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RESEARCH ARTICLE

Willingness to Pay A Premium for Green Agricultural Products in Live Streaming: The Relationship between Attitude, Self-Efficacy and Social Influence with the Moderating Effect of Ascription of Responsibility

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ABSTRACT

This study addresses the gap in research on consumer behavior related to the willingness to pay a premium for green agricultural products in the context of live streaming platforms. It explores how emotional factors, such as health consciousness and environmental concern, alongside social factors, such as social influence, impact customers' willingness to pay for green premium products. By integrating the Theory of Planned Behavior (TPB), Technology Acceptance Model (TAM), and Norm Activation Theory (NAT), the study develops a comprehensive model to examine key determinants influencing users' willingness to pay. Additionally, the study investigates the moderating role of ascription of responsibility, providing deeper insights into how this factor influences the relationship between attitudes and willingness to pay. Conducted using a representative sample of Chinese consumers who have engaged with e-commerce live streaming of green agricultural products, the research utilizes Partial Least Squares Structural Equation Modelling (PLS-SEM) and SPSS to validate measurement scales and confirm interactions among constructs. The findings contribute to the literature by enhancing the understanding of consumer attitudes and behaviors on live streaming platforms, offering valuable insights for optimizing marketing strategies and product offerings to boost the appeal and market share of green agricultural products.

1. INTRODUCTION

In the evolving "Internet plus" era, the online shopping market has gained substantial importance in the global economy. Particularly in rural areas, improvements in infrastructure, advancements in information technology, and the ongoing enhancement of national e-commerce support policies have fuelled the growth of e-commerce models for green agricultural products in parts of China. Recently, e-commerce live streaming has emerged as a popular online shopping trend in China, driving significant momentum. Through live streaming, hosts present the journey of agricultural products from fields to consumers' tables, enabling a deeper understanding and appreciation of the quality and value of green agricultural products (Hong and Hoo, 2022). Moreover, these platforms offer consumers enriched experiences and spaces for interaction, fostering an engaged community environment that increases purchasing intent. Major e-commerce platforms have invested heavily in live streaming, supporting the fast growth of green agricultural product e-commerce. This model's widespread adoption has effectively promoted agricultural modernization, enhanced infrastructure and public services in rural areas, improved farmers' livelihoods by increasing their income and living standards and supported rural industry transformation and upgrading. These developments contribute to achieving strategic goals in rural revitalization, building beautiful countryside, and advancing a prosperous society.

In China, environmental concerns are gaining increased attention, with consumers progressively recognizing their role in addressing these issues (Statista, 2021). Despite over half of consumers understanding this, the green agricultural product market in China still faces significant hurdles (Zheng et al., 2022). A major challenge lies in the high prices of green agricultural products, which have dampened market demand (Yang et al., 2021; Zheng et al., 2022). Studies indicate that while consumers often display a high level of environmental awareness and a willingness to pay extra, this intent does not consistently translate into actual purchasing behavior, highlighting a gap between attitudes and behaviors within the green agricultural market. In developed countries, consumers typically accept paying a premium for low-carbon agricultural products; however, in China, this trend remains underdeveloped. This is largely due to China's low-carbon agricultural market still being in its nascent stages, with a limited transaction scale and insufficient consumer awareness and acceptance of green agricultural products (González-Rodríguez et al., 2020). Additionally, the live streaming e-commerce sector lacks effective strategies to bridge this attitude-behavior gap concerning green agricultural products. Addressing issues such as assuring green quality, lowering costs, boosting market competitiveness, and appealing to a broader consumer base remains essential for advancing China's green agricultural market.

Several researchers have explored the impact of e-commerce on the market dynamics of green agricultural products. For instance, James et al. (2017) argued that digital sales channels significantly enhance market competitiveness and boost brand visibility for these eco-friendly products. In contrast, Ma et al. (2022) highlighted the unique challenges facing China's green agricultural sector due to its relatively recent emergence, noting that an evolving but incomplete legal framework for online sales remains a key obstacle. Scholars have examined various aspects of this market, including the growth trajectory of green product online retail (Setterstrom and Michael, 2019), innovative e-commerce business models (Yingjie et al., 2023), advancements in cold chain logistics (Alhaimer, 2022), and consumer preferences for purchasing green products online (Bölen and Özen, 2020).

Despite evidence of e-commerce's positive influence, limited attention has been given to the potential of live streaming as a marketing tool for green agricultural products. Furthermore, research on factors influencing customers' willingness to pay (WTP) for green agricultural products online remains sparse. Generally, WTP for green products on e-commerce platforms can be analyzed through three dimensions. The first dimension focuses on individual demographic characteristics, including gender, education, income, age, and marital status, which have been shown to significantly affect WTP (Cai et al., 2020; Konuk, 2019). The second dimension examines internal psychological factors, such as social influence, peer effects, perceived risk, and perceived enjoyment, all of which play a crucial role in shaping WTP (Güney and Giraldo, 2020; Khan et al., 2019; Konuk, 2018). Finally, external contextual factors, including the market environment (e.g., sales promotions, interactive entertainment, quality assurance, and storage costs) and relevant policies, have been analyzed for their impact on consumers' WTP (Jorge et al., 2020; Lu et al., 2022; Ngah et al., 2020; Setterstrom and Michael, 2019).

Both health-related factors (such as consumers' health consciousness) and pro-environmental factors (including environmental concern and ascription of responsibility) are often overlooked in studies. Health consciousness refers to the extent individuals prioritize health considerations in their daily choices (Tan et al., 2022). In the research by Xu et al. (2020), the link between consumers' pursuit of health and product choices was examined, showing that health-conscious consumers tend to prefer beneficial and healthy products, often aligning with green or organic options. Similarly, Shah et al. (2021) demonstrated that consumer health awareness positively influences preference for organic food, adding that altruistic motives also drive green purchases due to concerns for the environment and others. Ho et al. (2022) found that environmentally concerned consumers are more inclined to engage in behaviors like recycling, energy conservation, and purchasing green products. Hao and Chen Yue (2021) further corroborated the positive influence of environmental issues on consumers' attitudes and willingness to buy eco-friendly products. However, limited research exists on these factors within the context of live streaming commerce. While live streaming platforms attract consumers, effective methods to communicate health and environmental benefits remain underexplored. Future research should address the influence and underlying mechanisms of these factors in live streaming commerce to foster green consumption.

The Technology Acceptance Model (TAM), proposed by Davis in 1989, is widely used to predict and explain users' adoption behavior toward new technologies. The TAM framework has been extensively applied in areas like e-commerce, mobile commerce, and online gaming, indicating that users decide to adopt new technologies based on perceived usefulness and ease of use. In studies on green product markets, TAM can be applied to evaluate the role of live streaming in promoting green products (Wang et al., 2022). If live streaming effectively highlights the benefits and positive impact of green products, it can boost users' perceived usefulness and foster a sense of environmental responsibility and sustainable lifestyles. If live streaming is user-friendly and presents information clearly, enhancing users' ability to use it effectively to gain insights into green products, their perceived ease of use increases. These two elements influence users' acceptance, purchase intention, and behaviors toward green products through live streaming, thereby demonstrating its effectiveness in the green product market. However, most TAM-based studies on online consumer behavior primarily focus on logical decision-making processes, often neglecting internal psychological factors (like personal beliefs) and external social influences (such as peer pressure) that shape behavior (Venkatesh et al., 2022). Thus, this study incorporates health consciousness and environmental concern as antecedents to perceived usefulness, enhancing the TAM framework.

The theory of planned behavior (TPB) was proposed by Fishbein and Ajzen. The core components of it—attitude, perceived behavioral control, and subjective norms—interact to shape an individual's intentions and subsequent behavior. Perceived behavior control in the TPB model is said to be similar to how Bandura (1986) viewed self-efficacy, which is the perceived ability to execute a target behavior (Ajzen,1991). Numerous studies have shown empirically that self-efficacy is an important criterion in facilitating customers' purchasing decision (Shiau et al. 2020; Singh et al. 2019), and few have related both green self-efficacy and live streaming self-efficacy towards WTP premium for green agricultural products in the context of live streaming (Duane et al 2014;Lu et al. 2022). In addition, the nuanced effects of social influence (subjective norms) on consumer willingness to pay (WTP) for green products in the unique context of live streaming remain underexamined (Liang et al. 2021; Zhao et al. 2020).

This study will also delve into the potential moderating role of ascription of responsibility in the relationship between consumer social influence and willingness to pay (WTP) for green agricultural products within live streaming platforms. Ascription of responsibility posits that individuals are more likely to engage in pro-social behavior, such as purchasing green products, when they feel a sense of responsibility towards the outcomes of their actions (Schwartz 1973). Previous studies have investigated the relationship between ascription of responsibility and WTP in the context of green consumption (Afsar et al., 2020; Han et al., 2020). However, limited studies examined the role of ascription of responsibility in WTP premium for green agricultural products in live streaming.

In this study, we aim to understand the factors influencing Chinese consumers' willingness to pay a premium for green agricultural products via live streaming. To achieve this, we utilize an integrated framework combining the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB). TAM, widely recognized for assessing technology acceptance, and TPB, regarded as a robust framework for understanding human behavior, together offer a comprehensive approach to examine consumer motivations. Given the increasing popularity of live streaming as a tool to promote eco-friendly products, this integrated model provides insights into the psychological, social, and technological factors that drive consumer engagement and purchase intentions.

Our model includes constructs such as health consciousness and environmental concern, which influence perceived usefulness, a key TAM component. In turn, perceived usefulness and perceived ease of use shape consumers' attitudes toward green products in a live streaming context. Self-efficacy, broken down into live streaming self-efficacy and green self-efficacy, and social influences, comprising normative and informational social influences, further influence willingness to pay (WTP). Additionally, ascription of responsibility (AR) is incorporated as a moderating factor, affecting the relationship between social influences and WTP. By applying this integrated model and conducting an online survey among Chinese consumers, we analyze the data using structural equation modelling (SEM) to identify key drivers of green consumption in live streaming environments.

2. LITERATURE REVIEW

2.1 Technology acceptance model

The technology acceptance model (TAM) is a well-known theory put forward by Davis (Schifter and Ajzen 1985). Davis's research mainly explored the influential and predominantly external variables that determine attitudes toward using technology. The research also looked at perceived usefulness and perceived ease of use, and Davis argued that these two belief factors determine the user's attitude toward technology, and that the attitude will affect behavioral intention, while perceived usefulness will directly influence intention. On the basis of identifying the relationships between perceived ease of use, perceived usefulness, attitude, and behavioral intention, we can get essential information of the target system.

2.1.1 Perceived usefulness

The optimistic effects of perceived usefulness (PU) on consumer behavior have been confirmed in many information systems studies. TAM theorizes that PU is one of the two fundamental beliefs that influence the desire of the user to adopt the technology (Davis, 1989). PU has been defined as "the degree to which an individual is confident that using a specific system would improve his or her job performance" (Davis, 1989).

Makmor et al. (2019) indicated that PU did not improve the desire of customers to shop using mobile devices, although it directly affects attitude, suggesting that users would buy the technology even if it had no special advantages. In the realm of e-commerce, Sun and Zhang (2021) established the foundation by positing that PU significantly affects users' attitudes toward using technology, which in turn influences their actual usage. This has been extended by Marquez et al. (2020), who examined how PU influences online shopping intentions, demonstrating that consumers' perceptions of the usefulness of online shopping platforms positively affect their attitudes toward shopping online.

2.1.2 Perceived ease of use

Perceived ease of use (PEOU) is another key factor that is inversely associated with the amount of effort required to learn new technology. Davis (1989) defined PEOU as "the degree to which a person believes that using a particular system would require minimum effort." It is also described as the degree to which the customer thinks such technology should be effortless and simple to understand or perform (Prastiawan et al., 2021; Rahmiati and Yuannita, 2019).

PEOU has been found to significantly influence consumer attitudes towards online shopping, with ease of navigation and user-friendly interfaces contributing to more favorable attitudes and increased purchase intentions (Basuki et al., 2022). Studies specifically examining e-commerce platforms demonstrate that when users perceive a system as easy to use, they are more likely to develop positive behaviors toward online purchasing, contributing to an overall efficient and satisfying shopping experience (Lien et al., 2021). In live streaming contexts, user-friendly interfaces and seamless interaction mechanisms are crucial for encouraging viewer participation, fostering positive attitudes towards the platform, and enhancing the overall user experience, thereby increasing the likelihood of purchasing behavior and continuous platform use (Basuki et al., 2022).

2.2 Theory of planed behavior

The theory of planned behavior (TPB) was proposed by Fishbein and Ajzen (1991). It was adapted from the theory of reasoned action (TRA). Ajzen and Fishbein (1991) posited that behavioral attitude and subjective norms were the most important factors of behavioral intention. In 1985, on the basis of the original viewpoint, Ajzen (1991) added perceived behavioral control to the previous model. He believed that attitude, subjective norms, and perceived behavioral control jointly determined behavioral intention. Whether the target behavior occurs can be explained and predicted by a person's intention and the perceived behavior control. TPB is applied in a wide range of studies to explain how people behave in certain circumstances, e.g., individual consumption forecasting, online consuming behavior, and so on.

2.2.1 Attitude

Attitude changes emerge from the attitudinal-behavior theory family that includes the TRA, TPB, and TAM (Davis, 1989). Attitude is described as the psychological affinity and positivity of consumers in clarifying their assessments and convictions (Ajzen, 1991).

There is an extensive volume of distributed studies that describe the role of attitude in the context of online market studies. A strong relationship between attitude and behavior (either intentional behavior or actual behavior) has been reported, showing the impactful and positive effect of attitude on individual behavior (Baldi et al., 2021; Qian et al., 2021). Prior studies that have noted the importance of attitude and behavior have focused on e-commerce (Sadiq et al., 2023), online content consumption (Purnawirawan et al., 2012); and mobile e-commerce (Cai et al., 2020). Despite the numerous publications on this subject, most have failed to address how attitude, in regard to WTP premium for green agricultural products, applies specifically in the live streaming context.

2.2.2 Social influence

Social influence in the context of technology adoption is defined as the change in an individual's thoughts, feelings, or actions that results from interacting with another individual or a group (Kelman, 1958). Informational Social Influence is based on the desire to make informed and correct choices by observing the behaviors and outcomes of others' actions. It's grounded in the assumption that surrounding individuals possess more knowledge about an area in which the individual is uncertain. This concept was notably elaborated by Deutsch and Gerard (1955) in their studies on social conformity and has been applied to various fields, including consumer behavior, where consumers look to others for guidance on what products to purchase, especially in new or unclear situations. Normative Social Influence, on the other hand, stems from the desire to conform to the expectations of others to gain social approval or avoid social sanction. This form of influence is concerned with adhering to the norms and standards of one's social group. As described by Kelman (1958), normative influence is a powerful force in guiding consumer behavior, particularly in visible consumption scenarios where social acceptance and image are at stake.

2.2.3 Self-efficacy

Self-efficacy is what a person feels about him/herself while performing work by utilizing his/her abilities or actions. Bandura (1977) defined self-efficacy as a belief pattern stating it as “people’s judgements of their capabilities to organize and execute courses of action required for attaining designated types of performances in an organizational setup.” According to Bandura, self-efficacy beliefs are classified into three dimensions: level, strength and generality. The level dimension refers to the performance of difficult tasks and it requires different levels of self-efficacy required to exhibit. The dimension of strength refers to how forceful self-efficacy beliefs are. Especially, beliefs which are low in strength lead to failure and hamper the achievement of desired outcomes. Generality of self-efficacy belief is low if an individual believes him/herself to be capable only in distinct situations and for very few behaviors.

Within the context of live streaming platforms for green agricultural products, self-efficacy might relate to consumers' confidence in their ability to effectively use the platform to make informed purchasing decisions. This includes navigating the platform, interacting with content creators, and understanding the environmental impact of their purchases. Self-efficacy, differentiated into live streaming self-efficacy and green self-efficacy, is hypothesized to enhance an individual's intention to engage with live streaming services, promoting a positive WTP behavior (Wang et al., 2013).

2.3 Health consciousness

Health consciousness reflects an individual's awareness and proactive attitude towards their health and well-being(Lu et al. 2022). Health-conscious consumers may perceive such platforms as more useful due to the direct access to healthier, environmentally friendly food options (Ho et al. 2022; Yadav and Pathak 2017). By aligning their health priorities with their purchasing decisions, they are likely to find platforms that facilitate access to green products as enhancing their ability to maintain a healthy lifestyle, thus perceiving them as more useful (Tan et al. 2022).

2.4 Environmental concern

Environmental consciousness is hereby conceptualized as the degree to which individuals incorporate environmental considerations into their daily decision-making processes, particularly in their consumption habits (Mostafa, 2007; Fraj and Martinez, 2006). Environmental concern, characterized by an individual's awareness and apprehension regarding environmental issues and their willingness to engage in behaviors that mitigate adverse environmental impacts, plays a crucial role in shaping consumer preferences and behaviors towards sustainable products (Schultz, 2001; Stern, 2000). Despite the burgeoning interest in how digital engagement platforms like live streaming can influence purchasing decisions for green products, research remains scant on how these platforms' perceived usefulness is affected by consumers' environmental and health consciousness (Villarejo-Ramos and Sánchez-Franco, 2005). This gap is critical as understanding the perceived usefulness of live streaming technologies in promoting green agricultural products could significantly enhance engagement strategies and consumer willingness to pay a premium for such products.

2.5 Ascription of responsibility

Ascription of responsibility is a concept from the Norm Activation Model (NAM) which posits that acknowledging personal responsibility towards certain outcomes (such as environmental conservation) activates a normative response that can guide behavior (Schwartz, 1977). In the scenario of live streaming for green agricultural products, ascription of responsibility refers to the extent to which individuals believe they have a responsibility to perform behaviors that lead to environmentally positive outcomes (Stern, 2000). It encapsulates the extent to which individuals feel that their choices can make a difference in promoting environmental sustainability. Research indicates that a strong ascription of responsibility is associated with a higher willingness to engage in pro-environmental behaviors, including paying a premium for green products (Stern, 2000).

Apart from that, research by Bamberg and Möser (2007) illustrates the significant influence of ascription of responsibility on pro-environmental behavior, including the willingness to invest in environmentally friendly products. This is further supported by the findings of Stern et al. (1999), who highlight that individuals who perceive themselves as responsible for environmental preservation are more inclined to pay extra for products that align with these values. Moreover, the study conducted by Eriksson, Garvill, and Nordlund (2006) reinforces the concept that ascription of responsibility directly impacts individuals' ecological behaviors, including their purchasing decisions. This relationship underscores the importance of internalized personal norms and a sense of duty towards environmental stewardship in influencing consumer willingness to pay a premium.

H1: Health consciousness has a positive effect on perceived usefulness of purchasing green agricultural products in live streaming platforms.

H2: Environmental concern has a positive effect on perceived usefulness of purchasing green agricultural products in live streaming platforms.

H3: Perceived usefulness has a positive effect on attitude to purchasing green agricultural products in live streaming.

H4: Perceived Ease of Use has a positive effect on attitude to purchasing green agricultural products in live streaming.

H5: Attitude has a positive effect on a customer's willingness to pay a premium for green agricultural products in live streaming.

H6: Live-streaming self-efficacy has a positive effect on a customer's willingness to pay a premium for green agricultural products in live streaming.

H7: Green self-efficacy has a positive effect on a customer's willingness to pay a premium for green agricultural products in live streaming.

H8: Normative social influence has a positive effect on a customer's willingness to pay a premium for green agricultural products in live streaming.

H9: Informational social influence has a positive effect on a customer's willingness to pay a premium for green agricultural products in live streaming.

H10: Strong ascription of responsibility has a positive effect on a customer's willingness to pay a premium for green agricultural products in live streaming.

H11: Higher ascription of responsibility will strengthen the positive relationship of normative social influence on the willingness to pay a premium for green agricultural products in live streaming.

H12: Higher ascription of responsibility will strengthen the positive relationship of informational social influence on the willingness to pay a premium for green agricultural products in live streaming.

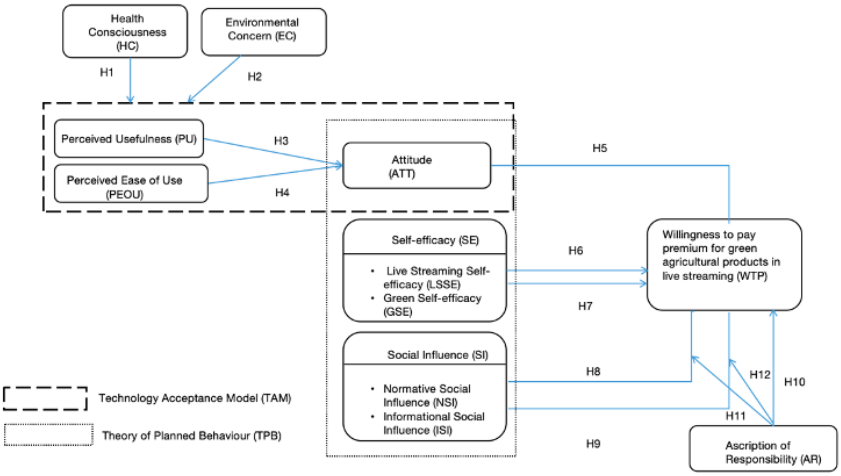


Figure 1: Conceptual framework

3. EMPIRICAL METHODOLOGY AND ANALYSIS

3.1 Questionnaire design

The questionnaire consists of three parts. The first part is to obtain a closed statement, setting at least six months of experience in watching live broadcasts of green agricultural products e-commerce. The second part explores potential variables that affect consumers' willingness to purchase green agricultural products through measurement tools, examining psychological, socio-cultural, platform services, and other factors. The third part collects demographic information, including core content such as age, gender, educational background, family structure, income level, and willingness to pay for green agricultural product e-commerce live streaming. On this basis, five experts were invited to review the questionnaire measurement items, namely from the National University of Malaysia, Peking University, and Henan University of Science and Technology. Resolve concerns through system revisions and form the final questionnaire. All projects are evaluated using the five point Likert scale.

The online survey was conducted by the Wen Juan Xing website, which is the most widely used data collection technology online platform in China. Using a purposive sampling method, ensure that the questionnaire is distributed to participants who have at least six months of experience watching green agricultural product e-commerce live broadcasts and are willing to pay. Subsequently, a total of 581 questionnaires were collected. During the data filtering process, incomplete data and blank questionnaires were removed, and ultimately 515 questionnaires were used for data analysis.

3.2 Data analysis

In statistical analysis, we adopted the PLS-SEM method from SmartPLS 3.0 software (Hair et al., 2019), which is widely used for modeling complex multivariate data and conducting causal relationship tests. Especially suitable for research in fields such as social sciences, behavioral sciences, and marketing. The first step in constructing a two-step model is to conduct confirmatory factor analysis to ensure that the data of the measurement tool reflects its design intent and theoretical concept (Hair et al., 2014). Through analysis, we obtained the standardized factor loadings of various measurement indicators on latent variables, which are important indicators for

measuring measurement effectiveness. Normally, it is required that the standardized factor load should be at least 0.5 or higher (Anderson, Gerbing, 1992). The second step is to establish a structural model to test the theoretical hypothesis relationships. Focus on the path coefficient and its significance level, which directly reflects the degree of influence of the independent variable on the dependent variable and whether it is statistically significant. To verify the overall goodness of fit and explanatory power, we calculated AVE and CR. In an ideal state, AVE should be greater than 0.5; CR needs to reach 0.7 or above (Fornell and Larcker 1981). To evaluate the effectiveness of the model discrimination, check if the square root of AVE is greater than the correlation coefficient with other latent variables. Ensure that latent variables are independent and undisturbed (Rani et al., 2023). Through these steps, we evaluate and optimize the quality of measurement tools and the rationality of theoretical models, providing support for subsequent research inference and decision-making.

4. FINDINGS

4.1 Socio-demographics

An analysis of the respondents' profile (Table 1) reveals that the sample is predominantly female, with women making up 64.4% of the participants, while men account for 35.6%. In terms of age distribution, the majority of respondents fall within the age brackets of 20 to 29 years old (26.8%) and 30 to 39 years old (26%), with a mean age likely around 35 years, given that 24.6% are in the 40 to 49 age range. Only a small proportion of the sample is over 50 years old (5.2%).

Regarding marital status, the majority of the respondents are married (59.9%), with 35.9% being single and a small fraction (4.1%) being divorced. Educational attainment among the respondents is relatively high, with 43.1% holding a bachelor's degree and 32% having completed a master's degree or higher. Those with only primary education or below represents a minor part of the sample (3.6%).

Income levels vary, with the largest group earning between RMB 4001 and RMB 5000 per month (43.9%). A significant portion earns between RMB 3001 and RMB 4000 (23.8%), while only a small group of respondents (2.5%) earn between RMB 6001 and RMB 7000 per month. These figures provide a comprehensive view of the respondents' socioeconomic status and demographic background in the study.

Table 1: Demographic characteristics of the respondents (N=362)

Demographic Variable	Category	Frequency	Percentage
Gender	Male	129	35.6
	Female	233	64.4
Age	18 to 19 years old	63	17.4
	20 to 29 years old	97	26.8
	30 to 39 years old	94	26
	40 to 49 years old	89	24.6
	50 years old and above	19	5.2
Marital status	Single	130	35.9
	Married Divorced	217 15	59.9 4.1
Education	Primary school and below	13	3.6
	Junior school	27	7.5
	Senior school	50	13.8
	Bachelor's degree	156	43.1
	Master's degree and over	116	32
Monthly income	¥3000 and below	49	13.5
	¥3001-4000	86	23.8
	¥4001-5000	159	43.9
	¥5001-6000	59	16.3
	¥6001 and 7000	9	2.5
	Over ¥7000	0	0.0

4.2 Measurement model testing

In PLS path modeling, the evaluation of the measurement model is carried out through three key indicators: indicator reliability, convergence validity, and discriminant validity.

In terms of indicator reliability, all items have satisfactory indicator reliability (ranging from 0.747 to 0.878) achieving the threshold vale set by Byrne (2016) with all AVE scores are higher than 0.5, fully demonstrating the high reliability of the indicators.

In addition, convergent validity refers to the extent to which individual indicators reflect the constructs in comparison to indicators measuring other constructs (Urbach and Ahlemann, 2010). To access convergent validity, the average variance extracted (AVE) is measured. The value of AVE should be higher than 0.5, which explains at least 50 per cent of the assigned indicators' variance (Chin, 2010a; Hair, Hult, Ringle, and Sarstedt, 2017). Using the PLS Algorithm in SmartPLS 4.0, the AVE value is calculated, and Table 2 shows the AVE values of all the constructs. All constructs recorded AVE values higher than 0.5 for each group of data. The lowest AVE value reported is for Perceived Ease of Use (0.627) followed by Informational Social Influence (0.632), Green Self-efficacy (0.637), Environmental Concern (0.644), Live Streaming Self-efficacy (0.654), Ascription of Responsibility (0.663), Normative Social Influence (0.679), Health Consciousness (0.686). Willingness to Pay a Premium for Green Agricultural Products in Live Streaming, Attitude and Perceived Usefulness obtained higher value of AVE, which explains more than 70% of the total variance. These results show that the measurement model demonstrated adequate convergent validity.

Table 2: Results summary for reflective measurement models

Variable	Item	Outer loadings	Cronbach's alpha	CR	AVE
Ascription of Responsibility (AR)	AR1	0.842	0.873	0.908	0.663
	AR2	0.753			
	AR3	0.800			
	AR4	0.830			
	AR5	0.843			
Attitude (ATT)	ATT1	0.789	0.898	0.925	0.711
	ATT2	0.855			
	ATT3	0.856			
	ATT4	0.836			
	ATT5	0.878			
Environmental Concern (EC)	EC1	0.805	0.862	0.900	0.644
	EC2	0.785			
	EC3	0.830			
	EC4	0.768			
	EC5	0.823			
Green Self-Efficacy (GSE)	GSE1	0.783	0.858	0.898	0.637
	GSE2	0.805			
	GSE3	0.796			
	GSE4	0.821			
	GSE5	0.787			
Health Consciousness (HC)	HC1	0.811	0.848	0.897	0.686
	HC2	0.837			
	HC3	0.809			
	HC4	0.856			
Informative Social Influence (ISI)	ISI1	0.782	0.854	0.896	0.632
	ISI2	0.772			
	ISI3	0.808			

	ISI4	0.787			
	ISI5	0.823			
Live Streaming Self-Efficacy (LSSE)	LSSE 1	0.793	0.868	0.904	0.654
	LSSE 2	0.823			
	LSSE 3	0.809			
	LSSE 4	0.818			
	LSSE 5	0.800			
Normative Social Influence (NSI)	NSI1	0.795	0.882	0.914	0.679
	NSI2	0.839			
	NSI3	0.794			
	NSI4	0.849			
	NSI5	0.841			
Perceived Ease of Use (PEOU)	PEOU 1	0.816	0.851	0.894	0.627
	PEOU 2	0.782			
	PEOU 3	0.816			
	PEOU 4	0.796			
	PEOU 5	0.747			
Perceived Usefulness (PU)	PU1	0.877	0.884	0.920	0.742
	PU2	0.861			
	PU3	0.869			
	PU4	0.837			
Willingness to Pay Premium for Green Agricultural Products in Live Streaming (WTP)	WTP 1	0.848	0.932	0.945	0.711
	WTP 2	0.806			
	WTP 3	0.840			
	WTP 4	0.872			
	WTP 5	0.842			
	WTP 6	0.869			
	WTP 7	0.824			

Subsequently, the discriminant validity of the model is assessed. Discriminant validity is the degree to which items differentiate among constructs or measure distinct concepts and is measured by determining the correlations between the measures that have the potential to overlap (Ramayah et al., 2018).

The discriminant validity test of the measurement model can be conducted using the Fronell-Larcker criterion. The Fronell-Larcker criterion is to test the discriminant validity by observing the square root value of the average extraction variance (AVE) and the correlation coefficient between the potential variables. If the square root value of AVE is greater than the correlation coefficient between the latent variables (that is, the value on the diagonal is greater than the value on the non-diagonal),

it indicates that the latent variables in the measurement model have good discriminative validity (Table 3).

Table 3: Fronell-Larcker criterion

	AR	ATT	EC	GSE	HC	ISI	LSSE	NSI	PEOU	PU	WTP
Ascription of Responsibility (AR)	**0.814**										
Attitude (ATT)	0.509	**0.843**									
Environmental Concern (EC)	0.473	0.403	**0.803**								
Green Self-Efficacy (GSE)	0.440	0.389	0.381	**0.798**							
Health Consciousness (HC)	0.516	0.412	0.508	0.403	**0.829**						
Informative Social Influence (ISI)	0.428	0.429	0.479	0.396	0.526	**0.795**					
Live Streaming Self-Efficacy (LSSE)	0.459	0.484	0.449	0.292	0.441	0.389	**0.808**				
Normative Social Influence (NSI)	0.425	0.350	0.332	0.316	0.545	0.464	0.345	**0.824**			
Perceived Ease of Use (PEOU)	0.475	0.583	0.361	0.360	0.504	0.483	0.431	0.431	**0.792**		
Perceived Usefulness (PU)	0.550	0.541	0.560	0.438	0.564	0.575	0.494	0.520	0.528	**0.861**	
Willingness to Pay Premium for Green Agricultural Products in Live Streaming (WTP)	0.452	0.559	0.396	0.523	0.455	0.506	0.371	0.587	0.443	0.542	**0.843**

4.3 Hypothesis testing

4.3.1 Results of path coefficient test

The results presented in the Table 4 indicate varying levels of significance across the hypothesized relationships. Specifically, the path from Ascription of Responsibility (AR) to Willingness to Pay (WTP) (β=0.059, p>0.05) did not show a significant positive effect, rendering the hypothesis invalid. In contrast, the path from Attitude (ATT) to WTP (β=0.330, p<0.05) demonstrated a significant positive effect, validating the hypothesis. Similarly, Environmental Concern (EC) had a significant positive effect on Perceived Usefulness (PU) (β=0.369, p<0.05), supporting the corresponding hypothesis. The relationship between Green Self-Efficacy (GSE) and WTP (β=0.295, p<0.05) was also significant, confirming the hypothesis. Health Consciousness (HC) positively influenced PU (β=0.377, p<0.05), and the hypothesis was supported. The impact of Informational Social Influence (ISI) on WTP (β=0.283, p<0.05) was significant, validating the hypothesis. However, Live Streaming Self-Efficacy (LSSE) did not significantly affect WTP (β=0.031, p>0.05), making the hypothesis invalid. Normative Social Influence (NSI) exhibited a significant positive effect on WTP (β=0.414, p<0.05), supporting the hypothesis. Lastly, both Perceived Ease of Use (PEOU) (β=0.411, p<0.05) and Perceived Usefulness (PU) (β=0.324, p<0.05) significantly influenced ATT, validating these hypotheses.

Table 4: Structural model assessment

Relationship	Path Coefficient (β)	t-value	p-value	Decision	R^2	f^2	Effect Size	VIF
EC -> PU	0.369	7.348	0.000	Supported	0.419	0.173	moderate	1.348
HC -> PU	0.377	6.770	0.000	Supported		0.182	moderate	1.348
AR -> WTP	0.059	1.492	0.136	Not supported	0.753	0.008	none	1.739
ATT -> WTP	0.330	8.206	0.000	Supported		0.271	moderate	1.629
GSE -> WTP	0.295	8.458	0.000	Supported		0.255	moderate	1.383

ISI -> WTP	0.283	5.893	0.000	Supported		0.193	moderate	1.678
LSSE -> WTP	0.031	1.013	0.311	Not Supported		0.003	none	1.483
NSI -> WTP	0.414	10.963	0.000	Supported		0.475	substantial	1.459
PEOU -> ATT	0.411	8.623	0.000	Supported	0.415	0.209	moderate	1.387
PU -> ATT	0.324	6.347	0.000	Supported		0.129	small	1.387

Notes: Ascription of Responsibility (AR); Attitude (ATT); Environmental Concern (EC); Green Self-Efficacy (GSE); Health Consciousness (HC); Informative Social Influence (ISI); Live Streaming Self-Efficacy (LSSE); Normative Social Influence (NSI); Perceived Ease of Use (PEOU); Perceived Usefulness (PU); Willingness to Pay Premium for Green Agricultural Products in Live Streaming (WTP)

4.3.2 Results of the moderation effect test

After testing the direct effect, the moderation hypothesis is tested. A moderator is characterised as a third construct that can change or affect the relationship between the independent and dependent variables (Dawon, 2014; Hair et al., 2016). This study used continuous types of data as the moderation, and the analysis is conducted using the SmartPLS 4.0. This study hypothesized that:

H11: Higher ascription of responsibility will strengthen the positive relationship of normative social influence on the willingness to pay a premium for green agricultural products in live streaming.

H12: Higher ascription of responsibility will strengthen the positive relationship of informational social influence on the willingness to pay a premium for green agricultural products in live streaming.

The moderation assessment follows the Orthogonalising Approach (Henseler and Chine, 2010). This approach builds on the indicators approach and requires creating all product indicators of the interaction terms (Ramayah et al., 2018). Henseler et al. (2012) introduced methods for handling moderating effects using product terms in PLS-SEM. Additionally, authors like Hair et al. (2021) and Sarstedt et al. (2020) also explore advanced moderation techniques in structural equation modeling. The first step is to create the interaction effect between the AR x NSI and AR x ISI. The R2 for the main model (without the interaction) is 0.56, and with the interaction effect model, the R2 is 0.753. Next, the effect size is calculated using the following formula (Strasheim 2014):

$$f^2 = \frac{R^2_{\text{included moderator}} - R^2_{\text{excluded moderator}}}{1 - R^2_{\text{included moderator}}}$$

Plugging in the values:

$$f^2 = \frac{0.753 - 0.56}{1 - 0.753}$$

$$f^2 = \frac{0.193}{0.247}$$

$$f^2 = 0.781$$

Figure 2: Effect size formula

Based on the guideline by Kenny (2016), 0.005, 0.01 and 0.025 respectively show the standards for small, medium, and large effects sizes. Therefore, based on the value of 0.401 and 0.012, it can be concluded that the effect sizes are large and medium (Kenny, 2016). But there is no confirmation either they are statistically significant or not.

To obtain the significant of the relationship, the bootstrapping procedures are conducted. This study followed the guidelines from Ramayah et al. (2018) and used Smart PLS for Partial Least Squares-Structural Equation Modeling (PLS-SEM). Bootstrapping is a resampling technique where multiple subsamples are created to estimate standard errors and significance levels. The bootstrapping subsample was set to 5,000 iterations, which provides robust estimates for path coefficients, such as β and p-values. Other researchers like Hair et al. (2019) also recommend this method for non-parametric significance testing in PLS-SEM analyses. From Table 5 below, AR x NSI -> WTP (β=0.389,

p<0.05) had a significant positive effect, indicating that AR has a positive moderating effect between NSI and WTP. Therefore, it can be concluded that the hypothesis H11 is accepted. AR x ISI -> WTP (β=0.065, p>0.05) has a significant positive effect, indicating that AR does not have a positive regulating effect between ISI and WTP, and the H12 is not valid.

Table 5: Moderation model assessment

	Path Coefficient	**Standard Error**	**T Value**	**F^2**	**P Value**	**Decision**
AR x NSI -> WTP	0.389	0.046	8.519	0.401	0.000	Supported
AR x ISI -> WTP	0.065	0.074	0.877	0.012	0.380	Not Supported

Next, as suggested by Dawson (2014), to further elaborate the moderating phenomenon of ascription of responsibility, the pattern of the interaction effect is plotted to see how the moderator changes the relationship between NSI and WTP. As seen in Figure 5.8) the red line is relatively flat, indicating that when AR is low, the relationship between NSI and WTP is weak or negligible. This suggests that when individuals feel less responsible, social influence does not significantly impact their willingness to pay for green products. 2) The blue line shows a moderate positive slope, indicating that as AR increases to the mean level, NSI starts to have a more positive influence on WTP. This suggests that individuals with an average sense of responsibility are somewhat influenced by social norms in their willingness to pay. 3) The green line has the steepest positive slope, indicating that when AR is high, the relationship between NSI and WTP is strong. This suggests that individuals who feel highly responsible are much more influenced by social norms, leading to a higher willingness to pay for green products.

To be concluded, the figure clearly shows that Ascription of Responsibility moderates the relationship between Normative Social Influence and Willingness to Pay. Specifically, the influence of NSI on WTP increases as AR increases. This means that the higher the ascription of responsibility, the stronger the impact of social norms on consumers' willingness to pay for green agricultural products in a live streaming context.

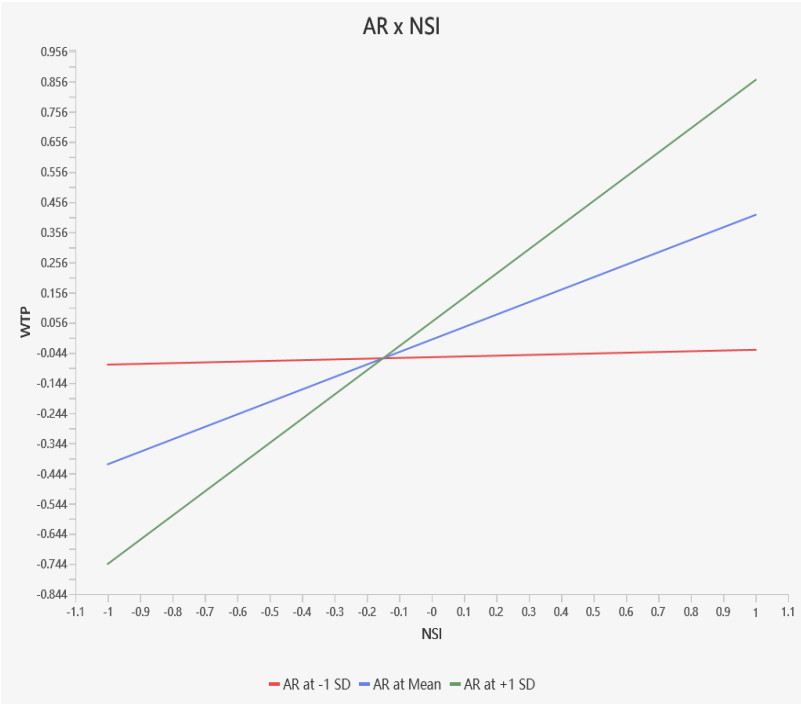
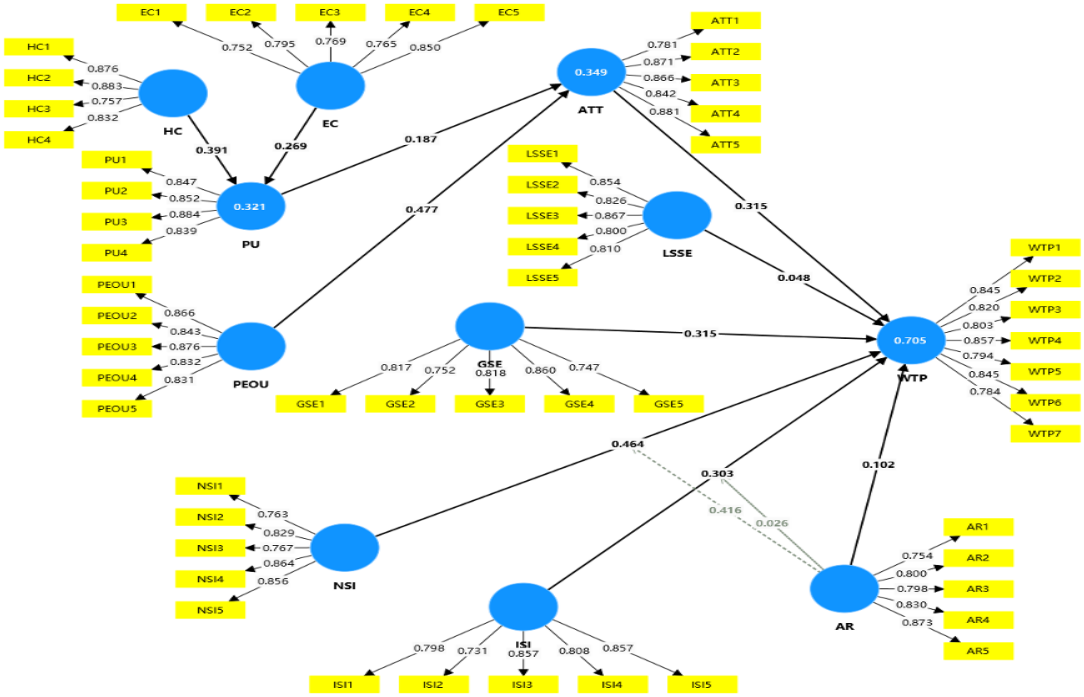


Figure 3: Interaction plot

Table 6: Standardised path coefficients of the structural model and hypothesis testing

***p < 0.05; **p < 0.01; ***p < 0.001**

*p < 0.05; **p < 0.01; ***p < 0.001



5. DISCUSSION

The integration of live streaming into the marketing of green agricultural products is transforming traditional agricultural marketing strategies. It not only enhances visibility and sales but also contributes to a more sustainable and consumer-responsive farming ecosystem.

Results indicate that H1 is supported, revealing that health consciousness significantly influences perceived usefulness of purchasing green agricultural products on live streaming platforms. This finding aligns with prior research indicating that health-oriented consumer behavior positively affects the adoption of eco-friendly products (Tan et al., 2022). In the burgeoning market of live-streamed eco-commerce in China, where such products are still gaining traction, consumers' awareness and acceptance play a critical role. However, despite the perceived health benefits, the relatively higher prices of green agricultural products might deter some consumers, especially when they lack sufficient understanding of these products' benefits. H2 also finds support, showing that environmental concern enhances perceived usefulness of purchasing green agricultural products in live streaming. This aligns with previous studies (Hameed et al., 2021; Leclercq-Machado et al., 2022) which found that environmental awareness directly correlates with eco-friendly purchasing habits. When consumers recognize their personal impact on the environment, they tend to prioritize green products, positioning these goods as their preferred choice. This suggests that enhancing consumer awareness of the ecological benefits of green agricultural products could further bolster this market segment. H3 confirms that perceived usefulness positively affects attitudes toward purchasing green agricultural products via live streaming platforms. This outcome corroborates findings from (Zheng et al., 2023), which highlighted that usefulness perceptions could significantly shape consumer attitudes in digital shopping environments. Similarly, H4 indicates that perceived ease of use positively influences attitudes toward utilizing live streaming platforms for purchasing green products, highlighting the critical role of user-friendly interfaces in cultivating favorable consumer attitudes. This research finding is consistent with the TAM model, emphasizing the critical role of technology usability in user adoption and acceptance of new technologies (Davis, 1989). In the context of live streaming platforms, users' positive attitude towards using live streaming platforms to purchase green agricultural products has enhanced their willingness to pay (Hiller et al., 2021; Khan et al., 2019).

The role of social influence, both normative and informational, was also supported by this study's findings. Normative social influence, which reflects the pressure to conform to the expectations of one's social group, was found to have a significant positive impact on WTP, consistent with previous research on e-commerce (Singh et al., 2019; Zhang et al., 2020). Consumers are more likely to purchase green products when they perceive that such behavior aligns with the norms and values of their social networks, especially within the live streaming environment where peer and influencer endorsements play a critical role (Zhao et al., 2020). Similarly, informational social influence, which refers to the reliance on others' knowledge or experience to inform one's own purchasing decisions, was also found to positively influence WTP. This finding aligns with studies by Hua and Wang (2019) and Spears (2021), which suggest that consumers increasingly depend on peer-generated content and real-time recommendations in online shopping contexts, especially when evaluating the credibility of green products.

Despite these positive findings, the relationship between live streaming self-efficacy and WTP was not supported in this study. This contradicts the expectation that higher self-efficacy in using live streaming platforms would lead to greater WTP, as suggested by previous research on self-efficacy in online shopping environments (McLaughlin et al., 2020; Hoffmann and Lutz, 2021). One possible explanation for this unexpected result is that while live streaming self-efficacy may enhance users' confidence in navigating the platform, it may not necessarily translate into a willingness to pay a premium for green products. While, the positive relationship between green self-efficacy and WTP highlights the importance of personal environmental values in shaping consumer behavior within the live streaming space. As Mildawani et al. (2022) point out, consumers with high green self-efficacy are more likely to view their purchases as contributing to broader environmental goals, thus increasing their willingness to pay for products that align with these values.

Contrary to expectations, this study's findings reveal that strong ascription of responsibility does not significantly influence a customer's willingness to pay a premium for green agricultural products in live streaming. This result deviates from studies such as Antonetti and Maklan (2014) and Liu et al. (2020), which found that consumers who feel responsible for environmental outcomes are more inclined to make sustainable purchases. A possible explanation for this divergence could be that, in the fast-paced, real-time environment of live streaming, other factors such as trust in the seller or the immediacy of the purchase may override the sense of personal responsibility for environmental impacts.

In this study, the hypothesis that higher ascription of responsibility strengthens the positive relationship of normative social influence on the willingness to pay a premium for green agricultural products in live streaming is supported. This aligns with the foundational theories of social influence and responsibility. Previous research by Confente and Scarpi (2021) demonstrated that individuals with a heightened sense of personal responsibility are more likely to conform to normative social cues, especially in settings that promote social and environmental consciousness. Nevertheless, the second hypothesis, which proposed that higher AR would strengthen the positive relationship between informational social influence and WTP, was not supported by the findings. This is an intriguing result, considering that prior literature, such as the work by Roser-Renouf et al. (2020) and Venkatesh and Davis (2022), has underscored the importance of informational social influence in shaping environmentally conscious purchasing behaviors. However, the lack of support for this hypothesis may be attributed to the specific dynamics of live streaming platforms, where the immediacy of peer recommendations and influencer endorsements may overshadow detailed informational cues.

The implications of this study are significant for marketers and policymakers aiming to boost the market penetration of green agricultural products via live streaming platforms. By fostering a supportive cultural and technological environment that enhances the perceived benefits and ease of purchasing green products, businesses and governments can profoundly influence consumer behavior towards sustainability. Additionally, educational campaigns that increase awareness of the environmental and health impacts of consumer choices could further empower consumers, driving the growth of the green market.

6. CONCLUSION

This study integrates the Theory of Planned Behavior (TPB) and the Technology Acceptance Model (TAM) to construct a comprehensive framework that explains Chinese consumers' willingness to pay a premium for green agricultural products on live streaming platforms. TPB offers insights into how attitudes, perceived behavioral control, and social influences shape consumers' intentions, while TAM contributes to understanding the role of perceived usefulness and ease of use in technology adoption. By combining these frameworks, this study provides a nuanced view of how both psychological drivers and technology perceptions influence consumer behavior in the digital marketplace for green products.

The integrated model reveals that consumers' willingness to pay is driven by a mix of individual motivations, such as health consciousness and environmental concern, alongside perceived platform utility and ease of use, which are crucial for fostering positive attitudes toward green agricultural products. Moreover, social influences—captured through constructs such as normative and informational social influence—are significant in shaping consumers' willingness to pay. Notably, the moderating role of ascription of responsibility (AR) emphasizes that when consumers perceive a company or platform as taking genuine responsibility for environmental and social impacts, their positive attitudes toward green products are more likely to translate into a willingness to pay a premium. This finding underscores the importance of corporate responsibility and transparency in promoting green consumption on digital platforms.

This study contributes valuable insights into the psychological and social dynamics underlying green consumer behavior in live-streaming contexts, offering practical implications for both marketers and policymakers. For marketers, the findings suggest the need to enhance consumer perceptions of platform functionality and to foster a sense of social responsibility to encourage premium pricing acceptance. For policymakers, understanding these dynamics can aid in crafting regulations and incentives that support sustainable digital commerce, especially within China's growing live-streaming market.

Despite its contributions, this study acknowledges certain limitations. While the model covers multiple factors influencing purchase intentions, it does not encompass all possible variables. Future research could expand this model to include additional dimensions, such as cultural and social variables, to deepen the understanding of consumer behavior. Furthermore, the focus on purchase intention rather than actual behavior limits the findings' applicability to real-world actions; thus, subsequent studies should track actual purchasing behaviors over time. Lastly, since the study was conducted solely within China, extending the research to other cultural contexts could test the model's generalizability and provide a more global perspective on green consumption via live streaming platforms.

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