

## Article

# Research on the Green Purchase Intentions from the Perspective of Product Knowledge

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**Abstract:** Based on the theory of planned behavior, the moderating effects of product knowledge on the relationships between three independent variables and green purchase intentions were explored. Independent variables included green purchase attitudes, subjective norms, and perceived behavior control. After that, the difference of moderating effects of product knowledge between convenience goods and shopping goods was further analyzed. The scales of the study passed the test of reliability and validity through confirmatory factor analysis, and 306 valid questionnaires were collected. The hypotheses were tested by stepwise regression analysis. The results of the study showed that product knowledge had a significant moderating effect on the relationship between three independent variables and green purchase intentions, and the explanatory power of three independent variables would decrease in the context of high product knowledge. Interesting conclusions were reached from the perspective of product classification. This study contributes to the literature by treating product knowledge as a moderating variable in the theory of planned behavior in the field of green purchase behavior and exploring from a new research angle—the perspective of product classification.

**Keywords:** attitudes; subjective norms; perceived behavior control; product knowledge; green purchase intentions; moderating effects

## 1. Introduction

As air, land, water pollution, and other environmental issues are becoming more and more serious in China, the public feel that their daily lives are facing threats from environmental pollution. Out of the motivation of altruism or self-benefit, more and more consumers pay attention to green products, such as organic foods and new energy vehicles. Due to the growing importance of green consumption, green buying behavior has become a popular research subject. Extant research defined green buying as a kind of environmentally friendly behavior, which refers to purchasing less polluting products [1,2].

According to the prior studies, green purchase intentions were affected by different factors, including environmental concern, attitudes, product price, and perceived consumer effectiveness. Laroche et al. pointed out that consumers with higher levels of environmental concerns would be more likely to exert environmentally friendly consumption [3]. Balderjahn believed that attitudes were the main predictor of environmental friendly behavior [4]. Although consumers professed strong support for green products, they were still sensitive to price when it came to buying green products. Kim and Choi argued that individuals with higher perceived consumer effectiveness were more likely to engage in environmentally friendly behavior [5]. Meanwhile, several scholars found that product knowledge could exert influence on consumer purchase behavior [6].

However, the findings of previous research were not consistent. Some scholars pointed out that product knowledge positively correlated with green buying intentions [7,8], while Kim

put forward that product knowledge had no significant impact on green purchase intentions [9]. In fact, prior research mainly analyzed the direct impact of product knowledge on green purchase behavior, and ignored the possibility that product knowledge could play a role of moderator. In addition to product knowledge, product classification may also act as a moderating variable. According to the degree of purchasing effort, products could be divided into three categories, namely convenience goods, shopping goods, and specialty goods [10]. Until now, none of earlier studies has explored the moderating effects of product knowledge in the field of green buying behavior, particularly from the perspective of product classification. Therefore, it is meaningful to carry out the study to enrich the literature. Based on the research of Gleim [11], we defined product knowledge as a construct including familiar with the products, label information, and trust in certification organizations.

To bridge the gap in the literature, this study aimed to explain the moderating effects of product knowledge based on the theory of planned behavior (TPB). The TPB is one of the most basic and influential theories of behavior decisions, and has been widely used in past research on green consumption behavior. In the TPB it is postulated that behavior is predicted by intentions which, in turn, is predicted by three social-cognitive factors: attitudes, subjective norms, and perceived behavior control [12]. Following this vein, the study differentiated from other studies by regarding product knowledge as a moderating variable and exploring its moderating effects on the relationships between attitudes and green purchase intentions, subjective norms and green purchase intentions, and perceived behavior control and green buying intentions. Additionally, the study further detected the difference of moderating effects of product knowledge between convenience goods and shopping goods, which was the new and interesting angle of research. The purpose of the study was to analyze the green purchase intentions from the perspective of product knowledge and product classification and further extend the application of the theory of planned behavior to the field of green purchase behavior.

## 2. Literature Review

### 2.1. Product Knowledge

Barrutia pointed out that consumers' product knowledge could directly influence their cognition of product attributions and evaluation criterion, which would further influence consumers' abilities to collect and handle information [13]. Betty and Gleim argued that product knowledge meant consumers' perceived knowledge of specific products [14], while Dacin and Mitchell considered that product knowledge was composed of concrete knowledge, indirect knowledge, and consumer feelings [15]. Therefore, as mentioned above, product knowledge in this study comprised familiarity with the products, label information, and trust in certification organization.

### 2.2. Green Purchase Attitudes

Attitudes are defined as an individual's positive or negative evaluation of self-performance of the particular behavior. Green purchase attitudes refer to the degree to which performance of green purchase behavior is positively or negatively valued. Many scholars found that attitudes had significant influence on green purchase intentions [16,17]. Attitudes include cognition attitudes and feeling attitudes [18]. Meanwhile, Chan pointed out that environmental awareness and price sensitivity also largely reflected the degree of green buying attitudes [19]. Therefore, attitudes in this study also involved these aspects.

### 2.3. Subject Norms

Subjective norms refer to the perceived social pressure that an individual feels to perform or not perform a particular behavior [12]. It is assumed that subjective norms are determined by a set of accessible normative beliefs concerning the expectations of important referents, such as family members, relatives, friends, colleagues, and so on. In fact, many researchers pointed

out that individual-consuming decisions were largely influenced by the attitudes of friends, family members, and other groups that were important to individuals [20]. In other words, the individual consumer was more likely to act in a manner corresponding with group beliefs; therefore, subjective norms could predict behavioral intentions to some degree.

#### 2.4. Perceived Behavior Control

According to Stern, perceived behavior control demonstrated the acquisition of opportunity and resources, such as skills and cooperation with others [21]. By adding perceived behavior control as an additional predictor, the TPB has a broader explanatory power toward non-volitional behavior. In the field of green purchase behavior, perceived behavior control can mediate behavior by changing situational factors, like economic cost, availability of product information, product availability, and ease of use, which reflect the individual's perception of the ease or difficulty in performing the task [22].

#### 2.5. Green Purchase Intentions

Green purchase intentions refer to an individual's readiness to perform green buying behavior, mainly reflecting the consideration of less pollution. It is assumed to be an immediate antecedent of behavior. Chen et al. defined green purchase intentions as the possibility that consumers would like to purchase environmentally friendly products [23]. Roe et al. argued this meant consumers bought green products in order to protect or not destroy the environment [24]. Chan put forward that green purchase intentions could be measured by three items, namely considering buying green products, switching to other brands for ecological reasons, and switching to a green version of a product [19].

However, existing research has not formed a consensus on how product knowledge affects green purchase intentions. This study explored the moderating effect of the product knowledge respectively on the relationships between attitudes and green purchase intentions, subjective norms and green purchase intentions, and perceived behavior control and green purchase intentions.

### 3. Hypotheses Development

#### 3.1. Attitudes, Perceived Behavior Control, Subjective Norms, and Green Purchase Intentions

Most studies suggested that green purchase attitudes would affect the green purchase intentions. The results of Fraj and Martinez showed that environmental attitudes had a significant positive impact on ecological behaviors [25]. Attitudes would determine a person's buying preference, and it was one of the most important predictors of green buying behavior [26]. As an important antecedent, subjective norms were expected to have direct influence on behavioral intentions, and this assumption had been manifested by lots of research [27]. Collectivist culture in Chinese society results in social norms playing an important role in the purchase decision-making process, and evaluations made by reference group members are key factors affecting consumption choices. Kim and Choi concluded that collectivism had a positive impact on the consumers' green buying behavior [5]. Kraft et al. pointed out that perceived behavior control was the confidence for consumers to complete a behavior, and the confidence depended on the perception of their own ability [28]. Hagger et al. found the positive impact of perceived behavior control on behavior intentions [29]. We deduced that the same situation would appear again in the field of green buying behavior. Therefore, the study proposed the following hypothesis:

*H1: Green purchase attitudes, subjective norms, and perceived behavior control have significant positive impacts on green purchase intentions.*

#### 3.2. The Moderating Effects of Product Knowledge

Product knowledge could exert impact on purchase decision making process, because it will enable consumers to have a better understanding of the products and increase rational consideration.

Synodinos put forward that increasing consumers' product knowledge would promote positive attitudes to green purchase intentions [30]. Chang argued that the spread of information had a positive impact on green purchase intentions [31]. In the case of more product knowledge, consumers would know traits of green products better, and be inclined to make purchase decisions based on rational thinking rather than feelings. Generally, more product knowledge will lead to stronger green purchase intentions because of better understanding of functional attributes or the price/performance ratio of green products. Therefore, the explanatory power of attitudes would decline. In the case of less product knowledge, consumers making purchase decisions mainly depend on their emotion, thus, the explanation of attitudes would enhance. Therefore, product knowledge would play an important role to moderate the relationship between attitudes and green purchase intentions. Based on the above analysis, this study proposed the following hypothesis:

*H2: Product knowledge has a moderating effect between attitudes and green purchase intentions.*

Shopping goods are something that customers repeatedly compare the utility, quality, price, and other basic attributes of products before making purchase decisions. So, when consumers consider shopping goods, they will have a higher degree of involvement than when considering convenience goods, which includes seeking information, understanding information, and taking effort to find green products [32]. In other words, consumers will be more rational and objective in the treatment of product information [33]. Under this situation, it can be expected that consumers are not likely to refuse to buy green products only because of attitudes bias. As for convenience goods, consumers may pay less attention to product knowledge because of their low-value and frequent purchase. Then it can be expected that consumers would be inclined to accept or refuse green daily products mainly according to their attitudes bias or brand loyalty. Therefore, this study proposed the following hypothesis:

*H3: The moderating effect of product knowledge on the relationship between purchase attitudes and green purchase intentions in shopping goods is stronger than that in convenience goods.*

Subjective norms reflect the perceived social pressure that individual feels to engage in a target behavior, and are determined by a set of beliefs that relate to culture values. Individualist and collectivist orientations have been found to influence a variety of social behaviors, including green purchase behavior [7]. In Chinese society, a collectivist culture is the mainstream culture and social outcomes play a role in consumers' purchase decision-making processes [20]. If consumers master more product knowledge, they would tend to depend on themselves to make purchase decisions rather than to rely on the decisions made by reference group members. Oppositely, when consumers only master less product knowledge, they have less confidence about themselves and are inclined to imitate other reference group members' purchase behavior. Thus, the study put forward the following hypothesis:

*H4: Product knowledge has a moderating effect between subjective norms and green purchase intentions.*

Since shopping goods are more important and more expensive for consumers than convenience goods, consumers will put more effort into the process of purchase decision-making and will put more emphasis on their own interests. In other words, the importance of evaluation that was put forward by other reference group members declines. As to convenience goods, consumers are more likely to engage in green purchase behavior, because they tend to be more cooperative and emphasize group goals over personal ones [7]. Therefore, we inferred that product knowledge could exert greater effects on the relationship between subjective norms and green purchase intentions in the case of purchase shopping goods. Therefore, this study proposed the following hypothesis:

*H5: The moderating effect of product knowledge on the relationship between subjective norms and green purchase intentions in shopping goods is stronger than that in convenience goods.*

Good resource conditions can increase the possibility of green consumption behavior and reduce barriers. Individuals who have more product knowledge could better understand the value of green products, and are more likely to take efforts to adopt green purchase behaviors [34]. In contrast, individuals with less product knowledge are not familiar with green products and lack motivation to overcome barriers [35]. In other words, once facing lower perceived behavior control, those consumers would think of a lot of negative effects of green purchase behavior, such as wasting their energy or money. Therefore, in the case of more product knowledge, the predictive power of perceived behavior control would decline, and the opposite situation would happen in the case of less product knowledge. Based on the above analysis, this study proposed the following hypothesis:

*H6: Product knowledge has a moderating effect between perceived behavior control and green purchase intentions.*

Convenience goods are often required and do not need to spend a lot of time, money, and energy to buy. Therefore, consumers have relatively low purchase involvement and do not pay much attention to product knowledge of convenience products. When consumers have more product knowledge, they have more motivation to take efforts to implement green purchase behaviors, especially facing shopping goods. As to convenience goods, consumers are not cautious about making an accurate judgment about functional attributes of products [36], and are more likely to refuse to buy green products because of time, money, and other limitations which affect the perceived behavior control. Based on this, the following assumptions were put forward:

*H7: The moderating effect of product knowledge on the relationship between perceived behavior control and green purchase intentions in shopping goods is stronger than that in convenience goods.*

## 4. Methodology and Measurement

### 4.1. Questionnaire Design

The survey questionnaire listed eight categories of green products, among which green foods, non-phosphate detergent, water-saving taps, mercury-free battery, and recycled paper represented convenience goods, while energy efficient air conditioner, an energy-saving lamp, and a new green energy vehicle represented shopping goods. Therefore, five categories belonged to convenience goods and three categories belonged to shopping goods, reflecting reality that there were more categories of green convenience goods in the market. Respondents of the study were asked to choose one that they were most familiar with, and then completed the questionnaire. By this means, the survey data were collected, including attitudes, subjective norms, perceived behavior control, product knowledge, and green purchase intentions. The development of the questionnaire was mainly based on the extant literature about green consumption. The scale items of green purchase intentions and attitudes were, respectively, mainly derived from studies of Bagozzi et al. [18], and Gleim [11]. The scale items of perceived behavior control and product knowledge originated, respectively, from scales developed by Fielding [37] and Gleim [11]. The subjective norms scale was mainly developed by Lao [38], and the minor modification was made according to the actual situation. This study applied a 7-point Likert scale to measure, from 1–7, ranging from strongly disagree to strongly agree. As a whole, the questionnaire included five variables and 18 items, as shown in Table 1.

According to the different types of green products that respondents chose, the questionnaires were divided into two groups, namely the convenience goods group and the shopping goods group. Eventually, 306 valid questionnaires were collected, among which 166 questionnaires belonged to the convenience goods group, and 140 questionnaires belonged to the shopping goods group.

**Table 1.** Variable design.

Variables	Items
Green purchase attitudes (GPA)	Green purchase brings us more benefits than non-green purchase (GPA1) Buying green energy-saving products will make me happy (GPA2) Buying a product, I will consider how it will affect the environment (GPA3) I am willing to spend a little more money to buy green products (GPA4)
Subjective norms (SN)	I think this kind of green products is more in line with my moral values (SN1) I think this type of green products more in line with the wishes of my relatives and friends (SN2) I think this kind of green products is in consistent with the trend of social development (SN3)
Perceived behavior control (PBC)	It's easy to buy a green product (PBC1) I can't decide whether to buy this kind of product (PBC2) It is very likely I will choose green products next time (PBC3) Buying habits will have a strong impact on decision making (PBC4) Past purchase experience will have a strong impact on decision-making (PBC5)
Product knowledge (PK)	I am familiar with this kind of green products (PK1) When buying green products, I read the specific information on the label (PK2) I believe in testing and identifying green products that are implemented by certification organizations (PK3)
Green purchase intentions (GPI)	Comparing with ordinary non-green products, I am more willing to buy green products. (GPI1) The next time to buy, the possibility of choosing green products is very high. (GPI2) The next time to buy, the desire to choose green products is not strong (GPI3)

#### 4.2. Data Collection and the Sample Profile

The survey was administered by a survey company—Sojump. This online survey company, which is very popular in China, has over 2.6 million respondents from all over the country, and many scholars collect research data in this manner. The online survey was conducted in April 2015, and we obtained 345 questionnaires, of which 306 were considered valid. Among 306 respondents, the percentages of male and female were, respectively, approximately 41% and 59%, and the percentage of monthly income above and below 4000 RMB were, respectively, 37% and 63%. The descriptive statistics of sample were shown in Table 2.

**Table 2.** The descriptive statistics of sample.

		Number	Percentage (%)
Gender	male	124	40.5%
	female	182	59.5%
Age	25 years old and below	168	54.9%
	26–45 years old	96	31.4%
	45 years old and above	42	13.7%
Degree of Education	junior college and below	22	7.2%
	undergraduate	258	84.3%
	graduate student and above	26	8.5%
Income level	4000 RMB and below	193	63.1%
	4001–6000 RMB	24	7.8%
	6000 RMB and above more	89	29.1%

## 5. Empirical Results

### 5.1. Reliability and Validity

This questionnaire included the measurement scales of purchase attitudes, subjective norms, perceived behavior control, product knowledge, and green purchase intentions, mainly based on previous studies. Meanwhile, items of the scales were discussed and adjusted by three experts, and those items were considered to be appropriate. Therefore, it could be deduced that the scales have



enough content validity. Since most scales of the study were derived from extant scales, which had enough reliability and validity, we carried out confirmatory factor analysis directly to test construct validity of the scales in the study.

Construct validity includes convergent validity and discriminate validity. Table 3 shows convergent validity of the scales. Items of GPI3 and PBC2 were deleted because of lower loading coefficients. After that, it can be seen that each item's loading coefficient on the variable was more than 0.5, and the combined reliability of each variable was higher than 0.7, while the average extraction variance (AVE) of each variable was greater than 0.5. According to the criteria for the evaluation of validity of Hair (2006) [39], we reached the conclusion that the scales passed through the test of convergent validity.

**Table 3.** Convergent validity of the scales.

Variables	Items	Loading Coefficient	Combined Reliability (CR)	The Average Variance Extracted (AVE)
GPA	GPA1	0.797	0.915	0.730
	GPA2	0.884		
	GPA3	0.872		
	GPA4	0.861		
SN	SN1	0.914	0.913	0.778
	SN2	0.850		
	SN3	0.881		
PBC	PBC1	0.668	0.883	0.655
	PBC3	0.845		
	PBC4	0.879		
	PBC5	0.829		
PK	PK1	0.797	0.875	0.701
	PK2	0.856		
	PK3	0.857		
GPI	GPI1	0.961	0.960	0.924
	GPI2	0.961		

Table 4 shows discriminate validity of the scales. Analysis results showed that the arithmetic square root of the AVE of purchase attitudes, subjective norms, perceived behavior control, product knowledge, and green purchase intentions were all greater than the correlation coefficient with other variables, indicating good discriminate validity.

**Table 4.** Discriminate validity of the scales.

	Green Purchase Attitudes	Subjective Norms	Perceived Behavior Control	Product Knowledge	Green Purchase Intentions
Green purchase attitudes	0.854				
Subjective norms	0.829	0.882			
Perceived behavior control	0.682	0.695	0.809		
Product knowledge	0.783	0.709	0.701	0.837	
Green purchase intentions	0.715	0.757	0.711	0.665	0.961

Note: the data in the matrix diagonal was the arithmetic square root of the latent variables of average extraction variance and the others are correlation coefficients.

Fitness tests were implemented by evaluating the degree of consistency between the internal structure and the actual data. The main fitness indicators are shown in Table 5. The ratio of chi square and degree of freedom was 1.926, less than 2; the value of RMSEA (Root Mean Square Error of Approximation) was 0.055, less than 0.08; the value of GFI (Goodness of Fit Index), IFI (Incremental Fit Index), and TLI (Tucker-Lewis Index) were, respectively, 0.937, 0.979 and 0.970, greater than 0.9; meanwhile, the values of PNFI (Parsimony Normed Fit Index) and PCFI (Parsimony Goodness of Fit Index) were greater than 0.5. All of these goodness-of-fit indicators represented a very good fitness and the measurement scales could be accepted.

**Table 5.** Key indicators of fitness

Key Indicators	$\chi^2/df$	RMSEA	GFI	IFI	TLI	PNFI	PCFI
Value	1.926	0.055	0.937	0.979	0.970	0.686	0.701
Fitness judgment	excellent	better	better	excellent	excellent	excellent	excellent

### 5.2. The Relationship between Attitudes and Green Purchase Intentions

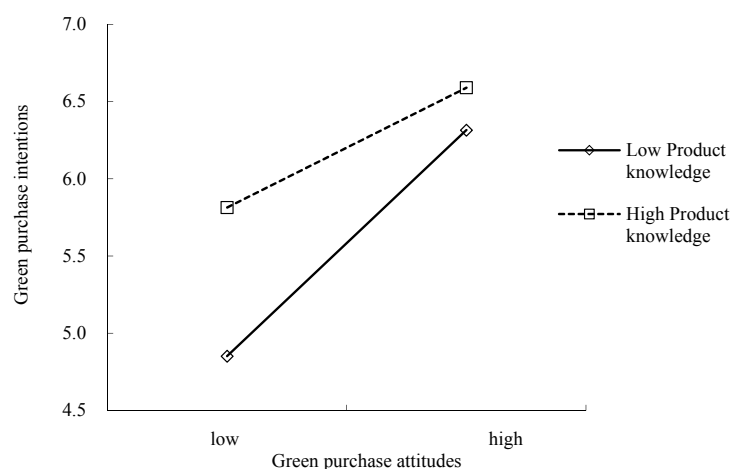
In order to investigate the moderating effects of product knowledge, the data should be processed by centralization [40]. Thus, we first centralized the data, and then established the relationship model of green purchase attitudes, product knowledge, and green purchase intentions. After that, stepwise regression analysis was applied to test the hypothesis. The independent variables included attitudes, product knowledge, and interaction of these two variables and they were, in turn, put into the regression model to predict the dependent variable, namely green purchase intentions [41]. The results of the analysis are shown in Table 6. From the model 1, it could be seen that attitudes had a significant positive impact on green purchase intentions ( $\hat{\alpha} = 0.715$ ,  $p < 0.01$ ).

**Table 6.** Regression coefficients of purchase attitudes and product knowledge.

Variables	Green Purchase Intentions (GPI)		
	Model 1	Model 2	Model 3
Green purchase attitudes (GPA)	0.715 **	0.500 **	0.452 **
Product knowledge (PK)		0.274 **	0.232 **
GPA $\times$ PK			−0.241 **
Adjusted $R^2$	0.509	0.537	0.586
$\Delta R^2$		0.029	0.051

Note: \*\* indicates a significant level of  $p < 0.01$ ; \* indicates a significant level of  $p < 0.05$ .

According to model 2 and model 3 in Table 6, we could safely draw the conclusions that: (1) green purchase attitudes had a significant positive effect on green purchase intentions; and (2) product knowledge had a moderating effect on the relationship between green purchase attitudes and green purchase intentions ( $\hat{\alpha} = -0.241$ ,  $p < 0.01$ ). In order to explain the moderating effect of product knowledge more directly, the simple slope diagram of the interaction between green purchase attitudes and green purchase intentions was drawn. As shown in Figure 1, the two lines cross-trend is obvious, indicating that there is a significant moderating effect. We found that in the case of low product of knowledge, the effect of green purchase attitudes on green purchase intentions was stronger. Therefore, hypothesis 2 was supported.

**Figure 1.** The effect of interaction of green purchase attitudes and product knowledge on green purchase intentions.



### 5.3. The Relationship between Subjective Norms and Green Purchase Intentions

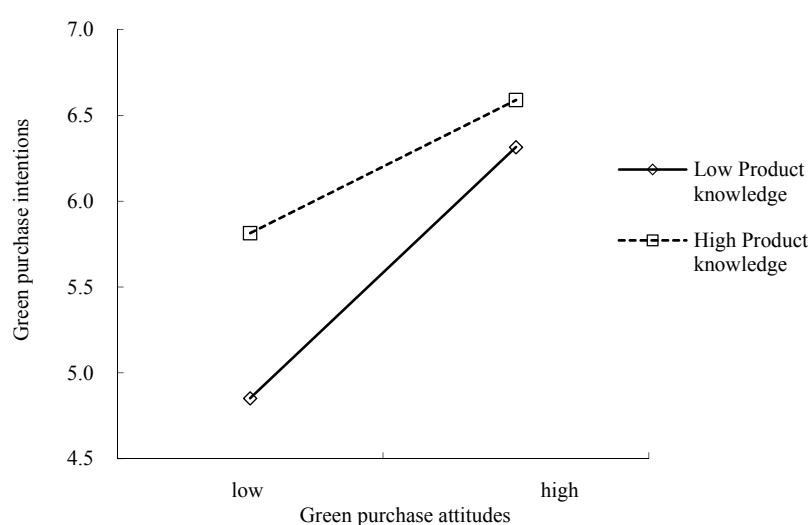
Similarly, we set up the relationship model of subjective norms, product knowledge, and green purchase intentions. By model 1 in Table 7, subjective norms had a significant positive impact on green purchase intentions ( $\hat{\alpha} = 0.757, p < 0.01$ ), which indicated that higher subjective norms lead to more intense green purchase intentions.

**Table 7.** Regression coefficients of subjective norms and product knowledge.

Variables	Green Purchase Intentions (GPI)		
	Model 1	Model 2	Model 3
Subjective norm (SN)	0.757 **	0.574 **	0.484 **
Product knowledge		0.258 **	0.245 **
SN $\times$ PK			−0.213 **
Adjusted $R^2$	0.572	0.604	0.638
$\Delta R^2$		0.033	0.035

Note: \*\* indicates a significant level of  $p < 0.01$ ; \* indicates a significant level of  $p < 0.05$ .

According to the model 2 and model 3 in Table 7, the results of this study indicated that: (1) subjective norms had a significant positive effect on green purchase intentions; and (2) the moderating effect of product knowledge on the relationship between subjective norms and green purchase intentions was significant ( $\hat{\alpha} = -0.213, p < 0.01$ ). As it can be seen from Figure 2, the two lines cross-trend is obvious, representing that there was a significant moderating effect. Therefore, hypothesis 4 was supported. In the case of low product knowledge, the influence of subjective norms on green purchase intentions was more apparent.



**Figure 2.** The effect of interaction of subjective norms and product knowledge on green purchase intentions.

### 5.4. The Relationship between Perceived Behavior Control and Green Purchase Intentions

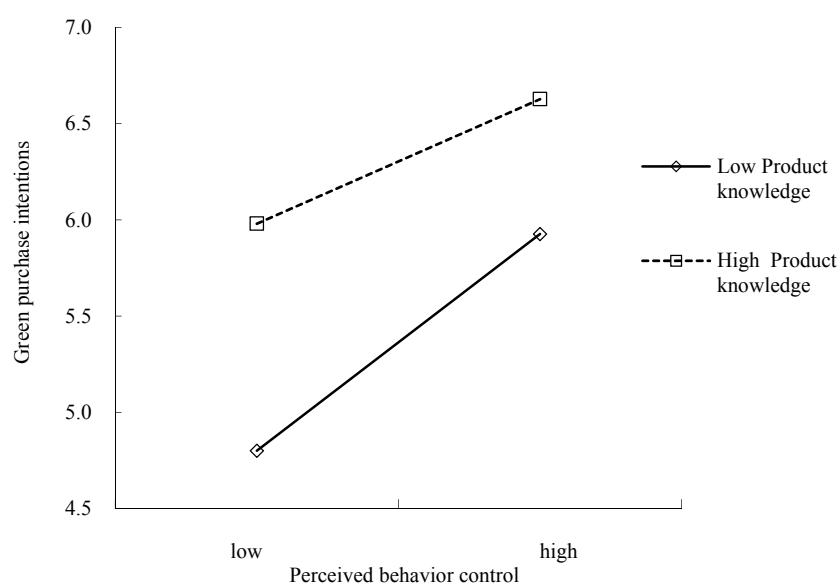
We established the relationship model of perceived behavior control, product knowledge, and green purchase intentions. By model 1 in Table 8, perceived behavior control had a significant positive impact on green purchase intentions ( $\hat{\alpha} = 0.696, p < 0.01$ ), which indicated that higher perceived behavior control would lead to more intense green purchase intentions. By integrating the research results of each model 1, which were showed, respectively, in Tables 6–8, hypothesis 1 was supported, and that meant that green purchase attitudes, subjective norms, and perceived behavior control had significant positive impacts on green purchase intentions.

**Table 8.** Regression coefficient of perceived behavior control and product knowledge.

Variables	Green Purchase Intentions (GPI)		
	Model 1	Model 2	Model 3
Perceived behavior control (PBC)	0.696 **	0.455 **	0.365 **
Product knowledge		0.366 **	0.353 **
PBC $\times$ PK			−0.189 **
Adjusted $R^2$	0.482	0.557	0.582
$\Delta R^2$		0.076	0.026

Note: \*\* indicates a significant level of  $p < 0.01$ ; \* indicates a significant level of  $p < 0.05$ .

According to the model 2 and model 3 in Table 8, the results of this study indicated that: (1) perceived behavior control had a significant positive effect on green purchase intentions; and (2) the moderating effect of product knowledge on the relationship between perceived behavior control and green purchase intentions was significant ( $\hat{\alpha} = -0.189$ ,  $p < 0.01$ ). In order to explain the moderating effect of product knowledge more directly, the simple slope diagram of the interaction between perceived behavior control and product knowledge was given. As it can be seen from Figure 3, there is a cross-trend between the two lines, representing a moderating effect. Therefore, hypothesis 6 was supported. When individuals mastered less products knowledge, the influence of perceived behavior control on green purchase intentions was more intense.

**Figure 3.** The effect of interaction of perceived behavior control and product knowledge on green purchase intentions.

### 5.5. Analysis from the Perspective of Product Classification

It was confirmed in the study that product knowledge had moderating effects on the relationship between attitudes and green purchase intentions, subjective norms and green purchase intentions, perceived behavior control and green purchase intention. Further, we explored the moderating effects of product knowledge from the perspective of product classification. As mentioned in the section of “questionnaire design”, 306 questionnaires were divided into two groups, namely the convenience goods group and the shopping goods group, respectively, including 166 questionnaires and 140 questionnaires.

### 5.5.1. Interaction Effects of Attitudes and Product Knowledge

After the questionnaires were classified into two groups, we conducted data centralization and established the relationship models of green purchase attitudes, product knowledge, and green purchase intentions, respectively, from the perspective of convenience goods and shopping goods. Similarly, stepwise regression method was applied to test the moderating effects of product knowledge. The results of the analysis are shown in Table 9.

**Table 9.** Coefficients of attitudes and product knowledge based on product classification.

Product Categories	Variables	Green Purchase Intentions (GPI)		
		Model 1	Model 2	Model 3
Convenience goods	Green purchase attitudes (GPA)	0.602 **	0.352 **	0.353 **
	Product knowledge (PK)		0.419 **	0.368 **
	GPA $\times$ PK			−0.212 **
	Adjusted R <sup>2</sup>	0.359	0.470	0.510
	$\Delta R^2$		0.113	0.043
Shopping goods	Green purchase attitudes (GPA)	0.719 **	0.394 **	0.364 **
	Product knowledge (PK)		0.428 **	0.304 **
	GPA $\times$ PK			−0.299 **
	Adjusted R <sup>2</sup>	0.514	0.589	0.655
	$\Delta R^2$		0.077	0.068

Note: \*\* indicates a significant level of  $p < 0.01$ ; \* indicates a significant level of  $p < 0.05$ .

The results of model 1 indicated that, regardless of the convenience or shopping goods, green purchase attitudes had a significant positive impact on green purchase intentions. Results of model 2 and model 3 indicated that, whether it was convenience or shopping goods, product knowledge had a moderating effect on the relationship between attitudes and green purchase intentions. The interaction coefficients of green purchase attitudes and product knowledge were, respectively, −0.212 and −0.299; therefore, it could be concluded that the moderating effect of product knowledge was more significant in shopping goods, and hypothesis 3 was supported.

### 5.5.2. Interaction Effects of Subjective Norms and Product Knowledge

Based on the product classification of convenience goods and shopping goods, we separately set up the relationship model of subjective norms, product knowledge and green purchase intentions. The results of stepwise regression are shown in Table 10.

**Table 10.** Coefficients of subjective norms and product knowledge based on product classification.

Product Categories	Variables	Green Purchase Intentions (GPI)		
		Model 1	Model 2	Model 3
Convenience goods	Subjective norms (SN)	0.654 **	0.418 **	0.415 **
	Product knowledge (PK)		0.338 **	0.287 **
	SN $\times$ PK			−0.254 **
	Adjusted R <sup>2</sup>	0.424	0.480	0.540
	$\Delta R^2$		0.059	0.062
Shopping goods	Subjective norms (SN)	0.772 **	0.520 **	0.425 **
	product knowledge (PK)		0.329 **	0.300 **
	SN $\times$ PK			−0.214 **
	Adjusted R <sup>2</sup>	0.593	0.635	0.665
	$\Delta R^2$		0.044	0.032

Note: \*\* indicates a significant level of  $p < 0.01$ ; \* indicates a significant level of  $p < 0.05$ .

Model 1 in Table 10 demonstrated that subjective norms had a significant positive impact on green purchase intentions, whether in convenience goods or shopping goods. Model 2 and model 3 further indicated that subjective norms had a moderating effect on the relationship between subjective norms and green purchase intentions. According to analysis results, the interaction coefficients of subjective norms and product knowledge were respectively −0.254 and −0.214. By contrast, the moderating

effect of subjective norms was more apparent in convenience goods than in shopping goods, which was contrary to the expectations, and hypothesis 5 was rejected. The possible reason lies that social values in China are changing from collectivism to individualism, and young consumers are inclined to make purchase choices mainly by themselves, especially in convenience goods.

### 5.5.3. Interaction Effects of Perceived Behavior Control and Product Knowledge

In order to test the interaction effects of perceived behavior control and product knowledge from the perspective of product classification, we separately established the relationship model of perceived behavior, product knowledge and green purchase intentions. The results of stepwise regression are shown in Table 11.

**Table 11.** Coefficients of PBC and product knowledge based on product classification.

Product Categories	Variables	Green Purchase Intentions (GPI)		
		Model 1	Model 2	Model 3
Convenience goods	perceived behavioral control (PBC)	0.682 **	0.473 **	0.424 **
	product knowledge (PK)		0.317 **	0.304 **
	PBC $\times$ PK			−0.178 **
	Adjusted R <sup>2</sup>	0.462	0.516	0.542
	$\Delta R^2$		0.057	0.028
Shopping goods	perceived behavioral control (PBC)	0.843 **	0.729 **	0.617 **
	product knowledge (PK)		0.142	0.119
	PBC $\times$ PK			−0.224 **
	Adjusted R <sup>2</sup>	0.709	0.714	0.745
	$\Delta R^2$		0.007	0.033

Note: \*\* indicates a significant level of  $p < 0.01$ ; \* indicates a significant level of  $p < 0.05$ .

Model 1 in Table 11 demonstrated that perceived behavior control had a significant positive impact on green purchase intentions, whether in convenience goods or shopping goods. Compared with convenience goods, the impact strength of perceived behavior control was greater in shopping goods ( $\beta = 0.682$ ,  $p < 0.01$ ;  $\beta = 0.843$ ,  $p < 0.01$ ). Model 2 and model 3 indicated whether it was convenience or shopping goods, and product knowledge had a moderating effect on the relationship between perceived behavior control and green purchase intentions. The interaction coefficients of perceived behavior control and product knowledge were significant and respectively −0.178 and −0.224. Therefore, compared with convenience goods, the moderating effect of product knowledge on the relationship between perceived behavior control and green purchase intentions was more significant in shopping goods, which was consistent with expectations. Therefore, H7 was supported.

## 6. Conclusions and Implications

### 6.1. Conclusions

The purpose of this study was to explore the moderating effects of product knowledge on the relationships between green purchase attitudes and green purchase intentions, subjective norms and green purchase intentions, and perceived behavior control and green purchase intentions, especially from the perspective of product classification. Three main conclusions could be drawn from this study. First, all of the three independent variables, including green purchase attitudes, subjective norms, and perceived behavior control, had significant positive influence on green purchase intentions, and this finding was consistent with previous studies. Second, product knowledge had a significant moderating effect on the relationship between the three independent variables and green purchase intentions. In the context of high product knowledge, the explanatory power of the three independent variables will decrease. Third, compared with convenience goods, product knowledge had a more significant moderating role on the relationship between attitudes and green purchase intentions and perceived behavior control and green purchase intentions in shopping goods, while the moderating effect of product knowledge on the relationship between subjective norms and green purchase intentions was

stronger in convenience goods. According to results of the study, H1, H2, H3, H4, H6, and H7 were supported, while H5 was rejected.

The moderating effect of product knowledge manifested in the context of low product knowledge, attitudes, subjective norms, and perceived behavior control and could exert more positive influence on green purchase intentions. Consistent with the study results of Fu et al., we found that higher product knowledge led to more rational consideration, so the influence of consumers' attitudes on green purchase intentions would be weakened [42]. A similar situation appeared when considering the moderating effect of product knowledge on the relationship between subjective norms and green purchase intentions, perceived behavior control, and green purchase intentions. Contrary to expectations, from the perspective of product classification, product knowledge had a more significant moderating role on the relationship between subjective norms and green purchase intentions in convenience goods, partly because individual value was increasingly popular in young people; young consumers had more confidence than before and tend to make purchase choices of convenience goods mainly by themselves.

## 6.2. Theoretical Contributions

The primary insight derived from this study was that product knowledge played an important moderating role in the relationship between attitudes, subjective norms, perceived behavior control, and green purchase intentions. According to results of the study, product knowledge could be treated as a moderating variable in the theory of planned behavior to explain the green purchase intentions and behavior. Thus, the study discovered the moderating effects of product knowledge on green purchase intentions, extending the theory of planned behavior in the field of green purchase behavior. As an innovative point of the study, we further analyzed the difference of moderating effects of product knowledge on purchase intentions between convenience goods and shopping goods, and reached interesting conclusions. Therefore, the results of this study could also enrich the research of green consumption behavior because of the perspective of product classification.

## 6.3. Managerial Implications

Environmental protection is a much concerned problem in Chinese society because of serious pollution, and green consumption behavior has been encouraged by governments and non-profit organizations. For example, consumers can significantly reduce the purchase cost of new green energy vehicles, because of subsidy policies. In addition to economic incentive policies, social norms of advocating green consumption behavior are also gradually set up so as to promote environmentally friendly behavior and be beneficial to sustainable development. The results of the study showed that green purchase intentions were directly influenced by attitudes, subjective norms, and perceived behavior control.

In order to promote green purchase behavior, we put forward the following suggestions. First, governments and companies should take efforts to enhance consumers' green purchase attitudes by means of offering positive information about green products and advocating the green lifestyle. Meanwhile, the governments should guide the formation of social norms of green consumption, through purchasing green office supplies and continue to offer price subsidies on green products and improve the quality of infrastructure to facilitate the usage of green products, further improve consumers' perceived behavior control. Companies should develop new green products with better function and lower cost, based on technological innovation. Second, companies should strengthen information offering to enhance consumers' product knowledge, including using authority certification of green products and designing labels carefully. Third, many consumers lack the appropriate product knowledge or have a skeptical attitude to product information, therefore, enterprises should emphasize the positioning of green products to impress consumers deeply, and further provide accurate label information. Fourth, both enterprises and governments should guide consumers to implement green purchase behavior through the dissemination of product knowledge, especially for shopping

goods. Enterprises should take the initiative to obtain green product certification from certification organizations and help consumers find information about products, thereby improving green product knowledge, promoting green purchase intentions, and improving green product market demand.

## 7. Limitations and Directions for Future Research

There were a number of limitations in this study. First, the distribution of samples could be improved. A high percentage of respondents of the study (86.3%) were young and middle age people below or on 45 years old. Thus, conclusions of the study were more suitable to young and middle-aged people and could not be expanded to the general population. Second, stepwise regression methods were set up, respectively, to test the moderating effects of product knowledge, rather than to test moderating effects in an integrated model, leading to research limitations. Third, the study analyzed convenience goods and shopping goods, but ignored specialty goods, which should be added in the future to complete the analysis from the perspective of product classification. Future research could be improved by overcoming the above limitations, such as applying the method of structural equation modeling to test moderating effects of product knowledge in an integrated model and optimizing sample distribution. Further, future research may develop competition models, respectively taking product knowledge as a moderating variable and an independent variable that exerts influence on green purchase intentions. By comparison, the model with more explanatory power could be distinguished, and more interesting conclusions could be reached. In addition, because the uniform definition of product knowledge has not formed, the concept of product knowledge and its measurement could be further explored.

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