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Understanding Green Purchase Behavior: Attitude, Knowledge, and the Mediating Role of Intention

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Abstract: As global concern over environmental sustainability continues to intensify, understanding the psychological mechanisms behind green consumer behavior has become increasingly important. This study aims to explore how green purchasing attitudes and environmental knowledge influence green purchasing behavior, and further investigate the mediating role of green purchasing intentions in this process. This study, based on the theory of planned behavior and using quantitative research methods, collected valid data from 130 consumers in Malaysia through questionnaire surveys. Through multiple regression and mediation analysis, it was found that both green purchasing attitude and environmental knowledge have a significant positive impact on green purchasing intention, and green purchasing intention has a strong predictive power for actual green purchasing behavior. The analysis of the mediating effect further indicates that the intention to purchase green plays a complete mediating role between attitude and behavior, while it plays a partial mediating role between environmental knowledge and behavior. The research results emphasize the significance of enhancing consumers' environmental awareness and positive attitudes in promoting sustainable consumption. This study provides empirical references for marketers and policymakers to promote green products in emerging markets. Furthermore, this study, taking developing countries as the background, expands the theoretical literature on green consumption behavior and reveals the psychological bridging role of purchasing intention between cognition and behavior.

Keywords: green purchase behavior; green purchase intention; environmental knowledge; mediation analysis; Malaysian consumers

1. Introduction

With the acceleration of climate change, the intensification of environmental degradation, and the increasingly serious unsustainable production and consumption patterns, green consumption has become one of the key issues on the global sustainable development agenda. Green Purchase Behavior (GPB) refers to the behavior of consumers actively choosing environmentally friendly products and services based on environmental awareness. It not only reflects an individual's sense of environmental responsibility, but also increasingly becomes the focus of enterprise marketing strategies and policy advocacy [1]; In recent years, the concept of green consumption has spread rapidly worldwide, and consumers have shown an increasingly strong concern for ecological sustainability. However, empirical studies have repeatedly pointed out that there is a

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significant disconnection between consumers' environmental protection attitudes and their actual purchasing behaviors. This phenomenon is usually referred to as the "green attitude-behavior gap" [2]. Although most consumers recognize the environmental value of green products, in actual purchases, they are often influenced by factors such as price, convenience, and brand trust, and thus fail to translate this into concrete actions [3]. How to effectively narrow this "gap between knowledge and action" has become an important topic in green consumption research.

In emerging market countries, consumers' green awareness is rising rapidly. Take Malaysia as an example. A survey by the Department of Statistics Malaysia (2022) found that over 75% of residents expressed concerns about climate change and stated their support for green initiatives. However, the actual adoption rate of green products remains relatively low, especially in the fields of household consumer goods, clothing and electronic products. Although young consumers (aged 18 to 35) show a strong sense of environmental protection, their behaviors exhibit obvious inconsistency and price sensitivity [4]; this phenomenon further highlights the complex psychological mechanisms among cognition, attitude and behavior, suggesting that it is necessary for us to conduct in-depth discussions from the perspectives of behavioral intention and psychological motivation.

The Theory of Planned Behavior (TPB) provides a powerful analytical framework for understanding how individuals develop behavioral intentions from attitudes, subjective norms, and perceived behavioral control, and ultimately transform them into specific behaviors [5]. In the field of Green consumption, Green Purchase Intention (GPI) is regarded as a key psychological variable connecting cognition and behavior. A series of studies have shown that although green attitudes and environmental knowledge are important, their influence on behavior often works through the mediating mechanism of behavioral intention [6,7].

Furthermore, although green consumption behavior has been relatively fully studied in Western societies, empirical analyses for developing economies are still relatively scarce, especially lacking systematic exploration of the transformation paths of green behavior in specific cultural contexts [8]. This research gap limits the applicability of theoretical models in a global context and also hinders the formulation of highly operational policies and marketing strategies.

Therefore, this study aims to fill the theoretical and practical gaps mentioned above, focusing on how green purchasing attitudes (GPA) and environmental knowledge (EK) influence green purchasing behaviors (GPB) through green purchasing intentions (GPI). Taking Malaysian consumers as the research subjects, a structural model is constructed using the TPB theory and empirical tests are conducted. The research not only helps to deepen the understanding of the psychological mechanism of green consumption, but also provides theoretical support and practical references for the green transformation policies and sustainable strategies of enterprises in developing regions.

2. Literature Review

2.1. Green Purchasing Behavior (GPB)

Green Purchase Behavior (GPB) is usually defined as the process in which consumers incorporate environmental impact into their decision-making considerations when purchasing products or services [9]. This kind of behavior emphasizes not only meeting individual needs but also minimizing the negative impact on the environment to the greatest extent. In recent years, with the intensification of problems such as global climate change and resource depletion, green Consumption has become an important means to promote sustainable development [10]. However, despite the continuous popularization of green products, there is still a significant gap between actual consumption behavior and environmental attitudes. This "attitudinal and behavioral inconsistency" phenomenon has become a classic problem in green consumption research [10,11].

2.2. Theory of Planned Behavior and Green Consumption

The Theory of Planned Behavior (TPB), proposed by Ajzen is a mainstream social psychological theory for explaining and predicting human behavior [5]. This theory points out that behavioral intention is the most direct predictor of behavior, and intention itself is influenced by three key factors: attitude toward the behavior,

subjective norm and perceived behavioral control. TPB has been widely applied in the field of green consumption and has been proven to have a high explanatory power in explaining green purchase intentions and behaviors [12,13].

Although TPB provides a relatively complete behavioral prediction model, scholars have gradually realized that its core structure still has certain limitations. For instance, in a green consumption context, consumers are often influenced by additional variables such as emotions, values, and knowledge levels. Therefore, recent studies have attempted to extend TPB to more dimensions to enhance its applicability and predictive power in the field of sustainable consumption [14].

2.3. Green Purchasing Attitude (GPA) and Green Purchasing Intention (GPA)

The Green Purchase Attitude refers to the positive or negative evaluations that consumers hold towards green products, including the comprehensive judgment on their environmental protection value, performance, price and brand image [15]. According to the TPB theory, attitude is the primary predictor of behavioral intention. In green consumption research, a large number of empirical studies have confirmed that green purchasing attitudes have a significant positive impact on green purchasing intentions [16,17].

However, some studies have pointed out that attitudes do not always successfully translate into behavioral intentions, which may be disturbed by the strength of values, brand trust or external obstacles. Therefore, although the green attitude is a necessary condition, it is not a sufficient one, and its effect often requires the assistance of other variables to be achieved [18].

2.4. The Role of Environmental Knowledge (EK)

Environmental Knowledge is usually defined as an individual's understanding of environmental issues and their cognitive level regarding solutions. It is divided into objective knowledge and subjective knowledge [19]. Studies have shown that environmental knowledge can not only enhance consumers' cognitive preference for green products, but also strengthen their sense of environmental responsibility, thereby increasing their purchase intention [20].

In the relevant research on extending TPB, environmental knowledge is often introduced as an external variable to strengthen the connection between behavioral attitudes and behavioral intentions. Some studies have even found that the influence of knowledge level on green purchase intent can be comparable to that of attitude [21]. However, some studies have pointed out that although knowledge is a prerequisite, if consumers lack the ability or motivation to transform knowledge into action, the improvement of their behavioral intentions is still limited [22].

2.5. The Mediating Role of Green Purchasing Intention (GPA)

Green Purchase Intention (GPI) is regarded as a key variable between psychological motivation and actual behavior in the TPB model. Behavioral intention not only reflects an individual's behavioral tendencies but is also regarded as a "psychological bridge" between attitude and behavior. Previous studies have shown that green purchase intent can significantly mediate the relationship between green attitudes and behaviors [23].

Furthermore, behavioral intent has also been confirmed to have a partial or complete mediating effect between environmental knowledge and green purchasing behavior [3]. This means that consumers' knowledge level may need to go through the cognitive processing process of "intention formation" before it can be transformed into substantive actions. Therefore, the mediating position of green purchase intent not only strengthens the path logic of the TPB model but also provides a key entry point for intervention design.

2.6. Research Review and Research Gaps

To sum up, although existing research generally supports the influence path of green purchasing attitudes and environmental knowledge on green behaviors, related studies still have deficiencies in the following aspects: First, green attitudes and knowledge are often discussed separately, lacking an integrated perspective; Secondly, most studies focus on the context of Europe, America or China, and pay relatively insufficient

attention to the psychological mechanisms of green consumption in emerging markets in Southeast Asia, especially in Malaysia. Thirdly, although the mediation mechanism of green purchase intent has been widely discussed, it still needs to be further deepened in the dual-path integration analysis (GPA → GPI → GPB and EK → GPI → GPB).

This study aims to address the above-mentioned research gaps, systematically examine the influence mechanism of green purchasing attitudes and environmental knowledge on behavior by using the extended TPB framework, and investigate the mediating role of green purchasing intentions in this process, with the expectation of providing a more integrated theoretical model and regional empirical support for the research on green consumption behavior.

2.7. Research Hypothesis Proposed

Based on the aforementioned literature review, this study constructs an analytical model based on the Theory of Planned Behavior (TPB) to explore how green purchasing attitudes and environmental knowledge influence green purchasing behavior through green purchasing intentions. To further verify the path relationship among the relevant variables, the following research hypotheses are proposed:

H1: *GPA has a significant and positive impact on GPI* [24,25].

H2: *EK has a significant and positive impact on GPI* [21,26].

H3: *GPI has a significant and positive impact on GPB* [23,27].

H4: *GPI plays a mediating role between GPA and GPB* [23].

The above hypotheses will be tested through empirical analysis to identify the mechanism of interaction among cognition, attitude, intention and behavior, and to verify the applicability of the TPB model in the field of green consumption.

3. Research Methodology

3.1. Research Design

This study adopted quantitative research methods and a cross-sectional research design. The aim is to explore the influence mechanism of Green Purchase Attitude (GPA) and Environmental Knowledge (EK) on Green Purchase Behavior (GPB) And further examine the mediating role of Green Purchase Intention (GPI) therein. The research is based on the Theory of Planned Behavior (TPB), which has wide applications in explaining environment-related decision-making behaviors [5]. The data were obtained through structured questionnaires and analyzed with the aid of IBM SPSS Statistics (Version 26).

3.2. Sampling and Data Collection

The research employed purposive sampling to identify Malaysian consumers who have a certain level of awareness of green products or environmental issues. The questionnaires were distributed online through social media and email to enhance the coverage and response rate of the sample. During the data cleaning process, questionnaires with a filling time of less than two minutes and those with missing or inconsistent content were eliminated. Eventually, 130 valid samples were obtained for subsequent empirical analysis.

3.3. Construct Measurement

The main variables involved in this study were all measured using the Likert five-point scoring scale (1 = strongly disagree, 5 = strongly agree) verified in existing literature, and some wording was fine-tuned according to the Malaysian context to ensure cultural fit and consistency in understanding. The specific measuring tools are as follows:

Green Purchasing Attitude (GPA): Five measurement items developed by Akbar et al. were used to evaluate consumers' overall subjective evaluation of green products [28].

Environmental Knowledge (EK): Based on the five items adopted by Adapted from Mostafa, measure the

factual cognition and operational knowledge of the respondents regarding environmental protection issues [29].

Green Purchase Intent (GPI): Adapted from Adapted from Kim et al. [30]; The scale of Akbar et al. consists of 5 items and is used to assess the willingness of respondents to engage in green consumption in the future [28].

Green Buying Behavior (GPB): According to Cardoso and van Schoor & Zhang and Dong, five developed items measure consumers' actual green purchasing behavior performance [31,32].

3.4. Pre-Test Procedure

Before the formal investigation, this study conducted a pilot test, inviting a total of 30 consumers to participate in questionnaire filling and feedback. The pre-test aims to examine the language clarity, logical rationality and structural integrity of the questionnaire items. Based on the feedback results, some wording and the sequence of items were fine-tuned to further enhance the reliability and validity of the measurement tools and the overall comprehensibility of the questionnaire.

3.5. Data Analysis Method

The research data were analyzed using IBM SPSS Statistics (Version 26), and the main statistical methods included:

Descriptive statistics: It is used to summarize the demographic characteristics of the sample and the mean, standard deviation, skewness and kurtosis of each variable to evaluate the distribution characteristics of the data.

Reliability analysis: The internal consistency of each measurement construct was tested by Cronbach's α coefficient ($\alpha \geqslant 0.70$ was considered acceptable).

correlation analysis: The Pearson correlation coefficient was used to analyze the bivariate linear relationship between variables.

Multiple linear regression analysis: It is used to examine the direct impact of green purchasing attitudes and environmental knowledge on green purchasing intentions and behaviors.

Mediation effect analysis: Based on the classic four-step method of Baron and Kenny and combined with the Sobel test, the mediation effect of green purchase intention between GPA/EK and GPB was examined [33].

All statistical analyses were set with a significance level of $p < 0.05$ to ensure the robustness and explanatory power of the empirical results.

3.6. Conceptual Framework

Based on the existing literature and research objectives, this paper proposes the following conceptual model (Figure 1), which demonstrates the hypothetical relationship among green purchasing attitude, environmental knowledge, green purchasing intention and green purchasing behavior.

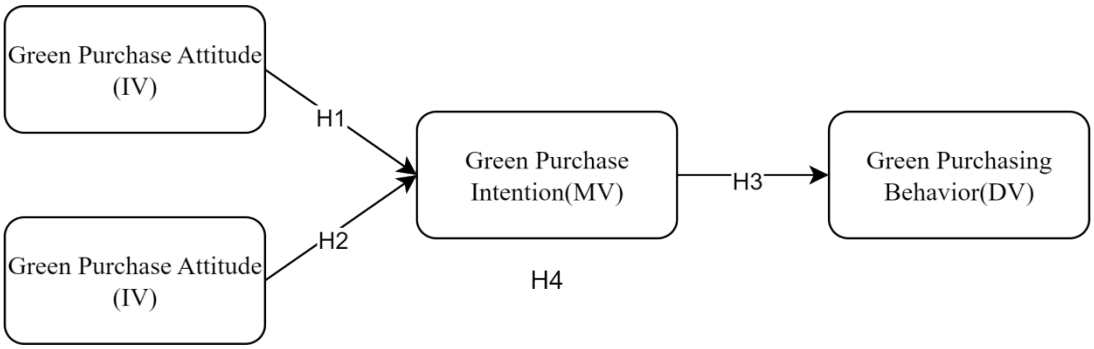

Figure 1. Proposed Research Model.

4. Data Analysis

Before officially conducting the empirical analysis, the study carried out strict data cleaning and screening operations on the original questionnaire data to ensure data quality and the validity of the analysis. Specifically,

all questionnaires that take less than two minutes to complete, contain missing values or have contradictory answers will be excluded. After preliminary processing, 130 valid questionnaire data were finally obtained as the empirical basis of this study.

All data were imported into IBM SPSS 26.0 software for statistical processing. According to the research framework and the setting of the hypothetical path, the analysis process successively includes: descriptive statistical analysis, measurement model testing (including reliability and validity), correlation testing, multiple linear regression analysis, and mediating effect testing.

4.1. Descriptive Statistical Analysis

Firstly, the study conducted descriptive statistical analysis on four main variables—Green Purchase Attitude (GPA), environmental knowledge (EK), Green Purchase intention (GPI), and Green purchase behavior (GPB). The adopted indicators include Mean, Standard Deviation, Skewness and Kurtosis to evaluate the central tendency, dispersion degree of the sample and the normality characteristics of the data distribution.

The results of the normality test (see Table 1) show that the skeweness values of all variables are between −2 and +2, and the kurtosity values fall within the reasonable range of −7 to +7, which conforms to the normal distribution judgment criterion proposed by George [34]. Therefore, the data basically meet the prerequisite conditions for subsequent parameter analysis.

Table 1. Descriptive statistics of study variables.

		M_GPB	M_GPI	M_GPA	M_EK
N	Valid	130	130	130	130
	Missing	0	0	0	0
Skewness		−0.621	−0.729	−1.210	−0.649
Std. Error of Skewness		0.212	0.212	0.212	0.212
Kurtosis		0.787	0.067	1.224	0.593
Std. Error of Kurtosis		0.422	0.422	0.422	0.422
Minimum		1.00	1.00	1.00	1.00
Maximum		7.00	7.00	7.00	7.00

To test the stability and internal consistency of the measurement tools, in this study, IBM SPSS Statistics 26.0 software was used to conduct reliability analysis on each variable. The main evaluation index is Cronbach's Alpha coefficient, whose value range is between 0 and 1. The higher the value, the stronger the internal consistency of the scale. Usually, 0.70 is an acceptable standard.

This study conducted reliability tests on four core constructs—Green Purchasing Attitude (GPA), Environmental knowledge (EK), Green Purchasing Intention (GPI), and Green Purchasing Behavior (GPB). The results are shown in Table 2. The Cronbach's Alpha values of all variables are much higher than 0.70. Among them, GPA and EK contain a total of 10 measurement items, and GPI and GPB contain a total of 14 items. The Alpha coefficients of the overall 24 items all exceed 0.90 The display scale has a high degree of internal consistency.

It is particularly worth noting that the five items for measuring green purchase intent demonstrated excellent reliability levels, further verifying their measurement validity as mediating variables in the model.

After completing the measurement reliability test, the bivariate relationships among the main variables were further evaluated through Pearson Correlation analysis. This method is used to measure the degree of linear correlation between two continuous variables and is one of the most common tools for correlation analysis [35]. The correlation coefficient (r) ranges from −1 to +1. A positive value indicates a positive relationship, while a negative value indicates a negative relationship. Moreover, the closer the correlation is to 1 or −1, the stronger the relationship.

Table 2. Reliability statistics.

	Cronbach's Alpha	N of Items
GPA	0.959	5
EK	0.932	5
GPI	0.949	5
GPB	0.915	9
GPA, EK, GPI, GPB	0.958	24

This study respectively examined the correlations among four variables: Green purchasing attitude (GPA), environmental knowledge (EK), green purchasing intention (GPI), and green purchasing behavior (GPB). The analysis results are shown in Table 3. There is a significant positive correlation among all variables, and the corresponding *p*-values are all less than 0.01, indicating that there is a statistically significant linear relationship among these variables.

Specifically, the correlation between green purchase intention and green purchase behavior is the highest ($r = 0.632$, $p < 0.01$), indicating that the stronger an individual's green purchase intention is, the more significantly they are likely to actually adopt green consumption behavior. In addition, both green purchasing attitude ($r = 0.514$, $p < 0.01$) and environmental knowledge ($r = 0.602$, $p < 0.01$) were significantly positively correlated with green purchasing behavior, providing preliminary empirical support for the hypothesized direct path relationship in the research model.

Table 3. Correlations of GPB, GPI, GPA and EK.

		M_GPB	M_GPI	M_GPA	M_EK
M_GPB	Pearson Correlation	1	0.632 **	0.514 **	0.602 **
	Sig. (2-tailed)		0	0	0
	N	130	130	130	130
M_GPI	Pearson Correlation	0.632 **	1	0.755**	0.592**
	Sig. (2-tailed)	0		0	0
	N	130	130	130	130
M_GPA	Pearson Correlation	0.514 **	0.755 **	1	0.471 **
	Sig. (2-tailed)	0	0		0
	N	130	130	130	130
M_EK	Pearson Correlation	0.602 **	0.592 **	0.471 **	1
	Sig. (2-tailed)	0	0	0	
	N	130	130	130	130

** Correlation is significant at the 0.01 level (2-tailed).

4.2. Multiple Linear Regression

After the reliability test confirmed that the measurement tools had good internal consistency, the study further used Pearson Correlation analysis to explore the bivariate relationship between the main variables. This method is used to measure the linear correlation strength between two continuous variables and is one of the widely adopted statistical techniques in empirical research [35]. The correlation coefficient (r) ranges from −1 to +1. A positive value indicates a positive correlation, while a negative value indicates a negative correlation. The closer the value is to ±1, the stronger the linear relationship between the variables.

This study focuses on the relationship among green purchasing Attitude (GPA), environmental knowledge (EK), green purchasing intention (GPI), and green purchasing behavior (GPB). The analysis results are shown in Table 4.

There is a significant positive correlation between each pair of the four variables, and the corresponding *p*-values are all lower than the significance level of 0.01, indicating a strong statistical correlation among these constructs.

As shown in Table 5, the coefficient of determination (R^2) of the regression model is 0.642, indicating that GPA and EK can jointly explain 64.2% of the total variation in green purchase intent. The Adjusted R^2 is 0.636, indicating that the model has a good fit and a certain degree of robustness (the adjusted R^2 does not change much from the adjusted R^2). The standard estimation error is 0.787, which is within an acceptable range and further supports the predictive ability of the model.

Furthermore, the correlation coefficient (R) of the overall model is 0.801, indicating a strong linear correlation between the two independent variables and the dependent variable. This result initially verifies the research hypotheses H1 and H2, that is, both green purchasing attitude and environmental knowledge are important predictors of green purchasing intention.

These correlation results not only verify the fundamental connections among the variables but also lay a solid foundation for subsequent multiple regression and mediating effect tests.

Table 4. Model Summary of EK and GPA.

Model	R	R^2	Adjusted R^2	S E of the Estimate
1	0.801 [a]	0.642	0.636	0.78728

[a] Predictors: (Constant), M_EK, M_GPA.

Table 5. ANOVA [a] of H1 and H2.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	141.24	2	70.62	113.938	0.000 [b]
	Residual	78.716	127	0.62		
	Total	219.957	129			

[a] Dependent Variable: M_GPI. [b] Predictors: (Constant), M_EK, M_GPA.

To test whether the regression model jointly constructed by Green Purchasing Attitude (GPA) and Environmental knowledge (EK) was statistically significant, an analysis of variance (ANOVA) was further conducted. As shown in Table 6, the F-score of the overall regression model is 113.938, and the significance level (Sig.) is 0.000 ($p < 0.001$), indicating that the model is statistically significant.

Table 6. Coefficients [a] of H1 and H2.

		B	SE	Beta	t	sig
1	(Constant)	−0.126	0.371		−0.339	0.735
	M_GPA	0.653	0.064	0.612	10.170	0.000
	M_EK	0.316	0.062	0.304	5.055	0.000

[a] Dependent Variable: M_GPI.

Specifically, the sum of squared variations explained by the regression model is 141.24, the degree of freedom is 2, and the mean square is 70.62. The sum of squares of the residuals is 78.716, the degrees of freedom are 127, and the mean square is 0.62. The total sum of squares is 219.957. This indicates that the two predictor variables, GPA and EK, have significant linear explanatory power for green purchase intent (GPI), supporting the validity of research hypotheses H1 and H2.

In conclusion, the model has passed the overall significance test and has a good fitting effect, which can be used to further explain the path relationship among various variables.

To further verify the influence paths of green purchase attitude (GPA) and environmental knowledge (EK) on green purchase intention (GPI), this study tested the regression coefficients of the multiple linear regression

model. The results are shown in Table 7. Both independent variables have a statistically positive impact on the dependent variable.

Table 7. Model Summary of GPI.

Model	R	R^2	Adjusted R^2	SE of the Estimate
1	0.632 [a]	0.399	0.394	0.97438

[a] Predictors: (Constant), M_GPI.

Specifically, the non-standardized regression coefficient (B) of the green purchasing attitude was 0.653, the standard error (SE) was 0.064, the standardized regression coefficient (Beta) was 0.612, the t value was as high as 10.170, and the *p* value was significantly less than 0.001, indicating that GPA has a strong and significant predictive effect on GPI. This result supports research hypothesis H1, indicating that when consumers hold a more positive attitude towards environmentally friendly products, they are more likely to have green purchase intentions.

The non-standardized regression coefficient (B) of environmental knowledge was 0.316, the standard error was 0.062, the standardized coefficient was 0.304, and the t value was 5.055, which were also significant ($p < 0.001$). This result supports Hypothesis H2, that is, when consumers have a higher level of environmental knowledge, their intention to make green purchases will also be significantly enhanced.

To sum up, both GPA and EK can significantly predict GPI, and the influence of GPA is relatively stronger, confirming the core role of green purchasing attitude as a motivational driver.

To verify the predictive power of green purchasing intent (GPI) for green purchasing behavior (GPB), a single regression model was further constructed with GPI as the independent variable and GPB as the dependent variable. The model summary results are shown in Table 8.

Table 8. ANOVA [a] of H3.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	80.727	1	80.727	85.028	0.000 [b]
	Residual	121.525	128	0.949		
	Total	202.252	129			

[a] Dependent Variable: M_GPB. [b] Predictors: (Constant), M_GPI.

From the results, the coefficient of determination (R^2) of the model is 0.399, indicating that the green purchase intention can explain 39.9% of the variation in green purchase behavior, suggesting that the model has a medium to high explanatory power. The Adjusted coefficient of determination (Adjusted R^2) was 0.394, eliminating the deviation after adjusting the degrees of freedom in the model and still maintaining a relatively high degree of interpretation, further confirming the important role of GPI in predicting GPB.

Furthermore, the Standard Error of the Estimate of the model is 0.974, which is within the acceptable range, indicating that the error between the predicted value and the actual observed value is relatively low.

In conclusion, this model supports the first part of the research hypothesis H3 (H3a), that is, the green purchase intention has a significant positive impact on green purchase behavior, laying a foundation for further mediating effect tests.

To further examine the statistical significance of the relationship between green purchase intent (GPI) and green purchase behavior (GPB), an analysis of variance (ANOVA) was conducted. The analysis results are shown in Table 9.

The F-value of the regression model is 85.028. Under the condition of (1, 128) degrees of freedom, the significance level (Sig.) is 0.000, which is much lower than 0.01, indicating that the regression model is statistically significant. In other words, the influence of green purchasing intent on green purchasing behavior is not accidental but has significant predictive power.

Table 9. Coefficients [a] of GPI-GPB.

		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.533	0.363		4.223	0.000
	M_GPI	0.606	0.066	0.632	9.221	0.000

[a] Dependent Variable: M_GPB.

The regression sum of squares was 80.727, accounting for a relatively large proportion of the total sum of squares (202.252), further indicating that the independent variable (GPI) in the model can significantly explain the variation of the dependent variable (GPB). The sum of the squares of the residuals is 121.525, indicating that there is still some unexplained variation in the model, but it is within a reasonable range.

In conclusion, the ANOVA results are consistent with the aforementioned model summary analysis, further verifying the rationality of the research hypothesis H3a, that is, green purchase intention can significantly predict green purchase behavior.

To further explore the specific influence degree of Green Purchase Intention (GPI) on Green Purchase Behavior (GPB), this study conducted a regression coefficient analysis, and the results are shown in Table 10.

Table 10. Coefficients [a] of GPA-GPB.

		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.651	0.472		3.499	0.001
	M_GPA	0.526	0.078	0.514	6.778	0.000

[a] Dependent Variable: M_GPB.

As can be seen from the table, the non-standardized regression coefficient (B) of the independent variable GPI is 0.606, the standard error is 0.066, and the standardized regression coefficient (Beta) is 0.632. The *t* value is 9.221, and the corresponding *p* value is less than 0.001 ($p = .000$), indicating that this path is statistically highly significant.

This means that, under the control of other variables, for every additional unit of green purchase intention, the green purchase behavior will significantly increase by 0.606 units. Furthermore, a higher standardization coefficient (Beta = 0.632) indicates that GPI is a strong predictor of green purchasing behavior.

In conclusion, the research results provide strong empirical support for the hypothesis that H3 (green purchase intention has a significant positive impact on green purchase behavior).

4.3. Mediation Analysis

4.3.1. Mediation Analysis (GPA-GPI-GPB)

First, the total effect between IV GPA and DV GPB is examined in the SPSS system. According to Table 11, it is evident that there exists a statistically significant total effect between GPA and GPB.

Table 11. Coefficients [a] of GPA-GPI.

		B	Std. Error	Beta	*t*	Sig.
1	(Constant)	0.567	0.376		1.508	0.134
	M_GPA	0.805	0.062	0.755	13.029	0.000

[a] Dependent Variable: M_GPI.

The direct effect of IV GPA on M GPI was then analyzed. According to Table 12, it can be seen that the effect of IV GPA on DV GPI is significant (*p*-value = 0.000). Error = 0.062.

In the third step, estimate the direct impact of IV GPA and M GPI on DV GPB. According to Table 12, it can

be seen that the direct effect of GPA on GPB is not significant ($p = 0.413 > 0.05$), but the direct effect of GPI on GPB is significant ($p < 0.05$).

Table 12. Coefficients [a] of GPA-GPI-GPB.

		B	SE	Beta	*t*	Sig.
1	(Constant)	1.343	0.431		3.117	0.002
	M_GPA	0.088	0.107	0.086	0.821	0.413
	M_GPI	0.544	0.100	0.567	5.418	0.000

[a] Dependent Variable: M_GPB.

Get all the coefficients for mediation analysis:

Path A = 0.085 (0.062)

Path B = 0.544 (0.100)

Path C = 0.088 (0.107)

Subsequently, the Sobel Test is employed to assess the statistical significance of the mediating effect, and a significance level of $p < 0.05$ is achieved as depicted in the diagram below (as shown in Figure 2).

Input:			Test statistic:	Std. Error:	*p*-value:
a	0.805	Sobel test:	5.01740547	0.08728017	5.2e-7
b	0.544	Aroian test:	5.00479412	0.0875001	5.6e-7
s_a	0.062	Goodman test:	5.03011264	0.08705968	4.9e-7
s_b	0.1	Reset all	Calculate		

Figure 2. Sobel Test 1 (Test statistic =5.01740547; Std. Error = 0.08728017; *p*-value = 5.2×10^{-7}).

Based on the aforementioned analysis, it can be deduced that the indirect impact of GPA on GPB via GPI is statistically significant and exhibits a complete mediating effect.

4.3.2. Mediation Analysis (EK-GPI-GPB)

First, the total effect between IV EK and DV GPB is examined in the SPSS system. As can be seen from Table 13, The total effect between EK and GPB is statistically significant.

Table 13. Coefficients [a] of EK-GPB.

		B	SE	Beta	t	Sig.
1	(Constant)	1.742	0.368		4.740	0.000
	M_EK	0.599	0.070	0.602	8.526	0.000

[a] Dependent Variable: M_GPB.

The direct effect of IV EK on MV GPI was then analyzed. According to Table 14, the effect of IV EK on DV GPI is significant (*p*-value = 0.000). Error = 0.074.

Table 14. Coefficients [a] of EK-GPI.

		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.247	0.387		5.809	0.000
	M_EK	0.614	0.074	0.592	8.314	0.000

[a] Dependent Variable: M_GPI.

In the third step, estimate the direct impact of IV GPA and MV GPI on DV GPB. According to Table 15, Evidently, the direct influence of GPA on GPB is significant ($p < 0.05$), along with the significant direct impact of GPI on GPB ($p < 0.05$).

Table 15. Coefficients [a] of EK-GPI-GPB.

		B	Std. Error	Beta	*t*	Sig.
	(Constant)	0.829	0.375		2.210	0.029
1	M_EK	0.349	0.079	0.351	4.413	0.000
	M_GPI	0.407	0.076	0.424	5.336	0.000

[a] Dependent Variable: M_GPB.

Then, Sobel Test is used to test the statistical significance of the mediating effect, and $p < 0.05$ can be obtained according to the Figure 3 below.

Get all the coefficients for mediation analysis:

Path A = 0.614 (0.074)

Path B = 0.407 (0.076)

Path C = 0.349 (0.079)

	Input:		Test statistic:	Std. Error:	*p*-value:
a	0.614	Sobel test:	4.499474	0.05553938	0.00000681
b	0.407	Aroian test:	4.47658136	0.0558234	0.00000758
s_a	0.074	Goodman test:	4.52272149	0.0552539	0.0000061
s_b	0.076	Reset all	Calculate		

Figure 3. Sobel Test 2 (Test statistic = 4.499474; Std. Error = 0.05553938; *p*-value = 0.0000000681).

Therefore, it can be concluded that the indirect effect of EK on GPB through GPI is statistically significant and has a partial mediating effect.

This chapter examines data reliability, validity, Pearson correlation coefficient, and multiple regression. It was found that the effect of both GPA and EK on the GPI of the dependent variable was significant in multiple regression. This means that both GPA and EK have an impact on people's green purchase intentions, but when they act at the same time, GPA has a greater impact. The linear regression analysis also revealed that GPI and GPB were significant, demonstrating that GPI and GPB can interact favorably. This study found that the indirect effect of GPA on GPB via GPI demonstrated statistical significance, suggesting a full mediating effect, when mediating variables were examined. A partly mediating effect was also shown by the indirect effect of EK on GPB through GPI, which was similarly statistically significant.5 Summary and Conclusion

5. Summary and Conclusions

5.1. Research Summary

Based on the Theory of Planned Behavior (TPB), this study constructed and verified the influence mechanism of green purchasing attitude (GPA) and environmental knowledge (EK) on green purchasing behavior (GPB), with a focus on examining the mediating role of Green Purchasing intention (GPI) therein. Through an empirical analysis of the questionnaire data from 130 Malaysian consumers, the following main conclusions were drawn:

Firstly, both green purchasing attitude and environmental knowledge can significantly and positively influence green purchasing intention, among which the influence of green purchasing attitude is more significant. Secondly, green purchase intention has a significant positive predictive effect on green purchase behavior, indicating that intention is an important psychological bridge for the transformation of attitude and knowledge into behavior. Further mediating effect tests show that green purchasing intention plays a complete

mediating role between green purchasing attitude and behavior, while playing a partial mediating role between environmental knowledge and behavior.

The research results not only verified the applicability of the TPB theory in the field of green consumption, but also deepened the understanding of the psychological and behavioral paths of green consumers.

5.2. Theoretical Contribution

Based on the existing literature, this study makes the following theoretical contributions:

By incorporating green purchasing attitudes and environmental knowledge into the TPB framework, the theoretical boundary of the formation mechanism of green consumption behavior has been expanded.

The key role of green purchase intention as a mediating variable in the "cognitive-intent-behavior" path was verified, further enriching the theoretical model of green consumption behavior.

It fills the gap of insufficient attention to emerging markets, especially the context of Malaysia, in previous green consumption research, and provides empirical support for cross-cultural green consumption research.

5.3. Practical Implications

The results of this study have certain practical value for government agencies, enterprises and environmental advocates:

The government and public institutions can enhance the public's environmental protection knowledge level, especially procedural knowledge, by strengthening environmental education and information disclosure, thereby effectively boosting the willingness to consume green.

Enterprises and brand owners should pay attention to consumers' green attitudes, and enhance the environmental trust of their products by means of environmental certification, product information transparency and social responsibility marketing.

Educators and non-governmental organizations can focus on the youth group, strengthen their environmental awareness through campus projects and social platforms, and guide them to form long-term green consumption behaviors.

5.4. Research Limitations and Future Directions

Although this study has made meaningful findings, there are still certain limitations:

The study adopted a cross-sectional design, which failed to capture the dynamic evolution of causal paths between variables. Subsequent research can verify this through longitudinal data or experimental methods.

The sample size is relatively small and concentrated in Malaysia. In the future, the sample size can be expanded and multi-regional comparative analyses can be conducted.

Subjective norms, perceived behavior control and other core variables of TPB were not included in the model. It is suggested that future research further enrich the theoretical structure.

In addition, the inclusion of variables such as price sensitivity, consumer trust, and social impact may help further explain the gap between green attitudes and behaviors.

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Data Availability Statement

The datasets generated and analyzed during the current study are not publicly available due to the confidentiality of participants. However, the data are available from the corresponding author on reasonable request.

Conflicts of Interest

The authors declare no conflict of interest.

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