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Application of the Extended Theory of Planned Behavior Model to Investigate Purchase Intention of Green Products among Thai Consumers

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Abstract: Green products are among the widely used products worldwide due to their environmental benefits. However, information on the consumers' purchase intention towards green products in developing countries, such as Thailand, is lacking. This study aims to investigate Thai consumers who are aged over 18 years, and whose base education is high school, on purchase intention for green products by using an extended framework of the theory of planned behavior (TPB). We derived and examined the model through structural equation modeling in a sample of 483 respondents in Thailand. The findings of this model indicated that consumer attitude, subjective norm and perceived behavioral control have significant positive influences on the purchase intention for green products. Furthermore, our results indicated that environmental concerns have a significant effect on attitude, perceived behavioral control and purchase intention for green products, but subjective norm. Moreover, environmental knowledge had no significant effect on the purchase intention for green products. Instead, it had a distinct indirect effect through attitude towards purchasing green products, subjective norm and perceived behavioral control. The findings from this study contribute to improving the understanding of intention to purchase green products, which could play a major role towards sustainable consumption.

Keywords: environmental concern; environmental knowledge; green products; purchase intention; sustainable consumption; theory of planned behavior

1. Introduction

Rapid economic growth has led to adverse environmental degradation. The environment has changed considerably worldwide because of factors such as climate change, air pollution, waste generation and natural disasters, which affect not only living organisms but also the economic and social status of people. Thailand is among the largest economies and business centers in Southeast Asia; industries have developed rapidly, resulting in environmental degradation through over-consumption and over utilization of natural resources. In the wake of such impacts, consumers are concerned about their environment [1]. Among the several ways of reducing their impacts on the environment, they can make appropriate decisions on which goods to purchase. Several studies have suggested that increased awareness and interest in sustainable consumption is expected to influence the purchasing decisions of consumers [2,3]. Furthermore, sustainable consumption has received more attention from corporate decision-makers due to strict environmental regulations and growing pressure of

stakeholders focused on environmental conservation [2,4–6]. Thus, environmental problems and their adverse impact on human health has become an important issue among academic, government and private organizations [7,8].

The consumption of environmentally friendly products (referred to as green products in this study) could be one way of reducing environmental impacts [9,10]. Green products refer to products that are safe to purchase, and are of good quality, and are produced under the principles of sustainable development [11]. In recent years, the production of green products has increased substantially worldwide; products that will not pollute the environment, and can be recycled or conserved using low-toxicity materials [12]. Consequently, they have popularity among consumers globally [2,9].

According to Ottman [13], consumers would purchase green products when their needs or wants for safety, quality, availability and convenience are a priority and when they realize that green products can help to solve environmental problems. Consumers judge the value of a product using quality indicators and then combine this judgment to evaluate their purchase intention. In marketing, most researchers are interested in identifying the source of green products purchase intention [14] as it helps to develop appropriate strategies and in gaining market share for such products. In addition, retaining customers, developing products, and responding to customer needs are the motives of good practices for every business. Several researchers in developed countries have studied the intentions and behavior of consumers towards green products such as in United States [15–17], United Kingdom [18], and Italy [19]. Paul et al. [2] suggested that consumers from developed countries are more concerned about the environment than those from developing countries. Moreover, green products have also drawn the attention of developing countries, including China [20], India [21,22], Indonesia [23], and Malaysia [17,24]. In Thailand, research on environmental issues and green purchasing behavior is just getting started when compared to other developing countries [25–27]. A theory widely used to examine the motivation of individuals intention and behavior, is the theory of planned behavior (TPB) [28,29]. It is the most popular theoretical framework to explain determinants and antecedents of purchase intention. For this reason, this theoretical framework was adopted in this study.

Previous studies have used the TPB model to examine the motivation of purchase intention for green products without factoring in the impacts of environmental concerns and environmental knowledge. Environmental concerns and environmental knowledge are important factors influencing the buying decision for green products [2,7]. Therefore, products acceptable to customers in terms of cost, quality, performance and product-related environmental concerns should be developed [30,31]. According to Gilg et al. [32], green consumption is a relatively new area of research and more information is still needed on the role of environmental concerns on green consumption. Environmental concern is a direct predictor of specific environmental behavior, which is estimated by the attitude of consumers towards a specific behavior [33,34]. Environmental knowledge on the other hand can provide concepts and general knowledge of how products interact with the natural environment and this could lead to sustainable development. Ohtomo and Hirose [35] observed that if consumers lack knowledge about green products, an attitude-behavior gap result between their environmental concern and their actual purchasing behavior. This may have strong influence on the purchase intention, and could prognosticate sustainable consumption behavior. Thus, environmental concern and environmental knowledge are considered equally important in the purchase decision for green products [36,37]. For these reasons, we integrate these two variables (environmental concerns and environmental knowledge) to the TPB model theoretical framework as antecedents of purchase intention for green products.

In addition, previous literature suggests that demographic variables (old age and high level education) influence green products purchasing behavior [2,38–41]. In 2015, Thailand had an estimated population of those aged 18 years (and over) and having a base education of high school of about 35 million people [42], which is half of the entire Thailand population estimated at 70 million. These groups often act as leaders in families having the responsibility to obtain new products, provide information, and to make purchases [43]. This study aims to investigate the intention of sustainable

consumption through green products by using an extended framework of the TPB model. It will be of great significance especially to policy makers as they develop sustainable marketing strategies specific to the target group.

2. Theoretical Background and Hypotheses Development

The structure of the proposed framework is shown in Figure 1. In total, 11 hypotheses are drawn from six constructs, namely, attitude towards purchasing green products, subjective norm, perceived behavioral control, environment concern, environment knowledge and purchase intention for green products.
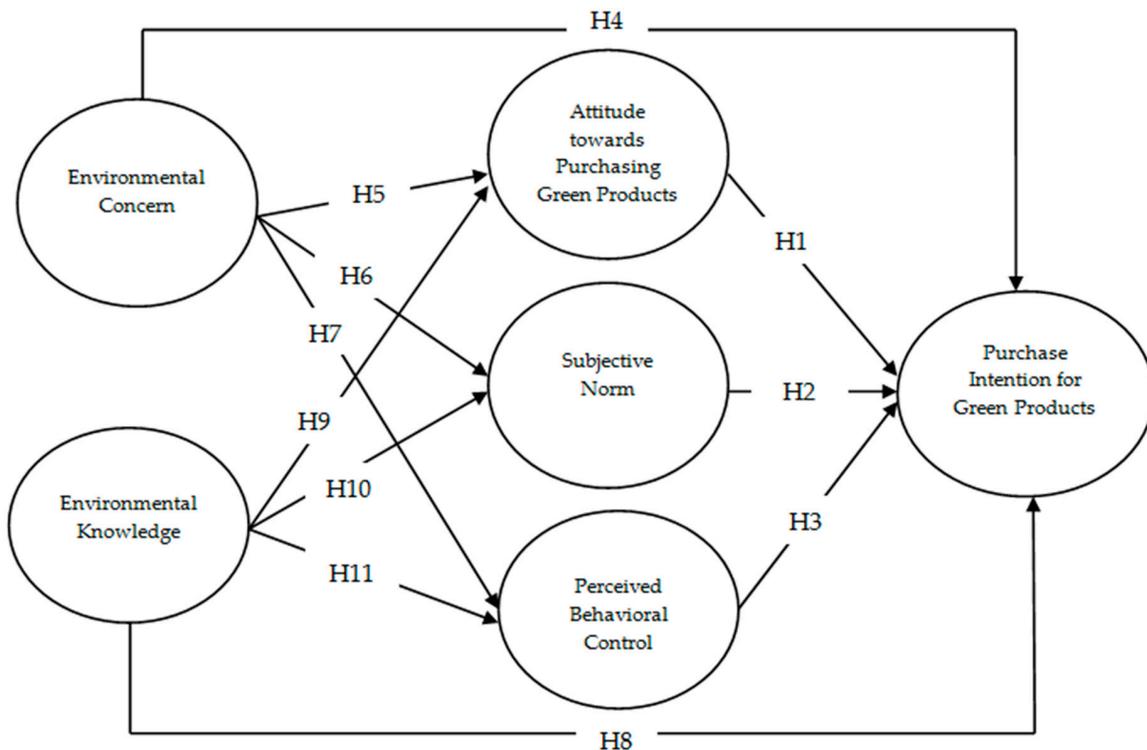

Figure 1. Proposed research framework.

2.1. Green Products

Green products have less environmental impact and are less harmful to human health. Srivastava [44] found that green products have evolved as a result of increasing concerns about global warming, global and local pollution levels, diminishing natural reserves, and the overflowing of wastes. Consumers translate environmental concerns into their staunch commitment to purchase green products. Consumers who are aware of and interested about environmental problems are called green consumers [45]. Green or sustainable consumption refers to the widespread change of consumer behavior in order to reduce the environmental impact associated with consumption [46]. According to Roman et al. [47], sustainable consumption implies "the use of goods and services which satisfy the basic needs and enable a better life quality and at the same time the minimization of the consumption of natural resources, the generation of toxic materials and waste and pollutants over a life cycle, so that there is no risk of the impossibility to satisfy the needs of future generations" (p. 2). In the short run, there is a need to create a shared sense of responsibility to the environment that will encourage consumers to buy green products, and in the long run, adopt an environmentally friendly lifestyle [48]. Therefore, the endeavor to understand the intentions of sustainable consumption towards green product is an important part of this study.

2.2. The Components of the Extended TPB Model

TPB has been commended as the best model to predict intentions [7,49]. The TPB framework, an extension of the theory of reasoned action (TRA) [50,51], is one of the most widely researched models among social psychologists for predicting behavioral intentions [52,53]. Intention is a conscious plan of action, which specifically requires a behavior and motivation to actuate it [54]. Many studies describe the intentions and generally think they are the best predictors of behavior and fully mediate the impact of attitudes, subjective norms, and perceived behavioral control [19,55,56]. More specifically, intention is accepted as the best available predictor of human behavior, which is at the heart of the TPB framework [55,57]. Rezai et al. [58] applied TPB towards green food consumption in Malaysia, showing that consumers' intention to go green in food consumption is an essential component in the adoption of green products, and Bonini and Oppenheim [1] and Paul et al. [2] demonstrated how this could help achieve environmental sustainability. Jones et al. [59], and Sutton [60] define environmental sustainability as the ability to maintain things or qualities that are of significant value in the physical environment.

2.2.1. Attitude towards Purchasing Green Products (ATT)

According to Fazio [61], attitude is an interaction in memory between a given object and a summary evaluation of this object. Attitude is likely to reveal the psychological assessment of a product by the consumer [62–64]. In particular, previous studies have focused on the relationship between attitudes and intention behavior. For example, Irland [65] concluded that consumer's purchasing intentions are dependent upon their environmental attitudes. According to Tsen et al. [66], attitude is among factors that plays a major role in predicting intentions of consumers who will pay for green products. Mostafa [67] found that the positive relationship between attitude and behavioral intention has been established in many cultures. Attitude has a clear role in the decision to accept a specific behavior. Based on literature review, attitude will have an influence towards purchasing green products and as a result, the hypotheses below can be drawn.

H1: Attitude towards purchasing green products is positively associated with purchase intention for green products.

2.2.2. Subjective Norm (SN)

Subjective norm refers to the perceived social pressure to perform or not to perform behavior [57,68]. Subjective norm is the opinion of an individual that have an influence in one's decision making [69]. Zukin and Maguire [70] studied social norms and found that they have a major influence on green consumption, and are the basis of many theories and models concerning consumption. Wiriyapinit [71] demonstrated that family norm values imparted by parents in Thailand and purchase intentions were associated. Several studies have reported that the subjective norm is an important determinant of intention to purchase green products [2], organic food [72], and for green hotel revisit intention [57,73,74]. Therefore, subjective norm is an important factor in encouraging purchase intention for green products and we propose that:

H2: Subjective norm is positively associated with purchase intention for green products.

2.2.3. Perceived Behavioral Control (PBC)

Perceived behavioral control refers to an individual's perceived ease or difficulty in performing a particular behavior [68]. A given behavior possibly occurs when an individual has both the ability and motivation to perform that behavior rather than when the individual has only one or neither factors [75]. According to the TPB model, developing perceived behavioral control prior to generating intention is essential. Li et al. [76] proposed that the perceived affordances were perceptual cues that consumers possessed and used to evaluate products before purchasing. Moreover, Olsen [77] pointed

that the most important control factors that influence consumers food purchasing include self-efficacy, and convenience/availability. Many researchers have concluded that confidence in the ability of the individual to control their behavior showed a positive relationship with purchase intention [78,79]. Furthermore, perceived behavioral control has been associated with purchase intention in green hotels [57,73], organic foods [80,81], and green products [82]. Based on this discussion we propose the following hypotheses.

H3: Perceived behavioral control is positively associated with purchase intention for green products.

2.2.4. Environmental Concern (EC)

Environmental concern is defined by Alibeli and Johnson [83] as the extent to which people are aware of environmental issues and their willingness to solve environmental problems. Diamantopoulos et al. [37] observed that environmental concerns are an important factor in consumer decision making process. Aman et al. [84] observed that an increasing number of consumers with environmental concerns will increase the intention to purchase green products. Consumers having a higher level of concern towards the environment may result in the purchase of green products. Thus, environmental concern is often cited as a strong motivator to purchase [85,86]. Several studies have examined the influence of environmental concern on the green products purchase intention [84,87,88]. Irawan and Darmayanti [88] also reported a positive impact of the environmental concern on green purchase intention among university students in Indonesia. Accordingly, the following hypothesis is suggested:

H4: Environmental concern is positively associated with purchase intention for green products.

Environmental concerns are important in the study of environmental attitudes [7,89]. Hanson [89] reported that environmental concern have a positive influence on attitude towards green consumers in Canada. Mostafa [67] observed that environmental concern positively influence the consumers' attitude towards green products which further influences their green purchase intention. Bamberg [90] defines environmental concern as a strong attitude for protecting the environment. Hartmann and Apaolaza-Ibáñez [91] considered the direct and indirect impacts of environmental concern, finding that environmental concern affects attitude and purchase intention towards green products. Thus, we hypothesize that:

H5: Environmental concern is positively associated with attitude towards purchasing green products.

Subjective norm is influenced by the increase in environmental concerns which reduces the perception of difficulty in terms of resources, time, as well as other factors [2]. Therefore, environmental concerns influence behavior through pressure from family and/or friends who accept or reject the green purchase behavior. Bamberg [90] reported that environmental concern has direct effects on subjective norm for students' decision to request an information brochure about green electricity products. This result indicates that the highly environmentally concerned students' perceived a stronger support from important reference persons (such as friends, parents/family, groups from the environmental movement, personally known professors, and energy providers) than low concerned students. Therefore, they showed more interest in obtaining information about green electricity products and intended to use the offered brochure for their actual requirements. Based on this discussion, we propose the following hypotheses.

H6: Environmental concern is positively associated with subjective norm.

In Chen and Tung [73], the intention to visit green hotels was indirectly influenced by environmental concern through attitude, subjective norms, and perceived behavioral control. Bamberg [90] showed that environmental concern can predict perceived behavioral control for energy conservation behaviors. Furthermore, few studies have reported the link between environmental concern and positive influences for attitude, subjective norm and perceived behavioral control [2],

all of which influences the purchase intention. On the basis of the above discussion, the following hypotheses are proposed.

H7: Environmental concern is positively associated with perceived behavioral control.

2.2.5. Environmental Knowledge (EK)

Environmental knowledge is defined by Taufique et al. [92], and Fryxell and Lo [93] as knowledge of the facts, key relationships that lead to environmental impacts, and environmental responsibility of the individual that leads to sustainable development. Hill and Lynchehaun [94] concluded that knowledge of an individual about the environment has a major influence on environmental issues. With an increase in environmental knowledge, the consumers become more informed, and that raises the possibility of high purchase intention [95,96]. Previous studies found that environmental knowledge is one of the important variables that have significant positive influence on consumers' intention to purchase green products [97–99]. As a result, we hypothesize that:

H8: Environmental knowledge is positively associated with purchase intention for green products.

If consumers have the knowledge of environmental issues, it will encourage consumers to have a positive attitude towards green products [84]. Bradley et al. [100] suggested that students have the low knowledge scores had unfavorable environmental attitudes compared with students have the high knowledge scores. Mostafa [67] showed that environmental knowledge is positively linked with attitude towards green products which further influences their purchase intention. Hence, based on the above discussion, this study hypothesizes that:

H9: Environmental knowledge is positively associated with attitude towards purchasing green products.

Moorman et al. [101] suggested that subjective knowledge influences the choice of the consumer, as they are inspired to act on the knowledge they have. Yang and Kahlor [102] proposed that when people perceive that others expect them to know about environmental issues, they might purposely present themselves as knowing a lot about this issue. Thus, people who act according to social norms might have paid more attention to environmental information and actually developed a greater knowledge base. The above discussion leads to the following hypotheses:

H10: Environmental knowledge is positively associated with subjective norm.

According to Kim et al. [103], knowledge will also increase the belief that one has control of the situation, thereby increasing perceived behavioral control. Therefore, it is hypothesized that:

H11: Environmental knowledge is positively associated with perceived behavioral control.

3. Methodology

3.1. Sample and Data Collection

Data used in this study were obtained from structured questionnaires designed to target those who were 18 years (or older) and highly educated with at least high school education. According to Chan [104], the green context under investigation is very difficult to be understood by minors due to the complexity of thought it brings to decision making. Thus, the ideal sample for this study consisted of adults (age 18 years or older). Furthermore, many researchers have suggested that people with less education find it hard to understand the topic under consideration compared to those with higher education [2,57,105–107]. Therefore, quota sampling technique was used in this study to select respondents of or over 18 years of age and having a minimum education level of high school that resided in Thailand. The Thailand National Statistical Office showed that in 2015, Thailand had about 20.601 million households with an average household size of 3.2 people per household. People who are aged 18 years or more and having a minimum high school education for this study had about

10.938 million households. Moreover, the statistical office showed that households nationwide earned an average of 26,915 THB per month and average income per person was 9212 THB per month [42].

Prior to formal data collection, two pilot tests were conducted. The first pilot test examined the validity and reliability of the questionnaire by testing it on 55 consumers who purchased green products. The comments and suggestions from these respondents were used to improve the questionnaire in terms of simplicity and ease of understanding. After the first revision, a second pilot test was conducted on another 55 consumers to re-evaluate the reliability. Finally, the questionnaire for data collection was established.

Responses were collected through face to face interviews from the consumers. Face to face interview survey was selected as an instrument, because they are based on personal interaction and can be controlled within the survey environment [108], and they reduce the non-response rate [109]. Nunnally and Bernstein [110] recommend a sample size of 300 or more and Charter [111] concluded that a minimum sample size of 400 was needed for a sufficiently precise estimate of the Cronbach's α coefficient. In this study, a total of 550 questionnaires were distributed among consumers (green shops, green market, and convenience and department stores) who bought green products in Thailand from December 2015 to February 2016. In total, 483 usable responses were obtained yielding a response rate of 87.82%, which was much higher than the recommended value of at least 400 for structural equation modeling (SEM). In addition, the sample size was determined based on a confidence level of 95%, with a 5% margin of error. The questionnaire developed could be completed in approximately 10–15 min. As an incentive to participants, each respondent who completed the questionnaire received 3 USD (approximately 100 THB) cash as an appreciation for their participation. All questionnaires were returned to the researchers directly after completion without using any intermediaries.

From the descriptive statistics shown in Table 1, a majority of the respondents were females (59.01%), aged 25–34 years (42.03%), married (58.39%), bachelor's degree (44.10%), with a family size of 2–3 persons (58.18%), full-time job (32.71%), and a monthly income range of 30,001–40,000 THB per person (1 USD = 35.7933 THB as of 1 December 2015).

Table 1. Sample characteristics (*n* = 483).

Items	Classification	Frequency	Percentage
Gender	Male	198	40.99
	Female	285	59.01
Age	18–24 years	79	16.36
	25–34 years	203	42.03
	35–44 years	132	27.33
	45–54 years	46	9.52
	55–64 years	19	3.93
	65 years or older	4	0.83
Marital Status	Single	187	38.72
	Married	282	58.39
	Divorced/Widowed	14	2.90
Education	High school	47	9.73
	Diploma	68	14.08
	Bachelor's degree	213	44.10
	Master's degree	134	27.74
	Doctoral degree	21	4.35
Family size	1 person	15	3.11
	2–3 persons	281	58.18
	4–5 persons	165	34.16
	More than 5 persons	22	4.55
Employment status	Student	59	12.22
	Housewife	81	16.77
	Unemployed	47	9.73
	Business	120	24.84
	Full-time job	158	32.71
	Part-time job	18	3.73

Items	Classification	Frequency	Percentage
	Less than 10,000	43	8.90
	10,001–20,000	66	13.66
Personal income—monthly (THB)	20,001–30,000	135	27.95
	30,001–40,000	169	34.99
	40,001–50,000	31	6.42
	More than 50,001	39	8.07

3.2. Measures

Measurement variables (shown in Table 2) considered for each construct used in this study were either selected or modified from previous studies. A total of six constructs were used. First, attitude towards green products was measured on three items and extracted from previous studies [2,99,112]. Second, the validated three items were used to measure subjective norm taken from these studies [48,55,72]. Third, perceived behavioral control was measured on four items based on [48,72,113]. Fourth, environmental concern was measured by four different items, as proposed by [2,21,114]. Fifth, environmental knowledge was measured using three items based on [7,21,55]. Finally, purchase intention for environmentally sustainable products was measured through three items taken from [2,99,115]. The questionnaire used the 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). This scale asks respondents to indicate how much they strongly disagree or agree with a series of statements on a particular topic [116].

Descriptive statistics of the questionnaire items are provided in Table 2, including the mean values of attitude, subjective norm, perceived behavioral control, environmental concern, environmental knowledge and purchase intention for green products were quite high and relatively favorable. The mean values of subjective norm were low compared with the other constructs at 3.424 because green products are still not common in Thailand.

Table 2. Descriptive statistics of the questionnaire items.

Constructs/Questionnaire Items	Mean	Standard Deviation
Attitude towards purchasing green products	4.102	0.847
ATT1: I think that purchasing green product is favorable	4.081	0.728
ATT2: I think that purchasing green product is a good idea	4.264	0.771
ATT3: I think that purchasing green product is safe	3.962	0.638
Subjective norm	3.424	0.991
SN1: My family think that I should purchase green products rather than normal products	3.372	0.943
SN2: My close friends think that I should purchase green products rather than normal products	3.468	0.991
SN3: Most people who are important to me think I should purchase green products rather than normal products	3.433	0.978
Perceived behavioral control	4.004	0.843
PBC1: I am confident that I can purchase green products rather than normal products when I want	3.560	0.974
PBC2: I see myself as capable of purchasing green products in future	4.218	0.742
PBC3: I have resources, time and willingness to purchase green products	4.342	0.737
PBC4: There are likely to be plenty of opportunities for me to purchase green products	3.894	0.851
Environmental concern	4.125	0.773
EC1: I am very concerned about the state of the world's environment	4.314	0.731
EC2: I am willing to reduce my consumption to help protect the environment	4.481	0.876

Table 2. *Cont.*

Constructs/Questionnaire Items	Mean	Standard Deviation
EC3: Major social changes are necessary to protect the natural environment	3.860	0.832
EC4: Major political change is necessary to protect the natural environment	3.843	0.893
Environmental knowledge	3.789	0.835
EK1: I prefer to check the eco-labels and certifications on green products before purchase	3.874	0.814
EK2: I want to have a deeper insight of the inputs, processes and impacts of products before purchase	3.935	0.762
EK3: I would prefer to gain substantial information on green products before purchase	3.557	0.978
Purchase intention for green products	4.130	0.764
PI1: I intend to purchase green products next time because of its positive environmental contribution	3.893	0.852
PI2: I plan to purchase more green products rather than normal products	4.097	0.813
PI3: I will consider switching to eco-friendly brands for ecological reasons	4.399	0.781

3.3. Tools for Analysis

Data analyses were conducted using the statistical package for social sciences (SPSS 23.0) and analysis of moment structures (AMOS 19.0) software, to achieve the purpose and to test hypotheses of this study. SPSS 23.0 was used for descriptive analysis to analyze preliminary results and to find out the demographic characteristics of the sample. Cronbach's α coefficient was adopted to test the reliability of the measurement items. With AMOS 19.0, confirmatory factor analysis (CFA) was used to assess the adequacy of measurement for confirming the reliability, convergent and divergent validity, followed by using SEM to test the hypothesized relationships among study constructs.

4. Results

4.1. Testing of Reliability and Validity of the Measurement Model

The measurement model fit was assessed through confirmatory factor analysis (CFA) to confirm the factor loadings of the six constructs; attitude, subjective norm, perceived behavioral control, environmental concern, environmental knowledge and purchase intention for green products. Convergent and discriminant validities and the overall fit with data were examined to ensure the model validity and reliability. To test the internal consistency of the indicators of each studied construct, the most common method is to calculate the coefficient alpha of a given construct [117,118]. As shown in Table 3, Cronbach's α coefficients were calculated for internal validity, and the values ranged from 0.808 to 0.943. Nunnally and Bernstein [110] suggested Cronbach's α level beyond 0.700. Therefore, the values obtained suggest that all constructs were internally consistent and reliable.

According to Hair et al. [119], the factor loading should be greater than 0.700. Therefore, all of standardized factor loadings were significant ranging from 0.704 to 0.970. The construct reliability was tested using composite reliability measures that assess the extent to which items in the construct measure the latent concept. Convergent validity of the CFA results should be supported by composite reliability (CR) and the average variance extracted (AVE) [119]. Hair et al. [119] proposed that the estimates of CR and AVE, which measures the amount of variance explained by the given construct, should be higher than 0.700 and 0.500, respectively. As presented in Table 3, the CR and AVE values ranged from 0.812 to 0.946 and 0.591 to 0.856, respectively, surpassing the respective recommended levels of 0.700 and 0.500.

Table 3. Reliability and validity of the constructs.

Construct	Question Item	Cronbach's α	Standardized Factor Loading	Composite Reliability	Average Variance Extracted
Attitude towards purchasing green products (ATT)	ATT1 ATT2 ATT3	0.858	0.891 [a] 0.720 *** 0.854 ***	0.873	0.680
Subjective norm (SN)	SN1 SN2 SN3	0.808	0.705 [a] 0.760 *** 0.834 ***	0.812	0.593
Perceived behavioral control (PBC)	PBC1 PBC2 PBC3 PBC4	0.850	0.704 [a] 0.768 *** 0.830 *** 0.813 ***	0.852	0.591
Environmental concern (EC)	EC1 EC2 EC3 EC4	0.892	0.826 [a] 0.860 *** 0.885 *** 0.856 ***	0.893	0.735
Environmental knowledge (EK)	EK1 EK2 EK3	0.830	0.745 [a] 0.794 *** 0.823 ***	0.830	0.624
Purchase intention for green products (PI)	PI1 PI2 PI3	0.943	0.854 [a] 0.950 *** 0.970 ***	0.946	0.856

Note: *** $p < 0.001$, [a] Values were not calculated because loading was set to 1.000 to fix construct variance.

All CFA results indicated that the measurement model had acceptable convergent and discriminant validities, the hypothesized measurement model was reliable and considerable for examining the structural associations among the constructs. The recommended acceptance of a considerable fit for a model requires that the obtained fit-indices of goodness-of-fit statistic (GFI), the adjusted goodness-of-fit statistic (AGFI), relative fit index (RFI), and normed-fit index (NFI) should be greater than 0.900 [120]. For alternative indices, comparative fit index (CFI) should be greater than 0.950, root mean square error of approximation (RMSEA) should be less than 0.080, and root mean square residual (RMR) should be less than 0.050 [121]. As shown in Table 4, the CFA results showed that the measurement model fit indices were as follows: the chi-square test result was 261.507 with 68 degrees of freedom (df), $p < 0.001$, the ratio of the chi-square value to the df was 3.845, and, according to the standard described by Marsh and Hocevar [122], we achieved a ratio of chi-square to the df ranging between 2 and 5. Furthermore, other fit index values for GFI, AGFI, RFI, NFI, CFI, RMSEA, and RMR were 0.939, 0.918, 0.969, 0.963, 0.971, 0.068, and 0.039, respectively. The results exceeded their respective common acceptance levels. Therefore, the measurement model had a good fit with the data. In addition, Table 5 shows that the inter-correlations among measurement variables in the research model. All correlations were significant ($p < 0.001$).

Table 4. Measurement model fit indices.

Fit Indices	Criteria	Indicators	Sources
Chi-square	$p > 0.050$	261.507 ($p < 0.001$)	[123–126]
Chi-square/df (degree of freedom)	<5.000	3.845 (261.507/68)	
Goodness of Fit Index (GFI)	>0.900	0.939	
Adjusted Goodness of Fit Index (AGFI)	>0.900	0.918	
Relative Fit Index (RFI)	>0.900	0.969	
Normed Fit Index (NFI)	>0.900	0.963	
Comparative Fit Index (CFI)	>0.950	0.971	
Root Mean Square Error of Approximation (RMSEA)	<0.080	0.068	
Root Mean Square Residual (RMR)	<0.050	0.039	

Table 5. Inter-correlations among model variables.

	ATT1	ATT2	ATT3	SN1	SN2	SN3	PBC1	PBC2	PBC3	PBC4	EC1	EC2	EC3	EC4	EK1	EK2	EK3	PI1	PI2	PI3
ATT1	1.000	0.509 ***	0.457 ***	0.448 ***	0.405 ***	0.479 ***	0.302 ***	0.375 ***	0.443 ***	0.539 ***	0.474 ***	0.446 ***	0.453 ***	0.473 ***	0.475 ***	0.307 ***	0.527 ***	0.443 ***	0.489 ***	0.559 ***
ATT2		1.000	0.613 ***	0.535 ***	0.523 ***	0.497 ***	0.451 ***	0.522 ***	0.508 ***	0.486 ***	0.463 ***	0.490 ***	0.507 ***	0.487 ***	0.544 ***	0.457 ***	0.449 ***	0.465 ***	0.442 ***	0.447 ***
ATT3			1.000	0.713 ***	0.407 ***	0.452 ***	0.305 ***	0.285 ***	0.416 ***	0.530 ***	0.460 ***	0.530 ***	0.410 ***	0.592 ***	0.502 ***	0.396 ***	0.502 ***	0.342 ***	0.507 ***	0.581 ***
SN1				1.000	0.454 ***	0.458 ***	0.573 ***	0.385 ***	0.590 ***	0.579 ***	0.448 ***	0.452 ***	0.395 ***	0.381 ***	0.389 ***	0.415 ***	0.327 ***	0.435 ***	0.389 ***	0.402 ***
SN2					1.000	0.452 ***	0.592 ***	0.610 ***	0.566 ***	0.477 ***	0.440 ***	0.409 ***	0.412 ***	0.417 ***	0.554 ***	0.640 ***	0.456 ***	0.464 ***	0.561 ***	0.467 ***
SN3						1.000	0.751 ***	0.435 ***	0.529 ***	0.584 ***	0.428 ***	0.496 ***	0.508 ***	0.455 ***	0.464 ***	0.370 ***	0.444 ***	0.537 ***	0.579 ***	0.465 ***
PBC1							1.000	0.714 ***	0.449 ***	0.510 ***	0.413 ***	0.370 ***	0.427 ***	0.359 ***	0.481 ***	0.484 ***	0.302 ***	0.395 ***	0.489 ***	0.548 ***
PBC2								1.000	0.605 ***	0.511 ***	0.402 ***	0.302 ***	0.428 ***	0.428 ***	0.473 ***	0.510 ***	0.311 ***	0.431 ***	0.581 ***	0.441 ***
PBC3									1.000	0.608 ***	0.550 ***	0.449 ***	0.597 ***	0.404 ***	0.441 ***	0.343 ***	0.437 ***	0.486 ***	0.531 ***	0.480 ***
PBC4										1.000	0.405 ***	0.511 ***	0.484 ***	0.499 ***	0.377 ***	0.369 ***	0.596 ***	0.504 ***	0.559 ***	0.430 ***
EC1											1.000	0.692 ***	0.755 ***	0.544 ***	0.512 ***	0.477 ***	0.499 ***	0.500 ***	0.513 ***	0.585 ***
EC2												1.000	0.601 ***	0.548 ***	0.483 ***	0.375 ***	0.523 ***	0.517 ***	0.372 ***	0.536 ***
EC3													1.000	0.524 ***	0.581 ***	0.465 ***	0.515 ***	0.487 ***	0.482 ***	0.495 ***
EC4														1.000	0.503 ***	0.351 ***	0.463 ***	0.475 ***	0.536 ***	0.452 ***
EK1															1.000	0.523 ***	0.431 ***	0.362 ***	0.524 ***	0.469 ***
EK2																1.000	0.538 ***	0.392 ***	0.532 ***	0.406 ***
EK3																	1.000	0.537 ***	0.496 ***	0.520 ***
PI1																		1.000	0.769 ***	0.530 ***
PI2																			1.000	0.712 ***
PI3																				1.000

Note: *** $p < 0.001$.

4.2. Testing of the Structural Equation Model

SEM was conducted by AMOS 19.0 using a maximum likelihood parameter that evaluated the hypothesized conceptual model of this study (Figure 2). As shown in Table 6, significant and satisfactory goodness-of-fit indices were obtained; χ^2 = 320.991 ($p < 0.001$), df = 71, χ^2/df = 4.521, GFI = 0.949, AGFI = 0.926, RFI = 0.978, NFI = 0.976, CFI = 0.958, RMSEA = 0.065, and RMR = 0.027. All these indices were higher than the suggested goodness-of-fit values [127,128] for the proposed structural model.

Table 7 shows that the results of the structural model, and the standardized path coefficient indicated positive effects among the constructs in the structural model. In total, nine out of eleven hypotheses were supported. The positive relationship between attitude towards purchasing green products and purchase intention for green products (H1: $\beta 1$ = 0.562, t = 8.512, $p < 0.001$) indicated that H1 was supported. According to H2, the positive estimate of coefficients between subjective norm and purchase intention for green products had significant positive effects (H2: $\beta 2$ = 0.307, t = 5.012, $p < 0.01$). Thus, H2 was supported. The impact of perceived behavioral control (H3: $\beta 3$ = 0.405, t = 6.512, $p < 0.001$) had significant positive effects on purchase intention for green products, supporting H3. Environmental concern had significant positive effect on purchase intention for green products (H4: $\beta 4$ = 0.461, t = 6.770, $p < 0.001$), attitude towards purchasing green products (H5: $\beta 5$ = 0.342, t = 6.322, $p < 0.01$) and perceived behavioral control (H7: $\beta 7$ = 0.413, t = 8.921, $p < 0.001$), but not on subjective norm (H6: $\beta 6$ = 0.109, t = 1.498). Thus, H4, H5 and H7 were supported, while H6 was not supported. Finally, environmental knowledge showed significant positive influences on attitude towards purchasing green products (H9: $\beta 9$ = 0.350, t = 4.977, $p < 0.01$), subjective norm (H10: $\beta 10$ = 0.245, t = 3.478, $p < 0.05$) as well as perceived behavioral control (H11: $\beta 11$ = 0.347, t = 6.458, $p < 0.01$), thus supporting H9, H10 and H11. However, environmental knowledge showed no significant influences on purchase intention for green products (H8: $\beta 8$ = 0.045, t = 0.827); hence, H8 was not supported. However, it had indirect effects through attitude towards purchasing green products, subjective norm and perceived behavioral control.
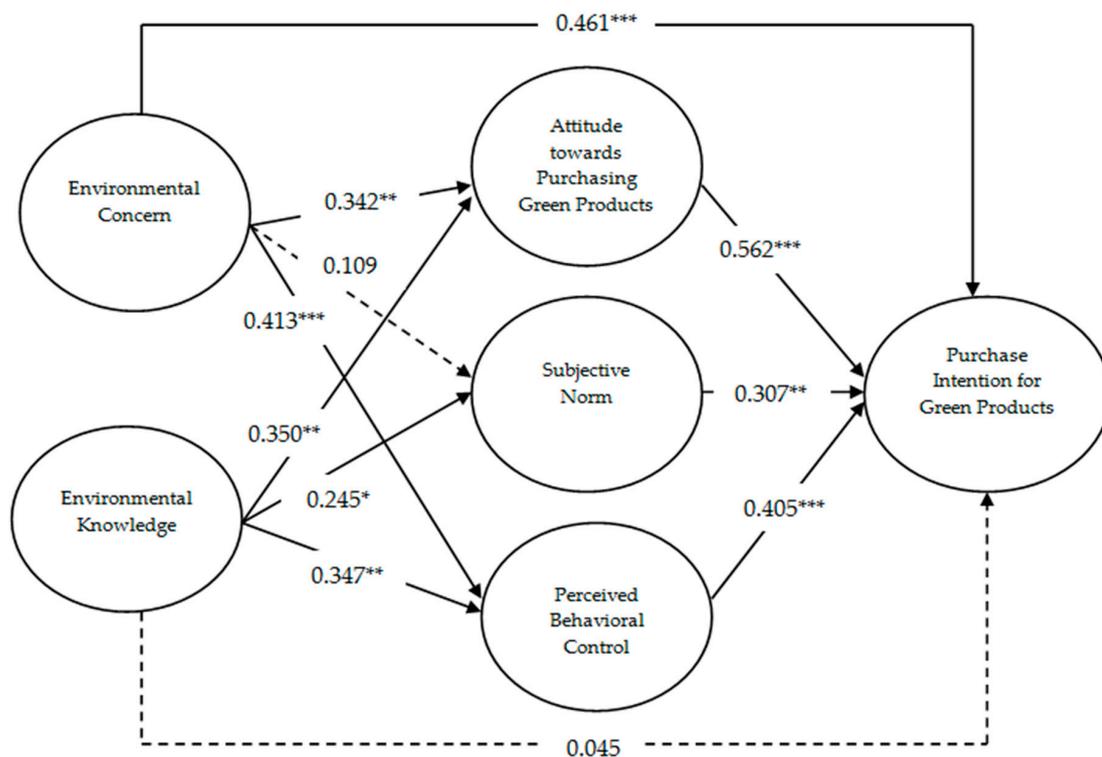

Figure 2. The results of the research model (* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$).

Table 6. Goodness-of-fit indices of the research model.

Fit Indices	Criteria	Indicators	Sources
Chi-square	$p > 0.050$	320.991 ($p < 0.001$)	[124–126]
Chi-square/df (degree of freedom)	<5.000	4.521 (320.991/71)	
Goodness of Fit Index (GFI)	>0.900	0.949	
Adjusted Goodness of Fit Index (AGFI)	>0.900	0.926	
Relative Fit Index (RFI)	>0.900	0.978	
Normed Fit Index (NFI)	>0.900	0.976	
Comparative Fit Index (CFI)	>0.950	0.958	
Root Mean Square Error of Approximation (RMSEA)	<0.080	0.065	
Root Mean Square Residual (RMR)	<0.050	0.027	

Table 7. Hypotheses results for the structural model.

Hypothesis	Path Correlation	Standardized Path Coefficient	*t*-Value	Results
H1	Attitude towards purchasing green products → Purchase intention for green products	0.562 ***	8.512	Supported
H2	Subjective norm → Purchase intention for green products	0.307 **	5.012	Supported
H3	Perceived behavioral control → Purchase intention for green products	0.405 ***	6.512	Supported
H4	Environmental concern → Purchase intention for green products	0.461 ***	6.770	Supported
H5	Environmental concern → Attitude towards purchasing green products	0.342 **	6.322	Supported
H6	Environmental concern → Subjective norm	0.109	1.498	Not supported
H7	Environmental concern → Perceived behavioral control	0.413 ***	8.921	Supported
H8	Environmental knowledge → Purchase intention for green products	0.045	0.827	Not supported
H9	Environmental knowledge → Attitude towards purchasing green products	0.350 **	4.977	Supported
H10	Environmental knowledge → Subjective norm	0.245 *	3.478	Supported
H11	Environmental knowledge → Perceived behavioral control	0.347 **	6.458	Supported

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

5. Discussion and Conclusions

This study examined the extended framework of the TPB model, in which environmental concern and knowledge are added as antecedents of attitude towards purchasing green products, subjective norm and perceived behavioral control. The purpose was to investigate Thai consumers' aged over 18 years and those with a minimum high school education level on the purchase intention of green products. The result suggested that consumers' intention for this group to buy green products can be predicted by attitude, subjective norm; perceive behavioral control, environmental concern as well as environmental knowledge.

Attitude, social norms, and perceived behavioral control were found to have significant positive effects on purchase intention of green products. Attitude had the most significant influence on consumer's purchase intention, which shows that attitude was the strongest predictor of purchase intention for green products followed by perceived behavioral control and lastly subjective norm. The overall results confirmed that the TPB model and its measures were suitable for the studied group. Ajzen [68] observed that the more the positive attitude consumers have towards purchase behavior, the stronger the consumer's intentions to perform a behavior under their control. According to Tanner and

Kast [129], the positive attitude of consumers towards environmental protection strongly facilitates purchasing green products. The empirical finding reported that subjective norms have lower influence on purchase intention for green products when compared to attitude and perceived behavioral control of the TPB model. The result of subjective norms indicate that friends/family members' influence resulted to a little thrust concerning the reasons to buy green products for consumers [14]. Perceived behavioral control has a direct influence on intention behavior according to the TPB model [68]. Therefore, the concept of perceived effectiveness of an individual's actions and their applications to products were considered effective in promoting favorable attitudes and sustainable consumption behaviors, resulting in being a major driving force in the competitive market. This relationship has a great influence in green marketing because perceived behavioral control has been considered a good indication of the individuals' intentions to purchase green products [2,78,130].

Environmental concern was found to be significant and positive for attitude, perceived behavioral control and purchase intention for green products, which is supported by the findings of Chen and Tung [73], and Paul et al. [2]. In addition, this study suggests that environmental concern does not influence subjective norm among the studied group in Thailand.

Environmental knowledge was found to have significant positive influence for attitude, subjective norm, and perceived behavioral control for green products. Consumers will have a positive attitude towards purchasing green products if they have a high level of environmental knowledge; therefore, environmental knowledge has a significant role in environmental behavior. Kumar [22] showed that environmental knowledge has a significant positive relationship with attitude towards green products. In another aspect, the environmental knowledge failed to provide any positive thrust concerning the reason of purchase intention for green products, just as shown by Ahmad and Thyagaraj [131], and Chekima [132]. However, indirect effects were observed.

Our findings highlight several implications that may help in developing sound strategies for green products and their purchase intentions. Attitude towards purchasing green products, subjective norm and perceived behavioral control had high significant effect on the purchase intention with attitude having a strongest influence, followed by perceived behavioral control and lastly subjective norm. With attitude exerting a stronger influence than the subjective norm, marketers should try to attract the attention of Thai consumers towards green products using infomercials and promotions as this could help in influencing the consumers to purchase green products. Environmental knowledge had no significant effect on purchase intention for green products; however, it showed indirect effects through three TPB variables. For example, taking attitude towards purchasing green products as a mediator to purchase intention, Thai consumers who are knowledgeable about the environment and have positive attitudes make favorable adjustments towards purchase intention for green products. Environmental concern is among the strongest influences on the purchase intention for green products, suggesting that the government, private sector, entrepreneur, and marketers should develop public interventions showcasing how consumption of green products by the environmentally concerned could help in reducing adverse impacts on the environment. This could help increase the consumers' purchase intention for green products and also impact positively the environment within Thailand.

6. Limitations and Future Directions

The limitations and future directions of this study can be summarized in three points. First, the study considers green products in general instead of specific green products, so the findings could be different for different products. Future research should test the proposed model for various specific green products, such as organic products, recycled products, green toys, eco-car, green certified products, green restaurant, green hotels and so on. Second, the longitudinal approach is suggested as part of the research methods for further research to ascertain the change of attitude and purchase intention. Such an approach would be very useful in observing the reactions of consumers who intend to purchase more sustainable products towards green products and could also help us to understand

how the behavioral intentions and attitudes are developed and influenced [133]. Finally, future studies may include samples from a diverse demographic population for more informed findings.

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