

THE INFLUENCE OF GREEN PACKAGING KNOWLEDGE ON GREEN PURCHASE INTENTION: THE MEDIATING ROLES OF ATTITUDE TOWARD GREEN PACKAGING AND PERCEIVED BEHAVIORAL CONTROL

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ABSTRACT

Against the backdrop of growing attention to sustainable consumption, this study aims to dissect the internal mechanisms through which green packaging knowledge drives consumers' green purchase intention. The research innovatively expands the Theory of Planned Behavior (TPB) by introducing two mediating variables, namely attitude towards green packaging and perceived behavioral control, to construct a theoretical model, offering a new perspective for exploring consumers' green consumption behavior. Through convenience sampling, a quantitative cross-sectional survey was conducted on 136 urban consumers. Data collected via an online questionnaire were analyzed using PLS-SEM. Results confirm that green packaging knowledge positively influences attitude and perceived behavioral control towards green packaging. Mediating variables are key to how green packaging knowledge (GPK) shapes green purchase intention (GPI). Further mediation testing indicates that attitude toward green packaging (ATGP) and purchase behavior control (PBC) serve as important transmission mechanisms, with the attitudinal route exerting the stronger indirect effect. Overall, knowledge functions as a key cognitive driver that fosters purchase intention by shaping environmentally oriented attitudes and perceived efficacy, thereby illuminating the persistent "green attitude and behavior gap." The study enriches the TPB by incorporating a knowledge component and suggests that future inquiries may validate this framework across cultural contexts and with observed behavioral outcomes.

Key words: Green packaging; green purchase intention; Theory of Planned Behavior; consumer behavior

INTRODUCTION

Global environmental challenges are becoming increasingly severe, and plastic pollution has emerged as one of the most pressing crises at present. According to data from a report, from 2000 to 2019, global plastic production doubled, climbing to 460 million tons. If the current trend persists, the global plastic production is projected to nearly triple by 2060 (Organization for Economic Co-operation and Development, 2022). Packaging represents the most prominent application field of plastics, accounting for approximately 40% of the total plastic consumption. This situation has led to the continuous generation of alarming amounts of waste globally. A critical issue is that waste management systems are incapable of coping with such a massive quantity, as merely 9% of plastic waste worldwide has been effectively recycled. A large proportion of the remaining plastic waste is either landfilled, incinerated, or leaked into the natural environment. This highlights the urgent need for a transition toward sustainable solutions, such as green packaging, to achieve systematic transformation.

Furthermore, packaging systems exert a significant environmental impact throughout their entire life cycle, particularly in terms of greenhouse gas emissions. Therefore, the selection of sustainable materials, optimization of design schemes, and improvement of recycling strategies are crucial for attaining sustainable development goals. Precisely against the backdrop of the urgent demands for addressing plastic pollution and transforming packaging systems, scholars generally emphasize that green packaging serves as a key strategy for advancing sustainable development (Wandosell, Parra-Meroño, Alcaide, & Baños, 2021). It pointed out that the adoption of recyclable and biodegradable materials, combined with the principles of circular design, not only cuts down on resource usage and environmental impact but also boosts the waste reduction outcome during the whole product life cycle (Markevičiūtė & Varžinskas, 2022). From an enterprise's standpoint, green packaging facilitates eco-innovation and aligns corporate operational practices with sustainable development goals. From the perspective of consumers, green packaging guides consumers to make environmentally responsible choices and strengthens their green behavioral patterns. Consequently, green packaging is widely regarded as a core driver for building more sustainable production and consumption systems.

Despite the growing environmental awareness among consumers, a long-standing challenge remains unresolved: While consumers generally demonstrate strong environmental consciousness, a pronounced divide often exists between such beliefs and their actual purchasing conduct. This phenomenon, termed the "green attitude-behavior gap," has been a core issue in the field of sustainable development research over the past decade (Joshi & Rahman, 2015). Meta-analytical studies have quantitatively confirmed the prevalence of this gap across multiple domains (Massey, O'Cass, & Otahal, 2018). Many consumers may endorse the concept of sustainable development in principle, yet this endorsement has not been consistently translated into a willingness to purchase green packaged products. This inconsistency underscores a key research question: current studies mostly focus on

the technical or market aspects of green packaging, but there is still insufficient exploration on how it affects consumers' internal psychological decision-making processes.

A large number of studies have proven that attitudes can effectively predict purchase intention. However, the role of green packaging knowledge as an antecedent variable has been scarcely addressed in the literature. Few studies have simultaneously examined ATGP and PBC in the TPB as dual mediating variables in the process of transforming green knowledge into green purchase intention. To address these research gaps, this study constructs a new model, as shown in Fig.1, to explore how green packaging knowledge influences purchase willingness. Theoretically, this research takes knowledge as a key antecedent variable and simultaneously tests the dual mediating pathways of ATGP and PBC, providing a more instructive theoretical model for green consumer behavior. Practically, the findings offer implications for enterprises and policy-making: green packaging design should not only shape consumers' positive attitudes but also enhance their sense of behavioral control. This research approach not only promotes the application of green packaging. It is not only helps bridge the disparity between green awareness and action, but also the realization of mutual benefits for environmental and commercial values that enterprises strive for.

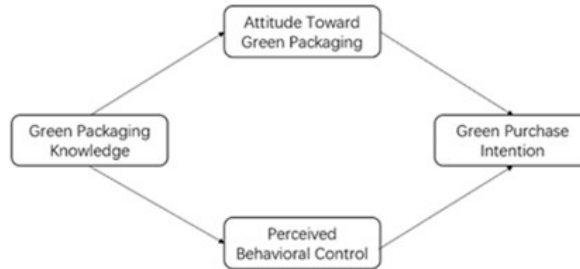


Fig.1 Conceptual Framework

The theoretical foundation of this study is based on the Theory of Planned Behavior (TPB), which explains how psychological factors drive behavior (Ajzen, 1991). In this theory, attitude toward behavior refers to an individual's overall positive or negative evaluation of performing a specific behavior, encompassing behavioral beliefs and outcome evaluations. Stronger green purchase intentions among consumers often originate from their positive mindset, which is in turn cultivated by the recognition of environmentally friendly purchasing as valuable and beneficial (Agustina, Yuniaristanto, & Sutopo, 2025). Subjective norm is also a key construct, referring to the social pressure an individual feels when performing or forsaking a specific behavior. However, this framework is not adopted in this study. It is an individual's perception of behavioral ease or difficulty in performing a specific action that constitutes perceived behavioral control, which consists of both internal factors and external factors, including access to necessary resources, skills, or opportunities. When consumers perceive no significant barriers to purchasing and using green-packaged products, their purchase intentions are more likely to translate into actual behavior. Drawing from the TPB, this study constructs its theoretical framework with structural adjustments and dimensional extensions. Specifically, the model retains the core constructs in TPB, taking attitude toward behavior and PBC as predictive variables of GPI, while excluding the dimension of subjective norms to focus on consumers' internal cognitive mechanisms.

Knowledge plays an important role as a cognitive prerequisite for attitude formation. Ecological knowledge has been confirmed as an antecedent to pro-environmental attitudes. In the context of green packaging, environmental knowledge enables consumers to evaluate the environmental benefits of products across their life cycle and identify misleading environmental claims, thereby fostering a positive attitude toward green packaging (ATGP) (Farooq, Majid, & Ahmed, 2023). While the knowledge-attitude link is well-validated in the broader environmental field, this study specifically tests this relationship within the sub-domain of packaging, leading to the following hypothesis:

H1: ATGP is positively influenced by GPK.

Perceived behavioral control reflects an individual's confidence in their ability to perform a behavior. In green consumption contexts, behavioral barriers such as uncertainty about environmental outcomes or perceived limited personal impact can weaken consumers' sense of control (Hoffmann et al., 2024). Green packaging knowledge can reduce these uncertainties by providing information that simplifies complex environmental decisions and strengthens consumers' confidence in their ability to contribute to environmental protection. Therefore, the following hypothesis is proposed:

H2: PBC is positively influenced by GPK.

Attitude is widely recognized as a core determinant of behavioral intention within the TPB framework. A positive attitude enhances intrinsic motivation by reflecting both cognitive beliefs about the benefits of a behavior and emotional approval of it. In the context of green packaging, consumers' recognition of its environmental value, functional performance, and aesthetic qualities can increase their intention to purchase such products. Previous empirical research indicates that positive environmental attitudes significantly influence consumers' willingness to pay more for eco-friendly packaging (Gomes et al., 2023). Therefore, the following hypotheses is proposed:

H3: GPI is positively influenced by ATGP.

In addition to attitude, perceived behavioral control also plays a direct role in determining behavioral intention. PBC reflects an individual's perception of their ability to perform a behavior, which includes self-efficacy and situational control. Consumers may support environmentally friendly packaging conceptually, but their purchase intentions may weaken if they perceive barriers such as high costs, limited availability, or difficulties in verifying environmental claims. Conversely, when consumers feel confident in their ability to identify and purchase genuine green products, their perceived behavioral control increases, strengthening their purchase intention. Therefore, the following hypothesis is proposed:

H4: GPI is positively influenced by PBC.

Based on the extended TPB framework, this study further examines the mediating mechanisms between green packaging knowledge and green purchase intention. Specifically, green packaging knowledge functions as a cognitive antecedent variable, while ATGP and PBC serve as mediating variables reflecting consumers' evaluative and self-efficacy beliefs. Green purchase intention (GPI) represents the behavioral outcome (Carfora et al., 2021). Accordingly, the following hypotheses are proposed:

H5. ATGP plays a mediating role in the effect of GPK on GPI

H6. PBC plays a mediating role in the effect of GPK on GPI.

METHODS

3.1 Research Design

The quantitative cross-sectional survey design used in this study was based on the TPB framework. This strategy was chosen in order to test the hypothesized connections between consumers' perceptions of control, knowledge, attitudes, and purchase intentions regarding green packaging at a particular moment in time.

3.2 Data Collection and Analysis

This study conducted an online structured questionnaire survey among urban consumers, distributing the questionnaire through multiple channels such as social media and e-commerce communities. Convenience sampling was employed to expand coverage, ensuring the sample's breadth and representativeness. After screening out invalid questionnaires, a total of 136 valid responses were finally obtained for analysis. SPSS software served as the tool for conducting descriptive statistics on the data, whereas partial least squares structural equation modeling (PLS-SEM) was utilized to examine reliability, verify validity, and validate the study's hypotheses.

RESULTS AND DISCUSSION

4.1 Analysis of Reliability and Validity

The results of reliability test indicate that the range of Cronbach's Alpha values for the latent variables is 0.848 to 0.916, all exceeding recommended threshold of 0.7 (Hair et al., 2010). Additionally, composite reliability values fall within the interval of 0.891 to 0.939, and all of these values surpass the benchmark of 0.8. These findings suggest the measurement scale exhibits good internal consistency and high reliability. For the evaluation of convergent validity, the range of Average Variance Extracted (AVE) values across all latent variables is 0.620 to 0.795, surpassing the 0.5 criterion, indicating that measurement items adequately reflect their respective latent variables and confirming convergent validity.

This study evaluated the model's discriminant validity via the adoption of the Fornell-Larcker criterion. Under this rule, it is required that the square root of each latent variable's AVE is larger than its correlation coefficients with other variables in the model (Fornell & Larcker, 1981). As shown in Table 1, all latent variables met this standard, demonstrating that the model has good discriminant validity. This substantiates the empirical distinction of the four constructs offer a strong basis for further structural model analysis.

Table 1. Discriminant validity

Construct	ATGP	GPI	GPK	PBC
ATGP	0.892			
GPI	0.794	0.84		
GPK	0.741	0.717	0.787	
PBC	0.593	0.779	0.728	0.838

4.2 Testing Structural Model

The coefficient of determination (R^2) was used in this study to evaluate how well the model explains variance. Results revealed that 53% of PBC's variance, 77.7% of GPI's variance, and 54.9% of ATGP's variance could be explained by the model. These R^2 values demonstrate strong predictive power, particularly compared with prior TPB-based studies where R^2 for behavioral intention typically ranged between 40% and 60%. The higher explanatory strength suggests that integrating GPK into the TPB framework substantially enhances the model's predictive accuracy, confirming the theoretical necessity of including cognitive antecedents.

4.3 Hypothesis Testing

The results in Table 2 indicate that all direct effects exhibit a significant positive relationship. GPK has strong predictive power for ATGP and PBC with standardized path coefficients of 0.739 ($P < 0.001$) and 0.738 ($P < 0.001$), respectively. ATGP and PBC are two significant factors influencing GPI. Specifically, the correlation coefficient of ATGP is 0.504 ($P < 0.001$), and that of PBC is 0.482 ($P < 0.001$), with both reaching the statistical significance level of $P < 0.001$. All f^2 effect sizes exceed 0.36, indicating substantial impacts among the variables. Hypotheses H1, H2, H3, and H4 are all validated by the findings presented in this research.

Table 2. Standardized structural estimates and tests of the main hypotheses

Hypotheses	Path	M	SD	T-values	P-values	Result
H1	GPK>ATGP	0.739	0.058	12.679	0.000	Accepted
H2	GPK>PBC	0.738	0.043	16.862	0.000	Accepted
H3	ATGP>GPI	0.504	0.084	6.099	0.000	Accepted
H4	PBC>GPI	0.482	0.077	6.135	0.000	Accepted

The results of research indicate that knowledge is a crucial antecedent in the formulation of green intentions and extend the TPB by demonstrating that domain-specific knowledge considerably strengthens both ATGP and PBC. The present finding is consistent with earlier studies, which show that knowledge diminishes consumer uncertainty and boosts consumers' perceived competence regarding green purchasing (Nguyen et al., 2021). Furthermore, the results reveal that attitude exerts a stronger influence on purchase intention than perceived behavioral control, a finding consistent with studies that identify attitude as the dominant predictor in green consumption contexts (Paul, Modi, & Patel, 2016).

4.4 Mediation Effects

Table 3 shows that both ATGP and PBC considerably moderate the connection between GPK and GPI. The value of the indirect effect is 0.380 ($P < 0.001$) through ATGP was stronger than through PBC, whose value is 0.346 ($P < 0.001$), supporting H5 and H6. By comparing the effect strengths of the two paths, it is found that ATGP's mediating role is somewhat more robust than that of PBC, indicating that enhancing consumers' green attitude is a more critical path to promote their purchase intention.

Table 3. Total effects and indirect effects

Hypotheses	Path	Total Effects		Indirect Effects		Result
		(β)	P	(β)	P	
H5	GPK>ATGP>GPI	0.726	0.000	0.380	0.000	Accepted
H6	GPK>PBC>GPI	0.726	0.000	0.346	0.000	Accepted

4.5 Discussion

This study confirms that Green Packaging Knowledge influences purchase intention through dual mediating pathways: Attitude and Perceived Behavioral Control. Path analysis indicates that the mediating effect of Attitude is stronger than that of Perceived Behavioral Control, suggesting that consumers' emotional endorsement serves as a more central driver than perceived capability. The coefficient of determination (R^2) results demonstrate that the model has significant explanatory power. The integrated model constructs knowledge as a cognitive antecedent within the TPB framework. Successfully identifying the core driving factors behind consumers' attitudes, perceived behavioral control, and green purchase intention is a key finding of this study.

CONCLUSION

This study integrates Green Packaging Knowledge into the TPB, showing it positively influences Green Purchase Intention through dual mediation by Attitude and Perceived Behavioral Control, with attitude as the stronger pathway. Findings validate domain-specific knowledge as a key cognitive driver, offer a nuanced explanation for the attitude and behavior gap, and suggest promoting green packaging knowledge to foster positive attitudes and reduce behavioral barriers. For future research, it will adopt large sample sizes and a longitudinal design for more thorough insights in order to overcome the cross-sectional design and convenience sampling constraints of this study.

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