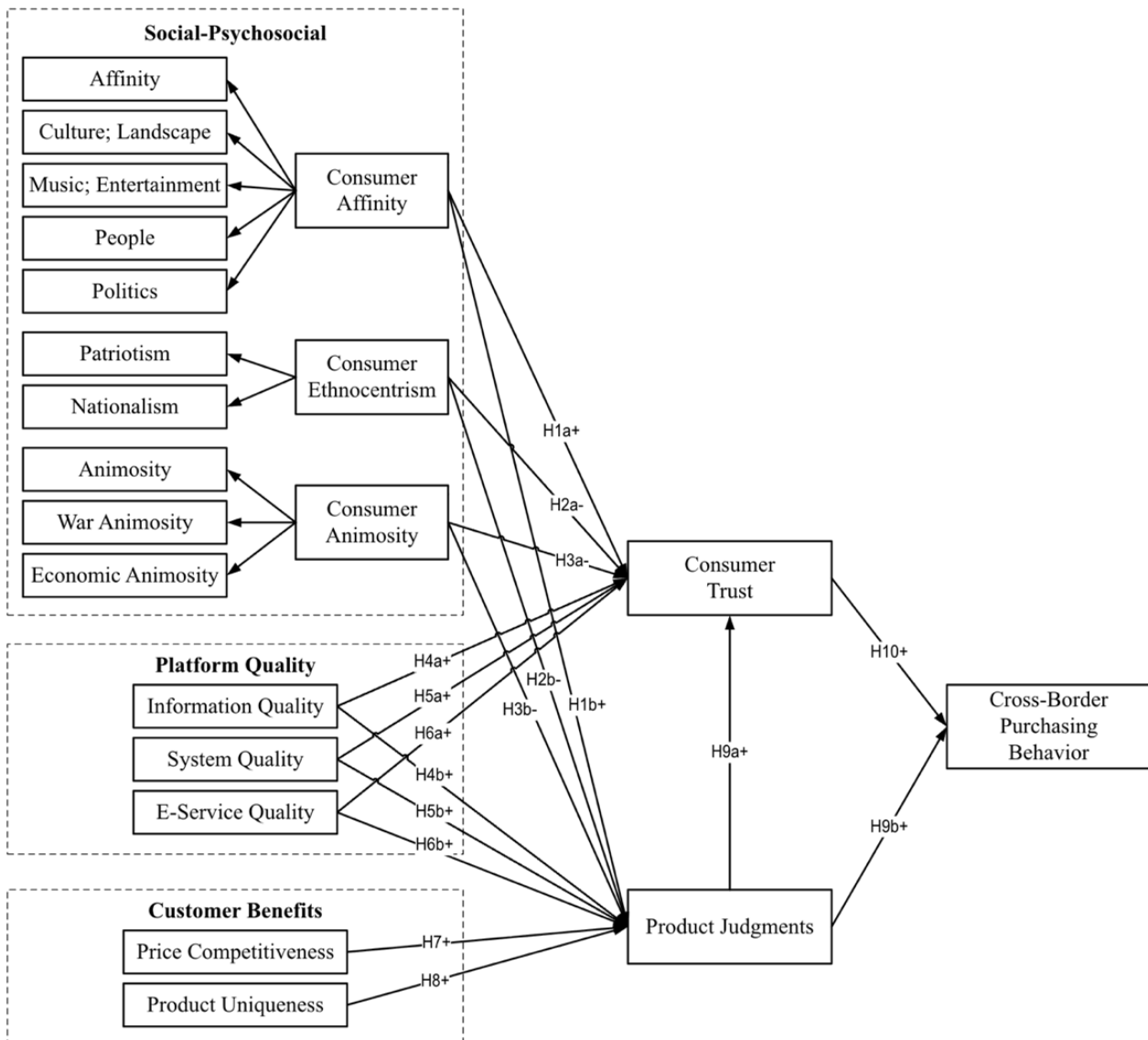


Figure 1 Research model

**2.10 Product judgments and cross-border purchasing behavior**

Consumers evaluate foreign items based on price, design, innovation, quality, durability, technical advancement, and production capacities [23]. Digital cues, platform knowledge, and brand reputation drive CBEC product evaluations, when consumers cannot physically inspect things. Trust and product ratings are linked. Foreign product quality and value

increase consumer trust in the vendor or platform. Superior product features increase perceived reliability. Product value boosts cognitive and affective trust [24]. This link is crucial in CBECs. Consumers trust platforms more when they think foreign products are valuable [15]. When a product meets quality, uniqueness, or perceived benefit expectations, consumers are more likely to buy. In international e-commerce, perceived product value drives purchase behavior.

Given these data, the following possibilities are proposed:

**H9a.** Product judgments have a positive relationship with consumer trust.

**H9b.** Product judgments have a positive relationship with cross-border purchasing behavior of consumers.

### 2.11 Consumer trust and cross-border purchasing behavior

Online commerce depends on consumer trust, especially in cross-border environments where consumers experience increased uncertainty. It shows customers trust the platform, sellers, and trust reduces digital transaction hesitancy and risk [18]. Trust is considerably more important in CBEC. Lack of physical touch, foreign delivery, payment processing, and platform unfamiliarity increase consumer trust as a risk-reduction tool [19]. This is supported by data. For instance, mobile CBEC platform trust significantly increases purchase intention [25]. Information quality moderates trust's favorable effect on cross-border purchase behavior [26]. These findings imply that trust is essential for cross-border purchasing, especially in emerging economies like Vietnam. We suggest the following hypothesis:

**H10.** Consumer trust has a positive relationship with cross-border purchasing behavior of consumers.

Research model is presented in Figure 1.

## 3 Research methodology

### 3.1 Instrument development and qualitative pre-testing

The study used a qualitative pre-test to verify content and context. All constructs were forward-backward translated into Vietnamese using cross-cultural adaption approach. To ensure clarity and contextual relevance, 14 industry professionals from CBEC platforms, exports, logistics, retail tech, branding, trade law, payments, consulting, and international business research assessed the draft questionnaire. Expert criticism led to minor phrasing and layout changes. Validated scales were used to measure all constructs on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree).

Social-psychological factors (affinity, ethnocentrism, animosity), platform quality (information, system, e-service quality), customer benefits (price competitiveness, product uniqueness), consumer trust, product judgments, and cross-border purchasing behavior were covered in the final instrument. A pilot test with 14 experienced CBEC users showed internal consistency with Cronbach's alpha over 0.7 for all constructions.

### 3.2 Sampling procedure and data collection

Non-probability purposive sampling was employed to target Vietnamese online consumers with prior experience in purchasing foreign products via CBEC platforms. Data were collected through an online survey distributed between September 2023 and May 2024. Measures to prevent duplication included IP checks and mandatory entry of unique email addresses. After data cleaning, two separate but parallel datasets were retained for analysis:

Study 1 (U.S. product context):  $n = 1,041$

Study 2 (Chinese product context):  $n = 1,013$ .

### 3.3 PLS-SEM analysis

The two-step Hair et al. (2019) approach was used for SmartPLS 4's core quantitative analysis:

Assessment of measurement models: Indicator reliability (loading  $> 0.708$ ), internal consistency reliability ( $CR > 0.7$ ), and convergent validity ( $AVE > 0.5$ ) were guaranteed for reflective constructs. Discriminant validity was confirmed by Fornell-Larcker criterion and HTMT ratio (all  $< 0.85$ ). If relevant, redundancy analysis and multicollinearity checks ( $VIF < 5$ ) were performed on formative constructs.

Evaluation of structural models: Model fit and predictive power were assessed using  $R^2$ ,  $Q^2$  (blindfolded), path coefficient t-values (bootstrapping with 5,000 samples), and effect sizes ( $f^2$ ). All path coefficients were evaluated for significance and directionality in both product-country settings. Model diagnostics confirmed multicollinearity was not a concern ( $VIF < 5$ ), and Durbin-Watson statistics ( $\approx 2$ ) ruled out residual autocorrelation.

### 3.4 Post-hoc predictive validation using artificial neural network

To complement the explanatory power of SEM and enhance out-of-sample predictive validity, an Artificial neural network analysis was performed. Significant SEM predictions were employed as input neurons in an MLP model using hybrid SEM-ANN technique [27]. Data were split by 90% training and 10% testing. ANN model performance was evaluated using RMSE and predicted  $R^2$ . Normalized importance was used to rank predictors using sensitivity analysis. Qualitative study results (Table 1).

*Table 1 Qualitative study results*

Company's industry field	Positions	Social-psychological -> Trust	Social-psychological -> Judgments	Platform quality -> Trust	Platform quality -> Judgments	Customer benefits -> Judgments	Judgments -> Trust	Judgments -> Behavior	Trust -> Behavior	Other insights provided
01. CBEC platform	Head of Product	✓		✓	✓				✓	Suggested cultural proximity as a mediating variable.
02. Consumer goods exporter	Export Manager					✓	✓	✓	✓	Raised concern on overreliance on platform cues; suggested UX consistency as moderating factor.
03. Logistics provider	Operations Director			✓	✓	✓	✓	✓	✓	Emphasized return policy as an overlooked trust factor.
04. Retail technology	Chief technology officer			✓	✓	✓	✓	✓	✓	Suggested integrating trust seals or certifications as variables.
05. University research center	Senior Researcher	✓	✓	✓	✓	✓	✓	✓	✓	Proposed comparison between Gen Z and Millennials in affinity strength.
06. Cross-border payment firm	Compliance Lead			✓			✓	✓	✓	Noted the role of local influencers in mitigating animosity.
07. Global brand marketing	Marketing Strategist	✓	✓	✓	✓	✓	✓	✓	✓	Recommended dynamic pricing as potential moderator between uniqueness and judgment.
08. B2C marketplace ops	Marketplace Manager	✓		✓	✓	✓		✓	✓	Suggested adding loyalty behavior as a follow-up outcome.
09. Digital marketing consultant	Principal Consultant	✓	✓	✓		✓		✓	✓	Proposed factoring time spent browsing as a moderator.
10. Consumer behavior research	Behavioral Analyst	✓	✓	✓		✓		✓	✓	Suggested comparing inbound vs outbound CBEC flows.
11. International business school	Lecturer in IB	✓	✓	✓		✓		✓	✓	Recommended distinguishing between hedonic and utilitarian products.
12. Product sourcing firm	Procurement Manager			✓		✓			✓	Suggested testing gender as a control variable.
13. Global trade association	Policy Analyst			✓					✓	Warned about data quality issues with Gen AI-generated reviews.
14. IT systems integration	Tech Architect			✓	✓				✓	Proposed assessing perceived risk as indirect path to purchase.

#### 4 Data analysis and results

Customers who were aware of cross-border e-commerce (CBEC) participated in the study conducted in Vietnam. In Study 1, 1,041 respondents assessed American-made products, while in Study 2, 1,013 respondents evaluated Chinese products. The demographic characteristics of the samples are summarized in Table 2.

Table 2 Demographic characteristics of samples

Demographics	Category	Study 1: United States Products			Study 2: China Products		
		Frequency (N = 1.041)	Valid percentage	Cumulative (%)	Frequency (N = 1.013)	Valid Percentage	Cumulative (%)
Gender	Female	561	53.9%	53.9%	470	46.40%	46.40%
	Male	480	46.1%	100.0%	543	53.60%	100.00%
Education	Undergraduate	497	47.7%	47.7%	234	23.10%	23.10%
	University	332	31.9%	79.6%	674	66.54%	89.63%
	Postgraduate	212	20.4%	100.0%	105	10.37%	100.00%
Occupation	Student	198	19.0%	19.0%	170	16.78%	16.78%
	Part-time	186	17.9%	36.9%	108	10.66%	27.44%
	Employed	657	63.1%	100.0%	735	72.56%	100.00%
Experience in CBEC	< 1 month	177	17.0%	17.0%	114	11.25%	11.25%
	1-6 months	319	30.6%	47.6%	215	21.22%	32.48%
	6-12 months	304	29.2%	76.8%	332	32.77%	65.25%
	> 1 year	241	23.2%	100.0%	352	34.75%	100.00%

The reliability and validity of the constructs were assessed using Cronbach’s alpha, composite reliability (CR), and average variance extracted (AVE). In this study, three exogenous latent constructs, namely consumer affinity, consumer antagonism, and consumer ethnocentrism, were modeled as higher order constructs (HOCs) using the hierarchical component model (HCM) approach in PLS-SEM.

As part of the reflective measurement model assessment, indicator loadings were examined. Items with loadings below the recommended threshold of 0.708 were removed. Specifically, in Study 1, the indicators ANI1, CAF4, CAF9, CET2, and CET6 were excluded. In Study 2, the indicators ANI1, CAF1, CAF2, and CAF11 to CAF19 were excluded.

After re-estimation, all remaining constructs demonstrated satisfactory internal consistency, with Cronbach’s alpha, composite reliability, and AVE values exceeding the recommended thresholds. These results, presented in Table 3, confirm the reliability and convergent validity of the measurement model.

Table 3 Construct reliability and validity

Constructs	Identification	United States Products (Study 1)			China Products (Study 2)		
		Cronbach’s alpha	Composite reliability (rho c)	AVE	Cronbach’s alpha	Composite reliability (rho c)	AVE
Consumer affinity	CAF	0.950	0.955	0.558	0.941	0.951	0.707
Affinity		0.834	0.923	0.858			
Culture; Landscape		0.832	0.888	0.665	0.912	0.934	0.739
Music; Entertainment		0.728	0.880	0.786	0.874	0.923	0.799
People		0.879	0.908	0.623			
Politics		0.785	0.875	0.700			
Consumer animosity	ANI	0.923	0.937	0.651	0.934	0.945	0.683
Economic Animosity		0.876	0.910	0.668	0.899	0.925	0.712
War Animosity		0.839	0.903	0.757	0.848	0.908	0.767
Consumer ethnocentrism	CET	0.924	0.941	0.726	0.931	0.943	0.676
Nationalism		0.748	0.888	0.798	0.808	0.887	0.723
Patriotism		0.902	0.932	0.773	0.905	0.929	0.724
Consumer Trust	CT	0.736	0.850	0.655	0.751	0.858	0.668
Cross-border purchasing	CBB	0.838	0.892	0.673	0.855	0.902	0.697
Information Quality	IQ	0.861	0.906	0.706	0.869	0.911	0.719
Price competitiveness	PC	0.796	0.867	0.620	0.816	0.879	0.644
Product judgments	PJ	0.858	0.894	0.586	0.874	0.905	0.613
Product uniqueness	PU	0.722	0.844	0.643	0.802	0.883	0.716
Service quality	SEQ	0.882	0.914	0.679	0.893	0.921	0.701
System quality	SYQ	0.827	0.878	0.591	0.885	0.916	0.686

Convergent validity is established when factor loadings exceed 0.70 and the Average Variance Extracted (AVE) is greater than 0.50. As shown in Table 3, all constructs in this study meet these criteria, confirming that the measurement items sufficiently represent their respective latent variables. The evaluation of discriminant validity utilized both the Fornell-Larcker criterion and the Heterotrait-Monotrait (HTMT) ratio. Table 4 demonstrates that this condition is met for all constructs, signifying sufficient discriminant validity. It is important to note that using the same indicators for both lower-order and higher-order constructs may compromise discriminant validity. However, in this study, the constructs are well distinguished, as evidenced by the AVE square roots being greater than the corresponding inter-construct correlations. This result confirms that the constructs are conceptually distinct and not redundant.

Table 4 Fornell-Larcker's discriminant validity

Study 1: United States Products (N = 1.041 samples)											
Constructs	CAF	ANI	CET	CT	CBB	IQ	PCN	PJ	PUQ	SEQ	SYQ
Consumer affinity	0.747										
Consumer animosity	-0.160	0.807									
Consumer ethnocentrism	-0.504	0.161	0.852								
Consumer trust	0.651	-0.156	-0.582	0.809							
Cross-border purchasing	0.541	-0.183	-0.510	0.656	0.821						
Information quality	0.420	-0.117	-0.532	0.591	0.452	0.840					
Price competitiveness	0.428	-0.184	-0.466	0.555	0.569	0.454	0.788				
Product judgments	0.586	-0.163	-0.647	0.676	0.646	0.628	0.667	0.765			
Product uniqueness	0.406	-0.027	-0.504	0.433	0.459	0.428	0.432	0.656	0.802		
E-service quality	0.129	0.027	-0.137	0.339	0.189	0.208	0.132	0.207	0.183	0.824	
System quality	0.282	-0.111	-0.244	0.436	0.306	0.366	0.282	0.329	0.168	0.136	0.769
Study 2: China Products (N = 1.039 samples)											
Constructs	CAF	ANI	CET	CT	CBB	IQ	PCN	PJ	PUQ	SEQ	SYQ
Consumer affinity	0.841										
Consumer animosity	-0.061	0.826									
Consumer ethnocentrism	-0.255	0.116	0.822								
Consumer trust	0.327	-0.193	-0.408	0.817							
Cross-border purchasing	0.242	-0.141	-0.397	0.653	0.835						
Information quality	0.149	-0.210	-0.314	0.553	0.487	0.848					
Price competitiveness	0.202	-0.174	-0.348	0.580	0.523	0.475	0.803				
Product judgments	0.351	-0.169	-0.478	0.688	0.656	0.566	0.698	0.783			
Product uniqueness	0.137	-0.028	-0.339	0.406	0.443	0.355	0.439	0.630	0.846		
E-service quality	0.107	-0.026	-0.064	0.364	0.213	0.239	0.173	0.339	0.228	0.837	
System quality	-0.056	-0.185	-0.084	0.445	0.339	0.308	0.379	0.286	0.147	0.082	0.828

The mean value of the item correlations across constructs in relation to the (geometric) mean of the average correlations for the items measuring the same construct is known as the heterotrait-monotrait ratio. When HTMT readings are high, discriminant validity issues arise. A threshold value of 0.90 or a lesser threshold value, such 0.85 or 0.90, should be determined based on the study environment. Table 5 demonstrates that all HTMT indicators are below 0.84, suggesting that the concepts are in fact different from one another.

Table 5 Heterotrait-monotrait ratio (HTMT) for discriminant validity

Study 1: United States Products (N = 1.041 samples)											
Constructs	CAF	ANI	CET	CT	CBB	IQ	PCN	PJ	PUQ	SEQ	SYQ
Consumer Affinity											
Consumer Animosity	0.170										
Consumer Ethnocentrism	0.538	0.174									
Consumer Trust	0.778	0.189	0.705								
Cross-Border Purchasing	0.606	0.208	0.578	0.834							
Information Quality	0.464	0.132	0.596	0.740	0.530						
Price Competitiveness	0.491	0.215	0.543	0.725	0.696	0.548					
Product Judgments	0.648	0.183	0.726	0.849	0.761	0.730	0.807				
Product Uniqueness	0.489	0.042	0.617	0.594	0.589	0.542	0.569	0.832			
E-Service Quality	0.140	0.040	0.152	0.420	0.219	0.238	0.156	0.236	0.229		

System Quality	0.318	0.128	0.279	0.559	0.366	0.434	0.346	0.388	0.214	0.159	
Study 2: China Products (N = 1.039 samples)											
Constructs	CAF	ANI	CET	CT	CBB	IQ	PCN	PJ	PUQ	SEQ	SYQ
Consumer Affinity											
Consumer Animosity	0.065										
Consumer Ethnocentrism	0.274	0.124									
Consumer Trust	0.388	0.231	0.487								
Cross-Border Purchasing	0.269	0.158	0.444	0.815							
Information Quality	0.165	0.234	0.348	0.682	0.564						
Price Competitiveness	0.231	0.200	0.397	0.740	0.627	0.563					
Product Judgments	0.388	0.187	0.529	0.849	0.759	0.648	0.826				
Product Uniqueness	0.158	0.046	0.390	0.523	0.534	0.424	0.542	0.753			
E-Service Quality	0.117	0.029	0.071	0.443	0.242	0.269	0.201	0.383	0.269		
System Quality	0.063	0.204	0.101	0.545	0.390	0.350	0.446	0.325	0.174	0.090	

The Q-squared index is computed using the cross-validated redundancy (blindfolding) technique ( $Q^2$ ). This index offers a more thorough assessment of the exogenous latent variable's predictive indicators. The  $Q^2$  values should be higher than zero for a particular endogenous construct to demonstrate the structural model's prediction accuracy.  $Q^2$  values greater than 0 indicate minor predictive relevance of the PLS-path model, whereas 0.25 and 0.50 indicate medium predictive relevance. According to study 1's findings, the endogenous latent variable of customer trust accounts for 42.5% of the exogenous latent variable's prediction ability, followed by product assessments at 44.2% and cross-border purchasing at 33.8%. Similarly, research 2's findings indicate that 40.5% of the exogenous latent variable's prediction ability may be explained by the endogenous latent variable of consumer trust, 44% by product judgments, and 35.1% by cross-border purchases.

Table 6 The results of R-square, construct cross validated redundancy (blindfolding), and Bayesian information criterion

Constructs	Study 1: United States Products				Study 2: China Products			
	Q2	R2	R2 adjusted	BIC	Q2	R2	R2 adjusted	BIC
Product Judgments	0.422	0.728	0.725	-1291.978	0.440	0.724	0.722	-1244.057
Consumer Trust	0.425	0.656	0.653	-1055.712	0.405	0.613	0.610	-907.684
Cross-Border Purchasing	0.338	0.506	0.505	-714.042	0.351	0.508	0.507	-698.044

Table 6 displays the  $R^2$  and  $R^2$ -adjusted results. The scale of cross-border purchase activity has the lowest  $R^2$  indicator, according to both studies' findings. This might be because the residuals outside the model ( $\epsilon$ ) contain the majority of the significance. However, in both experiments, the scale of product judgments has the highest  $R^2$  indication. This study's structural equation modeling satisfies the specified criteria. Other criteria, including the Bayesian information criterion (BIC), which has also been examined in Table 6, are also available to evaluate out-of-sample prediction without the need of a holdout sample. Further evidence that there is no multicollinearity problem comes from the Durbin-Watson coefficient (d) test, which shows that the model does not have autocorrelation when 1 and the variance inflation factors VIF are both less than 5.

Lastly, utilizing the PLS algorithm offered by SmartPLS 4, the study employed the PLS-SEM technique to evaluate the suitability of the structural model. The 5000-times PLS bootstrapping procedure was used to assess the model's parameters for significance. Figure 2 displays the individual normalized path coefficients and  $R^2$  for study 1, whereas Figure 3 displays the same for study 2. Table 7 provides more information on the path coefficients and  $R^2$  values.

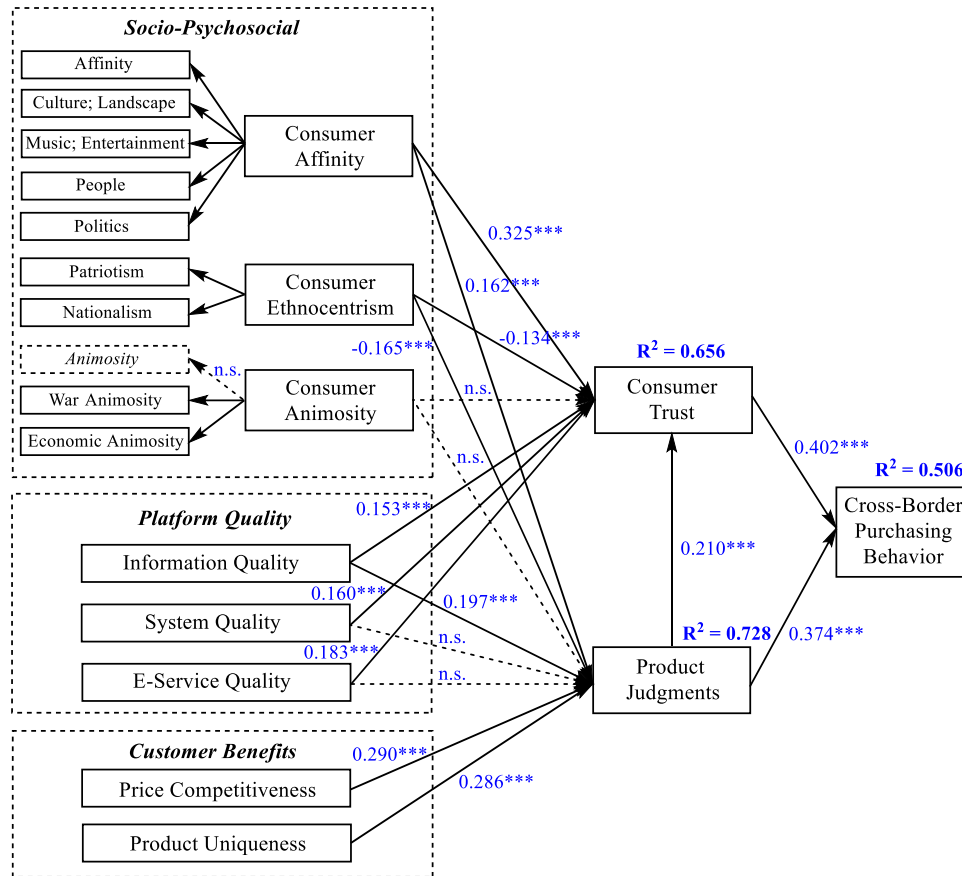


Figure 2 Model test results in study 1 (United States products) Note: \*\*\*  $p < 0.001$

Table 7 Hypotheses testing (bootstrapping 5,000)

Hypothesis	Relationship-construct	United States Products (Study 1)				China Products (Study 2)			
		Original sample	T Statistics	P Value	Supported	Original sample	T Statistics	P Value	Supported
H1a	Consumer Affinity -> Consumer Trust	0.325	12.147	0.000	Yes	0.146	6.051	0.000	Yes
H1b	Consumer Affinity -> Product Judgments	0.162	7.684	0.000	Yes	0.161	8.585	0.000	Yes
H2a	Consumer Ethnocentrism -> Consumer Trust	-0.134	5.257	0.000	Yes	-0.115	5.042	0.000	Yes
H2b	Consumer Ethnocentrism -> Product Judgments	-0.165	6.975	0.000	Yes	-0.140	7.485	0.000	Yes
H3a	Consumer Animosity -> Consumer Trust	-0.017	0.913	0.362	No	-0.021	1.119	0.263	No
H3b	Consumer Animosity -> Product Judgments	-0.023	1.256	0.209	No	-0.026	1.626	0.104	No
H4a	Information Quality -> Consumer Trust	0.153	4.779	0.000	Yes	0.170	5.546	0.000	Yes
H4b	Information Quality -> Product Judgments	0.197	7.674	0.000	Yes	0.170	7.769	0.000	Yes
H5a	System Quality -> Consumer Trust	0.160	7.266	0.000	Yes	0.274	12.208	0.000	Yes
H5b	System Quality -> Product Judgments	0.034	1.729	0.084	No	0.034	1.685	0.092	No

Hypothesis	Relationship-construct	United States Products (Study 1)				China Products (Study 2)			
		Original sample	T Statistics	P Value	Supported	Original sample	T Statistics	P Value	Supported
H6a	E-Service Quality -> Consumer Trust	0.183	9.008	0.000	Yes	0.158	6.443	0.000	Yes
H6b	E-Service Quality -> Product Judgments	0.028	1.596	0.111	No	0.137	7.695	0.000	Yes
H7	Price Competitiveness -> Product Judgments	0.290	10.976	0.000	Yes	0.361	13.653	0.000	Yes
H8	Product Uniqueness -> Product Judgments	0.286	11.710	0.000	Yes	0.305	11.923	0.000	Yes
H9a	Product Judgments -> Consumer Trust	0.210	6.172	0.000	Yes	0.351	10.440	0.000	Yes
H9b	Product Judgments -> Cross-Border Purchasing	0.374	11.225	0.000	Yes	0.393	10.631	0.000	Yes
H10	Consumer Trust -> Cross-Border Purchasing	0.402	11.905	0.000	Yes	0.383	10.064	0.000	Yes

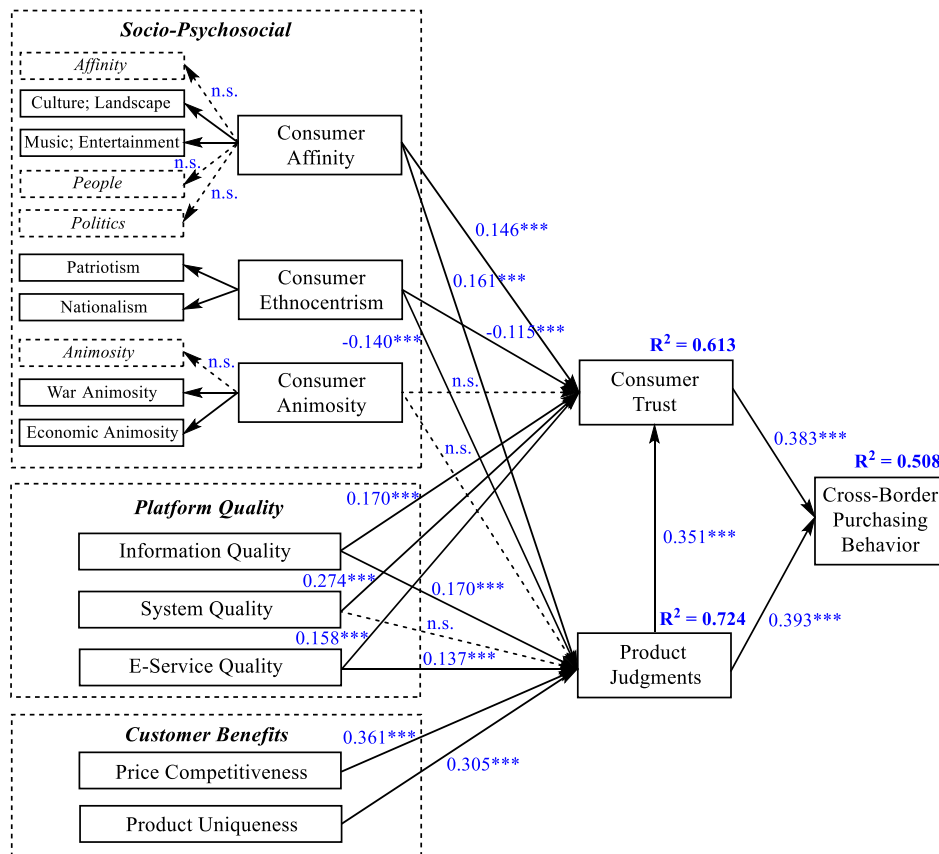


Figure 3 Model test results in study 2 (China products) Note: \*\*\*  $p < 0.001$

### 5 Artificial neural network (ANN) analysis

Following the structural model validation through PLS-SEM, an ANN analysis was conducted as a post-hoc phase to improve predictive validity and uncover potential non-linear interactions among key factors influencing cross-border purchasing behavior. This hybrid SEM-ANN approach was motivated by the complex, multidimensional nature of consumer decision-making and the likelihood of non-normal distributions within the dataset [27]. The ANN was particularly suitable for this research context given its robustness against outliers, noise, and sample irregularities, and its capacity to capture both linear and non-linear relationships without assuming data. Moreover, it accommodates non-

compensatory relationships, where a decrease in one predictor does not need to be offset by an increase in another. Significant predictors identified via PLS-SEM were used as input neurons across three sub-models in each national context. Each ANN model was trained using a feedforward-backpropagation (FFBP) learning algorithm. Multilayer perceptrons with sigmoid activation functions were implemented for both input and hidden layers. 90% of the samples were allocated to the training set, while the remaining 10% were used for testing. A ten-fold cross-validation method was employed to avoid overfitting and enhance generalizability.

Tables 8 and 9 present the RMSE values for each of the ten ANN runs under each model, corresponding to the U.S. and Chinese datasets, respectively. As shown, the average RMSE values range between approximately 0.094 and 0.119 for the U.S. model and 0.098 and 0.117 for the China model, indicating a satisfactory model fit and strong predictive performance.

Table 8 RMSE values for US model

Neural network	Model A		Model B		Model C	
	Input: Affinity, Ethnocent, InfoQual, PriceComp, ProdUnique		Input: Affinity, Ethnocent, InfoQual, SysQual, ServQual, ProdJudg		Input: Trust, ProdJudg	
	Output: ProdJudg		Output: Trust		Output: CBPurchase	
	Training RMSE	Testing RMSE	Training RMSE	Testing RMSE	Training RMSE	Testing RMSE
ANN1	0.100	0.096	0.097	0.123	0.098	0.123
ANN2	0.123	0.134	0.092	0.118	0.093	0.115
ANN3	0.114	0.128	0.095	0.119	0.098	0.124
ANN4	0.109	0.103	0.091	0.115	0.095	0.126
ANN5	0.091	0.102	0.096	0.122	0.095	0.114
ANN6	0.091	0.102	0.093	0.117	0.089	0.120
ANN7	0.087	0.107	0.098	0.120	0.098	0.112
ANN8	0.120	0.116	0.094	0.116	0.087	0.117
ANN9	0.109	0.112	0.097	0.121	0.090	0.113
ANN10	0.113	0.107	0.090	0.114	0.092	0.125
Mean	0.106	0.111	0.094	0.119	0.094	0.119
SD	0.012	0.012	0.003	0.003	0.004	0.005

Note: Affinity = Consumer affinity; Ethnocent = Consumer ethnocentrism; Animosity = Consumer animosity; InfoQual = Information quality; SysQual = System quality; ServQual = E-service quality; PriceComp = Price competitiveness; ProdUnique = Product uniqueness; Trust = Consumer trust; ProdJudg = Product judgments; CBPurchase = Cross-border purchasing behavior.

Table 9 RMSE values for China model

Neural network	Model A		Model B		Model C	
	Input: Affinity, Ethnocent, InfoQual, ServQual, PriceComp, ProdUnique		Input: Affinity, Ethnocent, InfoQual, SysQual, ServQual, ProdJudg		Input: Trust, ProdJudg	
	Output: ProdJudg		Output: Trust		Output: CBPurchase	
	Training RMSE	Testing RMSE	Training RMSE	Testing RMSE	Training RMSE	Testing RMSE
ANN1	0.086	0.111	0.098	0.117	0.099	0.101
ANN2	0.111	0.129	0.094	0.117	0.094	0.101
ANN3	0.090	0.118	0.099	0.123	0.100	0.107
ANN4	0.102	0.126	0.104	0.106	0.107	0.088
ANN5	0.110	0.113	0.094	0.107	0.093	0.089
ANN6	0.114	0.104	0.094	0.117	0.093	0.100
ANN7	0.102	0.129	0.104	0.113	0.108	0.096
ANN8	0.103	0.128	0.100	0.124	0.101	0.108
ANN9	0.086	0.111	0.092	0.114	0.091	0.097
ANN10	0.101	0.101	0.098	0.110	0.099	0.092
Mean	0.100	0.117	0.098	0.115	0.098	0.098
SD	0.010	0.011	0.004	0.006	0.006	0.007

Note: Affinity = Consumer affinity; Ethnocent = Consumer ethnocentrism; Animosity = Consumer animosity; InfoQual = Information quality; SysQual = System quality; ServQual = E-service quality; PriceComp = Price competitiveness; ProdUnique = Product uniqueness; Trust = Consumer trust; ProdJudg = Product judgments; CBPurchase = Cross-border purchasing behavior.

To further assess the relative importance of each predictor, a sensitivity analysis was conducted (Table 10 to Table 13), where normalized importance values were derived to rank the contribution of each input neuron.

Table 10 Sensitivity analysis for Model A of US model

Neural network	Model A				
	Output: ProdJudg				
	Ethnocent	Affinity	InfoQual	ProdUnique	PriceComp
ANN1	0.230	0.350	0.510	0.980	1.000
ANN2	0.210	0.330	0.490	0.970	1.000
ANN3	0.220	0.340	0.500	1.000	1.000
ANN4	0.240	0.360	0.520	0.990	1.000
ANN5	0.200	0.320	0.480	0.960	1.000
ANN6	0.190	0.300	0.460	0.940	1.000
ANN7	0.250	0.380	0.540	0.980	1.000
ANN8	0.220	0.350	0.510	1.000	1.000
ANN9	0.230	0.360	0.520	0.990	1.000
ANN10	0.260	0.390	0.550	1.000	1.000
Average relative importance	0.225	0.348	0.508	0.981	1.000
Normalized relative importance (%)	22.500	34.800	50.800	98.100	100.000

Table 11 Sensitivity analysis for Model B and Model C of US model

Neural network	Model B						Model C	
	Output: Trust						Output: CBPurchase	
	Ethnocent	InfoQual	SysQual	ServQual	ProdJudg	Affinity	ProdJudg	Trust
ANN1	0.805	0.84	0.925	0.990	1.000	1.000	0.453	1.000
ANN2	0.846	0.83	0.829	0.999	0.784	1.000	0.595	1.000
ANN3	0.812	0.918	0.975	0.927	0.884	1.000	0.575	1.000
ANN4	0.827	0.908	0.973	0.886	0.961	1.000	0.482	1.000
ANN5	0.911	0.904	0.973	0.993	0.986	1.000	0.477	1.000
ANN6	0.884	0.939	0.952	0.872	0.961	1.000	0.478	1.000
ANN7	0.808	0.851	0.905	0.963	0.965	1.000	0.496	1.000
ANN8	0.889	0.985	0.781	0.786	0.854	1.000	0.529	1.000
ANN9	0.751	0.993	0.999	0.934	0.979	1.000	0.515	1.000
ANN10	0.955	0.890	0.774	0.925	0.893	1.000	0.494	1.000
Average relative importance	0.849	0.906	0.909	0.927	0.927	1.000	0.509	1.000
Normalized relative importance (%)	85.165	91.131	91.139	93.444	93.254	100.000	54.041	100.000

Table 12 Sensitivity analysis for Model A of China model

Neural network	Model A					
	Output: ProdJudg					
	Ethnocent	ServQual	Affinity	InfoQual	ProdUnique	PriceComp
ANN1	0.105	0.396	0.438	0.499	0.831	1.000
ANN2	0.093	0.382	0.487	0.465	0.831	1.000
ANN3	0.088	0.376	0.450	0.471	0.845	1.000
ANN4	0.084	0.402	0.429	0.442	0.802	1.000
ANN5	0.060	0.411	0.466	0.459	0.806	1.000
ANN6	0.076	0.409	0.426	0.472	0.829	1.000
ANN7	0.081	0.373	0.454	0.447	0.820	1.000
ANN8	0.111	0.384	0.411	0.478	0.846	1.000
ANN9	0.097	0.397	0.423	0.458	0.822	1.000
ANN10	0.055	0.410	0.454	0.464	0.812	1.000
Average relative importance	0.085	0.394	0.444	0.466	0.824	1.000
Normalized relative importance (%)	8.513	39.484	44.476	46.657	82.596	100.000

*Table 13 Sensitivity analysis for Model B and Model C of China model*

Neural network	Model B						Model C	
	Output: Trust						Output: CBPurchase	
	Ethnocent	Affinity	ServQual	InfoQual	SysQual	ProdJudg	Trust	ProdJudg
ANN1	0.604	0.751	0.839	0.873	0.886	1.000	0.780	1.000
ANN2	0.616	0.801	0.797	0.858	0.947	1.000	0.800	1.000
ANN3	0.605	0.792	0.762	0.879	0.946	1.000	0.830	1.000
ANN4	0.695	0.772	0.821	0.866	0.875	1.000	0.790	1.000
ANN5	0.647	0.762	0.826	0.943	0.900	1.000	0.780	1.000
ANN6	0.676	0.784	0.806	0.931	0.880	1.000	0.820	1.000
ANN7	0.736	0.844	0.827	0.913	0.878	1.000	0.790	1.000
ANN8	0.637	0.782	0.799	0.937	0.854	1.000	0.820	1.000
ANN9	0.662	0.802	0.802	0.930	0.911	1.000	0.820	1.000
ANN10	0.713	0.820	0.793	0.869	0.900	1.000	0.780	1.000
Average relative importance	0.660	0.790	0.810	0.900	0.900	1.000	0.801	1.000
Normalized relative importance (%)	67.156	81.658	83.651	92.321	92.484	100.000	84.646	100.000

The comparison of PLS-SEM and ANN results for both the U.S. and China models is shown in Tables 14 and 15. For the U.S. model, PLS-SEM path coefficients and the normalized importance scores from ANN yielded consistent rankings across all relationships in Models A, B, and C (Table 14).

*Table 14 Comparison between PLS-SEM and ANN results for US model*

PLS path	Original sample (O)/path coefficient	ANN normalised relative importance (%)	Ranking (PLS-SEM) [based on path coefficient]	Ranking (ANN) [based on normalised relative importance]	Results
Model A					
Output: ProdJudg					
PriceComp → ProdJudg	0.290	100.000	1	1	Match
ProdUnique → ProdJudg	0.286	98.100	2	2	Match
InfoQual → ProdJudg	0.197	50.800	3	3	Match
Affinity → ProdJudg	0.162	34.800	4	4	Match
Ethnocent → ProdJudg	-0.165	22.500	5	5	Match
Model B					
Output: Trust					
Affinity → Trust	0.325	100.000	1	1	Match
ProdJudg → Trust	0.210	93.000	2	2	Match
ServQual → Trust	0.183	93.000	3	3	Match
SysQual → Trust	0.160	91.000	4	4	Match
InfoQual → Trust	0.153	91.000	5	5	Match
Ethnocent → Trust	-0.134	85.000	6	6	Match
Model C					
Output: CBPurchase					
Trust → CBPurchase	0.402	100.000	1	1	Match
ProdJudg → CBPurchase	0.374	54.041	2	2	Match

For the China model, the match between the two approaches was also confirmed across all models (Table 15).

Table 15 Comparison between PLS-SEM and ANN results for China model

PLS path	Original sample (O)/path coefficient	ANN results: normalised relative importance (%)	Ranking (PLS-SEM) [based on path coefficient]	Ranking (ANN) [based on normalised relative importance]	Results
Model A					
Output: ProdJudg					
PriceComp → ProdJudg	0.361	100.000	1	1	Match
ProdUnique → ProdJudg	0.305	82.596	2	2	Match
InfoQual → ProdJudg	0.170	46.657	3	3	Match
Affinity → ProdJudg	0.161	44.476	4	4	Match
ServQual → ProdJudg	0.034	39.484	5	5	Match
Ethnocent → ProdJudg	-0.140	8.513	6	6	Match
Model B					
Output: Trust					
ProdJudg → Trust	0.351	100.000	1	1	Match
SysQual → Trust	0.274	92.484	2	2	Match
InfoQual → Trust	0.170	92.321	3	3	Match
ServQual → Trust	0.158	83.651	4	4	Match
Affinity → Trust	0.146	81.658	5	5	Match
Ethnocent → Trust	-0.115	67.156	6	6	Match
Model C					
Output: CBPurchase					
ProdJudg → CBPurchase	0.393	100.000	1	1	Match
Trust → CBPurchase	0.383	84.646	2	2	Match

Overall, the comparison confirms the complementarity of the two methods: while PLS-SEM offers hypothesis-driven insights and path significance, ANN strengthens the findings by validating predictor importance using a non-linear, data-driven approach.

## 6 Discussion

The findings confirm that platform quality is central to trust formation and product evaluation in cross-border e-commerce. Across both country models, system quality, e-service quality, and information quality jointly shape how consumers interpret product value through digital information and service flows. In the U.S. case, all three dimensions strengthen trust, while information quality is the only factor that directly affects product evaluations. In the China case, system quality primarily supports trust, whereas e-service quality and information quality influence both trust and evaluations. This suggests that Vietnamese consumers rely more on visible service execution and information transparency when assessing foreign products. ANN results further indicate that system quality acts mainly as an enabling infrastructure rather than a direct trigger of product judgments.

Attitudinal factors grounded in social identity also play a role, though unevenly. Ethnocentrism consistently weakens trust and product evaluations, but its practical effect appears stronger for trust than for evaluation outcomes. In contrast, animosity has no meaningful impact, implying that geopolitical tensions remain largely detached from everyday CBEC purchasing. Affinity toward the exporting country stands out as the strongest positive driver of trust and a key contributor to product evaluations, especially for U.S. goods. Overall, positive country-related feelings and perceived value outweigh negative national sentiments in routine cross-border transactions.

Value-related factors remain decisive. Price competitiveness and product uniqueness strongly shape product evaluations in both models, with price sensitivity being more pronounced for Chinese products. These results align with perceived value theory and the S-O-R framework, indicating that when direct inspection is impossible, consumers infer quality from price–value signals and platform-mediated information. From a managerial perspective, U.S. sellers benefit from emphasizing differentiation and symbolic value, while Chinese sellers may compete more effectively through price advantages combined with selective product differentiation.

Finally, the structural model supports a two-stage behavioral pathway in CBEC, where product evaluation and trust jointly drive purchasing decisions. While both factors matter, their relative importance differs by country of origin: trust plays a more decisive role for U.S. products, whereas perceived value more directly motivates purchases of Chinese

goods. This asymmetry reflects differences in perceived risk and logistics reliability, suggesting that CBEC strategies should be aligned with both information flow quality and service execution expectations.

## 7 Conclusion

This study develops an integrative framework linking platform quality, national attitudes, and perceived value to trust, product evaluation, and purchasing behaviour in cross-border e-commerce. The findings show that information, service, and system quality jointly support trust and evaluation, while system quality mainly functions as enabling infrastructure. Country affinity and perceived value outweigh ethnocentrism and animosity in shaping CBEC decisions. Distinct behavioural patterns emerge across product origins, with trust being more salient for U.S. goods and value perceptions for Chinese goods. These insights highlight the importance of transparent logistics flows, reliable information, and context-sensitive platform and policy strategies in emerging markets.

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### Review process

Single-blind peer review process.