Journal of Digital Scholarship in Archives and Information
Volume 2, Issue 1, xx-xx.
e-ISSN: 3109-4023
https://e-journal.gomit.id/jdsai
DOI: 10.58723/jdsai.v2i1.171

Greenwashing Awareness, Consumer Behavior, and Energy-Efficient Appliances: An Expansion of the Theory of Planned Behavior

Toan-VU Le*, Tran Nhat Minh[a], Nguyen Truong Son[a], Le Huy Nghia[a], Nguyen Thi Nguyen[a]
[a]School of economics and management, Hanoi University of Science and Technology, Hà Nội, Việt Nam

*** Corresponding author:**
Tran Nhat Minh, Hanoi University of Science and Technology, Việt Nam ✉trannhatminh1204@gmail.com
Toan-VU Le, Hanoi University of Science and Technology, Việt Nam ✉toan.levu1@hust.edu.vn

Article Info

Article history:
Received: February 01, 2026
Revised: March 30, 2026
Accepted: March 31, 2026

Keywords:

Vietnam;
Theory of planned behavior;
Green skepticism;
Greenwashing;
Purchase intention

Abstract

Background: Under the urgency of escalating environmental degradation and climate change, understanding consumer behavior toward sustainable products has become increasingly critical. One important decision is the choice of energy-efficient appliances, which directly impacts household energy consumption and national energy security.
Aims: This study extends the Theory of Planned Behavior by incorporating green skepticism to examine its influence on university students' purchase intentions for energy-efficient appliances in Hanoi, Vietnam.
Methods: A quantitative survey was conducted with 239 students across multiple universities in Hanoi. The proposed model was tested using partial least squares structural equation modeling.
Results: The findings reveal that attitude exerts the strongest influence on purchase intention. Green skepticism negatively affects attitude but does not directly deter purchase intention, operating instead through an indirect pathway via attitude. The extended model explains 48.4% of the variance in purchase intention and 62.7% in purchase behavior.
Conclusions: These results provide a foundation for policymakers to strengthen green labeling regulations, improve consumer education initiatives, and implement targeted strategies addressing both skepticism and attitude development to promote sustainable consumption practices.

To cite this article: Author. (2026). Greenwashing Awareness, Consumer Behavior, and Energy-Efficient Appliances: An Expans the Theory of Planned Behavior. *Journal of Digital Scholarship in Archives and Information, 2*(1), https://doi.org/10.58723/jdsai.v2i1.171

INTRODUCTION

Theoretical background

As the world continues its development, global industrial production and household consumption have contributed significantly to environmental degradation and climate change (Le et al., 2025). Therefore, a balance must be struck between the amount of energy consumed and the environmental problems caused by the excessive and inefficient consumption of energy and energy sources that are not environmentally friendly (Neves & Oliveira, 2021). The World Meteorological Organization (2024) reported that radiative forcing caused by the greenhouse effect increased by 51.5% from 1990 to 2023, creating severe negative environmental impacts. Human behavior is one of the main factors causing climate change and energy shortages, thereby leading to the common goal of encouraging environmentally friendly behavior (Le et al., 2025). Consumers often rely on advertising and messages to make decisions. Because of this, many companies are looking to capitalize on the green trend to target environmentally friendly products and services (V. H. Nguyen et al., 2025).

From 2008 to 2018, household electricity consumption accounted for approximately 33% of total electricity consumption, along with increasingly high consumer demand (Lê et al., 2024). In Vietnam, this issue has become particularly critical, especially in dense cities, where high energy consumption may cause blackouts. Furthermore, CO2 emissions per capita have increased rapidly and have exceeded the global average since 2018 (Li et al., 2021), indicating that Vietnam has not yet effectively controlled and utilized energy. According to Vietnam Electricity Group (2022), electricity demand is projected to grow by 8.5% annually after 2023 (Lê et al., 2024). Therefore, encouraging households to use energy-saving products has become essential for ensuring national energy security and fulfilling Vietnam's environmental commitments and sustainable development goals (Li et al., 2021).

Under this weight, Vietnam's Ministry of Industry and Trade implemented an energy labeling program on a voluntary basis in 2009 and later became mandatory for households and industrial products in 2013 *(Decision No. 51/2011/QD-TTg)*. Appliances with 4 or 5-star labels represent those with the best energy-saving performance. However, despite these efforts, the adoption of energy-efficient appliances still faces significant challenges, particularly from the growing phenomenon called “greenwashing”. This is the act of misleading consumers about a company's environmental practices or the environmental benefits of a product or service; many advertisements and messages are becoming increasingly vague and misleading, and greenwashing is undermining consumer trust (V. H. Nguyen et al., 2025). Greenwashing also refers to corporate practices that make misleading or unsubstantiated claims about the environmental benefits of products or services, creating false perceptions of sustainability to reduce costs or optimize profits (Santos et al., 2024; Alevizou & Henninger 2025). Capitalizing on sustainable development trends, some companies would engage in greenwashing to maintain customer trust without genuinely committing to environmental innovation (V. H. Nguyen et al., 2025). This phenomenon emerge at two distinct levels: on the corporate level, companies would take environmental accountability while still fail to make any changes, and on the product level, businesses would use misleading certifications and labels suggesting environmental friendliness without any clear evidence, tricking the customer into paying more for a product with little to no difference (Santos et al., 2024; Alevizou & Henninger 2025).

LITERATURE REVIEW

Due to this fact, research on energy appliances consumption behavior has become increasingly urgent, especially in emerging economies, to mitigate climate change and protect environmental issues (Nekmahmud, 2024). TPB has been extensively employed to explain green purchase intentions, positing that behavioral intention is the most proximal determinant of actual behavior (Ejigu & Yeshitela, 2024; Joshi & Rahman, 2015). However, TPB has certain limitations when applied to green consumption, namely how it focuses on explaining general purchase behavior and does not incorporate factors specific to green consumer behavior, and second, TPB does not account for the consumers’ habitual buying behavior (Joshi & Rahman, 2015).

To address the limitations of the traditional TPB in capturing the distinction of sustainable consumption, researchers have increasingly developed extended TPB models that incorporate specific green related variables. For instance, Nabi Khan et al. (2025) expanded the TPB to bridge the "attitude-behavior gap" by integrating inward and outward environmental attitudes, perceived consumer effectiveness (PCE), eco-literacy, and unique consumer green perceptions such as green hardness, readiness, and stigma (Nabi Khan et al., 2025). Similarly, Bhutto et al. (2022) extended the framework to predict the adoption of energy-efficient appliances among young consumers by adding utilitarian environmental benefits, self-expressive benefits, and moral obligations (Bhutto et al., 2022). Other scholars have proposed comprehensive models that integrate the TPB with the Attitude-Behavior-Context (ABC) framework, introducing crucial contextual and environmental variables like ecological motives, green trust, green perceived value, and greenwashing concern to better explain the mechanisms driving eco-friendly purchases (Nekmahmud, 2024). Furthermore, foundational studies by Abdulsahib et al. (2019) and Yadav & Pathak (2017) have successfully extended the TPB by identifying environmental concern and health

consciousness as fundamental determinants of green purchase intentions in developing nations (Abdulsahib et al., 2019; Yadav & Pathak, 2017).

This research specifically examines the context of Hanoi, Vietnam's capital city, selected for two primary reasons. First, consumers in Hanoi have higher incomes and tend to pursue sustainable lifestyles, and second, Hanoi concentrates the highest number of energy-efficient appliance retailers nationwide (Lê et al., 2024). University students represent a particularly important demographic for this research. Young consumers, including university students, are considered highly educated individuals who often make purchasing decisions independently without consulting parents (Świtalski & Rybowska, 2021; Ziesemer et al., 2021). This suggests that understanding how digital information, including exposure to greenwashing claims, affects young consumers is crucial.

This study addresses the identified research gaps by investigating three primary questions:

RQ1: To what extent do the core factors of TPB influence university students' intention to purchase energy-efficient appliances?
RQ2: How does green skepticism affect university students' attitudes and purchase intentions toward energy-efficient appliances?
RQ3: How does the addition of green skepticism as an external variable improve the explanatory power of TPB in predicting energy-efficient appliance purchase behavior?

To answer these questions, and the analysis above, this paper has developed the following research model by extending TPB, incorporating green skepticism:

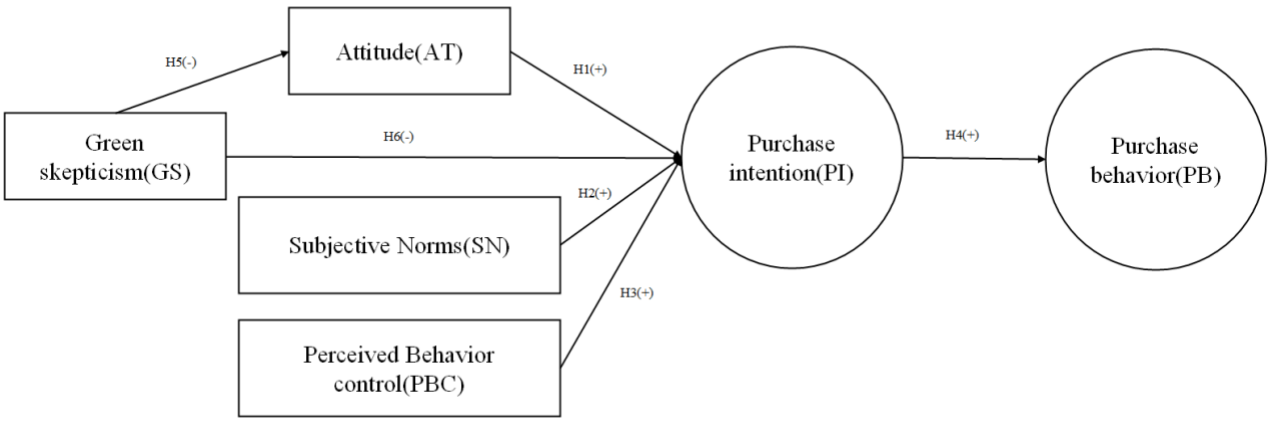

Figure 1. Research model

RESEARCH HYPOTHESES

The theory of planned behavior in energy-efficiency appliances (EEAs) purchase Intention

The theory of planned behavior has been widely used as a reliable framework for predicting intentions and behaviors across various domains (Ejigu & Yeshitela, 2024). Specifically, within the context of green consumer behavior, TPB can offer a clear lens for understanding the drivers behind purchasing EEAs and green products alike using its core variables: attitude, subjective norms and perceived behavior control (Bhutto et al., 2022). Recent research applying this model in Vietnam has confirmed that personal attitudes and perceived behavioral control are significant predictors of green purchase intentions among the younger generation (Đặng, 2025). These elements collectively influence an individual's behavioral intention, which subsequently dictates their actual purchasing decisions for sustainable energy equipment (T. N. Nguyen et al., 2017). Based on this foundational understanding, this research has developed the following hypotheses:

H1: Attitude towards purchasing EEAs has a positive effect on purchasing intention.

H2: Subjective norms have a positive effect on purchasing intention.

H3: Perceived behavioral control is positively related to purchasing intentions for EEAs.

H4: Purchase intention is positively related to the actual purchase behavior of EEAs.

Green Skepticism and its Consequences

Generally, skepticism is an individual's tendency to doubt, disbelieve and question certain information, and in the context of green marketing, it is the environmental benefits touted in advertisements and on product labels (Mohr et al., 1998). This construction is particularly relevant in markets where consumers are exposed to a high volume of environmental claims, some of which may be exaggerated or misleading (Courtat et al., 2023; Janssen et al., 2022). Furthermore, when consumers are skeptical, their information processing is altered; they are less likely to believe advertising claims and form less favorable attitudes toward the ads themselves (Wilson et al., 2021; Panigyraki & Polyportis, 2024).

Consumer skepticism serves as a significant psychological barrier that negatively impacts both brand attitudes and green purchase intentions. When consumers perceive a discrepancy between a firm's green claims and its actual practices, they form skeptical, negative attributions about the company's motives, which upset normal positive attitude formation and significantly depresses purchase intent (Nyilasy et al., 2014). Applying these insights to TPB, we argue that this negative evaluation directly impacts the model's core components. If a consumer is skeptical of the promised value of an EEAs, namely, its efficiency and environmental benefit, their positive beliefs about the outcome of the purchase are undermined. Consequently, their overall attitude towards purchasing such an appliance will become less favorable (Lee & Cheong, 2024; Wilson et al., 2021; Panigyraki & Polyportis, 2024).

This negative evaluation directly impacts the intention to act, as a consumer who holds a less favorable attitude is, by extension, less likely to form a strong intention to purchase the product (Bhutto et al., 2022). Therefore, we posit that green skepticism serves as a barrier in the decision-making process, negatively influencing both the attitudinal antecedent and the ultimate behavioral intention. This leads to the formulation of the following hypotheses:

H5: Green skepticism has a negative effect on consumers' attitudes toward purchasing EEAs.
H6: Green skepticism has a negative effect on consumers' intentions to purchase EEAs.

RESEARCH METHOD

To validate the proposed research model and test the hypotheses, this study employed a quantitative research design. The sample included students from various universities in Hanoi. Due to little research the awareness Vietnamese university students are about greenwashing and how it affects their intention to buy EEAs, a cross-sectional survey design was appropriate for examining the relationships between the different parts of the model. The research followed a structured process, including conceptual measurement, questionnaire development, data collection, and data analysis. Established items for the variables from prior studies were adapted to the context of EEAs and greenwashing awareness through green skepticism. Then, a large-scale survey was administered through online questionnaires to reach students across multiple universities in Hanoi. The data collected were then analyzed using SmartPLS to assess the measurement model, evaluate structural relationships, and test the proposed hypotheses. This approach was conducted according to the following procedure:

Concepts measurement and questionnaires construction

Table 1. Variable items

Variable	Label	Item count	Source
Attitude	AT	4	(Zhao et al., 2019)

Subjective norm	SN	3	(Bhutto et al., 2022)
Perceived behavior control	PBC	4	(Zhao et al., 2019)
Green skepticism	GS	4	(Mohr et al., 1998)
Purchase intention	PI	4	(Wang et al., 2017); (Bhutto et al., 2022)
Purchase behavior	PB	3	(Bhutto et al., 2022)

The questionnaire consists of two main parts: (1) demographic questions, and (2) observations related to the variables GS, AT, PBC, SN, PI. All variables mentioned were assessed using a 5-point Likert scale (with 1 = strongly disagree to 5 = strongly agree). The questions used to measure the variables Attitude (AT) and Perceived behavioral control (PBC) were referenced from (Zhao et al., 2019) with 4 items for both variables. Subjective norm (SN) and Purchase behavior (PB) both used 3 items each taken from (Bhutto et al., 2022), Purchase intention (PI) with 3 items from (Wang et al., 2017), 1 item from (Bhutto et al., 2022) and all 3 items in PB from the same source. Finally, the concept of "green skepticism" with 4 items was taken from (Mohr et al., 1998).

Data and sample collection

Table 2. Sample's demographic characteristics

Attributes	Options	Frequency	Percentage
Gender	Male	133	55.60%
	Female	100	41.80%
	Other	6	2.60%
Income	< 10m	229	95.80%
	10m - < 20m	5	2.10%
	20m - < 30m	1	0.40%
	> 30m	4	1.70%
Sources of knowledge about energy saving and environmental protection	From university profession	21	8.80%
	From work profession and requirement	6	2.50%
	Self-taught through media sources (newspapers, TV, the internet, etc.)	195	81.60%
	Other	17	7.10%

Source: Calculations by the authors.

The study employed a quantitative research method with the objective of gaining a deeper understanding of young consumers' purchase intentions and the influence of environmental claims on appliances toward their consumption intentions. Data were collected from students currently studying around Hanoi using convenience sampling, a method commonly employed in TPB extension studies (Alam et al., 2014; Ngo et al., 2024; Yadav & Pathak, 2017). A preliminary explanation of "greenwashing" was provided in the questionnaire to ensure a common understanding of the concept among respondents. After distributing the online questionnaire to students across multiple universities for approximately two weeks, more than 300 responses were collected. After screening for invalid responses, 239 valid responses remained for analysis. According to (Ahmed et al., 2024), a sample size of approximately 200 is appropriate for studies with fewer than 40 observed variables. Therefore, 239 responses represent a suitable sample size for this study.

The demographic characteristics of the respondents are presented as follows: approximately 41.80% of respondents were female, 55.60% were male, and the remainder preferred not to disclose their gender. Additionally, up to 95.80% of respondents had a monthly income below 10 million VND, this is consistent with student-focused data, where the majority rely on family financial support rather than personal income. While students have low personal income, they often act as primary decision-makers for

small appliances (e.g., fans, rice cookers, desk lamps) in rental households or influence family purchases for larger items (Kaźmierczak-Piwko et al., 2023). Studying this demographic also provides forward-looking insights into future consumer trends, as these students will become primary household decision-makers in the near future. According to the survey data, most students surveyed possessed knowledge about energy conservation through self-taught through media sources (accounting for approximately 81.60%), while the remaining respondents acquired their knowledge through formal training or other means.

Data analysis

The partial least squares structural equation modeling (PLS-SEM) approach was applied using SmartPLS to evaluate the underlying theoretical model and test the hypotheses. PLS-SEM is particularly useful when the research objective focuses on prediction and exploring relationships between theoretical concepts rather than strictly testing model structure (Hair et al., 2021; Albahri et al., 2021; Becker et al., 2022). This approach was carried out in two main stages. First, the reliability of the measurement items was assessed using Cronbach's Alpha, while reliability and convergence was evaluated through factor loadings, Composite reliability, and average variance extracted (AVE). Simultaneously, the Fornell-Larcker criteria were used to assess discriminant validity in the model. Then, the model was examined through path coefficients and the coefficient of determination (R^2) to indicate how much variance in the dependent variable can be explained by the independent variables. This analytical approach ensures the accuracy and reliability of the relationships examined within the research model.

RESULT AND DISCUSSION

RESULT

Measurement model analysis

Table 3. Reliability assessments of the measurements and its components.

Variables	Items	Factor Loadings	Cronbach's Alpha	rho_A	Composite Reliability	AVE
Attitude	AT1	0.861	0.896	0.899	0.928	0.763
	AT2	0.866				
	AT3	0.883				
	AT4	0.883				
Subjective norm	SN1	0.864	0.817	0.821	0.891	0.731
	SN2	0.854				
	SN3	0.848				
Perceived behavior control	PBC1	0.869	0.870	0.877	0.911	0.721
	PBC2	0.904				
	PBC3	0.757				
	PBC4	0.859				
Purchase intention	PI1	0.828	0.861	0.863	0.906	0.706
	PI2	0.870				
	PI3	0.808				
	PI4	0.854				
Purchase behavior	PB1	0.846	0.763	0.764	0.864	0.679
	PB2	0.839				
	PB3	0.786				
Green skepticism	GS1	0.867	0.886	0.928	0.919	0.740
	GS2	0.864				
	GS3	0.850				
	GS4	0.859				

Source: Calculations by the authors with the support of SmartPLS software.

The research model is conducted with 6 variables and 22 total items. Factor loadings, Cronbach's Alpha, composite reliability (CR) and average variance extracted (AVE) are used to assess the measurement validity. Results in

Table ***3*** shows Cronbach's Alpha value have surpassed the recommended 0.7 for all variables (Hair et al., 2014); rho_A value and CR both passed the benchmark at 0.7 (Hair et al., 2014). The AVE results shown are greater than the threshold of 0.5 (Hair et al., 2014).

Additionally, convergent validity of the measurement components was assessed through factor loadings derived from PLS-SEM analysis. The results indicate that all factor loadings for the observed variables within each component exceeded 0.7 (

Table ***3***). This indicates that the observed indicators used to measure each unidimensional scale in the research model demonstrated acceptable convergent validity. Therefore, the measurement model satisfies all established criteria, confirming the validity and reliability of the concepts used in this study.

Table 4. Assessment of Discriminant Validity using Fornell & Larcker

	AT	**GS**	**PB**	**PBC**	**PI**
AT	**0.873**				
GS	-0.228	**0.860**			
PB	0.607	-0.186	**0.824**		
PBC	0.373	-0.234	0.588	**0.849**	
PI	0.598	-0.218	0.793	0.542	**0.840**

Source: Calculations by the authors with the support of SmartPLS software.

To assess discriminant validity among the unidimensional components within the multidimensional scale, as well as between the latent variables in the model (both unidimensional and multidimensional), the study employed the Fornell-Larcker criterion (Fornell & Larcker, 1981). This criterion compares the square root of the average variance extracted (AVE) for each construct with the correlations between that construct and all other constructs. Discriminant validity is established when the square root of AVE for each construct is greater than its correlations with other constructs. As shown in

Table ***4***, the square roots of the AVE for each scale exceeded the correlation coefficients between each pair of latent constructs. Therefore, the scales in the model achieved satisfactory discriminant validity.

Table 5. Explanatory capacity and VIFs.

	R Square Adjusted	**VIF - Variance Inflation Factor**					
		AT	**GS**	**PB**	**PBC**	**PI**	**SN**
AT	0.048					1.432	
GS		1.000				1.088	
PB	0.627						
PBC						1.624	

PI	0.484	1.000	
SN			1.883

Source: Calculations by the authors with the support of SmartPLS software.

To evaluate the PLS-SEM model, calculations were done in SmartPLS. Through adjusted R^2, the model's explanatory capacity can be determined. Table 5 results show PB and PI both have high R^2 at 0.672 and 0.484 respectively, meaning the model explains 48.4% of the variance in purchase intention and 62.7% of the variance in purchase behavior, indicating satisfactory explanatory power for consumer behavior research (Hair et al., 2014). Meanwhile, AT with a low R^2 value reflects a weak explanatory power in the model.

Multicollinearity was assessed using the variance inflation factor (VIF). The VIF values shown in Table 5 ranged from 1.000 to 1.883, which is significantly below the threshold (Hair et al., 2014). This indicates the absence of significant multicollinearity, ensuring the accuracy of the model estimation.

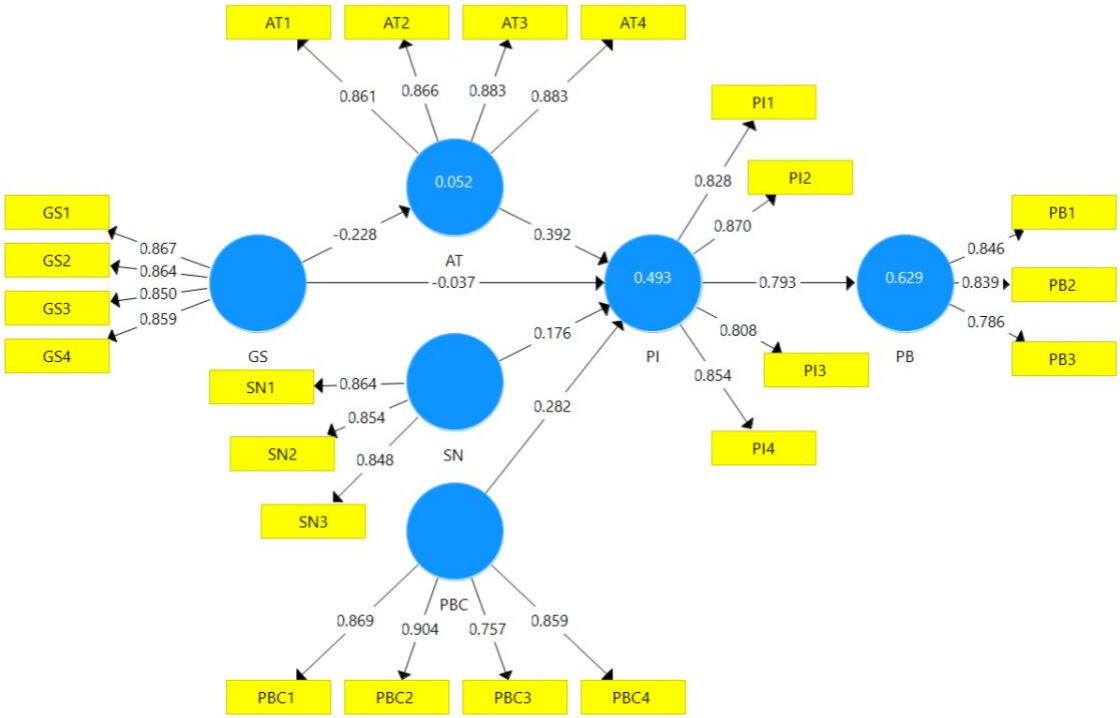

Figure 2. Path Coefficients Model

Hypothesis testing

Table 6. Hypothesis results of the proposed research model

Hypotheses	Relationships	β	P-Values	Result
H1	AT -> PI	0.392	0.000	Supported
H2	SN -> PI	0.176	0.020	Supported

H3	PBC -> PI	0.282	0.000	Supported
H4	PI -> PB	0.793	0.000	Supported
H5	GS -> AT	-0.228	0.000	Supported
H6	GS -> PI	-0.037	0.455	Not supported

Source: Calculations by the authors with the support of SmartPLS software.

The statistical significance level for hypothesis testing was set at 5%, following conventional practice. Table 6 presents the results of hypotheses testing. The four direct relationships influencing purchase intention from the basic TPB model for EEAs, attitude emerged as the strongest predictor (β = 0.392, $p < 0.001$). Meanwhile, the newly expanded variable, green skepticism, its direct effect on purchase intention was not supported by the data ($p = 0.455 > 0.05$). However, the negative effect of green skepticism on attitude was supported (β = -0.228, $p < 0.001$). The results specify that the original TPB variables continued to exert direct and significant effects on purchase intention for EEAs, including subjective norms (β = 0.176, $p = 0.020$) and perceived behavioral control (β = 0.282, $p < 0.001$). In summary, five out of six research hypotheses were accepted, while one hypothesis was not supported by the data.

Multi-group analysis

According to gender

Table 7. Multi-group gender comparison results(shortened)

Relationship	Diff (Female – Male)
AT -> PI	-0.304
PI -> PB	-0.118

Source: Calculations by the authors with the support of SmartPLS software.

To examine whether the structural relationships in the proposed model differed across gender, a multi-group analysis was performed. Respondents were divided into two groups: male and female. The third group, "rather not say," was excluded from this analysis due to insufficient sample size. Table 7 shows the only 2 relationships that showed any significant differences at the 0.05 level. The relationship between AT to PI and PI to PB (β =-0.304 and β = -0.118) both indicated that the positive influence of attitude on purchase intention and intention on actual behavior was more pronounced among male students. This result suggests gender played a limited moderating role, significantly influencing only the attitude-intention and intention-behavior relationships, while the remaining relationships were invariant across groups.

DISCUSSION

Key findings

This study successfully evaluated the influence of environmental claims on energy-efficient appliance purchase intentions among university students in Hanoi by extending TPB with the addition of green skepticism. Regarding RQ1, the results confirm that the core TPB components—attitude, subjective norms, and perceived behavioral control—significantly predict purchase intention. Consistent with our paper, previous studies have repeatedly demonstrated that attitude emerged as the strongest predictor for green purchase intentions (H1: β = 0.392, $p < 0.001$) (Bhutto et al., 2022; Shimul et al., 2021; Zhao et al., 2019). Perceived behavioral control demonstrated a moderate yet significant effect (H3: β = 0.282, $p <$ 0.001), indicating that consumers' confidence in their ability to purchase these products plays a meaningful role. In contrast, subjective norms exerted the weakest influence among the three TPB components (H2: β

= 0.176, p = 0.020), suggesting that social pressures play a relatively limited role in shaping purchase intentions for EEAs among young Vietnamese consumers. This weak effect warrants contextual explanation. In collectivist Vietnam, social pressure often operates through close family and trusted peers rather than broad societal expectations for energy-efficient appliance purchases (Bhutto et al., 2022). This pattern is not unique to our study. (Fischer & Karl, 2025) meta-analysis of 185 TPB studies concluded that subjective norm is generally a weak predictor of intentions. Recent research in Vietnam similarly found subjective norms to be an insignificant predictor of plastic waste minimization intention among young consumers (H. T. T. Nguyen, 2025).

To answer RQ2, analysis shows that green skepticism has a negative effect on attitude (H5: $\beta = -0.228$, $p < 0.001$). This indicates that as consumers become more skeptical of environmental claims, their positive perceptions of green products will deteriorate. Specifically, when consumers doubt the authenticity of environmental claims, they are more likely to attribute green marketing to self-serving corporate motives, which directly leads to negative product judgments (Elving, 2013). More importantly, in this research, green skepticism did not have a direct effect on purchase intention (H6: $p = 0.455 > 0.05$), which is aligned with (Kovač et al., 2025), where their findings show that despite skepticism toward green claims is common, it does not entirely deter purchase intention if they are perceived as truthful. Consumers remain willing to purchase if they believe the environmental benefits are genuine.

This finding reveals that skepticism operates through an indirect pathway—weakening attitude rather than directly deterring intention. However, whether green trust could alter intention or not remains unexplored. While skepticism represents doubt, green trust reflects consumers' willingness to depend on a product's environmental claims based on its credibility and reliability (Sio et al., 2022). The relationship between these two variables raises a notable question: does high trust overwhelm the negative effects of skepticism, or does skepticism persist regardless of trust? (Courtat et al., 2023; Janssen et al., 2022) posited that greenwashing diminishes green trust, subsequently influencing purchase intention. However, research has yet to extensively explore how skepticism and trust interact, whether as conflicting elements or independent processes, in the context of EEAs purchase intention. This gap in the literature presents a valuable opportunity for future research, as discussed in the limitations section.

Subsequently, this also answers RQ3, where green skepticism as an external variable enhances the explanatory power of the TPB framework. With skepticism included, the model captures a critical psychological barrier that indirectly influences purchase intention through its effect on attitude. Specifically, green skepticism does not directly hinder purchase intention but rather operates indirectly by reducing environmental knowledge and concern (Goh & Balaji, 2016). The inclusion of green skepticism provides a deeper understanding of how consumers process and react to green marketing, revealing that skepticism weakens the strongest predictor of intention, attitude, rather than directly deterring purchase behavior.

Policy implications

Based on the findings of this study, several policy recommendations emerge targeting government agencies, businesses, and educational institutions in Vietnam. The finding that green skepticism negatively affects attitude toward energy-efficient appliances (H5: $\beta = -0.228$, $p < 0.001$) is consistent with recent studies demonstrating that greenwashing concerns significantly damage consumer attitudes (Courtat et al., 2023; Janssen et al., 2022; Ngo-Thi-Ngoc et al., 2024). This indicates that consumers are increasingly aware of misleading environmental claims, and this awareness undermines their positive attitudes toward green products. Research in Europe shows that more than half of environmental claims are unverifiable from a consumer perspective, with a significant number considered misleading or lacking verification (Kovač et al., 2025). Despite Vietnam's implementation of an energy labeling program with *decision No. 51/2011/QD-TTg*, which has mandated star-rated labels for specific household and industrial products since 2013, the persistence of green skepticism implies that consumer trust remains low. If consumers continue to be skeptical despite the existence of official labels, the effectiveness of this energy efficiency policy is compromised. Policymakers, therefore, should strengthen regulations on environmental advertising and enforce stricter penalties for acts of greenwashing. This can be achieved through verifiable third-party certifications being authorized for energy labels and environmental claims. Such measures would reduce

consumer exposure to deceptive marketing and help restore trust in the energy efficiency labeling system. This approach aligns with previous recommendations emphasizing the importance of standardized label placement and transparent certification processes (Kovač et al., 2025).

The significance of this finding is further amplified by the role of attitude as the strongest predictor of purchase intention (H1: $\beta = 0.392$, $p < 0.001$). While not being able to directly deter purchase intention, green skepticism negative effect on attitude means it indirectly weakens the strongest factor that drives consumers' intention to purchase EEAs. This indirect relationship aligns with prior research demonstrating that skepticism operates through attitudinal means rather than directly influencing behavioral intentions ((Orazi & Chan 2018; Goh & Balaji, 2016). When consumers encounter deceptive environmental claims, their positive evaluations of these products would diminish, and this weakened attitude subsequently reduces their intention to purchase, compromising the effectiveness of sustainability policies. Consequently, policymakers should implement a strategy that addresses both the reduction of skepticism and the active reinforcement of positive attitudes. Public awareness campaigns should emphasize the tangible benefits of EEAs, encompassing long-term cost savings, environmental contributions, and alignment with national energy security goals. By providing truthful and simplified information to consumers, it can help mitigate the negative effects of skepticism on consumer attitudes (Luo et al., 2020). Additionally, integrating environmental education into school and university would help young consumers to familiarize themselves with EEAs, helping to give them a positive attitude toward sustainable products before encountering marketplace skepticism.

Beyond addressing skepticism and attitudes, policymakers must also leverage the social and practical factors that shape purchase intentions. The finding that subjective norms positively influence purchase intention (H2: $\beta = 0.176$, $p = 0.020$) confirms that consumers are influenced by the opinions and behaviors of people in their social circles. In Vietnam specifically, where group harmony and social approval are highly valued, subjective norms play a particularly significant role in shaping environmentally responsible consumption (Minton et al., 2018). Therefore, if consumers perceive through descriptive norms that their peers are purchasing EEAs, they are significantly more likely to form similar intentions to align with the group.

To capitalize on this social influence, policymakers should support community-based initiatives that showcase early adopters and encourage peer-to-peer learning. Employing role models and public figures to raise awareness on sustainability are effective strategies for normalizing green purchasing behavior (Prasetya et al., 2025). Additionally, social media platforms and community networks can be utilized to amplify positive word-of-mouth and promote the spread of green purchasing norms among peer groups (Yadav & Pathak, 2017).

Complementing the effect of subjective norms, the finding also shows that perceived behavioral control positively affects purchase intention (H3: $\beta = 0.282$, $p < 0.001$) underscores the importance of making sustainable choices easy and accessible. Consumers who believe they have the resources, knowledge, and opportunities to purchase EEAs, will form stronger intentions, whereas those who encounter obstacles—such as high upfront costs, limited product availability, or complex purchasing processes—may feel powerless to act despite their motivation to save on energy bills (Mohamed et al., 2025; T. N. Nguyen et al., 2017). This is a significant impediment to green purchase behavior, as consumers often weigh immediate costs against long-term benefits.

To confront this issue, policymakers could introduce financial support mechanisms, such as subsidies, tax rebates, or low-interest loans (Wang et al., 2017). Findings from emerging economies indicate that price sensitivity decisively shapes consumers' adoption decisions regarding EEAs, underscoring the value of targeted policy interventions (Mohamed et al., 2025; T. N. Nguyen et al., 2017). Additionally, enhancing the accessibility of clear, accurate product information using standardized labeling, digital platforms, and retailer training would serve to reinforce consumer confidence to make informed choices (Nabi Khan et al., 2025). By simultaneously leveraging social influence and reducing practical barriers, policymakers can create an environment where sustainable choices are not only socially encouraged but also personally feasible.

Beyond policy interventions, our findings offer several actionable recommendations for appliance manufacturers and green marketers. Notably, green skepticism does not directly reduce purchase intention (H6: $\beta = -0.037$, $p = 0.455$), revealing a counterintuitive strategic opportunity: skeptical consumers do not abandon purchase intentions, they simply ignore unsubstantiated claims. This means firms can confidently deploy factual, third-party certified messaging without fear of triggering behavioral backlash. To capitalize on this, manufacturers should replace vague environmental claims such as "eco-friendly" or "green" with specific, verifiable information, for example, "consumes 40% less electricity than non-certified models", and prominently display official 5-star energy labels verified by the Vietnamese government. As (Tan et al., 2026) demonstrate, precise green claims increase purchase intention, particularly among highly skeptical consumers. Finally, embedding QR codes on product labels that link directly to third-party test reports and certification documents allows skeptical consumers to independently verify claims. This transparency strategy reduces perceived greenwashing without requiring upfront trust, representing an underutilized market opportunity (Tan et al., 2026).

Limitations and future research

The current study has several limitations that can open opportunities to be addressed in future research. Firstly, our sample was limited to university students in Hanoi with predominantly low incomes, which restricts generalizability to higher-income segments or other Vietnamese regions; future studies should expand the sample to include working adults, individuals with higher academic backgrounds, and consumers from various income ranges. Second, convenience sampling was employed; future research using probability sampling would strengthen external validity. And the main drawback of this paper, the small sample (n=239), confined only to university students in Hanoi, which limits the generalizability of the findings to other demographic groups. Future studies should expand the sample to include working adults, individuals with higher academic backgrounds, and consumers from various income ranges to paint a more comprehensive picture of purchasing behavior across a broader population, as has been done in recent research (Hasni et al., 2024; Pranata et al., 2024; Prasetya et al., 2025).

Furthermore, while this paper only examined green skepticism as a direct effect on attitude and intention, the model can further be refined by incorporating awareness of greenwashing as a precursor variable to skepticism, as well as introducing green trust as an additional psychological mechanism. This may serve as an initial effect to green skepticism, reinforcing it while also deteriorating green trust simultaneously (Courtat et al., 2023; Janssen et al., 2022). Such an extension would provide a more in-depth understanding of how consumers process and react to misleading green marketing communications.

To achieve this and improve the explanatory power of the current TPB, our final suggestion for future research is to integrate the Cognition-Affect-Behavior (CAB) framework with the proposed skepticism-trust mechanism. The CAB model hypothesizes that cognitive processes (beliefs and knowledge) shape affective responses (emotions and attitudes), which in turn influence behavioral outcomes (Hussin & Abdul Wahid, 2023). This addition to TPB would allow for the inclusion of additional cognitive variables such as environmental knowledge and greenwashing awareness, noncognitive variables such as green trust and environmental concern, and their combined influence on behavioral intentions and actual purchase behavior. Both frameworks share behavior as the ultimate dependent variable, helping these models to merge easily. Future research adopting this integrated CAB-TPB framework may yield a broader understanding of how consumers process information, form attitudes, and translate those attitudes into sustainable purchasing decisions, consistent with emerging research agendas in Asian green consumption contexts (Prasetya et al., 2025).

CONCLUSION

In summary, this paper demonstrates that while the traditional TPB continues to be reliable predictors of EEAs purchase intention, the integration of green skepticism provides crucial understanding of the processes by which deceptive environmental claims lower the attitude toward sustainable consumption. Here, green skepticism did not directly deter purchase intention; rather, it operates indirectly

by weakening the strongest driver of intention being attitude. Yet the absence of a direct skepticism to intention relationship provides a gap for future researchers to examine whether green trust could serve as a neutralizing force, potentially mitigating the negative influence of skepticism on intention.

ACKNOWLEDGMENT

The authors of this paper would like to express their gratitude to those who have contributed to the survey forms and the teachers that have helped in the collecting process.

AUTHOR CONTRIBUTION STATEMENT

All authors have contributed their strength and specialties to the completion of this paper. We were all involved in each stage of the research, from data collecting, analysis and manuscript development, and all have contributed their feedback and approved the final version of this submission. All authors have agreed to be accountable for the work and ensure the validity of this research.

REFERENCES

Courtat, M., Joyce, P. J., Sim, S., Sadhukhan, J., & Murphy, R. (2023). Towards credible, evidence-based environmental rating ecolabels for consumer products: A proposed framework. *Journal of Environmental Management*, *336*, 117684–117684. https://doi.org/10.1016/j.jenvman.2023.117684

Janssen, C., Swaen, V., & Du, S. (2022). Is a specific claim always better? The double-edged effects of claim specificity in green advertising. *Journal of Business Research*, *151*, 435–447. https://doi.org/10.1016/j.jbusres.2022.07.005

Sio, S. de, Zamagni, A., Casu, G., & Gremigni, P. (2022). Green Trust as a Mediator in the Relationship between Green Advertising Skepticism, Environmental Knowledge, and Intention to Buy Green Food. *International Journal of Environmental Research and Public Health*, *19*(24), 16757–16757. https://doi.org/10.3390/ijerph192416757

Ejigu, A. K., & Yeshitela, K. (2024). Envisioning sustainable sanitation planning: a unified approach of diffusion of innovation and theory of planned behavior in predicting ecosan toilet adoption in Arba Minch City, Ethiopia. *Frontiers in Environmental Science*, *12*. https://doi.org/10.3389/fenvs.2024.1371659

Alam, S. S., Nik Hashim, N. H., Rashid, M., Omar, N. A., Ahsan, N., & Ismail, M. D. (2014). Small-scale households renewable energy usage intention: Theoretical development and empirical settings. *Renewable Energy*, *68*, 255–263. https://doi.org/10.1016/j.renene.2014.02.010

Orazi, Davide C., and Eugene Y. Chan. 2018. "'They Did Not Walk the Green Talk!:' How Information Specificity Influences Consumer Evaluations of Disconfirmed Environmental Claims." *Journal of Business Ethics* 163 (1): 107–23. https://doi.org/10.1007/s10551-018-4028-6.

Fischer, R., & Karl, J. A. (2025). What Predicts Intentions and Behavior? A Cultural Exploration of Attitude, Belief, and Norm Effects Across 55 Countries. *Cross-Cultural Research*, *59*(5), 615–650. https://doi.org/10.1177/10693971251338204

Bhutto, M. Y., Soomro, Y. A., & Yang, H. (2022). Extending the Theory of Planned Behavior: Predicting Young Consumer Purchase Behavior of Energy-Efficient Appliances (Evidence From Developing Economy). *Sage Open*, *12*(1). https://doi.org/10.1177/21582440221078289

Świtalski, M., & Rybowska, A. (2021). Product innovation in isotonic drinks – expectations of Tri-City University students. *Scientific Journal of Gdynia Maritime University*, *118*, 62–74. https://doi.org/10.26408/118.05

Ziesemer, F., Hüttel, A., & Balderjahn, I. (2021). Young People as Drivers or Inhibitors of the Sustainability Movement: The Case of Anti-Consumption. *Journal of Consumer Policy*, *44*(3), 427–453. https://doi.org/10.1007/s10603-021-09489-x

Ahmed, R. R., Štreimikienė, D., Štreimikis, J., & Šikšnelytė-Butkienė, I. (2024). A comparative analysis of multivariate approaches for data analysis in management sciences. *E+M Ekonomie a Management*, *27*(1), 192–210. https://doi.org/10.15240/tul/001/2024-5-001

Đặng Thị Minh Hiền, L. V. T. (2025). The impact of social media on green purchase intention: applying the TPB model among tourism students. *Journal of Science and Technology - HaUI*, *61*(6). https://doi.org/10.57001/huih5804.2025.227

Elving, W. J. L. (2013). Scepticism and corporate social responsibility communications: the influence of fit and reputation. *Journal of Marketing Communications*, *19*(4), 277–292. https://doi.org/10.1080/13527266.2011.631569

Fornell, C., & Larcker, D. F. (1981). Structural Equation Models with Unobservable Variables and Measurement Error: Algebra and Statistics. *Journal of Marketing Research*, *18*(3), 382–388. https://doi.org/10.1177/002224378101800313

Goh, S. K., & Balaji, M. S. (2016). Linking green skepticism to green purchase behavior. *Journal of Cleaner Production*, *131*, 629–638. https://doi.org/10.1016/j.jclepro.2016.04.122

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). *Multivariate Data Analysis (7th Edition)* (7th Editio). Pearson Education Limited.

Hussin, H., & Abdul Wahid, N. (2023). Conceptualizing Customer Experience in Organic Food Purchase Using Cognitive-Affective-Behavior Model. *Journal of Governance and Integrity*, *6*(2), 577–586. https://doi.org/10.15282/jgi.6.2.2023.9732

Joshi, Y., & Rahman, Z. (2015). Factors Affecting Green Purchase Behaviour and Future Research Directions. *International Strategic Management Review*, *3*(1–2), 128–143. https://doi.org/10.1016/j.ism.2015.04.001

Shimul, A. S., Cheah, I., & Khan, B. B. (2021). Investigating Female Shoppers' Attitude and Purchase Intention toward Green Cosmetics in South Africa. *Journal of Global Marketing*, *35*(1), 37–56. https://doi.org/10.1080/08911762.2021.1934770

Kovač, I., Dunković, D., & Kovač, B. (2025). Greenwashing and consumer skepticism toward eco-labels in Croatia: challenges and policy directions. *British Food Journal*. https://doi.org/10.1108/BFJ-02-2025-0122

Lê, B. N., Nguyễn, Đ. T., & Dương, X. C. (2024). Research about consumer purchase behavior of energy-efficient appliances: The mediating role of green perceived value and green trust. *Tạp Chí Kinh Tế - Luật và Ngân Hàng*, *268*(9), 85–100. https://doi.org/10.59276/JELB.2024.08.2629

Le, T.-V., Duc, L. Do, Thu, H. N., Ngoc, Q. H., & Canh, H. P. (2025). Green energy policy: Exploring the research of scholars worldwide between 1998 and 2023 from Scopus. *Multidisciplinary Science Journal*, *8*(4), 2026230. https://doi.org/10.31893/multiscience.2026230

Li, X., Zhang, D., Zhang, T., Ji, Q., & Lucey, B. (2021). Awareness, energy consumption and pro-environmental choices of Chinese households. *Journal of Cleaner Production*, *279*, 123734. https://doi.org/10.1016/j.jclepro.2020.123734

Albahri, A. S., Alnoor, A., Zaidan, A. A., Albahri, O. S., Hameed, H., Zaidan, B. B., Peh, S., Zain, A., Siraj, S. B., Masnan, A. H., & Yass, A. A. (2021). Hybrid artificial neural network and structural equation modelling techniques: a survey. *Complex & Intelligent Systems*, *8*(2), 1781–1801. https://doi.org/10.1007/s40747-021-00503-w

Becker, J.-M., Cheah, J., Gholamzade, R., Ringle, C. M., & Sarstedt, M. (2022). PLS-SEM's most wanted guidance. *UEA Digital Repository (University of East Anglia)*, *35*(1), 321–346. https://doi.org/10.1108/ijchm-04-2022-0474

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021a). An Introduction to Structural Equation Modeling. In *Classroom companion: business* (pp. 1–29). Springer International Publishing. https://doi.org/10.1007/978-3-030-80519-7_1

Kaźmierczak-Piwko, L., Kułyk, P., Dybikowska, A., & Dubicki, P. (2023). Sustainable consumption among children in the food market. *Scientific Papers of Silesian University of Technology Organization and Management Series*, *2023*(178), 323–331. https://doi.org/10.29119/1641-3466.2023.178.17

Luo, B., Sun, Y., Shen, J., & Xia, L. (2020). How does green advertising skepticism on social media affect consumer intention to purchase green products? *Journal of Consumer Behaviour*, *19*(4), 371–381. https://doi.org/10.1002/cb.1818

Nekmahmud, M. (2024). *Consumers' pro-environmental and sustainable consumption behavior in climate change mitigation* (Doctoral dissertation, Magyar Agrár-és Élettudományi Egyetem).. https://doi.org/10.54598/004180

Minton, E. A., Spielmann, N., Kahle, L. R., & Kim, C.-H. (2018). The subjective norms of sustainable consumption: A cross-cultural exploration. *Journal of Business Research*, *82*, 400–408. https://doi.org/10.1016/j.jbusres.2016.12.031

Mohamed, N. N., Razali, H., Ibrahim, K., & Hameed, R. A. S. (2025). Factors Influencing Consumers' Purchase of Energy-Efficient Appliances to Promote Sustainable Energy Consumption. *Business and Management Horizons*, *13*(1), 89. https://doi.org/10.5296/bmh.v13i1.23071

Mohr, L. A., Eroğlu, D., & Ellen, P. S. (1998). The development and testing of a measure of skepticism toward environmental claims in marketers' communications. *Journal of consumer affairs*, *32*(1), 30-55. https://doi.org/10.1111/j.1745-6606.1998.tb00399.x

Nabi Khan, S., Minhas, N., & Neale, N. (2025). Bridging the green gap: examining consumer green perceptions in an extended model of theory of planned behavior. *Future Business Journal*, *11*(1), 175. https://doi.org/10.1186/s43093-025-00593-9

Neves, J., & Oliveira, T. (2021). Understanding energy-efficient heating appliance behavior change: The moderating impact of the green self-identity. *Energy*, *225*, 120169. https://doi.org/10.1016/j.energy.2021.120169

Ngo-Thi-Ngoc, H., Nguyen-Viet, B., & Hong-Thach, H. (2024). Purchase Intention for Vegan Cosmetics: Applying an Extended Theory of Planned Behavior Model. *Sage Open*, *14*(1). https://doi.org/10.1177/21582440241240548

Ngo, T. T. A., Vo, C. H., Tran, N. L., Nguyen, K. V., Tran, T. D., & Trinh, Y. N. (2024). Factors influencing Generation Z's intention to purchase sustainable clothing products in Vietnam. *PLOS ONE*, *19*(12), e0315502. https://doi.org/10.1371/journal.pone.0315502

Nguyen, H. T. T. (2025). Correction: Antecedents of young consumers' behavioral intention toward plastic waste minimization in Vietnam. *Journal of Material Cycles and Waste Management*, *27*(3), 1984–1984. https://doi.org/10.1007/s10163-025-02199-3

Nguyen, T. N., Lobo, A., & Greenland, S. (2017). Energy efficient household appliances in emerging markets: the influence of consumers' values and knowledge on their attitudes and purchase behaviour. *International Journal of Consumer Studies*, *41*(2), 167–177. https://doi.org/10.1111/ijcs.12323

Nguyen, V. H., Thao, N. T., Phuong, T. N., Van, N. T. T., & Khanh, N. M. (2025). Perception of Greenwashing in the Cosmetics Industry: The Moderating Role of Green Authenticity and Green Transparency.

JOURNAL OF ASIAN BUSINESS AND ECONOMIC STUDIES, *36*(1), 35–51. https://doi.org/10.24311/jabes/2025.36.1.05

Nyilasy, G., Gangadharbatla, H., & Paladino, A. (2014). Perceived Greenwashing: The Interactive Effects of Green Advertising and Corporate Environmental Performance on Consumer Reactions. *Journal of Business Ethics*, *125*(4), 693–707. https://doi.org/10.1007/s10551-013-1944-3

Panigyraki, A., & Polyportis, A. (2024). Effects of consumer suspicion: a review and agenda for future research. *Warwick Research Archive Portal (University of Warwick)*, *41*(6), 610–623. https://doi.org/10.1108/jcm-10-2023-6376

Wilson, A. E., Darke, P. R., & Sengupta, J. (2021). Winning the Battle but Losing the War: Ironic Effects of Training Consumers to Detect Deceptive Advertising Tactics. *Journal of Business Ethics*, *181*(4), 997–1013. https://doi.org/10.1007/s10551-021-04937-7

Alevizou, Panayiota, and Claudia E. Henninger. 2025. "Greenwashing." In , 353–55. https://doi.org/10.4324/9781003584056-86.

Santos, Célia, Arnaldo Coelho, and Beatriz Lopes Cancela. 2024. "The Impact of Greenwashing on Sustainability through Green Supply Chain Integration: The Moderating Role of Information Sharing." *Environment Development and Sustainability*, May. https://doi.org/10.1007/s10668-024-05009-2.

Hasni, M. J. S., Konuk, F. A., & Otterbring, T. (2024). Anxious Altruism: Virtue Signaling Mediates the Impact of Attachment Style on Consumers' Green Purchase Behavior and Prosocial Responses. *Journal of Business Ethics*, *196*(3), 603–637. https://doi.org/10.1007/s10551-024-05734-8

Pranata, J. A., Riyanto, M. R. P., Hendrawan, S., & Gunadi, W. (2024). The Effect of Hedonic Motivation and IT Affordance on Impulsive Buying Decision in Social Commerce TikTok. *International Journal of Electronic Commerce Studies*, *15*(2), 62–102. https://doi.org/10.7903/ijecs.2303

Prasetya, P., Bakti, I. G. M. Y., Yarmen, M., Tercia, C. Y., Dinaseviani, A., Yaman, A., Widyanty, W., Oktasari, D. P., Sumaedi, S., & Fahlevi, M. (2025). A bibliometric analysis and policy recommendation on Asian consumers' green purchasing behavior. *Discover Sustainability*, *6*(1), 865. https://doi.org/10.1007/s43621-025-01723-7

Abdulsahib, J. S., Eneizan, B., & Alabboodi, A. S. (2019). Environmental concern, health consciousness and purchase intention of green products: an application of extended theory of planned behavior. *The Journal of Social Sciences Research*, *5*(4), 868-880. https://doi.org/10.32861/jssr.54.1203.1215

Tan, S. Z., Yang, L., & Loo, W. H. (2026). Green Specificity: Igniting curiosity and arousing emotional ambivalence. *Journal of Retailing and Consumer Services*, *88*, 104414. https://doi.org/10.1016/j.jretconser.2025.104414

Wang, Z., Wang, X., & Guo, D. (2017). Policy implications of the purchasing intentions towards energy-efficient appliances among China's urban residents: Do subsidies work? *Energy Policy*, *102*, 430–439. https://doi.org/10.1016/j.enpol.2016.12.049

Yadav, R., & Pathak, G. S. (2017). Determinants of Consumers' Green Purchase Behavior in a Developing Nation: Applying and Extending the Theory of Planned Behavior. *Ecological Economics*, *134*, 114–122. https://doi.org/10.1016/j.ecolecon.2016.12.019

Zhao, C., Zhang, M., & Wang, W. (2019). Exploring the influence of severe haze pollution on residents' intention to purchase energy-saving appliances. *Journal of Cleaner Production*, *212*, 1536–1543. https://doi.org/10.1016/j.jclepro.2018.12.134

Lee, J., & Cheong, H. J. (2024). Exploring the Relationship between Consumer Knowledge and Skepticism towards Pro-Environmental Advertising: An Empirical Investigation. *KOME*, *12*(1). https://doi.org/10.17646/kome.of.10