Effects of Subjective Norms and Environmental Mechanism on Green Purchase Behavior: An Extended Model of Theory of Planned Behavior

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Based on the theory of planned behavior, this paper presents a study on the core components of attitude, subjective norm, perceived behavior control, and introduces a moral emotional variable, namely environmental indebtedness, as the emotional factors in the attitude variable to explore the influencing factors and mechanism of consumer green purchase behavior. To examine the predictors of consumer green purchase behavior, data were collected from Chinese consumers and a total of 408 responses were considered valid. Through comparative analysis, it is found that environmental cognition, descriptive norm, and self-efficacy have a highly significant positive impact on green purchase intention, and self-efficacy was found the best predictor of intention. In addition to that, when environmental indebtedness, self-efficacy, controllability, and green purchase intention jointly have significant effects on green purchase behavior, environmental indebtedness has the best effect. This research offers significant contributions and provides decision-making recommendations.

Keywords: theory of planned behavior, green purchase behavior, green purchase intention, environmental indebtedness, China

INTRODUCTION

With the rapid development of the economy, environmental problems have become increasingly prominent (Wang Q. et al., 2021). After entering the post-industrial era, industrial pollution has declined, and consumer pollution has gradually risen (Li, 2020). Environmental problems caused by consumer individuals account for more than 30% of all environmental problems (Grunert, 1993). The consumption field has become an indispensable part of environmental problems. In recent years, with the construction of a resource-saving and environment-friendly society in China, the concept of ecological civilization has been gradually responded to, and the environmental awareness of Chinese consumers has been significantly improved. According to China's 2020 "Citizen Ecological Environment Behavior Survey Report," more than 90% of respondents believe that green consumption is of great significance, but only more than 50% are willing to practice. Thus, although consumers' environmental awareness has been improved, and they have a higher understanding of green consumption, their green consumption willingness has not been improved accordingly. Thus, how to promote consumers' consciousness of green consumption into green consumption behavior is an important realistic proposition.

Academic scholars often use the green purchase to measure and reflect green consumption. By shifting to green innovation product development, eco-friendly products policies are regarded as green approaches (Wand and Wu, 2015; Tam, 2019; Makhloufi et al., 2021), and green purchase behavior is often defined as the behavior of consumers who adhere to the concept of sustainable development and purchase goods to reduce resource loss or pollution (Roman et al., 2015). In the field of consumer behavior, the most used theory to study consumers' green purchase behavior is the Theory of Planned Behavior (TPB). In the theoretical model of the TPB, there are three antecedent variables, namely, attitude, subjective norms, and perceived behavioral control, one mediator variable, namely behavioral attention and one outcome variable, namely, behavior. The existing literature mostly takes the determinants, namely, attitude, subjective norms, and perceived behavioral control, as the research objects and does not divide the dimensions (Dakhan et al., 2020; Kesenheimer and Greitemeyer, 2021; Wang X. et al., 2019). However, the determinants lack the prediction difference information of its sub-components on willingness and behavior. Directly studying the antecedents and ignoring its sub-components will reduce the prediction information, and the research conclusion will also deviate (Rhodes and Courneya, 2003a). Moreover, it is obvious that moral emotion factors are often ignored in the TPB models. While moral emotion plays an increasingly important role in the process of modern civilization. Existing research on emotion generally divide emotion into two categories: positive or negative, and lack discussion on a specific emotion. In general, there is vast literature available on consumer behavior based on the TPB, which can predict consumer behavior well. Despite these significant contributions, there exist still two deficiencies in the existing literature: the lack of comparative test of the core components of these three pre-factors and the neglection of specific moral emotion factors. Critical omissions in the literature need to be addressed to advance this line of research theoretically and empirically (Khan et al., 2019).

Based on the above, we will subdivide the core components of these three antecedent variables in the TPB model, and introduce environmental indebtedness as a specific moral emotion factor into the research. The existing research on the sense of indebtedness mainly focuses on the field of social psychology, believing that the sense of indebtedness is limited to interpersonal emotions (Greenberg, 1980). However, in China, the environment is anthropomorphic under the influence of the idea of "unity of man and nature." The sense of indebtedness can be applied to people's emotion towards the environment and environmental indebtedness can be defined as compensatory psychology in which individuals believe they must improve the environment.

The purpose of this research is to explore the influence mechanism of green purchase behavior through the following questions: 1) These three antecedent variables contain multiple dimensions. Does each dimension have the same effect on green purchase intention? 2) Can environmental indebtedness affect green purchase intention, and whether it is enough to have a direct impact on green purchase behavior? The contributions of this research are that it explores the TPB model by investigating every dimension of each antecedent of the model, adds a moral emotion factor to TPB model and extends the scope of focus on the role of indebtedness in consumer green purchase behavior in this research through empirical research methods.

CONCEPTUAL FRAMEWORK AND HYPOTHESIS FORMULATION

Environmental Attitudes and Green Purchase Intention

In the research of individual environmental behavior, environmental attitude is the individual's subjective tendency towards certain environmental behavior, and it is one of the most frequently considered key factors in the study of influencing factors of environmental behavior. Environmental attitudes have a significant positive effect on environmental behaviors (Kesenheimer and Greitemeyer, 2021). However, attitudes and behaviors do not always show consistent results, which may be caused by different components of attitudes (Passafaro, 2019). According to the three components of attitude, attitude is composed of cognition, emotion, and intention, and there are significant discrimination and connections among the components (Bagozzi et al., 1979). As per TPB model, intention is a mediator whereas, attitude is an antecedent variable. Accordingly, the action path of attitude on intention can be divided into rationality and sensibility, namely cognition and emotion.

Environmental cognition is the secondary processing of environmental information, including screening, organization, and understanding (Sauer and Fischer, 2010), which is affected by personal knowledge level and information processing ability. Consumers with a higher level of cognition have a stronger ability to process information but are not sensitive to the price of green products, and thus a higher level of cognition can directly or indirectly affect their willingness to pay. Taking organic food as an example, the higher consumers' cognition of organic milk, the stronger is their purchase intention (Ali et al. 2021; Yuan and Xiao, 2021; Van Loo et al., 2013). Tian et al. (2021) agreed and they found that the cognition of new energy vehicles was an important factor affecting people's purchase intention. As the information basis for attitude formation, cognition is relatively rational and has a relatively stable influence on behavior. Individuals' relevant cognitive level will affect their choice preferences and purchase intention (Wang et al., 2019; Xiong and Wang, 2020; Khan et al., 2021). Based on the above, we think the higher consumers' cognitive level of the current ecological environment, the more they can understand and believe the importance of green behavior (Xu et al., 2021), the stronger their green consumption beliefs, and then they tend to buy green in consumption.

It is widely accepted that emotion exerts a great influence on individuals (Khan et al., 2018). For example, consumer emotion can induce impulse purchase intention (Orth et al., 2019; Zhang et al., 2020). However, regarding the study of emotion, the existing literature mainly divides emotion into two parts: positive and negative. There are few studies on the influence

of a specific emotion on behavior, especially the mechanism of negative emotional factors on consumer behavior. Feelings of indebtedness are often considered a negative emotion that hurts personal dignity and is uncomfortable (Liu et al., 2018). While Peng et al. (2017) believed that the sense of indebtedness was the fundamental reason for the occurrence of reciprocity and had positive significance. The stronger the sense of indebtedness, the stronger the motivation to take action to reduce it. There is a significant positive correlation between indebtedness and pro-social behavior (Peng et al., 2017). Pro-environmental behavior is also a pro-social behavior, Täuber et al. (2015) and Zubair et al. (2020) pointed out that even negative moral emotions can stimulate the occurrence of pro-environmental behavior. Sivanathan and Pettit (2010) believed that in daily consumption, compared with non-green purchase, compensatory consumption psychology could encourage individuals to consciously resist non-green consumption behavior and promote their stronger green purchase intention. That is to say, the sense of indebtedness would have a certain promoting effect on pro-environmental behavior intention.

Accordingly, the following assumptions are made:

Hypothesis 1A | Environmental cognition positively promotes green purchase intention.

Hypothesis 1B | Environmental indebtedness positively promotes green purchase intention.

The subjective norm, also known as a social norm, is culturally specific. China is a typical collectivist country, and subjective norm plays a more significant role in collectivist groups (Minton et al., 2018). With the advancement of ecological civilization construction, research shows that subjective norm is an important variable affecting green purchase behavior (Wang et al., 2019). When consumers realize that people in the group are more likely to buy green products, they are also subconsciously interested in green products and further generate an intention to buy in the hint of collective behavior. Subjective norms can be divided into the descriptive norm and injunctive norm, which have an independent predictive function on individual behavior intention (Chatzisarantis and Biddle, 1998). Therefore, the study of their differences can better understand the impact of subjective norms on behavior.

Descriptive norm, which is the behavior of most people perceived by individuals, plays an exemplary role. Due to individual convergence psychology, descriptive norm often shows conformity behavior, and individuals tend to show behavior similar to others to appear in groups (Hmielowski et al., 2019; Ega et al., 2021). Especially in environmental protection, environmental behavior has moral appeal, so descriptive norms can change individual environmental intention more effectively, such as environmentally friendly shopping (Onwezen et al., 2014). When consumers find that people around them pay attention to environmental protection, they will consciously examine whether their behavior is consistent with the collective. When inconsistent, consumers will consciously approach the collective green purchase behavior to avoid this difference, and even do better.

Salmivaara et al. (2021) found that descriptive norm was significantly associated with both actual and intended choice preference. So, we think consumers will have great green purchase intention under the descriptive norm.

An injunctive norm is the individual's recognition of a certain behavior, under the pressure of whether others approve of this behavior. Therefore, when an individual is affected by injunctive norms, he or she usually shows moral behavior. Vinnell et al. (2019) found that injunctive norm increased agreement for the legislation. In green, health-related fields, the importance of injunctive norms has been repeatedly verified (Göckeritz et al., 2010). Take healthy food as an example, injunctive parental norms promoted healthy snack food intake and resisted unhealthy snack intake (Bevelander et al., 2020). Influenced by the concept of green development, a green purchase is a very beneficial behavior to the ecological environment, which is widely recognized by consumers. When most people in the collective express support and appreciation for green purchase and express dislike or blame for non-green purchase, consumers will judge which behavior has more advantages in the collective. The green purchase has more moral advantages than a non-green purchase. Morality as an invisible constraint will make individuals yearn for beauty. Consumers tend to choose collective appreciation behavior to avoid collective exclusion and respond to other people's ecological protection expectations by adjusting their green purchase intention. Accordingly, the following assumptions are made:

Hypothesis 2A | Descriptive norm positively promotes green purchase intention.

Hypothesis 2B | Injunctive norm positively promotes green purchase intention.

Perceived behavioral control is an individual's perception of the degree of difficulty in completing an action, which is affected by self-ability judgment. The stronger perceived behavior control, the stronger belief in the execution of a certain behavior, which can promote the occurrence of behavior (Dakhan et al., 2020; Mirani et al., 2021). When consumers believe that they have enough ability to buy a certain product and have no or less perceived obstacles in the purchase process, their perceived behavioral control will be stronger and they will have more intention to buy green products (Wang et al., 2018). Terry and O'Leary (2018) confirmed the existence of a two-factor structure through the empirical test of perceptual behavior control, namely self-efficacy, and controllability, and the two factors were more persuasive than the single factor. In this regard, this research used self-efficacy and controllability to study the effect of perceived behavioral control on green purchase intention.

Self-efficacy is a subjective judgment of whether an individual can complete an action, which can reflect the degree of self-confidence of the individual and also determines whether the individual will take action (Bandura, 1997). Individuals are used to doing certain things and are unwilling to take risks to do

uncertain things without taking risks. Therefore, when individuals have sufficient confidence in certain behaviors, their motivation to take action is stronger (Li, 2020; Vamvaka et al., 2020). Furner et al. (2018) confirmed that high self-efficacy can increase trust and individual purchase intention. Pea-García et al. (2020) also found that self-efficacy was a key factor affecting purchase intention and purchase behavior online. That is, when consumers' self-efficacy is higher, their confidence in their ability to purchase green products will be stronger, even if they encounter difficulties in the purchase process can also show a stronger will to overcome, to show stronger green purchase intention and behavior. So, we believe self-efficacy will positively affect green purchase intention and behavior.

Controllability is the degree of control that an individual can complete an action. Individuals need to have certain basic conditions to complete certain behavior (Vamvaka et al., 2020). When an individual has enough conditions to complete these acts, the individual will be more willing to do. And when the individual has insufficient conditions to complete a certain action, the behavior intention will also be reduced. Jin and Ji (2011) found that controllability was an important factor of purchase behavior in China and it could lead to purchase intention. Controllability also affects changes in individual behavior (Joosten et al., 2016). When consumers have sufficient resources and control over their behavior, it means that consumers have sufficient confidence, and their intention to buy green products and actions will be stronger. Accordingly, the following assumptions are made:

Hypothesis 3A | Self-efficacy positively promotes green purchase intention.

Hypothesis 3B | Controllability positively promotes green purchase intention.

Hypothesis 4A | Self-efficacy has a significant positive impact on green purchase behavior.

Hypothesis 4B | Controllability has a significant positive impact on green purchase behavior.

The existence of green products does not directly lead to consumers' green purchase behavior. This is because the key to whether an individual takes a certain behavior lies in the subjective tendency and willingness of the behavior subject, and behavior intention is the best predictive tool for behavioral decision-making (Hagger et al., 2002). Consumers' green purchase behavior requires the accumulation of awareness and friendly attitudes towards green products, and the subjective preference and intention to buy green products are imperceptibly generated. With the purchase intention gradually strong, green purchase behavior is stimulated. Therefore, the more obvious consumers' preference for green products, the greater possibility of converting purchase intention into purchase action. Many previous studies have also shown that intention has a direct positive role in promoting behavior in different fields (Wang et al., 2021). Accordingly, this study suggests that:

FIGURE 1 | Conceptual framework.
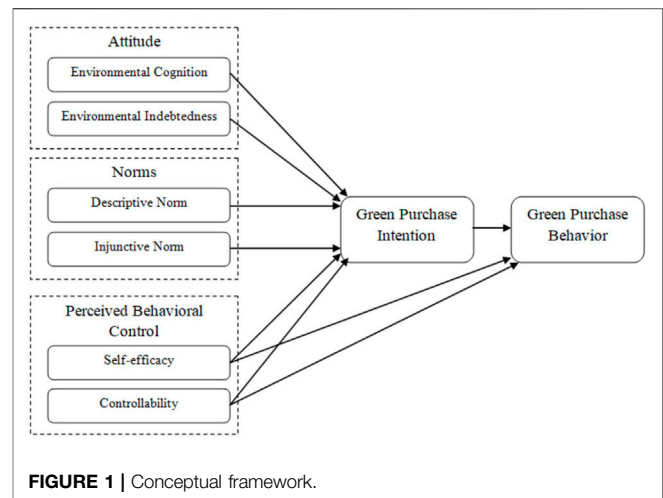
Hypothesis 5A | Green purchase intention positively mediates the relationship between environmental cognition and green purchase behavior.

Hypothesis 5B | Green purchase intention positively mediates the relationship between environmental indebtedness and green purchase behavior.

Hypothesis 5C | Descriptive norm has a significantly positive impact on green purchase behavior through green purchase intention.

Hypothesis 5D | Green purchase intention positively mediates the relationship between the Injunctive norm and green purchase behavior.

Hypothesis 5E | Green purchase intention positively mediates the relationship between Self-efficacy and green purchase behavior.

Hypothesis 5F | Green purchase intention significantly and positively mediates the relationship between Controllability and green purchase behavior.

Based on this, the theoretical conceptual model of this research study is shown in **Figure 1**.

METHODOLOGY

Participants

The online questionnaire platform was used to make and distribute the questionnaire, to ensure the randomness of questionnaire distribution and the anonymity of the participants. When designing the questionnaire, the items of each variable were properly disorganized to prevent the participants from subjective speculation. Firstly, data from 86 respondents were collected for pre-research, and the questionnaire was revised according to the results of data analysis. After determining the questionnaire, an electronic questionnaire was distributed to the general consumers. No

incentives were offered to the respondents to fill the questionnaires. From the literature, it can be seen that if the researcher gives a gift, respondents may be more inclined to try and find the answers they think the researcher is looking for (Khan et al., 2022). A purposive sampling technique was used to collect data from the respondents and a total of 483 surveys were collected. The invalid questionnaires were excluded due to repeated answers with the same IP, incompletes, and response biases. Finally, 408 valid questionnaires were collected, and the response rate was 84%. Total numbers of 29 items were used in this study. As per Hair et al. (2010), Hair et al. (2021), the general rule of thumb is to have a minimum of five observations per observed variable, and an acceptable sample size would have ten observations per observed variable. For this reason, a 290 sample size is acceptable for the robust analysis.

Among the 408 questionnaires, 51.7% were males and 48.3% were females, with a relatively uniform gender distribution. About 60% of them were young people under the age of 30. Young people with high education levels are concerned with the environment, good representatives of society, and the future consumer (Ali et al. 2021; Joshi and Rahman, 2015; Liu and Zheng, 2019). Because they were the main network active population, the proportion was relatively high. Moreover, Chinese young people have more money to spend on market offerings than older generations as a single child they benefit from six sources of disposable income with in "4-2-1" family structure (Xian et al., 2021) that come from their parents, maternal and fraternal grand parents. For this reason, this generation is called the privileged generation (Rahman et al., 2013).

In terms of occupation and monthly income, nearly half of the participants were students, and half of the participants' income was less than 3,000 yuan, which was consistent with the age distribution. *Statistical Bulletin of the People's Republic of China on National Economic and Social Development 2020* shows that in terms of household income and consumption, the annual per capita disposable income of national residents was 32,189 yuan. That is to say, the monthly per capita disposable income is less than 3,000 yuan, which indicates that the data collected is random and valid. The bulletin also shows that the annual per capita consumption expenditure of residents in China was 22,942 yuan. Green products are not just products that are too expensive for ordinary people to afford and green consumption is not exclusive to the rich. As studies conducted in hotels context showed, in reality, green hotel prices do not significantly differ from those of comparable conventional (or non-green) hotels (Manaktola and Jauhari, 2007; Kim and Han, 2010). One last thing to remember is not all sustainable products are expensive. Some are in fact sold at a similar or even more affordable price than their traditional counterparts (Xu et al. 2012; Rö diger and Hamm, 2015; Eric, 2021). It is shown in some studies that companies are competing to lower firm-idiosyncratic risk and higher cost-saving advantages (Chen and Chang, 2012; Whitson et al., 2014; Arli et al., 2018).

The popularization of green consumption cannot be achieved without the joint efforts of ordinary income groups. Therefore, although about 60% of the sample data in this study are younger

TABLE 1 | Demographic information.

Characteristics	Statistic	
	N	Percentage (%)
Gender		
Male	211	51.7
Female	197	48.3
Age		
18 years old and below	114	27.94
18–30 years old	134	32.84
31–40 years old	74	18.14
41–50 years old	35	08.58
50 years old and above	51	12.50
Occupation		
Student	202	49.51
Public officials	35	8.58
Teacher	30	7.35
Business manager	25	6.13
Employee	53	12.99
Farmer	9	2.21
Freelance	24	5.88
Other	30	7.35
Monthly income		
2000 yuan and below	173	42.40
2001–3000 yuan	41	10.05
3001–5000 yuan	84	20.59
5001–8,000 yuan	75	18.38
8,001 yuan and above	35	8.58
Education level		
Junior high school and below	34	8.3
High school/technical secondary school	28	6.9
Junior college	102	25.0
Undergraduate	196	48.0
Master's degree and above	48	11.8

and half of the monthly income is less than 3,000 yuan are still of research value. In terms of education level, 59.8% of the participants were undergraduate and above degree level. Participants' cultural level was high, so the data collected by this questionnaire is reliable.

The specific basic information distribution of participants in the questionnaire is shown in **Table 1**.

Measures

To ensure that the scale used in this study had good reliability and validity, the measurement of all variables in this study was drawn on the mature scale in related research, and under the guidance of team doctors and professors. The responses were measured using a 7-point Likert scale, 1 represents "very disagree", 7 represents "very agree".

Attitude included environmental cognition and environmental indebtedness. *Environmental cognition* was measured by three items adapted from the research of Dunlap et al. (2000). These items were the reality representing the growth limit, the vulnerability of natural balance, and the possibility of ecological crisis. The Cronbach alpha of this scale was .93, greater than .70, indicating that the reliability of the scale was good. The *environmental indebtedness* scale was measured by three items adapted from Naito and Sakata (2010). The scale reliability was found 0.93 α that was greater than .70.

The subjective norm was composed of the descriptive norm and injunctive norms. Descriptive and injunctive norms both were measured by three items each. These scales were adapted from the research of Rhodes and Courneya (2003b). The reliabilities of both scales were found greater than .70.

The two factors of perceptual behavior control are self-efficacy and controllability. Their scales referred to the research of Rhodes and Courneya (2003b) and modified the item terms according to the change of use scenarios. In this research, the Cronbach's α values of self-efficacy and controllability were .939, and .925, respectively, with good reliability.

Green purchase intention and green purchase behavior referred to the scale used by Trivedi et al. (2018). According to the research needs, four measurement items were obtained, and then revised based on the pre-survey results. Finally, three measurement items were retained. In this research, the Cronbach's α values of the two scales were .91 and .92, respectively, showing good reliability.

Ethical Statement

This study involved human participants and was reviewed and approved by the ethics committee of Jiangsu University, Zhenjiang, China.

RESULTS

Preliminary Data Analyses

Earlier than executing the formal data analysis, the researchers conducted preliminary data analysis. First, missing values (a value that is not stored for a variable in the observation of interest) in the dataset were treated through mean imputation because less than five percent of values were missing from the dataset. Moreover, the normality of data was assessed through skewness and kurtosis where the data were found on its normal condition. Data normality permits the researchers to use the parametric test on the data. It also permits researchers to use covariance-based structural equation modeling on the data. Furthermore, common method variance (CMV) was checked using Harman's one-factor test (Harman, 1967), where the total variance for a single factor was 35.82%. Hence, the common method bias was not the issue of this study.

Measurement Model Assessment

The Measurement model was assessed through the convergent validity and divergent validity. The convergent validity of the model was assessed through the item loading and average variance extracted (AVE), composite reliability (CR), and cross-loading. Composite reliability also measures the internal consistency of the items of the scale. All the items of all the constructs were exceeding the threshold level of .70 as recommended by Hair et al. (2021). Same as the item loading, all the average variance extracted (AVE) values for all the constructs were also exceeding the threshold level of .50. The loading is also called the association of items towards their respective constructs. The outer model measurement confirms that the items to measure the constructs are well designed to

measure the construct, and they are valid and reliable. For this purpose, the average variance extracted is recommended that reflect the overall amount of variance the items accounted for (Netemeyer, Bearden and Sharma, 2003). The average variance extracted (AVE) values for all the constructs were ranging from .553 to .683 that exceeds the threshold level of .50 (Hair et al., 2010; Hair et al., 2021). All the AVE values show adequate convergent validity (See **Table 2**).

Discriminant Validity

Discriminant validity was assessed through the criterion given by Fornell and Larcker (1981), where the square root of average variance extracted (AVE) should be greater than the correlation values vertically and horizontally. Discriminant validity is given in **Table 3**. All the values of square roots of AVE were greater than the correlation values vertically and horizontally. Results of the study confirm the discriminant validity.

Model Fitness

Based on the test of reliability and validity, AMOS 20.0 was used to test the model adaptation. Model fitness was assessed using multiple indices that include chi-square statistics, root mean square error of approximation (RMSEA), normed fit index (NFI), goodness of fit index (GFI), adjusted goodness of fit index (AGFI), and comparative fit index.

The fitting effect of the eight-factor model was the best, X^2/df was 1.108, less than three; GFI value was .952, AGFI value was .936, NFI value was .974, and CFI value was .997, all greater than .9; RMSEA was .016, less than .06, indicating that the model had good adaptability. All the values of the eight-factor models in **Table 4** showed a good fit.

Hypothesis Testing
Direct Effect Testing

AMOS 20.0 was used to evaluate the direct effects of attitude, subjective norm, perceived behavioral control on green purchase intention and behavior. First, the variance inflation factor (VIF) was calculated to determine the collinearity problem. The results showed that the VIF of all models was less than 5, so there was no serious collinearity between the independent variables in this research (see **Table 5**).

Researchers confirmed Gauss-Markov conditions for ordinary least square (OLS) regression such as normality, autocorrelation, homoscedasticity. In the first phase, normality was assessed through skewness and Kurtosis. All the skewness and kurtosis confirmed the normality of the data (see **Table 3**). Autocorrelation was assessed through the Durbin-Watson test by regression analysis in SPSS. Researchers found a Durbin-Watson value of 1.987 that indicates there is no autocorrelation detected in the sample. Homoscedasticity, a quantitative dependent variable that has an equal level of variability across a range of independent variables, was assessed through Levene's test that accesses the statistical hypothesis of equal variance across the level of independent variables. The results of Levene's test were found non-significant having values (F = .494, p > .05) that show the homogeneity of variance across independent

TABLE 2 | Measurement model results.

Variable	Item	Measurement	Loading	AVE	CR
EC	EC1	The earth is like a spaceship with very limited space and resources	.796	.624	.833
	EC2	The balance of nature is very fragile and easily upset	.795		
	EC3	If everything goes on as it is, we will soon suffer a serious environmental disaster	.779		
EI	EI1	If I keep taking from the environment without giving back, I feel I owe something	.804	.618	.829
	EI2	In order to enjoy the beautiful environment, I will try my best to do something beneficial to the environment	.797		
	EI3	If I don't do something good for the environment, I feel like I'm not good	.757		
DN	DN1	Most of my friends use eco-friendly products	.733	.562	.794
	DN2	Most of my family members use green health products	.765		
	DN3	Most of my colleagues (classmates, teachers, etc.) do not use high energy consuming products	.751		
IN	IN1	Most people in my social network want me to use more low-polluting products in the future	.820	.685	.867
	IN2	If I use more eco-friendly products in the future, most people in my social network will approve	.842		
	IN3	Using eco-friendly products is what most people in my social network think I should be doing	.820		
SE	SE1	I am confident that I can stick with environmentally friendly products that will have long-term benefits	.772	.572	.800
	SE2	I am confident that I can overcome the barriers that prevent me from using green and low-polluting products	.742		
	SE3	I believe I have the ability to use green and low pollution products	.754		
C	C1	It's up to me whether I can afford to use green, low-polluting products	.752	.588	.811
	C2	I have enough control over my use of green, low-polluting products	.775		
	C3	Using green, low-polluting products is completely out of my control	.773		
GPI	GPI1	I prefer to buy eco-friendly products	.802	.628	.835
	GPI2	Buying eco-friendly products will pay off in the long run	.825		
	GPI3	Buying environmentally friendly products gives me a sense of achievement	.749		
GPB	GPB1	I buy eco-friendly products whenever possible	.784	.553	.787
	GPB2	I buy healthy organic food whenever possible	.743		
	GPB3	I use products made from healthy and environmentally friendly materials whenever possible	.701		

Note: EC, environmental cognition; EI, environmental indebtedness; DN, descriptive norm; IN, injunctive norm; SE, Self-efficacy; C, controllability; GPI, green purchase intention; GPB, green purchase behavior.

TABLE 3 | Discriminant validity, descriptive statistics and correlations.

Variable	Mean	SD	Skewness	Kurtosis	EC	EI	DN	IN	SE	C	GPI	GPB
EC	4.742	1.593	−.837	−.347	**.790**							
EI	4.878	1.581	−.987	−.271	.652**	**.786**						
DN	5.023	1.390	−1.098	.207	.581**	.581**	**.750**					
IN	4.399	1.291	−.442	−.164	.515**	.517**	.540**	**.827**				
SE	4.839	1.549	−.863	−.27	.574**	.574**	.663**	.503**	**.756**			
C	4.474	1.567	−.602	−.721	.596**	.547**	.627**	.514**	.725**	**.767**		
GPI	4.848	1.494	−1.005	.017	.583**	.552**	.568**	.511**	.603**	.579**	**.793**	
GPB	4.985	1.621	−.952	−.411	.567**	.667**	.677**	.513**	.657**	.635**	.592**	**.743**

Note: N = 408. **p < .01. SD, standard deviation. Diagonal (Bold) values show the square root of AVE. EC, environmental cognition; EI, environmental indebtedness; DN, descriptive norm; IN, injunctive norm; SE, Self-efficacy; C, controllability; GPI, green purchase intention; GPB, green purchase behavior.

variables. The results of normality, autocorrelation and homoscedasticity confirm Gauss-Markov conditions for ordinary least square (OLS) regression.

After the assessment of Gauss-Markov conditions, researchers executed the model and checked the direct and indirect relationship where the value of R square was found .521. This value indicates that all the independent variables selected for the study accounted for 52.1% of the variance in the dependent variable.

First, the direct effects of environmental cognition and environmental indebtedness on green purchase intention were tested which is the part of attitude towards green products. According to the results, the two dimensions of attitude were put into the same equation for comparative study. It was found that environmental cognition and environmental indebtedness both have a significant positive effect on green purchase intention, and the effect of environmental cognition was slightly stronger than that of environmental indebtedness (B_{EC} = .186, B_{EI} = .116, p < .001). Hence, H1a and H1b were established.

Secondly, the direct effects of the descriptive norm and injunctive norm on green purchase intention were tested. Two dimensions of subjective norms were compared in the same equation. Both descriptive norm and the injunctive norm have a significant positive effect on green purchase intention, and the effect of the descriptive norm on green purchase intention was

TABLE 4 | Model Fitness.

Model	X²/df	GFI	AGFI	NFI	CFI	RMSEA
Single factor model	12.972	.561	.477	.652	.669	.172
Two-factor model	11.167	.600	.522	.701	.720	.158
Three-factor model	9.194	.649	.577	.756	.776	.142
Four-factor model	8.301	.672	.600	.782	.803	.134
Five-factor model	6.314	.726	.661	.837	.859	.114
Six-factor model	4.960	.768	.706	.875	.897	.099
Seven-factor model	3.216	.838	.790	.921	.944	.074
Eight-factor model	1.108	.952	.936	.974	.997	.016

Note: *Single factor model: EC + EI + IN + DN + SE + C + GPI + GPB; Two-factor model: EC, EI + IN + DN + SE + C + GPI + GPB; Three-factor model: EC, EI, IN + DN + SE + C + GPI + GPB; Four-factor model: EC, EI, IN, DN + SE + C + GPI + GPB; Five-factor model: EC, EI, IN, DN, SE + C + GPI + GPB; Six-factor model: EC, EI, IN, DN, SE, C + GPI + GPB; Seven-factor model: EC, EI, IN, DN, SE, C, GPI + GPB; Eight-factor model: EC, EI, IN, DN, SE, C, GPI, GPB.*

TABLE 5 | Results of Direct effect.

Hypothesis	Paths	Beta	S.E	t-value	Decision	VIF
H1a	EC → GPI	.186	.062	2.995	Accepted	1.116
H1b	EI → GPI	.116	.053	2.194	Accepted	1.490
H2a	DN → GPI	.113	.061	1.847	Accepted	1.695
H2b	IN → GPI	.131	.045	2.900	Accepted	1.364
H3a	SE → GPI	.201	.067	3.008	Accepted	1.665
H3b	C → GPI	.121	.056	2.152	Accepted	1.245
H4a	SE → GPB	.318	.053	6.045	Accepted	1.796
H4b	C → GPB	.259	.05	5.216	Accepted	1.663

R Square = 0.521, Durbin-Watson = 1.987.
Note: *EC, environmental cognition; EI, environmental indebtedness; DN, descriptive norm; IN, injunctive norm; SE, Self-efficacy; C, controllability; GPI, green purchase intention; GPB, green purchase behavior.*

much greater than that of the injunctive norm ($B_{DN} = .113$, $B_{IN} = .131$, $p < .001$). Therefore, H2a and H2b were established.

Third, the direct effects of self-efficacy and controllability on green purchase intention were tested. According to the results, when the two play a role together, self-efficacy and controllability both have a significant positive effect on green purchase intention, while the effect of self-efficacy on green purchase intention was slightly greater than that of controllability on green purchase intention ($B_{SE} = .201$, $B_C = .121$, $p < .001$). Thus, H3a and H3b were accepted.

Finally, the direct effects of self-efficacy and controllability on green purchase behavior were tested. As shown in the results,

these two variables have a significantly positive effect on green purchase behavior. Among them, the effective coefficient of self-efficacy was the largest, the coefficient of controllability was the smallest ($B_{SE} = .318$, $B_C = .259$, $p < .001$). For this reason H4a and H4b were accepted.

Mediating Effect Testing

The direct effect test results showed that environmental cognition, environmental indebtedness, descriptive norm, injunctive norm, self-efficacy, and controllability all had direct effects on green purchase intention, and the direct effect of green purchase intention on green purchase behavior was also significant. Hence, the mediating effect of green purchase intention was tested. The model had six indirect paths through mediating variable green purchase intention. PROCESS Macro was used to test the mediation with 5000 bootstrapping. Demographic variables such as gender, age, occupation, monthly income, and education level were considered as control variables. As shown in **Table 6**, the confidence intervals of the six mediation paths did not contain zero value, indicating that the six mediation paths were significant. Consequently, H5a, H5b, H5c, H5d, H5e, H5f were established.

Endogeneity Testing

The consideration of endogeneity is an important issue while applying the regression-based models (Hult et al., 2018). Endogeneity occurs when the predictors are correlated with the error term of the dependent construct to which it is related and violating the most important ordinary least square (OLS) estimation of exogenity assumptions (Bascle, 2008). In the condition, the predictor constructs explain both the dependent construct and its error term. Endogenity has multiple roots such as measurement error in the explanatory variable, dependent and independent variable are jointly determined and omitted variable (Ebbes et al., 2016; Papies et al., 2016; Sarstedt et al., 2020). This means the exogeneity condition is violated and the endogeneity condition is present. A common source of omitted variable bias is self-selection. Avoidance of the issue requires considering all the aspects of the dependent construct and many other aspects. However, considering all the aspects in a single study is very challenging (Sarstedt et al., 2020). Conversely, the omitted variable may affect both the dependent and independent construct in the model and induce the correlation between the

TABLE 6 | Results of Mediating effect.

Hypothesis	Indirect paths	Indirect effect	Standard error	Bootstrap lower limit	Bootstrap upper limit	Decision
H6a	EC → GPI → GPB	.228	.035	.159	.299	Mediation
H6b	EI → GPI → GPB	.174	.033	.111	.243	Mediation
H6c	DN → GPI → GPB	.171	.034	.105	.240	Mediation
H6d	IN → GPI → GPB	.224	.033	.163	.290	Mediation
H6e	SE → GPI → GPB	.183	.032	.122	.248	Mediation
H6f	C → GPI → GPB	.189	.034	.125	.258	Mediation

Note: *EC, environmental cognition; EI, environmental indebtedness; DN, descriptive norm; IN, injunctive norm; SE, Self-efficacy; C, controllability; GPI, green purchase intention; GPB, green purchase behavior.*

TABLE 7 | Endogeneity analysis.

Hypothesis	Paths	Beta	t-value	Description
H1a	EC → GPI	.115	4.513	No Difference
H1b	EI → GPI	.096	2.731	No Difference
H2a	DN → GPI	.105	2.014	No Difference
H2b	IN → GPI	.112	2.876	No Difference
H3a	SE → GPI	.151	2.905	No Difference
H3b	C → GPI	.102	2.766	No Difference
H4a	SE → GPB	.129	2.352	No Difference
H4b	C → GPB	.131	3.412	No Difference

Note: EC, environmental cognition; EI, environmental indebtedness; DN, descriptive norm; IN, injunctive norm; SE, Self-efficacy; C, controllability; GPI, green purchase intention; GPB, green purchase behavior.

independent variable and error term (Wooldridge, 2013) that can distort the estimate of the maximum probability and significant challenge of the acceptability of study findings. The omitted variable is the most common problem in social science researches.

As per Sussman and Gifford, (2019), the revision to the theory of planned behavior could have a deep impact on how the theory of planned behavior constructs are analyzed. Reverse causality in the model could have the potential to change the result. Handful research on the theory of planned behavior may include ordinary least square (OLS) regression that is misspecified due to the problem. Hence, in the study, multiple considerations motivated the researchers to consider the problem of endogeneity.

To deal with the endogeneity problem, multiple approaches are suggested such as the control variable approach, instrumental variable approach, and some of the instrumental variable-free approaches (Hult et al., 2018). Instrumental variable-free approaches are non-parametric approaches while control variable approaches and instrumental variable approaches are parametric in nature. Past studies of the theory of planned behavior (TPB) considered multiple techniques that dealt with the issue. As considering the study of Sánchez-García et al. (2021) age, income and education were considered as instrumental variables of the current study. In the next step, researchers employed the Heckman test to check the endogeneity problem as in past studies (e.g., Irfan et al., 2021; Tanveer rt al., 2021). Heckman's two-step procedure[1] uses two equations to address the self-selection Heckman et al., 1979. In the first equation, it used the probit model where it calculate the correction factor termed as "inverse Mills ratio." In the next step, named the "output equation" that is our regression of interest. It is computed with an OLS estimation plus the correction factor. Results of the study (**Table 7**) found there is no difference between the two models. Hence, there was no endogeneity bias in our findings.

Additionally, the two-stage test squares approach (2SLS) with instrumental variables was also employed for the verification by following the study of Sánchez-García et al. (2021). In the first stage, regressing each endogenous variable on all instruments and the exogenous variables in order to predict the relevant residuals. In the second stage, regress the dependent variable over all the exogenous variables and the predicted values gained from first stage. After running the two stage test squares (2SLS), the researchers conducted the Durbin-Wu-Hausman post-estimation test to identify the endogeneity problem. The test results indicated that all the exogenous variables in the model along with Sargan and Basmann Chi-square tests values were found non-significant. All the results indicated that the selected instruments variables were correctly explaining the exogenous variables.

DISCUSSION

Based on the theory of planned behavior, this research constructs a conceptual model of influencing factors and mechanisms of green purchase behavior. The sense of environmental indebtedness is incorporated into environmental emotion, and the dimensions of antecedent variables in the theory of planned behavior are further compared and studied. Through the regression analysis of the model, the following conclusions are drawn:

Firstly, environmental indebtedness positively promotes green purchase behavior. Different from Watkins et al. (2006) that the sense of indebtedness will make people take avoidance behavior, consumers' sense of indebtedness to the environment will make them take positive actions. Our results stand in line with the study of Peng et al. (2017) that indebtedness is significantly positively correlated with pro-social behavior. With the advancement of the concept of social-ecological civilization, people's potential moral consciousness is improved, and the sense of responsibility for protecting the environment is also significantly improved. People are no longer shy of recognizing the responsibility of environmental problems, and they are no longer blindly avoiding negative moral emotions. Our conclusions that consumers with the sense of environmental indebtedness can recognize that they are responsible for adverse outcomes and weaken this negative emotion with positive behaviors, such as green purchase, are similar to the conclusions of Yan and Jaideep (2021) that participants with a feeling of loneliness tend to have relatively more connected to less lonely products. Instead, consumers with a sense of environmental indebtedness can recognize that they are responsible for adverse outcomes and weaken this negative emotion with positive behaviors (Sim and Cheon, 2019). Therefore, unlike the attitude-behavior difference that environmental cognition may bring, environmental indebtedness can not only significantly promote green purchase intention, but also have a direct positive impact on its behavior. When environmental indebtedness, self-efficacy, controllability, and green purchase intention jointly affect green purchase behavior, the coefficient of environmental indebtedness is the largest, which fully proves that negative emotions are of great significance in the field of environmental behavior just as guilt can affect consumers' purchase intention (Li, 2020; Zubair et al., 2020).

Secondly, environmental cognition and environmental indebtedness can positively promote green purchase intention. Consumers with a high level of environmental cognition are more supportive of green purchases (Tian et al., 2021; Xiong and Wang,

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[1]For details of Heckman two-step procedure and equations see Hamilton and Nickerson, (2003).

2020; Chun et al., 2019), and consumers with a stronger sense of responsibility and indebtedness for environmental protection can also bring stronger green purchase intentions. When the two factors work together on green purchase intention, the effect of environmental cognition is slightly larger than that of environmental indebtedness, which is different from Montoya et al. (2017) and Vamvaka et al. (2020), and a reason for this can be as an emotional dimension of attitudes, environmental indebtedness has a limited impact on intentions compared with positive emotions (Meneses, 2010).

Thirdly, both descriptive norm and injunctive norm positively affect green purchase intention which is similar to the findings of Warner (2021), that both injunctive and descriptive norms predict water-saving intentions. The results of this study show that descriptive norm has a positive effect on consumers' green purchase intention, when most people collectively buy green products, their green purchase consciousness will be enhanced, which further confirms the conclusions of Ega et al. (2021), Hmielowski et al. (2019) and Salmivaara et al. (2021) that descriptive norm influences people's behavior intentions. When most people in the collective buy green products, their green purchase consciousness will be enhanced. The injunctive norm also positively affects green purchase intention, but compared with the descriptive norm, its impact on green purchase intention is weaker, which is different from Vinnell et al. (2019) and Bevelander et al. (2020).

Fourth, higher self-efficacy and controllability can bring higher green purchase intention and positive green purchase behavior. As the embodiment of individual will, perceptual behavior control not only affects individual will but also has a direct effect on their behavior (Dakhan et al., 2020; Mirani et al., 2021), which can be confirmed in the empirical results of this research. Furthermore, when the two dimensions jointly affect green purchase intention, the results are similar to the study of Rhodes and Courneya (2003b) that self-efficacy is better at predicting intent than controllability, self-efficacy is the better predictor of intention in this paper which is also endorsed by the studies of (Li, 2020; Elnadi and Gheith, 2021) that the influence of self-efficacy on individual intention cannot be ignored. Besides, this research also put the six dimensions of attitude, subjective norm, and perceived behavioral control into the same equation to test their effect on green purchase intention. A little different from the conclusions of Vamvaka et al. (2020) is that emotion and self-efficacy are the strongest predictors of intention, self-efficacy and environmental cognition are the strongest predictors of intention in this paper. The difference in this conclusion may be due to the different variables of emotional factors and the emotion in this paper is relatively more specific and negative.

Fifth, environmental cognition, environmental indebtedness, descriptive norm, injunctive norm, self-efficacy, and controllability can all positively promote green purchase behavior through green purchase intention. Among them, the mediating effect of green purchase intention accounts for only 26.58% of the effect of environmental indebtedness on green purchase behavior, which further confirms the direct effect of environmental indebtedness

on green purchase behavior. Although environmental indebtedness has a weaker impact on intention, it has a more direct and powerful driving effect on behavior. That is to say, under the background of contemporary civilization, the impact of environmental indebtedness on consumers cannot be ignored.

CONCLUSION

Based on the theory of planned behavior, this research studies the impact of environmental indebtedness on green purchase behavior. The results have important significance for promoting consumers' green consumption, and makes the following conclusions:

Companies should pay more attention to consumers' sense of environmental indebtedness. Environmental emotion certainly has a direct promoting effect on the green purchase. In the emotional guidance to consumers, positive emotions were given priority, and negative emotions were ignored. While negative emotions can promote social moral behavior. And green purchase is a moral behavior beneficial to the environment. In terms of brands, more attention should be paid to consumers' emotional needs from the perspective of sensibility, which is conducive to promoting consumers' green purchases. In particular, the advertising of green products should pay attention to the emotional elements of "green" and give consumers appropriate warning information on environmental issues, which helps to awaken consumers' emotional compensation for environmental protection and stimulate consumers' green purchase behavior. In terms of policymakers, environmental indebtedness has a direct positive effect on green purchase behavior, which means that actively promoting the construction of ecological civilization is an effective way to promote consumers' ecological friendly behavior. In the future, China should still take green development as the main theme and continue to build an ecological civilization.

Secondly, actively guide consumer attitudes, subjective norms, and perceived behavioral control. Among them, more attention should be paid to the role of self-efficacy. In terms of brands, efforts should be made to narrow the distance between consumers and products. In product design, pay attention to simplifying the use of barriers to consumers, as far as possible so that consumers have enough confidence in the use of the product. When marketing green products, we should pay special attention to soft marketing strategy, actively stimulate consumers' perceptual needs, and pay attention to the guidance of consumers' subjective construction. To enhance and strengthen the consumers' belief in green purchase and promote their direct purchase behavior. In terms of policymakers, more energy should be placed on actively promoting green consumption, such as emphasizing that green consumption is beneficial to consumers' health. Or provide direct financial benefits for consumers' green consumption behavior, such as appropriate monetary subsidies. At the same time, brands should be actively urged by policymakers to develop more convenient and green products from the perspective of consumers.

Limitations and Future Research Directions

This research takes the sense of environmental indebtedness as the emotional dimension of attitude, and the sense of indebtedness itself is negative. Therefore, the conclusions of the research are all aimed at negative emotions, and its corresponding surface—positive emotions—should also be concerned. In the future, we can continue to compare the sense of indebtedness and other positive emotions and discuss whether there are differences in the effects of the two emotions on intention and behavior.

Secondly, the single quantitative research in this study is not sufficient to obtain in-depth interview information. If qualitative research is conducted, more interesting conclusions may be found.

Thirdly, the percentages of 18-year-old and younger and students in the total number of respondents are almost one-third and one-half, respectively, and it would be better for future studies to also include older age groups in the survey, as well as a comparison, can be done between low wagers and high earners and see if there will be any difference in the results.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusion of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics committee of Jiangsu University, China. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

Definition of research objectives, models, and hypotheses: YX, MASK, DJ, FA, and SJ. The provision of materials (i.e., questionnaires): MASK, IS, and DJ. Data collection: YX, MASK, and SJ. Data analysis plan: MA, FA, and IS. Data analysis: MA and DJ. Principal article writing: YX, MASK, DJ, and SJ. Article revision and proofreading: FA, IS, and MA. Final approval: YX, MASK, DJ, SJ, IS, FA, and MA.

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