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Enhancing Green Consumption: Utilizing a Longitudinal Approach in Measuring Green Purchase Behavior

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Abstract

Environmental damage has sparked the formation of the green consumption movement. The need for environmentally friendly products creates business opportunities for marketers of environmentally friendly products. In general, the prediction of green buying behavior is done by using intention as a proxy for behavior. Whereas people who have green buying intentions do not necessarily translate their intentions into actual purchases. As a result, predictions of green purchasing behavior are inaccurate. Therefore, this study attempts to predict green buying behavior directly rather than through intention as a proxy for behavior.
The study was conducted with a cross-sectional and longitudinal design with a combination of two-stage cluster sampling and purposive sampling techniques. A sample size of 200 respondents was analyzed using the structural equation model triangulation method and regression analysis. The results of data analysis show that green knowledge has a significant effect on green trust, green knowledge has a significant effect on perceived consumer effectiveness, green trust has a significant effect on green buying intention, perceived consumer effectiveness has a significant effect on green buying intention, and green buying intention has a significant effect on green buying behavior. The research results make a positive contribution to stakeholders who are committed to preserving the natural environment, humans and animals.

Keywords: green knowledge; green trust; perceived consumer effectiveness; green buying intention; green buying behavior

1. Introduction

Environmental damage has sparked the formation of the green consumption movement (Yue et al., 2020). This need for green products creates business opportunities for green product marketers. Green products are products that promote the preservation of the natural environment, humans, and animals (Han, 2021).. Companies that care about environmental sustainability issues for future sustainability are starting to adopt the concept of eco-friendly marketing as a source of competitive advantage.

The study succeeded in identifying a research gap where the prediction of green buying behavior was carried out using intention as a proxy of behavior (Yadav and Pathak, 2017; Kumar et al., 2017; Ricci et al., 2018). Even though buying intentions do not necessarily end in actual buying (Sheeran and Webb, 2016; Caruana, Carrington, and Chatzidakis, 2016; Dapas et al., 2019), so predictions of green buying behavior are often

inaccurate. Therefore, this study tries to predict green buying behavior directly without intention as aproxy of behavior.

Green knowledge is closely related to the belief in consuming green products (Testa et al., 2019).. If consumers have extensive knowledge about product attributes, functions, and usage, they will have confidence in green products. Green trust is built because of the belief and expectations in environmental performance. Trust conditions the formation of green product buying intention. Customer trust has a positive influence on consumer buying intentions (Wang et al., 2019). Green buying intention manifests in the form of consumers' desires, hopes, and plans to buy green products.

Besides green trust, another construct identified as an important predictor of green buying intention is perceived consumer effectiveness (Wang et al., 2019; Choi and Johnson, 2019). Someone who has extensive knowledge about green products will realize how important consuming green products is for environmental sustainability now and in the future. Awareness of environmental sustainability will drive self-efforts to create a sustainable environment. This self-effort is the impetus for the growth of green buying intention (Keleg et al., 2022).

Price plays an important role in encouraging the formation of buying intentions (Wang et al., 2019). Price is a cue of quality. Generally green products are expensive. The high price of this green product indicates high quality and has leading environmental functions. Wang et al. (2019) in their research found that perceived price moderates the relationship between green trust and green buying intention. The researcher previously also conducted a series of green consumption surveys to show that consumers are willing to pay a premium price for green products. Lin and Huang (2012) survey results state that most consumers are willing to pay a certain premium to buy green products (Kucher, 2019; Berger, 2019).

In TPB it is stated that intention is the closest predictor of behavior (Ajzen, 1985). In order to promote green consumption, predicting green behavior is a must. Research needs to confirm the effect of this intention on green buying behavior. The creation of green buying behavior is expected to make a real contribution in expanding the green consumer segment and ensuring environmental sustainability in a sustainable manner.

2. Literature review

2.1. Green Buying Behavior

Green buying behavior is a complex form of ethical decision-making behavior and is considered a type of socially responsible behavior (Amin and Tarun, 2021; Zollo, 2021). As a form of social responsibility, green consumers take into account the public consequences of their private consumption and use their buying power to bring about social change. Zhang and Dong (2020). states that green buying behavior is consumer behavior in which every act of consumption applies environmentally friendly insights. Green buying behavior is also interpreted as a process of weighing the environmental attributes inherent in a product when consumers decide to buy environmentally friendly or organic products (Lago et al., 2020). Therefore, green buying behavior is defined as the behavior of applying environmentally friendly insights and considering green attributes when buying a product (Zhang and Dong, 2020; Lago et al., 2020). Environmentally friendly behavior manifests itself in four categories of behavior: Reduce, Reuse, Recycle and Redesign (Vlajic et al., 2021; Lange, 2021).

In the context of green consumption, the occurrence of green buying behavior is closely related to the green buying intention construct (Ajzen, 1985). Green buying intention arises because of consumer confidence in green attributes and benefits attached to a green product and perceived consumer effectiveness. Green belief and perceived consumer effectiveness are both rooted in how knowledgeable consumers are on environmental issues

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2.2. Green Buying Intention

According to TPB (Ajzen, 1985), buying intention is formed through a sequential process of forming behavioral beliefs that shape attitudes toward behavior, normative beliefs that form subjective norms, and control beliefs that shape perceived behavioral control. Furthermore, the three constructs of attitudes, subjective norms, and

perceived behavioral control produce purchase intentions. This purchase intention then becomes the closest predictor of behavior.

Soderlund and Ohman (2005) state that intentions often manifest: (1) intentions as plans, (2) intentions as expectation, (3) intentions as wants. In the context of green consumption, green buying intention has the meaning: want or expect or plan to buy a product by considering the green attributes attached to the product (Soderlund and Ohman, 2005; Zhang and Dong, 2020; Lago et al., 2020). Therefore, a hypothesis can be proposed:

H_1: Green buying intention has a positive effect on the green buying behavior.

2.3. Green Trust

Trust is the belief that other parties are reliable, do not manipulate, and are committed to their promises (Lin et al. 2011; Setiawan et al., 2020). In the context of green consumption, Green trust as belief in the credibility, goodness, and good environmental performance of a product (Yang and Zhao, 2019). Green trust motivates the formation of consumer intentions to consume green products. Consumers who have experienced the good performance of green products, will have greater buying intentions in the future.

Customer trust has a positive impact on buying intention (Zhao et al., 2019; Watanabe et al., 2020). Konuk et al. (2015) in their research reported that green beliefs positively affect green buying intentions. Chen and Chang (2012) also got the same result that green trust significantly influences green buying intention (Liet al., 2021; Tarabieh, 2021). Previously, Nhu, et al. (2019) also shows that green buying intention is influenced by trust in green products. Based on the explanation above, the following hypothesis can be proposed:

H_2: Green trust has a positive effect on green buying intention.

2.4. Perceived Consumer Effectiveness

Perceived consumer effectiveness is an important prerequisite for predicting green behavior (Wang et al., 2019; ; Nguyen dan Pervan, 2020; Al-Swidi dan Saleh, 2021). Perceived consumer effectiveness is interpreted as consumer belief that green buying behavior can bring benefits to the environment. Therefore, consumers will increase their purchases of green products (Wang et.al., 2019). Hanss and Doran (2019), define perceived consumer effectiveness as an assessment of its ability to contribute to sustainable development through certain behaviors. Based on some of the definitions above, perceived consumer effectiveness can be defined as a consumer's estimate of his or her ability to contribute to the environment which is manifested through green buying behavior (Wang et al., 2019; Hans and Doran 2019).

Research by Wang et al. (2019) confirms the effect of perceived consumer effectiveness on green buying intention. Sun dan Wang. (2020) in their research found that perceived consumer effectiveness has a positive impact on green buying behavior. Based on the basis of this explanation, a hypothesis can be proposed:

H_3: Perceived consumer effectiveness has a positive effect on green buying intentions.

2.5. Perceived Price

According to Voss and Giroud (2000) perceived price is a consumer's evaluation and assessment of a product that will influence behavior. Therefore, perceived price can be defined as a consumer's judgment about the sacrifice to benefit from the product consumed (Medina et al., 2020; Yue et al., 2021; Levrini et al., 2021).

Product price is an important factor influencing consumer choosing behavior. The price of green products is higher than traditional products in general. Tuna and Tiyarattanachai (2019), stated that in some cases, green products are priced higher than other products because green products are produced less. In fact, high prices indicate high-quality green products and have reliable and impactful environmental functions (Wang et al., 2019).

Kucher (2019) and Berger (2019) conducted a series of green consumption research and confirmed that consumers are willing to pay a premium price for green products. Research Wang et al. (2019), found a price moderation between green trust and green buying intention. Green trust has a greater impact on green purchase

intention due to high perceived price compared to low perceived price. Based on the explanation above, a hypothesis can be proposed:

H_4: Perceived price moderates the relationship between green trust and green buying intention

2.6. Green Knowledge

Lee (2011) defines environmental knowledge as the basic knowledge a person has about everything that can be done and attempted to help protect the environment. Green knowledge can be defined as the information that consumers have about green product attributes, functions, and benefits (Wang et al., 2019).

Banite et al. (2010) argues that the better the environmental knowledge, the more consumers will know about the quality of environmentally friendly products and motivate them to buy green products. Wang et al. (2019), stated that knowledge can influence the decision-making process. This means that based on their knowledge of green products, consumers buy green products. Testa et al. (2019)..found that knowledge of green products is closely related to beliefs about consuming green products. Knowledge causes consumers to have strong beliefs about the positive results of using environmentally friendly products (Wang et al., 2019; Hamzah and Tanwir, 2021; Han, 2021). Consumers believe that the use of environmentally friendly products can improve environmental performance. Likewise, knowledge increases consumer confidence that environmental problems can be reduced through green buying behavior (Wang et al., 2019; Naz et al., 2020). If one does not have green knowledge, one will not fully understand the environmental protection attributes and positive environmental impacts of green products (Wang et al., 2019). Based on the explanation above, the following hypothesis can be proposed:

H_5: Green knowledge has a positive effect on green trust

H_6: Green knowledge has a positive effect on perceived consumer effectiveness.

2.7. Research Model

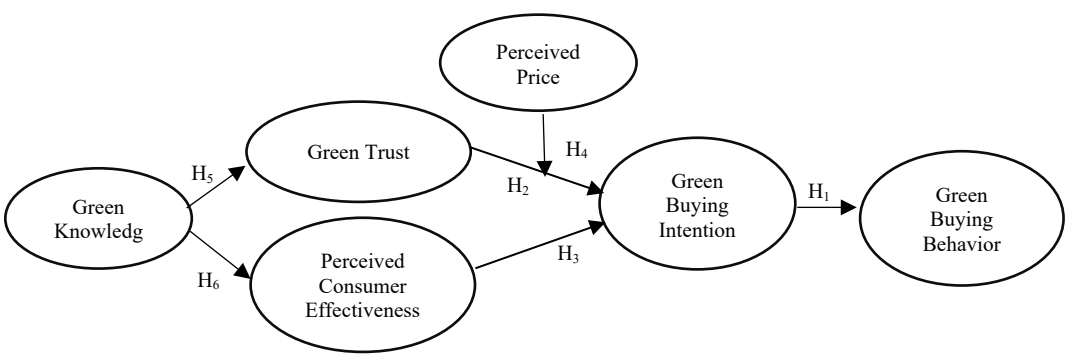

Figure 1. Research model

The model illustrates: green buying behavior is influenced by green buying intention which is formed due to the influence of several constructs of perceived price, green trust, perceived consumer effectiveness, and green knowledge.

3. Research Methods

The research was conducted with cross-sectional and longitudinal designs. The cross-sectional research design was conducted to measure the constructs of green knowledge, green trust, perceived consumer effectiveness, perceived price, and green buying intention. The longitudinal design is used to measure green buying behavior. Measurement of green buying behavior is carried out after all the determinant constructs of green buying behavior are measured. After several times (between 1-2 weeks), the same respondent was contacted via WhatsApp communication and asked if they had purchased the green product that was the object of research. If they had purchased it, they were asked to show a photo of the product purchased.

3.1. Operational Definitions and Measurement

In an order to measure the variables involved in research, it is important to define variables:

Green Buying Behavior

Green buying behavior is defined as the behavior of applying environmentally friendly insights and considering green attributes when buying a product (Zhang and Dong, 2020; Lago et al., 2020). The buying behavior of green products is measured on a nominal scale on the basis of buying = 1 and not buying = 0.

Green Buying Intention

Green buying intention is defined as a want or expectation or plan to buy by considering the green attributes of the product (Soderlund and Ohman, 2005; Zhang and Dong, 2020; Lago et al., 2020). Intention to buy green products is measured using a five-point Likert scale based on indicators: (1) expectations, (2) plans, (3) wants (Soderlund and Ohman, 2005).

Green Trust

Green trust is defined as belief in the credibility, goodness, and good environmental performance of a product (Yang and Zhao, 2019). Trust in green products is measured using a five-point Likert scale based on indicators: (1) company reputation, (2) environmental commitment, (3) claims of environmentally friendly products (Chen and Chang, 2012).

Consumer Perceived Effectiveness

Perceived consumer effectiveness can be defined as a consumer's estimate of his ability to contribute to the environment which is manifested through green buying behavior (Wang et al., 2019; Hans and Doran 2019). Perceived consumer effectiveness is measured with a five-point Likert scale based on indicators: (1) environmental promotion through individual purchases, (2) protecting the environment by buying green products, (3) feelings of being able to solve environmental problems by buying green products (Jaiswal and Kant, 2017).

Perceived Price

Perceived price is defined as a consumer's judgment about the sacrifice to benefit from the product consumed (Medina et al., 2020; Yue et al., 2021; Levrini et al., 2021). Perceived price is measured using a five-point Likert scale based on indicators: (1) Green products are more expensive, (2) Price compatibility with product quality (3) Price compatibility with benefits (Laroche et al., 2001; Sutopo, 2016).

Green Knowledge

Knowledge of green products can be defined as information held by consumers about the attributes, functions and benefits of green products (Amberg and Fogarassy, 2019; Wang et al., 2019).. Green product knowledge is measured using a five-point Likert scale based on indicators: (1) product knowledge reduces the impact of

environmental damage, (2) green product brand suggestions, (3) knowledge about green product safety (Adjaino et al., 2019).

3.2. Research Instrument Testing

Validity test

Testing the validity of the questionnaire using factor analysis method. The validity of the questionnaire is known by looking at the factor loading value in the rotated component matrix table. Statement items or instrument items can be said to be valid if they have a loading factor > 0.4 and are extracted in one factor (Hair et al., 2010). The results of the validity test are shown in Table 1.

Table 1. Questionnaire Validity Test Results

Rotated Component Matrix[a]

	Component				
	1	2	3	4	5
GK1				.698	
GK2				.663	
GK3				.674	
GT1			.728		
GT2			.742		
GT3			.775		
PCE1	.755				
PCE2	.801				
PCE3	.624				
PP1					.832
PP2					.612
PP3					.579
GBI1		.758			
GBI2		.778			
GBI3		.829			

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 8 iterations.

Source: Validity test results (2023).

The results of the analysis show that all questionnaire items in each construct gather at the same factor, thus indicating that each indicator is closely correlated with one another to form the picture of the construct it represents.

Reliability Test

Questionnaire reliability was tested using the Cronbach Alpha (α) method. The results of the questionnaire test are shown in Table 2.

Table 2. Questionnaire Reliability Test Results

Variable	Alpha Coefficient (α)
Green Trust	0,798
Perceived Consumer Effectiveness	0,964
Perceived Price	0,818
Green knowledge	0,915
Green buying Intention	0,935

Source: Reliability test result (2023).

Table 2 shows that all questionnaire items for each variable have a good reliability value so that it can be concluded that all questionnaire items are declared reliable.

3.3. Sampling Technique

The population is consumers in Surakarta city with a sample size of 200 respondents. The city of Surakarta was chosen because it is an industrial and educational city which is a business destination and seeks knowledge from all citizens of the Indonesian nation. Therefore, the population has ethnic diversity which depicts the miniature of the Indonesian nation. This condition is expected to approach the requirements for representativeness in forming samples which will have an impact on broad generalizations of research results.

Sample data was obtained by a combination of two-stage cluster sampling techniques and purposive sampling techniques. The first stage of sample members is determined based on five districts in the city of Surakarta.

In the second stage, samples were taken from each district purposively. The use of this method is expected to obtain sample characteristics close to random and representative, so that the research conclusions have good generalizations. The process of determining the sample is described in
Table 3.

Table 3. The process of determining the sample

Cluster	Total population	Proportion	Total respondents
Banjarsari	181.114	31,9%	64
Laweyan	101.871	17,9%	36
Serengan	54.323	9,6%	19
Pasar Kliwon	84.729	14,9%	30
Jebres	145.676	25,7%	51
Total	567.715	100%	200

Source: Department of Population and Civil Registration of Surakarta (2018).

3.4. Research Object

The object under study is the green product of plastic packaging bags made from cassava under the Telo bag brand. Telo bag has the advantage of being able to withstand loads and has the same elasticity as conventional plastics but is easy to decompose.

Figure 2. Research object

3.5. Method of analysis

Data were analyzed using the triangulation method, namely: structural equation modeling (SEM) and regression analysis. SEM is used to examine the relationship between variables as a whole in the formation of green purchase intentions. Regression analysis includes regression with interaction relationships and binomial logistic regression. Regression with an interaction relationship was used to examine the moderating role of perceived price in the relationship between green trust and green buying intention. Binomial logistic regression analysis was used to examine the relationship between green buying intention and green buying behavior.

4. Results and Discussion

Demographically, the characteristics of green consumers are: middle age, high income, education above the average, having prestigious positions, and knowledgeable (Vermeir and Verbeke, 2006). Two important characteristics of the research sample are the level of education and income of the respondents because they represent the main characteristics of green consumers. The composition of respondents with less education was 51 people (25.5%) and 149 people with higher education (74.5%). The composition of low income respondents was 57 people (28.5%) and middle to high income were 143 people (71.5%). Of the two hundred respondents, 153 people said they bought Telo bag green products (76.5%) while the remaining 47 people (23.5%) said they did not buy. The data supports Vermeir and Verbekke's (2006) statement that consumers of green products are highly educated and high-income consumers.

4.1. Results of structural equation model and regression analysis

Results of structural equation model analysis

The path diagram involving the constructs of green knowledge, green trust, perceived consumer effectiveness, and intention is shown in Figure 3

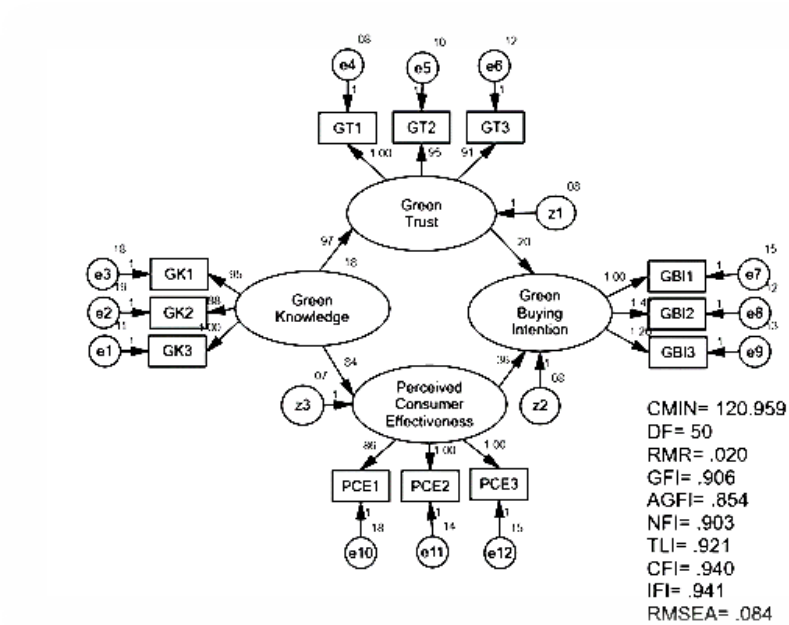

Figure 3 Diagram of the relationship path between variables
Source: SEM analysis results (2023)

The results of the Goodness of Fit test are shown in Table 4.

Table 4 Results of Goodness of Fit

Fit Index	Cut off	Analysis output	Explanation
CMIN/DF	< 2.00	2,419	Marginal
GFI	≥ 0,90	0,906	Very good
RMSEA	≤ 0,08	0,084	Marginal
AGFI	≥ 0,90	0,854	Marginal
TLI	≥ 0,90	0,921	Very good
NFI	≥ 0,90	0,903	Very good
CFI	≥ 0,90	0,940	Very good
CMIN/DF	≤ 2,00	2,419	Marginal
RMR	≤ 0,03	0,020	Very good
IFI	≥ 0,90	0,941	Very good

Source: SEM analysis result (2023).

Table 4 shows the green purchase intention model has a good Goodness of Fit, so it can be concluded that the model fits the data. The results of the analysis of the significance test of the relationship between variables are shown in Table 5.

Table 5. Significance Test Results between Constructs in Green Buying Intention

Relations between variables			Coefficient of determination	Significance
Green Knowledge	→	Green Trust	0,692	***
Green Knowledge	→	Perceived Consumer Effectiveness	0,646	***
Green Trust &		Green Buying Intention	0,424	0,013
Perceived Consumer Effectiveness				***

*= Significant at $\boldsymbol{\alpha}$ = 0,05; *** = Significant at $\boldsymbol{\alpha} = 0{,}001$
Source: SEM analysis result (2023).

The results of the significance test for the effect of green knowledge on green trust showed that green knowledge had a significant effect on green trust ($p < 0.001$). This relationship has a coefficient of determination of 0.692. This indicates that 69.2 percent of the variation in green trust is explained by green knowledge. Hypothesis 5 is supported.

The results of the significance test for the effect of product knowledge on perceived consumer effectiveness showed that green knowledge had a positive and significant effect on perceived consumer effectiveness ($p < 0.001$). This relationship has a coefficient of determination of 0.646. This indicates that 64.6 percent of the variation in perceived consumer effectiveness is explained by green knowledge. Hypothesis 6 is supported.

The results of the significance test for the effect of green trust on green buying intention have a significance of 0.013. It can be concluded that green trust has a positive effect on green buying intention ($p<0.05$). The results of the significance test for the effect of perceived consumer effectiveness on green buying intention found that perceived consumer effectiveness had a positive and significant effect on green buying intention ($p<0.001$). The relationship between green trust and perceived consumer effectiveness on green purchase intention has a coefficient of determination of 0.424. This indicates 42.4 percent of the variation in green intention is co-explained by green trust and perceived consumer effectiveness. So hypotheses 2 and 3 are supported.

Regression Analysis of the Moderating Role of Perceived Price

The moderating role of perceived price in the relationship between the green trust construct and green buying intention was tested by hierarchical regression analysis. The test results are shown in Table 6.

Table 6. The results of the test of the moderation role of perceived prices

Test stage			Coefficient of determination	Model significance test		Test the significance of the regression coefficient		Result of test
				F	P*	Beta	P*	
Green trust	→	Green buying intention	0,216	54,0254	0,000	0,465	0,000	Significant
Green trust	→	Green buying intention	0,274	38,558	0,000	0,320	0,000	Significant
Perceived consumer effectiveness	→	Green buying intention				0,294	0,000	Significant
Green trust	→	Green buying intention	0,271	25,647	0,000	0,146	0,745	Not significant
Perceived price	→	Green buying intention				0,126	0,772	Not significant
Interaction	→	Green buying intention				0,297	0,694	Not significant

*P Significant at α= 0.05.
Source: Regression analysis results (2023)

The table above explains that the interaction between green trust. and perceived price is not significant (p= 0.694; p> 0.05). This suggests that perceived price does not moderate the relationship between green trust and green purchase intention. These results indicate that perceived price is only an independent construct that has a direct effect on green purchase intentions.

Logistic Regression Analysis

Logistic regression analysis was conducted to test the significance of the effect of green buying intention on green buying behavior. The regression analysis used is binomial logistic regression analysis. The results of the analysis are shown in Table 7.

Table 7. Results of logistic regression analysis

Construct	Coefficient of determination		Model significance test: Hosmer and Lemeshow test		Test the significance of the regression coefficient	
	Cox & Snell R square	Nagelkerke R square	Chi-Square	P*	Beta	P*
Green buying intention	0,414	0,624	175,784	0,000	9,327	0,000*

*P = significant at α= 0,05.
Source: Logistic regression analysis results (2023)

Logistic regression analysis describes that 62.4 percent variation in green buying behavior is explained by green buying intentions. This indicates green buying intention is a strong predictor of green buying behavior. The relationship between green buying intention and green buying behavior is also significant ($p = 0.00 < 0.05$). It is concluded that green buying intention predicts green buying behavior. Hypothesis one is supported.

4.2. Discussion

All relationships between constructs in the model are supported by the data except for the moderating role of perceived price in the relationship between green trust and green purchase intention. The significant effect of green purchase intention on green buying behavior reinforces the theory that intention is the closest predictor of behavior (Ajzen, 1985). The 62.4 percent variation in green behavior explained by green purchase intention provides quantitative evidence of the magnitude of the influence of green purchase intention on green purchase behavior. The research results also confirm the significant effect of the constructs of green trust (Chen and Chang, 2012; Konuk et al., 2015; Zhao et al., 2019; Watanabe et al., 2020; Liet al., 2021; Tarabieh, 2021) and perceived consumer effectiveness (Wang et al., 2019; Sun dan Wang., 2020) on green buying intention. Variation in green purchase intention is strongly explained by the constructs of green trust and perceived consumer effectiveness together (42.4 percent). Green knowledge strongly explains the variation in green trust (69.2 percent) and perceived consumer effectiveness (64.6 percent).

Perceived price failed to significantly moderate the relationship between green trust and green purchase intention. This result is in line with the findings of Somro et al. (2020) which confirms that price does not moderate the relationship between green trust and green buying intention. In general, green products are expensive, due to natural raw materials whose availability is influenced by market conditions and seasons, costs of innovation and patents, and low market demand so that old products are in the introduction stage of the product life cycle. This high price does not attract consumer buying interest, considering that the same product made from synthetic raw materials is sold at a lower price. Therefore, it is very reasonable if the price does not moderate (strengthen) green confidence to encourage the creation of green buying intentions. Based on these results, the research succeeded in creating a robust enough model to predict green behavior. Model test results are shown in Figure 4.

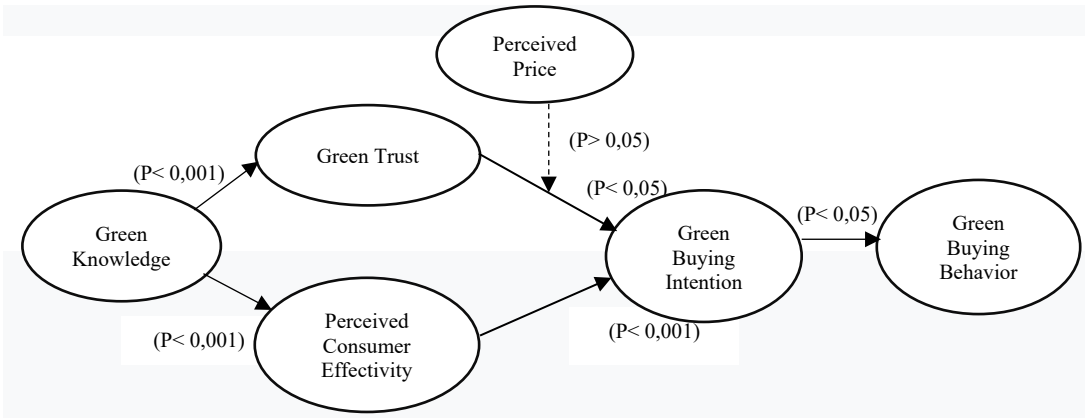

Figure 4. Test result model

5. Conclusion

The results of data analysis lead to the conclusion: (1) Green behavior is influenced by green purchase intention, (2) Green purchase intention is influenced by green trust and perceived consumer effectiveness, and (3) Green beliefs and perceived consumer effectiveness are influenced by green knowledge.

6. Limitations and suggestions for future research

The research was conducted on one green product object, namely environmentally friendly plastic bags so that generalizations to broadly environmentally friendly products are limited. Therefore, in order to improve the generalizability of research results, similar studies in the future need to accommodate the diversity of green product categories.

7. Managerial implications

The results of the study stated that green buying behavior was predictable. The need to protect environmental sustainability, green product innovation, and research activities that confirm consumers' willingness to consume green products open up wider marketing opportunities for green products. The increasing demand for green products is expected to raise hope for all parties, both government and non-government institutions concerned with environmental preservation, to be more active in realizing a sustainable natural environment in a sustainable manner.

Scientific Ethics Declaration

The author declare that the scientific ethical and legal responsibility of this article belongs to the author

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