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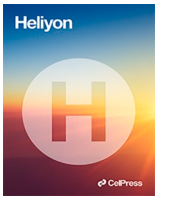

Research article

# How enterprises' public welfare low-carbon behavior affects consumers' green purchase behavior

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ABSTRACT

The Chinese economy has undergone high-speed, high-quality growth, and the concept of low-carbon technology has gained popular support. Businesses and consumers must jointly endeavor to achieve low-carbon economic development. Moreover, it is important to investigate whether enterprises' low-carbon behavior is correlated with consumers' green consumption behavior. We built a theoretical model to depict the relationship between corporate public welfare low-carbon behavior, consumers' green purchase intention, and green purchase behavior. We then divided corporate public welfare low-carbon behavior into three dimensions. We proposed hypotheses, collected data through a questionnaire survey, and analyzed the data using statistical analysis software of SPSS 26.0 and AMOS 24.0. Public welfare low-carbon behavior was significantly correlated with consumers' green purchase intention, and public welfare low-carbon participation and public welfare low-carbon motivation were significantly correlated with green purchase intention. Finally, we proposed suggestions from three perspectives: the public welfare low-carbon mechanism, public welfare low-carbon participation, and public welfare low-carbon motivation. The results provide theoretical support for research methods related to the low-carbon growth of enterprises and green consumption, as well as guidance and decision-making support for enterprises in carrying out cause marketing.

## 1. Introduction

China's economy has transitioned from high-speed development to high-quality development. High-quality development reflects the new development concept of "innovation, coordination, green, open and sharing" [1], emphasizing the ecological environment and advocating for a sustainable mindset [2]. Low-carbon and sustainable development are the primary features of high-quality expansion. Low-carbon development means that enterprise production should be low-carbon and clean, and people's consumption should be green. Enterprises' green production technology, products, marketing, and other behaviors may have a decisive influence on long-term, sustainable growth [3].

The consumer is the terminal of commodity circulation. Whether consumers' behavior is green is the ultimate embodiment of whether the economy can develop in a high-quality manner and is the output of excellent growth. With increasing pressure from market competition, enterprises' marketing models have become an important research issue in the field of business. Companies can

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enhance their core competitiveness through various means. Welfare marketing is evidence of modern enterprises fulfilling social responsibilities; they use public welfare marketing to establish a good interactive relationship with consumers, deepen consumers' goodwill and trust in product brands, and enhance the reputation and popularity of companies in the market [4]. Welfare marketing is becoming an increasingly important marketing strategy [5]. Thus, it is vital to study the relationship between enterprises' public welfare low-carbon behavior and consumers' green consumption behavior.

In order to clearly define the scope and boundary of this study, we give a descriptive definition of related concepts. This paper will study the relationship between enterprises' public welfare low-carbon behavior and consumers' green consumption intention and green consumption behavior. It is defined in the strategic context of China's high-quality development. In this paper, high-quality development means that economic development pays more attention to environmental friendliness and development sustainability, and gives up excessive requirements for development speed. Public welfare low-carbon behavior refers to the concept and behavior that enterprises pay attention to environmental protection and green in all aspects of operation such as production and sales, as well as the various efforts made to achieve environmental protection and green. Green consumption means that consumers pay more attention to whether the production process of the product is environmentally friendly and whether the various operating activities and behaviors of the enterprise are environmentally friendly and sustainable when they make post-purchase purchases.

As the world's largest carbon emitter, China has made commitments to the world to achieve carbon peak and carbon neutrality [6]. The study of low-carbon activities of Chinese enterprises and the consumption behaviors of consumers can provide the Chinese government and enterprises with decision-making support for low-carbon development and can also provide important references for other countries.

To sort the relevant theoretical support and empirical results, we conducted a two-part literature review.

### *1.1. Theoretical background*

The theory of planned behavior (TPB), attitude–behavior–context (ABC) theory and model, and responsible environment behavior (REB) model are employed as our theoretical basis.

TPB is a social-psychology-based method to understand human behavior. The theory proposes that an individual's purchase intention is influenced by attitudes [7]. Based on TPB, Archana et al. [8] examined the impact of fashion influencer measures on consumers' purchase intentions in the fashion industry. Salirrosas et al. [9] built a predictive model to examine the influence of environmental awareness on attitude and perceived behavioral control. Shannon and Gary [10] applied TPB to determine the role of subjective norms, attitudes, control, and environmental values in predicting both action and inaction for dietary behaviors. Finally, Ying et al. [11] established a conceptual model to examine the antecedents of green purchasing behavior by incorporating the extended TPB. TBP can provide theoretical support for the discussion of the relationship between consumers' green consumption intention and green consumption behavior.

ABC theory [12] has often been used in studies concerning environmental education and pro-environmental behavior. SiuCheung and CheukNam [13] analyzed the attitudes and behaviors of university students and perceived contextual factors in alternative assessment during the pandemic using ABC. Aral and Jordi [14] examined how European Union citizens systematically differ in their environmental attitude–behavior relationships according to country-level contextual drivers using ABC. Yunfeng et al. [15] incorporated trust and identity into ABC theory to investigate Chinese residents' participation in public-sphere pro-environmental behavior. Finally, Amandeep et al. [16] used ABC theory to examine the association of environmental knowledge, green trust, and environmental concern with environmental attitude and green apparel buying behavior. ABC theory can provide theoretical support for the rationality of questionnaire survey method and questionnaire setting. It can logically and theoretically explain why consumers' attitude towards enterprises' public welfare low-carbon behavior will affect their green consumption intention.

REB refers to any behavior that individuals or groups can use to promote the sustainable use of natural resources, which fosters the protection of tourism resources [17]. Hwang et al. [18] studied the relationship between environmental education and interpretation systems and REB. Chao and San [19] used self- and other-reported behaviors as measures of REB and examined their validities. Finally, Tipu et al. [20] explored travelers' REB toward coastal tourism within the social media user-generated content paradigm. REB theory provides theoretical support for the inner psychological motivation of consumers' green consumption behavior and the effect of this behavior on sustainable development.

### *1.2. Empirical results*

The following is a review of past studies on low-carbon development, corporate social responsibility (CSR), public welfare behavior, green consumption, and consumption behavior.

Yiping et al. [21] used a structural equation model to analyze the effects of various elements of informatization on companies' low-carbon development. Ruguo et al. [22] used game theory and pertinent theories of incentive mechanisms and considered adverse selection and moral hazards to build incentive contracts for businesses' low-carbon growth. Wang et al. [23] studied the status quo and influencing factors of Chinese non-governmental organizations' participation in low-carbon development and asserted that only with contributions from all sectors of society can the dual-carbon goal be realized faster. Lyu et al. [24] employed a multi-input–output model to examine the impact of digital transformation on the low-carbon growth of China's manufacturing industry. Chengyi et al. [25] explored the impact of environmental regulations on the green and low-carbon growth of the high-carbon manufacturing sector. They also empirically examined the regulatory effects of digital technologies on formal and informal environmental regulations affecting the low-carbon transformation of the high-carbon manufacturing sector using panel data. Based on a two-sector model, Kang

[26] investigated the impact of environmental regulations, carbon financing, and carbon emissions reduction on the low-carbon growth of resource-based enterprises. Taking iron and steel as examples, Wang et al. [27] analyzed the status quo, trends, and reasons for differences in the carbon emissions intensity of iron and steel enterprises and built a technical path for their low-carbon development. These studies focused on the influencing factors and paths of low-carbon development of enterprises, providing background support for the current study.

Xiaoping et al. [28] examined how companies' public welfare behavior affects their competitiveness, maintaining that public welfare behavior influences customers' purchasing behavior through customer trust and loyalty and ultimately enhances enterprises' competitiveness. Li et al. [29] quantitatively analyzed the relationship between public welfare marketing and the corporate profitability of Chinese listed companies, revealing that the profitability of listed companies and public welfare marketing promote each other in the short term. Liang [30] studied corporate environmental responsibility from the perspective of low-carbon development, built a "bee-type industrial enterprise," and proposed countermeasures from three aspects: enterprises, the government, and the public. Saha et al. [31] explored the impact of CSR on the performance of Bangladeshi commercial banks. Garcia [32] scrutinized the relationship between public welfare advertising behavior and purchase intention from a strategic angle and assessed the suitability of the strategic dimension. Tang [33] discussed the main impact of public welfare marketing on corporate brand image and proposed optimization strategies. By studying how the characteristics of enterprises' public welfare behaviors influence employees' organizational citizenship behaviors, Chen [34] proposed suggestions for public welfare marketing from the perspective of employees' perceptions, combined with market requirements for corporate public welfare marketing. The above research focused on the impact of corporate public welfare behavior, which provides logical support for the current study.

Much research has been done on green consumption, and promising results have been achieved [35,36]. Halder et al. [37] studied the impact of national culture and moral norms on green consumption. Codini et al. [38] tested whether individuals in a precautionary state are more likely to buy green products. Luyi et al. [39] investigated public participation in China's low-carbon development and found that green consumption is an important way for the public to participate. Others studied cultural and psychological factors influencing the green purchase behavior of Chinese and Indian consumers [40–42]. Tang et al. [43] conducted an empirical study on the overall status of the Chinese public's cognition, willingness to participate in low-carbon growth, participation behavior, and the relationship among these variables. Chu et al. [44] empirically explored the connection between consumers' social responsibility activities on social media, brand identity, and consumer behavior. Liu et al. [45] analyzed the factors influencing green consumption behavior using a questionnaire. Employing an experimental method, Xiaoping et al. [46] studied consumers' willingness to participate in CSR. Madad et al. [47] examined the impact of green consumption behavior and green purchase intention on environmental sustainability. Sun et al. [48] used Alipay's ant forest as an example to empirically investigate the impact of gamification motivation on green consumption behavior. Haiyang et al. [49] analyzed the link between ecological awareness and green consumption decision-making. Chi et al. [50] constructed and measured a green consumption index system. These studies explored green consumption intention or green consumption behavior from consumers' perspectives.

### *1.3. Research gaps and objectives*

Research on enterprises' low-carbon development, corporate social responsibility (CSR), public welfare behavior, and green consumption has produced a wealth of results that served as important references for writing this study. Researchers have done immense work on the factors influencing enterprise low-carbon development, the impact of corporate public welfare behavior on enterprises, and the factors influencing consumers' green consumption behavior. However, through a review of the existing literature, we identified the following research gaps:

(1) Enterprises' low-carbon development research tends to be performed at the macro and medium levels. Most studies focus on the impact of macroeconomic policies or industry development on enterprises' low-carbon transformation. Few studies have been conducted from a micro-level. Furthermore, there is little literature on enterprises' low-carbon development from the consumer's perspective.
(2) Few studies have structured measures for enterprises' public welfare low-carbon behavior. In most studies on CSR and enterprises' public welfare behavior, the scope of the concept is broad. More focused and structured measures of enterprises' public welfare behavior need to be established.
(3) In the field of green consumption, there are few correlation studies on enterprises' behavior. The existing researches are mainly carried out from the aspects of influencing factors of consumer green consumption and consumer green consumption participation. Enterprises' green marketing behavior, especially the relationship between enterprises' green public welfare behavior and consumers' green consumption intention, needs to be measured.

To address these challenges, we drew upon existing methodological frameworks [51–53]. From the standpoint of enterprises' green public welfare behavior, we studied the relationship between enterprises' green public welfare behavior and consumers' green consumption intention through a questionnaire survey and quantitative analysis tools, such as SPSS 26.0 and AMOS 24.0, for data processing.

The main objectives are as follows: (1) identify factors influencing public welfare behavior and low-carbon activity of firms, (2) determine how low-carbon activity and its effects can be effectively communicated through green marketing or public service marketing, (3) determine how these effects on consumers' purchase behavior are related to individual low-carbon consumption, and (4) identify what factors affect these marketing activities and create a positive brand image.

### 1.4. Research significance

Our findings have significant theoretical and practical implications. Theoretically, this study reveals the quantitative relationship between enterprises' public welfare low-carbon behavior and consumers' green purchase intention, which can provide a new research perspective and method for CSR and green consumption research.

In practice, our findings provide a quantitative basis and decision-making support for enterprises' green development, public relations, and marketing, thereby enhancing their competitiveness. Concurrently, our findings provide support for governments and industrial enterprises in formulating corporate low-carbon development policies.

### 1.5. Structure of this paper

The rest of this paper is organized as follows: Chapter 2 discusses the research design. It contains the methodological framework, definitions of the variables, conceptual model, research hypotheses, and questionnaire design. Chapter 3 presents the data analysis and model testing. It contains data collection, basic information about the sample, reliability and validity analyses, the current situation of consumers' green purchase intention, correlation analyses, normality assumption tests, and regression analyses. In Chapter 4, we put forward countermeasures and suggestions according to the analysis results. Chapter 5 presents the discussion and conclusions of this study.

## 2. Research design

This chapter includes five parts: Methodological framework, Definitions of the variables, conceptual model, research hypotheses, and questionnaire design. It is the theoretical framework of this research.

### 2.1. Methodological framework

We defined independent and dependent variables and formulated hypotheses according to the relationship between the variables. We gathered data through a questionnaire and then processed and analyzed them. We used path and regression analyses to examine the relationship between enterprises' public welfare low-carbon behavior and consumers' green consumption behavior and tested the hypotheses. We derived countermeasures based on the results.

Statistical analysis software of SPSS 26.0 and AMOS 24.0 were used for data processing. Reliability and validity analyses were performed to test the reliability and accuracy of the questionnaire. Among them, the validity analysis of Kaiser–Meyer–Olkin (KMO) and Bartlett's test of sphericity, structural validity analysis, aggregation validity analysis, and goodness-of-fit analysis were performed. Confirmatory factor analysis was used to test whether the relationship between a factor and the corresponding measure was consistent with the theoretical relationship designed in this research. The process of confirmatory factor analysis was also the test process of measure model. Path analysis and regression analysis were used to analyze the relationship between enterprises' public welfare low-carbon behavior and green purchase intention of consumers. The methodological flow chart is shown in Fig. 1. Among them, the research content is on the basis of the subsequent relevant research progress and results of the article (for the understanding of some specific content, it may be necessary to refer to the corresponding subsequent content of the article). Fig. 1 depicts a flowchart of this

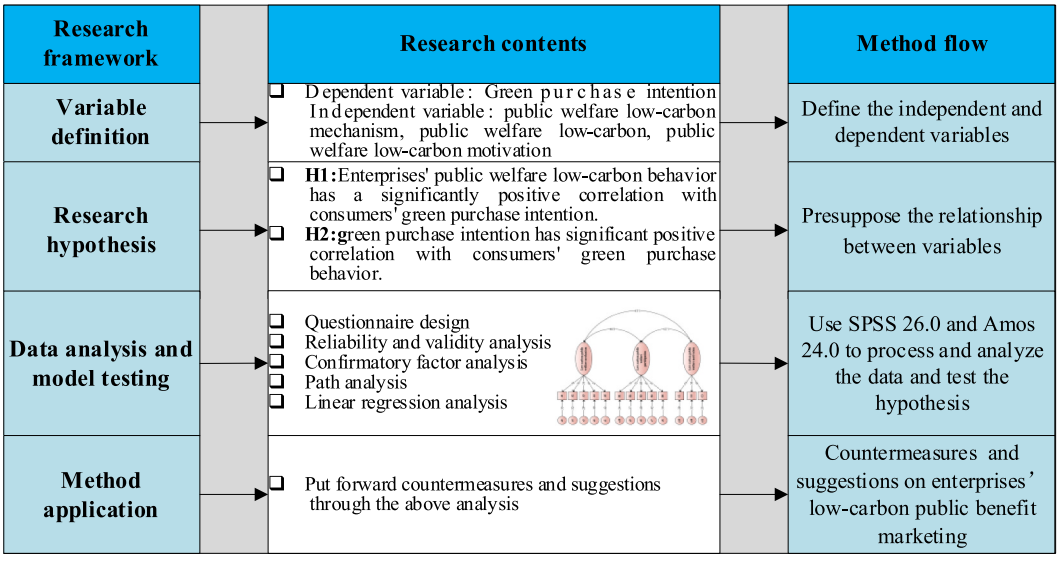


**Fig. 1.** Methodological flow chart.

study:

The framework of our study includes for steps: Variable definition, research hypothesis, data analysis and model testing, method application. According to relevant research findings and our research objective, we defined consumers' green purchase intention as dependent variable, enterprises' public welfare low-carbon behavior (public welfare low-carbon mechanism, public welfare low-carbon, public welfare low-carbon motivation) as independent variable, and also developed the research hypothesis. We used relevant research findings for reference, combined with the research objectives to design the questionnaire, and collected the questionnaire data through online platform—Questionnaire Star. We used SPSS26.0 and Amos 24.0 to process and analyze the data. We carried out reliability and validity analysis to ensure the reliability and validity of the questionnaire data. Test hypotheses using path analysis and regression analysis. Finally, we put forward countermeasures and suggestions based on analysis and findings.

### *2.2. Definitions of the variables*

The independent variable was enterprises' public welfare low-carbon behavior, and the dependent variable was consumers' green purchase intention.

#### *2.2.1. Independent variable*

Public welfare marketing refers to marketing behavior in which enterprises undertake certain social responsibilities, such as participating in public welfare activities (e.g., protecting the environment, alleviating poverty, making charitable donations) and cultivating consumers' trust and positive feelings toward products and services through different channels of communication, thus improving enterprises' reputations and popularity [4]. In this study, enterprises' public welfare low-carbon behavior refers to enterprises' public welfare behavior to reduce carbon emissions by taking certain steps based on their own resources, starting with environmental responsibility. For the measurement scale of enterprises' public welfare low-carbon behavior used in this study, we drew primarily on the findings of Chen [34]. Enterprises' public welfare low-carbon behavior includes three dimensions: the mechanism, participation, and motivation. The mechanism refers to the internal institutional and strategic design of enterprises' public welfare low-carbon activities. It is the cultural and institutional guarantee for organizing and implementing public welfare low-carbon behaviors. Participation refers to the degree of participation and support of enterprises in encouraging and supporting internal and external public welfare low-carbon activities. It is the resource guarantee of public welfare low-carbon behavior of enterprises. Motivation refers to the results and feedback brought by enterprises' public welfare low-carbon behavior. It is the supervision and guarantee of the effect and implementation process of enterprises implementing public welfare low-carbon behaviors.

#### *2.2.2. Dependent variables*

Mengping [54] noted that purchase intention is a type of subjective psychological intention that reflects consumers' psychological behavior and attitude before performing a transaction. We drew on the views of Dodds et al. [55] for the definition and measurement of purchase intention. Purchase intention refers to a customer's subjective probability of buying a certain product and can be quantified by their positive attitude and behavior when purchasing a product. Green purchase intention refers to the subjective probability that consumers will buy green products or make purchases in a low-carbon and green manner. In this paper, we mainly studied the relationship between green consumption intention and enterprises' public welfare low-carbon behavior. When we measured consumers' green purchase intention, we mainly related enterprises' public welfare low-carbon behaviors.

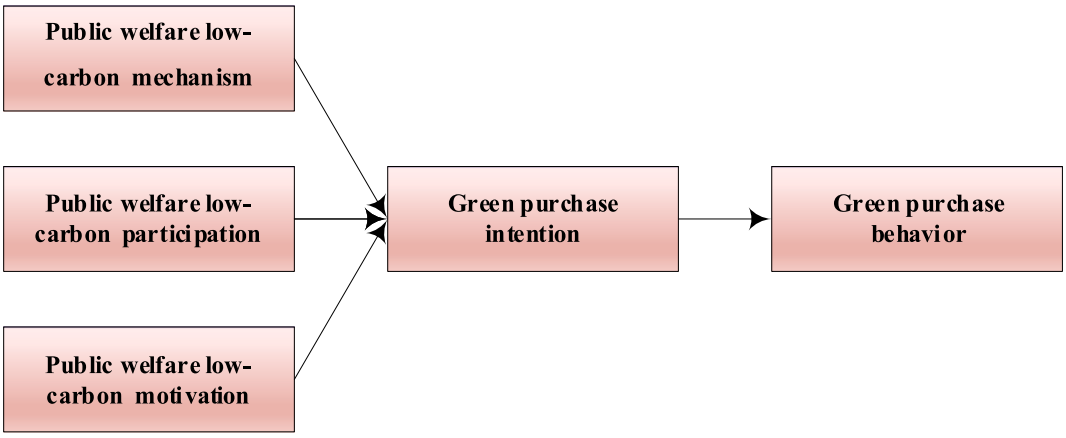


**Fig. 2.** Conceptual model of how corporate public welfare low-carbon behavior affects consumers' green purchase intention. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

### 2.3. Conceptual model

Based on a literature review of independent and dependent variables, we further subdivided enterprises' public welfare low-carbon behavior by referring to the measurement dimensions of relevant research in this study. Following Chen [34], we made corresponding adjustments and studied the relationship between the public welfare low-carbon mechanism, public welfare low-carbon participation, public welfare low-carbon motivation, and consumers' green purchase intention. According to social expectation bias theory, there may be a gap between attitude and behavior [56–59].

Therefore, we first analyze the relationship between enterprises' public welfare low-carbon behavior and consumers' green purchase intention. Then, we analyze the relationship between green purchase intention and green purchase behavior. Research shows that attitude or intention is an important antecedent of behavior [60,61]. Based on TPB, ABC, and REB, we design a conceptual model of the relationship between enterprises' public welfare low-carbon behavior and consumers' green purchase intention (Fig. 2).

In Fig. 2, public welfare low-carbon mechanism, participation, and motivation are dependent variables. Together, the three of them constitute the total independent variable: "public welfare low-carbon behavior of enterprises." Green purchase intention is the independent variable. In the first step, we test the relationship between "public welfare low-carbon behavior of enterprises" and "green purchase intention." In the second step, we test the relationship between "green purchase intention" (dependent variable) and "green purchase behavior" (independent variable). In this step, we take "green purchase intention" as dependent variable, and "green purchase behavior" as independent variable.

### 2.4. Research hypotheses

We measured enterprises' public welfare low-carbon behavior using three variables: the mechanism, participation, and motivation. The mechanism includes the concept of public welfare, enterprises' strategic measures, special management, and enterprises' decision-making participants. Participation includes the involvement of leaders, competitive business engagement, resources, and participation from employees. Motivation includes consumers' feedback, whether solving the problem of low-carbon social development is seen as beneficial to society, and rewarding and praising employees. Here, motivation refers to enterprises' altruistic motives. Liao et al. [62]

**Table 1**
Measured variables and items.

| Variables | Code | Measurement item | Reference |
|---|---|---|---|
| Green purchase behavior (Q) | Q1 | I buy products from companies that are environmentally responsible. | Dodds [55] |
| | Q2 | I buy products from companies with a good brand image. | |
| | Q3 | I buy products from companies that often participate in public welfare low-carbon activities. | |
| Green purchase intention (D): independent variable | D1 | When I buy similar products, I give priority to buying products from enterprises that perform public welfare low-carbon activities. | |
| | D2 | I am willing to recommend the products of enterprises that have performed public welfare low-carbon activities to my friends. | |
| | D3 | I am willing to pay a higher price to buy products related to enterprises that perform public welfare low-carbon marketing activities. | |
| | D4 | I think the products recommended by enterprises that take part in public welfare low-carbon activities are worth buying. | |
| Public welfare low-carbon mechanism (A): dependent variable | A1 | If a company's public welfare low-carbon concept reflects its mission and strategy, I will be more willing to buy its products. | Chen [34] |
| | A2 | If a company has established a clear vision and strategy for low-carbon public welfare, I will be more willing to buy its products. | |
| | A3 | If a company has a special person in charge of public welfare low-carbon projects, I will be more willing to buy its products. | |
| | A4 | If a company has an institutionalized public welfare low-carbon mechanism for project operations, I will be more willing to buy its products. | |
| | A5 | I would be more willing to buy a product if the company involved consumers in decision-making in public welfare low-carbon projects. | |
| Public welfare low-carbon participation (B): dependent variable | B1 | If the leaders of a company take the lead in participating in public welfare low-carbon activities, I will be more willing to buy its products. | |
| | B2 | If a public welfare low-carbon project is combined with a company's advantageous business, I will be more willing to buy its products. | |
| | B3 | If a company conducts low-carbon public welfare and organizes voluntary services, I will be more willing to buy its products. | |
| | B4 | If a company provides sufficient resources to support low-carbon public welfare, I will be more willing to buy its products. | |
| | B5 | I would be more willing to buy a product if the company provided training for employees to participate in public welfare low-carbon projects. | |
| Public welfare low-carbon motivation (C): dependent variable | C1 | If a company monitors and gives feedback on the implementation progress and the effect of public welfare low-carbon projects, I will be more willing to buy its products. | |
| | C2 | If a company's public welfare low-carbon activities effectively solve the problem of low-carbon social development, I will be more willing to buy its products. | |
| | C3 | If a company recognizes and rewards employees who are outstanding in public welfare low-carbon activities, I will be more willing to buy its products. | |

used Hongxing as an example to analyze the guidance mechanism of Weibo public opinion in brand public welfare marketing and found that the public welfare strategic measures implemented by enterprises in different public opinion environments had a certain impact on consumers. Shuyuan [63] showed that campaign design related to enterprises' cause marketing had a significantly positive impact on consumers' purchase intention toward related products or services. Jiang [64] found that enterprises' internal mechanisms played an important role in public welfare behavior, and the resources invested by enterprises had a key impact on consumers. In her research on the effect of information quality in cause marketing on consumers' participation intention, Li [65] found that information quality in virtual CSR co-creation activities had a significantly positive impact on consumers' participation intention. Zhang et al. [66] concluded that cause marketing had a significantly positive correlation with potential consumers' brand attitudes and that marketing had a significantly positive correlation with the purchase intention of potential consumers. You et al. [67] maintained that brand trust is one way for enterprises to influence consumers' attitudes toward their own brands. The results indicated that (1) public welfare had a positive effect on brand trust and brand attitude, and (2) cause marketing had a positive impact on consumers' attitudes toward brand trust and brand recognition. Von Schnurbein et al. [68] elaborated on the four basic elements of corporate philanthropy—economics, motivation, creativity, and morality—indicating the importance and prominent role of corporate philanthropy in today's enterprises and indirectly suggesting that the altruistic motives of corporate public welfare have a certain impact on consumers.

Based on the above relevant research conclusions and combined with the relevant findings from our literature review, we examine the relationship between enterprises' public welfare low-carbon behavior and consumers' green consumption behavior from three perspectives: mechanism, participation, and motivation. Consequently, we developed the following hypotheses:

**H1**. Enterprises' public welfare low-carbon behavior has a significantly positive correlation with consumers' green purchase intention.

**H1a**. Public welfare low-carbon mechanism has a significantly positive correlation with consumers' green purchase intention.

**H11a**. Public welfare low-carbon mechanism has the greatest correlation with consumers' green purchase intention.

**H1b**. Public welfare low-carbon participation has a significantly positive correlation with consumers' green purchase intention.

**H1c**. Public welfare low-carbon motivation has a significantly positive correlation with consumers' green purchase intention.

**H2**. Green purchase intention has a significantly positive correlation with consumers' green purchase behavior.

### *2.5. Questionnaire design*

Based on a more mature scale proposed by relevant research at home and abroad, we made corresponding adjustments according to research practice to form the final questionnaire, which comprised three parts. The first part involved the basic information of the sample with 6 items, and the second part related to the scale of consumers' green purchase behavior and green purchase intention with 7 items. The third part revolved around the scale of enterprises' public welfare low-carbon behavior with 13 items (as shown in Table 1). The questionnaire items were measured on a five-point Likert scale, with 1 indicating *strongly disagree* and 5 denoting *strongly agree*. The questionnaire received ethical approval from the Ethics Committee of the Business School of Suzhou University (no. SZXYBSEC20230323). Informed consent was obtained from all participants. At the beginning of the questionnaire, we we explained the purpose of the survey and made a commitment to the information protection of the survey objects.

## 3. Data analysis and model testing

In this chapter, we describe data collection, conduct reliability and validity analyses on the questionnaire data, perform a regression analysis, and test the research hypotheses.

### *3.1. Data collection*

We used an online platform—Questionnaire Star—to distribute the questionnaire. The survey period was from March 24, 2023, to April 24, 2023. Because our research doesn't need to target specific groups. we did not use a stratified random sample. We conducted a preliminary survey before issuing the questionnaire. The pre-survey data showed that the reliability and validity of the questionnaire were reasonable. Our team forwarded the questionnaire links to various social software communities. We provided explanations of the questionnaire items in each community and answered any raised questions as soon as possible. When forwarding questionnaire links, we took the approach of rewarding responses by offering cash bonuses. Because our questionnaire variables did not contain too many items. There were only 20 items. After consulting scholars and teachers in related fields, combined with the general practice, the number of questionnaires should not be less than 10 times of variable items to meet the requirements of the number of questionnaires. We issued 246 questionnaires and recovered all of them. According to our test, it took at least 25 s to complete this questionnaire carefully. We excluded questionnaires with response times of less than 25 s. Ultimately, we collected 221 valid questionnaires with an effective recovery rate of 89.84 %.

### 3.2. Basic information of the sample

In order to show the basic information of the participants, we performed statistical calculations on their socio-demographics, as shown in Table 2.

Seen from Table 2, there were slightly more women than men, but they were similar. The majority were under 40 years old. The education level was mainly junior college or above, among which the undergraduate was the most. Monthly income ranges were similar.

According to the China Green Consumer Report released by AliResearch [69], China's green consumers are mainly young people under the age of 35 years. Young people's green consumption behavior is more significant than that of their older counterparts [70,71]; therefore, we believe that the survey sample is representative.

In order to show the participants' answers to the variable items, we calculated the score of each variable item. Descriptive statistics of the Likert scale variables are presented in Table 3.

As can be seen from Table 3, the mean scores were relatively large, and the minimum mean value was 3.86, indicating that the answers were basically within the range of "agree" and above. Standard deviations were all less than 1, indicating a concentrated response.

### 3.3. Reliability and validity analysis

In order to test the validity and reliability of the questionnaire, we conducted a reliability test and a validity test.

#### 3.3.1. Reliability analysis

To ensure the reliability and consistency of the survey results regarding the scales measuring enterprises' public welfare low-carbon behavior, green purchase intention, and green purchase behavior, we employed SPSS 26.0 to calculate Cronbach's α reliability coefficients. In general, if Cronbach's α is above 0.9, the reliability of the scale is considered excellent. When it is between 0.8 and 0.9, the reliability is good; when it is between 0.7 and 0.8, the reliability meets the standard; and when it is lower than 0.7, the scale needs to be revised. Table 4 presents the results, which met the requirements.

#### 3.3.2. Validity analysis

When measuring a problem, validity refers to the degree of agreement between the measured results obtained from different individuals. This reflects the accuracy of the question itself and includes the validity of the content and structure. In general, KMO and Bartlett's sphericity test need to be done before factor analysis. The larger the KMO value, the more suitable the next step of factor analysis. Generally, the KMO value should be greater than 0.5; the closer it is to 1, the better it is. In addition, it is necessary to satisfy a P-value of less than 0.05 in the factor analysis to indicate its suitability. Finally, we used SPSS 26.0 and AMOS 24.0 for factor analysis. KMO and Bartlett's sphericity, structural validity and aggregate validity of the questionnaire were respectively tested in the following context.

(1) Questionnaire on enterprises' public welfare low-carbon behavior

First, we measured content validity. Based on the definitions of the relevant concepts of companies' public welfare low-carbon behavior, we created a formal questionnaire with reference to the mature scale of pertinent researchers and the guidance of experts and teachers in related fields. We analyzed the KMO and Bartlett's test of sphericity (Table 5).

As seen in Table 5, the KMO was 0.843, greater than 0.7. As for Bartlett's sphericity test, the value implies that the scale data have good validity. We used AMOS 24.0 software for a verification factor analysis, and we established the model (Fig. 3).

The scale for enterprises' public welfare low-carbon behavior comprises three dimensions: the mechanism, participation, and

**Table 2**
Basic information of the sample.

| Variable | Category | n | % |
|---|---|---|---|
| Sex | Male | 99 | 44.8 |
| | Female | 122 | 55.2 |
| Age | ≤20 | 26 | 11.8 |
| | 21–30 | 97 | 43.9 |
| | 31–40 | 68 | 30.8 |
| | ≥41 | 30 | 13.6 |
| Education level | ≥ Postgraduate | 21 | 9.5 |
| | Undergraduate | 111 | 50.2 |
| | Junior college | 56 | 25.3 |
| | ≤ High school | 33 | 14.9 |
| Monthly income (yuan) | <3000 | 57 | 25.8 |
| | 3000–5000 | 69 | 31.2 |
| | 5000–10,000 | 43 | 19.5 |
| | >10,000 | 52 | 23.5 |

**Table 3**
Descriptive statistics of the Likert scale variables.

| | N | Max | Min | Mean | Standard deviation |
|---|---|---|---|---|---|
| A1 | 221 | 1 | 5 | 3.95 | 0.767 |
| A2 | 221 | 1 | 5 | 4.05 | 0.926 |
| A3 | 221 | 1 | 5 | 3.95 | 0.788 |
| A4 | 221 | 1 | 5 | 4.09 | 0.877 |
| A5 | 221 | 1 | 5 | 4.18 | 0.849 |
| B1 | 221 | 1 | 5 | 3.95 | 0.761 |
| B2 | 221 | 1 | 5 | 4.05 | 0.867 |
| B3 | 221 | 1 | 5 | 4.03 | 0.744 |
| B4 | 221 | 1 | 5 | 4.09 | 0.751 |
| B5 | 221 | 1 | 5 | 3.89 | 0.769 |
| C1 | 221 | 1 | 5 | 4.15 | 0.886 |
| C2 | 221 | 1 | 5 | 4.12 | 0.828 |
| C3 | 221 | 1 | 5 | 3.86 | 0.855 |
| D1 | 221 | 1 | 5 | 4.03 | 0.794 |
| D2 | 221 | 1 | 5 | 3.90 | 0.820 |
| D3 | 221 | 1 | 5 | 3.79 | 0.876 |
| D4 | 221 | 1 | 5 | 3.89 | 0.781 |
| Q1 | 221 | 1 | 5 | 4.00 | 0.806 |
| Q2 | 221 | 1 | 5 | 3.99 | 0.817 |
| Q3 | 221 | 1 | 5 | 3.92 | 0.803 |

**Table 4**
Reliability results.

| Scale | Cronbach's α | Number of items |
|---|---|---|
| Green purchase behavior | 0.704 | 3 |
| Green purchase intention | 0.733 | 4 |
| Enterprises' public welfare low-carbon behavior | 0.878 | 13 |
| Total scale | 0.920 | 20 |

It can be seen from Table 4 that the Cronbach's α of each sub-scale was greater than 0.7, and the overall Cronbach's α of the questionnaire is 0.92, indicating that the questionnaire had good reliability.

**Table 5**
KMO and Bartlett's sphericity tests of the measurement variables of enterprises' public welfare low-carbon behavior.

| Measure of KMO sample appropriateness | | 0.843 |
|---|---|---|
| Bartlett's sphericity test | Approximate chi-square | 594.487 |
| | Degrees of freedom | 6 |
| | Significance | <0.001 |

motivation. There are five indicators of the mechanism, five for participation, and three for motivation. As seen in the diagram depicting the validation factor model of enterprises' public welfare low-carbon behavior, each observed variable corresponds to only one potential variable, and each potential variable has no fewer than three observed variables.

Second, we tested the structural validity of the scale. Table 6 presents the results.

As presented in Table 6, the CMIN/degrees of freedom obtained by the fitting model of the validated factor analysis for the questionnaire on enterprises' public welfare low-carbon behavior was 1.854, which is less than 3. The data reached the ideal value, indicating that the fitting model conformed to the original logical presets. The root mean square error of approximation (RMSEA) value reached 0.062 and was less than 0.080, indicating a high degree of fit between the model and the data as well as an overall fit. For the value-added fit index, the incremental fit index (IFI) was 0.941, and the Tucker–Lewis index (TLI) and comparative fit index (CFI) were 0.924 and 0.940, respectively. All estimates met the critical criteria for an acceptable model fit, suggesting a high fit between the model and the data as well as an overall fit.

The corresponding aggregate validity, combined reliability (CR), and the average variance extracted (AVE) values are listed in Table 7.

In general, an AVE above 0.5 or a CR above 0.7 indicates high aggregation validity (one or the other). Considering subjective and uncertain factors, we believe that the studied variables have good aggregate validity.

(2) Green purchase intention and the behavior questionnaire

First, we used the KMO and Bartlett's sphericity tests for the scale of consumers' green purchase intention. The analysis showed that the KMO was 0.867, greater than 0.7, and the outcome of Bartlett's sphericity test was significant ($P < 0.05$). We then used it to

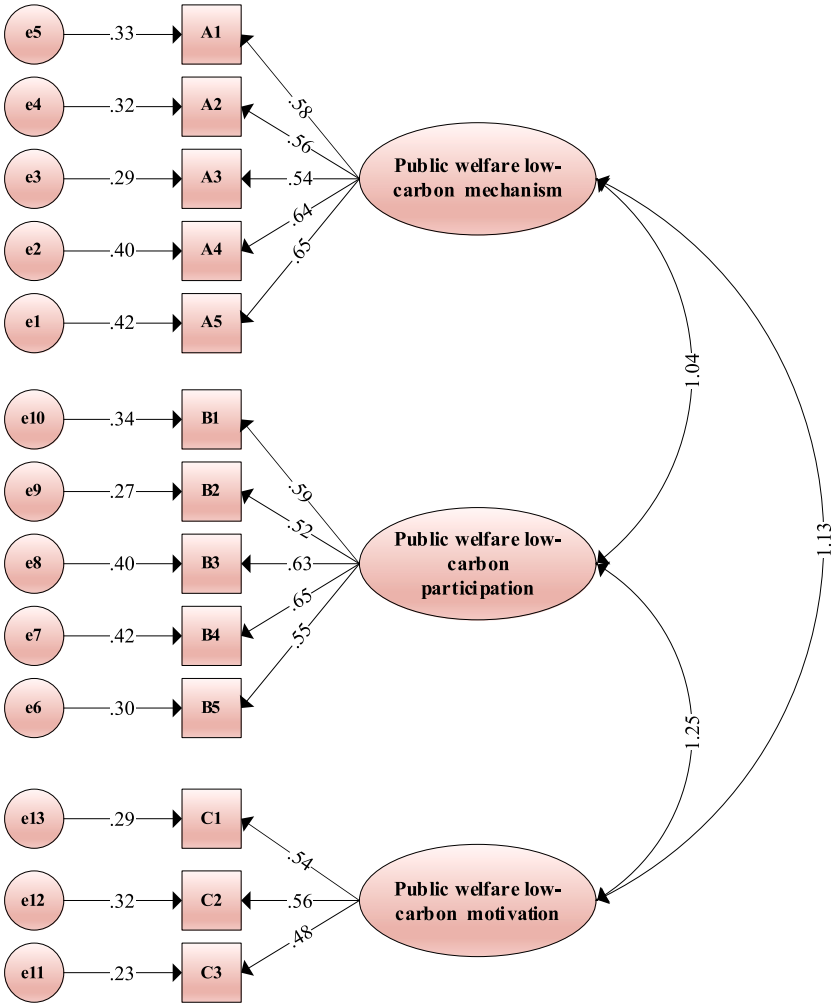


**Fig. 3.** Verification factor analysis model of enterprises' public welfare low-carbon behavior.

**Table 6**
Structural validity analysis of the scale for enterprises' public welfare low-carbon behavior.

| Index | Reference standard | Measured outcome |
|---|---|---|
| CMIN/df | 1–3 is excellent; 3–5 is good | 1.854 |
| RMSEA | <0.05 is excellent, 0.05–0.08 is good | 0.062 |
| IFI | >0.9 is excellent, 0.8–0.9 is good | 0.941 |
| TLI | >0.9 is excellent, 0.8–0.9 is good | 0.924 |
| CFI | >0.9 is excellent, 0.8–0.9 is good | 0.940 |

CMIN: chi square; Df: degree of freedom; RMSEA: root-mean-square error of approximation.
IFI: incremental fit index; TLI: Tucker-Lewis index; CFI: comparative fit index.

**Table 7**
Aggregation validity analysis.

| Scale | AVE value | CR value |
|---|---|---|
| Public welfare low-carbon mechanism | 0.355 | 0.731 |
| Public welfare low-carbon participation | 0.342 | 0.722 |
| Public welfare low-carbon motivation | 0.281 | 0.539 |

AVE: average variance extracted; CR: composite reliability.

**Table 8**
The goodness-of-fit indicators of consumers' green purchase intention and green purchase behavior.

| Index | Reference standard | Measured outcome |
|---|---|---|
| CMIN/df | 1–3 is excellent; 3–5 is good | 2.088 |
| RMSEA | <0.05 is excellent, 0.05–0.08 is good | 0.070 |
| NFI | >0.9 is excellent, 0.8–0.9 is good | 0.942 |
| GFI | >0.9 is excellent, 0.8–0.9 is good | 0.942 |
| CFI | >0.9 is excellent, 0.8–0.9 is good | 0.968 |

CMIN: chi square; Df: degree of freedom; RMSEA: root-mean-square error of approximation.
NFI: Bentler-Bonett normed fix index; GFI: goodness-of-fit index; CFI: comparative fit index.

measure the convergence validity of the model through a confirmatory factor analysis. The measurement results are listed in Table 8.

As depicted in Table 8, the fitting coefficient of the measurement model (CMIN/df) was 2.088, which is less than 3, and the data reached the ideal value, indicating that the fitting model conformed to logical presets. The RMSEA value reached 0.07 and was less than 0.080, denoting that the model fit the data well and that the overall fit was good. For the value-added fit index, the normed fit index was 0.942 and the goodness-of-fit index and CFI were 0.942 and 0.968, respectively. Each estimate conformed to the acceptable critical standard in the model, suggesting a high degree of fit between the model and data as well as an overall fit.

The results of aggregation validity analysis are shown in Table 9.

### 3.4. Score of variables

In order to show the score of variables rated by the participants, we calculated and presented the score of dependent and independent variables based on the questionnaire survey data. Table 10 presents the outcomes.

As outlined in Table 10, the average score of respondents' perception of enterprises' public welfare low-carbon activities was 4, indicating that consumers believed that public welfare low-carbon activities with public welfare low-carbon participation could affect their green purchase intention. For the status quo of public welfare low-carbon motivation, the average score was 4.04, meaning that consumers had good perceptions of their public welfare low-carbon behavior. For the public welfare low-carbon mechanism, the average score was 4.04, suggesting that the public welfare low-carbon mechanism had an impact on consumers' purchases. The average score for the green purchase intention was 3.9, implying that consumers were positive about the measurement of green purchase intention. The average score for green purchase behavior was 3.97, implying that consumers agreed that enterprises' public welfare low-carbon behavior had a certain impact on consumers' green purchasing.

### 3.5. Pairwise correlation analysis between variables

Correlation analysis is generally used to explore the degree of interaction between variables. The correlation coefficients range from −1 to 1. If the absolute value of the correlation coefficient between variables is close to 1, this indicates that the correlation between them is strong (positive/negative) and *vice versa*. We used the Pearson correlation for the preliminary analysis. Table 11 portrays the results of the correlation coefficients between the variables.

As presented in Table 11, each dimension of enterprises' public welfare low-carbon behavior was significantly positively correlated with green purchase intention and green purchase behavior. Thus, the hypotheses were preliminarily verified and were consistent with expectations.

### 3.6. Normality assumption test

According to the findings of Kock et al. [72], before regression analysis, we tested the normality of the variables, as shown in Figs. 4–7:

As shown in Figs. 4–7, all variables confirmed normal distribution. Regression analysis could be performed.

### 3.7. Hypotheses testing

In order to test our proposed hypotheses, we then conduct path analysis and regression analysis respectively, and show the results

**Table 9**
Analysis of aggregation validity.

| Scale | AVE value | CR value |
|---|---|---|
| Green purchase behavior | 0.446 | 0.707 |
| Green purchase intention | 0.422 | 0.742 |

AVE: average variance extracted; CR: composite reliability.
Following the CR and AVE guidelines noted above, the convergence validity of the model was considered good.

**Table 10**
Score of variables.

| Variables | | N | Min | Max | Average | Standard deviation |
|---|---|---|---|---|---|---|
| Public welfare low-carbon behavior | Public welfare low-carbon mechanism | 221 | 1.6 | 5 | 4.04 | 0.58 |
| | Public welfare low-carbon participation | 221 | 1.8 | 5 | 4 | 0.54 |
| | Public welfare low-carbon motivation | 221 | 1 | 5 | 4.04 | 0.62 |
| Overall public welfare low-carbon behavior among enterprises | | 221 | 1.77 | 5 | 4.03 | 0.52 |
| Overall green purchase intention | | 221 | 1.25 | 5 | 3.9 | 0.61 |
| Overall green purchase behavior | | 221 | 1 | 5 | 3.97 | 0.64 |

**Table 11**
Pairwise correlation analysis between variables.

| Variables | Public welfare low-carbon mechanism | Public welfare low-carbon participation | Public welfare low-carbon motivation | Green purchase intention | Green purchase behavior |
|---|---|---|---|---|---|
| Public welfare low-carbon mechanism | 1 | | | | |
| Public welfare low-carbon participation | 0.757** | 1 | | | |
| Public welfare low-carbon motivation | 0.713** | 0.780** | 1 | | |
| Green purchase intention | 0.622** | 0.727** | 0.692** | 1 | |
| Green purchase behavior | 0.649** | 0.680** | 0.738** | 0.689** | 1 |

Note: *P < 0.05, **P < 0.01.

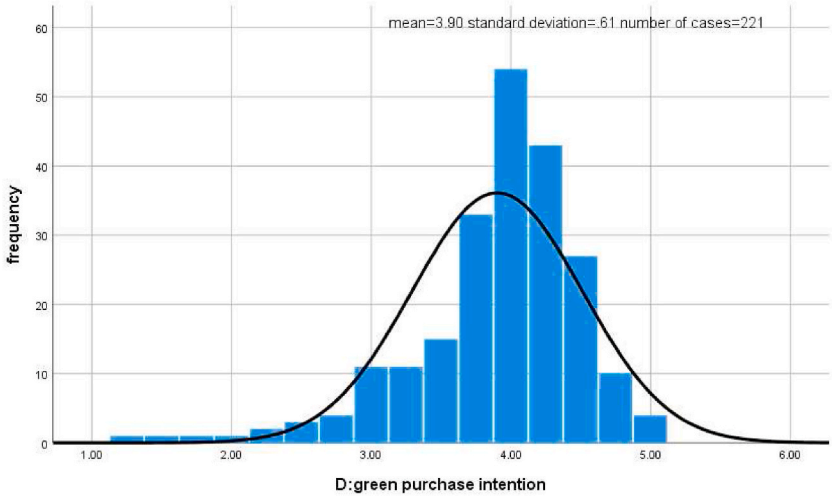


**Fig. 4.** Normality assumption test of D (green purchase intention). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

of hypotheses testing.

### *3.7.1. Path analysis*

According to the hypotheses, enterprises' public welfare low-carbon behavior includes three dimensions: mechanism, participation, and motivation as independent variables, and green purchase intention as the dependent variable. We used AMOS 24.0 software to establish the path model, as depicted in Fig. 8, and we used the potential variable path analysis model to test the hypotheses proposed above.

According to the model data, public welfare low-carbon participation had the largest positive correlation with green purchase intention, with a path coefficient of 0.52. The impact of public welfare low-carbon motivation on green purchase intention was relatively small, with a path coefficient of 0.35. H11a, "The public welfare low-carbon mechanism has the greatest correlation with consumers' green purchase intention," was not valid. Table 12 shows the specific data for the path analysis.

From the path analysis data, we can see that the overall influence of the public welfare low-carbon mechanism on green purchase intention was greater than 0.05, which is not significant, while public welfare low-carbon participation and public welfare low-carbon motivation was significant (P < 0.01). The non-standardized coefficients were all greater than zero, indicating that they all had

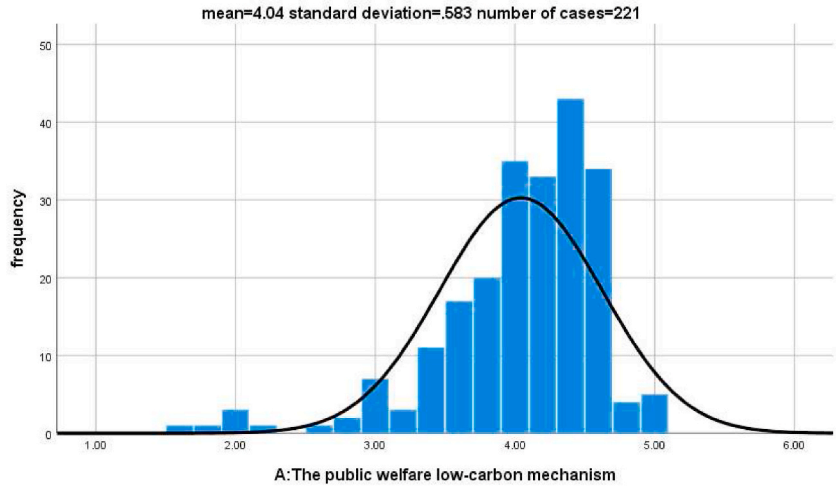


**Fig. 5.** Normality assumption test of A (The public welfare low-carbon mechanism).

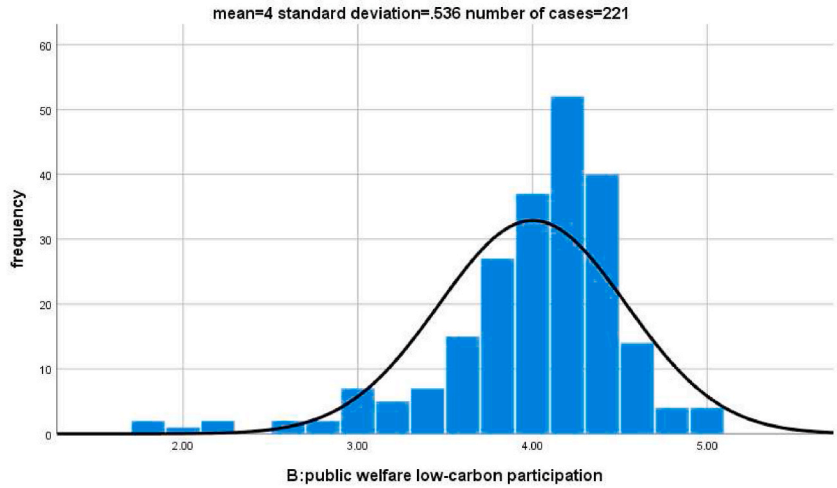


**Fig. 6.** Normality assumption test of B (public welfare low-carbon participation).

positive influences, and the remaining hypotheses were confirmed or negated accordingly.

### *3.7.2. Multiple linear regression analysis*

We used SPSS 26.0 software to analyze the impact of public welfare low-carbon behavior on green purchase intention using multiple linear regression analysis. With enterprises' public welfare low-carbon behavior as the independent variable and overall green purchase intention as the dependent variable, the linear regression analysis results are as follows (Table 13):

$R^2$ is a fitting measure for a linear regression model. It represents the percentage that the independent variables collectively explain the variance of the dependent variable. It value ranges from 0 to 1. The closer the value is to 1, the better the fit of the model. It is generally believed that the $R^2$ value is greater than 0.4 and the significance level is 0.05, which means that the model has a acceptable fit degree. From the above calculation outcomes, we could see that the fit degree $R^2$ was 0.565, and the fit degree of this model was acceptable. In addition, the regression equation outcomes show that at least one of the independent variables in this study had a significant impact on the dependent variable of green purchase intention ($F = 96.21$, $P < 0.001$). Public welfare low-carbon participation ($t = 5.46$, $P < 0.05$) and motivation ($t = 3.93$, $P < 0.05$) had a significantly positive impact on green purchase intention. There was also a positive relationship in the public welfare low-carbon dimension. From the perspective of the impact of these two dimensions on consumers' green purchase intention, public welfare low-carbon participation had a greater impact. In addition, the public welfare low-carbon mechanism did not significantly affect green purchase intention, and its regression coefficient was not significant ($P > 0.05$). This is consistent with the results of the path analysis described above.

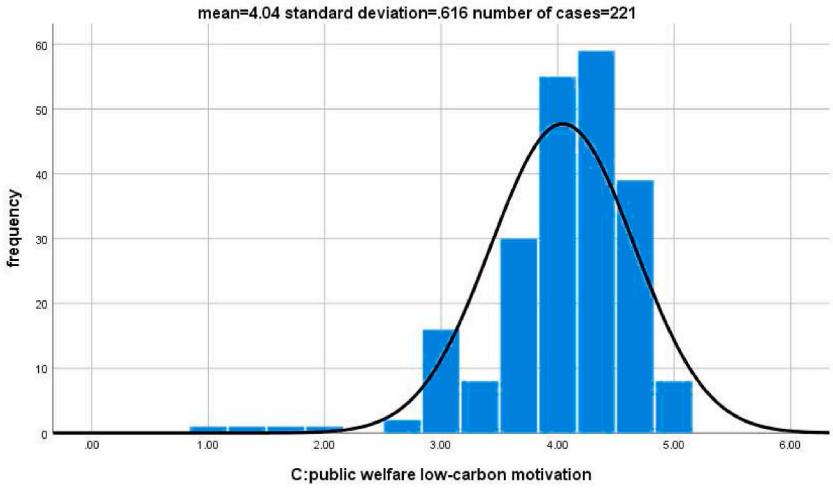


**Fig. 7.** Normality assumption test of C (public welfare low-carbon motivation).

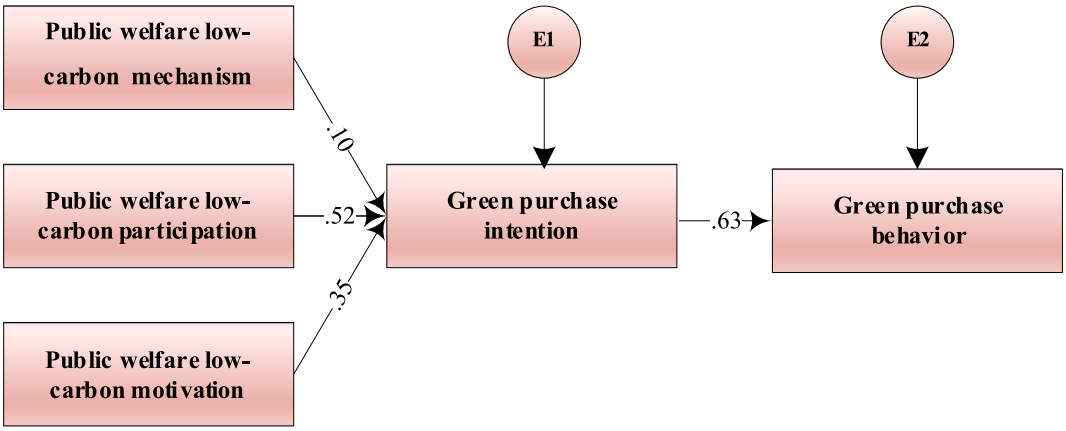


**Fig. 8.** Path model diagram.

**Table 12**
Path analysis.

| Variable | Path | Variable | Estimate | S.E. | C.R. | P |
|---|---|---|---|---|---|---|
| Overall green purchase intention | ← | Public welfare low-carbon mechanism | 0.087 | 0.046 | 1.874 | 0.061 |
| Overall green purchase intention | ← | Public welfare low-carbon participation | 0.496 | 0.050 | 9.870 | <0.001 |
| Overall green purchase intention | ← | Public welfare low-carbon motivation | 0.290 | 0.044 | 6.628 | <0.001 |
| Overall green purchase intention | ← | Overall green purchase intention | 0.724 | 0.061 | 11.899 | <0.001 |

S.E.: Standard error; C.R.: composite reliability.

### *3.7.3. Result of hypotheses testing*

To verify the hypotheses of the impact of various dimensions of public welfare low-carbon behavior on green purchase intention in the model, we used SPSS 26.0 and AMOS 24.0 to conduct data analysis and draw conclusions. The summary of hypotheses testing was shown in Table 14.

Seen from Table 14, we could find that enterprises' public welfare low-carbon behavior had a significantly positive relationship with consumers' green purchase intention. The path coefficient reached 0.97; In addition, the public welfare low-carbon mechanism, participation, and motivation had significantly positive relationship with green purchase intention.

## 4. Countermeasures and suggestions

Based on the above analysis, combined with the evaluation indicators of enterprises' public welfare low-carbon behavior, we

**Table 13**
Linear regression analysis results.

| Model | Non-standardized coefficient | | Standardized coefficient | t | Significance | Variance expansion coefficient |
|---|---|---|---|---|---|---|
| | B | Standard error | Beta | | p | VIF |
| (constant) | 0.39 | 0.21 | | 1.86 | 0.065 | |
| Public welfare low-carbon mechanism | 0.09 | 0.08 | 0.08 | 1.16 | 0.247 | 2.58 |
| Public welfare low-carbon participation | 0.50 | 0.09 | 0.44 | 5.46 | <0.001 | 3.23 |
| Public welfare low-carbon motivation | 0.29 | 0.07 | 0.29 | 3.93 | <0.001 | 2.80 |
| $R^2$ | | | 0.565 | | | |
| F | | | 96.21 | | | |
| P | | | <0.001 | | | |

Dependent variable: green purchase intention.
VIF: Variance Inflation Factor.

**Table 14**
Summary of hypotheses testing.

| Hypothesis | Hypothesis description | Test outcome | Basis of judgment |
|---|---|---|---|
| $H_1$ | Enterprises' public welfare low-carbon behavior has a significantly positive correlation with consumers' green purchase intention | Confirmed | According to the linear regression analysis data in Table 13, $P < 0.01$ |
| $H_{1a}$ | Public welfare low-carbon mechanism has a significantly positive correlation with consumers' green purchase intention | Rejected | According to the path analysis data and the data obtained by linear regression analysis, $P > 0.05$, which is not significant, and the B value was greater than 0, indicating a positive relationship |
| $H_{11a}$ | Public welfare low-carbon mechanism has the greatest impact on consumers' green purchase intention | Rejected | The path analysis chart data in Fig. 8 indicate that the path coefficient of the public welfare low-carbon mechanism had the smallest value and the smallest impact, and the data in Table 13 show that the largest value of the standardized coefficient was public welfare participation |
| $H_{1b}$ | Public welfare low-carbon participation has a significantly positive correlation with consumers' green purchase intention | Confirmed | As seen in Table 13, $P < 0.01$, and the B value was greater than 0 |
| $H_{1c}$ | Public welfare low-carbon motivation has a significantly positive correlation with consumers' green purchase intention | Confirmed | As seen in Table 13, $P < 0.01$, and the B value was greater than 0 |
| $H_2$ | Green purchase intention has a significantly positive correlation with consumers' green purchase behavior | Confirmed | As seen in Table 12, $P < 0.01$ |

propose countermeasures and suggestions for enterprises to improve their public welfare low-carbon marketing.

### *4.1. More effort in public welfare low-carbon participation*

The data analysis shows that there is a significant positive correlation between enterprises' public welfare low-carbon participation and consumers' green purchase intention. Enterprises should make more efforts in the public welfare low-carbon participation. Enterprises can begin with the following aspects:

#### *4.1.1. Full participation*

A company should establish a public welfare low-carbon participation mechanism and encourage all employees, from leaders to general staff, to participate in low-carbon public welfare. In this manner, company resources can be fully mobilized, and public welfare low-carbon behavior can become not only long-term and strategic work but also normal and tactical work. By promoting full participation in low-carbon public welfare, a company gradually forms a corporate culture with distinctive public welfare characteristics, thereby enhancing its core competitiveness.

#### *4.1.2. Establish a public welfare department or give a department the power and responsibility to perform public welfare low-carbon activities*

The establishment of public welfare departments can ensure the sustainability and stability of enterprises' public welfare low-carbon behavior. This department is responsible for developing enterprises' public welfare low-carbon behavior. Various forms of public welfare low-carbon marketing activities, such as online and offline marketing, can deepen consumers' goodwill and trust, improve the company's reputation, and promote consumers' purchase intention.

### *4.2. Strengthen feedback on the effect of public welfare low-carbon behavior*

According to the data analysis, if enterprises can monitor and provide feedback on the implementation progress and effect of public welfare low-carbon projects, consumers will show a stronger purchase intention. Thus, enterprises can incorporate the feedback and supervision of the effects of public welfare low-carbon activities into the input of public welfare low-carbon behavior. Feedback from

public welfare low-carbon activities can be used to match the target group. Through public welfare marketing combined with the level of situational involvement, the demand cognition of the target group can be deeply explored to enhance consumers' purchase intention and generate purchase behaviors. Based on the results obtained from monitoring and feedback, consumers' focus on public welfare marketing should be explored. Targeted methods should be adopted to solve the pain points of consumer demand, which can deepen consumer loyalty to a brand. In public welfare low-carbon motivation, emphasis is placed on showing motivation that is conducive to the low-carbon development of society, aiming to solve the problem of low-carbon development in the economy and society, which is more conducive to implementing emotional marketing and promoting consumers' purchases.

### *4.3. Improve the public welfare low-carbon mechanism*

Although the data show that enterprises' public welfare low-carbon behavior in the public welfare low-carbon mechanism does not have a strong impact on consumers' green purchases, it is undeniable that whether a company incorporates public welfare low-carbon behavior into its mission and strategy or daily work will have a key impact on consumers, which can also be seen in the questionnaire data. Respondents believed that consumers' participation in corporate low-carbon public welfare could further influence their green purchase intention. Hence, enterprises should carefully design public welfare low-carbon activities to form mechanisms and models for consumers and enterprises to jointly complete public welfare low-carbon behaviors. In this way, consumers can better understand the value of enterprises, enhance their purchase willingness, and generate purchase behaviors.

However, enterprises may still face some challenges or obstacles in the practice of implementing these strategies. When encouraging full participation, some employees may negatively treat or even resist these strategies. This may require strong leadership as well as a good corporate culture. Enterprises' implementation of low-carbon public welfare strategies will increase costs. Even if enterprises build a public welfare low-carbon mechanism, it is uncertain whether this mechanism can operate sustainably and effectively. Therefore, enterprises need to overcome these challenges or obstacles if they want to effectively implement public welfare low-carbon behavior.

## 5. Discussion and conclusions

Through a questionnaire survey of consumers, we put forward six research hypotheses and tested them through path and regression analyses. The four hypotheses—$H_1$, $H_{1b}$, $H_{1c}$ and $H_2$—were confirmed. This implies that enterprises adopting public welfare low-carbon behavior can encourage consumers to engage in green consumption. Furthermore, if the products or services of an enterprise are green and environmentally friendly concurrently, this can prompt consumers to buy its products or services and promote consumer satisfaction until a high level of customer loyalty is formed. The deeper the enterprise's participation in low-carbon public welfare, the stronger the consumer's willingness to make green purchases. This indicates that when designing and participating in public welfare matters, leaders take the lead, and combined with the company's advantageous business, they expand the scope of participation, the intensity of public welfare support, and the public welfare training of employees to encourage consumers to buy their products or services. Simultaneously, feedback on the company's public welfare low-carbon progress, low-carbon activities to solve problems related to social low-carbon development, and the recognition of outstanding public welfare low-carbon performance can also promote consumer purchases. Two hypotheses—that the public welfare low-carbon mechanism has a significantly positive impact on consumers' green purchase intention and that the public welfare low-carbon mechanism has the greatest impact on consumers' green purchase intention—were invalid. This indicates that consumers are not very concerned about the institutionalization of corporate low-carbon public welfare and are more concerned about the actions of corporate low-carbon public welfare.

We hypothesized and verified the impact of the public welfare low-carbon mechanism, participation, and motivation on consumers' green purchase intention. Theoretically, this study can provide a new research perspective for CSR, green consumption, and other studies. In practice, it can provide a quantitative basis and decision-making support for enterprises' green development, public relations, and marketing, thereby enhancing their competitiveness. Concurrently, it can provide support for governments and industrial enterprises in formulating corporate low-carbon development policies.

However, this study has some limitations. Consumers' green consumption behavior is not only influenced by enterprises' public welfare low-carbon behavior but also by personal, social, and other relevant factors. How these factors affect green consumption after superimposition requires further investigation. Concurrently, the analysis and demonstration of the internal mechanism of how the low-carbon behavior of enterprises affects the purchasing behavior of consumers and promotes the low-carbon consumption of individuals need to be examined in-depth. The construction of enterprise public welfare low-carbon behavior index system still need to be improved. In future research, a more scientific and reasonable enterprise low-carbon public welfare behavior index system needs to be constructed. In this study, we did not limit the types of enterprises, so the countermeasures and suggestions put forward are relatively general. Different industries may need different approaches to improve their low-carbon cause marketing efforts. With the development of China's low-carbon economy, more countermeasures and suggestions in line with the development trend and more tailored need to be further proposed.

## Ethical declarations

This study was reviewed and approved by the Ethics Committee of the Business School of Suzhou University (no. SZXYB-SEC20230323). All participants provided informed consent to participate. All participants (or their proxies/legal guardians) provided informed consent for the publication of their anonymized case details and images.

## Consent for publication

Not applicable.

## Data availability statement

Data will be made available on request.

## CRediT authorship contribution statement

**Fagang Hu:** Writing – original draft, Conceptualization. **Lyu Wu:** Writing – original draft, Investigation. **Yuxia Guo:** Software, Methodology. **Fan Liu:** Software, Methodology. **Yaliu Yang:** Writing – review & editing, Visualization. **Yu Wang:** Writing – review & editing, Visualization.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2024.e29508.

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