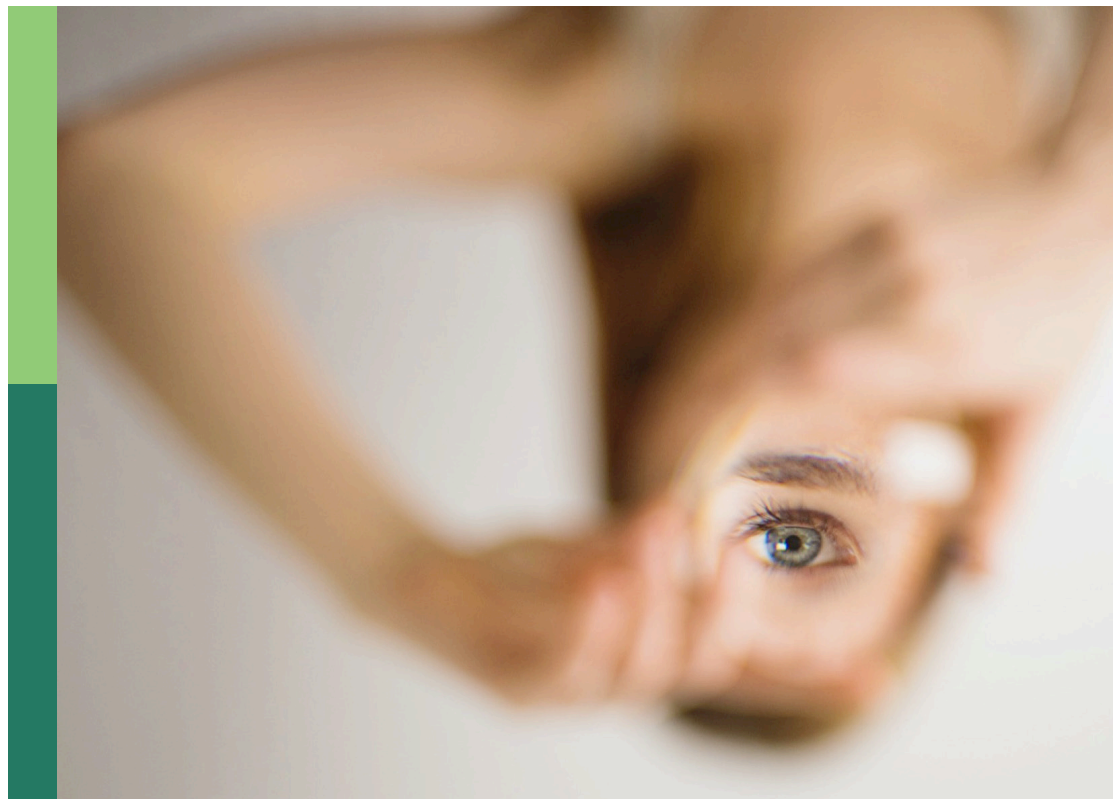# On poverty and its eradication

Edited by
Guillermina Jasso, Andrzej Klimczuk, M. D. R. Evans
and Jonathan Kelley

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On poverty and its eradication

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Table of
contents

Editorial: On poverty and its eradication

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KEYWORDS

poverty, poverty relief, poverty and inequalities, poverty and fairness, poverty and public policy

Editorial on the Research Topic
On poverty and its eradication

Overview

The Research Topic "*On poverty and its eradication*" was inspired by the International Day for the Eradication of Poverty, first commemorated in Paris in 1987 and formally designated by the United Nations. This day is dedicated to renewing the commitment to universal human development, enabling all individuals to achieve their highest potential, and reflecting on how poverty hinders this progress. The urgency of addressing poverty has increased after the COVID-19 pandemic, which exacerbated existing issues and highlighted the critical need for effective poverty eradication strategies. The studies included in this Research Topic aim to expand knowledge about poverty, its causes, consequences, and connections to crises, inequality, and fairness, and to assess policy measures for poverty reduction. The included contributions use various theoretical, empirical, quantitative, and qualitative approaches to drive sociological and policy-related discussions and initiatives, promoting fair and inclusive societies.

The presented Research Topic includes seven articles written by 29 authors from the following countries: China, the Philippines, the United Kingdom, and the United States. This Research Topic was co-organized in collaboration with five journals: "Frontiers in Human Dynamics," "Frontiers in Political Science," "Frontiers in Psychology," "Frontiers in Public Health," and "Frontiers in Sociology." The studies comprising this Research Topic are divided into four themes.

Theme I: entrepreneurship and consumption in poverty alleviation activities

In the context of this Research Topic, Valle et al. focused on studying the actions undertaken by higher education institutions to help reduce poverty by implementing community extension programs. Such schemes may

focus on capacity building and entrepreneurship training. The analysis assessing these programs found that entrepreneurship education, budgeting, financial literacy, and access to credit facilities contributed to poverty reduction. However, entrepreneurial performance did not show a significant direct impact due to the COVID-19 pandemic crisis. Despite these challenges, the findings highlight the importance of educational and financial support in promoting entrepreneurial success and alleviating poverty. Xin et al. presented different approaches to combating poverty focused on consumption-support measures. The authors argued that charity, while effective in helping vulnerable groups, is often short-term and creates dependency, leading to adverse effects. Thus, the authors analyzed China's poverty alleviation model through "altruistic consumption," which offers a sustainable alternative by leveraging pro-social behavior to support groups in need. The study found that altruistic consumption is driven by motivations related to group benefit, morality, demanders, and suppliers, with benefit-demander motivation having the most significant influence. These insights can guide targeted marketing strategies to sustain altruistic consumption efforts.

Theme II: digital growth in poverty reduction

Two studies focused on the use of e-commerce platforms to alleviate poverty. Li et al. continued the discussion on consumption-based poverty reduction in China. The authors showed that this approach has a crucial role in rural revitalization, but its sustainability is challenged by low consumer participation and reliance on government procurement. Trust is a significant factor affecting consumers' willingness to buy "poverty-alleviation agricultural products," primarily due to past adverse events that have damaged trust, such as slow sales. The study found that enhancing trust through, among others, user feedback mechanisms, platform supervision, product traceability, and certification mechanisms can increase consumers' purchase intentions and promote sustainable rural development. Wu et al. went into further detail on the potential of e-commerce systems. Based on collective efficacy and risk perception theories, their analysis found that symbolic ethical attributes positively influence consumers' willingness to buy products online more than their functional attributes. The research highlighted the mediating roles of collective efficacy and risk perception, offering practical suggestions for e-commerce enterprises and marketers to enhance their farmer-assisting marketing strategies.

Theme III: the role of health and employment in poverty mitigation

Another important trend observed in the papers included in this Research Topic is the combination of poverty alleviation measures with public health policies. Hou et al. presented a study that explored the impact of the New Rural Cooperative Medical Scheme (NRCMS) on the health status of the relatively poor population in rural China, using data from the China

Family Panel Studies. Employing propensity score matching methods, the analysis found that participation in the NRCMS significantly improved the health status of low-income individuals. The positive health effects were attributed to increased physical activity, more frequent medical care visits, and reduced healthcare expenditures. Using a different perspective, Wang et al. focused on disability as a significant contributor to global poverty. The authors studied how China's welfare reforms and employment interventions have been implemented to address this issue. By employing the Alkire-Foster method, the researchers measured multidimensional poverty among subjects with disabilities aged 16–59 in China, finding that a high percentage were deprived in at least one dimension, particularly education and social participation. Employment services were shown to significantly reduce multidimensional poverty across various fields, providing crucial evidence to inform public policies aimed at eradicating poverty among people with disabilities.

Theme IV: poverty and the income tax system

The final section includes a study by Jasso that argued that the linear income tax system, which aligns with principles of tax equity by increasing post-tax income, the amount of tax, and the rate of tax as pre-tax income increases, is an effective tool for poverty reduction. The study highlighted a potential issue where policies that help the poorest may harm the middle class, thus weakening this crucial segment of society. Moreover, the article contrasted different income distributions and demonstrated how to maintain tax fairness, even with additional resource injections, and how to estimate fair parameters for the linear income system.

Conclusion

The results presented in the articles in this Research Topic allow the articulation of six directions for further research. These are: (1) new understandings of poverty, absolute and relative poverty (see Brady and Burton, 2016; Greve, 2020); (2) new approaches to the measurement of poverty (see Beck et al., 2020; UNECE, 2017; Mysíková, 2021); (3) causes, effects, and forms of poverty, in the contemporary world and historically (see Curtis and Cosgrove, 2021); (4) interactions between poverty and situations of crisis and disasters such as pandemics and conflicts (see Fitzpatrick, 2019; Greve, 2021); (5) new links between poverty and inequality (see Edward and Sumner, 2019; UNRISD, 2022); and (6) national and international policies and programs to eradicate poverty (see Wang et al., 2020; Oberholzer, 2022).

Author contributions

AK: Conceptualization, Investigation, Methodology, Project administration, Supervision, Validation, Writing – original draft, Writing – review & editing. GJ: Supervision, Validation, Writing – review & editing. ME: Supervision, Validation, Writing –

review & editing. JK: Supervision, Validation, Writing – review & editing.

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.

The author(s) declared that they were an editorial board member of Frontiers, at the time of submission. This had no impact on the peer review process and the final decision.

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Research on Improving Online Purchase Intention of Poverty-Alleviation Agricultural Products in China: From the Perspective of Institution-Based Trust

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Poverty alleviation by consumption is a powerful way to help the poor people get rid of poverty, which plays a significant role in China's rural revitalization. However, the achievement of poverty alleviation by consumption mostly depends on government procurement, and the enthusiasm of customers to participate is low, facing the severe challenge of poor sustainability. Helping the poor is the most common motivation for customers to buy poverty-alleviation agricultural products (PAAP). However, as the negative events of poverty alleviation such as "tragic marketing" constantly appear in news reports, customers' trust in sellers has been seriously damaged. The psychological protection system for fear of being cheated hinders customers' purchase intention. Therefore, we believed that trust is an important factor in enhancing customers' purchase intention of PAAP. Customers buy PAAP mainly through online channels, and institution-based trust is the most important way to generate trust in online channels. Thus, this study investigated the institutional mechanisms that affect customers' trust in the sellers of PAAP and discussed the influence of trust on the online purchase intention of PAAP. Data were obtained through a questionnaire survey and tested empirically. The results showed that the effectiveness of the user feedback mechanism, platform supervision mechanism, product traceability mechanism, and product certification mechanism can enhance customers' purchase intention by enhancing their trust. Individual trust tendency positively regulated the relationship between the effectiveness of institutional mechanisms and consumer trust. The conclusion can not only provide new theoretical

guidance for the practice of poverty alleviation by consumption in China but also offer new ideas for the poverty alleviation undertakings in other countries.

INTRODUCTION

In 2021, the No. 1 Document of the China Central Committee pointed out that China is now in a smooth transition period from poverty alleviation to the comprehensive promotion of rural revitalization. It should continue to promote rural revitalization in poverty-stricken areas and expand poverty alleviation by consumption[1] Poverty alleviation by consumption is a new type of poverty-alleviation method in which people from all walks of life consume products and services from poor people to help them increase income and get rid of poverty (Li, 2021). Statistics show that the sales of poverty-alleviation products in China reached 306.94 billion CNY (US$48.235 billion) in 2020, effectively boosting the income of the poor and lifting them out of poverty[2] However, while achieving gratifying achievements, poverty alleviation by consumption also has some problems that cannot be ignored, among which the most serious is the sustainability of poverty alleviation by consumption. Currently, the participants of poverty alleviation by consumption are mainly government departments such as parties and government organs at all levels and state-owned enterprises and institutions, and the enthusiasm of customers to participate in purchasing is low (Fan and Liu, 2021). According to data released by the National Bureau of Statistics, the total retail sales of consumer goods in China in 2020 was 3.981 trillion CNY ($6,256.09 billion), and the sales of poverty-alleviation products accounted for only 0.78%. In other words, <1 CNY (US$0.15) is spent on poverty-alleviation products for every 100 CNY (US$15.72) of household consumption. This mode of assistance, which relies mainly on government procurement and lacks a long-term guarantee mechanism, is not only detrimental to the sustainable development of poverty alleviation by consumption, but also seriously hinders the promotion of rural revitalization, and is in urgent need of adjustment and optimization (Quan, 2021). Electronic commerce platforms are the most important channels for customers to purchase poverty-alleviation products, and their online shopping for poverty-alleviation products mainly focuses on agricultural products. Therefore, it is of great significance to study how to enhance customers' willingness to buy poverty-alleviation agricultural products (PAAP) online.

As a unique poverty-alleviation method in China, the related research on poverty alleviation by consumption is mainly concentrated in China and focuses on its connotation,

significance, and policy measures (Chen, 2019; Sun and Wang, 2020; Liu and Liao, 2021; Liu et al., 2021), but seldom on the purchase intention of PAAP. Few studies related to purchasing intention of PAAP mainly paid attention to the influence of quality characteristics of PAAP on purchase intention (Feng et al., 2021). For example, Fan and Liu (2021) thought that there were some problems in PAAP, such as single structure, poor product quality, and low brand awareness, which restricted customers' purchase intention. Li and Ning (2019) also pointed out that, in recent years, Chinese customers' demand for agricultural products has changed from quantity to quality. Their consumption trend is characterized by grading, individualization, and diversity, but the poverty-stricken areas still maintain the traditional, relatively single and backward agricultural production structure. The contradiction between supply and demand seriously limits the sales of PAAP. Long et al. (2021) found that agricultural products provided by poor areas in China have certain problems such as "production without quantity," "quantity without product," "product without quality," "quality without sound," and so on, which are out of line with the high standard and high-quality demand of customers in urban areas. The mismatch between supply and demand severely restricts urban customers' willingness to buy PAAP (Yuan, 2020).

However, current research has not focused on the role of the poverty-alleviation function attribute of PAAP in improving customers' purchase intention. As poverty alleviation by consumption has dual meanings of "consumption" and "poverty alleviation," customers' motivation for purchasing PAAP should be a combination of the private interest motivation in traditional economics and the public welfare motivation in charity economics. The investigation of Zeng et al. (2021) showed that helping the poor is the most common motivation for customers to buy PAAP (Zeng et al., 2021). In the initial stage of purchasing, most customers focus on the poverty-alleviation function of PAAP. They care about whether PAAP can really benefit the poor. Currently, China's poverty alleviation by consumption is still in its infancy, and, in the market development of PAAP, customers driven by poverty-alleviation function attributes will become the main purchasing force. E-commerce platforms such as Pinduoduo, JD.COM, and Suning.cn are the main channels for them to purchase PAAP. However, customers' trust in sellers has been seriously damaged after the negative events such as "slow sales," "false propaganda," and "posturing" in news reports. The lack of trust seriously restricts customers' online purchase intention of PAAP (Zhou, 2020). Previous studies have pointed out that the most important way to generate trust in online sellers is to make customers feel that transactions are protected by institutional mechanisms (Zucker, 1986). Then, which institutional mechanisms will affect customers' trust in the sellers of PAAP? Can trust significantly

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enhance customers' willingness to purchase PAAP online? To motivate the enthusiasm of customers to buy PAAP online and thus provide the impetus for sustainable development of poverty alleviation by consumption, this study investigated the institutional mechanisms that affect customers' trust in the sellers of PAAP and discussed the influence of trust on online purchase willingness of PAAP. The conclusion can not only provide new theoretical guidance for the practice of poverty alleviation by consumption in China but also offer new ideas for the poverty alleviation undertakings in other countries.

THEORETICAL BASIS AND RESEARCH HYPOTHESIS

Theoretical Basis

(1) Connotation and characteristics of PAAP

Poverty-alleviation agricultural products refer to agricultural products with poverty-alleviation effects recognized by the National Rural Development Bureau, which are produced in the poor areas of central and western China. The function of PAAP is "to make the policy dividend and market dividend of poverty alleviation by consumption finally fall on industries in poverty-alleviation areas, and to drive the poor people to increase their incomes and get rid of poverty."

(2) Institution-based trust and institutional mechanisms

Trust refers to one party's expectation that the other party will not engage in opportunistic behavior (Wei et al., 2019). Customers' trust in the sellers of PAAP (referred to as customers' trust) means that customers do not have opportunistic expectations of the sellers of PAAP, believing that sellers will transact as expected and sell genuine and qualified PAAP. Zucker (1986) pointed out that there are many ways to generate trusts, such as cognition-based trust, knowledge-based trust, calculative-based trust, and institution-based trust. Among them, institution-based trust is the most important trust creation model in the business environment, which is generally agreed upon by e-commerce researchers (Bruckes et al., 2019; Wei et al., 2019). When customers believe that reliable institutional mechanisms already exist, which can provide a guarantee for online transactions and online sellers will trade in a trustworthy way, they will have trust in online sellers (Yuliati et al., 2020; Guo et al., 2021).

The institution consists of a series of regulations, rules, or constraints that affect human behavior. Institutional mechanisms are commitments, regulations, legal resources, or other procedures established and implemented by third-party organizations to ensure the proper conditions under which transactions take place. These mechanisms are institutionalized to ensure that all transactions in complex trading situations can be carried out in a set way (He and Liang, 2018). In the field of e-commerce, the institutional mechanisms that affect customers' trust include authentication mechanisms, hosting mechanisms, credit guarantees, legal relationship and cooperation norms, and so on (Lu et al., 2016b; Guo et al., 2021). According to institutional theory, these institutional mechanisms can be divided into two categories, namely, informal institutional

mechanisms and formal institutional mechanisms. Informal institutional mechanisms are mechanisms formed by people's natural evolution in the process of market transactions, which embody the ethics and practices of the trading market, such as user feedback mechanism, platform supervision mechanism, and payment custody mechanism, which mainly depend on the market itself to play a regulatory role. Formal institutional mechanisms, such as product traceability mechanism and product certification mechanism, are trust guarantee mechanisms established by the state through laws, policies, and other means. These mechanisms are mandatory and violation of them will be punished in the legal sense (Shao and Yin, 2019).

(3) Factors of institutional mechanism affecting consumer trust in the process of buying PAAP

When judging whether the sellers of PAAP are trustworthy, customers will be influenced by informal and formal institutional mechanisms. From the point of view of informal institutional mechanisms, customers' trust in sellers of PAAP is mainly influenced by user feedback mechanism and platform supervision mechanism. Compared with online purchase of ordinary agricultural products, customers' perceived risk of online purchase of PAAP is greater. To reduce the perceived risk, customers will rely more on the evaluations of existing customers to decide whether to trust sellers or not (Cui and Ma, 2018). According to the theory of trust transfer, customers' trust in online shopping platforms can be transferred to the sellers on the platforms (Cheng et al., 2019; Xiao et al., 2019). That is to say, whether the online shopping platform can effectively screen farmers and supervise the trade of PAAP will affect customers' trust in the platform, thus affecting their trust in the sellers on the platform. From the perspective of formal institutional mechanism, product traceability mechanism and product certification mechanism will affect customers' trust. Using modern information technology, a traceability mechanism can realize information traceability of PAAP from production to circulation to consumption, effectively reducing the information asymmetry, thus affecting customers' trust (Yu et al., 2021). Although the poverty-alleviation attribute of agricultural products is difficult to observe, the government's poverty-alleviation certification mechanism for agricultural products can transmit reliable information to customers, thus affecting their trust (Stahl and Strausz, 2017).

In addition, as a stable personality trait, an individual's trust tendency is often used as a moderating variable in research to explore the boundary conditions of trustworthiness factors on consumer trust (Liu et al., 2021). Therefore, we selected the user feedback mechanism and platform supervision mechanism to represent the informal institutional mechanisms, the product traceability mechanism, and the product certification mechanism to represent the formal institutional mechanisms, introduced the individual trust tendency as the moderating variable, and built a research model of the influence of institution-based trust on online purchasing intention of PAAP. Since the effectiveness of institutional mechanisms is a subjective perception of customers, we discussed the influence of four institutional mechanisms on customers' trust from the perspective of consumer perception by referring to existing studies (Huang et al., 2017).

Research Hypothesis

(1) The impact of the effectiveness of institutional mechanisms on customers' trust

First, the effectiveness of the user feedback mechanism will affect customers' trust. The user feedback mechanism is a large-scale word-of-mouth network artificially built based on the two-way communication ability of the Internet, which mainly includes dynamic evaluation of stores, cumulative sales volume, text and picture comments, and so on. The effectiveness of the user feedback mechanism is the extent to which customers believe that the mechanism can provide accurate and reliable information about the past trading behavior of the seller of PAAP (Wang et al., 2018). On the one hand, due to the non-standardized characteristics of agricultural products, it is difficult for customers to judge the true quality of information about agricultural products they want to buy through the descriptions provided by sellers on the platform before purchase. On the other hand, the authenticity of the "poverty-alleviation" attribute of agricultural products is only known by sellers, but not easily recognized by customers, especially in online transactions where people and goods are separated and experience is lacking. Such differentiation of information possession and cognition will result in unequal status for both parties to the transaction and further strengthen customers' risk perception (Zhou, 2020). Therefore, compared with the online purchase of ordinary agricultural products, customers' perceived risk and uncertainty about the online purchase of PAAP are higher, and it is more necessary to rely on the purchase evaluation of existing customers to reduce perceived risk and uncertainty. Through the user feedback mechanism, customers can obtain relevant information about the seller and the products they sell, and make a basic judgment on whether the seller is trustworthy. From the perspective of signal transmission, the user feedback mechanism can be regarded as an informal signal transmitted by customers. If customers think that this signal is effective, they are more likely to trust this signal and will also trust the seller more (Shao and Yin, 2019). Therefore, hypothesis 1 is put forward as follows:

Hypothesis 1 (H1): The effectiveness of the user feedback mechanism positively affects customers' trust.

Second, the effectiveness of the platform supervision mechanism will affect customers' trust. The platform supervision mechanism consists of the rules, procedures, and systems of an online shopping platform to supervise all transactions by examining trading activities and imposing sanctions on illegal activities (He and Liang, 2018). The effectiveness of the platform supervision mechanism is the degree to which customers think that the mechanism can ensure that the trade of PAAP is implemented as expected. In response to the national policy, Pinduoduo, JD.COM, Suning.cn, and many other platforms have launched special areas for PAAP, where agricultural products are markedly different from ordinary agricultural products. According to the theory of trust transfer, based on the perceived connection between the online shopping platform and the sellers of PAAP on the platform, customers can transfer their trust in the platform to the sellers of PAAP, which has been proved by many scholars (Shao and Yin, 2019). Studies have shown that the degree of customers' trust in online shopping

platforms depends on their perception of the effectiveness of platform mechanisms (He and Liang, 2018; Xiao et al., 2019). In other words, if customers can perceive the role of the platform's supervision mechanism in fulfilling the social responsibilities of poverty alleviation, which include distinguishing the true identity of the poverty-alleviation targets, auditing the sellers, and enabling customers to buy real PAAP, they can generate trust in the platform and then generate trust in the sellers of PAAP on the platform. Therefore, hypothesis 2 is put forward as follows:

Hypothesis 2 (H2): The effectiveness of the platform supervision mechanism positively affects customers' trust.

Third, the effectiveness of the product traceability mechanism will affect customers' trust. The product traceability mechanism refers to the systems or procedures used by the agricultural product regulator to track or transform product-related information (Bhutta and Ahmad, 2021). The effectiveness of the product traceability mechanism is the degree to which customers think that this mechanism can reflect the production and circulation information of PAAP. According to the existing research, a traceability mechanism can timely scan, record, and transmit the information of PAAP from production to circulation to consumption to customers, effectively reducing information asymmetry, and thus enhancing customers' trust (Ping et al., 2018; Yu et al., 2021). By scanning the product logo of "One product, one code," customers can not only learn the quality and safety information of PAAP, to be more assured in consumption, but also obtain the poor households' file card information, to judge the authenticity of PAAP. Therefore, the product traceability mechanism can strengthen the information transmission of PAAP and effectively reduce opportunistic behaviors in the production process of PAAP. If customers think that the product traceability mechanism is effective, they will tend to trust the seller. Therefore, hypothesis 3 is put forward as follows:

Hypothesis 3 (H3): The effectiveness of the product traceability mechanism positively affects customers' trust.

Fourth, the effectiveness of the product certification mechanism will affect customers' trust. The product certification mechanism consists of a series of rules and systems formulated by the government (Brach et al., 2017). Through these rules and systems, it is proven that agricultural products meet the poverty-alleviation standards. The effectiveness of the product certification mechanism refers to the degree of authenticity and reliability of the written assurance that the mechanism gives the PAAP with specific standards to customers. PAAP are agricultural products that are recognized by government departments with the effect of benefiting poverty. According to the existing research, the certification result can be regarded as a formal signal provided by the government to customers. It can convey some unobservable product attribute information to customers, such as the poverty-alleviation attribute of agricultural products (Stahl and Strausz, 2017). When the authentication result is credible, the signal it sends can effectively reduce the consumer's perception of uncertainty and build trust. Brach et al. (2017) pointed out that customers will decide whether to trust certification results based on the credibility of the source of evidence. In the certification process of PAAP, the

FIGURE 1 | The hypothetical model.
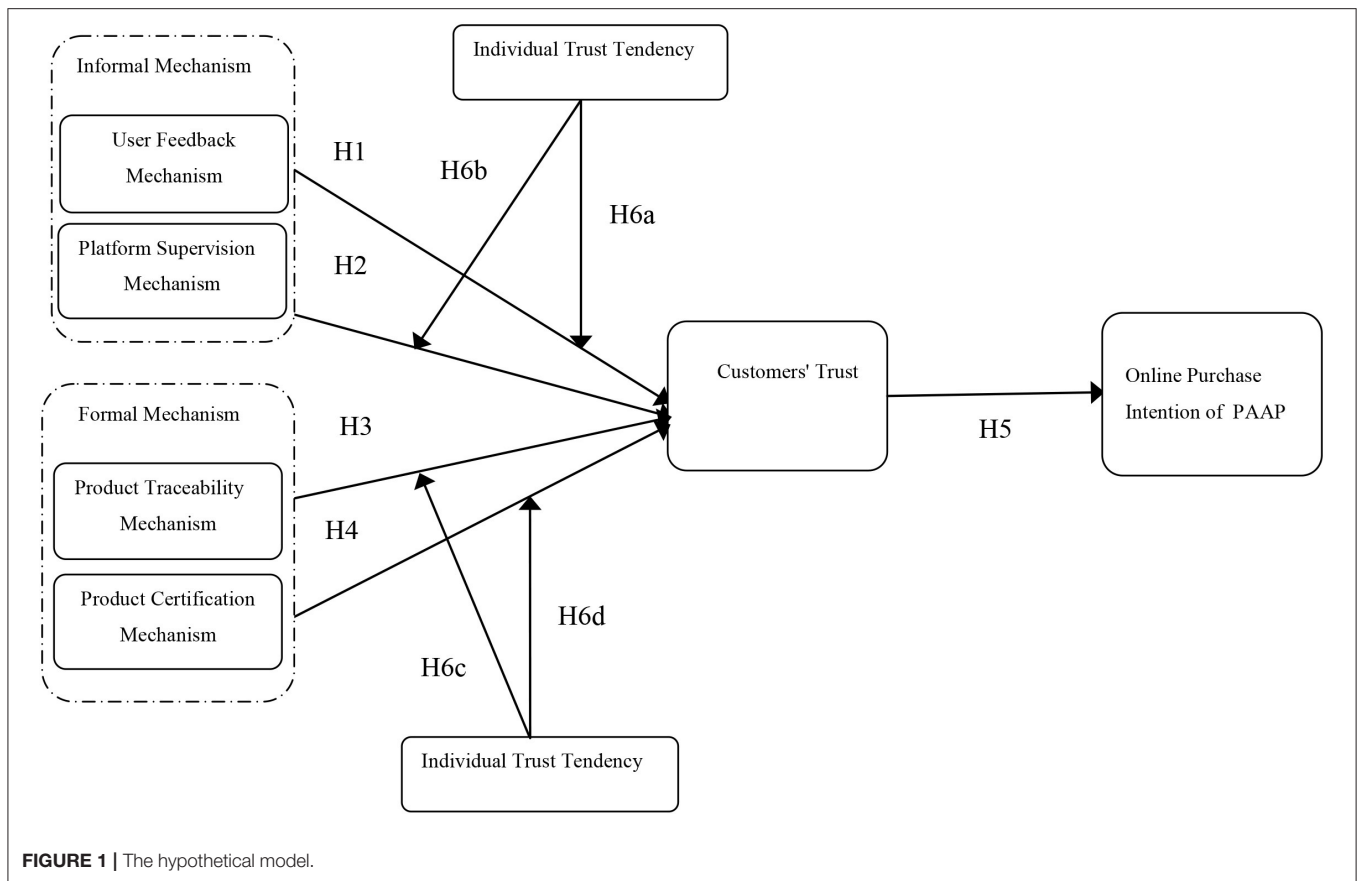
source of evidence is the certification mechanism, including the certification process, rules, and procedures. When customers perceive that the government's certification mechanism is more effective, they will have more trust in the certification results and thus have more trust in the sellers of PAAP. Therefore, hypothesis 4 is put forward as follows:

Hypothesis 4 (H4): The effectiveness of the product certification mechanism positively affects customers' trust.

(2) The influence of customers' trust on the online purchase intention of PAAP

Customers' trust is an important driving force of online purchasing intention (Yahia et al., 2018). Customers' trust will affect their online purchase intention in the following two ways: First, when customers think the seller is trustworthy, they tend to spend less time and energy searching for the seller's information and spend less cognitive effort when dealing with the seller. The reduction of non-monetary costs can enhance the experience value of customers in the process of purchasing, thus enhancing their online purchasing intention (Fang et al., 2018). Second, the trust allows customers to subjectively exclude the possibility of opportunistic behavior of sellers, thus reducing countless possible outcomes to a more manageable level, which is conducive to reducing customers' perceived risk, thus forming a positive attitude toward trading behavior and generating purchase intention (Agag and El-Masry's, 2017). Studies have shown that customers' trust in sellers is conducive to increasing

their willingness to buy products sold by sellers (Silva et al., 2019; Wei et al., 2019; Lăzăroiu et al., 2020). Therefore, when customers believe that the seller of PAAP is trustworthy, they will have fewer potential concerns about the transaction of PAAP, which is conducive to enhancing their willingness to purchase PAAP online. Thus, hypothesis 5 is put forward as follows:

Hypothesis 5 (H5): Customers' trust positively influences their willingness to purchase PAAP online.

(3) The moderating effect of individual trust tendency

The individual trust tendency refers to the degree to which customers are willing to trust others or other things. It is the general tendency to trust others formed by individuals based on long-term life experience (Wang et al., 2015; Lu et al., 2016a). Trust tendency reflects the individual's temperament, and it often needs to be combined with credibility factors to jointly form trust in others, so trust tendency is usually used as a moderate variable to influence the relationship between credibility factors and trust. When customers decide whether or how much to trust the sellers of PAAP, they will look for relevant clues, and the trust tendency will amplify or diminish the role of clues (Choi, 2019). In this study, the institutional mechanisms are important clues for customers to judge whether the sellers of PAAP are credible or not. When customers themselves have a low tendency to trust, they are unwilling to trust others. It is difficult for them to trust the sellers of PAAP even if they perceive the effectiveness of the institutional mechanisms is high. On the contrary, when

Variable	Reference scale	Magnitude
Effectiveness of user feedback mechanism (UF)	Shao and Yin (2019)	"1" means totally disagree
Effectiveness of platform supervision mechanism (PS)	He and Liang (2018)	"2" means disagree
Effectiveness of product traceability mechanism (PT)	Yu et al. (2021)	"3" means basically disagree
Effectiveness of product certification mechanism (PC)	Stahl and Strausz (2017)	"4" means uncertainty
Customers' trust (CT)	Yahia et al. (2018)	"5" means basically agree
Individual trust tendency (ITT)	Lu et al. (2016a)	"6" means agree
Online Purchase Intention (OPI)	Wei et al. (2019)	"7" means totally agree.

customers have a high propensity to trust, they are more likely to trust others; the higher the customers perceive the effectiveness of the institutional mechanisms, the higher their trust in the seller of PAAP will be (Liu et al., 2021). Therefore, hypothesis 6 is put forward as follows:

Hypothesis 6 (H6): The individual trust tendency positively moderates the influence of the effectiveness of institutional mechanisms on customers' trust.

Hypothesis 6a (H6a): The individual trust tendency positively moderates the influence of the effectiveness of the user feedback mechanism on customers' trust.

Hypothesis 6b (H6b): The Individual trust tendency positively moderates the influence of the effectiveness of the platform supervision mechanism on customers' trust.

Hypothesis 6c (H6c): The individual trust tendency positively moderates the influence of the effectiveness of the product traceability mechanism on customers' trust.

Hypothesis 6 (H6d): The individual trust tendency positively moderates the influence of the effectiveness of the product certification mechanism on customers' trust.

The hypothetical model of this study is shown in **Figure 1**.

Research Design and Data Collection
Variable Measurement and Questionnaire Design
The questionnaire was made on https://www.wjx.cn, the most used questionnaire design platform in China. To ensure good reliability and validity of the variable measurement, all variables measured in this study refer to the mature scale in existing studies. All the items in the scale are Richter scale 7. The sources of the scale are shown in **Table 1**.

Pre-investigation
Before the formal survey, a small pre-survey was conducted in Nanjing, China, and 112 valid questionnaires were collected. In the case of small internal differences in survey objects and a limited number of samples, convenient sampling can obtain data at a low cost. Therefore, in this study, we chose a convenient sampling method to obtain data. SPSS 20.0 software was used to test the validity of the data. The KMO value was 0.823 and passed the Bartlett sphere test ($P < 0.001$), indicating that the data were reliable and exploratory factor analysis could be performed. Exploratory factor analysis results showed that 7 factors were extracted from 27 questions, and the cumulative variance contribution rate was 69.59%. There was no cross-load phenomenon among the questions, and the corresponding relationship with the corresponding factors was consistent with the original scale. The Cronbach's α co-efficients of each factor were all above 0.7, and the Cronbach's α coefficients of each factor would be reduced after the deletion of each item. The above data indicated that each scale had good validity and reliability and could be used for formal research.

Formal Investigation
The survey was carried out in the developed regions of eastern China, such as Hangzhou, Shanghai, Nanjing, Suzhou, Changzhou, Wuxi, and so on, which are the main sales areas of PAAP. We collected questionnaire data by combining offline and online methods, using the convenient sampling method. The offline survey was mainly around the commercial plaza, stations, tourist attractions, residential areas, and so on. The investigators randomly invited passersby to fill out questionnaires. The online survey mainly distributed questionnaires through Wechat moments, Wei bo, QQ Space, and other platforms. In the formal investigation, a total of 364 questionnaires were collected. As for the handling of the questionnaire, we set an operational question "Have you ever purchased PAAP through online channels (such as Taobao, Pinduoduo, and wechat mini program)" in the questionnaire, to screen out respondents with online purchasing experience of PAAP. After eliminating invalid questionnaires with too many missed questions, completely consistent answers or obvious regularity, and <1 min of answer time, 328 valid questionnaires were selected as the research sample, with an effective rate of 90.1%. The descriptive statistics of the sample are shown in **Table 2**.

Data Analysis and Hypothesis Test
Reliability and Validity Tests
(1) Reliability test

In the reliability test of formal sample data, we still used Cronbach's α coefficient to test the internal consistency of each scale. SPSS 20.0 was used to calculate Cronbach's α co-efficients of 7 variables in this study, and the results are shown in **Table 3**. The Cronbach's α coefficient of each factor was between 0.723 and 0.930, and the Cronbach's α coefficient of the corresponding factor would be reduced after the deletion of each question, indicating that the reliability of the formal questionnaire was good.

(2) Validity test

In this study, AMOS 22.0 was used to test the validity of the formal survey sample data by confirmatory factor analysis. The results showed that $\chi^2/df = 1.187 < 5.000$, RMSEA = 0.024 < 0.080, GFI = 0.927 > 0.850, CFI = 0.991, NFI = 0.945, RFI = 0.931, IFI = 0.991, TLI = 0.988, all >0.900. All the fitting indexes were better than the fitting reference standard, indicating that the measurement model had a high fitting degree. Based on the results, we used AMOS 22.0 to further test the

Demographic variable	Classification	The percentage %	Demographic variable	Classification	The percentage %
Gender	Man	51.61	Education Level	Primary and below	1.82
	Woman	48.39		Junior high school	4.56
Age	Under the age of 18	1.22		Senior high school	29.42
	18–25 years old	16.23		Junior college	23.37
	26–30 years old	16.41		Undergraduate	23.8
	31–40 years old	27.02		Postgraduate and above	17.03
	41–50 years old	17.6	Monthly income	<2,000 yuan	19.45
	51–60 years old	10.22		2,000–5,000 yuan	19.18
	Over 60 years old	11.3		5,001–8,000 yuan	33.4
Marital status	Unmarried	46.78		8,001–11,000 yuan	18.24
	Married	53.22		More than 11,000 yuan	9.73

TABLE 3 | Analysis of the reliability and validity of convergence.

Construct	Measurement items	Factor loading	AVE	CR	Cronbach's α	Cronbach's α(Del)
Effectiveness of user feedback Mechanism (UF)	UF_1	0.747***	0.698	0.902	0.781	0.757
	UF_2	0.823***				0.700
	UF_3	0.884**				0.743
	UF_4	0.880***				0.748
Effectiveness of platform supervision mechanism (PS)	PS_1	0.791***	0.641	0.877	0.876	0.846
	PS_2	0.819***				0.837
	PS_3	0.817***				0.842
	PS_4	0.775***				0.840
Effectiveness of product traceability mechanism (PT)	PT_1	0.823***	0.695	0.901	0.864	0.809
	PT_2	0.844***				0.838
	PT_3	0.796***				0.827
	PT_4	0.869***				0.833
Effectiveness of product certification mechanism (PC)	PC_1	0.798***	0.659	0.885	0.851	0.805
	PC_2	0.752***				0.818
	PC_3	0.834***				0.817
	PC_4	0.860***				0.802
customers' trust (CT)	CT_1	0.866***	0.684	0.896	0.894	0.855
	CT_2	0.826***				0.866
	CT_3	0.854***				0.852
	CT_4	0.757***				0.882
Individual trust tendency (ITT)	ITT_1	0.786***	0.659	0.853	0.723	0.658
	ITT_2	0.835***				0.674
	ITT_3	0.813***				0.654
Online purchase intention (OPI)	OPI1	0.820***	0.762	0.927	0.930	0.918
	OPI2	0.883***				0.910
	OPI3	0.899***				0.899
	OPI4	0.887***				0.909

***$P < 0.010$.

convergence validity and discriminant validity of the formal survey scale. The convergence validity test results are shown in **Table 3**. The standardized factor loading coefficients of each item ranged from 0.747 to 0.899, which were all >0.500 and significant at 1% level. The combined reliability (CR) of each scale ranged from 0.853 to 0.927, higher than the standard of 0.700. The average variance extraction (AVE) amount of each scale ranged from 0.641 to 0.762, higher than the standard of 0.500. Therefore, the formal questionnaire had good convergence validity. For the discriminant validity of the scale, the calculation results are shown in **Table 4**. The diagonal value was the arithmetic square root of the average variance extraction (AVE) amount of each variable, and the value was greater than the absolute value of the correlation coefficient with other latent variables, indicating that the formal questionnaire had good discriminant validity.

variable	UF	PS	PT	PC	CT	ITT	OPI
UF	(0.856)						
PS	0.246***	(0.851)					
PT	0.203***	0.813***	(0.834)				
PC	0.256***	0.841***	0.767***	(0.861)			
CT	0.262***	0.781***	0.708***	0.757***	(0.827)		
ITT	0.153***	0.416***	0.333***	0.422***	0.452***	(0.815)	
OPI	0.270***	0.686***	0.633***	0.676***	0.736***	0.471***	(0.873)

***Means $P < 0.010$. Diagonal bracket data are the square root of latent variable AVE value. UF indicates the effectiveness of user feedback mechanism; PS represents the effectiveness of platform supervision mechanism; PT represents the effectiveness of product traceability mechanism; PC represents the effectiveness of product certification mechanism; CT stands for customers' trust; ITT represents individual trust tendency; OPI represents online purchase intention.

Hypothesis Test

In this study, SPSS20.0 was used for multiple regression and hierarchical regression to test the hypothesis. To ensure rigor, demographic factors such as gender, age, and monthly income of the respondents were taken as control variables. Before regression analysis, multiple collinearity tests were conducted on each variable. The results showed that the variance inflation factor (VIF) values of each model were <10, and the tolerance was >0.1, which indicated that there was no multiple collinearity problem and regression analysis could be conducted.

(1) The main effect test

Model 2 was constructed using the effectiveness of the user feedback mechanism, platform supervision mechanism, product traceability mechanism, and product certification mechanism as independent variables and customers' trust as dependent variables. With customers' trust as the independent variable and online purchase intention as the dependent variable, Model 4 was constructed. Model 1 and Model 3 corresponded to the influence of control variables on customers' trust and online purchase intention, respectively (refer to **Table 5**).

The results in **Table 5** showed that after the effectiveness of the two types of institutional mechanisms was added to the model, the explanatory power of Model 2 was significantly higher than that of Model 1, and the delta R^2 reached 0.588, which indicated that the effectiveness of the two types of institutional mechanisms had a significant impact on customers' trust. Besides, after customers' trust was added to the model, the explanatory power of Model 4 was significantly stronger than that of Model 3, and the delta R^2 reached 0.474, which indicated that customers' trust had a significant impact on the online purchase willingness of PAAP. The results of Model 1 and Model 3 showed that the control variables have different effects on customers' trust and online purchase intention for PAAP.

First, the effectiveness of informal institutional mechanisms positively affected customers' trust (Model 2). Specifically, the effectiveness of the user feedback mechanism and platform supervision mechanism had a significant positive impact on customers' trust. Customers perceived that the more effective the user feedback mechanism was, the more they can trust the sellers of PAAP, assuming H1 was proved ($\beta = 0.057$, $P < 0.100$). A study of Didi Taxi customers by Shao and Yin (2019) also showed that feedback mechanisms had a significant positive influence on customers' trust in drivers who provided services on the Didi

TABLE 5 | The main effect test results.

Variable	Customers' trust		Online purchase intention of PAAP	
Model	Model 1	Model 2	Model 3	Model 4
Gender	0.102*	0.047	0.077	0.004
Age	0.077	−0.043	0.108	0.054
Education level	0.183***	0.021	0.184***	0.052
Marital status	0.136**	−0.070*	0.169***	0.072
Monthly income	−0.019	0.045	−0.080	−0.067
UF		0.057*		
PS		0.395***		
PT		0.166***		
PC		0.294***		
CT				0.715***
R^2	0.073	0.661	0.090	0.564
ΔR^2	0.073	0.588	0.090	0.474
ΔF	5.068***	137.924***	6.361***	349.415***

*Means $P < 0.100$; **Means $P < 0.050$; and ***Means $P < 0.010$.
UF indicates the effectiveness of the user feedback mechanism; PS represents the effectiveness of the platform supervision mechanism; PT represents the effectiveness of the product traceability mechanism; PC represents the effectiveness of the product certification mechanism; CT stands for customers' trust.

Taxi platform. When customers perceived that the supervision mechanism of the platform played a greater role in helping the poor people, they were more inclined to trust the sellers of PAAP on the platform, assuming H2 was proved ($\beta = 0.395$, $P < 0.010$). Xiao et al. (2019) also proved that when customers believe that an intermediary platform is reliable, they are more likely to believe that the platform has implemented strict rules to manage sellers with whom they cooperate, which helps customers to avoid the opportunistic behavior of sellers and thereby have trust in sellers.

Second, the effectiveness of formal institutional mechanisms positively affected customers' trust (Model 2). In particular, the effectiveness of the product traceability mechanism and product certification mechanism significantly enhanced customers' trust. The more effective the product traceability mechanism was perceived by customers, the more inclined they were to trust the seller of PAAP, assuming H3 was proved ($\beta = 0.166$, $P < 0.010$). A study by Yu et al. (2021) on fresh agricultural products also

proved that product traceability information had a significant positive effect on customers' trust. The more effective customers perceived product certification mechanisms to be in identifying and helping poor people, the more trust they would have in the sellers of PAAP, assuming H4 was proved ($\beta = 0.294$, $P < 0.010$). In sustainable consumption, Brach et al. (2017) found that the perceived credibility of the third-party certification mechanism could effectively reduce customers' risk perception and enhance trust.

Third, the result of Model 4 showed that customers' trust would significantly enhance their online purchase intention of PAAP ($\beta = 0.715$, $P < 0.010$), assuming H5 was proved, which was consistent with the research results of most scholars. For example, Yang et al. (2021) conducted a study on customers in Sichuan Province, China, and found that in the context of a live broadcast, customers' trust had a significant positive impact on their online purchase intention of fresh agricultural products. Agag and El-Masry (2017) research on Egyptian consumers also indicated that trust could markedly improve customers' intention to purchase travel online.

Finally, the results of Model 1 and Model 3 showed that the control variables have different effects on customers' trust and online purchase intention of PAAP. Gender significantly affected customers' trust ($\beta = 0.102$, $P < 0.100$), indicating that female customers were more likely to trust sellers of PAAP. Gender had a positive effect on the online purchase intention of PAAP, but it was not statistically significant ($\beta = 0.077$, $P > 0.100$). Age had a positive influence on customers' trust ($\beta = 0.077$, $P > 0.100$) and online purchase intention ($\beta = 0.108$, $P > 0.100$) of PAAP, but it was not statistically significant. Education level had a significant positive impact on customers' trust and online purchase willingness of PAAP. It showed that the higher the education level, the easier it was for customers to trust the sellers of PAAP ($\beta = 0.183$, $P < 0.010$) and more willing to buy PAAP ($\beta = 0.184$, $P < 0.010$). Marital status also significantly positively affected customers' trust and online purchase willingness of PAAP, indicating that married people were more likely to trust the sellers of PAAP ($\beta = 0.136$, $P < 0.050$) and were more willing to buy PAAP online ($\beta = 0.169$, $P < 0.010$). Monthly income had a negative but insignificant effect on customers' trust ($\beta = -0.019$, $P > 0.100$) and online purchase intention ($\beta = -0.080$, $P > 0.100$).

(2) The moderating effect test

We used the hierarchical regression method to test the moderating effect of individual trust tendency. The specific method was as follows: The variables were first centralized, and then the interaction terms were obtained by multiplying the independent variables and moderating variables, respectively. Then hierarchical regression analysis was conducted. First, gender, age, education level, marital status, monthly income, effectiveness of user feedback mechanism, effectiveness of platform supervision mechanism, effectiveness of product traceability mechanism, effectiveness of product certification mechanism, and individual trust tendency were considered independent variables, and customers' trust was considered dependent variable in Model 5. Second, based on Model 5, the interactive items of the respective variables and the moderating

TABLE 6 | The moderating effect test results.

Variable	Customers' trust				
Model	Model 5	Model 6	Model 7	Model 8	Model 9
Gender	0.048	0.048	0.050	0.048	0.051
Age	−0.050	−0.060	−0.047	−0.045	−0.041
Education level	0.012	0.010	0.014	0.018	0.018
Marital status	−0.070*	−0.074*	−0.068*	−0.068*	−0.065
Monthly income	0.048	0.051	0.048	0.045	0.049
UF	0.051	0.060*	0.056	0.054	0.058*
PS	0.362***	0.365***	0.358***	0.366***	0.365***
PT	0.262***	0.262***	0.266***	0.270***	0.253***
PC	0.178***	0.178***	0.178***	0.163***	0.184***
ITT	0.130***	0.137***	0.144***	0.141***	0.151***
UF * ITT		0.055*			
PS * ITT			0.055*		
PT* ITT				0.048**	
PC * ITT					0.078
R^2	0.675	0.677	0.677	0.677	0.680
ΔR^2	0.602	0.003	0.003	0.002	0.005
ΔF	117.199***	2.722*	2.689*	1.937**	5.301**

*Means $P < 0.100$; **Means $P < 0.050$; and ***Means $P < 0.010$.
UF indicates the effectiveness of the user feedback mechanism; PS represents the effectiveness of the platform supervision mechanism; PT represents the effectiveness of the product traceability mechanism; PC represents the effectiveness of the product certification mechanism; CT stands for customers' trust; ITT stands for individual trust tendency.

variables were, respectively, included to construct Models 6, 7, 8, and 9. The results are shown in **Table 6**. The results of Models 6, 7, and 8 showed that individual trust tendency positively moderated the relationship between the effectiveness of the user feedback mechanism ($\beta = 0.055$, $P < 0.100$), platform supervision mechanism ($\beta = 0.055$, $P < 0.100$), product traceability mechanism ($\beta = 0.048$, $P < 0.050$), and customers' trust, assuming that H6a, H6b, and H6c were verified. The results of Model 9 indicated that the moderating effect of individual trust tendency between the effectiveness of the product certification mechanism and customers' trust was positive but not statistically significant ($\beta = 0.078$, $P > 0.100$), assuming that H6d was not proved.

DISCUSSION ON HYPOTHESIS TEST RESULTS

Through multiple regression analysis and hierarchical regression analysis, this study verified the relationship between the effectiveness of the user feedback mechanism, platform supervision mechanism, product traceability mechanism, product certification mechanism, and customers' trust and online purchase intention of PAAP, and the moderating effect of individual trust tendency between institutional mechanism effectiveness and consumer trust. The overall results of hypothesis testing in this study are shown in **Table 7**.

According to the hypothesis test results, most of the hypotheses in this study have passed the test. In other words,

TABLE 7 | Summary of hypothesis test results.

Number	Hypothesis	Results
H1	The effectiveness of user feedback mechanism positively affects customers' trust	Proved
H2	The effectiveness of platform supervision mechanism positively affects customers' trust	Proved
H3	The effectiveness of product traceability mechanism positively affects customers' trust	Proved
H4	The effectiveness of product certification mechanism positively affects customers' trust	Proved
H5	Customers' trust positively influences their willingness to purchase PAAP online	Proved
H6a	Individual trust tendency positively moderates the influence of the effectiveness of user feedback mechanism on customers' trust	Proved
H6b	Individual trust tendency positively moderates the influence of the effectiveness of platform supervision mechanism on customers' trust	Proved
H6c	Individual trust tendency positively moderates the influence of the effectiveness of product traceability mechanism on customers' trust	Proved
H6d	Individual trust tendency positively moderates the influence of the effectiveness of product certification mechanism on customers' trust	Not proved

the effectiveness of the user feedback mechanism, platform supervision mechanism, product traceability mechanism, and product certification could effectively enhance customers' trust in the seller of PAAP, thus increasing their willingness to purchase PAAP online. Hypotheses H1, H2, H3, H4, and H5 were all proven, which is consistent with Brach et al. (2017), Shao and Yin (2019), Xiao et al. (2019), Yang et al. (2021), and Yu et al. (2021). The results of the comparative analysis verify that the factors that generate trust in other contexts can also have an impact on trust in PAAP transactions and, through trust, on online purchase intentions. In this process, the individual trust tendency played a positive moderating role in the effectiveness of the user feedback mechanism, platform supervision mechanism, product traceability mechanism, and customers' trust. Thus, H6a, H6b, and H6c were verified. However, H6d failed as the individual trust tendency did not play a moderating role between the effectiveness of the product certification mechanism and customers' trust. In this regard, after consulting relevant literature and materials, this study holds that the possible reason is the main body of PAAP certification in China is government departments rather than private institutions. Studies have shown that Chinese urban customers generally have a high degree of trust in the government, which is less affected by the individual trust tendency (Qiu et al., 2007). In February 2022, the world's largest public relations consulting firm Edelman's latest global trust report "Edelman Trust Barometer 2022" also showed that Chinese respondents' trust in their own government reached 91%, ranking first among 28 countries for four consecutive years. Therefore, even though customers themselves had a low trust tendency, when they believed that the government's poverty-alleviation certification mechanism for agricultural products could accurately identify and help poor people, they were willing

to believe the government's certification results and then believe the sellers of PAAP.

CONCLUSION AND POLICY IMPLICATIONS

Conclusion

First, effective informal institutional mechanisms can enhance customers' trust. Under the network environment, sellers can only display the information about PAAP through words, pictures, and videos. Customers cannot know the real information about agricultural products before receiving them, so the experience of others becomes an important basis for customers to judge whether the sellers and the PAAP they sell are credible. The more effective the user feedback mechanism, the more customers can trust the sellers of PAAP. Although the e-commerce platform does not directly participate in the trade of PAAP, it can identify and screen the sellers by formulating rules and procedures and supervise the trading behavior to enhance customers' trust in the sellers of PAAP on the platform. Therefore, the effectiveness of the platform supervision mechanism is conducive to improving customers' trust. Second, effective formal institutional mechanisms are conducive to increasing customers' trust. The product traceability mechanism endows each PAAP with a unique product identification, which can realize the standardization and transparency of the information of PAAP from production, processing, and circulation to consumption and make it easy for customers to grasp the quality and safety of PAAP and the information of poverty-stricken attributes. The decrease in information asymmetry can effectively increase the customers' trust in sellers. The government's poverty-alleviation certification of agricultural products is a kind of commitment and guarantee to customers, which indicates that certified agricultural products can accurately drive poor households to increase income and get rid of poverty. When customers believe that the government's certification mechanism is effective, they can trust the certification results and then trust the sellers of PAAP. Third, trust can significantly enhance customers' willingness to purchase PAAP online. Fourth, individual trust tendency positively moderates the relationship between the effectiveness of the user feedback mechanism, platform supervision mechanism, product traceability mechanism, and customers' trust.

Policy Implications

First, the sellers of PAAP should pay attention to the establishment and maintenance of their own reputation. They should not only provide real and good quality PAAP to meet the needs of customers, but also pay attention to interaction and communication with customers, and encourage customers who have bought PAAP to express their real experiences and feelings, such as the time efficiency of logistics and the freshness of agricultural products. At the same time, they should actively do a good after-sales service. In view of the problems encountered by customers in the process of purchasing PAAP, it is necessary to remedy them in time.

Second, online shopping platforms should strengthen supervision and do publicity work. On the one hand, it is

necessary to shoulder the social responsibility of helping the poor, doing a good job in screening the sellers of PAAP, identifying the sellers' identities, and providing supervision services for the trade of PAAP. At the same time, they should improve the product quality standards on the platforms and strictly control the quality of PAAP. On the other hand, it is essential to increase publicity efforts to enhance customers' perception of the poverty-alleviation image of the platform through advertising and live promotion.

Third, the agricultural product regulator should improve the traceability mechanism of PAAP. They should fully use modern information technology, apply QR code, bar code, and RFID technology to the circulation of PAAP, and timely record the information of the whole process of PAAP from production, processing to transportation and consumption, to realize information sharing and reduce the information asymmetry of customers.

Fourth, the government should enhance the transparency of the certification of PAAP. In the process of identifying PAAP, the government should strengthen the standardization of construction of the certification mechanism for PAAP, improve the transparency of the certification process as well as the certification results, and regularly publish the list of PAAP on the "Social Assistance of China" website. Besides, the government can also encourage customers to actively participate in the supervision process of PAAP and to report false information about PAAP through 12,317 poverty alleviation supervision telephone.

Fifth, the government should increase its efforts to educate the public on the concept of integrity. China's government has a high level of credibility in the public; government-led official media such as "People's Daily," "CCTV news," and "Xinhua News Agency" are loved and supported by the general public. Thus, the government should make full use of the influence of these mass media to strengthen the education of public honesty and create a good atmosphere for honest trading through Weibo, WeChat, and other Internet information channels, to enhance the trust tendency of individuals.

Limitations and Future Research

This study focused on the role of the poverty-alleviation functional attributes of PAAP in enhancing customers' willingness to purchase PAAP online. A theoretical model between the effectiveness of institutional mechanisms, customers' trust, and willingness to purchase PAAP online is constructed, and the research hypotheses are tested through empirical analysis. The findings of the study are conducive to enhancing customers' willingness to purchase PAAP online and promoting sustainable development of poverty alleviation by consumption. At the same time, there are limitations to this study. Through literature review, this study identified four dimensions of

institutional factors that affect consumer trust, but there may be other factors that affect consumers' trust in online trading of PAAP, and follow-up research can be further carried out here.

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 for participation was not required for this study in accordance with the national legislation and the institutional requirements. Written informed consent was not obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

GL: guidance on topic selection, article framework formulation, article writing guidance, and article revision. XW: concept proposal and original paper writing. CY: analyzed and interpreted the data and modified paper. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

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Consumption replaces charity: Altruistic consumption behaviors and motivations targeting vulnerable groups—Research based on poverty alleviation consumption in China

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Poverty alleviation consumption, which we call altruistic consumption, has become a new effective way to help vulnerable groups, but there are a few empirical researches on poverty alleviation through consumption. This article takes China's poverty alleviation actions as the research object, investigates and studies the relationship between altruistic consumption motivations and altruistic consumption behaviors that aim for vulnerable groups. It is found that altruistic consumption behavior is mainly affected by benefit group motivation, benefit morality motivation, benefit demander motivation, and benefit supplier motivation. There is a correspondence between the four altruistic consumption motivations and the four altruistic consumption behaviors. The strength of altruistic consumption motivations changes with changes in altruistic buying behavior. The strength of benefit group motivation decreases with the increase in the times of altruistic purchases, while the strength of benefit morality motivation, benefit demander motivation, and benefit supplier motivation increase with the increase in the times of altruistic purchases. Among the four kinds of altruistic consumption motivations that affect the times of altruistic purchases, the benefit demander motivation has a relatively greater influence. The results of this study have important guiding significance for vulnerable groups to formulating targeted proactive marketing strategies, preventing the altruistic consumption relationship dissolution, and realizing sustainable altruistic consumption.

Introduction

The poverty problem of vulnerable groups is a social issue that is generally concerned by the international community today. The international community is trying to help vulnerable groups get rid of poverty through various channels and methods. Since 2018, a large number of e-commerce platforms such as JD.com, Taobao, and Pinduoduo in China, client apps of a large number of communication, aviation, banking, and insurance enterprises such as China Mobile, Air China, and Bank of China, as well as "We Media" platforms such as Tiktok and Kwai and social platforms such as WeChat and microblog, have successively launched windows to display products from poverty-stricken areas. By encouraging consumers to buy products from such regions, we can help vulnerable groups overcome poverty. In 2020 alone, poverty alleviation products sold through various platforms reached 306.94 billion yuan (about US$46.8 billion), successfully helping a large number of vulnerable groups.

China's model of setting up special sales channels for poverty alleviation products through Internet platforms and encouraging consumers to buy products from poverty-stricken areas, so as to help vulnerable groups overcome poverty, has provided a new way for the international community to eliminate poverty. It is a two-way transaction based on altruism and a market-oriented way of helping others. According to Prosocial Behavior Theory (Batson and Powell, 2003), the behavior of helping others through consumption should be categorized as altruistic behavior; it is a mutually beneficial altruistic behavior that can result in a win–win situation (Sloan, 2015). We call this type of consumption, which takes altruism as its purpose and helps vulnerable groups escape poverty by purchasing the products provided by the vulnerable groups, as altruistic consumption. The core idea of altruistic consumption is to introduce vulnerable groups into the social reproduction system and eliminate poverty through the social-economic cycle of production, distribution, circulation, and consumption and by selling their products through marketization. This is a sustainable way for vulnerable groups to eliminate poverty completely.

The poverty alleviation model launched by China's Internet platform differs from charitable behavior. As a humanitarian act with a long history, although charitable behavior has played an important role in alleviating the poverty of vulnerable groups, there are problems with using charitable methods to solve the poverty problem of the following vulnerable groups: Charity can only temporarily alleviate the poverty situation of vulnerable groups, while cannot completely solve their poverty problem (Eagles, 1993). At the same time, the charity might eventually lead recipients to become heavily dependent on charitable donations or services, turning into toxic charity, and destroying the ecology and vitality of local economic and social development (Lupton, 2011). Market-oriented charitable acts such as marketized philanthropy, as a special charity are considered to have brought a negative impact on the purest core "kindness" of charity (Nickel and Eikenberry, 2009).

In addition to charitable behavior (Thomas and Mcgarty, 2018), most of the research on poverty alleviation focuses on the tourism (Tchouamou and Neelu, 2018; Truong, 2018; Zhao and Xia, 2020), agricultural productivity (Madi et al., 2020), information and communication technology (Galperin and Viecens, 2017; Mbuyisa and Leonard, 2017; Lechman and Popowska, 2022), subsidy policy (Pan et al., 2021), insurance (Gabrah et al., 2020), and education (Brown and James, 2020). These studies mainly focus on improving the efficiency and output of vulnerable groups from the perspective of supply. However, from the perspective of consumption, there is a lack of research on the motivates and behavior of consumer consuming poverty alleviation products. What motivates consumers to engage in altruistic consumption? What impact do these motives have on consumers' altruistic consumption behavior? Is there an evolutionary trend in altruistic consumption motivation in altruistic consumption behavior?

Studying these issues has important theoretical and practical significance for advocating social altruistic consumption behavior, establishing altruistic consumption relationships, and preventing the dissolution of altruistic consumption relationships. It is also a new attempt at expanding prosocial behavior theory to the field of consumption.

Literature review

The theories related to this article mainly involve charitable behaviors, prosocial behaviors, altruistic behaviors, as well as the times of consumption and recommendation consumption behaviors.

Charitable behaviors

The meaning of Charity in Old English is "Christian love of one's fellows" (Falus, 2020). Later, the meaning of charity changed to "providing for those in need; generosity and giving" (Merriam-Webster, 2021). Starting from c.1300, charity means "alms, that which is bestowed gratuitously on a person or persons in need" (Online Etymology Dictionary, 2022). This indicates that charitable acts do not need to seek rewards. Charitable acts include providing tangible donations and intangible care. Charitable giving is the act of giving money (Chan and Septianto, 2022), goods (Diederich et al., 2021), or time (Costello and Malkoc, 2022) to the unfortunate, either directly or through a charitable trust or other worthy cause. Charitable care includes such things as visiting imprisoned

or homeless people, redeeming captives, educating orphans, and participating in social movements. The most important feature of charitable behavior is that it does not seek any returns.

In the category of charitable consumption behavior. Cause-related marketing is the creation of a mutually beneficial relationship (Chang and Chu, 2020). Its characteristic is that when customers participate in product exchanges that meet organizational and personal goals, the company provides a certain number of charitable donations to specific charities. Using cause-related marketing appropriately not only embodies the corporate social responsibility, but also meets the needs of shareholders to increase profits and market share (Gao et al., 2020). However, its essence is the same as traditional marketing, which is to enhance the corporate image and obtain more benefits.

Prosocial behaviors

Prosocial behavior is a positive social behavior that intends to help others, and needs to meet two conditions: the behavior is the subject's spontaneous behavior (Shi et al., 2020), including sharing, helping, caring, and comforting (Laguna et al., 2022). The manifestations and scenarios of these behaviors are different, but the essence is basically the same, that is focus on benefiting others (Miles et al., 2021).

In the research on why people have prosocial behaviors, the famous American psychologist Batson et al. (2011) wrote, "*we wish to consider four possible forms of prosocial motivation, each of which can lead a person to benefit-help-someone in need. Each form is defined by its distinct ultimate goal: self-benefit (egoism), benefit another individual (altruism), benefit a group (collectivism), and uphold a moral principle (principlism).*" Prosocial behavior does not exclude egoism, and it is also believed that both egoists and altruists will adopt prosocial behavior. For example, for the sake of their reputation, egoists take more prosocial behavior in public conditions than in private settings (Rotella et al., 2021). However, in the absence of benefits, egoists are less prosocial than altruists (Rotella, 2020). Regarding the collectivism motivation, Batson (1994) believes that if people value the welfare of a group, and this welfare is threatened or can be enhanced in some way, then they will have a collectivism motivation to promote action to benefit the group. Regarding the principlism motivation, he believes that its ultimate goal is to adhere to a moral principle in order to eliminate the variability of resorting to altruism due to sympathy, while maintaining a consistent moral principle.

This shows that, unlike charitable behaviors, prosocial behaviors include both voluntary helping others and not expecting any rewards, as well as attempts to help others for certain purposes or rewards.

Altruistic behavior

The concept of altruism has a long history in the fields of philosophy and ethics, and researchers in various fields have tried to explain altruistic behavior from different aspects. The research on altruistic behavior mainly focuses on anthropology, biology, psychology, and sociology. Some researchers believe that the theory of "kin selection" is derived from animal altruism. From an evolutionary biology point of view, Hamilton's Rule (Okasha, 2020) suggests that the genes of altruism can be continued through natural selection. The overall effect may be to increase the number of copies of altruistic behavior genes owned by the next generation, thereby increasing the incidence of altruistic behavior itself. Batson and Powell (2003) studied altruistic behavior from the perspective of motivation, and believed that pure altruistic behavior is based on caring for the interests of others, and does not expect to benefit from helping others. From the perspective of human and society, distinguished it from animal altruism, some scholars have explored theories such as "reciprocal altruism" (Eamonn et al., 2021) and "reputation-seeking" (Rotella et al., 2021). These studies believe that common altruistic behaviors also include reciprocal altruistic behaviors that expect to get rewards after helping others.

In terms of international trade cooperation, Fair Trade is regarded as an act of international altruism. According to the official definition of the World Fair Trade Organization, "*Fair Trade is a trading partnership, based on dialogue, transparency, and respect, that seeks greater equity in international trade. It contributes to sustainable development by offering better trading conditions to, and securing the rights of, marginalized producers and workers.*" In the Fair Trade movement, developed countries in the member state provide better trading conditions and guarantee of the rights of smallholders and workers—especially in developing countries (Re et al., 2020).

Altruistic behavior on internet

Altruistic behavior also occurs on Internet (Zheng et al., 2021). Altruistic behavior could be seen as an inevitable result of Internet evolution, since the Internet was initiated by volunteers who thought information should be free and easy to access quickly. Since the naissance of the Internet, it has sought a way in which almost infinite informative resources may be integrated and shared (Amichai Hamburger, 2008). Compared with face-to-face communication, people are more willing to

help others and more responsible online, for reasons such as anonymity of the Internet and minimization of the authority (Suler, 2004).

Times of consumption and consumption recommendation behavior

The behavior that a consumer adopts a new idea or new product for the first time is called the attempt purchase behavior or initial purchase behavior. Initial purchase was found to be significant predictor of service retention (Darley and Luethge, 2019). After purchasing a product for the first time, some people will give up continuing to consume, behave as the one-time consumption behavior, and become one-time consumers. While the other part of people will continue to buy the product, which is called repeatedly purchase behavior. For the important factor that affects repeated purchases in the context of online business, Trivedi and Yadav (2020) believe that it is the trust and E-satisfaction. If the experience is satisfactory, the consumer will make a second purchase. If the consumer does not continue to consume after the second purchase, it is called a two-times consumer. If consumers continue to consume three or more times, according to Dimitrieska and Efremova (2021), it is called loyal consumption, or continuous consumption. The core factor affecting continuous consumption is brand (Khamtanet and Jitkuekul, 2021). Some consumers not only consume by themselves, but also recommend others to consume. This behavior is generally called word-of-mouth spread in academics (see, e.g., Bastos and Moore, 2021). The core factor affecting word-of-mouth spread is consumers' satisfaction and their relationship with the recommendation (Leon and Choi, 2020; Oraedu, 2020). The purpose of studying the times of consumption is to find motivations for one-time consumption, two-times consumption, continuous consumption, and recommendation consumption, so as to realize the transformation from one-time consumption to continuous consumption and loyal consumption, to encourage consumers to recommend others to consume, prevent the dissolution of altruistic consumption relationship, and realize the sustainability of altruistic consumption.

Research framework and hypothesis

Research structure model

Vulnerable groups have low income, endure poverty, and are psychologically vulnerable (Shu, 2016). Some researchers believe that vulnerable groups refer to social groups that cannot maintain basic living standards for themselves and for their family by relying on their strengths or abilities and thus need

external support (Zheng and Li, 2003). The *vulnerable groups* referred to in this article refer to countries, regions, ethnic minorities, low-income groups that have the ability to yield but are in a state of poverty and backwardness, and groups that are economically damaged due to disasters. We call the products provided by vulnerable groups and consumed by altruistic consumers as *altruistic consumption products*, and marketing for altruistic consumption products as *altruistic marketing*.

According to prosocial behavior theory the motivation of prosocial behavior includes collectivism, egoism, altruism, and principlism (Batson et al., 2011). The altruistic consumption behavior studied in this study is also a kind of prosocial behavior, it should also include these four basic motivations. In Batson's theory, collectivism motivation refers to the motivation to benefit a specific group, including the group which the implementer of prosocial behavior belongs. In our previous research, we found that most of the altruistic consumption behaviors are triggered based on the initiative of the group to which the consumer belongs or some specific groups. In addition to helping vulnerable groups, consumers' motivation also lies in maintaining the group's reputation and values. In this article, we call the consumption motivation that benefits to groups in the process of altruistic consumption as the *benefit group altruistic consumption motivation*, abbreviate it as *benefit group motivation*. In Batson's theory, egoism refers to self-benefit, or benefit the implementer of prosocial behavior self. In the relationship of altruistic consumption, self-benefit is actually benefits to the consumers who consume altruistic products. In this article, we call the consumption motivation that are benefits to the consumers of altruistic product consumption as the *benefit demander altruistic consumption motivation*, abbreviate it as *benefit demander motivation*. In Batson's theory, altruism refers to benefit another individual. In the relationship of altruistic consumption, "another individual" is actually the supplier (i.e., vulnerable groups) of altruistic products. In this article, we call the consumption motivation that is benefits to the supplier of altruistic products as the *benefit supplier altruistic consumption motivation*, abbreviate it as the *benefit supplier motivation*. In Batson's theory, principlism refers to benefit a moral principle. In the relationship of altruistic consumption, it is mainly manifested as the promotion of a kind of social virtue. In this article, we call the consumption motivation that is benefits to social morality as the *benefit morality altruistic consumption motivation*, abbreviate it as the *benefit morality motivation*. In order to facilitate research, we collectively refer to these four altruistic consumption motivations as 4B altruistic consumption motivations.

According to the literature (Tucker, 1964; Bass, 1969; Blythe, 2006; Zhu, 2014) and our previous research, the altruistic consumption behavior in this article can be divided into one-time altruistic consumption behavior, two-times altruistic consumption behavior, continuous altruistic

consumption behavior, and altruistic recommendation consumption behavior. What is the relationship between these four kinds of consumption behaviors and the four kinds of consumption motivations? Do these four kinds of consumption behaviors have different dominant consumption motivations, respectively? Is there an evolutionary trend for the four kinds of altruistic consumption motivations in the four kinds of consumption behaviors?

Research hypothesis

The relationship between altruistic consumption behavior and altruistic consumption motivation

Consumers' motivation for consumption is the internal driving force that motivates consumers to implement consumption behaviors. There is a causal relationship between consumption motivation and consumption behavior. Altruistic consumption motivation should also be the internal driving force of altruistic consumption behavior, and there should also be a causal relationship between them. Consumption behavior not only includes the behavior that consumers purchase by themselves, but also includes the behavior that recommends others to purchase. It can be seen that altruistic consumption behavior should also include altruistic purchase behavior and altruistic recommendation consumption behavior. Therefore, no matter it is the altruistic purchase behavior of consumers themselves or the altruistic recommendation consumption behavior of recommending others to purchase, there should be an influential relationship between the altruistic consumption motivations.

Accordingly, the following hypotheses are proposed:

$H1_a$: There is an influential relationship between the altruistic purchase behavior of the vulnerable groups and the consumer's altruistic consumption motivation

$H1_b$: There is an influential relationship between the altruistic recommendation consumption behavior of the vulnerable groups and the consumer's altruistic consumption motivation

The relationship between four kinds of altruistic consumption behaviors and four kinds of altruistic consumption motivations

Whether it is one-time altruistic consumption behavior, two-times altruistic consumption behavior, continuous altruistic consumption behavior, or altruistic recommendation consumption behavior, all are altruistic consumption behaviors, and altruistic consumption behavior is a prosocial behavior. According to the research of Batson et al. (2011), prosocial behavior is affected by four kinds of motivations, so these four

kinds of altruistic consumption behaviors should also be affected by four kinds of prosocial behavior motivations. The benefit demander motivation, benefit supplier motivation, benefit morality motivation, and benefit group motivation proposed in this article are based on the four kinds of prosocial behavior motivations proposed by Batson et al. (2011), combined with the characteristics of altruistic consumption, which are the embodiment of the four kinds of prosocial behavior motivations in the field of consumption. In this sense, these four kinds of altruistic consumption behaviors should be affected by four kinds of altruistic consumption motivations.

If consumers' altruistic consumption motivation is the same, their altruistic consumption behaviors should be consistent. However, in the pre-survey phase of our questionnaire, we studied the altruistic consumption behavior of 198 consumers and found that some consumers only purchase one-time, some consumers purchase two-times, some consumers purchase multiple times, and some consumers not only purchase for themselves, but also recommend others for altruistic consumption. It can be seen that there are significant differences in the altruistic consumption behavior of consumers. Since consumers' behaviors are inconsistent, the strengths of the four kinds of altruistic consumption motivations that affect consumers' altruistic consumption behavior should also be different. Each consumer behavior may have different dominant motivations.

Accordingly, the following hypotheses are proposed:

$H2_a$: One-time altruistic consumption behavior is affected by four kinds of altruistic consumption motivations, and there are differences in the strength of the influence, with one or more dominant motivations.

$H2_b$: Two-times altruistic consumption behavior is affected by four kinds of altruistic consumption motivations, and there are differences in the strength of the influence, with one or more dominant motivations.

$H2_c$: Continuous altruistic consumption behaviors are affected by the four kinds of altruistic consumption motivations, and there are differences in the strength of the influence, with one or more dominant motivations.

$H2_d$: Altruistic recommendation consumption behavior is affected by the four kinds of altruistic consumption motivations, and there are differences in the strength of the influence, with one or more dominant motivations.

The evolutionary trend of altruistic consumption motivations' influence on altruistic consumption behavior

The essence of altruistic consumption is consumption. When consumers make purchase decisions, they will choose solutions with greater customer perceived value (Zeithaml, 1988). This means that consumers will choose products that

better meet their own needs. If consumers do not consider their own needs, it is pure altruistic behavior, rather than reciprocal altruistic consumption behavior. Therefore, among the four kinds of altruistic consumption motivations, the most basic motivation should be the consumer's benefit demander motivation, which means that if altruistic consumers are to continuously purchase altruistic products, they must meet their basic demand for products. Therefore, the benefit demander motivation should be the one that has the greatest influence on consumers' times of altruistic purchases among the four kinds of motivations.

Accordingly, the following hypotheses are proposed:

H3$_a$: Among the four kinds of altruistic consumption motivations that affect the times of altruistic purchases, the benefit demander motivation has relatively greater influence.

Our pre-survey research found that the altruistic consumption behavior of ordinary consumers is mostly influenced by the group, especially by the group's initiative. Therefore, the influence of benefit group motivation in the early stage of altruistic consumption should be relatively large. With the increase in the times of purchases, the focus of consumers' attention has shifted to the value of altruistic products and their consumption behaviors to vulnerable groups and society. Therefore, the strength of benefit group motivation should gradually decrease, while the strength of benefit morality, benefit demander, and profit supplier motivation should gradually increase.

Accordingly, the following hypotheses are proposed:

H3$_b$: The strength of the influence of benefit group motivation decreases with the increase in the times of altruistic purchases, while the strength of the influence of benefit morality motivation, benefit demander motivation, and benefit supplier motivation increases with the increase in the times of altruistic purchases.

Methodology

Sample selection and data sources

This study takes the altruistic product consumers participating in poverty alleviation consumption as the survey object, and obtains data through online and offline questionnaire survey. The survey time is from March to May 2021. The content of the questionnaire included the interviewee's basic information about altruistic consumption and the research scale. The variables were measured using the Likert 7 points scale, and the interviewees scored according to their actual consumption.

Measures

There are eight variables in the scale of this research. There are three items for the variables related to altruistic consumption behavior to measure the times of purchases and altruistic recommendation consumption behavior of interviewees. There are four variables about the motivation of altruistic purchase, and each variable is designed with three items to measure the strength of the altruistic purchase motivation. Regarding the altruistic recommendation consumption motivation, there are the same four variables, and each variable is designed with three items to measure the strength of the altruistic recommendation consumption motivation. The design of the measurement items draws on the scale design by Oyserman (1993), Gudykunst et al. (1996), Leung and Kim (1997), and Curry et al. (2018) [(as cited in Taras et al., 2014)], combined with the characteristics of altruistic products and the background of poverty alleviation we surveyed, and made adjustments and supplements and improvements on the scale. Through three experimental tests, factor analysis, and reliability and validity analysis were carried out, the scale was revised, and the final formal scale of altruistic consumption behavior and motivation in this article was formed.

Questionnaire pre-survey

After the questionnaire was formed, 198 questionnaires were formally distributed for pre-survey. We use IBM SPSS Statistics 26 to perform KMO and Bartlett's Test on the scale. The results show that the KMO value range of 8 variables is 0.729–0.769, which is higher than the accepted standard of 0.5, and the Bartlett's sphere test's Sig. < 0.001, reaches a significant level, indicating that the sample data is suitable for factor analysis. We perform exploratory factor analysis (EFA), using principal component analysis to extract common factors, and retain items with common factor variance > 0.7. According to the scholar Kaiser (1960) view, select factors with eigenvalues > 1 to determine the number of factors. After performing principal component analysis on 8 variables, each variable has only one eigenvalue > 1, which means there is no transposition situation, and its explained variance reaches 82.568–95.067%, which shows that all 8 variables in this questionnaire are single-dimensional indicators.

Finally, we analyzed the reliability of the scale and found that the reliability coefficient (Cronbach's α value) of the variable was 0.894–0.974, indicating that the measurement item has high reliability and stability. Therefore, it is determined that the design of the questionnaire is reasonable and the questionnaire can be formally distributed. Since the questionnaire was not revised after the test, the 198 questionnaires from the pre-survey were included in the official statistics.

Results

Sample characteristics

This study adopts a bricks-and-clicks survey method, using the "Wenjuanxing" online survey platform to distribute and collect questionnaires online, and doing field surveys by distributing paper questionnaires, the survey scope covers most areas of China. Collecting data through two distribution channels at the same time that ensured the sample data is sufficient on the one hand, and guaranteed the diversity and reliability of the sample sources on the other hand. A total of 1,591 questionnaires were collected in the survey, 254 invalid questionnaires with incomplete information, conflicting information, or not in the scope of the survey were excluded, and 1,337 valid questionnaires were obtained. The statistical characteristics of the sample of valid survey objects are shown in Table 1.

Reliability and validity analysis

This article mainly uses exploratory factor analysis (EFA) to test the validity (see Table 2). The KMO values of the variables are all > 0.7, higher than the minimum standard of 0.5, and $p < 0.001$ (significant value) in Bartlett's sphericity test, which indicates that the correlation between the variable measurement items is strong. Principal component analysis (PCA) was performed on 8 variables, and items with common factor variance > 0.7 were retained. Factors with eigenvalues > 1, their explained variance lie between 75.674 and 94.488%. Therefore, it can be considered that the scale has good validity.

In the reliability test conducted in this study (see Table 2), the reliability coefficients (Cronbach's α value) of the eight variables are all > 0.7, therefore the scale can be considered to have good reliability.

Hypothesis verification

Using Stata SE 15.0 to analyze the data, through the hypothesis verification, we found that the hypothesis has been verified.

The relationship between altruistic consumption behavior and altruistic consumption motivation

We have studied the influence of four kinds of altruistic consumption motivations and four kinds of altruistic recommendation consumption motivations on altruistic consumption, and the statistical results are shown in Table 3.

TABLE 1 Sample basic information.

	Feature	Frequency	%
Gender	Male	678	50.71
	Female	659	49.29
Age	Under 18	6	0.45
	18–25	169	12.64
	26–30	310	23.19
	31–40	346	25.88
	41–50	282	21.09
	51–60	186	13.91
	60 and above	38	2.84
Educational background	High school and below	140	10.47
	Associate degree	269	20.12
	Bachelor degree	573	42.86
	Postgraduate degree and above	355	26.55
Career	Student	119	8.90
	Private company employees	422	31.56
	Self-employed individual	100	7.48
	Government and public institution employees	415	31.04
	Freelancer	100	7.48
	Retired and honorable discharge personnel	75	5.61
	Others	106	7.93
Average monthly income	3,000 RMB and below	192	14.36
	3,001–6,000 RMB	328	24.53
	6,001–10,000 RMB	459	34.33
	10,000 RMB and above	358	26.78

There is an influential relationship between the altruistic purchase behavior for the vulnerable group and the consumers' altruistic consumption motivation. Our investigation is about the motivations of consumers who have purchased altruistic products. The same questionnaire item can only measure the motivation of purchasers, but not the motivation of non-purchasers. Therefore, we cannot perform inferential statistics, but can only perform descriptive statistics.

We calculated the data of the benefit group consumption motivation item in the scale and found that 22.51% of consumers disagree, 9.20% of consumers maintain a neutral attitude, and 68.29% of consumers agree. This shows that when consumers purchase altruistic products, most consumers have obvious benefit group motivation, that is, there is an influential relationship between altruistic purchase behavior and benefit group consumption motivation.

We calculated the data of the benefit morality consumption motivation item in the scale and found that 12.42% of consumers disagree, 4.79% of consumers maintain a neutral attitude, and 82.79% of consumers agree. This shows that when consumers

TABLE 2 Reliability and validity test.

Measured variable	KMO	Cronbach's α	Percentage of explained variance	Bartlett's sphericity test
Benefit group consumption motivation	0.751	0.924	86.929	$p < 0.001$ Reject sphericity hypothesis
Benefit morality consumption motivation	0.765	0.939	89.210	$p < 0.001$ Reject sphericity hypothesis
Benefit demander consumption motivation	0.721	0.881	80.973	$p < 0.001$ Reject sphericity hypothesis
Benefit supplier consumption motivation	0.781	0.968	94.001	$p < 0.001$ Reject sphericity hypothesis
Benefit group recommendation consumption motivation	0.767	0.955	91.801	$p < 0.001$ Reject sphericity hypothesis
Benefit morality recommendation consumption motivation	0.768	0.935	88.596	$p < 0.001$ Reject sphericity hypothesis
Benefit demander recommendation consumption motivation	0.702	0.836	75.674	$p < 0.001$ Reject sphericity hypothesis
Benefit supplier recommendation consumption motivation	0.778	0.971	94.488	$p < 0.001$ Reject sphericity hypothesis

purchase altruistic products, most consumers have obvious benefit morality motivation, that is, there is an influential relationship between altruistic purchase behavior and benefit morality consumption motivation.

We calculated the data of the benefit demander consumption motivation item in the scale and found that 10.02% of consumers disagree, 6.81% of consumers maintain a neutral attitude, and 83.17% of consumers agree. This shows that when consumers purchase altruistic products, most consumers have obvious benefit demander motivation, that is, there is an influential relationship between altruistic purchase behavior and benefit demander consumption motivation.

We calculated the data of the benefit supplier consumption motivation item in the scale and found that 15.41% of consumers disagree, 5.16% of consumers maintain a neutral attitude, and 79.43% of consumers agree. This shows that when consumers purchase altruistic products, most consumers have obvious benefit supplier motivation, that is, there is an influential relationship between altruistic purchase behavior and benefit supplier consumption motivation.

Therefore, we believe that the altruistic purchase behavior for the vulnerable group is related to the consumer's altruistic consumption motivation, that is, hypothesis $H1_a$ holds.

There is an influential relationship between the altruistic recommendation consumption behavior for the vulnerable group and the consumers' altruistic consumption motivation. Our investigation is about the motivations of consumers who have purchased altruistic products. The same questionnaire item can only measure the motivation of purchasers, but not the

motivation of non-purchasers. Therefore, we cannot perform inferential statistics, but can only perform descriptive statistics.

We calculated the data of the benefit group recommendation consumption motivation item in the scale and found that 32.06% of consumers disagree, 11.70% of consumers maintain a neutral attitude, and 56.24% of consumers agree. This shows that when consumers recommend others to consume altruistic products, most consumers have obvious benefit group motivation, that is, there is an influential relationship between altruistic recommendation consumption behavior and benefit group consumption motivation.

We calculated the data of the benefit morality recommendation consumption motivation item in the scale and found that 8.40% of consumers disagree, 6.62% of consumers maintain a neutral attitude, and 84.98% of consumers agree. This shows that when consumers recommend others to consume altruistic products, most consumers have obvious benefit morality motivation, that is, there is an influential relationship between altruistic recommendation consumption behavior and benefit morality consumption motivation.

We calculated the data of the benefit demander recommendation consumption motivation item in the scale and found that 7.00% of consumers disagree, 4.20% of consumers maintain a neutral attitude, and 88.80% of consumers agree. This shows that when consumers recommend others to consume altruistic products, most consumers have obvious benefit demander motivation, that is, there is an influential relationship between altruistic recommendation consumption behavior and benefit demander consumption motivation.

TABLE 3   Distribution of variable data.

Altruistic consumption motivation		Scale anchors	Freq.	Percent	Cum
Altruistic purchase motivation	Benefit group motivation	<4	301	22.51	22.51
		4	123	9.20	31.71
		>4	913	68.29	100.00
	Benefit morality motivation	<4	166	12.42	12.42
		4	64	4.79	17.20
		>4	1,107	82.79	100.00
	Benefit demander motivation	<4	134	10.02	10.02
		4	91	6.81	16.83
		>4	1,112	83.17	100.00
	Benefit supplier motivation	<4	206	15.41	15.41
		4	69	5.16	20.57
		>4	1,062	79.43	100.00
Altruistic recommendation consumption motivation	Benefit group motivation	<4	252	32.06	32.06
		4	92	11.70	43.77
		>4	442	56.24	100.00
	Benefit morality motivation	<4	66	8.40	8.40
		4	52	6.62	15.01
		>4	668	84.98	100.00
	Benefit demander motivation	<4	55	7.00	7.00
		4	33	4.20	11.20
		>4	698	88.80	100.00
	Benefit supplier motivation	<4	32	4.07	4.07
		4	40	5.09	9.16
		>4	714	90.84	100.00

We calculated the data of the benefit supplier recommendation consumption motivation item in the scale and found that 4.07% of consumers disagree, 5.09% of consumers maintain a neutral attitude, and 90.84% of consumers agree. This shows that when consumers recommend others to consume altruistic products, most consumers have obvious benefit supplier motivation, that is, there is an influential relationship between altruistic recommendation consumption behavior and benefit supplier consumption motivation.

Therefore, we believe that the altruistic recommendation consumption behavior for the vulnerable group is related to the consumer's altruistic consumption motivation, that is, hypothesis H1$_b$ holds.

The relationship between four kinds of altruistic consumption behaviors and four kinds of altruistic consumption motivations

We studied the relationship between one-time consumption behavior, two-times consumption behavior, continuous

consumption behavior, and altruistic recommendation consumption behavior and four kinds of altruistic consumption motivations. The statistical results are shown in Table 4.

One-time altruistic consumption behavior is affected by four kinds of altruistic consumption motivations, and there are differences in the strength of the influence, and there is a dominant motivation. Analyzing the mean value of the data about the four kinds of altruistic consumption motivations for consumers who have only purchased altruistic products one time, it is found that the mean value of benefit group consumption motivation is 5.292, the average value of benefit morality consumption motivation is 5.101, the average value of benefit demander consumption motivation is 4.898, and the mean value of benefit supplier consumption motivation is 5.005. The data of these consumers on the four kinds of altruistic consumption motivations are all > 4, indicating that these consumers do have four kinds of altruistic consumption motivations, which means one-time altruistic consumption behavior is related to the four kinds of altruistic consumption motivations. In the mean value analysis, it can be seen that the mean value of the benefit group consumption motivation is the largest. We perform t-tests on the benefit group consumption motivation with benefit morality consumption motivation, benefit demander consumption motivation, and benefit supplier consumption motivation, respectively. The results found that the difference in the mean value between benefit group consumption motivation and the other three kinds of altruistic consumption motivations was significant ($p < 0.05$), indicating that benefit group motivation has the greatest influence among the four kinds of altruistic consumption motivations that affect one-time altruistic consumption behavior. Therefore, hypothesis H2$_a$ holds.

Two-times altruistic consumption behavior is affected by four kinds of altruistic consumption motivations, and there are differences in the strength of the influence, and there is a dominant motivation. Analyzing the mean value of the data about the four kinds of altruistic consumption motivations for consumers who have only purchased altruistic products two times, it is found that the mean value of benefit group consumption motivation is 4.854, the average value of benefit morality consumption motivation is 5.271, the average value of benefit demander consumption motivation is 5.572, and the mean value of benefit supplier consumption motivation is 5.301. The data of these consumers on the four kinds of altruistic consumption motivations are all > 4, indicating that these consumers do have four kinds of altruistic consumption motivations, which means two-times altruistic consumption behavior is related to the four kinds of altruistic consumption motivations. In the mean value analysis, it can be seen that the mean value of the benefit demander consumption motivation is the largest. We perform t-tests on the benefit demander consumption motivation with benefit group consumption motivation, benefit morality

TABLE 4 Mean value and *t*-test of variable data.

	Motivation	Behavior			
		One-time consumption behavior	Two-times consumption behavior	Continuous consumption behavior	Altruistic recommendation consumption behavior
Mean value	Benefit group	5.292	4.854	4.714	4.447
	Benefit morality	5.102	5.272	5.941	5.681
	Benefit demander	4.898	5.573	5.659	5.622
	Benefit supplier	5.005	5.301	5.790	5.993
The mean values' significance of *t*-test	Benefit group Benefit morality	$p < 0.05$		$p < 0.001$	
	Benefit group Benefit demander	$p < 0.001$	$p < 0.001$		
	Benefit group Benefit supplier	$p < 0.01$			$p < 0.001$
	Benefit morality Benefit demander		$p < 0.01$	$p < 0.001$	
	Benefit morality Benefit supplier			$p < 0.001$	$p < 0.001$
	Benefit demander Benefit supplier		$p < 0.05$		$p < 0.001$

consumption motivation, and benefit supplier consumption motivation, respectively. The results found that the difference in the mean value between benefit demander consumption motivation and the other three kinds of altruistic consumption motivations was significant ($p < 0.05$), indicating that benefit demander motivation has the greatest influence among the four kinds of altruistic consumption motivations that affect two-times altruistic consumption behavior. Therefore, hypothesis H2$_b$ holds.

Continuous altruistic consumption behavior is affected by four kinds of altruistic consumption motivations, and there are differences in the strength of the influence, and there is a dominant motivation. Analyzing the mean value of the data about the four kinds of altruistic consumption motivations for consumers who have purchased altruistic products continuously, it is found that the mean value of benefit group consumption motivation is 4.713, the average value of benefit morality consumption motivation is 5.941, the average value of benefit demander consumption motivation is 5.659, and the mean value of benefit supplier consumption motivation is 5.790. The data of these consumers on the four kinds of altruistic consumption motivations are all > 4, indicating that these consumers do have four kinds of altruistic consumption motivations, which means continuous altruistic consumption behavior is related to the four kinds of altruistic consumption motivations. In the mean value analysis, it can be seen that the mean value of the benefit morality consumption motivation

is the largest. We perform *t*-tests on the benefit morality consumption motivation with benefit group consumption motivation, benefit demander consumption motivation, and benefit supplier consumption motivation, respectively. The results found that the difference in the mean value between benefit morality consumption motivation and the other three kinds of altruistic consumption motivations was significant ($p < 0.05$), indicating that benefit morality motivation has the greatest influence among the four kinds of altruistic consumption motivations that affect continuous altruistic consumption behavior. Therefore, hypothesis H2$_c$ holds.

Altruistic recommendation consumption behavior is affected by four kinds of altruistic consumption motivations, and there are differences in the strength of the influence, and there is a dominant motivation. Analyzing the mean value of the data about the four kinds of altruistic consumption motivations for consumers who not only purchased altruistic products themselves but also recommend others to purchase altruistic products, it is found that the mean value of benefit group recommendation consumption motivation is 4.446, the average value of benefit morality recommendation consumption motivation is 5.681, the average value of benefit demander recommendation consumption motivation is 5.622, and the mean value of benefit supplier recommendation consumption motivation is 5.992. The data of these consumers on the four kinds of altruistic recommendation consumption motivations are all > 4, indicating that these consumers do have four

kinds of altruistic recommendation consumption motivations, which means altruistic recommendation consumption behavior is related to the four kinds of altruistic recommendation consumption motivations. In the mean value analysis, it can be seen that the mean value of the benefit supplier recommendation consumption motivation is the largest. We perform t-tests on the benefit supplier recommendation consumption motivation with benefit group recommendation consumption motivation, benefit morality recommendation consumption motivation, and benefit demander recommendation consumption motivation, respectively. The results found that the difference in the mean value between benefit supplier recommendation consumption motivation and the other three types of altruistic recommendation consumption motivations was significant ($p < 0.05$), indicating that benefit supplier motivation has the greatest influence among the four kinds of altruistic consumption motivations that affect altruistic recommendation consumption behavior. Therefore, hypothesis H2$_d$ holds.

In order to show the above data more intuitively, we summarized and plotted the data matrix of altruistic consumption motivation and altruistic consumption behavior (shown in Figure 1).

The evolutionary trend of altruistic consumption motivations' influence on altruistic consumption behavior

We performed the dominance analysis and Shapley value decomposition of the four kinds of altruistic consumption motivations' influence on times of altruistic consumption and altruistic consumption behavior. The data results are shown in Tables 5, 6.

Among the four kinds of altruistic consumption motivations that affect the times of altruistic consumption, the influence of benefit demander motivation is relatively larger. Dominance analysis of the times of consumers' altruistic consumption and the four kinds of altruistic consumption motivations (shown in Table 5) shows that the benefit demander motivation affects the times of consumers' altruistic consumption most, followed by benefit morality motivation and benefit group motivation, and benefit supplier motivation. That is, among the four altruistic consumption motivations that affect the times of altruistic consumption, the benefit demander motivation has relatively larger influence. In order to get a more intuitive view of the importance of the four altruistic consumption motivations' influence on the times of altruistic consumption, we used Shapley value decomposition and found that the contribution rate of benefit demander motivation to the times of altruistic consumption was 36.270%, the contribution rate of benefit morality motivation to the times of altruistic consumption was 25.440%, the contribution rate of benefit group motivation to the times of altruistic consumption was 24.590%, and the contribution rate of benefit supplier motivation to the times

of altruistic consumption was 13.700%. Both test methods show that among the four kinds of altruistic consumption motivations that affect the times of altruistic consumption, benefit demander motivation has a relatively larger influence. Therefore, hypothesis H3$_a$ holds.

In the process of statistical analysis, we found that among the four altruistic consumption motivations that affect altruistic consumption behavior, benefit supplier motivation has a relatively larger influence. Dominance analysis of the consumers' altruistic consumption behavior and the four kinds of altruistic consumption motivations (shown in Table 5) shows that the benefit supplier motivation affects the altruistic consumption behavior most, followed by benefit group motivation and benefit demander motivation, and benefit morality motivation. In order to get a more intuitive view of the importance of the four altruistic consumption motivations' influence on the consumers' altruistic consumption behavior, we used Shapley value decomposition and found that the contribution rate of benefit supplier motivation to the altruistic consumption behavior was 45.930%, the contribution rate of benefit group motivation to the altruistic consumption behavior was 35.670%, the contribution rate of benefit demander motivation to the altruistic consumption behavior was 11.120%, and the contribution rate of benefit morality motivation to the altruistic consumption behavior was 7.280%. Both test methods show that among the four kinds of altruistic consumption motivations that affect the consumers' altruistic consumption behavior, benefit supplier motivation has a relatively larger influence.

The strength of benefit group motivation decreases with the increase in the times of altruistic consumption, while the strength of benefit morality motivation, benefit demander motivation, and benefit supplier motivation increases with the increase in the times of altruistic consumption. We take the times of the altruistic consumers' altruistic consumption as the abscissa, and the mean value of the questionnaire items related to the four kinds of altruistic consumption motivations as the ordinate, and made a line chart of the four kinds of altruistic consumption motivations (shown in Figure 2). Therefore, hypothesis H3$_b$ holds.

Discussion

Research conclusion

This research shows that there is an influential relationship between altruistic consumption motivations and altruistic consumption behaviors that aim for vulnerable groups. Altruistic consumption behavior is mainly affected by benefit group motivation, benefit morality motivation, benefit demander motivation, and benefit supplier motivation. There is a correlation between the four kinds of altruistic consumption behaviors and the four kinds of altruistic consumption

FIGURE 1
Data matrix of altruistic consumption motivation and altruistic consumption behavior.
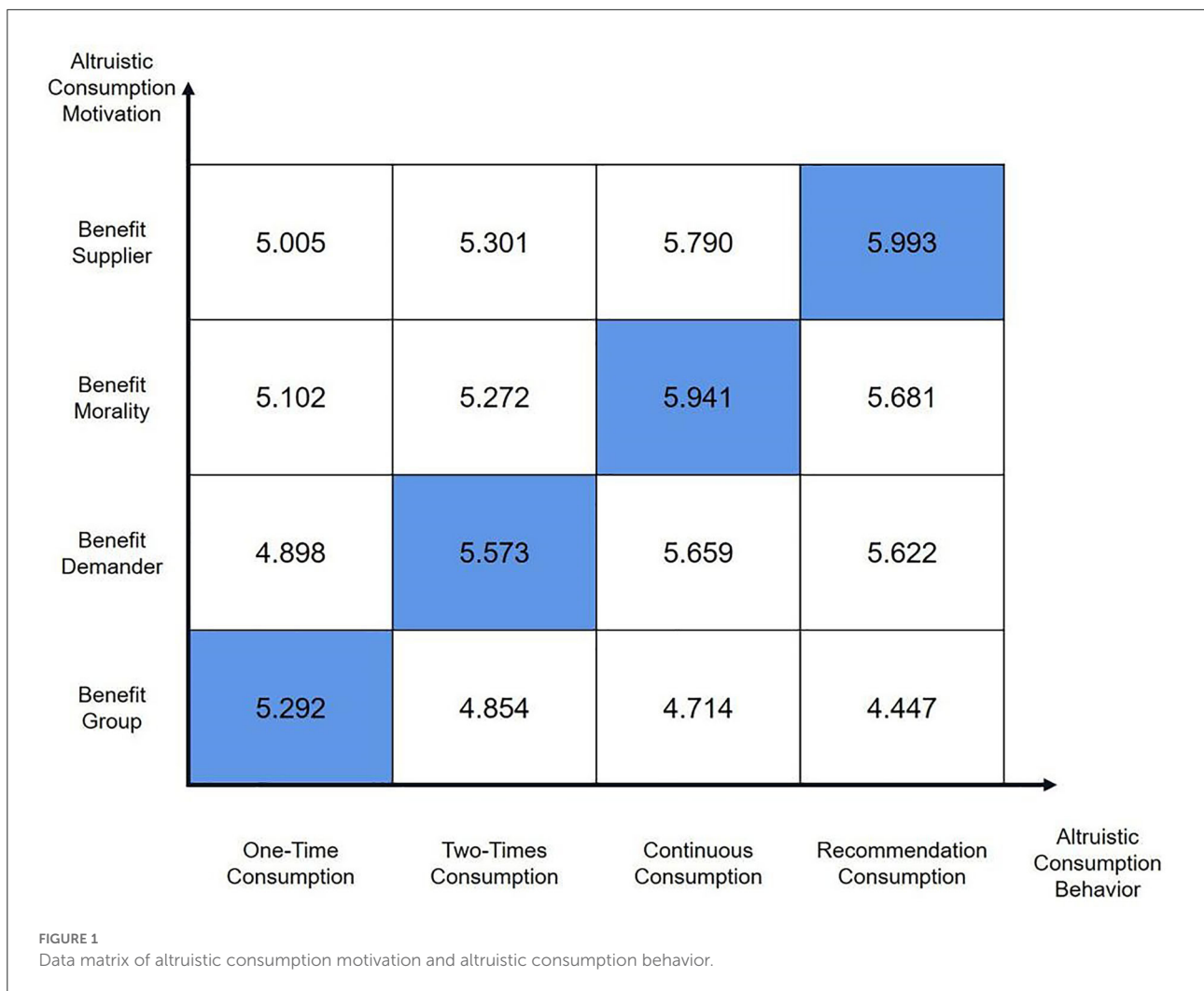
motivations. There is a correlation between the four kinds of altruistic consumption behaviors and the four kinds of altruistic consumption motivations. However, in the one-time altruistic consumption behavior, the benefit group motivation has larger influence than the other three motivations, in the two-times altruistic consumption behavior, the benefit demander motivation has larger influence than the other three motivations, in the continuous altruistic consumption behavior, the benefit morality motivation has larger influence than the other three motivations, and in the altruistic recommendation consumption behavior, the benefit supplier motivation has larger influence than the other three motivations. The strength of altruistic consumption motivations changes with the times of altruistic consumption behavior. Among them, the strength of benefit group motivation decreases with the increase of the times of altruistic consumption behavior, while the strength of benefit morality motivation, benefit demander motivation, and benefit supplier motivation increases with the increase of the times of altruistic consumption behaviors. Among the four

kinds of altruistic consumption motivations that affect the times of altruistic purchase, the contribution of the benefit demander motivation is relatively larger, and among the four kinds of altruistic consumption motivations that affect the altruistic consumption behavior, the contribution of benefit supplier motivation is relatively larger.

Practical inspiration

Charitable behavior is a unilateral effort of donors to improve the plight of recipients, while recipients are passive or even inaction recipients, while altruistic consumption fully mobilizes the enthusiasm of beneficiaries of altruistic consumption. Altruistic consumption can lead vulnerable groups into the social reproduction cycle by consuming their yield. Through altruistic beneficiaries' planned, organized, and targeted reciprocal behavior, the sustainability of altruistic consumption behavior can be realized. This research found that

TABLE 5 Dominance analysis.

	Factors	Dominance statistics	Standardized dominance statistics	Ranking
Times of altruistic consumption	Benefit group motivation	0.028	0.246	3
	Benefit morality motivation	0.029	0.254	2
	Benefit demander motivation	0.041	0.363	1
	Benefit supplier motivation	0.015	0.137	4
Altruistic consumption behavior	Benefit group motivation	0.025	0.357	2
	Benefit morality motivation	0.005	0.073	4
	Benefit demander motivation	0.008	0.111	3
	Benefit supplier motivation	0.032	0.459	1

TABLE 6 Shapley value decomposition.

	Factors	First round effects	Shapley value	%
Times of altruistic consumption	Benefit group motivation	25.313	28.255	24.59
	Benefit morality motivation	56.422	29.237	25.44
	Benefit demander motivation	65.869	41.687	36.27
	Benefit supplier motivation	42.737	15.745	13.70
Altruistic consumption behavior	Benefit group motivation	11.660	12.367	35.67
	Benefit morality motivation	3.543	2.525	7.280
	Benefit demander motivation	7.105	3.853	11.12
	Benefit supplier motivation	20.473	15.921	45.93

consumers' altruistic consumption is based on four kinds of altruistic consumption motivations, so the supplier of altruistic products can adopt different marketing strategies according to the altruistic consumption motivations of different altruistic consumers, changing passive acceptance of charity into active altruistic consumption marketing. Vulnerable groups can use outside support to benefit from their own yield to completely get rid of poverty, replace charity with consumption, and turn themselves from a social burden to a creator of social wealth.

As a new altruistic consumption model, the active marketing of vulnerable groups as the supplier must consider the marketing strategy based on the relationship between altruistic consumption motivation and altruistic consumption behavior.

It is found that the times of altruistic consumption vary from person to person, and it is of great significance for suppliers to study the altruistic consumption motivations of consumers with different consumption times. For one-time altruistic consumption consumers, group promotion is effective. Therefore, suppliers of altruistic consumption products should make full use of their status as vulnerable groups, and make use of the influence of the group initiatives to promote the attempt consumption of their products, promote their products to enter the market, and solve the market entry case of products of vulnerable groups. Our research found that the altruistic consumption behavior dominated by benefit group motivation has a one-time consumption tendency, while the

two-times altruistic consumption consumers' benefit demander motivation is relatively stronger, that is to say, the benefit demander motivation is the main factor affecting two-times altruistic consumption behavior. Therefore, in order to make consumers consume again, the supplier should focus on the consumer's demand for the product itself. Only by satisfying the consumer's benefit demander motivation, can the consumer's two-times altruistic consumption of the product be realized, so as to solve the problems of market consolidation for the products of vulnerable groups. Our research found that only meet the demand, the consumption is also difficult to make the continuous altruistic consumption, because there are many products that can meet consumer needs in society and are available everywhere, therefore, in order for consumers to continuous altruistic consumption, in addition to satisfying consumers' benefit demander motivation, suppliers must also meet consumers' benefit morality motivation. Only by letting consumers realize that while consuming the products they need, they can also promote social virtues and fulfill their social responsibilities, will they have the motivation to continuous altruistic consumption, realize the continuous consumption of altruistic products. Only by solving the problem of continuous sales of products of vulnerable groups can the problem of continuous poverty of vulnerable groups be solved, and the return to poverty caused by the consumption relationship dissolution can be prevented, and the true goal

FIGURE 2
Line chart of altruistic consumption motivation and the times of altruistic purchases.
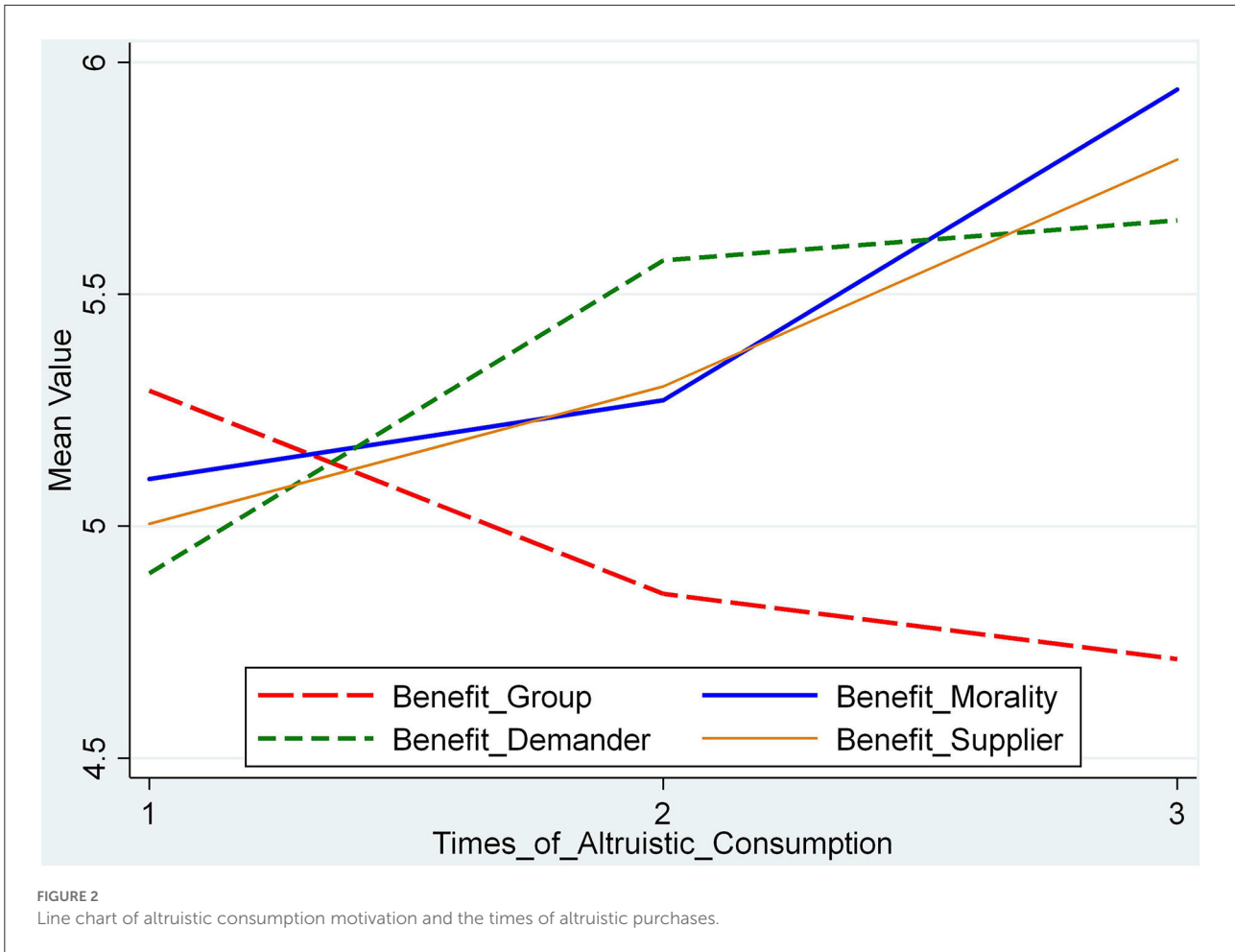
of altruistic consumption can be realized. The research also found that among the four kinds of motivations that affect consumers' altruistic recommendation consumption behavior, the benefit supplier motivation is relatively stronger, which means that it is of great significance for more consumers to realize that their consumption behavior can help the vulnerable groups get rid of the vulnerable status, they are willing to recommend to others, and drive more people to consume the altruistic products of the vulnerable groups. Therefore, as a supplier of vulnerable groups, it is necessary to feedback to the society the huge changes brought about by altruistic consumption to vulnerable groups through various channels, so that altruistic consumers know that their altruistic recommendation consumption behavior has produced a positive altruistic effect, which is helpful to encourage altruistic consumers' recommendation consumption behavior. The altruistic marketing strategy adopted for consumers' benefit group altruistic consumption motivation can be called the *benefit group altruistic marketing strategy*, which mainly solves the problem of attempting consumption by altruistic consumers and the problem of entering the market of altruistic products;

The altruistic marketing strategy adopted for consumers' benefit demander altruistic consumption motivation can be called the *benefit demander altruistic marketing strategy*, which mainly solves the problem of re-consumption of altruistic products and the problem of market consolidation of altruistic products; The altruistic marketing strategy adopted for consumers' benefit morality altruistic consumption motivation can be called the *benefit morality altruistic marketing strategy*, which mainly solves the problem of continuous consumption and the continuous sales of altruistic products; The altruistic marketing strategy adopted for altruistic recommendation consumption behavior can be called the *benefit supplier altruistic marketing strategy*, which mainly solves the problem of the recommendation consumption of altruistic consumers and the market expansion of altruistic products. We can also collectively refer to these altruistic marketing strategies as "4B altruistic marketing strategies".

The corresponding relationship between "4B altruistic marketing strategy" and "4B altruistic consumption motivation" is relative. Each marketing strategy can play a role in every altruistic consumption behavior,

FIGURE 3
Matrix of altruistic consumption behavior/altruistic consumption motivation and altruistic consumption marketing strategy.
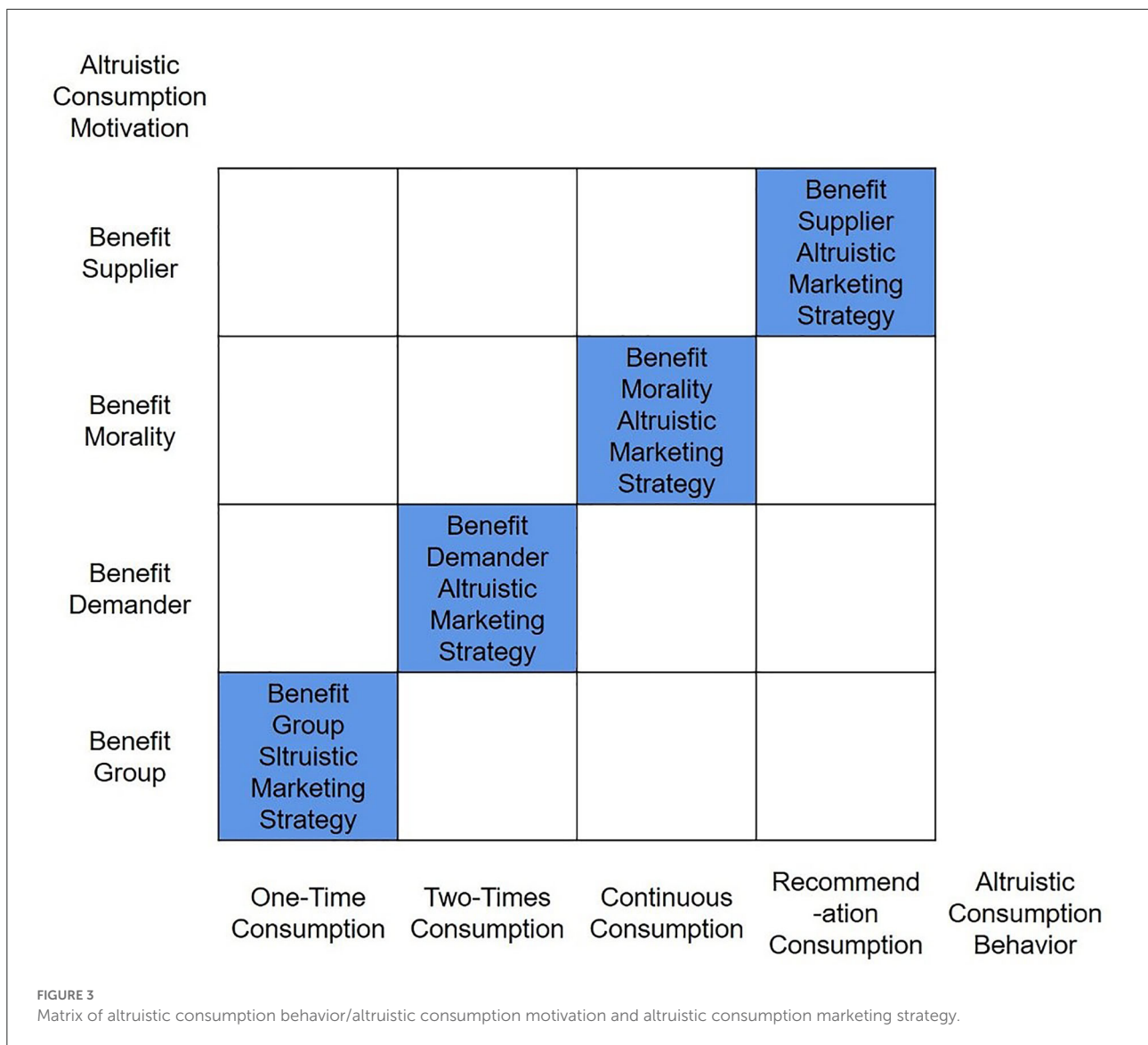
but the degree of influence is different in different consumption behaviors.

This research summarizes and plotted the matrix of altruistic consumption behavior/altruistic consumption motivation and altruistic consumption marketing strategy (shown in Figure 3).

Benefit group altruistic marketing strategy has the greatest influence on the initial consumption, and as the times of consumption increase, its influence gradually decreases. However, the influence of the benefit demander altruistic marketing strategy, the benefit supplier altruism marketing strategy, and the benefit morality altruism marketing strategy are smaller on the initial consumption, as the times of consumption increases, the influence gradually increases. Therefore, in order to achieve good altruistic marketing effects, suppliers

must be good at the combined application of altruistic marketing strategies.

Active marketing of vulnerable groups should also arrange targeted altruistic marketing strategies based on the contribution of altruistic motivations. The research also found that among the four kinds of altruistic consumption motivations that affect consumers' altruistic consumption behavior, the contribution of the benefit supplier motivation is relatively stronger, indicating that the core of altruistic consumption behavior is altruism. Therefore, when formulating altruistic marketing strategies, suppliers must always emphasize the value that altruistic consumption can bring to vulnerable groups, meaning that emphasizes the altruistic nature of consumption, which makes sense for the vulnerable groups to promote the altruistic consumption of their products. However, among the four

kinds of altruistic consumption motivations that affect the times of consumers' altruistic consumption, the contribution of benefit demander consumption is relatively stronger. This tells us that altruistic consumption is not a kind of charitable behavior, but a reciprocal altruistic behavior. Therefore, the product must meet the consumer's own needs, that is, satisfy the consumer's benefit demander motivation. Therefore, improving the quality of altruistic consumption products, improving consumer services, setting appropriate prices, and providing convenient channels are essential to prevent the consumption relationship dissolution, maintain the stability of the consumer market, and promote the continuous consumption of altruistic consumption products.

Limitations and prospects

This research focuses on the relationship between altruistic consumption motivation and altruistic consumption behavior. Regarding the altruistic consumption model, the research team has completed relevant research and published articles, so there is not much involved in this research. This research only studied the motivations of different individuals' one-time, two-times, and continuous consumption, while did not study the motivations of the same individual's first, second, and continuous consumption. Therefore, this research cannot answer the question of why an individual decides to consume again after the first consumption, and why an individual decides to consume continuously. Researching these motivations is also of great significance for expanding the altruistic consumer market. This research is investigative research, and the object of research is consumption motivation. Consumers' motivations are inherent and cannot be directly expressed through consumers' consumption behavior, nor can they be derived from actual statistics data. This study focuses on consumers who buy poverty alleviation products and on vulnerable groups with productive capacity in China. Whether the study represents all altruistic consumers and vulnerable groups requires further investigation.

The development of real society is always uneven, there are always a large number of groups that in the countries, regions, ethnic minorities, low-income groups, and affected by disasters that in a state of poverty and backwardness. In the long run, it is challenging to help vulnerable groups out

of poverty using the one-way charity model. Adopting the reciprocal altruistic consumption method can be an effective way to help vulnerable groups escape poverty. Using marketing methods to help vulnerable groups is an essential extension of the theory of cause-related marketing, a new field of marketing study, and a manifestation of the new function of marketing.

Data availability statement

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

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislations and institutional requirements. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

HX and CL designed and conducted the study. All authors contributed to the article and approved the final version.

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.

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Participating in health insurance and health improvements for the relatively poor population: A propensity score analysis

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This study examined the causal relationship between participation in the New Rural Cooperative Medical Scheme (NRCMS) and health status among relatively poor population in rural China. Data were obtained from the China Family Panel Studies (CFPS) conducted in 2018, which contained 4,507 samples. This study used propensity score matching (PSM) to examine the net effect of participation in the NRCMS on the health of the relatively poor population, and this effect was tested for equilibrium using nearest neighbor matching, radius matching, and kernel matching. This study showed that participation in the NRCMS has a significant and positive effect on the health status of the relatively poor population and the positive health effect may come from three channels, including the increased frequency of physical activity, the fact that an individual is more likely to seek medical care at a lower level of visit, and a plan to reduce health care expenditures.

Introduction

It has been proven that health is an important factor influencing poverty reduction and impoverishment ([1]), and health insurance can alleviate poverty vulnerability under health shock ([2]). In China, the distribution structure of the relatively poor population is mainly concentrated in areas with poor natural resource endowment, poor economic conditions and deep poverty. The group distribution of the relatively poor population mainly includes disabled individuals, widowed and orphaned individuals, elderly individuals, and individuals with long-term poverty due to illness. Therefore, regardless of the distribution structure of the relatively poor population or the distribution of specific groups, health problems will become one of the main obstacles in solving relative poverty. Health is an important issue raised by human capital theory. Human capital theory clearly puts forward that health is an important part of human capital, and high-quality human capital is crucial for promoting economic development and improving individual welfare ([3]). Therefore, in recent years, health insurance, as an international issue, has attracted the attention of all countries. Many developing countries have health insurance programs that provide health insurance for individuals or families

through subsidies from government funds (4–6). The main purpose of health insurance is to reduce the medical expenses of an individual or a family, reduce the risk of becoming poor due to major diseases and help to spread the health risks that may arise.

Therefore, to improve the farmers' health level, reduce the medical burden, and solve the problem of poverty due to illness, in July 2003, the State Council of China started the pilot work of the New Rural Cooperative Medical Scheme (NRCMS). The NRCMS is funded by individual payments, collective support and government subsidies, which are led and organized by the government. It is a medical mutual aid system for rural residents that focuses on the overall planning of serious diseases and the settlement of minor diseases (7). It is a voluntary program and the voluntary feature was adopted to overcome public mistrust in the government-run insurance program (8, 9). The survey showed a high enrolment rate of 92% in this voluntary insurance scheme (10). Based on fee-for-service and cost-sharing models, the NRCMS mainly applies to inpatient services and some medical outpatient services, aiming to reduce the burden of disease costs for the rural population (8, 11). By 2008, the NRCMS covered both inpatient and medical outpatient services in most counties (9). The per capita annual premium of the NRCMS gradually increased from US $4.88 in 2005 to US $65.11 by the end of 2014 (12). By 2015, its coverage rate had reached 98 percent (13). At the same time, per-capita reimbursement caps have been raised, with outpatient reimbursement rising to $14, outpatient observation reimbursement to $163, and total medical expense reimbursement to $32,558 by the end of 2014. For hospitalization, 85 percent of the total expenses can be reimbursed by township hospitals, 70 percent by county hospitals, 55 percent by municipal hospitals and 50 percent by provincial hospitals (14).

Previous studies have examined the impact of health insurance on health status but have come to different conclusions. Researchers have found that participation in the NRCMS can improve the health status of rural residents mainly by reducing the incidence of poverty caused by illness or returning to poverty due to illness. In terms of actual effects, the NRCMS has a better poverty alleviation effect compared with previous medical insurance systems (8, 15). In addition, some researchers measured health status by using self-rated health and the number of illnesses or injuries in the past 4 weeks and studied the impact of participation in the NRCMS on health status. These researchers found that participation in the NRCMS did not significantly improve the health level of the participants (16, 17). Other researchers have studied the effects of health insurance in other countries. Researchers believe that medical insurance for rural areas will play a positive role in poverty reduction (18). Medical insurance can improve residents' health and reduce poverty vulnerability caused by health shock (19), while public medical insurance and premium subsidies can reduce the incidence

of health poverty by 1/3 (1). In addition, Vietnam's Poor Health Protection Fund (HCFP) has significantly reduced cash expenditures on health for the poor population (20). Bangladesh's micro-health insurance scheme has significantly increased household income and stability and reduced the probability of falling into poverty (18). Medicare support programs in the United States have greatly reduced income inequality and improved welfare for the poor population by providing government subsidies (21).

Therefore, this study took the relatively poor rural population in China as the research object to investigate whether participation in the NRCMS has effectively improved the health status of this population. If the answer was yes, then the mechanism through which participation in NRCMS improved the health status of this population was further analyzed. Previous studies have mainly used multiple linear regression models to explore the relationship between health insurance and health, which has endogenous problems. In addition, the causal effect of medical insurance on the health status of the insured population should not be clear. Therefore, this study used the propensity score matching (PSM) to construct a counterfactual framework to test the causal relationship between participation in the NRCMS and the health status of the relatively poor rural population in China and then addressed the problem of causal inference that cannot be solved by traditional regression analysis. In this study, PSM was adopted to balance the confounding variables that affect participants' behaviors, which could solve the self-selection problem of the sample to some extent, and the net effect of this policy was obtained, providing a mechanism for explaining the health promotion effect of medical insurance.

Methods

Data

This study used data from China Family Panel Studies (CFPS), a survey designed and conducted by the China Center for Social Surveys at Peking University. CFPS data samples are nationally representative, and the survey team constantly updates the survey methods to ensure that the survey results are authentic and reliable, ultimately forming a database including family member answers, individual self-answers and individual proxy answers. The data cover 25 provinces, municipalities and autonomous regions in China, giving a more comprehensive picture of the demographic, economic and social characteristics of the Chinese population. In this study, CFPS data from 2018 were used. Combined with the database indicators required by the study, family sample codes were used as matching indicators to merge the data from a horizontal perspective. The final data content included variables such as household size,

household income and health expenditures at the household level, as well as variables such as education level, income level, work status, smoking status and level of medical care at the individual level.

The object of this study was the relatively poor rural population. International experiences of relative poverty screening generally take a certain percentage of the median income as the threshold standard. For example, researchers propose using 50% of the median income as the relative poverty line (22). However, this kind of relative poverty screening based on the income method has some limitations; it ignores the essence of utility economics that describe that relative poverty is a subjective feeling. This subjective feeling is an individual's assessment of whether he or she is poor, and this self-assessment standard is usually related to the reference group set by the individual himself or herself. Therefore, this study drew on lessons from previous studies on subjective relative poverty and selected the relatively poor population based on the answers to the subjective relative poverty question (23). This study first selected individuals in rural households from the total sample and then selected individuals in the relatively poor population according to the their answer to the question "What is your income in the local area?" Answers was ranked on a scale of one to five; the higher the number, the higher an individual's local income. This study selected the population with indicators of one and two as the relatively poor population. After deleting invalid samples and sorting out data, 4,507 valid samples were finally obtained in this study.

Variables and measures

Table 1 presents a description of variable.

The independent variable in this study was whether an individual participated in NRCMS. Based on the question "What medical insurance system have you participated in?" in the questionnaire, the individuals participating in the NRCMS were assigned a value of 1, and those participating in other medical insurance systems and those not participating in a medical insurance system were assigned a value of 0.

The dependent variable in this study was the health status of individuals in the rural relatively poor population. Personal health is generally measured from subjective perceptions, medical diagnoses and physical function. Self-reported health status is an individual's subjective judgment, in accordance with his or her own objective health to be able to fully reflect the multidimensional nature of the health and integrity. Using this index can comprehensively reflect residents in terms of their physical, psychological, cognitive and external environments with multidimensional information and can form comprehensive evaluation results of their health more accurately (24). Therefore, this study chose the question of "How do you think your health is?" to measure the self-reported health status of the sample, and the answer to this question had reordered values for "1 =" unhealthy, "2 =" general, "3 =" more healthy, "4 =" very healthy, and "5 =" very healthy; the higher the value, the more healthy the rural relative poverty population was.

In addition, according to previous research conclusions, age, sex, education level, marital status, working status, frequency

TABLE 1 Definition and descriptive statistics of various variables.

	Variables	Variable definitions
Dependent variable	Health status	Continuous variable, ranging from 1 to 5
Independent variable	NRCMS	Categorical variable, NRCMS participants = 1,non-NRCMS participants = 0
	Age	Continuous variable
	Sex	Categorical variable, 0 = female, 1 = male
	Education level	Continuous variable, average education years
Control variables	Marital status	Categorical variable, 0 = unmarried, 1 = married
	Working status	Categorical variable, 0 = no, 1 = yes
	Frequency of internet use	Continuous variable, ranging from 0 to 6
	Smoking status	Categorical variable, 0 = no, 1 = yes
	Alcohol status	Categorical variable, 0 = no, 1 = yes
	Time spent watching TV	Continuous variable, ranging from 0 to 50
	Frequency of physical activity	Continuous variable, ranging from 0 to 50
	The level of medical care at the point of the visit	Continuous variable, ranging from 1 to 5
	Time spent performing housework	Continuous variable, ranging from 0 to 12
	Family size	Continuous variable, ranging from 1 to 15
	Health care expenditures	Continuous variable
	Bank loan repayment status	Categorical variable, 0 = no, 1 = yes
	Family income level	Continuous variable, take the logarithm

of internet use, smoking status, alcohol status, time spent performing housework, time spent watching TV, family size, bank loan repayment status and family income level were selected as control variables.

In theory, health insurance can affect an adult's health in three ways. First, under the financial incentive of medical insurance, residents may change their choice of medical institutions at different levels when seeking medical services, which may ultimately affect their health status (25). Second, after participating in medical insurance, people are more likely to choose more diversified physical exercise methods and increase the frequency of physical activity, thus affecting their health status (26). Finally, health insurance can also influence the health status of the population by reducing incentives to take precautions against personal health, such as reducing the purchase and use of health supplies (27). Therefore, we chose the level of medical care at the point of the visit, the frequency of physical activity, and health care expenditures as important mechanism of action variables to examine. Among them, the measurement question corresponding to the variable of the level of "medical care at the point of the visit is" where do you usually go if you want to see a doctor, "and the corresponding option is" 1 = general hospital, 2 = specialized hospital, 3 = township health center, 4 = village health room, 5 = clinic. "The answer is reversely coded, indicating that the higher the value is, the higher the level of medical care is. The variable of the frequency of physical activity corresponds to the measurement question" How many times do you get physical activity in the past week. The forms of physical activity include different forms of outdoor activities, all kinds of ball games and contact sports. The variable of the health care expenditures corresponds to the measurement question "How much did you spend on health care in the last 12 months?"

Propensity score matching

The PSM was proposed by Rosenbaum and Rubin (28), and it is considered that the propensity score is the conditional probability influenced by an explanatory variable under the control of numerous observable confounding variables. The propensity score matching method is a popular new statistical method for social science. This method allows researchers to focus on the independent variable intervention implementation randomized allocation, which can overcome the problem of choice; at the same time, it can maximize the limit for confounding variables and make the probability of an event occurring in the treatment group and the control group close to achieve the purpose of a simulation experiment. In addition, the role of propensity score matching lies in the construction of a "counterfactual framework". The

TABLE 2 OLS regression results of the health level of the relatively poor population in rural areas.

Comparison term	Health status
NRCMS (non-NRCMS participants)	
NRCMS participants	0.096**
	(0.039)
Control variables	All control variables
Constant term	1.382***
	(0.282)
N	4,507
F	22.96***
R^2	0.080

*P < 0.10, **P < 0.05, ***P < 0.01; The value in brackets is standard error.

occurrence of an event that an individual experiences may depend on two opposite states. However, in real life, people can only be in one life state and cannot re-experience the other state. We can use PSM to construct a "counterfactual framework" to address the problem of causal inference that traditional regression analysis cannot solve. In traditional regression models, there are many confounding variables between explanatory variables and explained variables, so it is difficult to find the net effect between explanatory variables and explained variables. Therefore, the PSM method can put these confounding variables into the logit model to predict the propensity value and then control the propensity value to mitigate the biased causal inference caused by selection bias. Therefore, this study first established the OLS model as a benchmark model for the data as a whole to test the impact of participating in NRCMS on the health status of individuals in the relatively poor rural population. Then, on the basis of overcoming selection bias due to participating in the NRCMS, the conclusions of the OLS model were further verified to investigate whether such influence continues to exist through the establishment of the PSM method.

Results

Baseline regression results

In this study, a nested OLS model was used to empirically test the impact of participating in NRCMS on the health status of individuals in the relatively poor rural population. Table 2 shows the baseline results of the regression model. As seen in Table 2, the health level of NRCMS participants was 9.6% higher than that of non-NRCMS participants, and the test result was significant at the 5% level.

TABLE 3   The result of selection bias of participation in the NRCMS.

Comparison term	Percentage of NRCMS OR Mean of NRCMS vs. non-NRCMS	χ^2 or t-test
Age	33.442 (3,478) vs. 30.859 (1029)	0.000
Sex	25.76(896)	0.072
	74.24 (25,82)	
Education level	8.545 (3,478) vs. 11.087(1029)	0.000
Marital status	85.42 (2,971)	0.000
	14.58 (507)	
Working status	90.86 (3,160)	0.000
	9.14 (318)	
Frequency of internet use	4.980 (3,478) vs. 5.328 (1029)	0.000
Smoking status	4.49 (156)	0.053
	95.51 (3,322)	
Alcohol status	6.38 (222)	0.000
	93.62 (3,256)	
Time spent watching TV	9.194 (3,478) vs. 8.204 (1029)	0.000
Frequency of physical activity	1.801 (3,478) vs. 1.780 (1029)	0.000
The level of medical care at the point of the visit	3.304 (3,478) vs. 3.400 (1029)	0.000
Time spentperforming housework	1.903 (3,478) vs. 1.152 (1029)	0.000
Family size	5.772 (3,478) vs. 4.906 (1029)	0.000
Health care expenditures	179.309 (3,478) vs. 365.761 (1029)	0.000
Bank loan repayment status	15.12 (526)	0.000
	84.88 (2,952)	
Family income level	10.944 (3,478) vs. 11.199 (1029)	0.000
Health status	3.255 (3,478) vs. 3.143 (1029)	0.000

Selection bias of participation in the NRCMS

Table 3 shows the results of the chi-square test or T-test for participation in the NRCMS and confounding variables. The preliminary results of the chi-square test or T-test showed that selection bias in the samples obtained by the NRCMS did exist, and the results of other confounding variables showed a significant correlation at the 1% level, except for the test results of sex and smoking status at the 10% level. This showed that the distribution of the samples for participation in the NRCMS was unbalanced. Due to the existence of these selectivity biases, processing allocation is unavoidable and therefore needs to be further corrected.

Propensity score prediction

In this study, all confounding variables were simultaneously incorporated into the binomial logit regression model to predict the probability of the influencing samples' participation in the NRCMS. Table 4 shows the results of the regression model. Education level, marital status, working status, smoking status, alcohol status, time spent watching TV, time spent performing housework, family

size, bank loan repayment status, family income level and other variables have a significant impact on the probability of participating in the NRCMS. Therefore, the selective problem of whether individuals participate in the NRCMS objectively exists; that is, these confounding variables can significantly predict whether individuals participate in the NRCMS.

Propensity score matching

Matching quality test: Presentation of the common range of propensity scores

Figure 1 shows the common range of the propensity scores. Propensity matching requires that the distribution of propensity values overlaps greatly between the control group and the treatment group. As seen in Figure 1, the common support interval between the group that participated in the NRCMS and the group that did not participate in the NRCMS was relatively large, which means that the data application conditions were good.

Table 5 shows the common range of supported domains for propensity score matching. As seen in Table 5, among the 4,507 observed values, 12 values in the control group were not in the common value range, 29 values in the treatment group were not

in the common value range, and the remaining 4,466 values were in the common value range.

Balance test of the sample

Table 6 shows the balance test results of the samples. The results showed that no matter which preference matching method was used, all variables were almost balanced in the NRCMS participants group and the non-NRCMS participants group. After matching, the differences of all variables between the two groups of samples were no longer significant, which indicates that propensity score matching achieved sample equilibrium results to a certain extent.

Propensity score matching results

There are two results of propensity score matching, namely, the ATT (average effect of health status of actual NRCMS participants) and ATE (average effect of health status of NRCMS participants and non-NRCMS participants). This study focused on the impact of participation in NRCMS on health status, so the ATT needed to be observed. Table 7 shows the ATT obtained by using various matching methods, including in 1-to-1 matching, 1-to-4 matching, radius matching and kernel matching. The T value of the ATT corresponding to 1-to-1 matching, 1-to-4 matching, radius matching and kernel matching in the nearest neighbor matching method were 4.17, 4.21, 4.85, and 3.5, respectively, which were all greater than the T value corresponding to a 1% significance level of 2.76, indicating that after controlling for sample selectivity bias, participation in the NRCMS has a positive effect on the health level of the participants. In other words, participation in the NRCMS can improve the health of individuals in the relatively poor rural population.

Impact mechanism analyses

We attempted to explore the impact mechanism behind the influence of participation in the NRCMS on health status. Table 8 presents the potential impact mechanisms of participation in NRCMS on health status. The results show that participation in NRCMS significantly increased the frequency of physical activity including different forms of outdoor activities, all kinds of ball games and contact sports at a different significance level. Studies have proved the relationship between health insurance and physical activity or outdoor activity in different groups. Using panel data from China Rural Mutual Health Care, the researchers analyzed the impact of medical insurance on the health status of enrollees and found that medical insurance had a positive impact on the daily physical activity of people over 55 years old (29). Besides, the researchers analyzed the impact of NRCMS on the health of the elderly

TABLE 4 Binomial logit propensity prediction model for rural relatively poor population to participate in NRCMS.

Control variables	NRCMS
Age	−0.098 (0.007)
Sex	0.032 (0.099)
Education level	−0.131*** (0.012)
Marital status	0.576*** (0.113)
Working status	−0.678*** (0.167)
Frequency of internet use	−0.042 (0.027)
Smoking status	0.647*** (0.22)
Alcohol status	1.077*** (0.207)
Time spent watching TV	0.028*** (0.005)
Frequency of physical activity	0.012 (0.012)
The level of medical care at the point of the visit	−0.136*** (0.047)
Time spent performing housework	0.273*** (0.034)
Family size	0.162*** (0.019)
Health care expenditures	−0.0004 (0.0003)
A bank loan was taken out	0.808*** (0.129)
Family income level	−0.461*** (0.063)
Chi-square	745.39***
−2 Loglikelihood	4097.125
Pseudo R^2	0.1539

in rural areas by using data from Chinese Longitudinal Health Longevity Survey, and found that the frequency of outdoor activities expressed by the elderly participants was higher than that of non-participants. NRCMS promoted the awareness of outdoor activities of the elderly and realized the goal of improving the physical function of the elderly (30). Furthermore, compared with people of higher and middle socioeconomic status, people of lower socioeconomic status may suffer worse physical health due to higher family social stress and lower stress control ability (31). In a randomized cross-sectional study of 1,650 adult men aged 20 to 50 years from rural Bangladesh, the researchers found that compared with men of middle and higher socioeconomic status, men of lower socioeconomic status with higher family socio-demographic stress, economic hardship, family stress and lower psychological resources are most likely to suffer from poor physical health (32). Therefore, the relatively poor population in rural areas will pay more attention to their own physical conditions, participation in NRCMS has a significant impact on the frequency of physical activity by providing affordable and cost-effective health care services and enhancing their awareness of health care (33). Regardless of the reimbursement or compensation granted to the relatively poor population, maintaining a healthy body and reducing the utilization of medical care remains the optimal solution. Increasing the frequency of physical activity is a direct and effective method.

In addition, we found that participation in NRCMS reduced the possibility of seeking medical care at a higher level

FIGURE 1
Common range of values for propensity score.
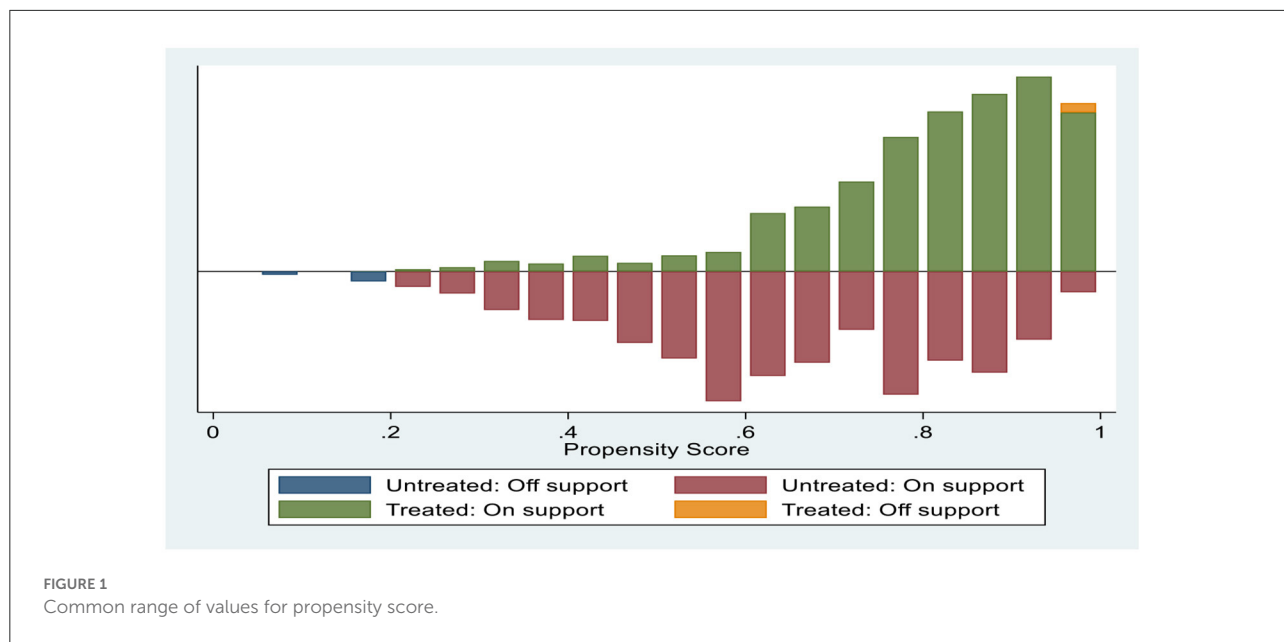
TABLE 5 The common range of supported domains.

Treatment assignment	Off support	On support	Total
Untreated	12	1,017	1,029
Treated	29	3,449	3,478
Total	41	4,466	4,507

of visit and taking health care expenditures at a different significance level. The above conclusion can be inferred that medical insurance may bring a series of negative effects, one of the important problems is the moral hazard which occurred to the insured. Moral hazard refers to the tendency of the insured to increase the consumption of medical services, which has been studied by a large number of theoretical and empirical work (34–36). The moral hazard can be divided into two kinds: ex-post moral hazard and ex-ante moral hazard. Ex-post moral hazard refers to the behavior of patients who overconsume medical resources after they have health insurance because they face lower marginal prices, such as extending hospital stay or choosing a lower level of hospital stay (37). Ex-ante moral hazard refers to that when patients participate in insurance, their motivation and activities of self-protection and disease prevention will decrease as the disease loss they face will be reduced due to the insurance compensation (27). For example, the researcher found that medical insurance coverage poses a significant moral hazard to the probability of access to health care (38). In addition, in the case of lower income level, medical insurance will bring about implicit behavior or moral hazard incentive effect, and poor policyholders are more inclined

to use hospital facilities and medical public services. The decline in the price of medical services due to insurance coverage increases utilization by the poor to a greater extent (39). Therefore, the above conclusions inspire us to prevent the possibility of moral hazard arising from participating in NRCMS.

Thus, these findings support the view that participation in NRCMS has a strong impact on the frequency of physical activity, the choice of the level of medical care and expenditure on health care, which in turn highlights possible mechanisms by which health insurance improves health outcomes.

Discussion

Participation in the NRCMS has a significant positive impact on the health status of individuals in the relatively poor rural population

In this study, we investigated the impact of participation in the NRCMS on the health status of individuals in the relatively poor rural population using CFPS 2018 data. In the process of investigation, we mainly used PSM to discover the net effect of participation in NRCMS on health status. The evidence showed that participation in NRCMS had a significant and positive impact on the health of relatively poor individuals in rural areas. This is consistent with the conclusions of previous studies. In a survey of 2,093 rural adults, the researchers found that NRCMS participation had a significantly positive impact on their self-assessment and

TABLE 6 Comparison of sample characteristics before and after matching.

Variable	Sample	Mean value		Standardized bias (%)	Bias reduction (%)	T Value	P-Value
		Treated	Control				
Age	Unmatched	33.442	30.859	35.5		9.70	0.000
	Matched	33.416	33.289	1.7	95.1	0.73	0.464
Gender	Unmatched	0.258	0.286	−6.3		−1.80	0.073
	Matched	0.260	0.228	3.1	23.7	0.17	0.224
Education	Unmatched	8.545	11.087	−63.9		−18.57	0.000
	Matched	8.603	8.335	1.6	89.4	0.69	0.787
Marital status	Unmatched	0.854	0.703	37.1		11.26	0.000
	Matched	0.853	0.850	0.6	98.5	0.27	0.786
Working status	Unmatched	0.909	0.951	−16.8		−4.42	0.000
	Matched	0.909	0.853	4.1	−30.2	0.18	0.135
Internet frequency	Unmatched	4.980	5.329	−21.5		−5.78	0.000
	Matched	4.981	4.636	3.9	45.8	0.53	0.712
Smoking status	Unmatched	0.045	0.031	7.2		1.94	0.053
	Matched	0.045	0.026	4.2	−39.4	4.29	0.000
Alcohol status	Unmatched	0.064	0.033	14.4		3.75	0.000
	Matched	0.064	0.065	−0.3	98.1	−0.10	0.922
Housework time	Unmatched	1.903	1.152	49.1		12.89	0.000
	Matched	1.850	2.230	−2.1	40.6	−0.26	0.309
Time spent watching TV	Unmatched	9.194	8.204	12.9		3.58	0.000
	Matched	9.136	9.405	−3.5	72.8	−1.32	0.186
Family size	Unmatched	5.772	4.906	38.1		10.36	0.000
	Matched	5.772	4.444	3.5	−53.3	0.45	0.576
Bank loanrepayment	Unmatched	0.151	0.089	19.1		5.08	0.000
	Matched	0.148	0.133	4.7	75.6	1.80	0.171
Family income	Unmatched	10.944	11.199	−36.4		−10.12	0.000
	Matched	10.953	10.876	11.0	69.7	4.56	0.000

TABLE 7 PSM results.

	Health status		
	ATT	SE	T Value
1 to 1 neighbor matching	0.327	0.078	4.17
1 to 4 neighbor matching	0.316	0.071	4.43
Radius matching	0.298	0.048	2.77
Kernel matching	0.271	0.049	3.35

mental health (40). In addition, the researchers used data from the 2013 China Health and Retirement Longitudinal Survey to study the impact of medical insurance on the health status and life satisfaction of elderly individuals, and the results showed that medical insurance contributes to the improvement of health status and life satisfaction of elderly individuals (41).

Participation in the NRCMS influences health status by influencing the frequency of physical activity, the choice of the level of medical care and expenditure on health care

This study found several mechanisms by which participating in the NRCMS affects health. First, after participating in the NRCMS, relatively poor rural people will pay more attention to their physical condition, actively participate in daily exercise, and deliberately increase the amount of exercise, which will be more conducive to their health. Therefore, participating in more physical activity is a channel to improve health. Second, NRCMS participants improve their health by increasing their chances of seeking medical care at relatively low-quality medical institutions. As individuals in the relatively poor population mainly live in rural areas, the relatively low level of medical facilities can improve their immediate access to health care,

TABLE 8 Impact mechanism analyses of NRCMS on health status.

	The level of medical care at the point of visit			Frequency of physical activity			Health care expenditure		
	ATT	SE	T Value	ATT	SE	T Value	ATT	SE	T Value
1 to 1 neighbor matching	−0.113	0.056	−1.77	0.168	0.181	1.93	−0.119	0.113	−1.82
1 to 4 neighbor matching	−0.171	0.051	−1.69	0.058	0.166	1.35	−0.176	0.214	−1.97
Radius matching	−0.188	0.037	−2.37	0.123	0.124	2.99	−0.182	0.147	−2.44
Kernel matching	−0.191	0.038	−2.39	0.105	0.126	1.83	−0.219	0.175	−2.76

thereby improving their health status. This mechanism may be related to the implementation of a hierarchical medical system. Third, NRCMS participants spend less on preventive health care, which in turn highlights possible mechanisms through which health status is changed with medical insurance.

Implications

These findings have important policy implications. First, it is necessary to further expand the coverage of medical insurance and improve health status through comprehensive medical insurance coverage. It needs more strengthening by encouraging peoples' participation into NRCMS with a necessity to implement a new reimbursement payment system by health care providers (42). Second, the mechanism of medical insurance financing and compensation should be appropriately oriented to vulnerable groups and areas in difficult circumstances, especially to relatively poor groups, such as individuals with subsistence allowances, individuals who are extremely poor, individuals in low-income groups, families in poverty caused by illness and seriously ill patients. Third, in order to prevent the occurrence of moral hazard, medical insurance should combine with long-term care insurance, strengthen the propaganda of disease prevention and increase individual awareness of disease prevention. At the same time, the policy of providing a free medical check-up every year as a reward for those who do not use any of the reimbursed medical services can effectively prevent moral hazard and promote the use of preventive health care among participants.

The marginal contribution of this study is as follows: First, based on the data of a large national micro tracking survey, this study specifically studied the impact of health insurance on the health of the relatively poor population, providing new empirical evidence for existing relevant studies. Second, this study balanced the confounding variables that affect the behavior of insured individuals through PSM, which can solve the self-selection problem of a sample to a large extent; this was conducive to the net effect of the policy impact and improved the accuracy of the estimated results. Third, from the perspective of the influencing mechanism, this study analyzed the channels through which medical insurance affects the health level, which provides a reference value for the formulation of relevant policies.

Limitations

This study has the following limitations. First, considering the differences in the reimbursement ratio of medical insurance in different regions, such differences will have different impacts on the health services and health status of insurance participants. However, due to the limitation of the data, we could not control this variable. Second, some other control variables, such as the urbanization index and air pollution index, are also important factors affecting the health status of a population. However, due to the limited data content, we could not control these variables. When more data are available, we will control these factors. Third, as the research object of this study is the relative poor population in rural areas and the relationship between their participation in the NRCMS and their health status, this study does not analyze the frequency of physical activity of the urban poor population after they participate in health insurance. However, the comparison of the two groups could be studied as a new topic in the future.

Data availability statement

Publicly available datasets were analyzed in this study. This data can be found at: http://www.isss.pku.edu.cn/cfps/.

Author contributions

BH was responsible for writing and contributed to the conception of the work, data analysis and interpretation, and drafting the article. SH and YW contributed to the data collection, data analysis and interpretation, and give important revising suggestions. All authors contributed to the article and approved the submitted version.

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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.

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When helping is risky: The influence of ethical attributes on consumers' willingness to buy farmer-assisting agricultural products online

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Chinese e-commerce platforms have long helped to sell agricultural products through farmer-assisting marketing activities, effectively alleviating the problem of stagnant agricultural products in some areas, and have become a valuable cause-related marketing strategy. The ethical attributes of farmer-assisting agricultural products have unique value compared with other agricultural products. However, the existing research rarely pays attention to the influence of the ethical attributes of farmer-assisting agricultural products on consumers' willingness to buy farmer-assisting agricultural products online. Based on collective efficacy theory and risk perception theory, this study systematically explores the influence mechanism of ethical attributes (symbolic ethical attribute and functional ethical attribute) on consumers' willingness to buy farmer-assisting agricultural products online through three situational experiments. The results show that compared with functional ethical attributes, symbolic ethical attributes have a more positive impact on consumers' willingness to buy farmer-assisting agricultural products online. In addition, it further reveals two mediating pathways of ethical effects (collective efficacy and risk perception) and boundaries (emergency of farmer-assisting events). This study helps to understand the ethical attributes of farmer-assisting agricultural products, and provides some practical suggestions for e-commerce enterprises implementing farmer-assisting marketing communication activities or marketers developing and promoting farmer-assisting agricultural products.

Introduction

Unlike traditional promotions, e-commerce-assisted agricultural marketing is an innovative model that links the social support of e-commerce platforms to the sales of farmer-assisting agricultural products (Lee and Charles, 2021). In fact, since the outbreak of the COVID-19 pandemic, Chinese e-commerce platforms have helped sell agricultural products through farmer-assisting marketing activities, effectively alleviating the problem of stagnant agricultural products in some areas and reducing the impact of the epidemic on farmers' income loss (Gu and Wang, 2020). In 2021, the e-tailing volume of agricultural products recorded in China reached 422.1 billion yuan, up 2.8% year on year, but only accounted for 4% of the e-tailing volume of physical goods, said a report on E-Commerce in China (2021) released by the Chinese Ministry of Commerce. The above data fully demonstrates that although the e-commerce of agricultural products in China is gradually developing, its penetration rate is still relatively low. Thus, if we want to promote growth in rural incomes further, it is essential to fully utilize the active role of digital technology in rural revitalization. In face of the COVID-19 pandemic, e-commerce-assisted agricultural marketing has become a valuable cause-related marketing strategy, which can not only sell stagnant agricultural products but also force rural advantageous and characteristic industries to become bigger, stronger, and better, and develop into an important channel for online sales of agricultural products (Xiao et al., 2021). In terms of e-commerce-assisted agricultural marketing, this study also refers to the relevant research on cause-related marketing (Guerreiro et al., 2016).

E-commerce-assisted agricultural marketing has received more and more attention and support (Li et al., 2022). It is essentially a moral economic behavior that people's purchasing behavior is imbued with good moral value by encouraging consumers to buy agricultural products, with the help of moral mobilization (Mai and Li, 2014; Han et al., 2018). Thus, the purchase of farmer-assisting agricultural products by consumers is essentially a kind of "ethical consumption" (Quan, 2021). Ethical consumption is defined as a type of product purchased by consumers that contains not only direct use value but also other attribute values (such as social development or environmental sustainability; Long and Murray, 2013). Wang et al. (2021) revealed that ethical attributes are the main motivation for consumers to buy agricultural products online from poor areas and to pay more. Thus, ethical attributes are a potential influence on consumers' purchase of farmer-assisting agricultural products, and this study uses the term "ethical effect" to refer to this influence. This effect is similar to earlier studies on prosocial behavior, green consumption, and fair-trade consumption, but these studies also point to the complexity of consumers' consumption decisions for products with ethical attributes (Herédia-Colaço and Coelho do Vale, 2018). The studies by Bodur et al. (2014) and Herédia-Colaço and Coelho do Vale (2018) have emphasized the importance of alignment of ethical attributes and

product category interests. Customers could be worried about buying things with moral qualities that fall short in terms of utility and quality for normal use (Mai et al., 2019). However, unlike the general type of ethical commodities previously investigated, farmer-assisting agricultural products not only satisfy the private utility value of consumer health and safety but also reflect the public utility value of assisting struggling farmers (Wang et al., 2021; Zeng Q. Y. et al., 2021). As a result, earlier research on ethical consumption motives for general types of products is no longer useful in assessing and forecasting consumer purchase decision problems involving farmer-assistance agricultural products. Agriculture products are the most important component in the e-commerce-assisted agriculture marketing scenario for gaining market recognition, and it is necessary to explore further the deeply embedded psychological mechanisms and theoretical logic of the influence of their ethical attributes on consumers' decisions to purchase assisted agriculture products online.

In the past, most scholars have focused on the psychological variables of the individual level of philanthropists to research ethical consumption issues. For example, philanthropists formed positive ethical consumption attitudes, willingness, or behaviors based on psychological factors such as ethical values, empathy, guilt relief, or personal cost-effectiveness (Yang et al., 2014; Savary and Goldsmith, 2020). However, Fritsche et al. (2018) questioned the individualistic view and emphasized that the collective dimension of ethical consumption should be addressed. When consumers are concerned about collective goals, demand for social welfare products increases (Simpson et al., 2021), especially in the network, the positive dynamic events can enhance the network collective behavior intention through the digital emotion infection (Goldenberg and Gross, 2020; Xie and Li, 2022). Thus, although some studies have indicated that the e-commerce platform has the potential for farmer-assisting and poverty alleviation (Peng et al., 2021; Li et al., 2022; Zeng et al., 2022), few scholars consider the role of social media communication in the psychological process of consumers' online shopping for farmer-assisting agricultural products. In particular, there are few related studies on collective efficacy based on e-commerce platform (Hornsey et al., 2021; Lee and Littles, 2021; Valizadeh et al., 2022). This study argues that the concept of collective efficacy is an essential supplement to ethical consumption research. It is necessary to further study the potential mechanism of the influence of ethical attributes on consumers' willingness to buy farmer-assisting agricultural products online from the perspective of collective efficacy.

Furthermore, in online retail, the physical distance between the online retailer and the consumer generates Internet ethics concerns among consumers (Lee and Charles, 2021). As an illustration, some online retailers "trap" consumers through false and exaggerated "tragic marketing" tricks (Zhou, 2020). Fresh agricultural products are relatively non-standardized products, and quality issues such as shoddy products and inconsistent pictures exacerbate risk concerns in the e-commerce environment (Fan and Liu, 2021). Previous research has found that the degree

to which consumers are willing to take risks also affects their willingness to help others when doing so may expose them to certain risks (Gangadharan et al., 2019; Beaud et al., 2022; Costa et al., 2022). Consumers' decision to buy farmer-assisting agricultural products with ethical attributes online is complicated by the potential conflict of interest between individual goals (immediate product benefits) and long-term collective goals (contributing to social well-being).

The significance of a product's ethical attributes for marketers seeking to differentiate their products cannot be overstated, as acknowledged by the vast majority of academics (Iweala et al., 2019; Hindsley et al., 2020; Quan, 2021). However, it is crucial to consider what ethical attributes agricultural products should have in order to increase consumers' willingness to buy farmer-assisting agricultural products online. What is the underlying mechanism behind the ethical effect? Where are the boundaries of ethical effect? To address the above issues, this study focuses on the special nature of farmer-assisting agricultural products themselves (i.e., ethical attributes), and explores the differences between different ethical attributes (symbolic and functional) on the intrinsic drivers in the formation of consumers' online purchase decisions through the introduction the collective efficacy theory and risk perception theory. Simultaneously, various scenarios of the urgency of farmer-assisting events are introduced in order to identify clear boundaries.

The study is innovative in three aspects. First, in cause-related marketing activities, scholars have explored the impact on consumer behavioral decisions from marketing strategies such as victim's image (Homer, 2021; Zhou et al., 2021), victim's recognizability (Hou et al., 2022), and advertising personalization (Kim and Kim, 2022). However, few studies have focused on product attributes. This study broadens the research viewpoint on cause-related marketing by examining the relationship between the ethical attributes of farmer-assistance agricultural products and consumers' willingness to buy online. This study distinguishes between symbolic and functional ethical attributes and compares them. Incorporating collective efficacy theory and risk perception

theory clarifies the psychological mechanisms by which the two ethical attributes effect consumers' willingness to purchase agricultural products online. Second, this study identified the importance of collective efficacy and risk perception for consumers to understand the significance of e-commerce-assisted agricultural marketing activities, thereby contributing to relevant research on collective efficacy and risk perception theories. Third, the moderating effect of the urgency of farmer-assisting events (sudden disaster scenario and normative difficulty scenario) on the relationship between ethical attributes and consumers' online purchase decisions was investigated. The interaction of the two has a significant effect on customers' willingness to buy farmer-assisting agricultural online, so complementing prior research on consumers' ethical consumption. In summary, the findings of this study provide a necessary theoretical basis for e-commerce platforms to effectively develop farmer-assisting marketing strategies, thus helping agricultural products access the market and enhancing farmers' income, as well as rural revitalization.

Theoretical backgrounds

Ethical attributes of farmer-assisting agricultural products

Ethical attributes refer to product attributes that reflect social fairness, environmental protection, and other ethical issues. Bezençon et al. (2020) have revealed that purchasing products with ethical attributes (e.g., EcoConscious or No Child Labor statement) can reflect their concerns and support for social or ethical issues, but has nothing to do with the function of the product itself. Thus, ethical attributes also refer to symbolic ethical attributes to a certain extent (Peloza et al., 2013; Sama et al., 2018; Hindsley et al., 2020; Tofighi et al., 2020; Das et al., 2021; Wang et al., 2021; Salam et al., 2022; see Table 1). Unlike previous research, Bodur et al. (2014) believed that products with ethical attributes also have functional benefits at the same time. Ethical

TABLE 1 Literature on ethical attributes.

Reference	Topic	Ethical attributes	Ethical-related intention
Peloza et al. (2013)	Green marketing	Environmental sustainability	Product preference
Sama et al. (2018)	Fair trade	Socio-environmental responsibility	Willingness to pay premiums
Hindsley et al. (2020)	Direct-trade coffee	Farmers receive a premium amount，harvesting method is sustainable	Willingness to pay premiums
Tofighi et al. (2020)	Sustainable brands	Positive implications for the environment, human rights, social issues, and animal welfare	Brand evaluations
Das et al. (2021)	Gift-giving	Made of eco-friendly ingredients	Purchase intention
Wang et al. (2021)	Poverty alleviation consumption	Apples from poverty-stricken areas	Willingness to pay
Salam et al. (2022)	Organic food consumption	Ethical production	Purchase intention
Previous studies	Focus on standardized products consumption	Focuses on symbolic benefits of ethical attributes	
This paper	Non-standardized fresh produce consumption	Focus on symbolic ethical attributes and functional ethical attributes	Consumers' willingness to buy farmer-assisting agricultural products online

attributes can generally be divided into functional ethical attributes (such as product performance, safety, etc.) and symbolic ethical attributes (such as public welfare, social responsibility, etc.; Bodur et al., 2014; Tofighi et al., 2020).

Consumers' purchasing decisions are based on evaluations and needs for product-specific attributes. A necessary condition for promoting e-commerce-assisted agricultural marketing in consumer groups is that consumers have an effective demand for farmer-assisting agricultural products. This demand depends on whether farmer-assisting agricultural products can bring special value to consumers compared with traditional e-commerce agricultural products. Thus, according to the difference in the characteristics of ethical attributes, consumers' demand for farmer-assisting agricultural products can be divided into two situations: on the one hand, farmer-assisting agricultural products convey the message of "functional ethical attributes," emphasizing the advantages of naturalness, safety and taste, and meeting consumers' practical needs in terms of functionality. The common perception is that the land in remote mountainous areas is fertile, the environment is not polluted, the production conditions are more traditional, and the products are healthier and more nutritious (Wang et al., 2018). On the other hand, farmer-assisting agricultural products convey the message of "symbolic ethical attributes," emphasizing that the products have the characteristics of helping trapped or impoverished farmers, and can meet the emotional needs of consumers in terms of morality and emotion. Zeng Q. Y. et al. (2021) revealed that helping farmers is the most common motivation for consumers to buy farmer-assisting agricultural products.

In general, most of the existing research on the ethical attributes of farmer-assisting agricultural products is still limited to the symbolic value of the product, ignoring the functional value of the product such as safety and taste. Thus, further systematic analysis of the ethical attributes of farmer-assisting agricultural products is required.

Collective efficacy

Collective efficacy originates from psychology and sociology and is based on the development of self-efficacy theory. Bandura (2002) defined collective efficacy as an individual's belief in the collective ability of the collective to effectively achieve a goal. Thus, collective efficacy is not the ability of the group itself, but the individual's perception of the collective ability. When a majority of the group expresses support and appreciation for prosocial activities, individuals respond to others' prosocial behavioral expectations by adjusting their behavioral willingness to participate in environmental protection activities (Bamberg et al., 2015), plastic reduction (Reese and Junge, 2017), and recycling activities (Wang et al., 2020), etc.

Collective efficacy is considered one of the critical factors in collective activity research, and its importance has been explored in research contexts such as community activity (Carbone and McMillin, 2019), environmental protection (Higham et al., 2019; Hornsey et al., 2021), organizational leadership (Valizadeh et al., 2022), and political activity (Chapman et al., 2022). Valizadeh et al. (2022) pointed out that collective efficacy has a significant positive impact on social resilience in the COVID-19 pandemic. Zhao et al. (2022) also indicated that during the epidemic, people's participation efficacy motivates them to participate in online collective activities. Although there are few studies on collective efficacy in the context of e-commerce-assisted agricultural marketing, the above studies confirm the role of individuals' expected outcomes of collective power in stimulating pro-environmental actions and social participation intentions. Further, the study by Simpson et al. (2021) states that when the collective efficacy of crowdfunding participants is high, they will be motivated to pursue and accomplish goal outcome that benefits the collective. The results of this study also indicated that collective efficacy enhances consumer demand for socially beneficial products but does not affect the demand for self-interested products. Similarly, Li and Sun (2022) showed that altruistic appeals in green product advertising can motivate consumers to increase their purchase intentions when they are concerned about collective interests. Thus, collective efficacy theory provides a valuable perspective on how people view the ability and effectiveness of actions to solve the problem of farmer-assisting and poverty alleviation. Specifically, e-commerce-assisted agricultural marketing can enhance the demand for farmer-assisting agricultural products by increasing consumers' attention to collective goals. Based on the definition of Doran and Hanss (2022), this study defines the collective efficacy of farmer-assisting consumption as people's perception of the collective's ability to successfully help farmers solve the problem of stagnant agricultural products.

The urgency of farmer-assisting events

In cause-related marketing activities, consumers' judgment of the urgency of causal-related events will affect their attitudes and behavioral decisions (Luo and Lv, 2019). Zheng et al. (2019) divided cause-related events into two scenarios according to their urgency: long-term difficulty (e.g., poverty, pollution) and sudden disaster (e.g., epidemic, earthquake). People are more likely to donate to sudden disasters than to long-term difficulties. According to the attribution theory, when a company provides help to the people suffered a sudden disaster, not only the uncontrollable and unpredictable nature of the disaster can prevent people from blaming the victim, but also the company's behavior will also increase the consumer's sense of identity (Vanhamme et al., 2012; Chang et al., 2021). When a company conducts cause-related marketing campaigns on long-standing problems, it often leads consumers to associate with the company's

self-interested purpose (such as improving performance or reputation; Kuo and Rice, 2015; Zhang et al., 2020; Chang et al., 2021). Thus, the urgency of farmer-assisting events may affect consumers' decision-making on ethical behavior to a certain extent. Combined with previous studies on the urgency of cause-related events, this study also divides the urgency of farmer-assisting events into sudden disasters and normative difficulties. A sudden disaster scenario refers to carrying out farmer-assisting activities for the problem of stagnant agricultural products caused by sudden disasters; a normative difficulty scenario refers to carrying out farmer-assisting activities for the long-term disharmony between the production and marketing of agricultural products in poor areas.

Research hypotheses

Ethical attributes and consumers' willingness to buy farmer-assisting agricultural products online

Ethical attributes play a crucial role in consumers' ethical consumption (Bezençon et al., 2020; Tofighi et al., 2020; Das et al., 2021). Both symbolic ethical attributes and functional ethical attributes can bring utility to consumers (Zeng Q. Y. et al., 2021). Herédia-Colaço and Coelho do Vale (2018) and Iweala et al. (2019) found that organic products with symbolic ethical attributes (e.g., environmental protection, animal welfare) lead to higher ratings by consumers. Thus, the symbolic ethical attributes of products are considered to be an important factor affecting the ethical consumption of consumers. With the improvement of consumers' awareness of food safety, the actual demand for high-quality agricultural products is also increasing. The natural health attributes and local characteristics of farmer-assisting agricultural products perfectly fit the consumer's interest motives (Zeng Y. C. et al., 2021). In particular, self-interest motivation based on natural health attributes has repeatedly appeared in consumer purchasing decision research (Chekima et al., 2017; Zhou et al., 2017). On that basis, this study believes that the two types of ethical attributes will have a positive impact on consumers' willingness to buy farmer-assisting agricultural products online.

Further, some scholars have indicated that consumers also face attribute trade-offs when purchasing ethical products with multiple attributes (Araque-Padilla et al., 2015). When products are rated low, symbolic ethical attributes are more likely than functional ethical attributes (or other attributes) to give consumers the pleasure and satisfaction derived from the perceived assessment of contributing to the well-being of society (Bezençon et al., 2020). For example, in the fresh products e-commerce scenario, the uncertainty of the quality and standardization of fresh agricultural products also further leads to lower overall consumer evaluation of online agricultural products. Thus, compared with functional ethical attributes, the symbolic ethical attributes of farmer-assisting agricultural products can more

directly convey the social benefits of farmer-assisting to consumers, thereby increasing consumer evaluation and willingness to purchase online. Based on the above analysis, this study proposes the following hypothesis:

> *H1*: Ethical attributes influence consumers' willingness to buy farmer-assisting agricultural products online, and symbolic ethical attributes have a more positive impact on consumers' willingness to buy farmer-assisting agricultural products online compared to functional ethical attributes.

Ethical attributes and consumers' willingness to buy farmer-assisting agricultural products online: The mediating effect of collective efficacy

Consumers' participation in cause-related marketing activities is not only a prosocial behavior but can also be considered a collective activity (Hou et al., 2022). The study by Alavi and McCormick (2018) showed that collective efficacy determines an individual's attempts and efforts to engage in collective activities. For example, Doran and Hanss (2022) found that sustainable environmental protection actions can only be promoted when people recognize the value of collective efforts. Thus, as a type of collective activity, farmer-assisting consumption requires not only individual efforts but also collective efforts to jointly address.

Based on social identity theory, Arslanagic-Kalajdzic et al. (2022) discovered that moral appeals related to social issues will activate cohesion within consumer groups and increase the likelihood of positive behavioral responses, such as generating purchase intentions. van Zomeren et al. (2012) combined moral beliefs with a social identity model of collective activity, and pointed out that moral beliefs positively affect collective efficacy and can predict collective activity intentions. Similarly, this study infers that if farmer-assisting agricultural products convey ethical appeal and ethical value information to consumers, it can activate the sense of identity of individuals and groups, thereby forming collective efficacy. Although both types of ethical attributes of farmer-assisting agricultural products demonstrate the benefits of participating in activities, symbolic ethical attributes are designed to stimulate the moral feeling of helping others, while functional ethical attributes emphasize the practical utility of self-interest. Thus, symbolic ethical attributes are more in line with the public's ethical values, attract online audiences more widely, and form collective efficacy. Based on the above analysis, the following hypotheses are made:

> *H2a*: Ethical attributes affect consumers' collective efficacy, and symbolic ethical attributes can stimulate consumers' collective efficacy more than functional ethical attributes.

> *H2b*: Collective efficacy plays a mediating role between ethical attributes and consumers' willingness to buy farmer-assisting agricultural products online.

Ethical attributes and consumers' willingness to buy farmer-assisting agricultural products online: The mediating effect of risk perception

E-commerce-assisted agricultural marketing is a new scenario extended by the combination of cause-related activities and fresh online shopping. Compared with traditional offline cause-related marketing, consumers have information asymmetry before receiving goods, mainly facing risks in information search, product quality, logistics, and transportation, as well as after-sales service (Zhang et al., 2015), which also hinders consumers from frequently purchasing fresh agricultural products online to some extent (Zheng et al., 2020; Wu et al., 2022).

Scholars have pointed out that ethical attributes may come with liability, especially in terms of product quality, to mitigate consumer risk perceptions to some extent (Bodur et al., 2014). Xue et al. (2022) pointed out that the green image of the platform reflects the platform's commitment to social responsibility and sustainable development, which is conducive to enhancing consumer identification and reducing concerns. Thus, symbolic ethical attributes can, to a certain extent, improve product credibility and mitigate consumer risk perceptions. However, some scholars also found that it is not always beneficial for products to have ethical attributes. Based on zero-sum heuristic research, consumers may equate a product's ethical attributes with its lower functional attributes (Chernev, 2007; Mai et al., 2019), i.e., positioning an ethical product as a "humanitarian" but less functional product. A typical example is when a functional product (such as laundry detergent) is labeled as ethical (compared to no label), consumers will use a larger amount (Lin and Chang, 2012). Quan (2021) emphasized that although farmer-assisting agricultural products convey information about functional ethical attributes such as health and safety to consumers, concerns about product quality may affect purchase intentions to some extent due to the low level of consumers' overall knowledge about the quality and function of cause-related products. Thus, this study argues that consumers' attitudes toward the farmer-assisting agricultural products with functional ethical attributes tend to be based on more rational or practical considerations, resulting in more risk perceptions. In contrast, the symbolic ethical attribute of farmer-assisting agricultural products is conducive to stimulating positive associations among consumers, thus reducing risk perceptions. Based on the above analysis, the following hypotheses are proposed:

H3a: Ethical attributes affect consumers' risk perception, and symbolic ethical attributes can alleviate consumers' risk perception more than functional ethical attributes.

H3b: Risk perception plays a mediating role between ethical attributes and consumers' willingness to buy farmer-assisting agricultural products online.

The moderating effect of the urgency of farmer-assisting events

External environmental issues have a significant moderating effect on the relationship between consumers' cognitive values and ethical consumption willingness (Kushwah et al., 2019). Thus, consumers' cognition and value judgment on the characteristics of ethical attributes will be greatly affected by the urgency of the farmer-assisting event. Specifically, the study by Hou et al. (2022) showed that consumers tend to provide more help for tangibly identifiable individuals or events than for unidentified or normative events. That is, consumers are more responsive to a single sudden disaster scenario. Further, sudden disasters receive more social media coverage and appeals than ongoing difficulties, which tend to resonate with the public and create a resonance effect (Vanhamme et al., 2012). For example, the epidemic has rapidly driven the social ethics of "one side in trouble, all sides support," and the general public voluntarily joins and establishes emergency organic relationships under the social media "positive energy" propaganda (Zhang and Meng, 2021). At the same time, the real-time dynamic information delivered by social media further helps consumers understand the progress and effectiveness of the emergency, activating some positive cognitive evaluation while alleviating risk concerns (Mirbabaie et al., 2021). However, in an emergency, if the information involves functional factors, it will increase the sensitivity and vigilance of consumers (Liu et al., 2022). Based on this, this study argues that in sudden disaster scenarios, symbolic ethical attributes are more effective in enhancing consumers' ethical emotions, and communication and interaction through social media can further enhance collective efficacy and mitigate risk perceptions, thus promoting consumers' willingness to buy farmer-assisting agricultural products. However, as the scale of the group in need of help increases, consumers will perceive an increase in the difficulty of helping (Sharma and Morwitz, 2016). In contrast, in a normative difficulty scenario, farmer-assisting events will not attract strong social attention and consumers will not be able to see the effect of farmer-assisting in the short term (Salam et al., 2022), thus ignoring the difference between the two types of ethical attributes to some extent. Thus, there is no significant difference between the collective efficacy and risk perceptions inspired by symbolic and functional ethical attributes. Based on the above analysis, this study proposes the following hypotheses:

H4: The urgency of farmer-assisting events moderates between ethical attributes and collective efficacy. When in a sudden disaster scenario, symbolic ethical attributes elicit more collective efficacy among consumers than functional ethical attributes. When in a normative difficulty scenario, there is no difference in the collective efficacy induced by functional ethical attributes and symbolic ethical attributes.

H5: The urgency of farmer-assisting events moderates between ethical attributes and risk perception. When in a
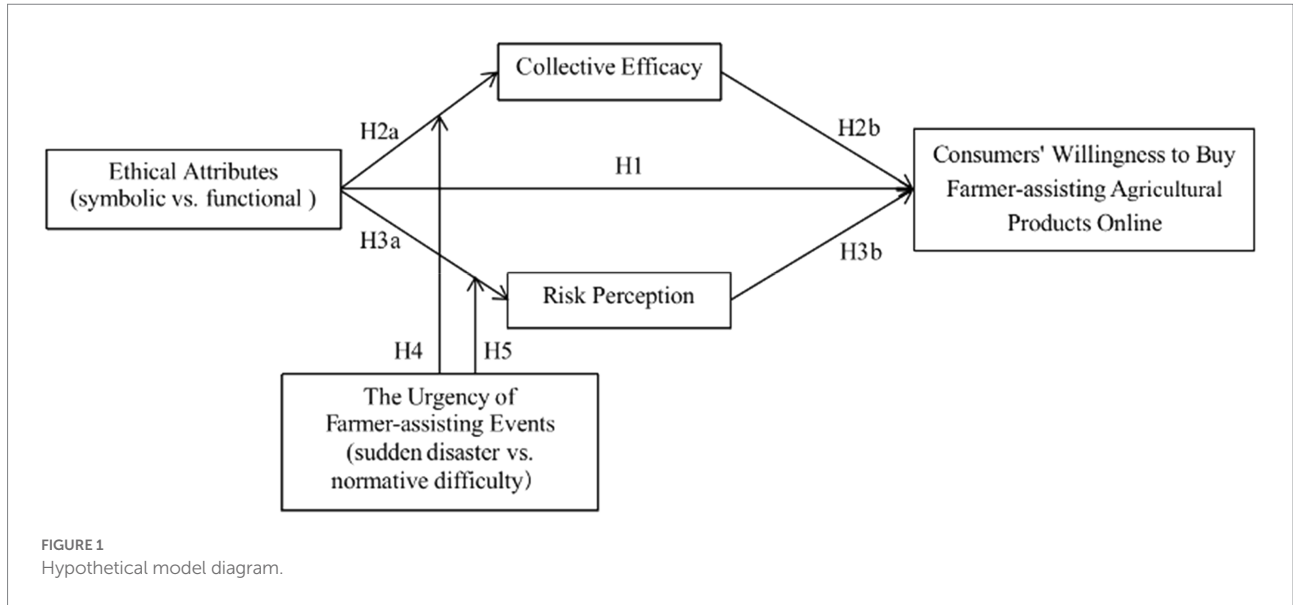
FIGURE 1
Hypothetical model diagram.

TABLE 2 Outline of the studies.

Effect/hypothesis	Tested in	Subject source	Independent variable manipulation	Variable measurement
Main effect: H1	Study 1	Credamo platform 150 subjects	3 (functional ethical attribute vs. symbolic ethical attribute vs. non-ethical attribute)	Consumers' willingness to buy farmer-assisting agricultural products online
Mediating effect: H2	Study 2	Credamo platform 110 subjects	2 (functional ethical attribute vs. symbolic ethical attribute)	Consumers' willingness to buy farmer-assisting agricultural products online; Collective efficacy; Risk perception
Moderating effect: H3	Study 3	Credamo platform 180 subjects	2 (functional ethical attribute vs. symbolic ethical attribute) * 2 (sudden disaster scenario vs. normative difficulty scenario)	Consumers' willingness to buy farmer-assisting agricultural products online; Collective efficacy; Risk perception

sudden disaster scenario, symbolic ethical attributes mitigate consumers' risk perceptions more than functional ethical attributes. When in a normative difficulty scenario, functional ethical attributes do not differ from symbolic ethical attributes in terms of consumers' risk perceptions.

Based on the above theoretical basis and discussion, this study proposes a research model on the influence of ethical attributes on consumers' willingness to buy farmer-assisting agricultural products online. The details are as follows (see Figure 1).

Study design and results analysis

This study used an online behavioral experiment research method to verify the causal relationship between the independent and dependent variables. Expressly, we set up an experimental scenario of selling farmer-assisting agricultural products on an e-commerce platform. Subjects were asked to view different information and pictures of farmer-assisting agricultural products and play the role of consumers in making online purchase choices. Finally, we compare the differences in consumers' willingness to buy farmer-assisting agricultural products online between different groups to test the hypothesis. Overall, three experiments were conducted to test these hypotheses (see Table 2). In Study 1, we tested the main effect of ethical attributes on consumers' willingness to buy farmer-assisting agricultural products online. Through Study 2, we re-validated the main effect and evaluated the mediating role of collective efficacy and risk perception. In Study 3, the moderating effects of the urgency of farmer-assisting events were investigated. The ethical attributes of farmer-assisting agricultural products were manipulated in two different ways: as orange pictures containing "character" images in Study 1; as orange pictures without "character" images in Study 2 and Study 3. The online experiments were conducted on the Credamo platform, which has been accepted in many refereed journals and has resulted in many excellent papers (Huang and Jaideep, 2020; Gai and Puntoni, 2021).

Pre-test

The purpose of the pre-test is to identify the farmer-assisting agricultural products for formal experiments. Through interviews with 10 consumers who have experience in purchasing farmer-assisting agricultural products, the types of farmer-assisting agricultural products with high familiarity with the e-commerce platform have been preliminarily determined, including fruits such as oranges and apples, and vegetables such as potatoes and garlic. Furthermore, 30 respondents were randomly selected using a convenience sample questionnaire to answer the question "How familiar are you with the following farmer-assisting fruits or vegetables" (1 = "very unfamiliar"; 7 = "very familiar"). The results showed that consumers have the highest familiarity score with farmer-assisting oranges, M = 5.41. Thus, this study selects oranges as the following experimental materials.

Study 1: The influence of ethical attributes on consumers' willingness to buy farmer-assisting agricultural products online

Pre-experiment

The purpose of the pre-experiment is to test the validity of the experimental stimuli reflecting two dimensions of ethical attributes (functional ethical attributes and symbolic ethical attributes). Referring to the experimental materials and experimental process design of Bodur et al. (2014) and Bezençon et al. (2020), this study adopts a scenario simulation experimental method and the stimuli are in the form of "pictures + text." Oranges in A area from the Taobao Baba Farm love channel are selected as the material, which has both "health" and "public welfare" ethical attributes.

The pre-experiment randomly selected 30 subjects (%females = 53.3%, $M_{age} = 26.690$ years, SD = 3.854) through the sample recommendation service of the Credamo platform. First, all the subjects were presented with the same introduction scenario materials, that is, a kind of stagnant oranges (29.9 yuan, 5 catties, 75–85 mm) in A area is noticed on the e-commerce platform. The subjects then randomly watched one of the two sets of materials presented. The first group read the pictorial material describing the functional ethical properties of the stagnant oranges. The specific content is "the original ecological planting of oranges in A area, sweet and moisturizing with no inflammation, rich in vitamin C, good for beauty and skincare." The second group read pictures and materials that describe the symbolic ethical attributes of the stagnant oranges. The specific content is "the oranges in A area are hard to find a way to sell, and the mountain farmers are growing them with great effort and urgently need your support." After the subjects read the above materials, they rated the ethical attribute information of the stagnant oranges on the Semantic Difference Scale (1 = "functional ethical attributes," 7 = "symbolic ethical attributes"). The independent

sample t-test results showed that the mean scores of the first group and the second group were significantly different ($M_{symbolic} = 5.933$, SD = 0.961 vs. $M_{functional} = 2.267$, SD = 1.486; t(28) = 8.023, p < 0.001), and the stimuli in this group were preliminarily considered to be effective. The effect on perceived ethical attributes was further tested by analysis of covariance (ANCOVA) when controlling for the age and gender of the subjects, and the results were consistent with one-way ANOVA. The specific results were no significant effect of gender on ethical attributes [$F(1, 26) = 1.325, p = 0.265$] and no significant effect of age on ethical attributes [$F(1, 26) = 1.821, p = 0.189$; for brevity, this test was conducted for all the following experiments, but the results of this step of the analysis are not presented].

Formal experiments

The purpose of study 1 is to test the influence of ethical attributes on consumers' willingness to buy farmer-assisting agricultural products online, i.e., testing hypothesis H1. A single-factor three-level (functional ethical attribute vs. symbolic ethical attribute vs. non-ethical attribute) between-group experiment was designed. The formal experiment recruited 150 subjects (%females = 51.3%, $M_{age} = 31.967$ years, SD = 6.925) on the Credamo platform, and randomly assigned the subjects to the symbolic ethical attribute group, functional ethical attribute group, and non-ethical attribute group (control group). The three groups of subjects read the experimental materials in the pre-experiment. The experimental materials of the non-ethical attribute group are the same stagnant orange pictures as the ethical attribute group, but there is no ethical attribute text on the picture (see Figure 2). After the subjects read it, they filled in the items of consumers' willingness to buy farmer-assisting agricultural products online and demographic information. The questionnaire of consumers' willingness to buy farmer-assisting agricultural products online was adapted from the study of Zhou et al. (2021), with a total of six questions, including "I plan to buy this orange online," "If necessary, I am willing to buy this orange online," etc. The question items were assessed using the 7-point Likert scale with 1 = "strongly disagree" and 7 = "strongly agree." After excluding 30 invalid questionnaires, 40 valid questionnaires were obtained for the functional ethical attribute group, 40 for the symbolic ethical attribute group, and 40 for the non-ethical attribute group (control group).

Analysis of results

First, the Cronbach's alpha value of consumers' willingness to buy farmer-assisting agricultural products online was 0.788, which was greater than 0.7, and the scale passed the reliability test. Leven's test showed that $F(2, 117) = 1.218, p = 0.299$, further one-way ANOVA can be carried out (All series of experimental analyses of the research passed this test. For the sake of brevity, the following experimental results are omitted to report the data results of this step). Secondly, one-way ANOVA results showed that the influence of symbolic ethical attributes, functional ethical attributes, and non-ethical attributes on consumers' willingness
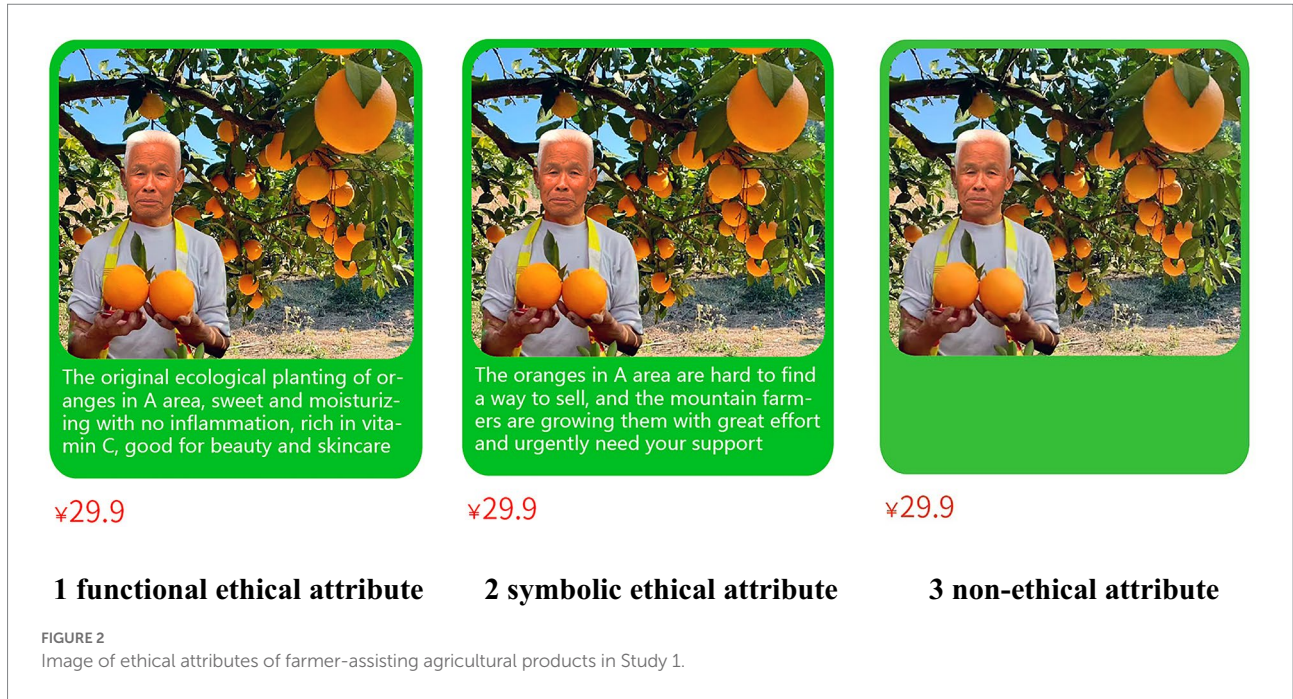
FIGURE 2
Image of ethical attributes of farmer-assisting agricultural products in Study 1.

TABLE 3 Test results of consumers' willingness to buy farmer-assisting agricultural products online.

(I) Group	(J) Group	Mean difference (J − I)	SD	95%CI	
				LLCI	ULCI
Non-ethical attribute (control group)	Symbolic ethical attribute	0.758*	0.111	−1.023	−0.494
	Functional ethical attribute	0.442*	0.111	−0.706	−0.177
Functional ethical attribute	Symbolic ethical attribute	0.316*	0.111	0.052	0.581

*$p < 0.05$.

to buy farmer-assisting agricultural products online was significantly different [$F(2, 117) = 23.422$, $p < 0.001$]. Finally, Turkey's HSD multiple post-test results showed (see Table 3) that symbolic ethical attribute group ($M_{difference} = 0.758$, $p < 0.05$) and functional ethical attribute group ($M_{difference} = 0.442$, $p < 0.05$) were more willing to buy farmer-assisting agricultural products online than non-ethical attribute group (the control group). Furthermore, consumers' willingness to buy farmer-assisting agricultural products online in symbolic ethical attribute group was significantly higher than that in the functional ethical attribute group ($M_{difference} = 0.442$, $p < 0.05$). The results of the independent samples t-test also indicate (see Table 4) symbolic ethical attribute group is more likely to increase consumers' willingness to buy farmer-assisting agricultural products online than the functional ethical attribute group [$M_{symbolic} = 6.083$, $SD = 0.571$ vs. $M_{functional} = 5.767$, $SD = 0.392$, $t(78) = 3.792$, $p = 0.002$].

In conclusion, Study 1 preliminarily proved that compared with the non-ethical attribute, the ethical attribute can significantly improve the willingness of consumers to buy farmer-assisting agricultural products online. Compared with the functional ethical attribute, the symbolic ethical attribute can significantly

improve the consumers' willingness to buy farmer-assisting agricultural products online. Thus, hypothesis H1 is validly verified. In Study 1, the usual marketing stimuli materials, that is, "character" images, were used to meet the real consumption scenarios to a large extent. However, as far as the experimental results are concerned, the presence of "character" images increases the experimental error. Thus, in Study 2, the "character" image in the above stimuli was eliminated, and new stimuli were formed to further explore the mediating effect of collective efficacy and risk perception.

Study 2: The mediating effect of collective efficacy and risk perception

Pre-experiment

The pre-experiment of Study 2 replicated the pre-experiment of Study 1, but the image of farmers was removed from the pictorial material. In this study, 30 subjects (%females = 46.7%, $M_{Age} = 25.033$ years, $SD = 3.843$) were randomly selected through the sample recommendation service of the Credamo platform. The results showed that there were significant differences in the

material scores of the subjects for symbolic ethical attributes and functional ethical attributes [$M_{symbolic} = 5.250$, SD = 1.199 vs. $M_{functional} = 2.643$, SD = 2.061; $t(28) = 4.108$, $p < 0.001$]. Thus, this set of stimuli was proved to be effective.

Formal experiments

The purpose of Study 2 is, first, to revalidate the results of Study 1 and enhance the internal validity of the theoretical model, i.e., to exclude the interference of farmer's images; second, to test the mediating effects of collective efficacy and risk perception, i.e., to test hypotheses H2a, H2b, H3a, and H3b. A one-way two-level between-group experiment (symbolic ethical attributes vs. functional ethical attributes) was designed. The formal experiment recruited 110 subjects (%females = 50.9%, $M_{age} = 28.400$ years, SD = 8.190) on the Credamo platform. The subjects were randomly assigned to the symbolic ethical attribute group and the functional ethical attribute group and read the experimental materials in the pre-experiment (see Figure 3). After reading the materials, the subjects were required to fill in the items of consumers' willingness to buy farmer-assisting agricultural products online, collective

efficacy, risk perception, and demographic characteristic. The scale of consumers' willingness to buy farmer-assisting agricultural products online was the same as in Study 1. The collective efficacy scale was adapted from the study of Doran and Hanss (2022), with four questions, such as "I believe that we as consumers can work together to solve the problem of stagnant oranges" and "I believe that we as consumers can contribute to farmer-assisting and poverty alleviation." Risk perception was adapted from the study of Zhang et al. (2015), with 4 questions, such as "I am worried that the oranges are inferior and the quality varies," "I am worried that the oranges will be damaged during transportation," etc. All scale items were on a 7-point Likert scale, with 1 = "strongly disagree" and 7 = "strongly agree." After eliminating 30 invalid questionnaires, 40 valid questionnaires were obtained for the functional ethical attribute group and 40 for the symbolic ethical attribute group.

Analysis of results

First, a reliability test was performed. The results showed that the Cronbach's alpha value of consumers' willingness to

TABLE 4 Results of independent samples *t*-test.

Variable	Factors	Mean value	SD	T	95%CI	
					LLCI	ULCI
Consumers' willingness to buy farmer-assisting agricultural products online	Symbolic ethical attribute	6.083	0.571	3.133**	0.115	0.518
	Functional ethical attribute	5.767	0.392			

**$p < 0.01$.

FIGURE 3
Image of ethical attributes of farmer-assisting agricultural products in Study 2.
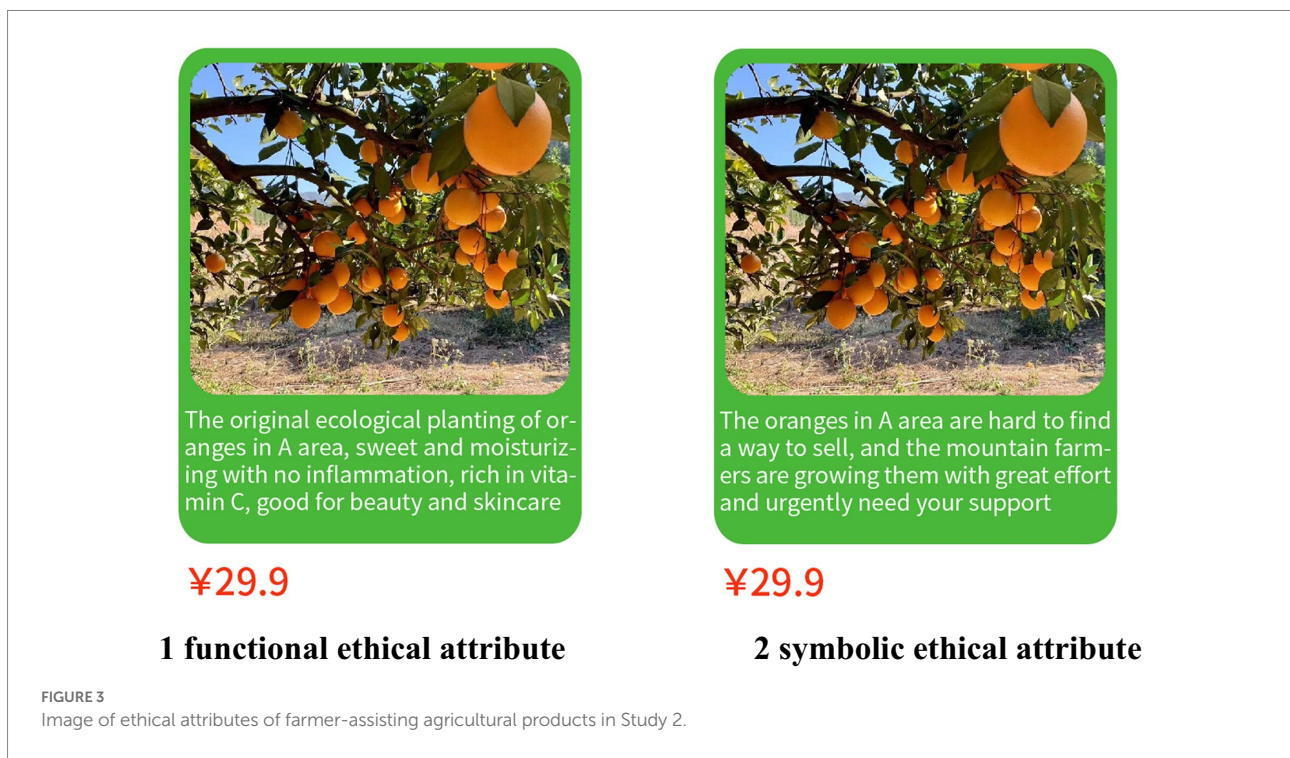
buy farmer-assisting agricultural products online was 0.844, the Cronbach's alpha value of collective efficacy was 0.804, and the Cronbach's alpha value of risk perception was 0.851, which were all greater than 0.7. Thus, each scale passed the reliability test.

Second, the independent sample t-test was used to verify the main effect of ethical attributes on consumers' willingness to buy farmer-assisting agricultural products online. The results showed that (see Table 5) compared with functional ethical attributes, consumers showed more willingness to buy farmer-assisting agricultural products with symbolic ethical attributes online [$M_{symbolic}$ = 5.758, SD = 0.406 vs. $M_{functional}$ = 5.358, SD = 0.518, $t(78)$ = 3.792, $p < 0.001$], thus the main effect was proved to be significant. The independent sample t-test was also used to test the influence of ethical attributes on mediating variables. The results showed that consumers showed higher collective efficacy [$M_{symbolic}$ = 5.404, SD = 0.429 vs. $M_{functional}$ = 5.062, SD = 0.477, $t(78)$ = 3.324, $p < 0.001$] and lower risk perception [$M_{symbolic}$ = 4.325, SD = 0.421 vs. $M_{functional}$ = 4.656, SD = 0.392, $t(78)$ = 3.596, $p < 0.001$] for the farmer-assisting agricultural products with symbolic ethical attributes. Thus, H1, H2a, and H3a were verified.

Finally, we examined the mediating effect of collective efficacy and risk perception. Using the process3.0 of the statistical software SPSS22.0, the number of Bootstrap sampling was set to 5,000, the

confidence interval was 95%, and model 4 was selected (Hayes, 2013). The results showed that the direct effect of ethical attributes on consumers' willingness to buy farmer-assisting agricultural products online was not significant ($\beta_{direct\ effect}$ = 0.063, 95%CI = [−0.044, 0.170], including 0), but the indirect effect was significant ($\beta_{indirect\ effect}$ = 0.343, 95%CI = [0.149, 0.564], not including 0). Specifically, the mediating effect of collective efficacy was significant (β = 0.210, 95%CI = [0.071, 0.378], not including 0). The mediating effect of risk perception was also significant (β = 0.133, 95%CI = [0.056, 0.235], not including 0), but smaller than collective efficacy (see Figure 4). Thus, collective efficacy and risk perception play a mediating effect between ethical attributes and consumers' willingness to buy farmer-assisting agricultural products online. Accordingly, hypotheses H2b and H3b were verified.

The results of Study 1 and Study 2 showed that, compared with functional ethical attributes, symbolic ethical attributes have a more positive impact on consumers' willingness to buy farmer-assisting agricultural products online, regardless of whether the image of farmers exists or not. Furthermore, ethical effects work through collective efficacy and risk perception, with collective efficacy playing a larger mediating role than risk perception. The first two studies briefly described the scenarios of farmer-assisting events, to explore the influence of ethical attributes on consumers' willingness to buy farmer-assisting agricultural products online. However, these

TABLE 5 Results of independent samples t-test.

Variable	Factors	Mean value	SD	T	95%CI	
					LLCI	ULCI
Consumers' willingness to buy farmer-assisting agricultural products online	Symbolic ethical attribute	5.758	0.406	3.792***	0.190	0.610
	Functional ethical attribute	5.358	0.518			
Collective efficacy	Symbolic ethical attribute	5.404	0.429	3.324***	0.137	0.546
	Functional ethical attribute	5.062	0.477			
Risk perception	Symbolic ethical attribute	4.344	0.421	−3.596***	−0.515	−0.148
	Functional ethical attribute	4.675	0.392			

***$p < 0.001$.

FIGURE 4
Statistical mediation diagrams for collective efficacy and risk perception. **$p < 0.01$, ***$p < 0.001$.
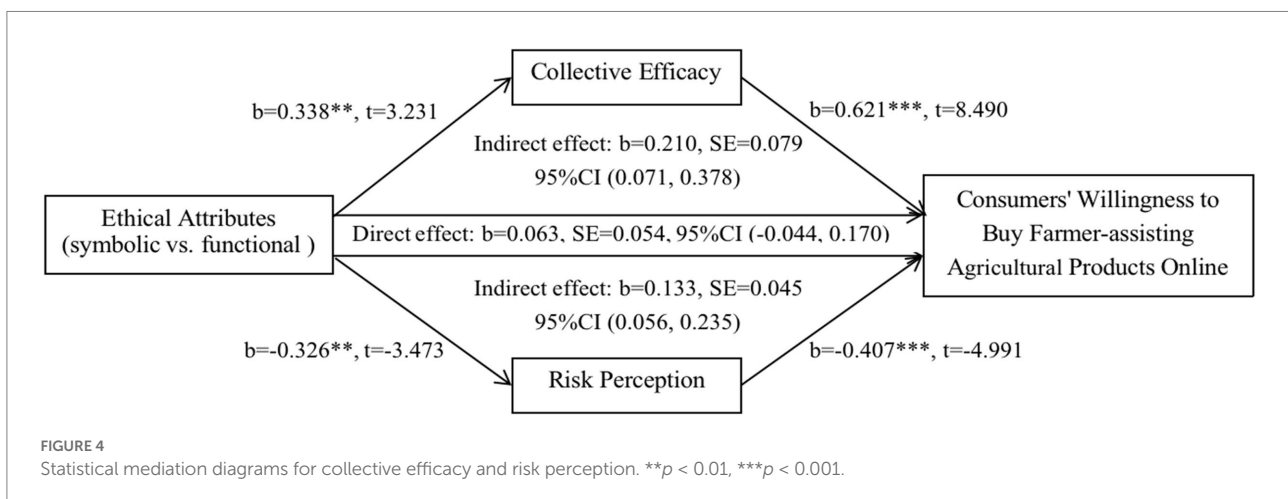
farmer-assisting event scenarios do not involve the expression and distinction of urgency. Thus, in Study 3, we studied how consumers' willingness to buy farmer-assisting agricultural products online changes with the urgency of farmer-assisting events to explore the boundary conditions for the influence of ethical attributes on consumers' willingness to buy farmer-assisting agricultural products online.

Study 3: Moderating role of the urgency of farmer-assisting events

Pre-experiment

The purpose of the pre-experiment is to test the validity of different farmer-assisting event urgency scenarios and experimental materials. Referring to the study of Zheng et al. (2019), the farmer-assisting event urgency was divided into the sudden disaster scenario group and the normative difficulty scenario group. In this study, a random sample of 60 subjects (%females = 51.7%, M_{Age} = 30.237 years, SD = 1.213), was surveyed through the sample recommendation service of the Credamo platform. First, the subjects were invited to watch a push message: the first group read "An earthquake occurred in A area, and oranges are stagnant"; the second group read "The remote mountainous region in A area, and oranges are stagnant." Then the semantic difference scale was used to rate the information on the urgency of the farmer-assisting event: "What do you think is the scenario in A area?" (1 = "sudden disaster scenario," 7 = "normative difficulty scenario"). The results showed that there was a significant difference between the subjects' ratings of the two groups [M_{sudden} = 3.438, SD = 1.848 vs. $M_{normative}$ = 5.724, SD = 1.461; $t(59)$ = −5.322, $p < 0.001$], and the stimulus for the urgency of the farmer-assisting event (i.e., the moderating variable) was tentatively considered valid. Experimental materials were selected from the same orange picture information in the Study 2 pre-experiment. The results showed that the subjects differed significantly [$M_{symbolic}$ = 5.600, SD = 0.932 vs. $M_{functional}$ = 2.133, SD = 1.074; $t(58)$ = 13.350, $p < 0.001$] on different dimensions of ethical attributes, and Thus, the ethical attributes (i.e., independent variables) stimulus was valid. Finally, after the subjects read the above materials, they were asked to fill in the Situational Authenticity Scale (7-point Likert scale, 1 = "strongly disagree" and 7 = "strongly agree"), i.e., the degree to which this scenario conforms to the real scenario. The results of the One Sample t-test showed that the subjects rated the scenario authenticity significantly higher than 5 [$M_{scenario\ authenticity}$ = 5.483, SD = 0.592, $t(59)$ = 6.278, $p < 0.001$].

Formal experiments

The purpose of Study 3 is to test the moderating effect of the urgency of farmer-assisting events based on the previous two studies, that is, the moderating effect of the urgency of farmer-assisting events between ethical attributes, collective efficacy, and consumers' willingness to buy farmer-assisting agricultural products online, as well as the moderating effect between ethical attributes, risk perception, and consumers' willingness to buy farmer-assisting

agricultural products online. A 2 (ethical attribute: functional ethical attribute vs. symbolic ethical attribute) × 2 (urgency of farmer-assisting events: sudden disaster scenario vs. normative difficulty scenario) between-group experimental design was designed. The formal experiment was carried out on the Cremado platform. A total of 180 subjects (%females = 52.2%, M_{age} = 30.240 years, SD = 6.89) were recruited, and the subjects were randomly assigned to one of 4 experimental scenario groups, namely sudden disaster × symbolic ethical attribute group, sudden disaster × functional ethical attribute group, normative difficulty × symbolic ethical attribute group, normative difficulty × functional ethical attribute group. First of all, the subjects read the urgency materials of farmer-assisting events in the pre-experiment, and then read the ethical attribute materials. After the four groups of subjects read the corresponding picture information, the subjects were asked to fill in the same questions as in Study 2, i.e., consumers' willingness to buy farmer-assisting agricultural products online, collective efficacy, and risk perception. All items used the 7-point Likert scale for evaluation with 1 = "strongly disagree" and 7 = "strongly agree." Finally, the demographic information was filled in. After excluding invalid questionnaires, there were 40 copies of each group, totaling 160 copies.

Analysis of results

First, a reliability test was performed. The results showed that the Cronbach's alpha value of consumers' willingness to buy farmer-assisting agricultural products online was 0.866, the Cronbach's alpha value of collective efficacy was 0.882, and the Cronbach's alpha value of risk perception was 0.815, all of which were greater than 0.7. Thus, each scale passed the reliability test.

Second, the results of the independent sample t-test showed that (see Table 6) the influence of symbolic ethical attributes and functional ethical attributes on consumers' willingness to buy farmer-assisting agricultural products online [$M_{symbolic}$ = 5.915, SD = 0.574 vs. $M_{functional}$ = 5.598, SD = 0.449, $t(158)$ = 3.865, $p < 0.001$], collective efficacy [$M_{symbolic}$ = 5.806, SD = 0.950 vs. $M_{functional}$ = 4.959, SD = 0.628, $t(158)$ = 7.726, $p < 0.001$], and risk perception [$M_{symbolic}$ = 3.338, SD = 0.712 vs. $M_{functional}$ = 3.956, SD = 0.398, $t(158)$ = −7.878, $p < 0.001$] were significantly different, that is, symbolic ethical attributes can stimulate consumers' willingness to buy farmer-assisting agricultural products online, collective efficacy, and reduce risk perception more than functional ethical attributes. Thus, hypotheses H1, H2a, and H3a were verified again.

Then, the moderating effects of the farmer-assisting event urgency on the ethical attributes, collective efficacy, and consumers' willingness to buy farmer-assisting agricultural products online, as well as moderating effects on ethical attributes, risk perception, and consumers' willingness to buy farmer-assisting agricultural products online were examined. The results of the two-way analysis of variance (Two-way ANOVA) showed that the interaction item of urgency and morality of farmer-assisting events had a significant impact on collective efficacy, $F(3, 156)$ = 64.204, $p < 0.001$. Further simple effect analysis (see Figure 5) found that in the sudden disaster scenario (group A), the collective efficacy of the subjects

TABLE 6 Results of independent samples *t*-test.

Variable	Factors	Mean value	SD	T	95%CI	
					LLCI	ULCI
Consumers' willingness to buy farmer-assisting agricultural products online	Symbolic ethical attribute	5.915	0.574	3.865***	0.155	0.478
	Functional ethical attribute	5.598	0.449			
Collective efficacy	Symbolic ethical attribute	5.806	0.429	7.726***	0.630	1.063
	Functional ethical attribute	4.959	0.628			
Risk perception	Symbolic ethical attribute	3.338	0.712	−7.878***	−0.774	−0.463
	Functional ethical attribute	3.956	0.398			

***$p < 0.001$.

FIGURE 5
Multiple comparisons of symbolic ethical attributes with functional ethical attributes. **(A)** in the sudden disaster scenario, results of Study 3 on collective efficacy; **(B)** in the normative difficulty scenario, results of Study 3 on collective efficacy; **(C)** in the sudden disaster scenario, results of Study 3 on risk perception; **(D)** in the normative difficulty scenario, results of Study 3 on risk perception. ***$p < 0.001$; ns is not significant.

in the symbolic ethical attribute group ($M_{symbolic} = 6.294$, SD = 0.374) was significantly higher than that in the functional ethical attribute group ($M_{functional} = 4.619$, SD = 0.512, $p < 0.001$). In the normative difficulty scenario (group B), there was no significant difference in the collective efficacy between the symbolic ethical attribute group

($M_{symbolic} = 5.320$, SD = 0.726) and the functional ethical attribute group ($M_{functional} = 5.300$, SD = 0.447, $p = 0.509$). Similarly, the interaction term between the farmer-assisting event urgency and ethical attributes had a significant impact on risk perception, $F(3, 156) = 50.966$, $p < 0.001$. The results of the simple effect analysis (see

Figure 3) showed that in the sudden disaster scenario (group C), the risk perception of the subjects in the symbolic ethical attribute group ($M_{symbolic}$ = 3.000, SD = 0.418) was significantly lower than that in the functional ethical attribute group ($M_{functional}$ = 4.131, SD = 0.447, p < 0.001). However, in the normative difficulty scenario (group D), there was no significant difference in risk perception between the symbolic ethical attribute group ($M_{symbolic}$ = 3.675, SD = 0.510) and the functional ethical attribute group ($M_{functional}$ = 3.781, SD = 0.225, p = 0.259).

In order to test the moderated mediation effect, we referred to the method proposed by Edwards and Lambert (2007) to test whether there is a difference in the size and significance of the mediation effect at the level of the moderation effect, to determine whether the mediation strength is moderated, so as to verify H4. Using process 3.3 of the statistical software SPSS22.0, the number of Bootstrap sampling was set to 5,000, the confidence interval was 95%, and model 7 (Hayes, 2013) was selected. The results showed that (see Table 7), the direct effect of ethical attributes and consumers' willingness to buy farmer-assisting agricultural products online did not reach a significant level ($\beta_{direct\ effect}$ = 0.080, 95%CI = [−0.179, 0.195], including 0) after adding collective efficacy and risk perception. In the normative difficulty scenario, the mediating effect of collective efficacy ($\beta_{indirect\ effect}$ = 0.004, 95%CI = [−0.078, 0.058], including 0) and risk perception ($\beta_{indirect\ effect}$ = 0.022, 95%CI = [−0.015, 0.065], including 0) did not reach a significant level. In the sudden disaster scenario, the mediating effect of ethical attributes → collective efficacy → consumers' willingness to buy farmer-assisting agricultural products online ($\beta_{indirect\ effect}$ = 0.354, 95%CI = [0.019, 0.684], not including 0), ethical attributes → risk perception → consumers' willingness to buy farmer-assisting agricultural products online ($\beta_{indirect\ effect}$ = 0.237, 95%CI = [0.061, 0.409], not including 0) reached a significant level, that is, H4 and H5 were verified. Thus, Study 3 further verified the boundary conditions for the existence of ethical effects by manipulating the urgency of farmer-assisting events.

Conclusion and theoretical contributions

Conclusion

This study begins with the socialization perspective of assisting farmers and aims to encourage the sustainable development of farmer-assisting agricultural consumption. Focusing on the ethical attributes of farmer-assisting agricultural products, we examine the effects of ethical attributes, the urgency of farmer-assisting events, and collective efficacy and risk perceptions on consumers' willingness to buy farmer-assisting agricultural products online. This paper explains why many high-quality agricultural products in China are not widely welcomed and provides a theoretical foundation for e-commerce platforms and farmers to overcome market barriers.

Drawing on three experimental studies, this study found that consumers' willingness to buy farmer-assisting agricultural products online was influenced by ethical attributes, while collective efficacy and risk perception mediate this effect, and that the urgency of farmer-assisting events moderates this effect.

Theoretical contributions

First, by exploring the influence of the ethical attributes of farmer-assisting agricultural products on consumers' willingness to buy farmer-assisting agricultural products online, this study expands the theoretical framework of the research on product ethical attributes and extends the application scope of ethical attributes in e-commerce-assisted agricultural marketing scenarios. Previous studies have proved that channelization strategy can effectively promote the sales of farmer-assisting agricultural products (Quan, 2021), but neglected the important role of product attributes in e-commerce-assisted agricultural marketing. The information on the ethical attributes of farmer-assisting agricultural products shows that they have the characteristics of farmer-assisting and poverty alleviation, which is different from the alternatives in other markets, and it has also become a key driver of consumers' willingness to buy online. Thus, this study analyzes which ethical attribute (symbolic ethical attributes and functional ethical attributes) of products has a greater impact on online purchasing intentions when consumers buy farmer-assisting agricultural products online, to further clarify the effective ways for e-commerce enterprises to express ethics in farmer-assisting marketing. Specifically, compared with functional ethical attributes, symbolic ethical attributes have a more positive impact on consumers' willingness to buy farmer-assisting agricultural products online. This conclusion is consistent with the conclusion of Zeng Q. Y. et al. (2021). At the same time, this conclusion is also in line with the existing practical problem in current e-commerce-assisted agricultural marketing, that is, emphasizing farmer-assisting but neglecting the quality characteristics.

TABLE 7 Test results of the moderated mediating effects based on Bootstrap.

Moderated variable	Mediated variable	Moderated level	Indirect effect	SE	95% CI	
					LLCI	ULCI
The urgency of farmer-assisting events	Collective efficacy	Sudden disaster scenario	0.354	0.178	0.020	0.709
		Normative difficulty scenario	0.040	0.033	−0.078	0.063
	Risk perception	Sudden disaster scenario	0.237	0.089	0.060	0.407
		Normative difficulty scenario	0.022	0.020	−0.015	0.065

Then, this study expands the antecedent psychological factors of consumers' willingness to buy farmer-assisting agricultural products online from the perspective of collective efficacy and risk perception. Scholars have explained the reasons for consumers' ethical consumption based on attribution theory, SOR theory, self-signaling theory, and other theories. They mainly focused on individual psychological variables such as the improvement of ethical sense at the level of ethical psychology (Zheng et al., 2019) and the trade-off of related interests at the level of teleological evaluation (Das et al., 2021). On the one hand, this study expands the psychological mechanism of consumers' ethical consumption from the collective level. In the Internet context, new media communication can help consumers build and strengthen collective efficacy. Consumers may think that e-commerce platform companies need collective efforts to contribute to social good through the goal of farmer-assisting, and then translate this collective perception into positive purchasing intentions. On the other hand, different from the previous ethical consumption research that focused on offline physical consumption scenarios (Jin et al., 2020; Tofighi et al., 2020; Salam et al., 2022), this study is based on the e-commerce-assisted agricultural marketing scenario and introduces risk perception to analyze the key factors that inhibit consumers' willingness to buy farmer-assisting agricultural products online. Based on this, the research on the potential mechanism affecting consumers' ethical consumption willingness is further improved, and a more in-depth theoretical scenario exploration can be carried out on the psychological cognitive process of ethical consumption. The results of this study find that symbolic ethical attributes elicit higher levels of collective efficacy and lower risk perceptions in consumers than functional ethical attributes. Consumers' collective efficacy and risk perception have dual mediating effects between ethical attributes and consumers' willingness to buy farmer-assisting agricultural products online.

Finally, this study clarifies the boundary conditions for the mediating mechanisms of collective efficacy and risk perception in the process of ethical attributes influencing consumers' willingness to buy farmer-assisting agricultural products online. Previous studies mainly emphasized that when the functional and ethical attributes of a product are weighed and compared simultaneously, consumers focus more on the functional attributes of the product (Luchs et al., 2012). In this study, we further find that for farmer-assisting agricultural products, symbolic ethical attributes can increase consumers' willingness to buy farmer-assisting agricultural products online by increasing collective efficacy and reducing risk perceptions more than functional ethical attributes in the sudden disaster scenario, while there is no significant difference in normative difficulties. This study completes the research on the ethical attributes of products by introducing the variable of farmer-assisting event urgency.

Management implications

After years of construction and development, e-commerce of agricultural products in China has become an engine and new impetus to boost the development of agricultural and rural economy. In the post-epidemic era, e-commerce of agricultural products in China is an essential and growing market segment. As we all know, New Oriental's "Oriental Selection" platform has achieved remarkable achievements in marketing model innovation for farmer assistance. Thus, although the existing pain point of low standardization of fresh food remains unaddressed, operators should consider ethical positioning to boost consumers' propensity to buy agricultural products online.

This study provides some theoretical guidance value and practical suggestions for e-commerce enterprises or marketers to effectively use the ethical attributes of agricultural products to enhance consumers' willingness to purchase. First, when e-commerce companies carry out farmer-assisting marketing, they should pay attention to the information on the ethical attributes of farmer-assisting agricultural products. Specifically, the marketing strategy of enterprises should be based on the symbolic attributes of farmer-assisting agricultural products for public welfare and poverty alleviation, while taking into account the functional ethical attributes such as product quality and characteristics, to gradually form the market competitiveness and consumer stickiness of e-commerce farmer-assisting agricultural products. Secondly, e-commerce companies can consider the role of collective efficacy in consumers' purchase decision-making process, and use Internet social media platforms to promote the dissemination of farmer-assisting events, to mobilize more netizens to participate in farmer-assisting instead of being a bystander. At the same time, enterprises should pay attention to the disclosure of information on real farmer-assisting events, improve the quality of farmer-assisting agricultural products, enhance the transportation and logistics system, and avoid the negative impact of reducing the willingness to buy farmer-assisting agricultural products due to consumers' risk perception. Finally, e-commerce companies should pay attention to sudden disasters and help farmers in a timely manner when choosing what kind of situational marketing to help farmers. This is because consumers are more positively responsive to sudden disasters. They are more likely to provide timely relief activities for sudden disaster areas through farmer-assisting marketing activities.

Research limitations and perspectives

This study uses a single stimulus (oranges) and farmer-assisting event urgency scenarios (sudden earthquakes and remote mountainous areas). farmer-assisting agricultural products include not only fruits but also vegetables, seafood, and other categories. There are also other types of emergency scenarios for farmer-assisting events, such as epidemics and high-temperature weather. Different product categories and events may lead to different conclusions. Future research could ultimately address these issues by replicating or testing extensions across multiple agricultural product categories.

Although this study focuses on the influence of ethical attributes on consumers' willingness to buy farmer-assisting agricultural products online, it only lays emphasis on the process of consumers' purchasing decisions. Due to uncertain factors such as product quality in the online shopping process, consumers' expectations after

purchasing may vary. It will affect the subsequent evaluation, repurchase, and other behaviors of consumption. Thus, the impact of consumer expectations on the evaluation of farmer-assisting agricultural products and the decision to repurchase can be considered in the future.

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 author.

Ethics statement

Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

JW: conceptualization, methodology, formal analysis, and writing—original draft preparation. CW: software and validation. YY and CW: investigation. JW and CW: data curation. QZ: writing— review and editing and funding acquisition. All authors contributed to the article and approved the submitted version.

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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.

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Community extension MSME's entrepreneurial activities in relation to poverty reduction

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Introduction: Higher Education Institutions play a role in poverty reduction by implementing community extension programs focusing on capacity building and entrepreneurship training. Cebu Technological University programs offer these programs through various skills training to its targeted beneficiaries. This study aims to assess the community extension Micro-, Small and Medium-sized Enterprises (MSMEs) entrepreneurial activities concerning poverty reduction. The research participants are beneficiaries of community extension programs that primarily focus on capacity building and entrepreneurship training, and they eventually become entrepreneurs.

Method: Using a cross-sectional survey, 172 valid responses were analyzed, with entrepreneurship education (EE), budgeting financial literacy (BFL), access to credit facilities (ACF), and entrepreneurial performance (EP) as predictors of poverty reduction (PR). Results from Partial Least Squares - Structural Equation Modeling (PLS-SEM) generate insights from the seven hypothesized paths of the proposed model.

Results and discussion: Findings revealed that entrepreneurship education ($\beta = 0.258$, $p < 0.05$), budgeting financial literacy ($\beta = 0.147$, $p < 0.05$), and access to credit facilities ($\beta = 0.541$, $p < 0.001$) help reduce poverty. However, no significant relationship was found between entrepreneurial performance and poverty reduction ($\beta = 0.132$, *ns*) whose cause may be directly pointed to the pandemic's significant impact on MSME's entrepreneurial activities.

Conclusion: This study confirms the importance of entrepreneurship education, budgeting, financial literacy, and credit access in promoting entrepreneurial success and reducing poverty.

KEYWORDS

community extension, PLS-SEM (partial least squares - structural equation model), higher education institute, entrepreneurship, poverty reduction

Introduction

Poverty is a multifaceted issue with numerous interconnections. Innovative ways of finding solutions are required to lessen poverty's effect on people, society, and the environment (Moniruzzaman and Day, 2020). In order to better understand poverty and develop strategies to combat it, various economic, social, structural, capacity, and learning techniques have been used to date (Sofo and Wicks, 2017). A rural community in the Philippines, like fishermen and farmers, remains the poorest primary sector in the Philippines (PSA, 2018). Due to the fact that Filipino farmers are still considered to be poor, it's necessary to give them an additional source of income (Yamagishi et al., 2021). Higher poverty rates are associated with poor rural subsistence on fishing and farming, illiteracy, unemployment, and larger family sizes (Cerio, 2019; Siphesihle and Lelethu, 2020).

Higher education institutions (HEIs) in the Philippines play an important role in reducing poverty (Yulo Loyzaga et al., 2022). Universities and colleges carry out a variety of entrepreneurship training through community extension programs that are offered to assist aspiring entrepreneurs. Community extension communicates and transfers knowledge and technology to specific sectors and target clientele, specifically those not enrolled in formal degree programs and course offerings (Palmén et al., 2020). The target beneficiaries can improve production, community, institution, and quality of life while enhancing HEI academic and research programs (CHED CMO No. 08-S. 2010). A unique ecosystem of collaboration of HEIs with communities, businesses, and industries facilitates the transfer of knowledge and technology in specific developmental sectors that directly impact the lives of individuals, families, and communities (Vermesan and Friess, 2022). In this case, extension is defined as the systematic transfer of technology, innovation, or information generated by HEIs and its partner to seek solutions to specific developmental concerns (Declaro-Ruedas et al., 2022). It is a purpose-specific, target-specific, and need-specific program of action utilizing the best available data, science, and evidence from various disciplines to inform systematic approaches to developmental solutions (Krasadakis, 2020). Research, innovation, and extension in Philippine higher education must work contextually and purposefully (Hirsu et al., 2021). Knowledge generation in HEIs should enable us to (a) deepen our understanding of ourselves as a people and as a nation and discover practical evidence- and science-based answers that can address real-world social, economic, and environmental challenges of families and communities (CHED CMO No. 52-S. 2016). Extension services are government-run programs that offer learning opportunities that support producers' technical ability and expertise (Ullah et al., 2021). These programs had been implemented to reach out to the local people for more significant development (ElMassah and Mohieldin, 2020). They

influenced them to pursue a passion that maintains different aspects, especially employment, business, culture, norms, and values. Extension services are essential, and the best way to reach out to young people is through effective extension and advisory services (Ortiz-Crespo et al., 2021). Thus, it is possible to create extension programs that involve youths using participatory methodologies to provide input on program priorities (Ivanich et al., 2020).

In the Philippines, higher education institutions are thrust to strengthen university-community engagement through extension activities (Medina, 2018). For the aforementioned points to be taken seriously, it is important to keep in mind the following: (a) actions and decisions made in the form of a program have an impact on other people; (b) extension services planning is a coordinated effort that entails the identification, evaluation, and assessment of needs, issues, resources, priorities, and solutions; (c) while many other benefits, such as participant education, may result from the process, an extension services strategy is a matter that must be taken seriously. As a result, the function of extension programs continues to change. This technique facilitates an iterative, collaborative learning process where options are presented to users, who then modify them in response to local circumstances (Morrone, 2017; Villanueva et al., 2020).

The Cebu Technological University facilitates sustainable development in poor communities through extension services. CTU community extensions were made possible through the strong linkage between Cebu Technological University and the Local Government Unit. Ngaka and Zwane (2018) stressed that partnerships are indispensable in extension services. Similarly, partnerships can help reinforce, support, and even renovate individual partners, resulting in higher program quality, more well organized resource use, and better alignment of goals and programs (Weiss et al., 2010; Campos-Silva et al., 2021). As a result, several community extension services were successfully conducted with all support from the University Extension Services Office and the partner institution (Gutter et al., 2020; Antwi-Agyei and Stringer, 2021).

Most of CTU's extension services programs were designed to help the community to fight poverty (e.g., FEU community extension services 2020, Building Your Community Resources for Local Entrepreneurs 2021, and Creating Entrepreneurial Communities Conference 2022,). These programs were focused mainly on capacity building and entrepreneurship training. On the one hand, capacity building is the process whereby relevant stakeholders and organizations unleash, support, generate, acclimate and maintain capacity over time, usually to promise sustainable growth and improve the lives of the stakeholders (Jones et al., 2020; Loss et al., 2020; Casado-Asensio et al., 2022). It requires acquiring specific skills and developing opportunities to put the skills to prolific use (Issa et al., 2010; Harley et al., 2020; Ng et al., 2021). Full implementation of a well-designed capacity-building program ensures a sustainable extension service

delivery system where extension workers can operate in the expected commercial economy (Issa, 2013; Costa and Andreaus, 2020). On the other hand, the goal of entrepreneurship programs for low-income self-employed people is to enhance their livelihood rather than promote cutting-edge innovation and business growth (Cho et al., 2016; George et al., 2021). Maziriri and Chivandi (2020) and Babajide et al. (2021) averred that entrepreneurship programs have variables that include entrepreneurship education, budget financial literacy, access to credit facilities, and entrepreneurial performance.

As an HEI, CTU's role in poverty reduction through entrepreneurship is carried out through its community extension programs that focus mainly on capacity building and entrepreneurship training, which offer various skills training to the beneficiaries. This paper evaluates the entrepreneurial activities of the community extension program by examining the variables that include entrepreneurship education, budget financial literacy, access to credit facilities, and entrepreneurial performance. Evaluating the effectiveness and sustainability of these programs that mainly assist the beneficiaries with becoming entrepreneurs impacts whether they should be forwarded, corrected, or terminated (Rahmat and Izudin, 2018).

The rest of the paper is organized into four sections: Section Literature review and hypothesis development presents the conceptual model and the hypotheses. Section Methods describes the methodological procedures. Section Data analysis and results reports the result of the PLS-SEM analysis. Section Discussions presents the discussion of the findings, while Section Recommendations provides concluding remarks, limitations, and some recommendations.

Literature review and hypothesis development

Entrepreneurship education and entrepreneurial performance

According to Manyaka-Boshielo (2019), entrepreneurship education (EE) is defined as 'the skills and knowledge that individuals acquire through investment in schooling, on-the-job training, and other types of experience. While Mabenge et al. (2020) stated the ability of innovation to drive every firm activity, such as cost reduction, revenue growth, and aggressiveness, is referred to as entrepreneurial performance. The relationship between entrepreneurship education and entrepreneurial performance must be clarified. Van der Sluis et al. (2008) contend that investing in the education of imminent business visionaries results in greater entrepreneurial performance. The human capital idea affirms that previously acquired knowledge is crucial for academic execution. Coad et al. (2022) further point out that education enhances the performance of the entrepreneur in several areas, including

business survival, firm development, and the association's entry into speculation. Based on the cases above, this theory is put forth:

H1: Entrepreneurship education positively and significantly impacts the entrepreneurial performance of MSMEs.

Budgeting financial literacy and entrepreneurial performance

The capacity of managers to successfully manage money when making financial decisions is referred to as financial literacy (Marcolin and Abraham, 2006). According to Ripain et al. (2017), MSMEs play a crucial role in the economic development of many nations, and their performance and expansion have come to the attention of a number of stakeholders, including the government, policymakers, and financial institutions. The element of financial management is one of the most frequently mentioned success aspects of MSME, per Salikin et al. (2014). In Uasin Gishu County, Chepngetich (2016) observed a relationship between financial literacy and MSMEs' entrepreneurial success and discovered that financial literacy significantly impacted MSME performance. Further, Ibor et al. (2017) discovered that financial services had a favorable and significant impact on the functioning and expansion of MSMEs. Access to financial services is beneficial for MSMEs and other vulnerable and underprivileged businesses. According to Ratnawati (2020), financial inclusion has a direct and indirect impact on MSMEs' performance through the use of financial intermediation and capital access. As a result, we can speculate:

H2: Budgeting financial literacy positively affects the entrepreneurial performance of the community extension MSMEs

Access to credit facilities and entrepreneurial performance

Kurgat et al. (2017) and Stubbs et al. (2021) defined a credit facility as an agreement with a bank or other credit institutions that enables a person or organization to borrow money when needed. Chege's (2014) and Maziriri and Chivandi (2020) investigation of the impact of credit facilities on the development of the 100 best MSMEs in Kenya found that access to credit facilities has a significant effect on the development of these enterprises. Therefore, the execution of an entrepreneurial venture relies on the entrepreneur's access to finance (Amouri et al., 2021). Enhancing the poor's access to financial services empowers them to develop beneficial resources and improve their profitability and potential for manageable jobs (Maziriri

and Chivandi, 2020; Setiawan et al., 2020; Tisdell et al., 2020). When an MSME has access to credit facilities, it enhances the execution of its entrepreneurial endeavors (Madan, 2020). As such, the following hypothesis can be formulated

H3: Access to credit facilities positively affects the entrepreneurial performance of the community extension MSME.

Entrepreneurial education and poverty reduction

For low-income individuals who want to start and grow their individual firms, entrepreneurship education can be helpful in delivering fundamental understanding, capabilities, and attitudes (Santos et al., 2019). Therefore, entrepreneurship provides reduced people a way out of poverty and an opportunity to enhance their society, create jobs, engage in self-employment, reduce crime, sustain their families, and realize other public welfare (Morris et al., 2020). Particularly during economic downturns (Lewis and Lee, 2020). Small-scale individual innovation and entrepreneurship have emerged as crucial elements in the fight to eradicate poverty following decades of large-scale state planning failure (Prideaux et al., 2020). Research in financial economics (Schwert, 2021) and applied economics and entrepreneurship. Karimi and Makreet (2020) recently affirmed the significance of entrepreneurship in the engagement of "bottom of the pyramid" consumers and the sensible decisions they may make regarding products and consumer welfare (Mehera and Ordonez-Ponce, 2021). As such, we can hypothesize:

H4: Entrepreneurship education positively affects poverty reduction

Budgeting financial literacy and poverty reduction

Presented the method of developing a financial plan that projects future expenditures and income is known as budgeting (Warue and Wanjira, 2013; Moshashai et al., 2020; Srithongrung et al., 2021). On the one hand, Ayhan (2019), Sharif and Naghavi (2020), Pu et al. (2021) defined financial literacy as the information, services, and capability to direct increasingly multifaceted economic marketplaces. It is thought to give customers the power to make wise financial decisions. Additionally, Maziriri et al. (2018), Singla and Mallik (2021), Anshika and Singla (2022) emphasized that MSMEs' performance is significantly impacted by their lack of financial literacy regarding budgeting. Managers of rural MSMEs must become financially literate, specifically in budgeting (Gosal and Kamase, 2021). Thus, many Filipinos are

suffering outward economic uncertainty from the deficiency of financial literacy, hindering their ability to survive during the pandemic. Therefore, we hypothesize that:

H5. Budgeting Financial Literacy positively affects poverty reduction

Access to credit facilities and poverty reduction

Tasos et al. (2020) saw poverty as a universal fact that no one can deny; it was also recognized as the greatest catastrophic economic and social crisis mankind has encountered from its inception. This problem has made it difficult for most people to achieve their goals, such as receiving an education, earning money, starting businesses, or even finding a job. It takes a lot of effort to overcome poverty in many ways, depending on how an individual deals with all the situations. On the other hand, the governmental and private sectors have developed programs and advantages that could assist the Philippines in transcending poverty, such as expanding credit access. Implicating a credit facility, according to Chen et al. (2022), is a type of loan issued in the context of a business or corporate financing. It enables the borrowing company to borrow money over a longer time rather than reapplying for a loan each time it requires funds; in effect, a credit facility enables a company to take out an umbrella loan to generate capital over a longer period of time. Gichuki et al. (2014) stated that the high cost of payback, stringent collateral requirements, people's unwillingness to act as guarantors, expensive credit facility processing charges, and short repayment terms were prohibiting micro and small businesses from obtaining credit. As a result, it is recommended that financial institutions establish more flexible, affordable, and appealing terms for financing micro and small businesses. Water, electricity, and food are critical resources for regional social and economic development, according to Pan et al. (2022). They can be used as indicators or methods for measuring sustainable development goals to get finance, and the results can aid in the coordination of resource management and hence the reduction of poverty. The credit facilities will undoubtedly assist an individual in overcoming the challenge of poverty. Thus, we hypothesize that:

H6: Access to credit facilities positively affects poverty reduction

Entrepreneurial performance and poverty reduction

Micro, Small, and Medium Enterprises (MSMEs) contribute significantly to income generation, employment creation, poverty reduction, and income inequality reduction (Marwa,

2014; Sriary and Nyoman, 2020). Small businesses, according to Matchaba-Hove et al. (2015), have an important role in improving development, progress, and vitality, as well as lowering unemployment and poverty. Similarly, Sarkar and Kumar, 2011; Egere et al., 2022 emphasized its importance in improving the socioeconomic conditions of the poor, creating job opportunities, allowing for greater exploitation of local raw materials and other resources, and boosting the country's economic progress. According to Sokoto and Abdullahi (2013), the potential of any organization to generate employment is critical in reducing the incidence of poverty among economic agents. Additionally, Yasa Kerti et al. (2013); Orji et al. (2022) conclude that improvements in MSME performance have a significant and fundamental impact on poverty reduction. The greater the change in MSME performance, the more significant the poverty reduction. Therefore, we can hypothesize,

H7: Entrepreneurial performance of the community extension MSME positively affects poverty reduction.

Methods

Research model

This paper adopted and modified the structural model of Maziriri and Chivandi (2020) of the key predictors that stimulate the entrepreneurial performance of small and medium enterprises (SMEs) and poverty. The aim of this study is to assess the community extension beneficiaries turned entrepreneurs and their entrepreneurial activities concerning poverty reduction during and after a crisis (e.g., health crisis, economic crisis due to calamities). Particularly, the effects of entrepreneurship education, budget financial literacy, access to credit facilities, and entrepreneurial performance in alleviating poverty. The structural equation model is shown in Figure 1.

Sampling and data collection

The measurement items of each construct in this study were adopted from measures in prior works (see Appendix A). Entrepreneurial education (EE) has 13 measurement items, entrepreneurial performance (EP) has ten, poverty reduction has ten, access to credit facility has eight, and budgeting financial literacy has eight. The data were gathered through face-to-face questionnaire completion. The survey was distributed to around 200 participants for 4 weeks. There were 187 responses collected. The 15 responses had non-interactive responses and were subsequently removed. Of 187, only 172 were valid and used for the final analysis.
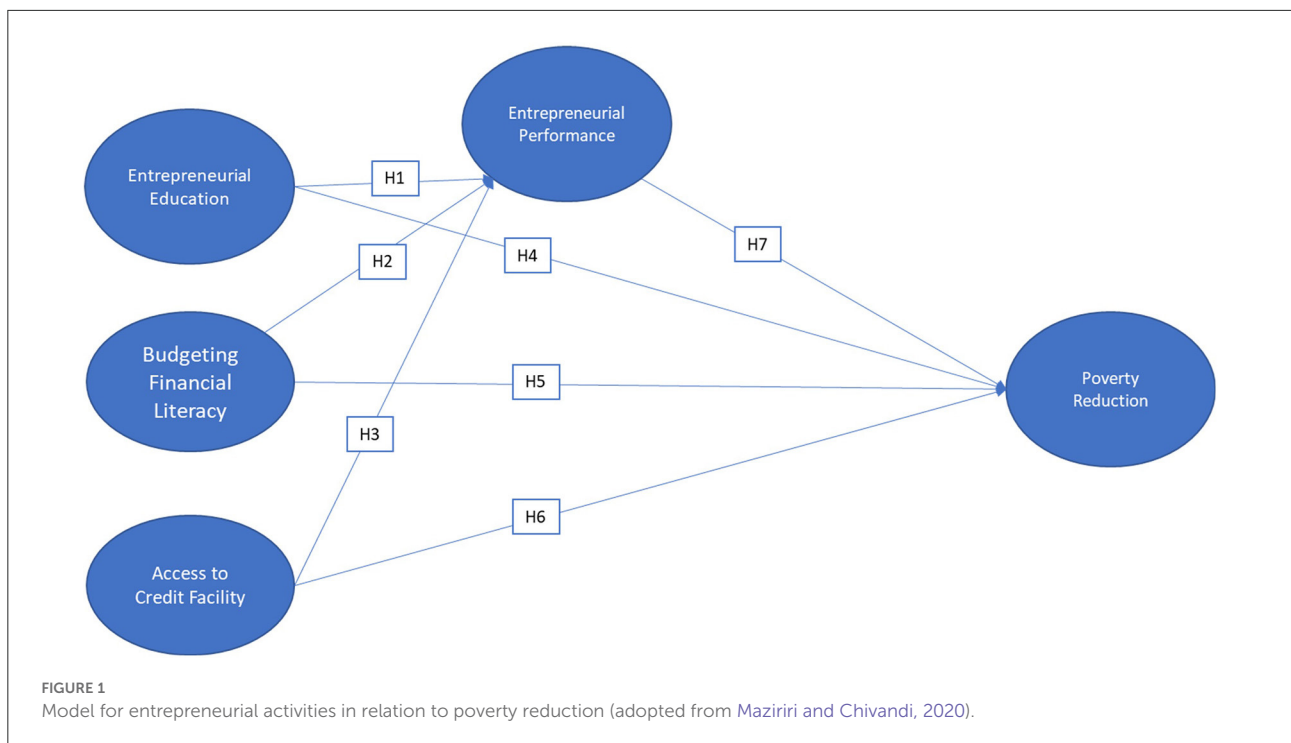
Instruments

This study used a modified survey questionnaire to collect the necessary data. The questionnaire was divided into 3 sections. The first part includes questions such as the respondents' age, gender, special skills and community extension program. Second, the assessment of entrepreneurship education (Mwiya, 2014) and performance (Sariwulan et al., 2020), budgeting financial literacy (Siekei et al., 2013), access to credit facilities (Kurgat et al., 2017), and poverty reduction (Duclos and Tiberti, 2016) were gathered.

Participants

A total of 172 community extension beneficiaries turned into micro-, small and medium sized entrepreneurs (56 males and 116 females). They were trained in different community extension programs; specifically, 46.02% attended Bread and Pastry, 17.44% had computer training, 15.12% detergent production, 14.53% was trained in both Coco water treated bottled milkfish in Spanish style with Rosemary Production and Coco water treated bottled milkfish sardines. Another 14.53% were trained in Virgin Coconut oil and Coconut water treated pork tocino production. Other training attended by at most 10% of the respondents were as follows; Kamias-based dishwashing liquid, rug making, t-shirt/mug printing, commercial cooking, sewing, cosmetology, and massage. The participants came from different municipalities in the Province of Cebu, Central Visayas Region. 6.40% of the participating entrepreneurs have below 40 hours of entrepreneurial education. 9.88% had 41–80 hours, 28.49% had 81–120 hours, while the majority of respondents, 54.65%, had 121 hours and above entrepreneurial education. All respondents volunteered to participate and were assured that their answers would be kept strictly confidential. The profile of the participants is reflected in Table 1.

Data analysis and results

This study utilized partial least-squared structural equation modeling (PLS-SEM) to determine the causal relationships between the investigated variables. PLS-SEM is a statistical technique that has become a potent method for examining correlations between variables, even in the presence of non-normality (Chinomona and Surujlal, 2012). Data were fed into Smart PLS software to ensure the internal consistency of the items within each section. Smart PLS statistical software estimates the parameters of the structural model and assesses the psychometric qualities of the measurement model. All survey questions required a forced response in order to guarantee that all responses were comprehensive and contained

FIGURE 1
Model for entrepreneurial activities in relation to poverty reduction (adopted from Maziriri and Chivandi, 2020).

all necessary information. Furthermore, suspicious response patterns were deleted.

Measurement model assessment

The PLS analysis allows parallel testing of the outer measurement model and the inner structural model and the presence of reflective and formative latent variables (Fornell and Bookstein, 1982). Since the proposed model in this study includes reflective measures, the first criterion in evaluating the model is to examine the measures' reliability and validity (Hair Jr et al., 2017). Based on the measurement model assessment result, all indicators were convergent and reliable, as shown in Table 2, where the factor loading for each item is greater than 0.70 (Henseler et al., 2009). Factor loadings less than 0.7 were removed (Chin, 1998). Nineteen item indicators (i.e., ACF2, ACF3, ACF4, ACF8, BFL1, BFL2, BFL3, EE1, EE2, EE3, EE4, EP1, EP3, EP9, PR1, PR2, PR3, PR4, and PR6) were removed after calculations through the SmartPLS algorithm until all the item indicators reached the threshold value of 0.70. There were 30 measurement indicators that remained for the final analysis. All measures for each construct were valid. With Average Variance Extracted (AVE) statistics greater than the threshold value of 0.5, all constructs have appropriate convergent validity (Fornell and Larcker, 1981), ranging from 0.609 to 0.768. Furthermore, the measurement items were all reliable, with all the constructs garnered above the Cronbach's alpha (α) threshold value of 0.60, which is considered of

acceptable reliability and an acceptable index (Nunnally, 1994; Ursachi et al., 2015) and composite reliability (CR) threshold value of 0.70 (Hair Jr et al., 2017). The Cronbach's alpha ranges from 0.893 to 0.927, while the CR values range from 0.895 to 0.932. These results indicate high-reliability values. Table 2 provides a summary of the measurement model results.

The correlations of the measures of potential overlapping variables are used to assess the degree to which the measurement items measure distinctively among constructs (Hair Jr et al., 2014). The square root of AVE was calculated to ensure discriminant validity. The AVE of the constructs was found to support discriminant validity because it is greater than the squared correlation of each latent variable (Fornell and Larcker, 1981). Table 3 bolds the square roots of the AVE, while non-bolded values represent the intercorrelation value between constructs. All off-diagonal values are less than the square roots of AVE, indicating that Fornell and Larker's condition is satisfied. Overall, the measurement model's reliability and validity tests were met. All items used in this study to measure constructs are valid and fit to estimate parameters in the structural model.

In Table 3, the research model fitness demonstrates an acceptable fit with a Standardized Root Mean Square Residual (SRMR) value of 0.077 and a common acceptable fit value of 0.08. The Normed Fit Index (NFI) value is 0.696, reflecting a moderate acceptable value with the threshold of NFI < 0.90. The NFI generates values ranging from 0 to 1. The closer the NFI is to one, the better the fit. In general, NFI values greater than 0.9 imply an excellent fit.

TABLE 1 Profile of the respondents.

Category	n	%
Age (in years)		
Below 20	4	2.33
21–35	73	42.44
36–45	51	29.65
46–55 years old	26	15.12
56 and above	18	10.47
Sex		
Male	56	32.56
Female	116	67.44
Num. of hours of entrepreneurial Educ.		
Below 40 hours	11	6.4
41–80 hours	17	9.88
81–120 hours	49	28.49
121 and above	94	54.65
Skills training attended		
Bread and pastry	74	43.02
Computer	30	17.44
VCO based liquid handwash/detergent	26	15.12
Coco water treated bottled milkfish in Spanish style w/Rosemary	25	14.53
Coco water treated bottled milkfish sardines	25	14.53
Coconut water-treated pork tocino	25	14.53
Virgin coconut oil	25	14.53
Kamias based	18	10.47
Dishwashing liquid		
Rug making	18	10.47
T-shirt/mug printing	17	9.88
Commercial cooking	12	6.98
Sewing	11	6.4
Cosmetology	10	5.81
Massage	7	4.07

TABLE 2 Measurement model assessment results.

Items	Loadings	AVE	Cronbach α	CR
ACF1	0.806	0.768	0.898	0.9
ACF5	0.893			
ACF6	0.91			
ACF7	0.893			
BFL4	0.778	0.723	0.906	0.926
BFL5	0.889			
BFL6	0.837			
BFL7	0.87			
BFL8	0.872			
EE5	0.813	0.633	0.927	0.932
EE6	0.793			
EE7	0.707			
EE8	0.832			
EE9	0.855			
EE10	0.722			
EE11	0.798			
EE12	0.799			
EE13	0.828			
EP2	0.769	0.609	0.893	0.895
EP4	0.816			
EP5	0.782			
EP6	0.793			
EP7	0.767			
EP8	0.787			
EP10	0.749			
PR5	0.767	0.704	0.894	0.896
PR7	0.854			
PR8	0.848			
PR9	0.857			
PR10	0.866			

α, Cronbach's alpha; CR, composite reliability; AVE, average variance extracted; ACF, access to credit facility; BLT, budgeting financial literacy; EE, entrepreneurial education; EP, entrepreneurial performance; PR, poverty reduction.

Structural model

The influence of the independent variables on the dependent variable is tested using a structural model (Hair Jr et al., 2014). When using PLS-SEM, the three main factors used to assess the structural model are the strength of the path coefficients, R^2 values (prediction power), and f2 (effect size) (Hair Jr et al., 2017). The path coefficients of the structural model indicate that the six hypotheses are supported (H1, H2, H3, H4, H5, H6), and only one is not supported (H7). The results are summarized in Table 4 (Figure 2). The acceptable values of 0.75, 0.50, and 0.25 correspond to significant, moderate, and modest levels of prediction accuracy, respectively (Henseler et al., 2009; Hair Jr et al., 2014). The coefficient of determination (R^2) in this study provides the predictive accuracy of the structural model, as indicated in Figure 2. PR is explained to have the

highest variance with a value of 0.763 (76%), while EP has a value of 0.635 (63.5%). Thus, the R^2 criterion is met, and the predictive ability of the structured model is considered moderately high.

The effect sizes (f^2) were estimated using the SmartPLS algorithm, indicative of a minor, medium, or substantial effect on the link between exogenous and endogenous constructs with f^2 values of 0.02, 0.15, and 0.35, respectively (Hair Jr et al., 2017). A value less than 0.02 indicates that exogenous constructs do not affect endogenous constructs. The f^2 results show that ACF substantially affects EP ($f^2 = 0.444$), and ACF substantially affects PR ($f^2 = 0.434$). Furthermore, EP has a small effect on PR ($f^2 = 0.026$). These results, as indicated in Table 5, are consistent with the other findings in this study.

TABLE 3 Fornell and Larcker results.

	ACF	BFL	EE	EP	PR
ACF	**0.876**				
BFL	0.159	**0.85**			
EE	0.683	0.075	**0.795**		
EP	0.772	0.243	0.633	**0.781**	
PR	0.842	0.246	0.7	0.748	**0.839**

Square root of AVE is shown on the diagonal of the matrix in bold; inter-construct correlation is shown off the diagonal.

TABLE 4 Path coefficient results.

	β	t values	p-values	Decision
ACF -> EP	0.573	5.588	0.000***	Supported
ACF -> PR	0.541	6.455	0.000***	Supported
BFL -> EP	0.171	1.992	0.046**	Supported
BFL -> PR	0.147	1.964	0.049**	Supported
EE -> EP	0.253	2.599	0.009**	Supported
EE -> PR	0.258	3.176	0.002**	Supported
EP -> PR	0.132	1.386	0.166[ns]	Not Supported

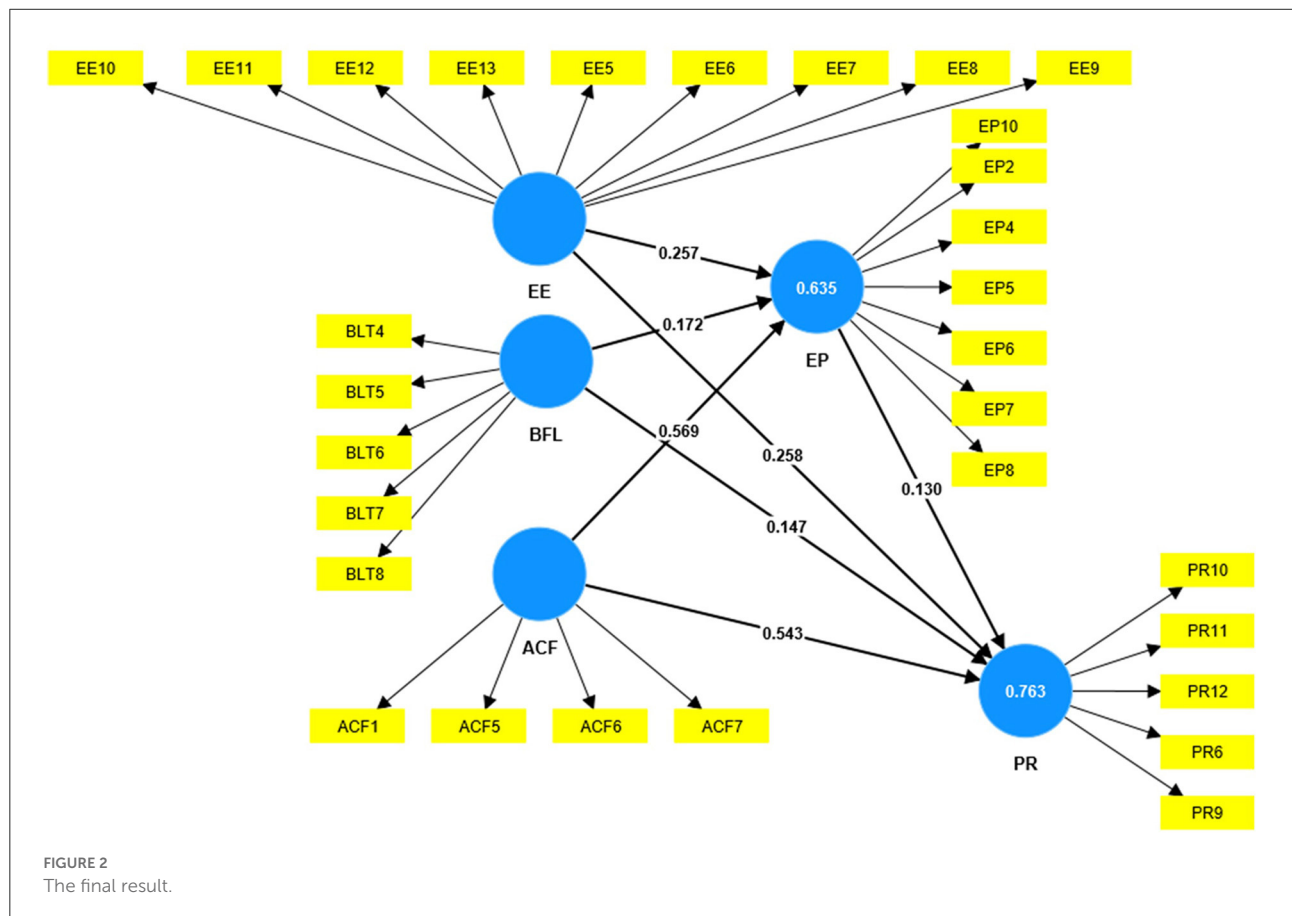***$p < 0.001$; **$p < 0.05$; ns, not significant.

FIGURE 2
The final result.

TABLE 5 Effect size results.

	ACF	BFL	EE	EP	PR
ACF				0.444	0.434
BFL				0.076	0.08
EE				0.093	0.132
EP					0.026
PR					

Discussion

This section presents the salient features of the PLS-SEM analysis and how these results can be applied to the current discussions of Community Extension MSME's entrepreneurial activities in relation to poverty reduction. The flow followed the discussions from the antecedent variables toward the model and how it affects entrepreneurial performance and poverty reduction.

It can be seen in Table 4 that Entrepreneurial performance directly impacts entrepreneurship education (β = 0.253), budgeting financial literacy (β = 0.171), and Access to credit facilities (β = 0.573). The results of the hypothesis testing are congruent with the findings of Green et al. (2006). For example, if the expansion of the business is due to the application of transferred technology, it helps to seek better business opportunities. Further, if the entrepreneurial performance encourages business start-ups, then the level of budgeting skill is relevant to the business ventures. Similarly, if the entrepreneurial performance creates something to take advantage of the creative needs, it can improve the level of income in the business. It can be noted that entrepreneurial performance directly impacts entrepreneurship education, budgeting financial literacy, and access to credit facilities. Thus, if entrepreneurial performance can control the business and motivate the businessmen and entrepreneurs who show low interest in the business, they would tend to pursue business because they believe it can improve the standard of living and have a potential unlimited income.

The PLS-SEM analysis discloses that entrepreneurship education (β = 0.258), budgeting finance literacy (β = 0.147) and access to credit facilities (β = 0.541) directly impacts poverty reduction. Further, this collaborates with the study of Sokoto and Abdullahi (2013), Pan et al. (2022). For instance, if food scarcity has been reduced, it empowers me to strive for a better standard of living. Moreover, if the family members are sent to school, they will acquire skills in profit planning, business financing, and cash flow management. Additionally, if the family can buy additional appliances, then access to credit facilities is empowered to own property.

The path coefficient reflected in Table 4 shows that the EP to PR (β = 0.132) were not supported. Since the advent of the coronavirus, COVID-19 has generated one of the most urgent crises at the global level in recent times; with the steepest downgrades in economic growth among all global recessions, there is no significant relationship between entrepreneurial performance and poverty reduction (Parnell et al., 2020; Ratten, 2020; Crupi et al., 2022). It has a negative impact on aspiring entrepreneurs, particularly those from developing nations where government help is restricted (Nasar et al., 2019). Authorities' lockdowns and movement control orders are the most significant elements influencing entrepreneurial activity (Nasar et al., 2019; Ionescu-Somers and Tarnawa, 2020; Perveen et al., 2022). The epidemic has also resulted in low demand and market stagnation, making it more difficult for entrepreneurs to continue their start-up projects. The business environment has heightened the dread of failure, with maximal risks of ceasing or reducing entrepreneurial activities (Nasar et al., 2019). The fear factor was highlighted as an essential indication restricting potential and embryonic entrepreneurs' entrepreneurial activities (Li, 2011; Morgan and Sisak, 2016). Because the economic implications would continue longer, the entrepreneurial activity would decline regardless of whether they were located in a developed or developing country (Nasar et al., 2022). Entrepreneurs have suffered greatly due to COVID-19's social distancing rules and other altered corporate operating processes (Nasar et al., 2022). Entrepreneurs encounter complex challenges to preserve their standing because they use opportunities to address problems and develop goods that help society (Williams et al., 2017).

Recommendations

Based on the research findings, the following claims are made: Credit finance promotes development by allowing MSMEs to engage in profitable ventures that frequently necessitate large capital investments. As a result, financial lending institutions should consider lowering collateral requirements to make it easier for MSMEs to access and promote their activities. Furthermore, in order to make good financial decisions, MSMEs must acquire financial literacy skills, specifically budgeting financial literacy. On the other hand, entrepreneurial education strives to provide expertise, entrepreneurship skills, and inspiration among entrepreneurs; consequently, aspiring entrepreneurs should take. Also, MSME entrepreneurs should be given education and assistance in times of calamities, natural disasters, and global pandemics since they are vital in the economy's recovery. Finally, MSMEs should be given proper attention by allocating additional resources to the sector, particularly in the aftermath of the COVID-19 outbreak.

Conclusion and limitation of the study

The objective of this study was to look into the effects of entrepreneurship education, budgeting, and financial literacy, and access to credit on entrepreneurial performance and poverty reduction. The study confirms the importance of entrepreneurship education, budgeting, financial literacy, and credit access in promoting entrepreneurial success and reducing poverty. Entrepreneurial performance was found to have a greater impact on poverty reduction than entrepreneurship education and access to credit facilities. A strong correlation was also established between budgeting financial literacy and entrepreneurial performance. Except for hypothesis 7, which was positive but insignificant, the findings confirm all of the stated assumptions. The implications of the findings and future research goals were highlighted. However, this study has some limitations that must be considered. This used the cross-sectional research design; specifically, the sample population of the community extension beneficiaries turned into micro-small-medium entrepreneurs and the data was collected during the start of the economic recovery caused by the COVID-19 pandemic. Overall, this study will contribute to the existing knowledge in entrepreneurship and small business management. In academia, this study context is currently under-researched and under-appreciated.

Data availability statement

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

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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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.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fsoc.2022.1038006/full#supplementary-material

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Multidimensional poverty of persons with disabilities in China: An analysis of poverty reduction effect of employment services

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Introduction: Disability is a global public health problem, and poverty due to illness and disability has always been a major problem and challenge for global poverty governance. In order to eradicate poverty, China has carried out a series of welfare reforms and employment interventions for people with disabilities. The purpose of this study is to examine the levels of multidimensional poverty of persons with disabilities aged 16−59 in China and the poverty reduction effect of employment services.

Methods: The Alkire-Foster (AF) method is applied to measure and decompose the multidimensional poverty index (MPI) of people with disabilities in this study. In order to make the results more robust, ordinary least squares (OLS) regression and the combination of propensity score matching and difference-in-differences (PSM-DID) are used to study the effect of employment services on multidimensional poverty of the disabled.

Results: The results show that among persons with disabilities aged 16−59, about 90% are deprived in at least one dimension, and about 30% are in a state of severe multidimensional poverty until 2019. The contributions of deprivation in the dimensions of education and social participation are remarkably higher than dimensions of economy, health and insurance. In addition, employment services have a significant improvement effect on multidimensional poverty, which is reflected not only in the economic dimension, but also in the dimensions of education, insurance and social participation.

Conclusion: People with disabilities are generally in multidimensional poverty in China, and their abilities in learning and social integration are seriously inadequate. Employment services have played a great role in improving poverty, but the improvement has been different in different dimensions and different disability categories. These findings provide important evidence for recognizing multidimensional poverty of persons with disabilities and the poverty reduction effect of employment services, which will help to formulate more reasonable public policies to eradicate poverty.

KEYWORDS

disability, multidimensional poverty, employment services, AF method, PSM-DID

1. Introduction

Disability is a complex situation which affects individuals and families around the world. According to the World Health Organization (WHO) and the World Bank (WB), about 15% of the world's population lives with some form of disability, and 80% of those with disabilities live in low- and middle-income countries (1). According to the data of China's sixth census and the Second China National Sample Survey on Disability, the total number of persons with disabilities in China at the end of 2010 was 85.02 million (2). Poverty due to illness and disability is a long-term and complex problem, which has always been a major problem and challenge for global poverty governance. China has a large population with disabilities, and poverty due to disability is common. In 2018, the poverty rate due to disability has exceeded 14% (3). By the end of 2020, China's poverty alleviation goals and tasks have been fully completed as scheduled, but the

deprivation of education, health, housing and other benefits has become the main manifestation of poverty. In the post poverty alleviation era, the poverty alleviation goal will face a strategic transformation, that is, from absolute poverty to relative poverty. Due to factors such as physical disabilities, limited labor capacity, and low educational attainment, persons with disabilities are more likely to suffer from poor quality of life and become a prominent group in relative poverty (1, 4). Therefore, in the process of consolidating the achievements of poverty alleviation, it is necessary not only to prevent the disabled from returning to poverty, but also to help them improve their health, education, social security, etc., that is, on the basis of solving the absolute poverty of the disabled, it is necessary to improve the multidimensional poverty with insufficient basic capabilities.

The analysis of poverty has gone beyond the lack of income and material, and entered into the study of the nature of poverty from the dimensions of human development and spirituality. The capability theory of Sen has been at the forefront of the movement away from the unidimensional income approach to poverty measurement, with Sen defining poverty as a lack of freedom due to the deprivation of basic capability (5). The capability not only has the tool value of eliminating poverty, but also represents a kind of human welfare. Based on this theory, relevant studies have shown that in most developing countries, disability is found to be significantly associated with higher multidimensional poverty as well as lower educational attainment, lower employment rates, and higher medical expenditures (6). Persons with disabilities have a lower quality of life and face a higher risk of multidimensional poverty (7), and social policies should aim to reduce their high levels of multidimensional poverty and deprivation of capabilities (8).

Based on the severe multidimensional poverty of the disabled, relevant studies have pointed out that employment can be an effective way to improve personal wellbeing (9), and full and effective employment is a key link to realize the replacement of "blood transfusion" assistance with "hematopoietic" support and the replacement of maintaining basic survival guarantee with promoting development-oriented welfare in the field of disabled people's undertakings. However, persons with disabilities consistently have lower employment rates than non-disabled persons (10), and face significant challenges in wages, promotion, workplace and accommodation (11). The employment of persons with disabilities has become a long-term concern of many governments around the world, and has led to a series of welfare reforms and employment intervention policies. But it appears that putting the actual policies and legislation into practice has had limited success across China and, for the most part, China's disabled population remains out of the mainstream wherein access to education, training, and good-paying jobs are a minimum (12). Long-term unemployment for persons with disabilities is serious problem in China, with millions of unemployed disabled persons living in poverty (13). Therefore, reasonable and effective employment support measures are the key to solve the multidimensional poverty problem.

Employment services play an important role in promoting and ensuring the employment of persons with disabilities. In 2007, China promulgated the Regulations on Employment of Persons with Disabilities (14). Employment services are an important part of the regulations, and it is very necessary to evaluate the current implementation effect. As an important intervention means to alleviate poverty and improve the quality of life of the disabled, employment services have been evaluated by some scholars. The effectiveness of different occupational interventions in improving employment, educational, clinical, and quality-of-life outcomes for persons with psychiatric disabilities has been evaluated, and the research shows that the vocational and educational outcomes have been significantly improved (15). Some studies have pointed out that vocational rehabilitation services aimed to improve life functioning will lead to an improvement in quality of life (16, 17). The Individual Placement and Support (IPS) has been studied by several scholars and has shown that it can increase life satisfaction and time spent in daily occupations and community life for persons with disabilities (18), and it is effective in gaining employment and integrating into the local community (19). It can be seen that the role of employment services on disabled people may not only be reflected in the economy. It is more thorough and comprehensive to evaluate the poverty reduction effect of employment services from the perspective of multidimensional poverty of the disabled.

The goal of the employment service is to promote persons with disabilities to be in a state of optimal economic self-sufficiency, and the ultimate goal is that the recipient of employment services should experience improvement in his or her quality of life. Therefore, the evaluation of the poverty reduction effect of employment services should not be limited to income, but should focus on the perspective of multidimensional poverty. In addition, achievement of the ultimate goal can be expected to result from a process in which vocational outcomes such as the improvement of employment opportunities, vocational skills and employment forms are obtained *via* targeted employment services. In view of the above analysis, the data in Basic Service Status and Demand Information for Persons with Disabilities registered in 2018 and 2019 were used in this study. First, this paper expands the poverty measurement standard of the disabled from one-dimensional income poverty to multidimensional capabilities poverty, and identifies multidimensional poverty from five dimensions of economic capacity, physical function, learning capacity, risk resistance and social integration capacity. Second, the improvement effect of employment services on multidimensional poverty of the disabled is evaluated from a micro perspective. Finally, in order to gain a deeper understanding of the relationship between employment services and multidimensional poverty of the disabled, the mediation effects of the three vocational outcomes of employment opportunities, vocational skills and Internet employment are verified. Based on the above analysis, this paper proposes the mechanism of employment services to improve multidimensional poverty of persons with disabilities (as shown in Figure 1).

Based on the collation and analysis of the literature, we can find that there are still some deficiencies in the current research. First, China has achieved remarkable results in poverty reduction. However, it cannot be ignored the fact that exclusion of disabled persons from education, employment, social and political activities have not been improved by the increase in their income (20). A single monetary indicator does not capture other negative aspects that affect persons with disabilities and their families, such as social exclusion. Therefore, it is fundamental to analyze the poverty situation of the disabled from a multidimensional perspective. However, the existing researches on multidimensional poverty mostly focus on rural households, and there are relatively few studies on the multidimensional poverty of the disabled, especially in China. Second, the existing research focuses on theoretical analysis and evaluation of employment services for the disabled, lacking empirical data. A review of the studies suggests that China's employment legislation is quite progressive in terms of access to employment and in terms of protecting employment rights of persons with disabilities,

FIGURE 1
The mechanism of employment services to improve multidimensional poverty of persons with disabilities.
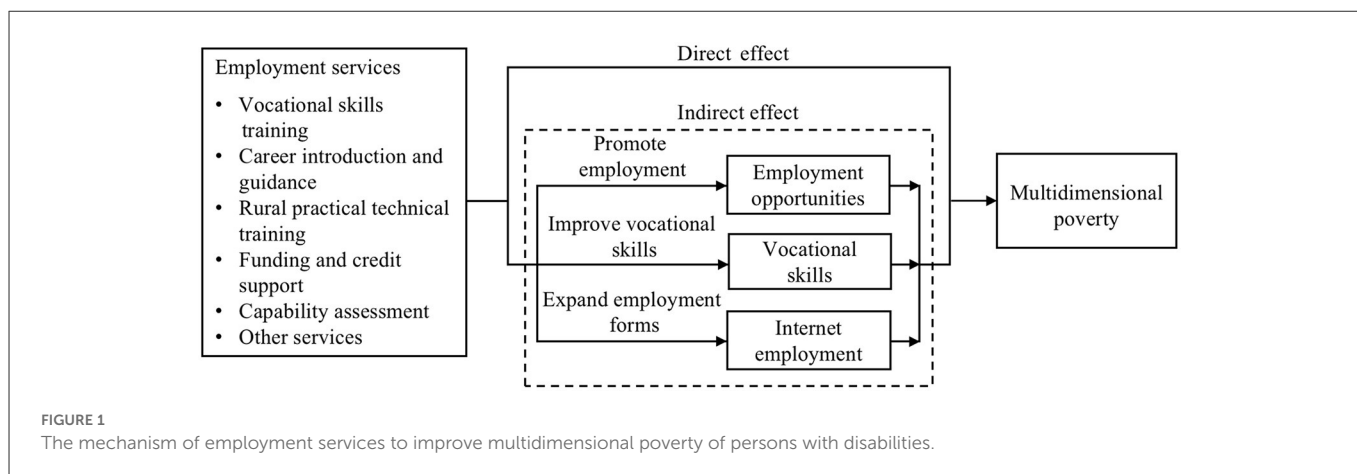
but there appears to be a huge disconnection between the actual legislative policies and implementation of the stated policies (12, 20). Social services, rehabilitation services, employment services and other services are insufficient to meet development needs, resulting in poverty for the majority of persons with disabilities (20). A scholar explained qualitatively why the actual employment situation in China stagnated or even worsened despite the impression that employment support for the disabled was improving (21). It can be seen that most scholars believe that the actual effect of employment services is extremely limited in China. It is worth noting that these studies are mostly macro qualitative analysis, lacking quantitative demonstration using micro data. Third, some scholars pointed out that employment should not be used as the sole indicator of rehabilitation success. They advocate that assessing changes attributable to vocational interventions should focus on the impact of improvement of life skills through vocational interventions on multiple areas of quality of life (17). A number of scholars have evaluated the effects of employment services for persons with disabilities in terms of employment, education, daily activities, community integration, quality of life, etc. (15–18). However, there are still shortcomings in the current research. On the one hand, most of the research only takes the mental disabled as the research object, which leads us to not have a more comprehensive understanding of the disabled group. On the other hand, most studies only evaluate employment support measures from a single area of the living conditions of the disabled, which may underestimate the impact of employment support measures on the disabled.

Based on the above analysis, this paper has the following contributions to measure multidimensional poverty of the disabled and to evaluate the poverty reduction effect of employment services. First, this paper builds a multidimensional poverty index system for the disabled based on Sen's capability theory, which not only enriches the research results of the application of capability theory to the field of the disabled in China, but also helps to improve our overall understanding of the poverty situation of the disabled. Second, based on the existing qualitative research on the employment support policies for the disabled in China, quantitative analysis using micro data can provide more accurate evidence for the implementation effect of employment support policies. Third, employment service is a development-oriented policy aimed at disabled persons with working ability in China's poverty alleviation policy. Multidimensional poverty involves multiple areas

of disabled persons' lives. This paper evaluates employment services and analyzes different categories of disabled people from the perspective of multidimensional poverty, which makes the evaluation of employment service more comprehensive and accurate. In addition, this study provides guidance for China to alleviate poverty by improving the employment service system in the post-poverty era. Fourth, the PSM-DID method of causal inference is used for analysis, which helps to solve the endogenous problem in the model and ensures the reliability of the benchmark regression results.

2. Materials and methods

2.1. Data

The data used in this study come from Basic Service Status and Demand Information for Persons with Disabilities. This is a large-scale survey organized and coordinated by the State Council Disabled Persons' Working Committee, and the specific work is undertaken by the China Disabled Persons' Federation. The purpose is to grasp the basic service status and needs of persons with disabilities in a timely manner, establish and improve the national basic database of certified persons with disabilities, and promote the high-quality development of the cause of persons with disabilities. The subjects of the investigation are the disabled who hold the Disabled Person Certificate of the People's Republic of China. The survey content includes main survival and development items (basic information, housing, education, employment, social security, basic medical care and rehabilitation, accessibility, culture and sports, etc.) and basic public service facilities in all villages (communities) across the country. Due to the difficulty in obtaining data, this paper only uses the data of Jilin Province in 2018 and 2019 for research, and takes the working-age disabled people aged 16–59 as the main research group. Finally, the 435,312 samples in 2018 are selected and the information in 2019 is tracked.

2.2. Analysis method: Multidimensional poverty measurement

2.2.1. Alkire-Foster method

Alkire and Foster, scholars of Oxford Poverty and Human Development Initiative (OPHI), proposed AF method to measure

multidimensional poverty (22). At present, the AF method has become the mainstream method to measure multidimensional poverty and has been recognized by the United Nations Development Progarmme (UNDP). The AF method was adopted in our study to measure multidimensional poverty based on the capability theory. The fundamental logic of selecting the AF method is that it admits the independence of several dimensions of poverty, and it also highlights the threshold of the number of deprived dimensions to be multidimensional poverty. Generally, three key processes were used to accomplish the measurement: identification, aggregation and decomposition. For the process of identification, the method of dual cutoff identification is adopted to identify poor disabled persons according to two distinct cutoffs: deprivation and poverty cutoffs. First, a deprivation cutoff is used to identify whether a person with disabilities is deprived in each dimension, and each disabled person's deprivation score is defined as the sum of weighted scores of all dimensions. Second, a poverty cutoff is used to determine whether a person with disabilities could be considered multidimensionally poor. A disabled person is identified as multidimensionally poor if his or her deprivation score is greater than or equal to a given poverty cutoff (k) (22, 23).

The process of aggregation needs to be imitated to aggregate multiple dimensions to get a composite index after identifying the deprivation of dimensions of poverty. The aggregation step of our methodology proposes an adjusted headcount ratio, which builds upon the standard FGT technology and overcomes its shortcomings (22). The adjusted headcount ratio (M_0), also referred to the MPI, is calculated by multiplying the incidence (H) and intensity (A) of poverty. The incidence of poverty (H), namely the multidimensional headcount ratio, is defined as the proportion of persons with disabilities who are poor in multiple dimensions. It is calculated as the number of persons with disabilities identified as multidimensionally poor (q) divided by the total number of persons with disabilities (n). The intensity of poverty (A) indicates the average deprivation score among the poor. Based on the above description, M_0 is defined as follows:

$$M_0 = H \times A = \frac{q}{n} \times \frac{\sum_{i=1}^n c_i(k)}{qd} = \frac{\sum_{i=1}^n c_i(k)}{nd} \quad (1)$$

where $c_i(k)/d$ represents the share of possible deprivations experienced by a poor person i, and hence the average deprivation share across the poor is given by $A = \sum_{i=1}^n c_i(k)/(qd)$. This partial index conveys relevant information about multidimensional poverty, namely, the fraction of possible dimensions d in which the average poor person is deprived.

Decomposition analysis can provide targeted policies for poverty alleviation. In this study, M_0 was decomposed according to dimensions in order to reveal the underlying structure of deprivation. Dimensional breakdown refers to the contribution of each deprivation dimension to overall poverty (M_0). Therefore, the contribution of each dimension (P_{0j}) is calculated as the poverty index for each dimension (M_{0j}) divided by the overall poverty index (M_0).

2.2.2. Selecting dimensions, indicators and deprivation cutoff

Measurement of poverty is an essential prerequisite for targeting interventions and designing programs and policies to alleviate poverty. Given its multidimensional nature, there are various indicators, such as income, expenditure, deprivation, and social exclusion, that could be used to measure multidimensional poverty (24). UNDP has established a multidimensional human development index to measure the development level of each country, including three dimensions of education, health and living standards (25), which has been adopted by the existing studies of multidimensional poverty (8, 26–28). Relevant research scholars have expanded the measurement dimensions of multidimensional poverty. Four dimensions of health (disability), education, housing and living standards were used to measure multidimensional poverty among Iranian older adults (29); six dimensions of economy, health, housing, employment, social protection and interpersonal relationship were used to measure multidimensional poverty of disabled families in South Korea (30); other dimensions are added to measure multidimensional poverty of persons with disabilities in different countries, such as social participation, information and communication, basic daily activities, subjective and psychological wellbeing, etc. (31, 32). It can be seen that there is no consensus on how to design a multidimensional poverty measure, and the most appropriate deprivation indicators and the results of multidimensional poverty studies vary across countries, regions, and groups.

In this research, five deprived dimensions—economy, health, education, insurance and social participation—including eight indicators were selected to form our MPI based on previous studies and the availability of data. According to the construction method issued by UNDP, each dimension is assigned equal weight (the indicators under each dimension are also assigned equal weight) to reflect the equal importance of each dimension in the evaluation system (25). The two indicators of income and housing are used to measure the dimension of economy. The poverty line in income is not fixed but changes along with economic development. In the process of registering disabled information, the income of disabled people will be divided into different categories according to the poverty line of the year. Previous studies only used income to reflect economic status (30), and housing situation was added to this paper to deepen the study of economic capacity. As far as health dimension is concerned, a series of variables, such as nutrition, child mortality, self-assessed health status, and the presence of a chronic illness are usually selected to measure the health deprivation (8, 23). Due to the limitation of registration content, the indicator of other diseases besides disability is used to measure the physical function of persons with disabilities, and the health dimension needs to be further improved. As far as education dimension is concerned, two indicators are often selected: years of schooling (primary school incomplete for adults) and child school attendance (children aged 6–16 years old are not attending to school) (8, 33). Persons with disabilities aged 16–56 are the research group in this paper, and educational attainment plays a crucial role in their lives, so adults' completion of primary school is used as an indicator to measure the educational dimension. As for insurance dimension, health insurance is selected to measure the insurance deprivation (30). For persons with disabilities, the capacity to resist risk is critical, and medical insurance and pension insurance are chosen to represent insurance status. As for social participation dimension is concerned, participation in community activities is usually selected to measure its deprivation (31), but such measurement is somewhat singular. This paper tries to evaluate social participation from multiple perspectives. The Internet is an

TABLE 1   Dimensions, indicators, deprivation criteria and weights.

Dimension	Indicator	Deprivation cutoff (deprived if …)	Weight
Economy	Income level	The person's average annual income is below the national poverty line	1/10
	Housing situation	The person has no housing title in urban areas or poor housing conditions in rural areas	1/10
Health	Other diseases besides disability	The person has other diseases besides disability	1/5
Education	Education level	The person has not completed primary school education	1/5
Insurance	Medical insurance	The person has no medical insurance	1/10
	Pension insurance	The person has no pension insurance	1/10
Social participation	Cultural and sports activities	The person does not often participate in cultural and sports activities	1/10
	Internet	The person does not use the internet	1/10

important channel for information acquisition and communication, especially for the working-age population, its role in social life is indispensable. Thus, participation in social activities and the use of Internet are chosen to represent social participation status.

Table 1 presents the deprivation dimensions, indicators, and cutoffs used in this study. The levels of multidimensional poverty vary according to the selection of poverty cutoffs (k). Based on previous studies, a cutoff (k = 0.33) is selected because it has a normative justification and provided a wide distribution of poverty results (25). That is, a person is considered multidimensionally poor if his or her weighted sum of deprivations is equal to 33% or higher. In addition to this multidimensional poverty line, severe (50%) and vulnerable (20%) poverty cutoffs are used to calculate the percentage of people who are severely multidimensionally poor and vulnerable to multidimensional poverty (34). In order to make the results more objective, variable poverty cutoffs (20–50%) are adopted in this section to describe the levels of multidimensional poverty for persons with disabilities.

2.3. Analysis method: The poverty reduction effect of employment services

2.3.1. Benchmark model

In order to preliminarily investigate the impact of employment services on the MPI of the disabled, ordinary least squares (OLS) is used in this paper, and the model is set as follows:

$$M_i = \beta_0 + \beta_1 S_i + \beta_j X_i + \varepsilon_i \qquad (2)$$

where i represents the individual with disabilities; M_i is the explained variable, representing the MPI of the disabled; S_i is the explanatory variable, representing that the disabled are provided with employment services; X_i represents a series of covariates such as personal, family and social support of the disabled; ε_i represents random error term. The explained variable is a categorical variable, so OLS is selected for regression analysis.

2.3.2. PSM-DID

It is worth noting that persons with disabilities in severe multidimensional poverty are more likely to receive employment services, social assistance, welfare subsidies and other assistance, that

is, whether persons with disabilities receive employment services is not random, but is affected by their own characteristics and needs. Therefore, in order to solve endogenous problems such as sample selection bias and missing variables, the PSM-DID method is adopted to investigate the improvement effect of employment services on multidimensional poverty.

The DID method has advantages in investigating the effectiveness of policy by comparing the differences in the effects of a certain policy between the treatment group and the control group. In the DID model, the treatment group and the control group must meet the parallel trend assumption in the base period, however, in reality, the parallel trend assumption cannot be easily satisfied (35). In order to solve this problem, this study introduces the PSM method to match the treatment group and the control group in the base period. By controlling the heterogeneity of the two groups, the treatment group and the control group after the base period matching are closer to the natural experiment, so as to ensure that the DID method meets the parallel trend assumption to a certain extent. The PSM-DID regression approach can be applied for causal inferences to counter selection bias or confounding (36), and is widely used in academic research (35, 37–40).

We used the samples after conducting a panel balance for the data in 2018 and 2019. The samples that did not receive employment services in 2018 and 2019 were defined as control group C, and the samples that did not receive employment services in 2018 but received employment services in 2019 were defined as treatment group T. At the same time, age, gender, hukou status, disability categories, disability grades, marital status and other welfare policies were selected as the control variables. The fixed effect model constructed in this paper is as follows:

$$M_{it} = \beta_2 + \beta\, treat_i \times time_t + \rho X_{it} + \mu_i + \vartheta_t + \varepsilon_{it} \qquad (3)$$

where M_{it} is the explained variable, which represents the MPI of the disabled, i represents the individual with disabilities, and t represents the time before and after the disabled obtain employment services; the treatment variable $treat_i$ is a binary indicator that represents the group dummy variable, $treat = 1$ represents the treatment group that the individuals obtain employment services, and $treat = 0$ represents the control group that the individuals do not obtain employment services; $time_t$ represents the time dummy variable, $time = 1$ represents the time after the implementation of employment services (the year of 2019), and $time = 0$ represents

the time before the implementation of employment services (the year of 2018); the variable $treat_i \times time_t$ denotes the interaction between groups and time; X_{it} represents a set of individual covariates of disabled i at time t; μ_i and ϑ_t represent the individual and time level fixed effects, respectively; ε_{it} denotes the random error term and contains information other than the main variables of the model. β is calculated by the PSM-DID model and represents the net effect of employment services on the improvement of multidimensional poverty. The formula for calculating β is as follows:

$$\begin{aligned} \beta = {}& E\left(Y^T_{2019i} - Y^T_{2018i} \mid p(X_{2018i}), D_i = 1\right) \\ & - E\left(Y^C_{2019i} - Y^C_{2018i} \mid p(X_{2018i}), D_i = 0\right) \end{aligned} \quad (4)$$

where Y_{2018i} represents the MPI of individuals in 2018, and Y_{2019i} represents the MPI of individuals in 2019; $p(X_{2018i})$ is the probability of obtaining employment services in 2019 calculated according to the characteristics of individuals in 2018. D_i represents the treatment variable in 2018, $D_i = 1$ represents the treatment group, and $D_i = 0$ represents the control group.

2.3.3. Mediation effect model

In the above mechanism analysis, we propose that employment services may improve multidimensional poverty of the disabled by promoting employment, improving employment skills and promoting internet employment. In order to test the mediation effect, the model is constructed as follows:

$$M_{it} = \beta_0 + \beta_1 S_{it} + \beta_j X_{it} + \mu_i + \vartheta_t + \varepsilon_{it} \quad (5)$$

$$Z_{it} = \alpha_0 + \alpha S_{it} + \beta_j X_{it} + \mu_i + \vartheta_t + \varepsilon_{it} \quad (6)$$

$$M_{it} = \theta_0 + \theta S_{it} + \theta_1 Z_{it} + \beta_j X_{it} + \mu_i + \vartheta_t + \varepsilon_{it} \quad (7)$$

In formula (5), the coefficient β represents the total effect of employment services on the MPI. In formula (6), the coefficient α represents the effect of employment services on the mediation variable Z_{it}. In formula (7), the coefficient θ represents the direct effect of employment services on the MPI under the control of the mediation variable, and the coefficient θ_1 represents the effect of the mediation variable on the MPI under the control of employment services. When β is significant in formula (5), the mediation effect is jointly tested by formulas (6) and (7). If α, θ and θ_1 are all significant, there is a partial mediation effect; if α and θ_1 are significant, θ is not significant, there is a full mediation effect.

3. Results

3.1. Multidimensional poverty estimates

Table 2 presents H, A and M_0 for persons with disabilities aged 16–59 under different poverty cutoffs. First, the incidence of poverty (H) in 2018 varies from 93.9% (k = 20%) to 78.0% (k = 30%) and 39.0% (k = 50%). Meanwhile, M_0 values are 0.390, 0.358, and 0.220 for these three cutoffs, respectively. With the increase of the poverty cutoff, H and M_0 show a downward trend, and the same trend is shown in 2019. This is because the increase of the poverty cutoff means that the threshold of identifying multidimensional poverty rises, and the number of people who reach the threshold of multidimensional poverty decreases. Second, with the increase of

TABLE 2   Incidence (H), Intensity (A), and MPI (M_0) for different poverty cutoffs.

Cutoffs (k)	Year	Incidence (H)	Intensity (A)	MPI (M_0)
0.2	2018	93.9%	41.5%	0.390
	2019	90.8%	39.2%	0.356
0.3	2018	78.0%	45.9%	0.358
	2019	71.9%	44.2%	0.318
0.4	2018	60.3%	50.6%	0.305
	2019	53.5%	49.2%	0.263
0.5	2018	39.0%	56.4%	0.220
	2019	31.7%	55.5%	0.176

the poverty cutoff, A shows an increasing trend. Since A reflects the poverty intensity of the poor, the disabled who are in poverty are deprived in more dimensions when the multidimensional poverty threshold rises, which leads to an increase in the poverty intensity. Third, compared with 2018, H, A, and M_0 all decreased to varying degrees in 2019, which shows that the levels of multidimensional poverty among persons with disabilities has decreased. In general, the results show that about 90% are deprived in at least one dimension, and about 30% are in a state of severe multidimensional poverty until 2019. It can be seen that the disabled faced a higher level of multidimensional poverty.

In order to see the deprivation degree of the disabled in each dimension, we decompose the MPI into the sum of the poverty index of each dimension, and then calculate the percentage contribution. Table 3 presents M_{0j} and P_{0j} for persons with disabilities aged 16–59. Under different poverty cutoffs, P_{01}, P_{02} and P_{04} change slightly, and are basically below 20%, indicating that the dimensions of economy, health and insurance present similar levels of deprivation. Compared with 2018, P_{01}, P_{02} and P_{04} decrease in 2019, indicating that poverty in the dimensions of economy, health and insurance has improved. The year 2020 is the year for China to achieve the goal of building a moderately prosperous society in all respects, and the end of the battle to win the fight against poverty in all respects. Toward 2020, China's poverty reduction policy is committed to solving absolute poverty and improving people's livelihood. The dimensions of economy, health and insurance are directly related to the basic survival of persons with disabilities, which has been greatly improved. In addition, P_{03} and P_{05} are higher than 20%, indicating that the disabled have higher levels of deprivation in the dimensions of education and social participation. The disabled face many difficulties in education and social participation due to physiological defects. It is necessary to further improve the education system for the disabled and strengthen the infrastructure and information construction.

There are large internal differences among persons with disabilities. In order to see the deprivation degree of the disabled in different disability categories, we decompose the MPI into the sum of the poverty index of each disability category. Table 4 shows M_{0j} of persons with different disability categories aged 16–59. Under different poverty cutoffs, the multidimensional poverty of persons with different disability categories presents the same characteristics, that is, M_{0j} of persons with intellectual disabilities is the highest, and M_{0j} of persons with physical disabilities is the lowest. It can

TABLE 3 Decomposition results of MPI for different poverty cutoffs: different dimensions.

k	Year	Economy		Health		Education		Insurance		Social participation	
		M_{01}	P_{01}	M_{02}	P_{02}	M_{03}	P_{03}	M_{04}	P_{04}	M_{05}	P_{05}
0.2	2018	0.074	18.9%	0.007	1.8%	0.081	20.7%	0.057	14.6%	0.172	44.0%
	2019	0.066	18.6%	0.005	1.4%	0.075	21.1%	0.047	13.2%	0.163	45.7%
0.3	2018	0.071	19.9%	0.007	1.9%	0.081	22.5%	0.054	15.1%	0.145	40.6%
	2019	0.063	19.8%	0.005	1.5%	0.075	23.5%	0.043	13.6%	0.132	41.5%
0.4	2018	0.061	20.0%	0.006	2.1%	0.078	25.7%	0.045	14.6%	0.115	37.6%
	2019	0.052	19.8%	0.004	1.7%	0.071	27.1%	0.034	12.9%	0.101	38.5%
0.5	2018	0.045	20.5%	0.006	2.5%	0.061	27.8%	0.032	14.6%	0.076	34.6%
	2019	0.037	21.0%	0.004	2.1%	0.050	28.3%	0.024	13.4%	0.062	35.1%

TABLE 4 Decomposition results of MPI for different poverty cutoffs: different disability categories.

Cutoffs (k)	Year	Visual disability	Hearing disability	Speech disability	Physical disability	Intellectual disability	Psychiatric disability	Multiple disability
0.2	2018	0.369	0.368	0.426	0.355	0.509	0.434	0.459
	2019	0.338	0.329	0.388	0.316	0.485	0.409	0.434
0.3	2018	0.332	0.332	0.404	0.315	0.500	0.413	0.442
	2019	0.295	0.287	0.361	0.269	0.475	0.384	0.414
0.4	2018	0.274	0.276	0.360	0.254	0.478	0.363	0.406
	2019	0.235	0.227	0.315	0.208	0.449	0.329	0.375
0.5	2018	0.187	0.186	0.275	0.168	0.411	0.271	0.324
	2019	0.147	0.138	0.213	0.124	0.366	0.230	0.280

be seen that persons with intellectual, multidimensional, psychiatric or speech disabilities face a serious poverty situation, while those with physical, visual or hearing disabilities have a relatively good living condition. From the perspective of time, M_{0j} of all categories of disabled persons in 2019 has decreased compared with that in 2018, which indicates that the living conditions of all categories of disabled people have improved, and the improvement of persons with physical, hearing or speech disabilities is relatively large. In the process of poverty reduction, the diversity within the disabled deserves attention.

3.2. The poverty reduction effect of employment services

3.2.1. Descriptive statistics of variables

Explained variable: MPI. According to relevant literature (26, 34), k = 0.33 is set as the poverty cutoff in this part. Persons with disabilities whose MPI is ≥ 0.33 are considered to be in multidimensional poverty, and the higher the MPI, the more severe multidimensional poverty of the disabled.

Explanatory variable: employment service. Employment services in Regulations on the Employment of Persons with Disabilities are mainly provided free of charge by the China Disabled Persons' Federation and its affiliated employment service agencies for the disabled. In the registration form of Basic Service Status and Demand Information for Persons with Disabilities formulated

by China Disabled Persons' Federation, employment services include vocational skills training, career introduction, rural practical technical training, funding and credit support, vocational guidance, etc. The employment service is set as a binary variable, which is assigned a value of 1 if the disabled person obtains any of the above services, otherwise, it is assigned a value of 0.

Control variable: individual characteristics, family characteristics and social support. Individual characteristics include gender, age, hukou status, disability level, and disability type. Among them, gender and hukou status are both binary variables; disability categories (multiple, visual, hearing, speech, physical, intellectual and psychiatric disabilities) and disability grades (grades 1–4) are categorical variables. Family characteristics include marital status, which is assigned a value of 1 if the disabled person has a spouse, otherwise, it is assigned a value of 0. Social support includes social assistance, welfare subsidies, rehabilitation services and barrier-free reconstruction, all of which are binary variables.

Mediation variable: employment opportunity is a binary variable, which is assigned a value of 1 if the disabled person is employed, otherwise, it is assigned a value of 0; vocational skill is set as a categorical variable, representing the number of vocational skills mastered by persons with disabilities; Internet employment is a binary variable, which is assigned a value of 1 if the disabled person uses the Internet for employment, otherwise, it is assigned a value of 0. Table 5 shows the specific definitions of each variable.

Persons with disabilities aged 16–59 who are not incapacitated and in need of employment services are mainly provided with employment services. The samples of studying in school, retirement

TABLE 5 Definition of variables.

Variable	Variable type	Variable meaning
MPI	Numeric	Between 0 and 1
Age	Numeric	Between 16 and 59
Gender	Categorical	Male = 1; female = 0
Hukou status	Categorical	Non-agricultural = 1; agricultural = 0
Disability categories	Numeric	Between 1 and 7
Disability grades	Numeric	Between 1 and 4
Marital status	Categorical	With spouse = 1; without spouse = 0
Social assistance	Categorical	Get = 1; not get = 0
Welfare subsidies	Categorical	Get = 1; not get = 0
Rehabilitation services	Categorical	Get = 1; not get = 0
Barrier-free reconstruction	Categorical	Get = 1; not get = 0
Employment opportunity	Categorical	Yes = 1; no = 0
Vocational skill	Numeric	Between 0 and 10
Internet employment	Categorical	Yes = 1; no = 0

and no employment intention were deleted in this part, and finally 57,510 people in 2018 were selected and the information in 2019 was tracked (total sample of 115,020 in two periods). The descriptive statistics of each variable are shown in Table 6. It can be seen that the MPI of persons with disabilities who received employment services was 0.323, and that of persons with disabilities who did not receive employment services was 0.344. The MPI of persons with disabilities who received employment services was significantly lower. In addition, the mean values of employment opportunities, employment skills and Internet employment for persons with disabilities who received employment services were higher than those who did not receive employment services.

3.2.2. OLS regression analysis

The OLS method in this part is used to preliminarily investigate the relationship between employment services and multidimensional poverty of persons with disabilities, and the results are shown in Table 7. As China implements various support policies for the disabled, the multidimensional poverty of the disabled will not only be impacted by employment services, but also by other social support. In order to enhance the robustness of the model, the personal characteristics and social support are gradually incorporated into the model. The results of models (1), (3) and (5) show that the correlation coefficients between employment services and the MPI of persons with disabilities are −0.028, −0.012 and −0.020, respectively, which are significant at the level of 0.1%, indicating that employment services can significantly reduce the MPI of persons with disabilities. After adding social support indicators, the results of models (2), (4) and (6) show that the correlation coefficients between employment services and the MPI of persons with disabilities are −0.034, −0.018 and −0.024, respectively, which are also significant at the level of 0.1%, indicating that employment services can still significantly reduce the MPI of persons with disabilities after controlling other

policy shocks. The empirical analysis proves that China's current employment services have played a greater role in solving the poverty problem of the disabled in the process of poverty alleviation, and the effect of employment intervention measures is not as negative as expected.

3.2.3. PSM-DID analysis

In order to more accurately investigate the poverty reduction effect of employment services on the multidimensional poverty of the disabled and solve the endogenous problems such as sample selection bias and missing variables, PSM-DID method is used for analysis in this part. The treatment group is the disabled who did not receive employment services in 2018 and received employment services in 2019, and the control group is the disabled who did not receive employment services in 2018 and 2019. There are 6,482 samples in the treatment group and 40,626 samples in the control group.

The effect of employment services on MPI and different poverty dimensions is shown in Table 8. The DID value is the result of our main concern and represents the effect of employment services on the multidimensional poverty of persons with disabilities. The DID value of the MPI is −0.015 ($p = 0.000$), which means that the MPI of persons with disabilities has decreased by 0.015 units after receiving employment services, indicating that employment services have a significant effect on improving the multidimensional poverty of persons with disabilities. In order to further analyze the role of employment services in improving each poverty dimension, this paper uses the same method to study the five poverty dimensions of the disabled respectively. The results show that the DID values of the poverty index in economy, education, insurance and social participation are −0.002 ($p = 0.008$), −0.003 ($p = 0.008$), −0.005 ($p = 0.000$) and −0.008 ($p = 0.000$), respectively, which means that the poverty index in the four dimensions decreases by 0.002 units, 0.003 units, 0.005 units and 0.008 units respectively after the disabled obtain employment services. It can be seen that employment services have a positive impact on many areas of life for the disabled. As pointed out by relevant scholars, assessing changes attributable to vocational interventions should focus on the impact of improvement of life skills through vocational interventions on multiple areas of quality of life (17). It is worth noting that employment services play a greater role in improving the poverty of education, insurance and social participation than in economic poverty, which to some extent indicates that China provides a minimum guarantee in ensuring that the disabled and their families have a decent income (12).

The effect of employment services on MPI of different disability categories is shown in Table 9. DID value is the result of our main concern and represents the change of MPI of different categories of disabled people after receiving employment services. The DID results of models (1) – (7) are −0.026 ($p = 0.000$), −0.018 ($p = 0.003$), −0.011 ($p = 0.007$), −0.011 ($p = 0.000$), −0.023 ($p = 0.001$), −0.015 ($p = 0.049$), −0.014 ($p = 0.213$), respectively. It can be seen that, compared with other types of disabilities, employment services have the greatest effect on poverty reduction for persons with visual disabilities, which may be related to China's strong support for the development of blind massage industry and encouraging the scale and branding of blind massage during the 13th Five-year period. It is worth noting that, the DID results of persons with psychiatric disabilities or multiple disabilities are not significant, which means that employment services have little effect on poverty reduction of

TABLE 6 Descriptive statistics of variables.

Variable	All (n = 115,020)				Employment services (n = 20,443)		No employment services (n = 94,577)	
	Mean	SD	Min	Max	Mean	SD	Mean	SD
MPI	0.340	0.159	0	1	0.323	0.161	0.344	0.158
Age	45.918	9.203	16	59	46.122	8.997	45.874	9.246
Gender	0.682	0.466	0	1	0.705	0.456	0.677	0.468
Hukou status	0.263	0.440	0	1	0.161	0.368	0.285	0.452
Disability categories	4.572	1.366	1	7	4.580	1.324	4.571	1.375
Disability grades	3.047	0.941	1	4	3.075	0.940	3.041	0.941
Marital status	0.751	0.433	0	1	0.760	0.427	0.749	0.434
Social assistance	0.472	0.499	0	1	0.574	0.495	0.450	0.497
Welfare subsidies	0.352	0.478	0	1	0.432	0.495	0.335	0.472
Rehabilitation services	0.218	0.413	0	1	0.334	0.472	0.192	0.394
Barrier-free reconstruction	0.021	0.143	0	1	0.057	0.231	0.013	0.113
Employment opportunity	0.620	0.485	0	1	0.762	0.426	0.589	0.492
Vocational skill	0.406	0.541	0	18	0.708	0.590	0.341	0.507
Internet employment	0.012	0.108	0	1	0.022	0.145	0.010	0.098

TABLE 7 Effect of employment services on MPI: OLS estimate result.

Variable	2018		2019		All	
	(1)	(2)	(3)	(4)	(5)	(6)
Employment service	−0.028*** (0.002)	−0.034*** (0.002)	−0.012*** (0.002)	−0.018*** (0.002)	−0.020*** (0.001)	−0.024*** (0.001)
Age	0.002*** (0.000)	0.002*** (0.000)	0.002*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
Gender	−0.021*** (0.001)	−0.021*** (0.001)	−0.024*** (0.001)	−0.024*** (0.001)	−0.022*** (0.001)	−0.022*** (0.001)
Hukou status	−0.016*** (0.001)	−0.018*** (0.001)	−0.004* (0.001)	−0.007*** (0.001)	−0.010*** (0.001)	−0.013*** (0.001)
Disability categories	0.006*** (0.000)	0.005*** (0.000)	0.005*** (0.000)	0.004*** (0.000)	0.005*** (0.000)	0.005*** (0.000)
Disability grades	−0.031*** (0.001)	−0.023*** (0.001)	−0.032*** (0.001)	−0.023*** (0.001)	−0.031*** (0.000)	−0.023*** (0.001)
Marital status	−0.066*** (0.002)	−0.061*** (0.002)	−0.066*** (0.001)	−0.059*** (0.001)	−0.065*** (0.001)	−0.059*** (0.001)
Social assistance		0.027*** (0.001)		0.038*** (0.001)		0.034*** (0.001)
Welfare subsidy		0.026*** (0.002)		0.022*** (0.002)		0.023*** (0.001)
Rehabilitation service		−0.006** (0.002)		−0.003* (0.001)		−0.020*** (0.001)
Barrier-free reconstruction		0.020*** (0.005)		−0.032*** (0.004)		−0.015*** (0.003)
Constant	0.425*** (0.004)	0.385*** (0.004)	0.392*** (0.004)	0.346*** (0.004)	0.412*** (0.003)	0.372*** (0.003)
N	57,510	57,510	57,510	57,510	115,020	115,020
Pseudo R2	0.077	0.093	0.081	0.103	0.075	0.096
F	682.105	535.262	722.540	603.083	1,340.193	1,115.182

*$p < 0.01$, **$p < 0.005$, ***$p < 0.001$; standard errors are given in brackets.

TABLE 8 Effect of employment services on MPI and different poverty dimensions.

		MPI	Economy	Health	Education	Insurance	Social participation
		(1)	(2)	(3)	(4)	(5)	(6)
Before	Control	0.366	0.027	0.005	0.089	0.101	0.170
	Treated	0.370	0.033	0.005	0.088	0.100	0.171
	Diff (T-C)	0.005***	0.004***	0.000	−0.001	−0.001	0.001
After	Control	0.329	0.018	0.003	0.085	0.088	0.165
	Treated	0.318	0.021	0.005	0.081	0.082	0.156
	Diff (T-C)	−0.011***	0.002**	0.003***	−0.004***	−0.006***	−0.009***
DID		−0.015***	−0.002**	0.003***	−0.003**	−0.005***	−0.008***
t		7.41	2.67	6.95	2.64	4.94	13.9
p		0.000	0.008	0.000	0.008	0.000	0.000
Control variable		Yes	Yes	Yes	Yes	Yes	Yes
N		94,216	94,216	94,216	94,216	94,216	94,216

**$p < 0.005$, ***$p < 0.001$.

TABLE 9 Effect of employment services on MPI of different disability categories.

		Visual disability	Hearing disability	Speech disability	Physical disability	Intellectual disability	Psychiatric disability	Multiple disability
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
Before	Control	0.353	0.378	0.413	0.344	0.477	0.406	0.447
	Treated	0.375	0.388	0.416	0.349	0.483	0.4	0.463
	Diff (T-C)	0.022***	0.010**	0.003	0.005***	0.005	−0.006	0.016*
After	Control	0.323	0.335	0.381	0.303	0.451	0.38	0.413
	Treated	0.319	0.327	0.373	0.296	0.433	0.359	0.414
	Diff (T-C)	−0.004	−0.008*	−0.008*	−0.006***	−0.018***	−0.022***	0.002
DID		−0.026***	−0.018**	−0.011*	−0.011***	−0.023***	−0.015	−0.014
t		3.94	2.94	6.95	4.44	3.35	1.97	1.25
p		0.000	0.003	0.007	0.000	0.001	0.049	0.213
Control variable		Yes	Yes	Yes	Yes	Yes	Yes	Yes
N		9,131	10,116	1,751	58,031	6,373	6,335	2,294

*$p < 0.01$, **$p < 0.005$, ***$p < 0.001$.

these two types of disabled people. In the post-poverty alleviation era, China needs to adjust the employment service measures for these two categories of disabled people.

3.2.4. Mediation analysis

From the above analysis, we can see that employment services can effectively improve poverty in economy, education, insurance and social participation, and promote the reduction of MPI. The starting point of employment services is to improve employment skills, promote employment and enrich employment forms, and the quality of life for persons with disabilities is improved by achieving these vocational outcomes. Then whether employment services will improve multidimensional poverty by achieving vocational outcomes, and the mediation effects of employment opportunities, vocational skills and Internet employment are verified in this part.

The mediation effect results of employment opportunities are shown in Table 10. The correlation coefficient between employment services and employment opportunities of persons with disabilities in model (2) is 0.118, which is significantly at the level of 0.1%, indicating that employment opportunities of the disabled increases by 0.118 units after receiving employment services. Employment services and employment opportunities are introduced into model (3) at the same time. The correlation coefficient between employment services and the MPI in model (3) is −0.010, which is lower in absolute value compared to the coefficient in model (1), indicating that employment services can improve multidimensional poverty by promoting the employment of persons with disabilities. The results show that employment opportunities have a partial mediation effect in the relationship between employment services and multidimensional poverty.

TABLE 10 Results of the mediation effect test of employment opportunities.

Variable	MPI	Employment opportunity	MPI
	(1)	(2)	(3)
Employment service	−0.020*** (0.002)	0.118*** (0.005)	−0.010*** (0.002)
Employment opportunity			−0.075*** (0.001)
Control variable	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes
Constant	0.382*** (0.022)	0.480*** (0.068)	0.417*** (0.021)
Pseudo R2	0.103	0.068	0.151

***$p < 0.001$; standard errors are given in brackets.

TABLE 11 Results of the mediation effect test of vocational skills.

Variable	MPI	Vocational skill	MPI
	(1)	(2)	(3)
Employment service	−0.020*** (0.002)	0.329*** (0.006)	−0.010*** (0.002)
Vocational skill			−0.031*** (0.001)
Control variable	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes
Constant	0.382*** (0.022)	0.383*** (0.078)	0.394*** (0.022)
Pseudo R2	0.103	0.089	0.115

***$p < 0.001$; standard errors are given in brackets.

The mediation effect results of vocational skills are shown in Table 11. The correlation coefficient between employment services and vocational skills of persons with disabilities in model (2) is 0.329, which is significantly at the level of 0.1%, indicating that the vocational skills of persons with disabilities increase by 0.329 units after obtaining employment services. Employment services and vocational skills are introduced into model (3) at the same time. The correlation coefficient between employment services and the MPI in model (3) is −0.010, which is lower in absolute value compared to the coefficient in model (1), indicating that employment services can improve multidimensional poverty by improving the vocational skills of persons with disabilities. The results show that vocational skills have a partial mediation effect in the relationship between employment services and multidimensional poverty.

The mediation effect results of Internet employment are shown in Table 12. The correlation coefficient between employment services and Internet employment of persons with disabilities in model (2) is 0.011, which is significantly at the level of 0.1%, indicating that the probability of Internet employment of persons with disabilities increase by 0.011 units after receiving employment services. Employment services and Internet employment are introduced into model (3) at the same time. The correlation coefficient between employment services and the MPI in model (3) is −0.019, which is slightly lower in absolute value compared to the coefficient in model (1), indicating that employment service can improve multidimensional poverty by promoting Internet employment for persons with disabilities. Internet employment has a mediation effect, but this effect is very limited.

4. Discussion

This paper uses the data of the disabled in Jilin Province, China to measure the levels of multidimensional poverty of the disabled. The results show that among persons with disabilities aged 16–59, about 90% are deprived in at least one dimension, and about 30% are in a state of severe multidimensional poverty until 2019. One study showed that 41.1% of the population with disabilities in Peru suffer deprivations in at least three out of the eight dimensions (32). Although scholars choose different indicators for multidimensional poverty in different countries and the results cannot be directly compared, it can at least prove that serious multidimensional poverty is widespread among people with disabilities, which is a common phenomenon in many countries, especially low- and middle-income countries (6, 8, 34). In addition, the degree of poverty in different dimensions is different. The results on contribution of economy, health and insurance are relatively low, indicating that the basic livelihood of persons with disabilities has been guaranteed to a certain extent. The results on contribution of education and social participation are relatively high, indicating that the disabled are obviously insufficient in their ability to learn and integrate into society. This phenomenon is not only found in China, but also in most countries (6, 8). Persons with disabilities are underrepresented in all forms of cultural life and suffer from severe social exclusion (41). Moreover, it is more difficult to meet the needs of the disabled in education services, rehabilitation programs, social services and other development than to meet their basic living needs and provide income security benefits.

TABLE 12 Results of the mediation effect test of Internet employment.

Variable	MPI	Internet employment	MPI
	(1)	(2)	(3)
Employment service	−0.020*** (0.002)	0.011*** (0.001)	−0.019*** (0.002)
Internet employment			−0.107*** (0.006)
Control variable	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes
Constant	0.382*** (0.022)	0.045*** (0.016)	0.389*** (0.022)
Pseudo R2	0.103	0.007	0.110

***$p < 0.001$; standard errors are given in brackets.

While multidimensional poverty is prevalent among persons with disabilities, there has been significant progress in economy, social and community participation over the past 25 years. In part, these advancements are due to improving policy frameworks and laws, occupational and vocational rehabilitation strategies, and corporate practices in support of a more diverse and inclusive workforce (42). The results of this study show that the MPI of the disabled decreased in 2019 compared with that in 2018, which indicates that the multidimensional poverty degree of the disabled has been reduced and the overall trend of multidimensional poverty of the disabled in China is improving. However, different poverty dimensions show different development situations. The results on contribution of economy, health and insurance decreased significantly in 2019 compared with that in 2018. Because these three dimensions are closely related to the basic life of the disabled, the decline in the contributions of these three dimensions represents that the basic living security of the disabled in China has achieved positive results in recent years. During the 13th Five-year period, China took the cause of the disabled as an important part of ensuring people's livelihood, continuously improved the medical security system for the disabled and made a series of welfare reforms, which greatly improved the basic living standards of the disabled. In addition, the contributions of education and social participation are still high, indicating that persons with disabilities are more seriously deprived in the dimensions of education and social participation. Education and social participation are higher-level needs of persons with disabilities. Due to physical defects, disabled people face many difficulties in these two dimensions. In order to ensure that the disabled have equal rights to education and participate in social life, China has taken relevant measures to intervene. In 2012, China promulgated the Regulations on the Construction of Barrier Free Environment (State Council 2012–622), and in 2017, China issued the revised Regulations on Education for Persons with Disabilities (State Council 2017–674). However, it is not so easy to implement these regulations, which leads to slow progress in education and social participation of the disabled. Therefore, in the post-poverty era, China needs to pay attention to the development needs of disabled people on the premise of ensuring their survival.

In order to improve the wellbeing of persons with disabilities, the disability policy of the welfare state has generally undergone a convergence transition from income maintenance to employment incentives (43, 44). The Chinese government has always attached great importance to encouraging and helping disabled persons to find employment through various means, but there is a lack of research on the effects of employment policies for disabled persons in China. First, the results of this study show that the MPI has decreased significantly after persons with disabilities receiving employment services, indicating that employment services have played a great role in reducing poverty. As studied in other countries, employment intervention and occupational rehabilitation not only improve vocational outcomes, but also improve education, community integration, quality of life and other areas of life (15, 45). Second, after the disabled receive employment services, the poverty dimensions of economy, education, insurance and social participation have been improved to varying degrees, and the poverty dimensions of education, insurance, and social participation are improved to a stronger degree than economy. The possible reason is that employment services generate income by promoting employment, but the employment quality of the disabled is not high and the promotion space is small. Moreover, that the traditional mindset is that it is acceptable for persons with disabilities to be relegated to lower-paying, less-valued jobs that are separate from mainstream employment opportunities, so the degree of employment services to improve the economic ability of persons with disabilities is limited. This also reflects, to some extent, that Chinese government legislation asserts the protection of the rights of persons with disabilities but provides minimal direction in ensuring that the disabled and their families have a decent income (12). Finally, the research results of different categories of people with disabilities showed that employment services did not significantly improve multidimensional poverty for people with psychiatric or multiple disabilities. This is inconsistent with previous studies (15–18), suggesting that the effect of employment services provided to people with psychiatric or multiple disabilities in China is extremely limited from the perspective of multidimensional poverty compared to other countries. In the post-poverty alleviation era, China needs to adjust the employment service measures for these two categories of disabled people.

This study further verifies the mediation mechanism of the relationship between employment services and multidimensional poverty of the disabled. The results show that employment opportunities, vocational skills and Internet employment have a partial mediation effect in this relationship. That is to say, employment services can improve multidimensional poverty of persons with disabilities by obtaining some vocational outcomes. This is similar to related research findings in other countries. Some studies

pointed out that receiving counseling/guidance, on-the-job training, job search assistance, on-the-job supports, information/referral services, maintenance, and supported employment were positive predictors of competitive employment (45, 46). These services may have alleviated some of the barriers to employment for persons with disabilities including inadequate training, lack of information, unavailability of jobs, and negative employer perceptions (47). At the same time, employment can enhance problem-solving confidence, social support, sense of community and network ties of persons with disabilities, and has long been associated with quality of life and wellbeing (48, 49). In addition, it should be noted that the effects of the three mediation variables are different. Compared with employment opportunities and vocational skills, the mediation effect of Internet employment is lower, which means that employment services have a limited effect on promoting Internet employment. On the one hand, disabled people are often excluded from digital life due to barriers like high cost, poor design of devices and software, and the lack of relevant knowledge and skills (50, 51). It is difficult for the disabled to obtain employment through the Internet. On the other hand, China has increased its support for the new employment form of "Internet Plus" in the Protocols of the Promotion of Disability Employment in the 13th Five-year period, but the relevant policies are still in their infancy, and the obstacles in their implementation and promotion lead to limited effect of employment services in promoting Internet employment. Internet employment has a positive and effective role in the lives of persons with disabilities, and it is necessary to continuously improve the relevant policy intervention system.

We have obtained some meaningful conclusions by evaluating the effect of employment services on multidimensional poverty, but this study also has some limitations. First, due to data limitations, eight indicators are used to measure multidimensional poverty of persons with disabilities in the current analysis, however, many other indicators (such as per capita income, nutrition, self-rated health, living standards, etc.) could be used to measure multidimensional poverty of the disabled more deeply. Second, employment service is operated as a comprehensive indicator in this paper, and the research on its poverty reduction effect focuses on whether persons with disabilities have received a certain service. However, the type and intensity of employment services received by persons with disabilities are equally critical to outcomes, and this section deserves further study.

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 author.

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 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

XW and JG conceived the idea. JG and HL processed the data and drafted the manuscript. XW, JG, and HL revised and polished this article. All authors contributed to the article and agree to submit this version.

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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.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1093978/full#supplementary-material

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Poverty, redistribution, and the middle class: redistribution via probability distributions vs. redistribution via the linear income tax system

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It has been known for a long time that (1) when graphs of income amount on income relative rank for two income distributions intersect twice, three "transfer groups" are generated, with the poorest and richest both gaining under the same alternative income distribution and the middle group losing; and (2) the linear income tax system satisfies three fundamental principles of tax justice, namely, that as pretax income increases, three quantities should also increase—posttax income, tax amount, and tax rate. This paper links those two ideas, suggesting that the linear income tax system may be the natural and most effective way to guard against poverty reduction policies which, while helping the poorest, as urged by Rawls, may harm the middle, contributing to the weakening of the middle class, thought at least since Aristotle to be the backbone of society. This paper illustrates the two approaches with one initial distribution and three alternative final distributions, contrasting their minimum, median, proportion below the mean, and inequality. It also shows how to guard the linear income tax system against violating the tax amount principle of tax fairness when there is an injection of resources (e.g., from deficit spending or oil revenues) and how to empirically estimate the parameters (e.g., the marginal tax rate) of the linear income system that the population will regard as fair.

KEYWORDS

poverty, redistribution, middle class, lognormal distribution, Pareto distribution, linear income tax system, inequality, income fairness and tax fairness

1 Introduction

It has been known for a long time that (1) when graphs of income amount on income relative rank for two income distributions intersect twice, three "transfer groups" are generated, with the poorest and richest both gaining under the same alternative income distribution and the middle group losing (Schutz, 1951; Budd, 1970; Budd and Seiders, 1971; Jasso, 1983); and (2) the linear income tax system satisfies three fundamental principles of tax justice, namely, that as pretax income increases, three quantities should also increase—posttax income, tax amount, and tax rate (Fei, 1981; Musgrave, 1959, 1963; Intriligator, 1979; King, 1983; Seidl, 2007a,b; Jasso and Wegener, 2022). This paper links those two ideas, suggesting that the linear income tax system may be the natural and most effective way to guard against poverty reduction policies which, while helping the poorest, as urged by Rawls (1971), may harm the middle, contributing to the weakening of the middle class, thought at least since

Aristotle (1952) (*Politics*, Book IV) to be the backbone of society, the "solid core" (Blau, 1964, 296-297).[1]

The study of poverty—how to define it, how to measure it, and how to alleviate it—has a rich and long history. Plato (c.428–348/7 BCE), concerned that societies suffer from both poverty and wealth, has the Athenian Stranger say (Plato, 1952, *Laws*, Book V):

> [T]here should exist among the citizens neither extreme poverty, nor, again, excess of wealth, for both are productive of both these evils [faction and distraction]…[The minimum lot assigned in the beginning] ought to be preserved, and no ruler, nor anyone else who aspires after a reputation for virtue, will allow the lot to be impaired in any case… [The law] will permit a man to acquire double or triple, or as much as four times the amount of this [minimum lot]. But if a person have yet greater riches, whether he has found them, or they have been given to him, or he has made them in business, or has acquired by any stroke of fortune that which is in excess of the measure, if he give back the surplus to the state, and to the Gods who are the patrons of the state, he shall suffer no penalty or loss of reputation.

St. John Chrysostom (c.347–407 CE), in the *Homily 66.3, On the Gospel of Matthew* (Chrysostom, 1860, c. 386–407), estimated the proportions rich and poor in the prosperous city of Antioch at one-tenth each.[2] Other highlights in the voluminous literature spanning philosophy, social sciences, humanities, and public policy include Fisher (1992), Friedman (1965), Fuchs (1967), Himmelfarb (1984), Orshansky (1965), Rawls (1971), Smith (1976a,b), and Vives (1947, 1520–1540), together with single-country and cross-country scholarly research on all aspects of poverty, as well as reports by the major international organizations (e.g., the United Nations and the World Bank) and non-profit "think tanks."[3]

This paper first explores the two originating ideas and then links them. Of course, inequality is an active partner in the fate of the poor and the middle class. Indeed, even earlier than Plato, Confucius (c. 551–c. 479 BCE) taught that the underlying driver of social ills is inequality (An, 2021). Accordingly, inequality is never far from our discussion.

The present work may come at a propitious time, as the world prepares to celebrate the 500th anniversary of the classic and probably earliest book on poverty reduction, *De Subventione Pauperum* (*On the Relief of the Poor*), written in 1526 by Juan Luis Vives (1493–1540) for the Senate of Bruges.

2 Distribution and redistribution of income via probability distributions

We begin with two iconic probability distributions widely used in the study of wages, earnings, income, wealth, and other money variables (for convenience, termed "income")—indeed, "the two classical size distributions" (Kleiber and Kotz, 2003, 126, 238): the lognormal and the Pareto.[4] They are continuous univariate two-parameter distributions defined on positive numbers. The two parameters are a location parameter (such as the mean) and a shape parameter, which governs all measures of relative inequality and is thus called a general inequality parameter, denoted c (Jasso and Kotz, 2008). Both distributions permit incomes to range to infinity. However, they differ in their behavior at the bottom; while the lognormal goes to zero (from the right), the Pareto has a minimum positive amount. Thus, the lognormal is a reasonable representation of initial income and the Pareto for final income, the Pareto's minimum income representing the social safety net. There is a large literature on the two distributions, to which Kleiber and Kotz (2003) provide valuable and succinct introduction, together with an introduction to size distributions in general and biographies of the major originators and contributors.[5]

For studying poverty and the middle class, important dimensions of income distributions include the minimum, the median, and the proportion below the arithmetic mean, as well as overall inequality and inequality within selected regions. For overall inequality, we report three measures: the widely used Gini coefficient (Kleiber and Kotz, 2003, 30) and two members of the class of generalized entropy inequality measures (Cowell and Kuga, 1981), the Theil MLD (Theil, 1967, 125–127) and the Atkinson (1970, 1975) measure (here called ATK) that arises when the inequality aversiveness parameter in the Atkinson family approaches one. All have excellent properties and an array of partisans. For example, Shorrocks (1980, p. 625) views the MLD as the "most satisfactory of the decomposable measures," and Cowell and Flachaire (2023, p. 23) observe that the MLD "has all of the attractive properties of the Gini coefficient" and also "estimates variations in inequality more accurately" than the Gini. We also report

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the share held by the top 1%, at least since 2011 an iconic marker of inequality (Atkinson et al., 2011; Stiglitz, 2011; Jasso, 2020). In continuous, univariate two-parameter distributions, the Gini, Atkinson, Theil, and top share measures are monotonic functions of the general inequality parameter. For measuring inequality among the poor, following Parolin et al. (2023), we use the ratio of the 15th percentile to the 5th percentile. Formulas for all these measures in both mathematically specified and observed distributions are widely available (e.g., Jasso, 1980, 2018, 2020; Jasso and Kotz, 2008, p. 38–39).[6]

For visualization, we rely on graphs of income relative amount on income relative rank, formally, on graphs of the quantile function (QF) for income relative amount.[7] If income is equally distributed (the benchmark case), the graph is a horizontal line at one (the average of the relative amounts). For unequal distributions, the graph increases as relative rank increases. As Pen (1971) put it, the QF for income distribution is like a parade that begins with dwarfs and ends with giants. Importantly, the flatter the curve, the lower the inequality, and there may be regions of greater or lesser flatness.[8]

Even more important, for present purposes, is that the QF signals not only the magnitude of inequality but also, in comparisons of two or more distributions, the exact cutoff points identifying who gains and who loses in a switch from one distribution to another (Schutz, 1951; Budd, 1970; Budd and Seiders, 1971; Jasso, 1983). When the alternatives pertain to absolute income, it is possible that everyone gains or everyone

loses. However, when the alternatives pertain to relative income, there are always winners and losers; the QF graphs cross at least once, providing information about both the relative ranks and the relative income amounts at the boundaries of the "transfer groups." Individuals are better off in the distribution whose QF graph gives them the higher vertical placement. When two QF graphs of relative income cross once, all transfers occur in one direction. Thus, there are two transfer groups, and the point of intersection shows whether the leftmost or the rightmost group is in the majority. When two QF graphs of relative income cross twice, transfers occur in both directions. In this case, there are three transfer groups, with the poorest and the richest gaining under the same alternative and the middle group losing. The three transfer groups can manifest any configuration of location and size, such as the middle group being the majority or the minority.[9, 10]

2.1 Representing the initial income distribution by the lognormal

The lognormal (Aitchison and Brown, 1957; Kleiber and Kotz, 2003, p.107–145), whose application to economic variables began with the pioneering work of Gibrat (1931), is the classical distribution for the case where incomes can be both very low (going to zero) and very high (going to infinity). It would not be a good model for the initial income distribution in eras when pay schemes have rigid minimums or, as in Elizabethan England, rigid maximums (McArthur, 1900). However, it is not unreasonable as an early step in representing the initial distribution in contexts where it is possible to earn both very little and very much.[11]

Figure 1A shows the graph of the relative amount on relative rank for one member of the lognormal family, with general inequality parameter c equal to 0.5. The grid features a vertical line at the median and a horizontal line at the mean (equal to one in a distribution of relative amounts, as noted above). The graph enables visualization of the relative income corresponding to each relative rank, for example,

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6   The Theil MLD and the Atkinson measure both depend on ratios of the geometric mean and the arithmetic mean and are thus algebraic transformations of each other: ATK=1 − exp(−MLD) and MLD=−ln(−ATK). Indeed, given that ATK sits on the unit interval but the MLD ranges beyond one, the Atkinson measure may be regarded as a "normalization" of the MLD (Cowell, 2011, p.186; Jasso, 2023, p. 312–313).

7   Relative income is income divided by the arithmetic mean. If the incomes are arranged in ascending order, their absolute ranks range from 1 to the group or population size N, and relative rank is absolute rank divided by $N+1$. Formally, graphs of (relative) income amount on income relative rank are graphs of the quantile function, one of the three main associated functions of probability distributions, also known as the inverse distribution function, the percent point function, and, when used for income or other money variables, Pen's Parade (Pen, 1971; Cowell, 1977, 2011; Jasso, 1983; Atkinson, 2017; U.S. National Institute of Standards and Technology, 2018).

8   Among the three main associated functions of probability distributions, the most basic is the cumulative distribution function (CDF), the best known is the probability density function (PDF), and perhaps the most useful in studies of income inequality is the quantile function. The three are related to each other in specified ways (Jasso, 1983, p.276–277). For example, the QF is the inverse of the CDF (hence one of its alternate names), and in continuous distributions the PDF is the first derivative of the CDF. For further detail on the QF and its relation to the other associated functions of probability distributions, together with formulas and graphs, see the Gallery of Distributions in the online *eHandbook of Statistical Methods* (also known as the *Engineering Statistics Handbook*) published by U.S. National Institute of Standards and Technology (2018); the one-volume handbook by Forbes et al. (2011); and the comprehensive compendia originated by Johnson and Kotz (1969-1972) and continued with Balakrishnan and Kemp (e.g., Johnson et al., 1994–1995, 2005). Formulas and graphs for the basic associated functions of the lognormal and Pareto are widely available, for example, in the sources above and Jasso and Kotz (2008, 36-37).

9   As shown, the QF is useful not only for studying the income structure and how it changes but also, when individuals retain their ranks, how individuals become better-off and worse-off. Thus, two elements crucial to understanding income distribution and discussed by Marx (1818–1883) are important in this article—relative amounts (Marx, 1968) and rank invariance (Marx, 1964).

10   We note in passing that the literature contains important links between the QF and inequality and between the QF and the Lorenz curve. For example, two QFs of relative income intersect one more time than the corresponding Lorenz curves, so that the canonical case of nonintersecting Lorenz curves is equivalent to the case of QFs intersecting once—and these indicate that the two distributions can be unambiguously ranked on their degree of inequality. Further pertinent literature includes Arnold and Sarabia (2018), Atkinson (1970, 1975, 2017), Budd (1970), Budd and Seiders (1971), Cowell (1977, 2011), Fields and Fei (1978), Jasso (1983, 2020), Kleiber and Kotz (2003), and Schutz (1951).

11   Notable recent developments include (1) work by Battistin et al. (2009) noting that the lognormal's fit is better for consumption than for income and that "the logic of Gibrat's law applies not to total income, but to permanent income and to marginal utility" and (2) work by Venkatasubramanian (2017) and Venkatasubramanian et al. (2015) showing that self-organizing free-market dynamics reach an equilibrium state with an emergent equilibrium distribution which turns out to be lognormal.
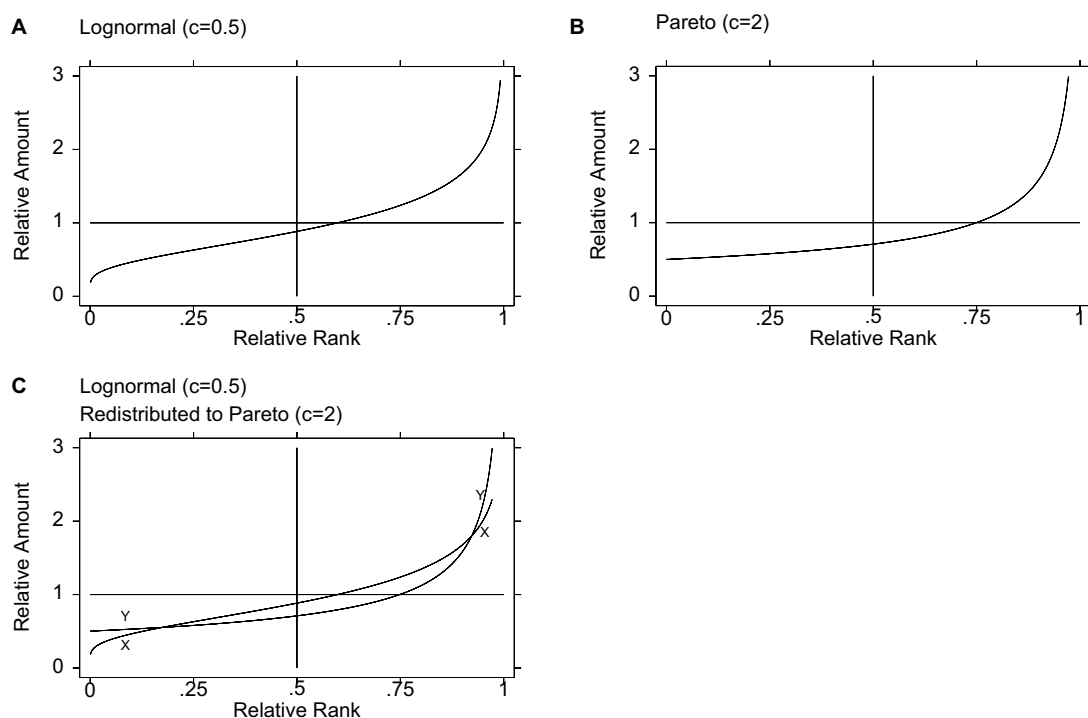
FIGURE 1
Redistribution from lognormal to Pareto. The poor and rich are better off, and the middle is worse off. The initial Lognormal distribution denoted *X* and the final Pareto distribution denoted *Y*. Figure 1C is based on Figure 3(a) in Jasso (2015, p. 889).

at the 25th percentile, the median, or the mean. The median is approximately 0.882, and the mean occurs at approximately the relative rank of 0.599, so approximately 59.9% have incomes below the mean. As for overall inequality, the values of the Gini, MLD, and ATK measures are 0.276, 0.125, and 0.118, respectively. The share held by the top 1% is 3.39%. Moreover, the graph makes it possible to gauge the amount of inequality in selected regions of the distribution; for example, following Parolin et al. (2023), inequality among the poor can be assessed by taking the ratio of the 15th to the 5th percentile. In the lognormal depicted in Figure 1A, the 5th and 15th percentiles are 0.388 and 0.526, yielding a P15/P5 ratio of 1.356. Similarly, eyeballing flatness in the curve, it is clear that inequality is much greater among the top 25% than among the bottom 25%.

2.2 Representing the final income distribution by the Pareto

The Pareto (Kleiber and Kotz, 2003, 59–106), pioneered by Pareto (1895), accommodates a distribution where incomes have a positive minimum and can also be very high—going to infinity. It is a reasonable model for the final income distribution in contexts where redistribution assures a social safety net but allows high earners to retain large amounts.

Figure 1B shows the graph of relative amount on relative rank for the member of the Pareto family with general inequality parameter *c* equal to 2. As with the lognormal in Figure 1A, the grid features a vertical line at the median and a horizontal line at the mean, and the graph enables visualization of the relative income corresponding to each relative rank. The minimum is half the mean, the median is $((\sqrt{2})/2\approx)$ 0.707, and the

mean occurs at approximately the 75th percentile. As for overall inequality, values of the Gini, MLD, and ATK measures are 0.333, 0.193, and 0.176, respectively. The share held by the top 1% is 10%—higher than in the lognormal (*c*=0.5), highlighting the divergent paths that inequality and poverty can take. Meanwhile, the 5th and 15th percentiles are 0.513 and 0.542, so that, following Parolin et al. (2023), the P15/P5 ratio registers 1.057, suggesting less inequality among the poor than in the lognormal. Similarly, the curve is much flatter among the bottom half than among the top half, suggesting far less inequality among the bottom half than among the top half.

2.3 Redistribution from the lognormal (*c* = 0.5) to the Pareto (*c* = 2)

Suppose now that a society with an initial distribution approximated by the lognormal (*c*=0.5) decides to redistribute to a Pareto (*c*=2), perhaps overlooking the facts that in this Pareto 75% of the incomes are below the mean and inequality is greater (e.g., a Gini of 0.333 vs. 0.276 and a top 1% share of 10% vs. 3.39%), so compelling is the other fact that the lowest income cannot go below half the mean. Figure 1C illustrates the result: three transfer groups, with the leftmost and the rightmost gaining and the middle group losing.[12] In

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12 The three transfer groups visible in Figure 1C emerge from the two intersections of the distributions' quantile functions. Equivalently, the two distributions' Lorenz curves intersect once. Thus, this situation echoes Cowell's (1977, 36, 49) insightful remarks that "there has been a redistribution away from

redistributions of relative income from a lognormal to a Pareto, there are three transfer groups—the bottom and top are always better off in the Pareto and the middle in the lognormal—but the transfer groups may differ markedly in their size and boundaries. In the case of the two distributions used in this illustration, the lognormal and the Pareto curves, denoted X and Y, respectively, cross at approximately the 17th and 92nd percentiles, so that a large middle majority of some 75% becomes worse off, while the poorest 17% and the richest 8% become better off. Put differently, persons immediately above the 17th percentile who might have expected to benefit from redistribution to the poor appear to be underwriting the advancement of persons not much poorer than themselves.[13, 14]

The illustration in this section evokes contemporary discussions of the middle region of the income distribution losing ground (Stiglitz, 2015; Case and Deaton, 2020). Moreover, it prompts a search for a possibly better way to achieve poverty reduction.

3 Distribution of income via probability distribution, redistribution of income via the linear income tax system

The linear income tax system has been widely studied (Fei, 1981; Musgrave, 1959, 1963; Intriligator, 1979; King, 1983; Seidl, 2007a,b; Jasso and Wegener, 2022), and its properties and simplicity make it an appealing option. It satisfies the three principles of tax justice, namely, that as pretax income increases, so do final income, tax amount, and tax rate. The linear income tax system begins with a simple equation

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middle-income receivers to the top *and* to the bottom" and that the "Lorenz curves that we wish to compare often intersect."

13 To illustrate the variability in size and boundaries of the transfer groups, if the initial income distribution were a lognormal ($c=0.6$) rather than the lognormal ($c=0.5$) in Figure 1, redistribution to the same Pareto ($c=2$) in Figure 1 would lead to a smaller middle region of some 67% extending from the 28th percentile to the 95th percentile becoming worse-off, and if the initial income distribution were a lognormal ($c=1$), redistribution to the same Pareto ($c=2$) would lead to an even smaller "middle" region of some 38% extending from the 61st percentile to the 99.76th percentile becoming worse-off (Jasso, 1983, 291–294). Moreover, if the initial income distribution were a lognormal ($c=0.82$), redistribution to the same Pareto ($c=2$) would lead to the case in which the majority comprises the bottom 49% and the top 1.3%—and hence does not include the median person (Jasso, 2015, 888–889). Always, however, the "poorest" (or leftmost) and the "richest" (or rightmost) share the same fate, their interests opposite the interests of the "middle" region. Finally, a transfer group may be so tiny that it would be discernible only in a very large population; for example, in a redistribution from a lognormal ($c=2$) to a Pareto ($c=2$), the point of intersection between the "middle" region and the "top" region occurs between 0.999999999 and 0.9999999999.

14 Of course, the lognormal and Pareto pair are not the only distributions giving rise to three transfer groups. Other examples include a power function and Pareto pair (Jasso, 2015, 888–889). As well, observed empirical distributions also may intersect. For example, Budd (1970) and Weisskoff (1970) report that in the United States in the 1945–1965 period and in Mexico in the 1950–1963 period, a large bottom segment and a small top segment became worse-off in relative income, while the middle group became better-off.

in which posttax income y is a linear function of pretax income x. The slope b represents the fraction of pretax income kept by the taxpayer, not counting the intercept a. When a is positive, it represents the minimum posttax income, known as the demogrant or social component, and, in Islamic law, the Nisab (Seidl, 2007a,b; Jasso and Wegener, 2022). If a is zero, the linear tax system reduces to a flat tax, which violates the third principle of tax justice, failing progressivity. Formally, the just linear tax system is written as:

$$y = a + bx,$$

$$a > 0, 0 < b < 1$$

3.1 Properties of the just linear tax system

Exploring the just linear tax system in a population of taxpayers leads to three useful further properties (Jasso and Wegener, 2022). First, besides the intercept a and slope b, there is a third parameter, the level of extraction/injection of resources, represented by the ratio of the average posttax income to the average pretax income and denoted k. Resources may be extracted to fund the government, for security, etc. Conversely, the injection of resources may reflect colonial revenues, oil revenues, deficit spending, or economic growth.[15] Importantly, when pretax income and posttax income are expressed as relative amounts, the parameter k equals one.

Second, embedded in the just linear tax system is a standard form of the intercept and slope, denoted by asterisks and called the signature system. This standard pair—*viz.*, a^* and b^*—occurs naturally when pretax income and posttax income are expressed as relative amounts and has the property that the two parameters sum to one. Moreover, because a^* represents the just relative minimum final income and $1-b^*$ is the standard form of the marginal tax rate, it follows that a^* represents both the just relative minimum final income and the marginal tax rate. Thus, "increasing the relative minimum is the same as increasing the marginal tax rate" (Jasso and Wegener, 2022, p.210), and the fates of the poor and rich are intertwined.

Third, it turns out that the second principle of justice—that as pretax income increases, the tax amount should also increase—is violated if the injection of resources grows to the point that k reaches or exceeds $1/b^*$. Thus, for given signature parameters, it is possible to know *a priori* how much injection of resources can be tolerated without violating the second principle (Jasso and Wegener, 2022, p. 213, Table 4).

3.2 Redistribution from the lognormal ($c = 0.5$) via the just linear tax system

Suppose now that a society with an initial distribution approximated by the same lognormal ($c=0.5$) as in Section 2 decides to redistribute via the linear tax system. Two tax systems are considered, specified by their signature standard parameters. The first signature set has a^* of 0.225 and b^* of 0.775. This is the signature

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15 For a line of inquiry exploring the relations among growth, redistribution, and poverty, see Chenery et al. (1974).
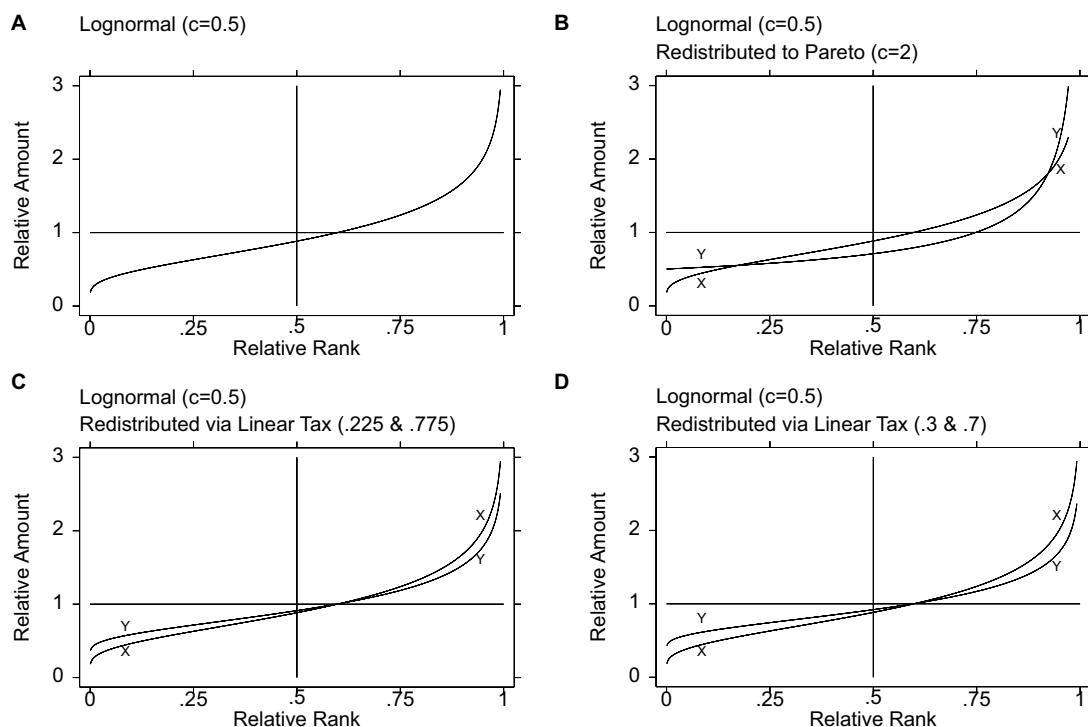
FIGURE 2
Redistribution from lognormal via linear tax. Leftmost better off, rightmost worse off (plus contrast with redistribution to Pareto). The initial lognormal distribution denoted *X* and the final distributions denoted *Y*. Figure 1B is based on Figure 3(a) in Jasso (2015, 889)

parameter set estimated empirically for a probability sample of German earners in 2009, based on their responses to questions asked in the German SocioEconomic Panel (GSOEP) about their current actual pretax income and their idea of the just posttax income for themselves (Jasso and Wegener, 2022). The second signature set has $a*$ of 0.3 and $b*$ of 0.7. Of course, the society could specify any other signature set, cognizant that $a*$ represents the standard form of both the relative minimum income and the marginal tax rate, or it could estimate empirically its population's ideas about the just system.[16]

Figure 2C depicts the graphs of relative amount on relative rank for the pretax distribution (lognormal of $c = 0.5$), denoted X, and the posttax distribution obtained from the 0.225 to 0.775 tax system, denoted Y. As shown, the two graphs intersect only once, at the mean of one and the relative rank of approximately 0.599. Thus, the leftmost 60% have gained from the redistribution, and the rightmost 40% have lost. The lowest income has increased from close to zero (in a population of a 1,000, approximately 18.8% of the mean) to 37.1% of the mean. The highest income has declined from 4.14% of the mean

(again, in a population of a thousand) to 3.43% of the mean. Of course, in a population of millions, the figures at the extremes would differ. The three overall inequality measures—Gini, MLD, and ATK—register 0.213, 0.0713, and 0.0688, respectively, indicating a nontrivial decline in inequality. The share held by the top 1% is 2.76%. Finally, to gauge inequality among the poor, following Parolin et al. (2023), we obtain the 5th and 15th percentiles (0.525 and 0.632), yielding a P15/P5 ratio of 1.203 and suggesting less inequality among the poor than in the lognormal, where it is 1.356 (but more than in the Pareto, where it is 1.057, visible in the curve's flatness).[17]

Now suppose that a combination of economic growth and deficit spending permits the average of the final income distribution to increase. How much could be used in redistribution without violating the second principle of tax justice? The answer is that k could increase to $1/b*$, or approximately 1.29, for an injection of resources equal to 29% of the initial income distribution (Jasso and Wegener, 2022, p. 213, Table 4). If the society wanted to take k to 1.5, injecting resources equal to half the initial total income, then to safeguard the second principle of tax justice, the tax system parameters would have to change to 0.333–0.667 (Jasso and Wegener, 2022, p. 214, Table 5). That is, the standard relative minimum final income (and, identically, the standard marginal tax rate) would have to increase from 0.225 to 0.333, or approximately 33%.

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16 Empirical approximation of the signature system viewed as fair by a population is straightforward if data are available on each respondent's own actual pretax income and own just posttax income (*viz.*, the posttax income regarded as just for self by the respondent); the procedure simply regresses just posttax income on actual pretax income, both in relative form (Jasso and Wegener, 2022). Such data have been available in Germany since 2009 and are now available for almost 30 countries in the European Social Survey, Round 9 (2018–2019).

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17 Figures 2A,B repeat Figures 1A,C enabling visual contrast of all three redistributions.

Analyzing the 0.3–0.7 tax system exactly as above for the 0.225–0.775 system, Figure 2D depicts the graphs of relative amount on relative rank for the pretax distribution (lognormal of $c = 0.5$) and the posttax distribution obtained from the 0.3–0.7 tax system. As shown, the two graphs intersect only once, at the mean of one and the relative rank of approximately 0.599. This is exactly as in the 0.225–0.775 system, which is not surprising given that the tax system is a linear transformation. The lowest income has increased from close to zero (in a population of a thousand, approximately 18.8% of the mean) to 37% of the mean. The highest income has declined from 4.14% of the mean (again, in a population of a thousand) to 3.20% of the mean. Of course, in a population of millions, the figures at the extremes would differ. The three overall inequality measures—Gini, MLD, and ATK—register 0.192, 0.0579, and 0.0563, respectively, indicating a further decline in inequality. The share held by the top 1% is 2.59%. Finally, to gauge inequality among the poor, following Parolin et al. (2023), the 5th and 15th percentiles are 0.571 and 0.668, yielding a P15/P5 ratio of 1.169 and suggesting less inequality among the poor than in the lognormal (where it is 1.356) or via the 0.225–0.775 system (where it is 1.203) but more than in the Pareto (where it is 1.057).

As mentioned above, we now ask how much of a windfall (or deficit spending) could be used in redistribution without violating the second principle of tax justice. The answer is that k could increase to $1/b^{\ast}$, or approximately 1.429, for an injection of resources equal to 42.9% of the initial income distribution (Jasso and Wegener, 2022, p.213, Table 4). If the society wanted to take k to 1.5, injecting resources equal to half the initial total income, then, exactly as above, to safeguard the second principle of tax justice, the tax system parameters would have to change to 0.333–0.667 (Jasso and Wegener, 2022, p.214, Table 5). That is, the standard relative minimum final income (and, identically, the standard marginal tax rate) would have to increase from 0.3 to 0.333, or approximately 33%.

4 Contrasting the two approaches to redistribution and poverty reduction

Figure 2 makes it possible to visualize at a glance the original pretax distribution and the three posttax distributions achieved via a probability distribution and via the linear tax system. It is evident that while redistribution via the Pareto (Figure 2B) renders a middle region worse off, redistribution via the linear tax system (Figures 2C,D) does no harm to the middle. For further concreteness, Table 1 reports all the key measures reported above—the minimum, the median, the proportion below the mean, the three measures of overall inequality, the share held by the top 1%, and the P15/P5 measure of inequality among the poor.

It is evident from both Table 1 and Figure 2 that the Pareto option provides the highest minimum income. We may wonder whether even the most committed Rawlsian would hesitate before choosing it, knowing that it harms the middle, has the lowest median, has the largest proportion below the mean, and has the highest overall inequality. The differences in this illustration are not subtle. The Pareto's minimum income of half the mean is larger than the two tax systems' minimums of 0.371 and 0.432 of the mean. The Pareto's median of 0.707 is smaller by over 20 percentage points than the two tax systems' medians of 0.909 and 0.918. The Pareto's 75% proportion

below the mean exceeds by 15 percentage points the proportion below the mean in the two tax systems' redistribution. Further, by all the measures of overall inequality, the Pareto's overall inequality is the largest—for example, a Gini coefficient of 0.333, over 10 percentage points greater than the two tax systems' Ginis of 0.213 and 0.192. Finally, the share held by the top 1% is over three times greater in the Pareto than in the two tax systems (10% vs. 2.76% and 2.59%). In the Pareto's defense, however, the P15/P5 ratio registers the lowest magnitude of inequality among the poor—1.057 vs. 1.203 and 1.169.

Of course, this illustration is based on specific members of the lognormal and Pareto distributional families and specific signature parameters of the linear tax system. Exact results will differ by the exact combinations.[18] What might be some general conclusions? First, the iconic Pareto is no panacea, given its harm to the middle. Second, redistributions via members of lower inequality from the same distributional family will not harm the poor, as they generate only two transfer groups, and thus it would seem useful to explore "shifted" or "generalized" forms of the lognormal as approaches to both distribution and redistribution. Third, it would also seem useful to explore other distributional families, such as the shifted exponential, the shifted gamma, and the quadratic with its beautiful symmetry.[19]

5 Discussion

This paper combined two well-known ideas—(1) redistribution from one to another distribution can yield three transfer groups such that the poorest and richest gain and the middle loses and (2) the linear income tax system satisfies three basic principles of fairness, namely, that as initial income increases, so do final income, tax amount, and tax rate, suggesting that the linear income tax system may be the natural and most effective way to guard against poverty reduction policies which, while helping the poorest, harm the middle.

Further work might examine, more deeply and both theoretically and empirically, the links between poverty, redistribution, and the middle class, on the one hand, and inequality and both income fairness and tax fairness, on the other hand.

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18   Consider the focal distributions used in this paper to model pretax and posttax income, the lognormal ($c = 0.5$) and the Pareto ($c = 2$), respectively. The reader will have noticed in the text and in Table 1 that by all three measures of overall inequality, the Pareto has greater inequality than the lognormal. But this is not universally the case. In fact, by the Gini measure, the Pareto ($c = 2$) is less unequal than any lognormal of c greater than 0.609, and by the Atkinson measure, it is less unequal than any lognormal of c greater than 0.622. Thus, there is a "zone of ambiguity" in ranking the Pareto ($c = 2$) and members of the lognormal family with c between 0.609 and 0.622 (Fields and Fei, 1978, p.315; Jasso, 1982, p.319–321).

19   The four small "toy distributions" provided by Jasso (2018, 202) are based on the lognormal, Pareto, shifted exponential, and quadratic, and thus can be used to experiment with further options for redistribution. Note that the toy quadratic has a minimum income of half the mean and a maximum income of three times the mean, well within the maximum allowed by the Athenian Stranger in Plato's *Laws* (quoted above).

TABLE 1 Key measures in the pretax and posttax distributions.

Key measures	Pretax distribution	Posttax distributions		
	Lognormal (*c* = 0.5)	Redistribution to Pareto (*c* = 2)	Redistribution via Linear Tax (0.225–0.775)	Redistribution via Linear Tax (0.3–0.7)
Minimum	→0+	0.5	0.371	0.432
Median	0.882	0.707	0.909	0.918
Proportion below Mean	0.599	0.75	0.599	0.599
Gini Coefficient	0.276	0.333	0.213	0.192
Theil MLD	0.125	0.193	0.0713	0.0579
Atkinson inequality	0.118	0.176	0.0688	0.0563
Share held by Top 1%	3.39%	10%	2.76%	2.59%
P15/P5	1.356	1.057	1.203	1.169

In this illustration, the pretax distribution is modeled by the lognormal (*c* = 0.5), and the three posttax distributions are modeled by the Pareto (*c* = 2) and two just linear tax distributions with signature standard parameters of 0.225–0.775 and 0.3–0.7. The lognormal has no safety net and no maximum; the Pareto has a safety net but, like the lognormal, no maximum. In all four distributions, income is represented by relative amounts, viz., the absolute amount divided by the arithmetic mean; thus, the arithmetic mean in these relative-amount distributions equals one. The P15/P5 ratio measures the inequality among the poor (Parolin et al., 2023). Values for the key measures in the lognormal and Pareto distributions are approximated via the corresponding formulas in mathematically specified distributions, and values in the posttax distributions obtained via the linear tax are approximated by the corresponding numerical formulas in observed distributions (Jasso, 2018, 2020; Jasso and Kotz, 2008, 36–39).

With respect to income fairness, there are at least three links ripe for further study. First, justice theory provides a decomposition of overall injustice (the average of the individual-specific justice evaluations) into injustice due to poverty and injustice due to inequality (Jasso, 1999, 2023), enabling new empirical research on the question of whether injustice is poverty-led or inequality-led in approximately 30 European countries (with longitudinal information available as well for Germany, as noted in text footnote 16). Second, justice theory provides a further decomposition of overall injustice based on the MLD:

$$E(J) = \ln\left[E(X)\right] - \ln\left[E\left(X^*\right)\right] - \mathrm{MLD}(X) + \mathrm{MLD}\left(X^*\right)$$

where *X* denotes actual income and *X** denotes just income. This new decomposition makes it possible to look closely at what the societal data reveal about how individuals form their ideas of the just reward for self, in particular, whether individuals are converging on an idea of the just reward and whether that idea is close to the average actual reward. Third, both the ATK and MLD inequality measures have exact links to a special case of overall injustice (in which subjective ideas of just income coalesce around the average). In fact, in this special case, overall injustice equals the negative of the MLD (Jasso, 1999, 2023; Cowell, 2011). Importantly, the new European data permit estimation for both pretax income and posttax income.

With respect to tax fairness, the new data permit approximation of the specific linear tax scheme regarded as fair in almost 30 European countries in Round 9 of the European Social Survey, building on the German study discussed above. These data will enable comparison for the first time of just linear tax schedules across a set of countries.

With respect to the link between income fairness and tax fairness, the stage is set for both new theoretical work and new empirical work linking the principles of income justice (such as need, merit, and equality and including both principles of microjustice and principles of macrojustice) and the principles of tax justice (pertaining to the final income, the tax amount, and the tax rate, as discussed in this paper). Note that if individuals or societies judge that the initial distribution is unjust, they will not want to use it as the base for redistribution, but instead will first modify it to achieve a just pretax distribution before continuing to the redistribution to achieve a just posttax distribution. The European Social Survey and the GSOEP, with their data on both just pretax income and just posttax income, will be invaluable for studying this more complicated scenario.

Finally, consider that there are two types of inequality—inequality between persons (the inequality measured by the Gini, Theil MLD, and Atkinson measures) and inequality between subgroups (the inequality measured by ratios and gaps)—as known for a long time [at least since Jencks et al. (1972) and later systematized in Jasso and Kotz (2008)]. To this point, all the inequality considered in this paper has been inequality between persons. Yet subgroup inequality—inequality between subgroups defined by qualitative characteristics, such as race, gender, ethnicity, nativity, citizenship, language, religion, and so on—may have special links to poverty, poverty reduction, and the middle class, and these warrant careful study.

Consider gender. Plato and Confucius, near contemporaries in areas of the world that had apparently not yet met, both thought inequality was the source of societal ills. While Plato (*Meno*; *Republic*, Book V) found in nature no bar to full gender equality (Jasso, 2011), his pupil Aristotle and Confucius found it straightforward to assign bondage to half the world. Did Gregory the Great (1849, 540–604) think of gender when he observed in (1849) *Moralia in Job* xxi, "Where there is no sin, there is no inequality"? The retorts would come, but sporadically and not in torrents: Jerome (347–419/420), pleading with a friend's daughter not to marry (Jerome, 1845–1846, Letter XXII, to Eustochium, written in A.D. 384); Anselm (1033/4-1109), addressing saints and gods as Mother (Fortin, 2017); and Vives (1947) writing "On the Duties of a Christian Husband". Today, we may ask whether poverty or harm to the middle class is more tolerated in one gender than another. This is a topic ready for study all over the world. Of course, the same questions can be asked about other subgroup categorizations beyond gender—race, ethnicity, nativity, citizenship, language, religion, and so on.

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