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Study on consumers' motivation to buy green food based on meta-analysis

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Introduction: There exists a noticeable gap between consumers' willingness to purchase green food and their actual purchase behavior. However, the awareness of green development is a crucial factor influencing this purchase behavior and acts as an internal driving force promoting green consumption. Consumers' green development awareness is shaped by various psychological motivations, including environmental concern, health consciousness, knowledge, norms, and price considerations. The existing literature often focuses on specific regions or groups, lacking comprehensive cross-regional and multivariate evaluations, and frequently overlooks the potential impact of moderating variables such as economic development level, product type, and behavior type.

Methods: To clarify the overall effect of each motivational factor on green food purchase behavior, this study conducted a meta-analysis. We selected eight causal variables and three moderating variables that significantly influence consumers' green food purchase behavior. The analysis included 132 independent effect values from 45 research papers.

Results: The meta-analysis revealed that: ① Consumers' green food purchase behavior is significantly positively correlated with eight motivational factors: environmental awareness, health awareness, green attitude, green knowledge, subjective norms, price awareness, perceived behavior control, and perceived usefulness. ② Economic development level, product type, and behavior type significantly affect consumers' green food purchase behavior. ③ The impact of motivational factors on actual purchase behavior is weaker than on purchase intention, suggesting that interventions should focus on converting purchase intentions into actual purchase behavior. ④ The findings indicate that environmental responsibility, government policies, and marketing strategies can influence consumers' psychological motives, guiding them toward more responsible consumption choices.

Discussion: Enhancing consumers' environmental and health awareness is essential, and policy support and marketing strategies can effectively promote green food consumption. These insights underscore the importance of targeted interventions to bridge the gap between green purchase intention and behavior.

KEYWORDS

health concern, environmental concern, green food, purchase intention, meta-analysis

1 Introduction

1.1 Research background

Green development depends on green production and green consumption. Green food promotes green production, producing green consumption and boosting high-quality agricultural development (Zhu et al., 2013). Green food is essential to feed the ever-increasing population of the world (Ehrlich and Harte, 2015). In the newly revised Measures for the Administration of Green Food Labels issued by the Ministry of Agriculture and Rural Affairs of the People's Republic of China on January 7, 2022, green food continues to be defined as safe, high-quality edible agricultural products and related products produced in an excellent ecological environment, made in accordance with green food standards, implemented complete process quality control and obtained the right to use green food labels. Green food is a pollution-free, safe, high-quality and nutritious product that follows the principle of sustainable development, is produced by a specific mode of production, is recognized by a particular agency, and is allowed to use green food signs (Lin et al., 2009). Therefore, green food should not only emphasize the characteristics of "safety," but also have the characteristics of "high quality" and "nutrition" (Giudice et al., 2006). Green consumption is a fundamental requirement in the development of human society and the inevitable choice for developing a low-carbon economy (D'Amato and Korhonen, 2021). With the development of social economy, the green development of the food system has become an important area of people's concern. At the same time, people are increasingly aware of the different effects of daily consumption behavior on the environment, health and the lives of others. Therefore, people are very concerned about becoming more responsible consumers and making more choices conducive to environmental and social development, such as buying more green food. Consumer purchase behavior is a highly complex process, which is affected by price and income and various motivations or preferences (Jaiswal and Singh, 2018; Dangelico et al., 2021; Kim et al., 2022). According to the consumer behavior theory, the purchase behavior of individuals is formed through a complex purchase decision-making process under the induction of multiple motivations (Qi and Ploeger, 2021). Although many consumers are willing to pay for green food, there are structural differences in consumers' preferences for green food in different regions and with different incomes (Yu et al., 2014). Consumers themselves wholly complete this decision-making process, so it is also known as cons the user's "Black box" or "dark box" (Sheng et al., 2019). Breaking the black box and exploring the consumption decision are always the eternal themes in researching consumption behavior. Scholars at home and abroad have researched the motivation of consumers' green product purchase behavior (Fang and Zhang, 2018; Saleem et al., 2021; Nekmahmud et al., 2022). Still, the existing research has not reached a consensus on which motivational factors have a significant impact on consumers' green purchase behavior, nor on the direction and intensity of the impact. The existing literature mainly focuses on a single region or a specific group, with a lack of cross-regional and multivariate systematic evaluation, and often ignores the potential influence of regulatory variables such as economic development level, product type and behavior type. In particular, the reasons for the differences between different studies have not been effectively explained, which restricts researchers to draw more accurate conclusions from the macro research level.

Green food is generally defined as unpolluted and harmless food produced in a an excellent ecological environment, mainly including pollution-free agricultural products, organic food, etc. (Tobler et al., 2011). In recent years, the income level of residents has steadily increased, and the demand and structure of food consumer demand has gradually changed, beginning to shift from subsistence to health care (Annunziata and Mariani, 2018; Nguyen H. V. et al., 2019). In particular, the ecological and environmental crisis in China has become increasingly serious in the course of urbanization and industrialization, and the reduction of non-traditional factors in agricultural production and the increase of industrialized factors have led to increasing safety issues such as pesticide residues, hormone use and micro-organisms of farm products. Against this backdrop, there is a burgeoning demand for green food consumption that is healthy, safe, organic and pollution-free (Vanhonacker et al., 2012). The 2021–2022 CFSAN Centers of Excellence Annual Report issued by the US Food and Drug Administration and the China Food Safety Development Report (2021) edited by the China Food Safety News Agency show that urban consumers are highly concerned about food safety and are willing to pay a premium for green food.

Consumers' green food purchase behavior, also known as sustainable consumption of green food, refers to a new type of consumer behavior and process characterized by moderate consumption control, avoiding or reducing environmental damage, advocating nature and protecting the ecology (Lassar et al., 2005). In order to better understand and predict the consumer green food purchase behavior, this paper based on the rational behavior theory and planning behavior theory, by analyzing the relationship between these motivation factors and purchasing behavior, build a theoretical analysis framework of the main motivation of consumers to buy green food, so as to identify the main motivation factors affecting consumers to buy green food, for policy makers, green product manufacturers and sellers to provide important reference to develop marketing strategies to promote green consumption. From the perspective of meeting ecological needs, with the primary connotation of being beneficial to health, protecting the ecological environment and sustainable development, etc., the purpose is to enable people's consumption behavior to meet not only the consumption needs, safety needs and health needs of our generation, but also the consumption needs, safety needs and health needs of future generations. Therefore, based on a systematic review of the existing literature, this paper includes as much collected literature as possible in the research samples (50 literatures) and research variables (health awareness, environmental awareness, green attitude, green knowledge, subjective norms, price awareness, perceived behavior control, perceived usefulness, eight independent variables), and then uses strict meta-analysis procedures, Comprehensive evaluation of the nature and intensity of consumers' motivation factors to buy green food is expected to eliminate the inconsistencies in relevant research conclusions; In addition, we will further explore which regulatory variables (economic development level, product type, behavior type) will affect the relationship between antecedent variables and outcome variables, to provide some more

comprehensive, objective and referential research conclusions, and provide inspiration for future research.

1.2 Literature review and analytical framework

1.2.1 Theoretical basis

To understand the motivation of consumers to buy green food, it is necessary to explore their purchase behavior first. Rational and planned behavior theory has been used in studying attitudes and intentions to understand and predict individual behavior laws. These theories have been widely used in various empirical studies, from material recycling, effective use of energy, biodiversity protection, physical exercise (Smith and Biddle, 1999), speeding behavior (Stead et al., 2005) and even condom use (Wilson et al., 1992). In green consumption, these theories are also used to analyze the purchase intention or behavior of green food such as organic food (Pino et al., 2012), low carbon and energy (Wang et al., 2012). Natural cosmetics (Nguyen P. et al., 2019), put man and nature in a balanced and coordinated position, take "harmonious coexistence" between man and nature as the ethical basis, and pay attention to protecting the ecological system. Therefore, consistent with previous studies, this paper selects research variables based on rational and planned behavior theories.

Rational behavior theory predicts behavior by evaluating the intention to perform a specific behavior. The intention is determined as the effort that an individual is willing to make to implement behavior, including motivation. The intention is considered the precursor of behavior and, therefore, the best predictor of behavior. Among them, health awareness, environmental awareness, price awareness, attitude, knowledge, subjective norms, and perceived usefulness are important motivational factors for consumers' purchase behavior (Azizan and Suki, 2014; Reimers et al., 2017; Malik et al., 2019).

Based on the theory of rational behavior, the theory of planned behavior introduces the variable of perceived behavior control. Adding this variable can explain why people cannot control their related behaviors completely. Perceived behavior control refers to the degree of ease or difficulty that an individual perceives in performing a specific behavior, which reflects the individual's perception of factors that promote or hinder the implementation of behavior (Jin et al., 2019). Regarding green food, price and availability are perceived behavioral control factors because they may restrict consumers' purchases.

1.2.2 Attitude and knowledge

Attitude is an individual's favorable or unfavorable evaluation of behavior (Ajzen, 2011). As far as consumers are concerned, attitude is a predictor of purchase intention and purchase behavior (Sun and Wang, 2020). If consumers believe buying a particular commodity will bring positive results, they will form a favorable attitude toward this behavior. In a word, attitude will affect consumers' purchase intention. The more favorable the attitude is, the stronger the consumers' intention to buy green food is (Yadav and Pathak, 2016).

Most of the existing studies support the attitude intention relationship. Squires et al. found that consumers with environmental attitudes buy more organic food than consumers without environmental attitudes (Squires et al., 2001). Tarkiainen and Sundqvist (2005) confirmed this and found a positive correlation between consumers' attitudes toward green food and their purchase intentions. In contrast, Magnusson et al. believed that a positive attitude may only sometimes reflect their willingness to buy. In their research, most respondents held a positive attitude toward green food. Still, some consumers are unwilling or unable to buy green food according to their attitude because their income hinders their perception of value (Magnusson et al., 2001). However, most studies show that many consumers have a positive attitude toward green food. The stronger the positive attitude, the greater the willingness to buy, and the greater the likelihood of consumers buying green food.

Knowledge is essential, and many researchers believe it has a critical king process impact on consumers' decisions. The research of Moorman et al. supports this view. They found that subjective knowledge will affect consumers' choices because they will be inspired to act according to their knowledge (Moorman et al., 2004). Hutchins and Greenhalgh's research on organic food also found that consumers understand the core characteristics of organic food. Still, they lack an understanding of organic agricultural practices and their differences from traditional agricultural methods (Hutchins and Greenhalgh, 1995). Other studies have also confirmed this conclusion (Chen, 2008; Gundala and Singh, 2021), which shows that although most consumers have a basic definition of green food, they lack a complete understanding of its meaning, production, and certification processes. In addition, the willingness to pay the premium is related to green knowledge; Consumers need a reason, such as better quality or more delicious goods, to explain why they pay more for green food (Carfora et al., 2021).

1.2.3 Health awareness and environmental awareness

Green food is generally considered healthier than nongreen alternatives (Lea and Worsley, 2005). Many studies have shown that health is an important motivation to buy green food. Most consumers purchase green food for health reasons, especially organic food (Erdoğan Yazar and Burucuoglu, 2019; Wang et al., 2019). Health is generally considered to include personal and family health, defined as a person's responsibility for the family and his well. Research on the impact of health awareness on consumers' green product purchase behavior is mixed. Squires et al. (2001) found that consumers who pay more attention to health are more likely to buy green food than those without awareness. Based on the research on Chinese consumers, Wu (2021) also found that consumers' worries about health issues would significantly increase their willingness to buy organic food. However, these studies show that different product categories may produce different results. For example, Nguyen et al. found that health awareness will make Vietnamese women more inclined to buy eco-friendly cosmetics. However, there is still a correlation with their willingness to purchase organic food (Nguyen P. et al., 2019). Therefore, more

than health awareness is needed to explain consumers' motivation to buy green food.

Environmental awareness is another important explanatory variable. Grunert and Juhl (1995) define consumers who pay attention to the environment as "knowing that the production, distribution, use, and disposal of products will lead to external costs, and making a negative assessment of such external costs, trying to minimize them through their actions." Environmental awareness is usually considered a strong driving force for consumers to buy green food. Some scholars have found that the increase in green consumption is related to society's growing concern about environmental issues. For example, Allenby et al. and Wei et al. conducted a questionnaire survey on 150 American consumers who purchase eco-friendly clothes (Allenby et al., 1995; Wei et al., 2018). Xu et al. (2020) researchers based on China's housing market also found that the concern for her health concerns to choose green and environmentally friendly decoration methods. However, Environmental motivation can only explain a small part of consumers' green product purchase behavior (Ramakrishnan et al., 2021).

1.2.4 Subjective norms and price awareness

Subjective norms are defined as the degree of the tendency of the actor to make specific behaviors due to the expectations of people and society who have an important influence on the actors (Oliver and Bearden, 1985; Liu et al., 2020). In other words, subjective norms are the opinion of other people who are essential to the individuals and affect personal decisions (Nguyen and Nguyen, 2020; Sun et al., 2022) Subjective norms are the kind of social pressure that will lead to shame when decision-makers implement "socially valuable behaviors" in their lives, leading to self-esteem and pride (Kalafatis et al., 1999). Subjective norms have been proven to prevent consumers' purchasing behavior (Xu et al., 2022). Subjective norms and consumers' green consumption intention (Li et al., 2019). Liu et al. research on the energy consumption behavior of Beijing residents also supports this view (Liu et al., 2015). However, Smith and Paladino found that the impact of subjective norms on consumer behavior is regulated by consumption visibility. If the visibility of green consumption is low, the impact of subjective norms on consumers' green consumption behavior is insignificant (Smith and Biddle, 1999).

Price is usually considered the main obstacle for consumers to buy green food. Some studies have shown that this is especially true for low-income people. In low-income people, high price premiums may make it impossible to buy green food. If the price premium is reduced, most consumers will buy more green food (Radman, 2005). However, some scholars have found that some consumers are willing to pay a premium for green food. For example, Gumber and Rana have shown that most consumers are prepared to pay up to 30% of the additional cost for organic products (Gumber and Rana, 2021). Although this number varies in different studies, consumers are willing to spend 10%−20% more (Lockie et al., 2004). This finding is significant because it indicates that price premiums may be the main obstacle for consumers to buy green food. Wang et al. (2019) survey of Kenya's organic food consumer market also supports this conclusion, and price awareness has no significant impact on whether Kenyan consumers choose to buy organic food. Moreover, with the development of technology, the price of green food in some fields is falling, making them comparable to traditional goods, which means that we need to understand better the role of price awareness in purchasing decisions.

1.2.5 Perceived usefulness and perceived behavior control

Lack of availability is generally considered an obstacle for consumers to buy green food (Magnusson et al., 2001). Lyons et al. (2001) found in their research on the green consumer market in Australia that there are few varieties of green food with significant differences in consistency, and their shelf life is usually shorter than that of traditional products. This indicates that the lack of availability may inhibit consumers' willingness to buy green food. The research on organic crops found that one of the disadvantages of organic crops compared with traditional agricultural products is that the yield is reduced. Fewer products are sold, resulting in the lower availability of organic produce. Consumers want to see an increase in the supply and scope of organic products. Most consumers will buy more readily if organic products are more easily available. However, some scholars have found that limited supply is not the main obstacle for consumers to buy green food (Mehraj and Qureshi, 2020). For example, Tarkiainen and Sundqvist (2005) found that the perceived usefulness of organic food has no significant impact on consumers' purchase intention.

According to the theory (Ajzen and Madden, 1986) of planned behavior, attitude, subjective norm and perceived behavior control will affect consumers' feelings about specific behaviors, which is crucial to understand consumers' purchase behavior of green food (La Barbera and Ajzen, 2020; Lindgren et al., 2021) Perceptual behavior control is "the perception of the difficulty of executing the behavior of interest." It mainly corresponds to situations where people cannot wholly control appropriate behaviors (Ajzen, 1991). Perceived behavior control reflects the barriers to implementing purchase intention, which will reduce appropriate behaviors, possibly including price and supply. Because price and supply may restrict or even prevent consumers from buying. Ajzen (1991) believes that perceived behavior control can significantly impact consumers' purchase intention because a higher level of perceived control can improve the intention of executing behavior. Although purchase intention cannot be wholly transformed into purchase behavior, it can be used to measure and predict purchase behavior under certain conditions (Morwitz, 2012). Therefore, we regard perceived behavior control as critical in explaining consumers' motivation to purchase green food. In a word, in the existing research, there is no consensus on the correlation and directionality between consumers' green purchase behavior and their psychological motivations, as well as the relative importance of these motivations in determining green product purchase behavior. Therefore, this study has built a theoretical model of consumers' purchase motivation for green food, as shown in Figure 1.

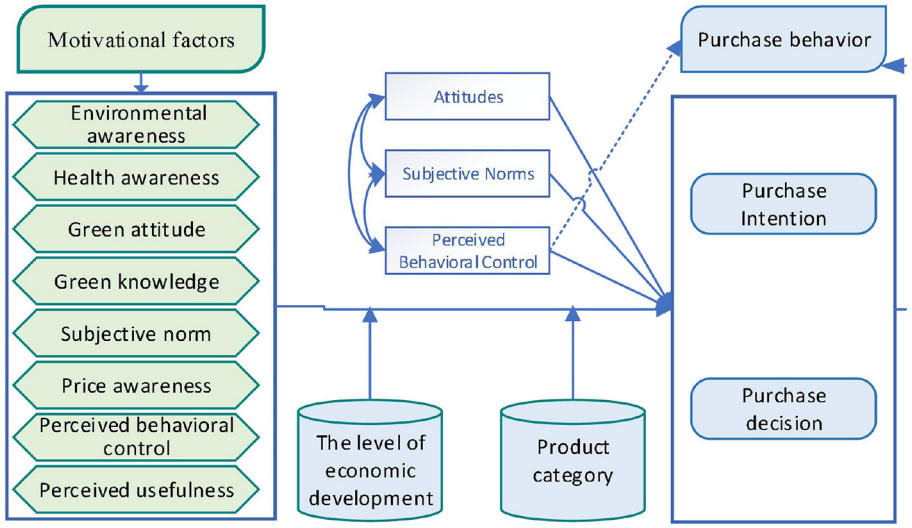

FIGURE 1
A theoretical model of consumers' motivation to buy green food.

2 Materials and methods

2.1 Data source and sample screening

We searched peer-reviewed scientific journals found in internet databases. The search used keywords such as: "motivation," "green food," "concern," "purchase," "shop," "buy," "factor," "impact," "effect," "determine." The Web of Sciences, PubMed, Scopus, CNKI and WANFANG databases were searched from January 2000 to December 2022, Document type = Article; As for the retrieval language, the retrieval language used in the four databases (Web of Sciences, PubMed, Scopus and WANFANG) is English, and the retrieval language used in the CNKI database is Chinese. A total of 6,865 documents were retrieved, including 5,904 English and 961 Chinese documents. A two-decade period in which societal emphasis has shifted toward health, environmental, and ethical issues, which may be reflected in consumer purchasing habits.

We carefully read the full-text literature obtained and then screened it according to the following criteria. The inclusion criteria were:

① It must be empirical research literature on green food consumption behavior.
② The sample size must be clearly stated, and the correlation coefficient between the antecedents involved in the research model and the purchase intention/behavior must be reported, or the *T*-value can be converted into the correlation coefficient.
③ Consumers buy for themselves, not for organizations/businesses.
④ The research object is adult consumers, because the spending of adult consumers tends to be stable and mature.
⑤ Studies should focus on consumer purchasing, including purchase intention, purchase attitude, purchase decision, purchase frequency and/or willingness to pay a premium price.

Some articles are excluded according to the following criteria:

① Thesis collection, qualitative research, systematic review, experimental research and conceptual research.
② The research focuses on product consumption, shopping places (such as online shopping) or other decisions or behaviors (such as protection, open change, self enhancement, self transcendence and non-purchasing behaviors).
③ The moderating or indirect effect of purchase motivation on purchase behavior is studied.
④ The full text of the literature cannot be obtained.
⑤ The research data is incomplete, or the research results do not explain the variance and mean value.
⑥ Use duplicate samples.
⑦ The experiment did not use standardized quantitative evaluation on the results of green purchase behavior.
⑧ The interaction of the dependent variables in the study was not excluded, and the behavioral results could not be evaluated whether it was caused by residents' green purchase motivation.
⑨ Unable to determine the exact behavioral outcome of the study.

According to the above criteria, this paper eliminated the unqualified documents through searching and screening, and then read and browse the title, abstract, key words and topic relevance of 168 retained documents. This process again excluded 123 documents that could not be reviewed in full text. Finally, 45 documents on green consumption behavior of residents were obtained. After reading and reviewing the 45 documents, 132 records of influencing factors on green product purchase behavior were obtained. The following is a flowchart showing a summary of

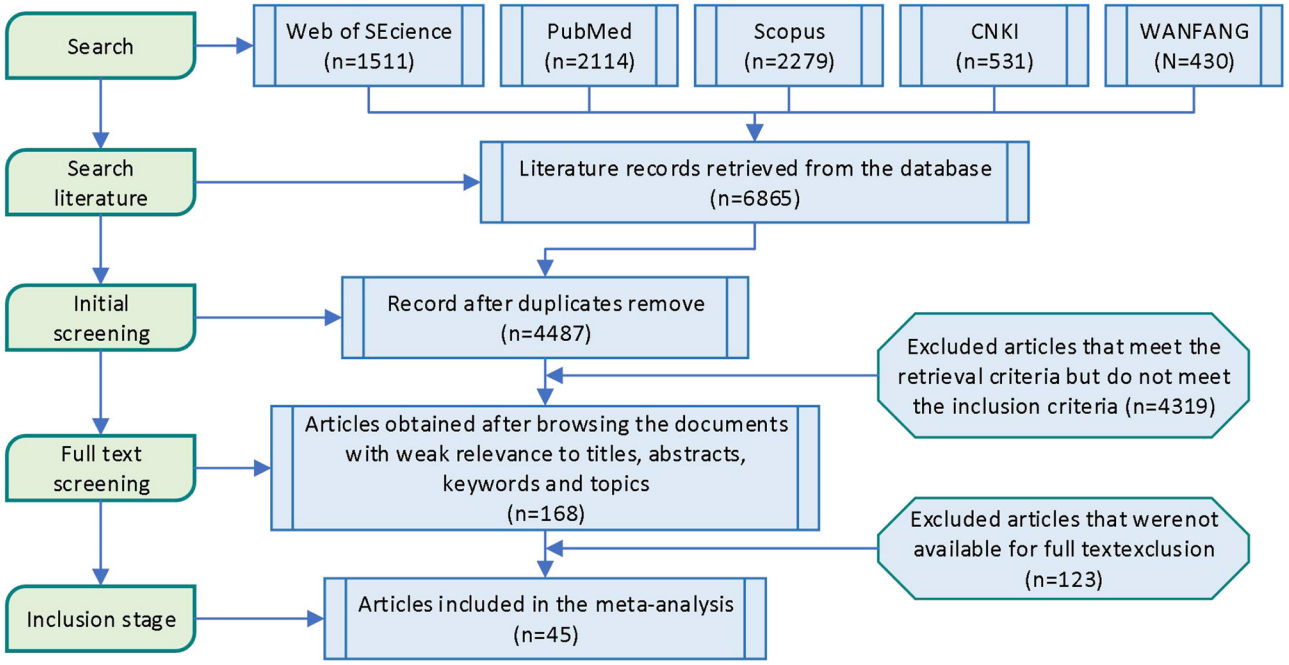

FIGURE 2
The search and selection process for identifying papers included in the meta-analysis.

the search and selection process used to identify the papers included in the meta-analysis (see Figure 2).

2.2 Meta-analysis methods

American scholar Glass first put forward the meta-analysis in 1976 (Glass, 1976). It is a state of many existing empirical documents using the corresponding statistical formula. Compared with the traditional qualitative description method of literature, meta-analysis carries out systematic and comprehensive retrieval, access and evidence grade evaluation of the research results in strict accordance with statistical methods and procedures to minimize bias and ensure the objectivity, authenticity and effectiveness of the conclusions (Yang et al., 2022). It is one of the statistical research methods to analyze the correlation between two variables according to the statistical significance obtained (Lin et al., 2022). A single causal analysis or relationship analysis cannot find potential laws. To avoid possible factual error, sample error, and measurement error of the observed value of the study sample, meta-analysis requires that each observed correlation coefficient be weighted to obtain the average estimate of the overall correlation to obtain an accurate overall correlation and its error (Neves et al., 2022). Therefore, this paper has corrected the error of research samples and measurement errors found the adjusting variables, and conducted group research. At the same time, it has imposed certain conditions on the data used to minimize various biases and ensure the scientific, objective, and proper conclusion.

A random-effects model was used to generate forest maps and funnel plots and perform heterogeneity, meta-analysis, and subgroup analyses. The random effects model was selected due to its consistency with reality. First, the random effects model was used to explain the heterogeneity between studies. Second, the *I*-squared statistic (I^2) and the chi-squared test were used to assess heterogeneity. A high *I*-squared statistic indicates significant heterogeneity, whereas a low *I*-squared number indicates study homogeneity (typically fixed at 30%). Third, the effect size and confidence intervals, as well as the overall effect size, were displayed in forest maps. Fourth, subgroup analyses were carried out to investigate the relationships between the three areas of interest and the various forms of purchasing behavior. Fifth, the effect of product type and nation development level on the connections between health, environmental, and ethical concerns and consumer buying behavior was investigated using moderator analyses. Sixth, publication bias was assessed through funnel plots.

2.3 Data extraction and coding

Based on the elimination of duplicates and weak topic relevance of the title, abstract and key words, 168 documents entered the full text review stage. Three researchers conducted the full text independent screening and document access review respectively in October 2022 to determine whether the documents were included in the analysis list. If there are any differences, the third researcher must judge and solve them, or three researchers must vote to solve them, Finally, 45 papers about green consumption behavior of residents were obtained. After the review of the title, abstract and key words, each article that meets the inclusion criteria will be comprehensively reviewed, and data will be extracted from the following aspects: author, year of publication, focus, purchase attitude, purchase intention, purchase decision, purchase frequency

and willingness to pay premium, method of measuring purchase behavior, product purchase, data collection method, country or region, sample size, correlation coefficient Statistical methods and results of analysis data. Due to space limitation, the coding information and statistical description of 45 documents are shown in Table 1.

2.4 Effect amount

Referring to existing research, this paper selects Pearson correlation coefficient r[1] to represent the size of the effect quantity. When using the correlation coefficient for meta-analysis, the effect quantity cannot be directly synthesized. Instead, it needs to convert the correlation coefficient into Fisher's Z unit, calculate the standard error SE_z of Z, and then combine the effect quantity through Z and SE_z. The specific steps are as follows:

① The correlation coefficient r is converted into Fisher's Z unit, and the formula is $Z = 1/2*LN((1 + r)/(1 - r))$.
② Calculate the variance of Z, that is $V_Z = 1/(n - 3)$.
③ The standard error for calculating Z is $SE_z = \sqrt{V_z}$.
④ The summary correlation coefficient is Summary $r = (e^{2z} - 1)/(e^{2z} + 1)$.

The above calculation is completed by stata 15.0.

2.5 Descriptive analysis

Among the 45 articles included in the meta-analysis, a total of 132 independent studies with 47,286 samples were reported in 45 literatures included in the meta-analysis. Among them, 19 were studies on health awareness (14.39%), 28 on environmental awareness (21.21%), 22 on green attitudes (16.67%), 17 on green knowledge (12.88%), 16 on subjective norms (12.12%), 8 on price awareness (6.06%), 13 on perceived behavior control (9.85%), and 9 on perceived usefulness (6.06%). According to the world's economic development level grouping by the World Bank in 2021, it is divided into three categories: China, low- and middle-income countries (except China), and high-income countries. Among them, 40 are studies on Chinese consumers (30.30%), 65 are studies on low- and middle-income economies (49.24%), including India, Iran, Malaysia, Bangladesh, etc., and 27 are studies on consumers in high-income countries, including the United States, the United Kingdom, South Korea, France, etc. (20.45%). In terms of product category, 58 studies focused on the consumption behavior of organic food (43.94%), 37 studies focused on the consumption behavior of other nonfood green food (28.03%), including clothing, furniture, cosmetics, etc., and 37 studies did not report the specific type of green food (28.03%). In addition, 80.7% of the included literatures was published after 2015, 94.6% used the structural equation analysis model, and the remaining 5.3% used the multiple regression model for research.

3 Results

3.1 Publish offset analysis

Due to the influence of systematic factors, some relevant literature may not be collected so the meta-analysis results may be biased due to errors in the included literature. For example, journals tend to accept articles with significant influence among research variables, while articles with insignificant research results may not be collected because they cannot be published. Similar situations cannot be avoided in the research process. It is necessary to report the deviation correctly to reduce the impact of the variation on the meta-analysis results. In this study, a funnel chart was used for observation (as shown in Figure 3), and the practical values of the documents included in the study were evenly distributed on both sides of the total effect values, indicating that there was no significant publication bias for the research documents with relevant motivation selected for inclusion.

To overcome the subjectivity of funnel chart visual observation, this study further used the methods of Begg's Test, Egger's Test and Trim&Fill to conduct a quantitative statistical analysis of publication bias. The criteria for no publication bias of the three methods were: Begg's Test requirement $Z > 1.96$, $p < 0.05$; the standard of Egger's Test is $p > 0.05$; Trim&Fill needs to observe the corrected point estimates. If the size of the point estimates changes significantly but does not affect the final results, then the publication error is acceptable. The test results are shown in Table 2. Based on various test methods, the publication bias of each variable included in the study is moderate and acceptable.

3.2 Heterogeneity test

Considering that each study included has differences in research scenarios, research quality, research methods, research samples, etc., the differences in effect values may be caused by sampling errors and the different effect values of different studies. Therefore, this study needs to be tested for heterogeneity. The heterogeneity test results were consistent with expectations (as shown in Table 3), and the Q test results of each factor were significant ($p < 0.001$), indicating that there was heterogeneity in each effect value. At the same time, the I-squared values are >75%, which further indicates a high degree of heterogeneity between the effect values. Therefore, this study selected a random effect model in which the effect value was determined by intragroup error and intergroup error and carried out a regulatory effect test.

3.3 Overall effect test

The random effect model is used to analyze each motivation factor, and the forest diagram is shown in Figure 4; Descriptive statistical results such as factor affect value and 95% confidence interval are shown in Table 4. It can be seen from Figure 4

1 Some literatures do not report the value of correlation coefficient r, so we convert the value of t in the original research into the correlation coefficient r, with the conversion formula of $r = \sqrt{t^2/(t^2 + df)}$, where df is the degree of freedom.

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TABLE 1 Coding information and statistical description of 45 documents.

ID	Name	Year	Country	Sample size	Motivation type	Coefficient r	Product category	Research method
1	Wu Cuizhong	2021	China	1,107	Health awareness	0.384	Organic food	Multiple regression
2	Li Hang	2020	China	338	Green knowledge	0.057	Other non-food green products	Structural equation
					Subjective norm	0.494		
					Perceived behavior control	0.176		
3	Wang Xiucun	2012	China	239	Environmental consciousness	0.524	Other non-food green products	Structural Equation
4	Sheng Guanghua	2019	China	680	Environmental consciousness	0.236	Didn't tell the product category	Structural equation
					Price awareness	0.307		
5	Wang Jianhua	2021	China	839	Environmental consciousness	0.41	Didn't tell the product category	Structural equation
6	Li Sheqiu	2013	China	214	Environmental consciousness	0.156	Didn't tell the product category	Structural equation
7	Chen Xiangyu	2017	China	392	Health awareness	0.087	Organic food	Multiple regression
					Green knowledge	0.082		
8	Liu Yiqing	2018	China	649	Green knowledge	0.031	Didn't tell the product category	Multiple regression
9	Weekly level	2020	China	372	Green knowledge	0.119	Didn't tell the product category	Structural equation
10	Black cloud flower	2020	China	120	Green knowledge	0.284	Organic food	Multiple regression
					Health awareness	0.299		
11	Yang Xiaoyan	2009	China	470	Environmental consciousness	0.199	Didn't tell the product category	Multiple regression
12	Wang Zhengxin	2022	China	251	Perceived usefulness	0.201	Didn't tell the product category	Structural equation
					Subjective norm	0.196		
13	Zhang Min	2019	China	380	Perceived usefulness	0.47	Other non-food green products	Structural equation
					Perceived usefulness	0.365		
					Health awareness	0.145		
14	Schill	2019	France	641	Environmental consciousness	0.237	Other non-food green products	Structural equation
15	Malik	2019	Pakistan	1,008	Environmental consciousness	0.253	Didn't tell the product category	Structural equation
16	Aditi Mishal et al.	2017	India	500	Environmental consciousness	0.283	Didn't tell the product category	Structural equation
					Perceived usefulness	0.488		
					Green attitude	0.314		
17	Reza Saleki et al.	2019	Malaysia	246	Green attitude	0.62	Organic food	Structural equation
					environmental consciousness	0.403		
					Perceived behavior control	0.581		
					Price awareness	0.542		

(Continued)

TABLE 1 (Continued)

ID	Name	Year	Country	Sample size	Motivation type	Coefficient r	Product category	Research method
					Subjective norm	0.542		
18	Vaughan Reimers et al.	2017	Australia	296	Environmental consciousness	0.58	Other non-food green products	Structural equation
					Green attitude	0.71		
19	Ahmad Reza Salimi	2019	Iran	359	Green attitude	0.45	Didn't tell the product category	Structural equation
					Environmental consciousness	0.46		
					Green knowledge	0.49		
					Subjective norm	0.53		
					Perceived behavior control	0.57		
					Perceived usefulness	0.42		
20	Muhammad Abrar et al.	2018	Pakistan	198	Green attitude	0.404	Other non-food green products	Structural equation
					Environmental consciousness	0.304		
					Green knowledge	0.83		
					Subjective norm	0.494		
					Health awareness	0.479		
21	Hyun-Joo Lee	2016	The Republic of Korea	898	Health awareness	0.15	Organic food	Structural equation
					Environmental consciousness	0.093		
					Price awareness	0.002		
					Perceived behavior control	0.063		
					Green attitude	0.64		
22	Jeong-Ju Yoo et al.	2013	U.S.A	122	Environmental consciousness	0.05	Other non-food green products	Structural equation
					Perceived behavior control	0.33		
23	Jan P. Voon et al.	2011	Malaysia	300	Health awareness	0.616	Organic food	Structural equation
					Subjective norm	0.761		
					Green knowledge	0.628		
					Price awareness	0.583		
24	Norazah Mohd. Suki	2013	Malaysia	200	Environmental consciousness	0.278	Other non-food green products	Structural equation
					Green knowledge	0.333		
					Price awareness	0.372		
25	Shu-Yen Hsu et al.	2016	China	252	Green attitude	0.527	Organic food	Structural equation
					Health awareness	0.512		
					Green knowledge	0.546		
26	Evrim Erdo g an Yazar et al.	2019	Türkiye	388	Green attitude	0.676	Organic food	

(Continued)

TABLE 1 (Continued)

ID	Name	Year	Country	Sample size	Motivation type	Coefficient r	Product category	Research method
					Health awareness	0.308		
27	Seahee Lee	2011	U.S.A	150	Environmental consciousness	0.39	Other non-food green products	Structural equation
					Green knowledge	0.12		
28	Deepak Jaiswal et al.	2018	India	351	Perceived behavior control	0.337	Didn't tell the product category	Structural equation
					Green attitude	0.529		
					Environmental consciousness	0.419		
					Green knowledge	0.324		
29	Ninh Nguyen et al.	2020	Vietnam	596	Price awareness	0.068	Organic food	Structural equation
					Health awareness	0.294		
					Subjective norm	0.386		
					Green attitude	0.45		
30	Jie Jin et al.	2019	China	336	Health awareness	0.57	Didn't tell the product category	Structural equation
					Environmental consciousness	0.45		
					Subjective norm	0.35		
					Perceived behavior control	0.57		
					Green attitude	0.51		
31	Jianming Wang et al.	2020	China	518	Environmental consciousness	0.45	Organic food	Structural equation
					Perceived usefulness	0.47		
					Price awareness	0.42		
32	Nina Michaelidou et al.	2010	Britain	222	Health awareness	0.23	Organic food	Structural equation
					Green attitude	0.67		
33	Giovanni Pino et al.	2012	Italy	291	Health awareness	0.204	Organic food	Structural equation
					Green attitude	0.651		
34	Samantha Smith et al.	2010	Australia	157	Health awareness	0.27	Organic food	Structural equation
					Price awareness	0.14		
					Subjective norm	0.44		
					Perceived usefulness	0.2		
					Perceived usefulness	0.43		
					Green knowledge	0.17		
					Environmental consciousness	0.01		
					Green attitude	0.46		
35	Gyan Prakash et al.	2018	India	527	Health awareness	0.038	Organic food	Structural equation

(Continued)

TABLE 1 (Continued)

ID	Name	Year	Country	Sample size	Motivation type	Coefficient r	Product category	Research method
					Environmental consciousness	0.492		
					Perceived behavior control	0.35		
					Green attitude	0.308		
					Green knowledge	0.311		
38	Xiaoping Xu et al.	2019	China	460	Subjective norm	0.572	Other non-food green products	Structural equation
					Health awareness	0.65		
					Perceived behavior control	0.642		
					Green attitude	0.46		
39	Razia Sultana Sumi et al.	2018	The People's Republic of Bangladesh	174	Environmental consciousness	0.389	Organic food	Structural equation
					Price awareness	0.202		
					Green attitude	0.474		
40	Phuong Ngoc Duy Nguyen et al.	2019	Vietnam	295	Health awareness	0.439	Other non-food green products	Structural equation
					Environmental consciousness	0.376		
					Green knowledge	0.38		
					Perceived usefulness	0.606		
					Green attitude	0.61		
41	Richa Chaudhary et al.	2018	India	202	Green attitude	0.795	Didn't tell the product category	Structural equation
					Subjective norm	0.666		
					environmental consciousness	0.647		
					Perceived behavior control	0.677		
42	Shanyong Wang et al.	2016	China	433	Environmental consciousness	0.37	Other non-food green products	Structural equation
					Green attitude	0.22		
					Subjective norm	0.54		
					Perceived behavior control	0.46		
43	Sharifah Zannierah Syed Marzuki et al.	2017	Malaysia	311	Health awareness	0.5	Organic food	Structural equation
					Green attitude	0.84		
					Subjective norm	0.79		
					Perceived behavior control	0.38		
44	Xuhui Wang et al.	2018	Kenya	350	Green knowledge	0.18	Organic food	Structural equation

(Continued)

TABLE 1 (Continued)

ID	Name	Year	Country	Sample size	Motivation type	Coefficient r	Product category	Research method
					Health awareness	0.32		
					Perceived behavior control	0.56		
					Green attitude	0.42		
					Subjective norm	0.29		
45	Nik Ramli Nik Abdul Rashid et al.	2017	Malaysia	121	Environmental consciousness	0.0586	Other non-food green products	Structural equation
					Green knowledge	0.158		

and Table 4 that the eight motivational factors have significant positive effects on consumers' willingness or behavior to purchase green food.

3.4 Adjustment effect analysis

The heterogeneity test shows that there is high heterogeneity among the research samples, indicating that there may be significant regulatory variables. A regulatory effect test is required to explain the causes of heterogeneity scientifically. For this reason, this paper combined with the research sample design, selected three variables, including the level of economic development (China, low- and middle-income countries and high-income countries), product category (organic food, other green food), and behavior type (purchase intention, purchase decision), to conduct adjustment effect analysis. The analysis results are shown in Tables 5, 6. If the p-value is <0.05, it indicates that the difference in the effect value under this regulating variable is significant. It can be seen that the national economic development level and the category of green food have played a significant regulatory role in the eight motivational factors. The behavior type moderates on four motivational factors: health awareness, green knowledge, subjective norms and perceived usefulness.

4 Discussion

4.1 Analysis of the antecedents of purchasing behavior

4.1.1 Environmental awareness and health awareness

According to the empirical results, consumers' green product purchase behavior is significantly positively correlated with their health awareness and environmental awareness ($r = 0.371$, $p < 0.001$; $r = 0.349$, $p < 0.001$). According to the theory of planned behaviorism, consumers' motivations mainly include two types, namely, egoistic motivation (such as concern about health) and altruistic motivation (such as concern about the environment) (Ajzen, 1991). Health generally includes personal and family health, a person's responsibility for the family and his wellbeing. Zanoli et al. (2012) distinguished the two and pointed out that personal health rather than family health is the most significant driving force for buying green food. Hutchins and Greenhalgh have investigated consumers' basic cognition of "green food." Their research results show that consumers generally describe "green food" as "natural, unprocessed, chemical free," and agree that green food are healthier and more environmentally friendly than nongreen alternatives (Hutchins and Greenhalgh, 1995). Therefore, it is not difficult to understand that the higher the health awareness of consumers, the higher their willingness and behavior to buy green food. Similarly, environmentalists tend to buy green food out of altruism. As green food is always publicized as harmless to the environment, consumers with higher environmental awareness tend to buy green food. Therefore, from the analysis process and research results of this paper, we know that the consistency of multiple research results has been evaluated through meta-analysis, which once again confirms that environmental and health problems significantly impact consumers' purchase of green food. Its mechanism of action is also universal in a larger population across time and regions.

4.1.2 Green attitude and green knowledge

The results of the meta-analysis showed that consumers' green product purchase behavior was positively correlated with green attitude and green knowledge ($r = 0.624$, $p < 0.001$; $r = 0.335$, $p < 0.001$). Attitude plays a vital role in the purchase decision-making process of consumers because consumers need to understand their attitudes and motivations to overcome the perceived purchase barriers they face. Most previous studies supported the attitude intention relationship, indicating that environmental attitudes impact consumers' green purchase intentions. This paper's conclusion further confirms a positive relationship between consumers' attitudes toward green food and their intention or behavior to buy green food.

Green knowledge is also a critical antecedent variable. Previous studies have shown that although most consumers have a basic definition of green food, they need a complete understanding of its meaning, production and certification process, and are skeptical of the reliability of green product labels. This distrust makes it more difficult for them to identify "fakes," which distorts their subjective attitude and thus hurts their willingness and

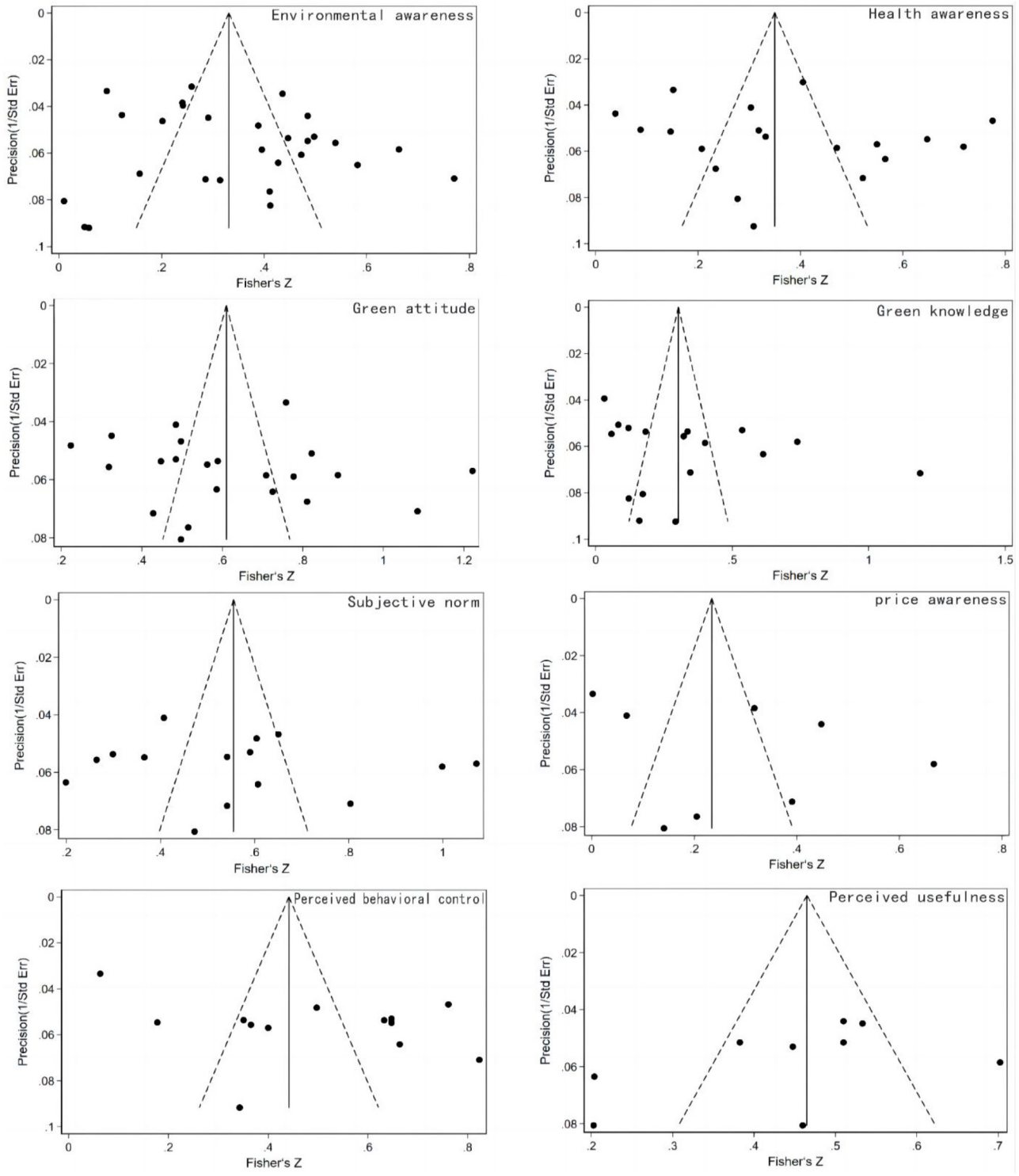

FIGURE 3
Funnel diagram of effect value distribution.

behavior to buy green food (Reimers et al., 2017). It can be seen that green knowledge will affect consumers' choices, and the increase in green knowledge will help improve consumers' positive attitudes, thus affecting their willingness or decision-making on green food.

4.1.3 Subjective norms and price awareness

The results of the meta-analysis showed that consumers' purchase behavior toward green food was positively correlated with subjective norms and price awareness ($r = 0.564$, $p < 0.001$; $r = 0.279$, $p < 0.001$). One of the advantages of rational

TABLE 2 Published deviation test results.

Motivational factors	Begg's test		Egger's test		Trim & fill	
	z-value	*p*-value	*t*-value	*p*-value	Adjust the number of articles	Point estimate
Environmental awareness	0.14	0.890	1.24	0.225	3 (L)	0.349–0.310
Health awareness	0.98	0.327	0.85	0.405	6 (L)	0.371–0.267
Green attitude	1.24	0.215	0.62	0.540	0	0.624–0.624
Green knowledge	1.36	0.174	1.29	0.218	0	0.335–0.335
Subjective norms	0.00	1.000	0.48	0.638	0	0.564–0.564
Price awareness	0.12	0.902	1.05	0.332	5 (L)	0.279–0.135
Perceptual behavior control	0.18	0.855	2.00	0.071*	5 (L)	0.490–0.328
Perceive usefulness	1.16	0.246	−1.35	0.220	0	0.445–0.445

* indicate the significance levels of 10%.

TABLE 3 Heterogeneity test results.

Motivational factors	*Q*-value	df (*Q*)	*p*-value	*I*-squared/%	Tau squared
Environmental awareness	294.04	27	0.000***	90.80	0.026
Health awareness	330.22	18	0.000***	94.50	0.045
Green attitude	415.12	21	0.000***	94.90	0.055
Green knowledge	370.34	16	0.000***	95.70	0.078
Subjective norms	267.61	15	0.000***	94.40	0.054
Price awareness	154.70	7	0.000***	95.50	0.051
Perceptual behavior control	289.05	12	0.000***	95.80	0.065
Perceive usefulness	50.80	8	0.000***	84.30	0.017

*** indicate the significance levels of 1%.

behavior theory is that it includes the concept of norms and price awareness, and in some cases evaluates their role. Subjective norms refer to individuals' perceptions of specific behaviors, influenced by the judgments of essential others (such as parents, spouses, friends and teachers). Since consumer behaviors may be located in and dependent on specific social networks and organizations, their attitudes and purchasing behaviors will be affected by friends, family members and society (Davies et al., 1995). Li et al. interpreted the subjective norm that implementing "socially valuable behavior" will lead to self-esteem and pride, while failure to enforce such behavior will lead to shame (Li et al., 2019). The concept of green consumption is gradually emerging. As Tarkiainen and Sundqvist (2005) pointed out, the attitude passed between people and those who have a positive attitude toward green food will affect the attitude formation of people around them. Previous studies have shown that subjective norms can affect consumers' decision-making choices. The empirical results again confirm the universality of the impact of subjective norms on consumers' green buying behavior.

Price awareness is usually defined as the degree of individual perception and reaction to the price change (or difference) of products (or services). Previous studies have yet to determine the relationship between price awareness and consumers' green purchase behavior. Early studies generally believed that because green food was more expensive than traditional alternatives, price awareness would reduce consumers' green consumption, especially for low-income people (Radman, 2005). However, Davies et al. put forward different views. In his research, most consumers agree that organic food is more valuable and are prepared to pay up to 30% of the additional cost for organic food (Davies et al., 1995). Lockie and Radman's research on other types of green food also confirmed this conclusion. On average, consumers are willing to pay 10%−20% more for green food (Lockie et al., 2004). This finding is significant, meaning price awareness may not negatively impact consumers' green purchasing behavior. Smith et al.'s research on the organic food market in Australia shows that there is a positive correlation between price awareness and consumers' organic food purchase intentions. He believes that, with the progress of production technology, most organic food prices have been on a par with traditional substitutes. The price premium may no longer be the main obstacle for consumers to buy green food, and the role of price awareness in purchasing decisions has also changed significantly (Smith and Biddle, 1999). The meta-analysis results of this study support Smith's research conclusion that price awareness is positively related to consumers' green purchase intentions or behaviors. Among them, one important reason may be that the 8 articles on price awareness were published after 2018, and this conclusion must be treated with caution.

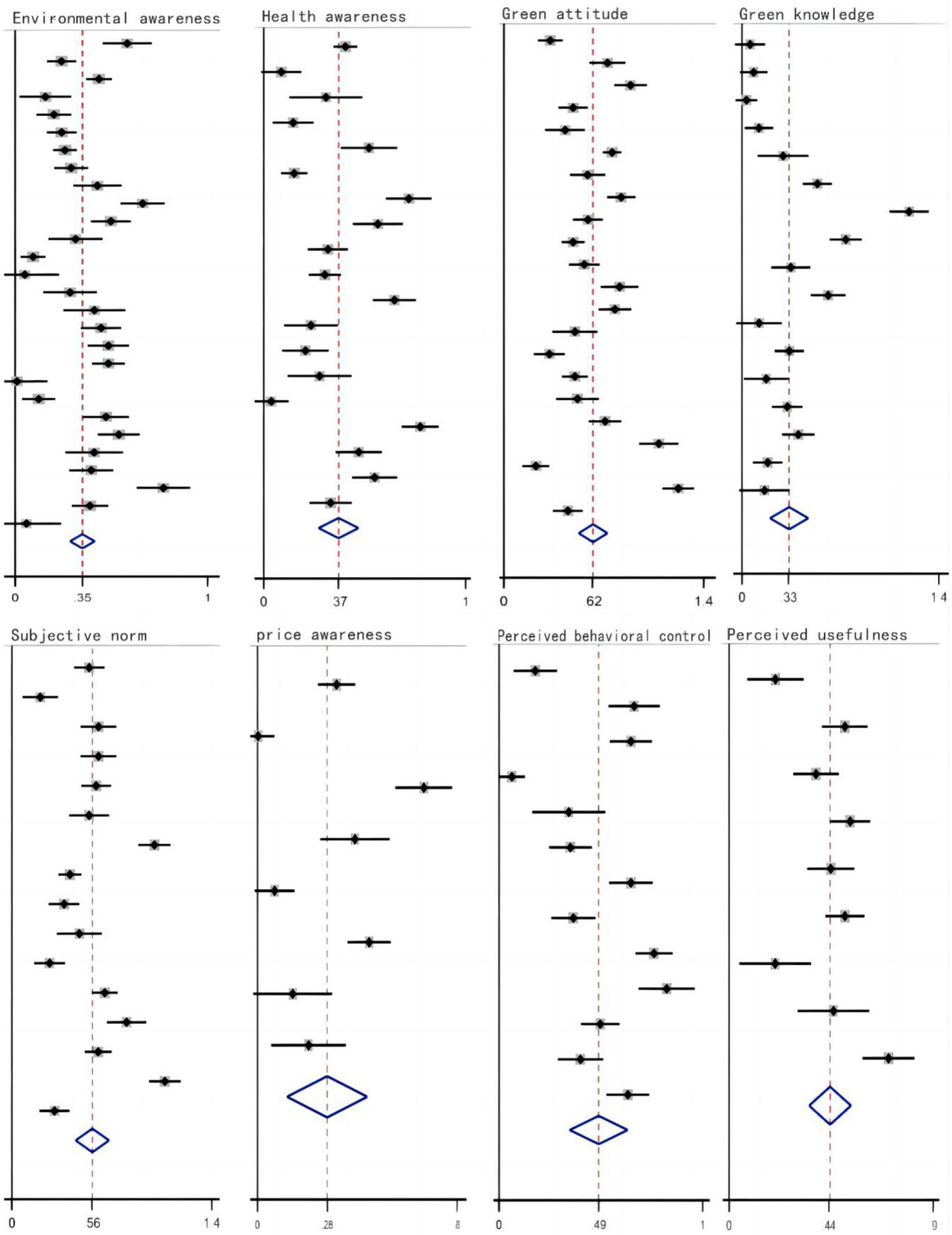

FIGURE 4
Forest map of effect value distribution.

TABLE 4 Descriptive statistics.

Motivational factors	Number of research items	Sample size	The effect value	95% confidence interval		With	*p*-value
				LL	Hive		
Environmental awareness	28	10,774	0.349	0.285	0.411	10.70	0.000***
Health awareness	19	7,580	0.371	0.272	0.469	7.38	0.000***
Green attitude	22	7,641	0.624	0.523	0.725	12.11	0.000***
Green knowledge	17	4,930	0.335	0.198	0.471	4.81	0.000***
Subjective norms	16	5,109	0.564	0.446	0.681	9.43	0.000***
Price awareness	8	3,532	0.279	0.118	0.440	3.40	0.001***
Perceptual behavior control	13	4,732	0.490	0.347	0.632	6.74	0.000***
Perceive usefulness	7	2,460	0.445	0.352	0.537	9.44	0.000***

*** indicate the significance levels of 1%.

4.1.4 Perceived behavior control and perceived usefulness

The empirical results show that there is a positive correlation between perceived behavior control, perceived usefulness and consumer green consumption behavior ($r = 0.490$, $p < 0.001$; $r = 0.445$, $p < 0.001$). Planned behavior theory is an extension of rational behavior theory, which believes that perceived behavior control is the third predictor of behavioral intention and behavior (Jaiswal and Kant, 2018). Perceived behavior control refers to the extent to which a person feels that their behavior is under voluntary control. Perceived behavior control may affect behavior directly or indirectly through behavior intention. As a classic construct of the theory of planned behavior, consistent with previous research conclusions, perceived behavior control has indeed had a significant impact on consumer purchase behavior, which once again confirms the universality of the theory of planned behavior, and provides meta-analysis support for the relationship between the antecedent variable (perceived behavior control) and the outcome variable (green product purchase behavior).

Perceived usefulness is another influential variable introduced by the theory of planned behavior, also known as perceived value. Lack of availability is often considered an obstacle to buying green food. Early studies generally believed green food had fewer varieties, poor consistency and low perceived value than traditional alternatives. However, with the rapid development of society, many researchers have found that there are other obstacles to purchase than limited availability. Padel and Foster believe that the lack of availability of green food is not due to the low value of the product itself, but due to the low supply and poor availability; in their research, most respondents hope to buy green food where they usually shop, and hope to see the supply and scope of green food increase (Zanoli et al., 2012). Wang et al. supported this conclusion by investigating Kenya's organic food cons. He found that consumers generally agree that organic food is more valuable than traditional alternative food, and this perceived usefulness significantly impacts news to buy organic food (Wang et al., 2019). The meta-analysis results of this study show that perceived usefulness plays an important role in improving consumers' green purchasing behavior.

4.2 Adjustment effect analysis

The meta-analysis results show that the influence of relevant antecedents on consumers' green product purchase behavior is moderated by three variables: national economic development level, product category and behavior type.

4.2.1 Economic development level

It can be seen from Tables 5, 6 that the level of economic development has a significant regulatory effect on all eight motivational factors. Li et al. believed this regulatory effect was mainly due to the differences in consumers' relative wealth, education and culture in different countries. It can be seen from the specific analysis that the practical value of environmental awareness, health awareness, green knowledge, subjective norms, price awareness, perceived behavior control and perceived usefulness in low- and middle-income countries is significantly higher than that in high-income countries. In comparison, the effect value of a green attitude is lower than that in high-income countries. This phenomenon reveals a meaningful connection; that is, consumers' relative wealth, education, culture and other characteristics may have a different impact on their purchase intentions or various antecedent motivation factors in the decision-making process. This regulatory role has yet to be discussed in previous studies, and needs more empirical evidence to support it.

Focusing on the regulatory effect of Chinese consumers, it can be seen that the practical value of Chinese consumers is close to that of low- and middle-income countries in terms of the relationship between environmental awareness, health awareness, green attitude, price awareness and perceived behavior control and green purchasing behavior; In terms of the two motivational factors of green knowledge and perceived usefulness, the effect value of Chinese consumers is closer to that of high-income countries. It can be seen that the purchase behavior of Chinese consumers of green food shows a noticeable transition from low- and middle-income countries to high-income countries.

TABLE 5 Regulatory effect analysis results (1).

Regulate variables		Environmental awareness				Health awareness				Green attitude				Green knowledge			
		k	*r*	*Q*	*p*-value	*k*	*r*	*Q*	*p*-value	*k*	*r*	*Q*	*p*-value	*k*	*r*	*Q*	*p*-value
The level of economic development	China	8	0.372	23.21	0.000***	7	0.420	54.21	0.000***	4	0.465	104.69	0.000***	6	0.194	119.4	0.000***
	Low- and middle-income countries	13	0.371			7	0.416			12	0.610			9	0.468		
	High-income countries	7	0.280			5	0.229			6	0.769			2	0.147		
Product category	Organic food	7	0.288	23.0	0.000***	14	0.479	69.78	0.000***	11	0.696	65.73	0.000***	6	0.347	17.48	0.000***
	Other green food	10	0.346			4	0.320			5	0.548			6	0.379		
	Not reported	11	0.389			1	0.648			6	0.557			5	0.267		
The behavior type	Willingness to buy	22	0.365	3.04	0.271	17	0.520	28.04	0.000***	22	0.624	–	–	11	0.368	15.62	0.000***
	Purchase decisions	6	0.292			2	0.354			0	–			6	0.274		

*** indicate the significance levels of 1%.

TABLE 6 Regulatory effect analysis results (2).

Regulate variables		Subjective norms				Price awareness				Perceptual behavior control				Perceive usefulness			
		k	*r*	*Q*	*p*-value	*k*	*r*	*Q*	*p*-value	*k*	*r*	*Q*	*p*-value	*k*	*r*	*Q*	*p*-value
The level of economic development	China	5	0.475	9.21	0.01**	2	0.381	72.69	0.000***	4	0.522	154.68	0.000***	4	0.407	15.80	0.000***
	Low- and middle-income countries	10	0.618			4	0.332			7	0.552			3	0.559		
	High-income countries	1	0.472			2	0.052			2	0.19			2	0.331		
Product category	Organic food	7	0.637	32.76	0.000***	6	0.255	12.39	0.000***	4	0.438	50.23	0.000***	2	0.364	12.40	0.000***
	Other green food	4	0.596			1	0.391			4	0.448			2	0.604		
	Not reported	5	0.443			1	0.317			5	0.564			3	0.399		
The behavior type	Willingness to buy	14	0.633	20.28	0.000***	6	0.197	59.89	0.000***	13	0.490	–	–	6	0.493	20.80	0.000***
	Purchase decisions	4	0.530			2	0.297			0	–			1	0.204		

** and *** indicate the significance levels of 1% and 5% respectively.

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4.2.2 Product category

The regulating effect of different product types is also different. From the meta-analysis results, it can be seen that the practical value of organic food is significantly greater than that of nonfood green food in the correlation effect between health awareness, green attitude, subjective norms and consumers' green purchase behavior. The opposite is accurate regarding environmental awareness, price awareness and perceived usefulness. This may be related to the elasticity of different types of green food. In the field of consumer behavior research, Researchers usually define demand elasticity as the degree of individual perception and reaction to the price change (or difference) of products (or services) (Lichtenstein et al., 1993). Compared with other green food, organic food is less flexible. Therefore, regarding the correlation with consumers' green purchase behavior, the health awareness of egoism is more intense in the food field. In contrast, the environmental awareness of altruism is more evident in such fields as furniture and clothing.

Green attitudes, subjective norms and consumers' purchase behavior of organic food are more relevant. As Tarkiainen and Sundqvist pointed out, attitudes passed between people and those who have a positive attitude toward products will affect the formation of attitudes of people around them; that is, there is a significant relationship between subjective norms and attitudes (Tarkiainen and Sundqvist, 2005). This is especially true in the field of food. As food is related to the vital interests of human health, compared with other green food, consumers tend to be more cautious about consuming organic food. Some scholars also propose that the visibility of consumption will affect the formation of subjective norms, thus affecting the possibility of decision-makers acting according to these norms. Compared with other green food, the visibility of organic food consumption is low. A cheerful green attitude can be generated in society only by forming a higher subjective norm, thus promoting consumers' behavior or willingness to buy organic food (Pedersen, 2000).

Price awareness and perceived usefulness are more closely related to the purchase behavior of nonfood green food. As mentioned above, such green food is more flexible than organic food. Some scholars have shown that consumers face tradeoffs between buying green food, saving money, and buying other luxury accessories (Tarkiainen and Sundqvist, 2005). This is important because it shows that the green product market not only competes with traditional substitutes, but also with other commodities. Consumers' willingness to pay a price premium is related to quality. Therefore, if consumers think green food is higher quality than cheap traditional substitutes or has better cost performance than other commodities, they will be willing to buy them.

4.2.3 Behavior type

According to the theory of planned behavior, consumer behavior is a collection of consumer preferences, intentions and decisions in the market, and consumer behavior can be roughly divided into two types. That is, purchase intention and purchase decision. Purchase intention refers to the subjective probability or possibility of consumers buying specific products rather than an actual purchase; the purchase decision refers to the actual purchase behavior of the product (Ajzen, 1991). The meta-analysis results show that health awareness, environmental awareness, green knowledge, subjective norms and perceived usefulness, the five antecedents, have a higher impact on consumers' purchase intentions than purchase decisions. In comparison, the impact of price awareness on purchase intentions is weaker than on purchase decisions (Joshi et al., 2021; Zaremohzzabieh et al., 2021; Eberle et al., 2022). The conclusion of this study supports this view; that is, consumers' worries about the environment and health problems, as well as the influence of antecedents such as knowledge and social norms, seem to be mainly reflected in the nonactual purchase behavior. In addition, as expected, price awareness has a more significant impact on purchase decisions, indicating that consumers need value for money and prove that the price premium paid is reasonable before purchasing green food. As Magnusson and others pointed out, price is an essential determinant for consumers to purchase green food, and green food should not be more expensive than traditional alternatives (Magnusson et al., 2001; Yadav and Pathak, 2017; Marcon et al., 2022).

5 Conclusions

This paper uses meta-analysis to select eight antecedent variables, three moderating variables, and 45 empirical literatures. It combines the research on the relationship between these main motivational factors and consumers' green product purchase behavior. Through the meta-analysis program, this paper elaborates on the correlation between antecedent and outcome variables in det. Further, it analyses the moderating effects of the three moderating variables on the above relationship. The results show a significant positive correlation between environmental awareness, health awareness, green attitude, green knowledge, subjective norms, price awareness, perceived usefulness and perceived behavior control and consumers' green product purchase behavior. This correlation is moderated by two variables: the level of national economic development and product category. There are apparent differences in the impact of different motivation factors on consumers' purchase intentions and purchase decisions.

In general, the research contributions of this paper are mainly as follows: (1) There is a lack of consensus on the relevance and directionality between consumers' green food purchase behavior and their health, environment, price, norms and other related psychological motivations, as well as the relative importance of these motivational factors in determining green purchase behavior. (2) This paper provides an essential reference for policymakers, green product manufacturers and sellers to formulate marketing strategies to promote green consumption. (3) The research results may help practitioners to evaluate and formulate intervention strategies to improve consumer health, or promote consumer buying behavior that is conducive to the environment. (4) Policies and marketing strategies can guide consumers to make more responsible consumption choices by interfering with consumers' psychological motives to better benefit the environment and society. (5) Consumers' concerns about health and environmental issues and other motivational effects are mainly reflected in nonactual purchasing behaviors, so intervention strategies can focus on translating these "good intentions" into actual purchasing decisions. (6) People may change their purchase decisions based

on psychological motivations, such as environmental awareness, health awareness, and social norms, rather than purely based on price, which indicates that marketing and policy intervention may take advantage of these concerns only considering the price.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding authors.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent from the [patients/ participants OR patients/participants legal guardian/next of kin] was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

LC: Conceptualization, Investigation, Methodology, Software, Visualization, Writing – original draft, Writing – review & editing. HC: Methodology, Supervision, Visualization, Writing – original draft. ZZ: Formal analysis, Resources, Supervision, Writing – review & editing. MY: Data curation, Methodology, Software, Writing – review & editing. YZ: Data curation, Formal analysis, Resources, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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