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Original Research

Towards a Cleaner Environment: Investigating the Impact of Environmental Motivation and Innovativeness in Chinese Youth's Intentions Towards Bio-Plastic Use

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Abstract

The extensive use of plastics is a major source of environmental pollution and has become a growing concern for countries worldwide that require immediate response. Several measures have been taken to reduce the increasing use of plastics. Bio-plastics have been introduced in many parts of the world as an alternative to conventional plastics. Bioplastics are plastic materials produced from renewable biomass sources that are more environmentally friendly than conventional plastics. This study analyzed the impact of altruism, innovativeness, and environmental motivation on Chinese youth switching intentions in the context of bio-plastics in China. Data collected from 400 young Chinese consumers through convenience sampling were analyzed using PLS-SEM. The findings indicate that altruism, innovativeness, and environmental motivation significantly impact young Chinese consumers' switching intentions. The findings also revealed that attitudes towards bio-plastics significantly mediate between innovativeness, environmental motivation, and environmentally friendly bio-plastic use intentions. Introduce incentives such as discounts, rewards, or recognition programs for Chinese youth who actively choose bio-plastic products over conventional plastics. These incentives can help reinforce positive behavior and encourage the widespread adoption of environmentally friendly alternatives.

Keywords: Environmental motivation, sustainable consumption, bioplastics, green behavior, consumption value

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Introduction

An important element of sustainable development goals (SDGs) is the adoption of sustainable consumption practices [1]. Sustainable consumption implies that goods and services should be consumed in such a manner that they have minimal harmful effects on the environment. This includes promoting waste reduction, using renewable resources, and curtailing emissions of greenhouse gases (GHGs). The increasing use of plastics and landfills filled with plastic waste and their environmental impact has been a growing concern for the global community. According to an estimate, 8 million metric tons of plastic waste are released into the oceans each year [2]. Additionally, it has been estimated that only 9% of the 9 billion tons of plastic produced have been recycled [3]. We cannot adequately reprocess the bulk of this plastic; hence, the majority remains in one form or another [4]. Plastic pollution occurs in every part of the world and has been found from the deepest ocean trenches to the highest mountain peaks [2]. The prevalence of plastic waste on every surface of the Earth has given rise to the idea that it should be viewed as a geological indicator of the anthropogenic period [5].

In recent decades, waste management procedures have evolved, resulting in higher collection rates and a wider range of plastic disposal solutions [6]. However, the final destination of most plastic objects remains unknown, particularly in underdeveloped nations, because of several variables, including the absence of global statistics and official collecting mechanisms in many regions and unreported waste disposal (including illegal waste disposal and uncontrolled combustion) [7]. Waste is not only a problem for marine life but also poses a threat to human life because plastic particles have been found in seafood and drinking water [8]. The excessive use of single-use plastic products such as straws, bags, and cutlery has significantly contributed to this problem. In particular, packaging is the leading contributor to trash and ocean plastics. It is extremely difficult to remove plastic once it reaches water, and as a result, it accumulates [9]. The challenges associated with marine plastic buildup are also projected to worsen as solid waste creation increases rapidly without a corresponding improvement in waste management infrastructure [10]. Researchers [2, 11] have stressed that if existing plastic manufacturing and waste management practices/trends continue, by 2050, almost 12 billion tons of plastic rubbish will be in landfills or the natural environment. Therefore, it is necessary to build a long-term plastic economy that eliminates negative externalities.

A viable solution to this problem is the adoption of biodegradable bioplastics derived from renewable resources. In comparison to traditional plastics, which take a very long period to break down, the decomposition time of bioplastics is very short, within months or years, depending on the conditions [12]. Additionally, bioplastics are not derived from fossils and can be manufactured from abundantly available and renewable sources, such as corn starch, sugarcane, and cellulose, which make them sustainable alternatives. Thus, the adoption of bioplastics is crucial to promote sustainable consumption and reduce plastic waste in the environment. However, despite their potential benefits, the adoption of bioplastics by consumers is low. Therefore, it is important to investigate barriers to the adoption of bioplastics. In this regard, researchers have identified a lack of awareness, perceived high cost, uncertainty about the performance of the product, and limited availability as potential barriers to adoption [13]. Consumer behavior has been discussed as the most critical factor in the success of new products. Therefore, an understanding of the factors that influence consumers' switching intentions towards bioplastics is crucial. Switching intention refers to the "probability that a consumer will switch from their current product to a new one." In this study's perspective, switching intentions refer to the likelihood that a consumer will switch from traditional plastic to bioplastics. Therefore, this study aimed to examine the factors influencing consumers' switching intentions toward bioplastics.

The majority of the existing research on consumer behavior towards bioplastics has been conducted in developed countries, while literature from developing countries is scant. China is a developing country with the largest population in the world and is greatly affected by plastic pollution. China is the largest producer of plastic waste worldwide, with a production of 61 million in 2019, of which only one-fourth was recycled [14]. Nanjing, one of the largest cities in China, is facing significant challenges in managing its plastic waste. Nanjing is a rapidly growing urban center, and its large population and use of plastics have created many environmental challenges. Along with higher levels of air pollution, plastic waste is a significant environmental concern in developing countries [15]. The use of bioplastics can reduce plastic waste, promote sustainable consumption, and improve the environment in developing countries. Therefore, this study was conducted in Nanjing City, China, to identify the factors influencing the switching intentions of young consumers toward bioplastics.

This study contributes significantly to the achievement of SDG 12. Furthermore, the study has many important implications for policymakers looking to promote sustainable consumption in China and also contributes to the existing literature on sustainable consumption in emerging economies.

Literature Review and Hypothesis Development

This section discusses theoretical perspectives on consumer behavior towards environmentally friendly or new products and formulates the hypotheses. Consumer behavior towards the adoption of new products has been

extensively studied in many parts of the world, and an array of influencing factors has been identified, such as the perceived qualities of the product, perceived benefits and risks, societal influence, and individual characteristics. Roberts et al. discussed the influence of product benefits on consumer adoption. [16]. Before using a new product, consumers evaluate its potential advantages and benefits. Customers are more likely to use products with clear and compelling benefits [17]. On the other hand, perceived risk has a negative influence on the adoption of a new product; if consumers perceive a high risk related to a new product, they are less likely to adopt that product [18]. The perceived risk associated with the adoption of new products has been discussed by Hoban et al. as an impediment to adoption. [19]. Some researchers have found an impact of social influence on customers and adoption decisions [20]. Zhang and Yang [21] discussed that adoption decisions can be influenced by positive or negative references from experts, peers, or opinion leaders. Researchers have also discussed the influence of individual characteristics on adoption decisions [20, 22-24]. Individual characteristics, such as demographics and personality traits, have been found to have a significant impact on customers' adoption decisions.

Researchers have used various models to explain consumer behavior related to sustainable consumption, green purchasing, or eco-friendliness. Most researchers use the Theory of Planned Behavior (TPB) to understand consumer behavior. To understand consumer behavior towards eco-friendly products, Liang et al. [25] used TPB in their study. Zhou et al. [26] studied customer intention and behavior by applying TBP and found that attitude, subjective norms, and perceived behavior control are significant determinants of intention and behavior. The Norm-Activation Model, the Theory of Value Belief Norms, and the Innovation Diffusion theory are other models used by researchers to study consumer adoption behavior [27].

The hypotheses of this study were grounded in the Theory of Consumption Value. According to this theory, consumers' appraisal of any product is not only based on its tangible features or benefits but also on the emotional connection and experiences associated with owning or using it [28]. In other words, before adopting a product, consumers consider its practical usefulness and emotional and psychological benefits. The theory of consumption value was first introduced in 1990 by Mary Jo Bitner, a marketing professor at Arizona State University. Since then, this theory has undergone several developments and has been used in marketing, consumer behavior, psychology, and many other fields to understand consumer perceptions of value and decision-making. For example, Kim et al. [29] applied the theory of consumption value to find that consumer decisions related to luxury products are influenced by emotional and social values. Similarly, the theory of consumption value has been used to evaluate services in the tourism and hospitality industries and to examine the relationship between functional and emotional values and patients' satisfaction and loyalty. Wang et al. [30], by applying this theory, found that emotional and social values significantly affect continued usage of social media platforms and mobile applications. Since its introduction, the theory of consumption value has undergone significant development and widespread applications in various fields.

Researchers have demonstrated that various factors, such as environmental awareness, bioplastic attributes, perceived benefits, price, social factors, consumer knowledge, and innovativeness, are significant in the adoption of bioplastics. Research on the relationship between sociodemographic factors and environmental actions presented merely a partial backing of the findings. Due to the unclear findings in the analyzed research, we concluded that only a small number of sociodemographic factors (such as age, gender, and education) could affect the willingness to switch to bioplastic products in this study.

Switching Intention

Intention, as a fundamental psychological construct, refers to the cognitive state that controls and organizes behavior [31]. Intention refers to an individual's willingness to act in a specific manner to achieve a particular state of affairs. Until it is actualized in behavior, it remains an intention. Ajzen [32] stressed that intentions have a compelling feature that substantially influences behavior and actions. Switching intentions refer to consumers' likelihood of switching from their current brand, provider, or product to another one [33]. Switching intention is an important concept that has been frequently studied in consumer behavior and marketing. An array of factors can influence consumers switching intentions, such as perceived quality, value of the product being used, and cost or convenience of switching to a new product. The level of satisfaction with the current product or brand is another important factor: satisfied customers are expected to stay loyal, while dissatisfied ones are more likely to switch. Switching intentions to green brands, such as bioplastics, can be described as the desire to enjoy environmentally beneficial services or products. Globally, there has been an extraordinary increase in the intention to adopt green practices and products, mainly driven by increasing concerns for public health and the environment [31]. According to Arısal and Atalar [34], environmental consciousness has led society towards environmental consumerism and demand for eco-friendly alternatives. These growing intentions have resulted in a myriad of green products, such as recyclable household objects, chemical-free personal care items, biodegradable plastics, and energy-efficient lighting [34]. Biodegradable plastics have been discussed for several reasons. One believes in its potential to solve environmental issues caused by synthetic plastics, while the other believes it is impractical. Proponents believe that the emergence

of bioplastics indicates people's inclination to solve environmental issues created by synthetic plastics [31]. This paradigm shift in intentions leads to a gradual transition to biodegradable plastics over synthetic ones [35]. As the world moves towards a more sustainable future, the intention to adopt environmentally friendly practices continuously influences consumer behavior and product development [36]. The production of biodegradable packaging material from sustainable natural resources (particularly plant-based materials) has become popular in several parts of the world. This implies a common intention to explore innovative solutions to environmental challenges.

The decisive role of intention extends beyond individual actions; it affects organizational strategies and policy formulation processes [37]. The importance of collective intentions in the implementation of global sustainability initiatives is well recognized at the global level. In conclusion, intention plays an important role in understanding human behavior and decisions, particularly in the context of adopting eco-friendly products. The growing global intention to promote green products, including biodegradable plastics, reflects a transformational shift towards environmentally conscious choices. Society can strengthen its connection to the planet and ensure future generations' well-being by combining individual goals and communal actions.

Altruism

According to Kraut et al. [38], "behavior is normally described as altruistic when it is motivated by a desire to benefit someone other than oneself for that person's sake." In other words, it is how much people are willing to care about the interests of others. Because everyone enjoys the benefits of the environment, considering environmental benefits can be categorized as the interests of others. Research has shown that altruistic individuals are more likely to care about the environment. Batson and Powell [39] mentioned that individuals with altruistic behavior are more inclined to indulge in pro-environmental behaviors. The positive relationship between altruism and pro-environmental behavior has also been supported by many other studies. Beldad et al. reported a positive relationship between altruistic behavior and the purchase of environmentally friendly products. [40]. Similarly, altruism can play a crucial role in forming consumer behavior toward bioplastics. As bioplastics are marketed as a sustainable alternative to synthetic plastics, highly altruistic consumers may be inspired by the desire to reduce plastic waste, protect the environment, and switch to bioplastics. Therefore, it is hypothesized that

H_{1A}: Individuals who exhibit a higher level of altruistic behavior are more likely to have a positive attitude towards bio-plastic products."

H_{1B}: Altruism positively relates to young consumers' switching intentions.

Innovativeness

Innovativeness can be defined as "consumers' innate predisposition to seek arousal and novelty from new products [41]. Several studies have established a relationship between innovativeness, consumer behavior, and attitude. Ngobo and Jean [42] reported that consumers with higher innovativeness are more likely to have a positive attitude towards environmentally friendly products. Persaud and Schillo [43] also find a positive and significant impact of consumer innovativeness on organic product purchase intention. Similarly, Xie et al. [44] find a positive relationship between the adoption of new and sustainable technologies and innovativeness. Lee and Hong [45] discussed the significantly positive effect of innovativeness on attitudes towards and intentions to purchase green products. Thus, a positive role for innovativeness in bioplastic purchase intention can be proposed. Bioplastics are new products, and consumers with high innovativeness may be inclined to try these products. Kim et al. and Choi [27] suggested that innovative consumers are more open to trying new and unconventional products (such as bioplastics). Additionally, innovativeness has also been found to be positively related to the willingness to pay for eco-friendly products [27]. Studies have found that innovativeness is related to positive attitudes towards eco-friendly products. It is hypothesized that:

H_{2A}: The innovativeness of individuals positively affects their attitude toward bioplastic products.

H_{2B}: The innovativeness is positively related to switching intentions.

Environmental Motivations

Environmental motivation refers to consumers' motivation to protect the environment and reduce the impact of their actions. Environmental motivation can also be defined as an individual's concern about environmental issues. It has been acknowledged as a critical driver for the adoption of sustainable behaviors [46]. Consumers with high environmental motivation tend to behave more pro-environmentally, recycle, reduce energy consumption, and have a higher willingness to pay for green products. Moreover, today's consumers are well aware of their importance to society and how their actions and reactions affect environmental issues. Rusyani et al. [47] suggested that consumers with environmental concerns are willing to purchase and use sustainable and green products.

Kaiser et al. [48] reported that consumers with higher environmental motivation tend to choose products with eco-labels. Another study by Nguyen et al. [49] found that environmentally conscious people are more likely to have a positive attitude towards biodegradable packaging materials. Lau and Hashim [50] find a significant and positive impact of a higher level of environmental motivation on the adoption of environment-friendly products.

Thus, consumers who are highly motivated to protect the environment may be more willing to switch to bioplastics. Therefore, it is hypothesized that:

H_{3A}: Environmental motivation is positively associated with individuals' attitudes towards bio-plastic products.

H_{3B}: Environmental motivation is positively related to switching intentions.

Attitude Towards Bioplastics

Several researchers have reported the role of attitudes towards green products in predicting consumer purchasing behavior. For example, Chang et al. [51] stated that consumers' positive attitudes toward green products positively impact their intention to adopt and use these products. Similarly, another study by Scherer et al. [52] showed that environmental attitudes and eco-friendly product choices are positively related. Moreover, Leong et al. [53] found a significantly positive association between consumers' attitudes towards eco-friendly product packaging and switching intentions toward packaging. In the context of bioplastics, attitudes may significantly influence consumers' intentions to switch from synthetic to bioplastic. Hence, based on this evidence, it is hypothesized that:

H_4: Attitude towards bioplastics is positively related to switching intentions.

Mediating the Role of Attitude Towards Bioplastics

A favorable attitude towards bioplastics is expected to enhance consumers' willingness to adopt and use these products. Johnson and Brown [54] reported that a favorable attitude towards bioplastics coupled with the altruistic behavior of consumers may strengthen their intention to switch to bioplastics from traditional plastics. Furthermore, Moshood et al. [55] reported that attitude positively mediated the relationship between environmental motivation and switching intention.

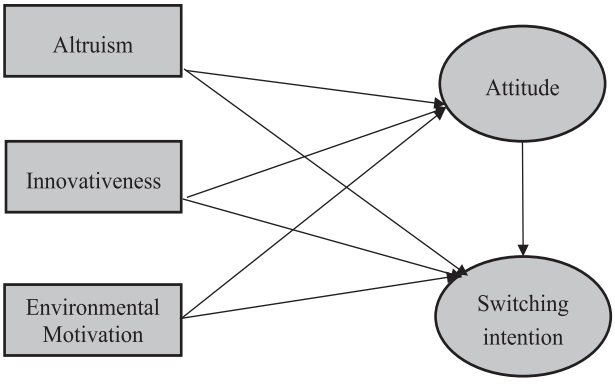

Fig. 1. Conceptual framework

Hence, the following hypotheses are developed:

H_5: Attitude towards bioplastics positively mediates the relationship between altruism and consumer switching intention.

H_6: Attitude towards bioplastics positively mediates the relationship between environmental motivation and consumer switching intention.

H_7: Attitude towards bioplastics positively mediates the relationship between innovativeness and consumer switching intention.

Fig. 1 shows the relationship among different constructs of the study.

Materials and Methods

Data and Sources

The study population consisted of consumers in Nanjing, China. Nanjing was chosen as the universe of the study because it is one of the largest cities from a population perspective in China. Nanjing is also the capital of Jiangsu Province in China. Pollution is one of the greatest problems faced by city governments and societies in China. Therefore, Nanjing consumers aged 18 years or older were the target population of the study. Owing to the unavailability of a sampling frame, a non-probability sampling technique was employed in this study. The study participants were selected using convenience sampling.

A total of 400 Chinese consumers were selected to obtain a representative sample. Survey research was utilized in this study to gather data from respondents. To gather information about a sizable number of people's origins, habits, beliefs, or attitudes, survey research uses a questionnaire or formal interview. The data was collected through an online survey. An online survey method was chosen because it is simple, quick, and affordable. Researchers can save their expenditures by using this method, which also lowers paperwork, travel, and printing expenses. Additionally, online surveys provide convenience and comfort to the respondents; they can answer the questionnaire anytime and anywhere.

Measures and Scales

This study used several constructs for the proposed model. Table 1 presents the constructs and items used in this study. A five-point Likert scale was used to measure all the constructs. The scale items of the environmental motivation construct were adapted from literature. Altruism was measured on a five-point scale. For innovativeness, the scale items developed by Tellis et al. [56] and Scherer et al. [52] were adopted in this study. The scale items for attitude were adopted from the study by Tellis et al. [56]. The switching intention construct was measured using a seven-scale item drawn from previous literature.

Table 1. Constructs and their items.

Variable	Items	Definition of items
Environmental motivation	EM1	I consider the potential environmental impact of my actions when making many of my decisions.
	EM2	It is important to me that the products that I use do not harm the environment.
	EM3	When I have choices between two products, I will purchase the one less harmful to the environment
	EM4	Mankind must not abuse the environment
	EM5	Humans must live in harmony with nature to survive
Altruism	ALT1	To help other people
	ALT2	To serve mankind
	ALT3	To share what you have
	ALT4	To give to others
	ALT5	To be unselfish
Innovativeness	INN1	I hate any change in my routines and habits.
	INN2	New products have an unacceptably high price.
	INN3	I am excited to try out new products.
	INN4	I enjoy the novelty of owning new products.
	INN5	I like to be confronted with new ideas.
Attitude	ATT1	If I had a choice, I would buy products that use biodegradable plastic-based packaging.
	ATT2	I will buy products from lesser-known companies if the products are biodegradable plastics
	ATT3	I would be willing to buy products that are recyclable for other uses.
	ATT4	Purchasing biodegradable plastic products is good and wise.
	ATT5	I will prefer biodegradable plastic products over synthetic plastic products.
	ATT6	Purchasing biodegradable plastic products is a favorable and good idea
Switch intensions	SI1	I will buy biodegradable plastic in the future
	SI2	I plan to buy biodegradable plastic regularly
	SI3	I intend to buy biodegradable plastic because they are more environmentally friendly
	SI4	I will consciously pay attention to biodegradable plastic products made of renewable resources in future purchase decisions
	SI5	When I choose a plastic product made of conventional materials and one made of renewable raw materials, I will choose one made of renewable raw materials in the future
	SI6	I will prefer to purchase biodegradable plastic for ecological
	SI7	I am willing to make an extra effort to purchase biodegradable plastic

Analysis Technique

The decision-making process of individuals regarding the adoption of biodegradable plastics is complex and can be explained by multiple variables. Therefore, the structural equation modeling (SEM) technique was deemed appropriate for testing the study hypotheses. SEM is a set of statistical methods that aims to explain the hypothesized relationships between the observed and latent variables. A questionnaire was used to measure the observed variables, while latent variables were assessed using the proposed structural model. SEM is generally categorized as variance-based SEM (PLS-SEM) and covariance-based SEM (CB-SEM) [57]. In this study, PLS-SEM was applied because of its ability to indicate the most critical antecedent variables in explaining individuals' switching intentions to adopt biodegradable adoption behavior [58, 59]. A confirmatory factor analysis was used to evaluate the measurement model in this study [60]. Path analyses were used for the analysis of relationships between latent variables.

Results

Sociodemographic Characteristics of the Respondents

Respondents' demographic information, such as gender, age, marital status, income, and employment status, is presented in Table 2. More than three-fifths of the young consumers participating in this study were male. Most consumers participating in this survey were under 25 years of age. Similarly, more than two-thirds of young consumers in this study were single. More than half of the consumers had less than 12 years of schooling. Most consumers in this study were employed in the private sector. More than 80% of consumers had a monthly income of less than 15,000 RMB.

Evaluation of the Measurement Model

Confirmatory factor analysis (CFA) was used to confirm if latent variables were well measured by observed variables (reliable and valid). At first, the factor loading of all items was examined. The factor loading (FL) values were above 0.5 (Table 3).

Table 2. Sociodemographic characteristics of the sample.

Variables	Number of respondents	Percentage (%)
Gender		
Male	241	60.3
Female	159	39.7
Age		
<25 years	197	49.3
25-30 years	150	37.5
>30 years	53	13.2
Marital status		
Single	277	69.3
Married	118	29.5
Divorced	5	1.2
Schooling years		
<12	210	52.5
≥12	190	47.5
Employment status		
Student	146	36.4
Unemployed	31	7.8
Private sector employee	192	48.0
Public sector employee	31	7.8
Income (RMB)		
<10000	177	44.2
10000-15000	192	48.0
>15000	31	7.8

Reliability and Validity Analysis

The validity of the measurement model was evaluated using convergent and discriminant validity. Convergent validity is the degree to which a measure correlates with the outer loadings of the indicators and other measures in a construct [61]. The average variance extracted (AVE) was used to assess convergent validity, and the recommended cutoff value for AVE was 0.5. The AVE value of all constructs is greater than 0.5, suggesting suitable convergent validity of the model. Discriminant validity was evaluated using two different indicators: the Fornell and Larcker criterion and the hetertrait-moniotrait ratio (HTMT). According to the Fornell–Larcker criterion, if the square root of AVE values is greater than the inter-construct correlations, then the construct has adequate discriminant validity [62]. The correlation values show that no value is greater than the square root of AVE; hence, Fornell and Lacker [63]'s criteria for discriminant validity were met in this study. Furthermore, the HTMT criterion was employed to assess the discriminant's validity. If all values were less than 0.9, then there was discriminant validity. As the HTMT values presented in Table 4 do not exceed 0.90, there is no discriminant validity. As a result, it can be said that the study has adequate reliability and validity.

Furthermore, the study examined multicollinearity issues by examining the variance inflation factor (VIF). Mason and Perreaulr [64] recommended that collinearity issues be resolved before performing regression analysis in SEM. The minimum accepted value of VIF is 1-5. The collinearity assumption is ensured if the VIF values are greater than 1 and less than 5. All VIF values in this study were below the threshold level, indicating no multicollinearity among the construct items.

Structural Model Assessment: Hypothesis Testing

The measurement model was evaluated based on the constructs' reliability and validity. Reliability is associated with the internal consistency of the constructs. Cronbach's Alpha and Composite Reliability (CR) were used to evaluate the internal consistency. According to Ringle et al. [58], values of Cronbach's Alpha and CR between 0.7 and 0.95 represent satisfactory reliable levels. Cronbach's Alpha and CR values are greater than 0.7 and meet the threshold set by other studies [59, 60], indicating adequate internal reliability of the constructs.

After evaluating the After-measurement model and confirming that all values met the After requirements, the hypotheses were tested by performing bootstrapping in Smart PLS. The quality of the model, which depends on its ability to predict endogenous constructs, was examined using different criteria. First, the model's

Table 3. Measures, Factor loading, reliability and convergent validity analysis.

Variables	Items	FL	Cronbach's Alpha	Composite Reliability	Average variance extracted	VIF
Environmental motivation	EM1	0.68	0.80	0.80	0.56	1.38
	EM2	0.78				1.81
	EM3	0.76				1.69
	EM4	0.74				1.61
	EM5	0.777				1.69
Altruism	ALT1	0.71	0.78	0.78	0.54	1.60
	ALT2	0.76				1.70
	ALT3	0.71				1.44
	ALT4	0.80				1.79
	ALT5	0.66				1.29
Innovativeness	INN1	0.60	0.80	0.84	0.51	1.42
	INN2	0.63				1.46
	INN3	0.78				1.86
	INN4	0.84				2.30
	INN5	0.79				1.80
	INN6	0.57				1.28
Attitude	ATT1	0.81	0.901	0.90	0.62	2.26
	ATT2	0.70				1.61
	ATT3	0.75				1.79
	ATT4	0.80				2.17
	ATT5	0.83				2.41
	ATT6	0.81				2.31
	ATT7	0.82				2.31
Switching intention	SI1	0.79	0.910	0.91	0.65	2.22
	SI2	0.84				2.70
	SI3	0.82				2.43
	SI4	0.79				2.29
	SI5	0.79				2.19
	SI6	0.81				2.50
	SI7	0.76				2.16

accuracy was examined using R2. R2, or the coefficient of determination, is a measure of the variance explained in each endogenous construct. An R-square value greater than 0.1 indicates the predictive ability of the model. According to Cohen [64], an R2 value >0.26 is strong, a value close to 0.13 is average, and <0.02 is weak. The structural model showed R2 values greater than 0.60, indicating that the predictive ability of the model was strong.

The second criterion used to assess the ability of the model to predict endogenous constructs is the f-square (effect size). Effect size evaluates the contribution of an exogenous variable to an endogenous latent variable's R-square value [65]. Hair et al. [57] recommended an f2 value above 0.35 to be a strong effect size, close to 0.15 as average, and below 0.02 to be weak. The f2 values in Table 5 show that environmental motivation and attitude have a strong effect size, while altruism and innovativeness have an average effect size.

Finally, some researchers have recommended examining the Stone–Geisser Q-square value. The cross-validated redundancy Q-square was used to examine the predictive relevance of the endogenous construct. Castro and Roldan [66] recommended that

Table 4. Discriminant Validity Analysis.

Fornell and Lacker Criterion					
Constructs	ALT	ATT	EM	INN	SI
ALT	0.735				
ATT	0.536	0.793			
EM	0.480	0.736	0.751		
INN	0.468	0.594	0.485	0.715	
SI	0.532	0.785	0.621	0.692	0.806
Heterotrait-Monotrait ratios					
	ALT	ATT	EM	INN	SI
ALT	-				
ATT	0.633	-			
EM	0.602	0.864	-		
INN	0.563	0.667	0.576	-	
SI	0.623	0.864	0.722	0.778	-

Note: The square roots of AVE are bold in diagonal.

Table 5. Structural model assessment.

	R^2	Adjusted R^2	Q^2	F^2
Switching intentions	0.616	0.615	0.213	
Attitude	0.633	0.630	0.297	
ALT>ATT				0.047
EM>ATT				0.529
INN>ATT				0.129
ATT>SI				1.607

Note: ALT [Altruism], INN [Innovativeness], ATT [Attitude], SI [Switching intention], EM [Environmental motivation].

for a model to be predictively significant, the Q-square value should be greater than 0, and a value <0 indicates that the model is flawed.

Finally, the strength of the relationship between the constructs was examined using the path coefficients and their significance. The results of the structural model assessments are presented in Table 6. The path coefficient from altruism to attitude was 0.157 and significant at the 0.001 level, indicating that altruism is positively related to attitudes towards bioplastics. The Path coefficients from Environmental Motivation and Innovativeness to attitudes were also greater than 0.1 and significant. Hence, H1, H2, and H3 are accepted. Similarly, the path coefficient from attitude towards bio-plastics to switching intention to bioplastics indicates a positive relationship between both variables (B = 0.785, p = 0.000). Thus, H4 was accepted.

Mediation Analysis

This study used attitudes towards bio-plastics as a mediating variable between altruism, innovativeness, environmental motivation, and the dependent variable (switching intentions). The results of the mediation are summarized in Table 7. According to these findings, ATT significantly mediated the relationship between EM and SI (t = 8.517, p = 0.000). ATT also significantly mediated the relationship between INN and SI (t = 4.056, p = 0.000) and between ALT and SI (t=3.154, p= 0.000). Hence, hypotheses H5, H6, and H7 were accepted.

Model Fitness

Different model fit indices were calculated to establish the goodness-of-fit of the research model. These include SRMR, D_ULS, D_G, Chi-square, and NFI. The minimum accepted value for SRMR is 0.08, and the rule of thumb for assessing model fitness through both criteria of exact model fitness (D_ULS and D_G) is that the difference between the estimated and saturated models should be insignificant or above 0.05 [67]. The results of the model fitness presented in Table 8 indicate that the value of SRMR is higher than the minimum accepted value, and the difference in both

Table 6. Hypotheses testing

Direct paths	Path coefficients	STDEV	t-statistics	P-values	Hypothesis
ALT ->ATT	0.157***	0.048	3.257	0.001	Accepted
EM->ATT	0.534***	0.067	7.921	0.000	Accepted
INN->ATT	0.262***	0.059	4.425	0.000	Accepted
ATT->SI	0.785***	0.029	27.551	0.000	Accepted
ALT->SI	0.124***	0.039	31.154	0.002	Accepted
EM->SI	0.419***	0.049	8.517	0.000	Accepted
INN->SI	0.205***	0.051	4.056	0.000	Accepted

Note: ALT [Altruism], INN [Innovativeness], ATT [Attitude], SI [Switching intention], EM [Environmental motivation].
*** shows significance level at 1%.

Table 7. Mediation analysis

Mediation paths	Path coefficients	STDEV	t-value	P-values
ALT->ATT->SI	0.124***	0.039	3.154	0.002
EM->ATT->SI	0.419***	0.049	8.517	0.000
INN->ATT->SI	0.205***	0.051	4.056	0.000

Note: ALT [Altruism], INN [Innovativeness], ATT [Attitude], SI [Switching intention], EM [Environmental motivation].
*** shows significance level at 1%.

Table 8. Model fit indices.

Model fit indices	Saturated Model	Estimated model
SRMR	0.086	0.09
D_ULS	1.693	2.49
D_G	0.511	0.56
Chi-Square	1148.56	1226.88
NFI	0.831	0.82

criteria of exact model fit is higher than 0.05. Hence, it is concluded that the current research model has achieved goodness of fit [68].

Discussion

The aim of this research was to analyze the impact of Altruism, Innovativeness, and environmental motivation on switching intentions toward bioplastics, as well as the mediating role of attitude towards bioplastics through the lenses of the theory of consumption value. As environmental issues have worsened, the increasing use of environmentally friendly products has become a priority for policymakers worldwide, especially in developing countries. In this scenario, the present study is important because it contributes to the discussion on the role of different factors in encouraging consumers to switch to environmentally friendly products. Based on the existing literature, this study developed a framework that argues that the intention to switch to bioplastics results from an interplay of consumers' environmental motivation, degree of altruism, and openness to new products. To the best of our knowledge, this is the first study in a developing country such as China to investigate consumers' intentions to switch to bioplastics from conventional plastics.

The results of the structural model showed that all three independent variables–environmental motivation, innovativeness, and altruism–are positively related to attitudes towards bioplastics. Based on the findings, it can be concluded that Chinese consumers can change their attitude towards bioplastics if they are motivated to protect the environment, are concerned about the welfare of others, and are open to adopting new and innovative products. Furthermore, EM, INN, ALT, and ATT had a significant and positive relationship with switching intentions. The positive relationship between environmental motivation and switching intention is consistent with the previous research by Moshood et al. [55].

The findings of this study that altruism is positively related to switching intentions toward bioplastics are in line with previous studies by Teng et al. [69] and Klein et al. [70]. These results strengthen the assumption that, as an individual's altruism increases, the probability of the intention to purchase bioplastic products increases, and the likelihood of intending to purchase bioplastic products increases as an individual's environmental incentive for bioplastics rises. The positive relationship between innovativeness and switching intentions indicates that the likelihood of adopting innovative products increases if potential consumers are innovative. These findings are consistent with those reported by Tellis et al. [56] and Osburg et al. [71].

Another stream of hypotheses was developed based on the hypothesized mediating role of attitude towards bioplastics between independent variables and switching intentions. The findings confirmed that attitude was positively related to switching intentions, which reveals that Chinese consumers' attitudes towards bioplastics influence their intentions to purchase bioplastics. The mediating role of attitude between EM, INN, ALT, and switching intention has been confirmed in previous studies [52, 55].

Conclusions and Policy Recommendations

To promote sustainable consumption and reduce plastic waste in the environment, the adoption of bioplastics by consumers is essential. The aim of this research was to study the impact of environmental motivation, altruism, and innovativeness on switching intentions towards bioplastics. The study hypothesized that these factors would have a positive effect on consumer switching intentions. The results of the study provided insights into the factors that impact consumer behavior toward bioplastics. Findings indicated that altruism has a favorable influence on green buying intentions. In this study, we identify brand innovation as a significant element influencing consumer switching intentions. This underpins the critical role of innovation and altruism in this industry, which is hampered by

the diversity of bioplastic application domains, varied product features of bioplastics, and the presence of many small-scale businesses in this field. Businesses should generate more environmentally friendly items. The most constant predictor of green purchasing behavior is one's attitude. The findings indicate that attitude plays a mediating role between altruism, innovation, environmental motivation, and consumer switching intention.

Based on the findings of this study, the following policies are recommended to increase the use of bioplastics in China. Policymakers should initiate programs to raise awareness among Chinese youth about the ecological benefits of bioplastics. These programs can be included in the educational curricula and social media campaigns to reach the maximum number of Chinese youths. Moreover, platforms should be provided to youth to actively participate in biodiversity conservation efforts and decision-making related to plastic use. This can include youth-led initiatives, competitions, and forums in which young Chinese youth can share ideas and solutions to reduce plastic pollution. Introduce incentives such as discounts, rewards, or recognition programs for Chinese youth who actively choose bio-plastic products over conventional plastics. These incentives can help reinforce positive behavior and encourage the widespread adoption of environmentally friendly alternatives. Foster entrepreneurship among Chinese youth by providing support and resources for startups and businesses that develop innovative bio-plastic products or sustainable solutions to address plastic pollution. This includes grants, mentorship programs, and access to funding.

Conflicts of Interest

The authors declare no conflict of interest.

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