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# Are farmers willing to enter the forestry property market? Evidence from collective forest areas in southern China

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The Chinese government encourages farmers to enter the forestry property market for forestry property trading and promotes the standardization of the forestry property trading market. Unfortunately, the development of the forestry property market is still very slow. Farmers are the most important subject of mountain and forest management and the micro foundation of forestry property market operation, and their active market participation is the key to the healthy development of forestry property market. Based on the theory of planned behavior, this paper used the survey data of farmers in collective forest areas in three southern provinces of China to reveal the psychological decision-making process of farmers entering the forestry property market by structural equation model (SEM). The research results show that: (1) Farmers' behavioral attitudes (AB), subjective norms (SN) and perceptual behavioral control (PBC) positively influence farmers' willingness to enter the forestry property market. (2) An important reason why farmers' intentions are largely not effectively translated into behavior is the constraint of PBC. (3) Reducing the risk of transfer and maintaining the interests of both parties constitute the main factors of AB, and the greatest external pressure on farmers' willingness to enter the forestry property market comes from the opinions of village collectives. (4) PBC has a significant impact on behavior, where unfamiliarity with the forestry property market is the main factor affecting farmers' PBC. Therefore, the government should further strengthen the propaganda of forestry property right market, improve the market service system, reduce the transaction cost, introduce specific encouragement policies and measures, and effectively consider farmers' interest demands on forestry property trading; in addition, the power of grassroots organizations should be emphasized when formulating forestry property trading policies.

KEYWORDS

**forestry property market, theory of planned behavior, farmers' market participation, farmers behavior, structural equation model**

## 1. Introduction

In 2003, the Chinese government launched a new round of reform of the collective forestry rights system, granting farmers the right to use, dispose of and earn income from forest land, and implementing related supporting measures, including issuing forestry property rights certificates and establishing a forestry property market

(Chen and Innes, 2013). As the first province of forestry reform, Fujian took the lead in establishing the Yongan Forestry Element Market. Subsequently, other provinces have also started to build regional forestry property markets. Different provinces have different names for the forestry property market, such as "forestry element market," "forest rights trading center" and "rural property market," but their basic functions are the same. The forestry property market is a comprehensive platform for forestry property transactions, where all administrative and financial functions related to forestry activities can be realized, such as forestry property transactions, forest property rights registration, and forestry property mortgage (Yang and Ming, 2006). The establishment of the forestry property market can, on the one hand, promote the flow of property rights of mountain and forest resources to reorganize and revitalize forest resources, and on the other hand, facilitate direct face-to-face negotiations and transactions between the two sides of forestry property transactions (Wang et al., 2007). This not only eliminates many intermediate links in the transaction process, but also reduces the cost of forest rights transactions and the probability of forest rights disputes, and protects the property rights interests of farmers. In addition, the trading platform can also provide relevant consulting services for both parties (Lin et al., 2022a). The forestry property market plays a bridge role in collective forestry property trading activities, which is of great significance to improving the rural property rights trading market.

China has introduced many policies to encourage farmers and other forestry operators to trade on the forest rights trading market. However, the establishment of a sound market system for forest rights trading requires not only state support and policy promotion, but also active market participation by farmers. The majority of farmers is the most important subject of mountain and forest management, and is also the micro-foundation of forestry property market operation. Farmers' market participation and forestry property market development are interrelated and mutually constrained, and what kind of attitude do farmers have toward forestry property market? Are they willing to enter a more secure and regulated forestry property market when conducting forestry rights transactions? What factors will influence their willingness and behavior? At present, scholars have paid less attention to these questions, and answering the above questions will help promote the healthy and standardized operation and sustainable development of forestry property markets.

At present, scholars have conducted rich research on the issues related to the forestry property market from different research perspectives. From the aspect of institutional guarantee, scholars mainly study the development of the forestry property market from the aspects of market development, institutional design, government function, and legal improvement (Kong and Du, 2008; Xu et al., 2020; Lin et al., 2022b), and believe that a mature forestry property trading market should be diversified in terms of flowing subjects and forms, and have developed intermediary organizations and a perfect policy and legal environment (Xie et al., 2014). From a functional point of view, the forestry property rights system has deficiencies and blind spots, insufficient specification of the system, coordination to be strengthened, and an imperfect matching of the system (Aggarwal et al., 2021). And, based on the process of forestry property transaction, the paper proposes the development and improvement of the government supervision system of forestry property transfer (Xu et al., 2013). In terms of farmers' behavior, scholars mainly focus on farmers' transfer transaction behavior and influencing factors. In terms of the characteristics of farmers' subjects, they mainly focus on individual characteristics, family characteristics, and factors of forest land resource endowment, etc (Feng and Heerink, 2008; Li, 2011; Tang and Wang, 2013; Deng et al., 2019; Li et al., 2020). A few scholars have also studied other aspects, for example, some scholars have confirmed that transaction costs are an important constraint to agricultural land transfer through the analysis of farm household survey data (Jin and Deininger, 2009; Li and Ito, 2021). In addition, property rights arrangement, risk perception also affects farmers' land transfer behavior (Deininger et al., 2014; Li et al., 2014; Cheng et al., 2019; Xu et al., 2021). Other scholars argue that factors such as the number of land plots and the accessibility of transportation networks also affect the transfer of agricultural land (Jiang et al., 2019). In addition, some scholars have observed that these studies are based on the assumption that "the objective facts faced by farmers are the basis for their decisions," but in fact, the decisions made by farmers are based on their cognitive trade-offs, because farmers' decisions are not only influenced by external objective factors, but also subjective cognitive constraints formed by farmers under specific circumstances (Shi et al., 2022).

In addition, many studies have focused on the application of the theory of planned behavior (TPB) to the behavioral decisions of farm households. TPB is one of the most influential behavior prediction theories in the field of social psychology. Ajzen and Madden (1986) proposed that behavioral attitudes (AB), subjective norms (SN), and perceived behavioral control (PBC) can help predict and explain behavioral intentions (BI) and thus influence individual behavior. As a successful application of the limited rationality assumption of behaviorist psychology to economics, TPB introduces psychological analysis to the study of economic behavior by incorporating individuals' multidimensional behavioral motivations (including earnings maximization, emotional satisfaction, and social approval) into behavioral explanations and predictions (Chen, 2022). Due to the close relationship between agricultural decision making and social psychology, agricultural economists and social psychologists have widely applied TPB to agricultural research, effectively solving the problem of limited rationality in farmers' decision making (Yang et al., 2022). This theory has been applied by scholars in various countries to explain cognition and behavior of farmers toward agricultural reform (Donati et al., 2015), homestead transfer (Lu et al., 2022), sustainable agriculture (Sarkar et al., 2022), ecological protection (Yaghoubi Farani et al., 2019), etc. And the significant effects of variables such as perceived benefits, perceived risks, and perceived fairness (Deng et al., 2022) on behavioral attitudes have been confirmed with different cases. Clearly, TPB is a valid analytical framework for supporting research related to sustainable behavior, and there is sufficient evidence that it is feasible in the study of most behaviors (Xie et al., 2013). In this way, the TPB provides a thorough understanding of the formation of the mechanisms of farmers' willingness to enter the forestry property markets.

The above research results have important theoretical value and practical significance for guiding farmers' forestry property transfer behavior and regulating the forestry property market. However, there are still two shortcomings in the existing research: firstly, it focuses on whether farmers have property rights trading behavior and the influence of various factors on property rights trading

behavior, but pays less attention to whether farmers are willing to enter the forestry property market for trading; secondly, it is insufficient to analyze the path of transforming farmers' behavior will into actual behavior. In view of this, this paper empirically analyzes the psychological decision-making process of farmers' entry into the forestry property market using farm household survey data under the framework of the theory of planned behavior (TPB) using structural equation modeling (SEM) with three provinces in the collective forestry region of southern China as the study area. It also compares behavioral attitudes, subjective norms and perceptual behavioral controls and their effects on farmers' entry into the forestry property market to better understand the determinants of farmers' behavioral intentions. The research results provide scientific references and policy recommendations for regulating the order of forestry property transactions and promoting the construction of a forestry property market.

## 2. Theoretical framework and research hypothesis

### 2.1. Analytical framework construction

The theory of planned behavior (TPB), derived from social psychology, is dedicated to the study of conscious human behavior, and is an important tool for explaining the logical relationship between "cognition-will-behavior" and action (Ajzen, 2020), and provides a complete theoretical and analytical framework for the study of the role of human psychological cognition on behavior. It uses latent variables to construct behavioral determinants, stating that an individual's specific behavior is determined by his behavioral intention (BI), which is influenced by a combination of individual psycho-cognitive factors, namely behavioral attitudes (AB), subjectivity norms (SN), and perceived behavioral control (PBC) (Ajzen, 1991). This paper introduces the theory of planned behavior into the scenario of farmers' forestry property transactions, explores the psychological factors and driving mechanisms of farmers' willingness to enter the forestry property market, and explains the decision-making process of farmers' behavior through the theory of planned behavior. Several scholars have researched and confirmed that the theory of planned behavior can significantly improve the explanatory power and prediction of behavioral intentions in research (Wauters et al., 2010; Borges et al., 2014; Schroeder et al., 2015; Hall et al., 2019). Therefore, based on the theory of planned behavior, we construct a psychological decision model for farmers to enter the forestry property market from three psychological cognitive factors: behavioral attitudes, subjective norms and perceptual behavioral control. The specific model structure is shown in **Figure 1**.

### 2.2. Theoretical analysis and research hypothesis

#### 2.2.1. Behavioral attitude

The natural motivation for the formation of subjective behavior is formed through the individual's knowledge, analysis, and judgment of external or internal things, which is a psychological cognitive process (Biddle et al., 1994). The theory of planned behavior defines behavioral attitudes as general and stable subjective evaluations with distinct tendencies that behavioral individuals hold about performing a behavior (Ajzen and Fishbein, 2008). Many current studies on farm household behavior consider behavioral attitudes as the single most important predictor variable (Deng et al., 2016; Wang et al., 2019). In this paper, we define behavioral attitude as farmers' perceptions of the necessity of entering the forestry property market and their perceptions of their main responsibility when they make forestry property transactions. This is reflected in three aspects: perceived benefits, perceived risks, and perceived utility, i.e., farmers weigh the benefits and risks of entering the forestry property market when making decisions on forestry property transactions. Based on this, we measure farmers' behavioral attitudes toward the forestry property market by six indicators: "farmers believe that entering the forestry property market can improve the efficiency of forestry property transactions and reduce costs (AB1)," "reduce the risk of forestry property transfer (AB2)," "help achieve open, fair and just forestry property transactions (AB3)," "protect the legal rights and interests of both parties to the transactions (AB4)," "help reduce the occurrence of forestry property disputes (AB5)," and "help promote scale management and optimal allocation of production factors (AB6)." Theoretically, farmers' good perceptions of forestry property market in terms of reducing transaction costs and risks and safeguarding the legal rights and interests of both parties to the transaction can increase farmers' willingness to enter the forestry property market. Therefore, this paper proposes hypothesis 1.

> H1: Behavioral attitudes (AB) have a significant positive effect on farmers' willingness to enter the forestry property market (PW).

#### 2.2.2. Subjective norms

Subjective norms refer to the individual's subjective judgment on whether other important relations will agree with him to perform a certain behavior, that is, the pressure on an individual to perform a certain behavior (Ajzen and Fishbein, 1977). In simple terms, the subjective norms of the actor are mainly derived from the perceived social norms and the behavioral patterns of the reference population. Park (2000) and Lam et al. (2003) jointly suggest that perceived pressure from social norms and group behavior is more pronounced in the Chinese cultural context, where behavioral norms reinforce the individual's avoidance of criticism and desire to gain recognition through social integration (Park, 2000; Lam et al., 2003). This is even more evident in rural China, which still retains the characteristics of "acquaintance society." In this study, subjective norms are defined as the social normative pressures and governmental constraints that farmers feel when trading forestry property through forestry property markets. When farmers recognize that important people or organizations around them (e.g., family members, village collectives, forestry departments, etc.) support their choice of forestry property markets for trading, they are likely to adopt their opinions to fit the expectations of the surrounding groups and the needs of social development. In addition, the reference to other farmers' norms is also a psychological effect of farmers' own conformity to group behavior to avoid being a "special case." Therefore, this paper

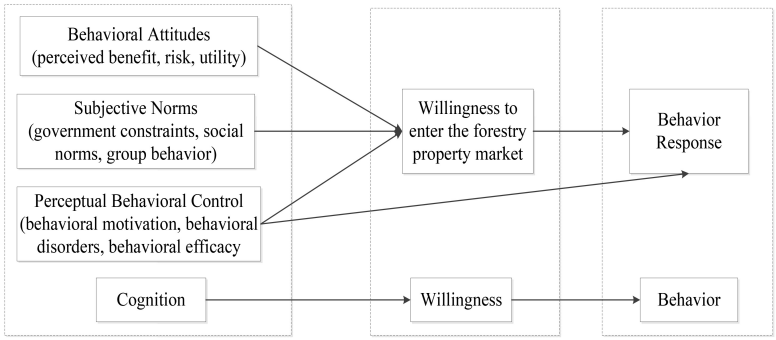


FIGURE 1
Psychological decision model for farmers to enter the forestry property market.

defines the subjective norms of farmers as three factors from social normative pressure, governmental constraint pressure, and group behavior reference. Specifically, the subjective norms are measured by four indicators: "the village collective believes that it should enter the forestry property market for trading (SN1)," "the government or forestry department believes that it should enter the forestry property market for trading (SN2)," "neighboring farmers believe that it should enter the forestry property market for trading (SN3)," and "family members believe that it should enter the forestry property market for trading (SN4)." Usually, the stronger the external pressure felt by farmers, the stronger their willingness to enter the forestry property market for forestry property trading. Therefore, this paper proposes hypothesis 2.

> H2: There is a significant positive effect of subjective norms (SN) on farmers' willingness to enter the forestry property market (PW).

### 2.2.3. Perceptual behavior control

Ajzen (1991) added perceptual behavioral control to the theory of rational behavior in order to overcome the unreasonable assumption of the individual's full capacity to act, as a way to reflect the influence of external conditions on the acting subject. Since external behavioral conditions are often difficult to measure directly, he further proposed to characterize the behavioral control situation as perceived by the actor. Behavioral control perceptions are mainly expressed as self-efficacy (Conner and Armitage, 1998), which is the farmer's perception of the extent of control of his own will and ability. In layman's terms, this refers to the perception of relevant factors that facilitate or hinder behavioral effects, including three aspects of perceived behavioral motivation, behavioral barriers, and behavioral efficacy (Fishbein and Ajzen, 2011). Self-efficacy reflects the perceived facilitative conditions or implementation barriers that facilitate or hinder farmers' willingness to enter the forestry property market to some extent. Therefore, this paper measures perceptual behavior control by five indicators: "farmers have sufficient tolerance for forestry property trading risks (PBC1)," "unfamiliarity with the forestry property market processes affects my entry into trading (PBC2)," "the state has good supporting policies (PBC3)," "the degree of regulation of the forestry property trading market (PBC4)," and "the degree of difficulty in obtaining trading information (PBC5)." If farmers' perceptual behavioral control is stronger, it means that farmers perceive greater social utility from entering the forestry property market, i.e., higher self-efficacy, and farmers are more inclined to enter forestry property market. Therefore, this paper proposes the following research hypothesis.

> H3: Perceived behavioral control (PBC) has a significant positive effect on farmers' willingness to enter the forestry property market (PW).

> H4: Perceived behavioral control (PBC) has a significant positive effect on farmers' behavior to enter the forestry property market (PB).

## 3. Materials and methods

### 3.1. Data collection

The data in this study were derived from the survey of farmers in three southern collective forest areas in Fujian, Zhejiang, and Jiangxi provinces from 2018 to 2020 by our research group. In the survey, we used all farmers who own forest land in these areas as the survey population and conducted the survey using stratified random sampling. Firstly, in the stratified sampling, we identified Fujian, Zhejiang, and Jiangxi provinces as the survey areas among the southern collective forest areas according to the economic development and forest resources. Then, we took 1∼2 typical prefecture-level cities from each of the three provinces as the survey areas. It should be noted that the distribution of forest resources in China varies widely, with primary and state-owned forests dominating in the northern regions, while collective forests dominate in the south, with a more even distribution of forest resources. The southern region is the region with the best natural conditions in China, and it's also the region with historically developed forestry, where planted forests occupy a high proportion and farmers in mountainous areas have the habit of operating forestry. In addition, these three provinces ranked first, third and

TABLE 1 Distribution of samples.

| Cities | Counties | Total sample size | Valid sample size |
|---|---|---|---|
| Sanming | Shaxian | 64 | 52 |
| | Youxi | 75 | 66 |
| Nanping | Jiangle | 82 | 66 |
| | Wuyi | 84 | 65 |
| Quanzhou | Dehua | 66 | 62 |
| Ganzhou | Quannan | 60 | 56 |
| | Anyuan | 57 | 54 |
| Lishui | Songyang | 57 | 44 |
| | Suichang | 59 | 54 |
| Total samples | | 604 | 519 |

sixth in forest cover, while the management species are mainly timber forests, Moso bamboo forests and economic forests. Fujian was the first pilot province in the country to carry out a new round of collective forest rights system reform in 2003, followed by Jiangxi and Zhejiang. The three provinces have adopted different approaches in the construction of forestry property rights market, and it is typical and representative to carry out forestry property rights market-related investigations in these regions.

Secondly, we used a random sampling method to select 2∼3 counties in each prefecture-level city, 5∼6 townships in each county, and 10∼15 sample farm households in each township. The survey was conducted in a one-to-one, face-to-face manner with questionnaires and semi-structured interviews. We obtained a total of 604 questionnaires, and after eliminating invalid questionnaires such as those with incomplete answers and inconsistencies, we finally obtained 519 valid questionnaires, with an effective rate of 85.93%. The distribution of the samples are showed in Table 1. The distribution of the study area is shown in Figure 2.

## 3.2. Questionnaire design and sample descriptive statistics

We designed the questionnaire from the following aspects: farmers' individual and household characteristics, forest land resource endowment, forest rights trading, farmers' cognition and demand for forestry property market, and farmers' willingness and behavior to enter the forestry property market. Of these, the latter two components were the main data sources for this study. In the cognitive survey, we mainly interviewed farmers' views on the advantages and disadvantages of forestry property market, and assigned "1–5" points according to the five-level Likert scale, indicating "strongly disagree ∼ strongly agree." The survey results showed that 66.9% of the farmers think it was necessary to enter the forestry property market for trading. The three advantages of "entering the forestry property market can protect the legitimate rights and interests of both parties," "reduce disputes over forest rights" and "fair, open and just transactions" were the most widely recognized. In the demand survey, we set "What services do you want the forestry property market to provide or improve?" According to the survey results, the top three businesses in demand were "registration and certification of forest rights," "assessment of forestry assets" and "release of forest rights trading information." The results also reflected the obstacles in realizing the value of forestry resources and the asymmetry of market information.

From the basic characteristics of the sample farmers (as shown in Table 2), the age of farmers was mainly distributed between 46 and 55 years old, with a sample proportion as high as 48.94%; their education level was concentrated in primary and junior high schools, accounting for 39.7 and 35.5% of the total sample, respectively, and their comprehensive quality and literacy were low; In terms of annual household income, 26.97% of the sample farmers' annual household income is below 50,000, 26.01% of the sample farmers' annual household income is between 50,000 and 100,000, more than half of the total sample farmers have an income below 100,000, and up to 22.35% of the farmers have an income above 200,000, with a serious polarization between farmers with high income and low income; The sample farmers also showed a bifurcation in the size of their woodlands, with 46.82% of farmers with woodlands under 5 hectares, 25.2% of farmers with woodlands over 20 hectares, and 28.08% of farmers with woodlands between 5 and 20 hectares. From the basic situation of the survey sample, it is basically consistent with the current reality of collective forest area farmers, and the data is real, reliable, and representative.

## 3.3. Research methodology

We used structural equation modeling (SEM) to analyze farmers' willingness to enter the forestry property market and the main influencing factors. Structural equation modeling is a statistical method to explore the relationship and structure between theories and concepts. Using structural equation model can simultaneously simulate the internal logical relationship between multiple factors, and analyze the relationship between multiple causes and multiple effects and the relationship between latent variables. It is a widely used multivariate data analysis tool. SEM provides an analytical tool for latent variables that are difficult to observe directly that can be observed and processed and can incorporate unavoidable errors into the model. SEM is generally represented by a system of linear equations, which is divided into two parts: the measurement model and the structural model. The measurement model reflects the relationship between the latent variables and the observed variables, and the latent variables can be defined by the observed variables through the measurement model; the structural model represents the relationship between the latent variables. The matrix equations of the measurement and structural models and the meanings they represent are shown below.

Measurement model:

$$X = \Lambda_X \xi + \delta \quad (1)$$

$$Y = \Lambda_Y \xi + \varepsilon \quad (2)$$

Structural model:

$$\eta = \beta_\eta \xi + \Gamma \xi + \zeta \quad (3)$$

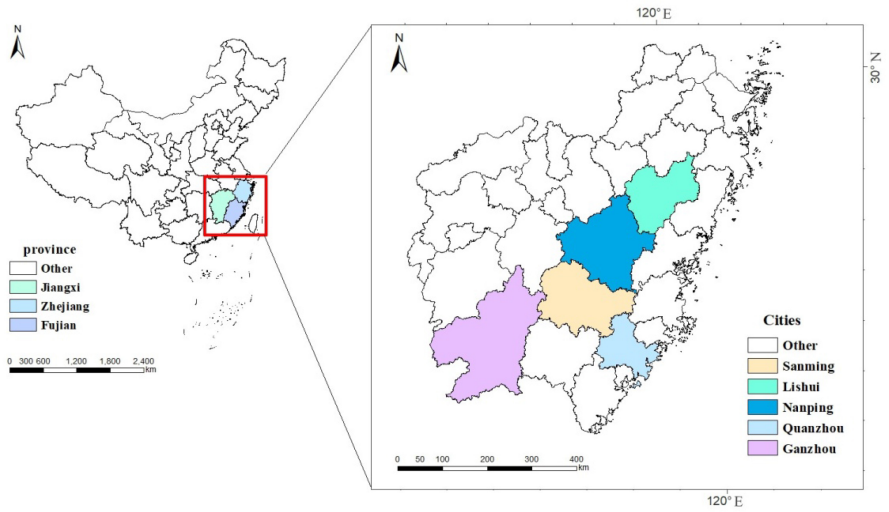


FIGURE 2
Distribution map of study areas.

In the above equations, $\xi$ and $\eta$are the exogenous latent variables and endogenous latent variables, X is the observed variable of $\xi$, Y is the observed variable of $\eta$, $\Lambda_X$ is the coefficient linking the variable X to the variable $\xi$, $\Lambda_Y$ is the coefficient linking the variable Y to the variable $\eta$, $\delta$ and $\varepsilon$are the errors of the variables X and Y, respectively, $\beta$ is the regression coefficient of the variable $\eta$, $\Gamma$ is the regression coefficient of the effect of the variable $\xi$ on the variable $\eta$, $\zeta$ is the error of $\eta$ .

## 3.4. Variable selection

Based on the above theoretical analysis, we designed three psychological cognitive factors, including behavioral attitudes, subjective norms, and perceived behavioral control, taking into account the characteristics of the forestry property market and farmers' perspectives. Then, we designed 4–6 observed variables for each latent variable using a 5-point Likert scale, with each item measured according to whether one agrees with the statement, with the number 1 indicating "strongly disagree" and the number 5 indicating "strongly agree," and the degree of agreement increasing from 1 to 5. The willingness and behavior of farmers to enter the forestry property trading center were dichotomized, with 1 indicating "yes" and 0 indicating "no." The specific question settings of the scale are shown in Table 3.

## 3.5. Reliability and validity test

In order to ensure the credibility and validity of the study findings, the scale was tested for reliability and validity, and the results are shown in Table 4. We examined the reliability of the sample data by Cronbach's α and combined reliability, and the Cronbach's α coefficients of the three dimensional observed variables of behavioral attitudes, subjective norms, and perceptual behavioral control were all above 0.8, indicating good agreement of the measures. Also, the combined reliability of each latent variable is greater than 0.8, and the extracted squared extracted variance of all latent variables is higher than the evaluation criterion of 0.5, indicating that the model has good reliability. In addition, a factor analysis of the sample data using SPSS 24.0 software yielded a Kaiser-Meyer-Olkin value of 0.956 and a cumulative variance contribution of 78.159%. Taken together, the model data were

TABLE 2 Basic characteristics of sample farm households.

| Variable | Classification rule | Frequency | Frequency% |
|---|---|---|---|
| Age | < 35 | 13 | 2.51 |
| (year) | 36~45 | 107 | 20.62 |
| | 46~55 | 254 | 48.94 |
| | 56~65 | 106 | 20.42 |
| | > 65 | 39 | 7.51 |
| Household income | < 50,000 | 140 | 26.97 |
| Chinese Yuan (CNY) | 50,000~100,000 | 135 | 26.01 |
| | 100,000~150,000 | 79 | 15.22 |
| | 150,000~200,000 | 49 | 9.44 |
| | > 200,000 | 116 | 22.35 |
| Education level | < 6 | 206 | 39.7 |
| (year) | 6~9 | 184 | 35.5 |
| | 9~12 | 108 | 20.8 |
| | > 12 | 21 | 4.0 |
| Forest land size | < 5 | 243 | 46.82 |
| (hectare) | 5~10 | 67 | 12.98 |
| | 10~15 | 47 | 9.1 |
| | 15~20 | 31 | 6.0 |
| | > 20 | 131 | 25.2 |

TABLE 3 Latent variables, observed variables and code settings.

| Latent variable | Abbr. | Observation variable definition |
|---|---|---|
| Behavioral attitude (AB) | AB1 | Improve efficiency and reduce costs of forestry property transactions |
| | AB2 | Reduce the risk of forestry property trading |
| | AB3 | Facilitate open, fair and just transactions |
| | AB4 | Protect the legal rights of both parties to the transaction |
| | AB5 | Reduce the occurrence of forestry property disputes |
| | AB6 | Promote large-scale operation and optimal allocation of production factors |
| Subjective norms (SN) | SN1 | The village collective believes that it should enter the forestry property market for trading |
| | SN2 | The government or forestry department thinks it should enter the forestry property market for trading |
| | SN3 | Neighboring farmers think it should enter the forestry property market for trading |
| | SN4 | Family believes it should be traded in the forestry property market |
| Perceptual behavioral control (PBC) | PBC1 | I have sufficient tolerance for trading risk |
| | PBC2 | Unfamiliarity with the forestry property market process affected my entry into the transaction |
| | PBC3 | The country has a very good support policy |
| | PBC4 | The degree of regulation of forestry property trading market |
| | PBC5 | Ease of access to transaction information |
| Willingness (PW) | PW1 | Willingness to enter the forestry property market for forestry property trading |
| Behavior (PB) | PB1 | Access to the forestry property market for forestry property trading |

suitable for factor analysis, and the model had high construct validity.

# 4. Results and discussions

## 4.1. Structural equation model fitness test results and model correction

Based on this study's hypotheses, measurement indicators, and test results, we constructed the structural equation model. The results of the structural equation model fitness test are shown in Table 5. According to the model path coefficients and correction indices, we revised the model in the order of the correction indices from largest to smallest, and added residual correlations between the variables SN3 and SN4, AB5 and AB6, AB6 and PB1, PBC1 and PBC5, and SN3 and PB1. The cardinality values can be effectively reduced after releasing the correlations between these groups of variables, and the theoretical assumptions are not violated. After the correction, the overall model fitness evaluation indexes all meet the evaluation criteria, indicating that the overall model fit is optimized and the analysis results are more accurate after the parameters are released. The modified structural equation model is shown in Figure 3.

## 4.2. Estimation results and discussions

Table 6 shows the structural equation model path coefficients. From the table, we can see that the three latent variables that determine the willingness of farmers to enter the forestry property market do not differ greatly in their degree of influence, "AB→PW1," "SN→PW1," "PBC→PW1" the three paths influence coefficients of 0.301, 0.338, and 0.341, respectively, and the three are not independently influencing farmers' willingness to make decisions, but there is a large interaction between them. The path "PBC→PB1" was significant with an effect coefficient of 0.367, indicating that perceptual behavioral control has a significant effect on behavior. The coefficients of the above paths are all significant at the 1% level, indicating that the four research hypotheses proposed in this paper have been verified, while the coefficient of the effect of farmers' willingness (PW1) on decision-making behavior (PB1) is 0.157, but it is not significant, indicating that the willingness is not completely transformed into behavior, and that the process of transforming farmers' willingness into behavior is hindered or interfered with by some external factors. In the following section we will discuss the impact of each path specifically.

### 4.2.1. The effect of AB on farmers' willingness to enter the forestry property market

Table 6 shows that in the psychological decision-making model of farmers, behavioral attitudes have a positive influence on farmers' willingness to enter the forestry property market, indicating that the more positive farmers' behavioral attitudes are, the higher their recognition of the forestry property market and the stronger their willingness to choose, so hypothesis 1 is verified. Hansson et al. (2012) also found a significant positive relationship between indirect attitudes and intentions, indicating that behavioral beliefs about possible outcomes influenced farmers' intentions.

Among the behavioral attitudes, the loading of AB1 factor loadings amount to 0.809, reflecting farmers' recognition of the transaction services provided by the forestry property market. The forestry property market generally has multiple comprehensive functions, in addition to organizing transactions and intermediary service. it also has a number of functions such as property rights management and information release (FAO, 2012). Farmers can enjoy one-stop services through the forestry property market, which simplifies the transaction process and improves the efficiency of the transaction, and therefore can stimulate the enthusiasm of farmers. Although many services in the forestry property market are free, there are still some items in some parts of the transaction that require certain fees, which should be reduced as much as

TABLE 4 Reliability and validity test results.

| Latent variable | Cumulative variance contribution rate (%) | Cronbach's α | Combinatorial reliability | Mean refinement variance |
|---|---|---|---|---|
| AB | 54.022 | 0.923 | 0.925 | 0.675 |
| SN | 67.028 | 0.830 | 0.827 | 0.645 |
| PBC | 78.159 | 0.809 | 0.812 | 0.528 |

TABLE 5 Evaluation index system and fitting results of the overall SEM suitability.

| Type of index | Abbr. | Acceptable fit values | Fit values | Result |
|---|---|---|---|---|
| Absolute fit index | X2/df | < 3.00 | 1.959 | Accept |
| | RMR | < 0.05 | 0.020 | Accept |
| | RMSEA | < 0.05 | 0.043 | Accept |
| | GFI | > 0.90 | 0.954 | Accept |
| | AGFI | > 0.90 | 0.935 | Accept |
| Incremental fit index | NFI | > 0.90 | 0.964 | Accept |
| | RFI | > 0.90 | 0.955 | Accept |
| | IFI | > 0.90 | 0.982 | Accept |
| | TLI | > 0.90 | 0.978 | Accept |
| | CFI | > 0.90 | 0.982 | Accept |
| Parsimonious fit index | PCFI | > 0.50 | 0.780 | Accept |
| | PNFI | > 0.50 | 0.766 | Accept |
| | AIC | Less than both the independent model value and the saturated model value | 301.520 < 306.000<br>301.520 < 5,990.535 | Accept |
| | CAIC | | 537.856 < 1,109.541<br>537.856 < 6,079.817 | Accept |

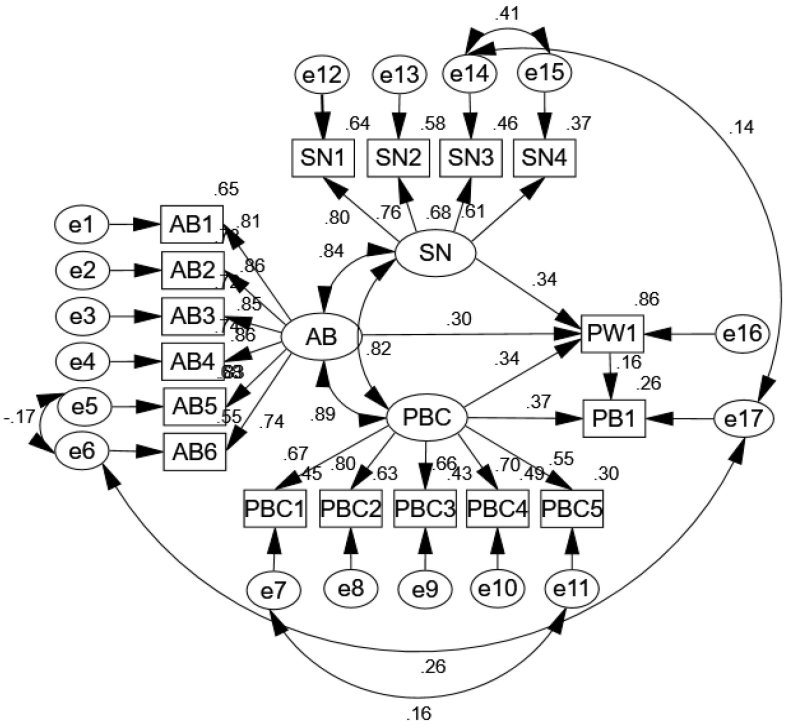


FIGURE 3
Modified structural equation model.

10.3389/ffgc.2023.1147233

TABLE 6 Estimation results of the SEM.

| Path | Standardized path coefficient | Standard error | Threshold ratio value | Hypothesis test |
|---|---|---|---|---|
| Structural model | | | | |
| AB→PW1 | 0.301*** | 0.091 | 4.315 | H1 accepted |
| SN→PW1 | 0.338*** | 0.067 | 5.991 | H2 accepted |
| PBC→PW1 | 0.341*** | 0.097 | 4.687 | H3 accepted |
| PBC→PB1 | 0.367*** | 0.060 | 3.330 | H4 accepted |
| PW1→PB1 | 0.157 | 0.042 | 1.519 | |
| Measurement models | | | | |
| AB→AB1 | 0.809*** | 0.056 | 18.870 | |
| AB→AB2 | 0.857*** | 0.057 | 20.095 | |
| AB→AB3 | 0.847*** | 0.055 | 19.840 | |
| AB→AB4 | 0.862*** | 0.059 | 20.246 | |
| AB→AB5 | 0.827*** | 0.060 | 17.964 | |
| AB→AB6 | 0.739*** | – | – | |
| SN→SN1 | 0.802*** | – | – | |
| SN→SN2 | 0.764*** | 0.050 | 18.264 | |
| SN→SN3 | 0.682*** | 0.056 | 15.920 | |
| SN→SN4 | 0.609*** | 0.056 | 13.936 | |
| PBC→PBC1 | 0.667*** | 0.062 | 14.057 | |
| PBC→PBC2 | 0.796*** | 0.066 | 16.588 | |
| PBC→PBC3 | 0.657*** | 0.079 | 13.876 | |
| PBC→PBC4 | 0.696 | – | – | |
| PBC→PBC5 | 0.549*** | 0.065 | 11.634 | |

*** indicates 1% significance level.

possible, lower the fee standard, and lower the forest resources assessment fee to attract traders.

AB2 factor loadings amount to 0.857, indicating that the risk of current forestry property trading is an important factor for farmers to choose the trading route, and that most of the current forestry property markets are government forestry department-affiliated institutions with a certain degree of authority, the relevant property rights registration and change procedures for trading are more complete, and the trading risk is relatively low.

AB3 factor loadings amounted to 0.847, indicating that the process through the forestry property market is more open, fair, and equitable than private transactions, and that the standardized transaction procedures play an important role in farmers' willingness and are more likely to be recognized by both sides of the transaction.

The AB4 coefficient reaches 0.862, which indicate that farmers' own rights and interests are the important aspect they consider when making forestry property rights transaction decisions, which largely determines the choice intention. Farmers generally lack a sense of security about the ownership of forestry rights (Liu et al., 2022), therefore, only when their own rights and interests are guaranteed, farmers are willing to trade through the forestry property market. The forestry property market should focus on serving forestry reform, starting with the comprehensive improvement of forestry's ability to serve social and economic development, actively expanding and extending the coverage of public service platform of forestry production, explore the construction of "forestry remote education service points" covering townships (towns), establish a "forest products information service platform," and optimizing the sharing of scientific and technological information services, so that the majority of farmers, forest enterprises cognitive benefits.

AB5 factor loadings amount to 0.827, indicating that unregulated forestry property transactions are likely to cause related forestry property disputes, while the forestry property market can eliminate related forestry property dispute potential problems, such as confirming whether the subject matter is defective before the transaction, supervising whether the trader is in breach of contract after the transaction, and the transaction process is relatively regulated and complete, avoiding disputes and safeguarding their own interests through regulated transactions. Forest tenure reform has often focused on formalizing the collective rights of communities to forest resources (Duguma et al., 2018), and the establishment of forestry property markets has further facilitated the formalization of forest rights transactions.

AB6 factor loadings amount to 0.739. The new round of forest reform has led to the fragmentation of forest land operations, which has hindered the enhancement of the scale efficiency of forest land operations and the optimal allocation of resources. The emergence of this institution, the forestry property market, has built an interconnected trading platform for both sides of

the transaction, and its role has been recognized by farmers and enhanced their willingness to a large extent.

### 4.2.2. The influence of SN on farmers' willingness to enter the forestry property market

The path of influence of subjective norms on farmers' willingness to enter the forestry property market is significant, indicating that a farmer feels pressure from the surrounding group when deciding whether to trade through the forestry property market, and this pressure may lead him to make decisions that are consistent with the opinions of others, and hypothesis 2 is tested. Among the subjective normative constructs, the factor loadings of SN1, SN2, SN3, and SN4 are 0.802, 0.764, 0.682, and 0.609, respectively, indicating that norms from different levels have different degrees of influence on farmers' psychological decisions to enter the forestry property market, and the magnitude of their influence is in the following order: village collective or group opinion > government or forestry department opinion > neighboring farmers' opinion > family opinion. This reflects that the influence of organizational-level norms on farmers' decision making is greater than that of individual-level norms.

Before the establishment of the forestry property market in collective forest areas, most of the forestry property transfer transactions were organized by village collectives (Kumar et al., 2015), therefore, the views of village collectives in the transfer transaction activities were regarded as important norms by farmers. After the establishment of the forestry property market, forestry property transfer regulations in some areas stipulate that state or collective forestry property transactions must be transacted through the forestry property market. Farmers are guided by the forestry property transfer policy and have a strong policy perception, which also strengthens their perceived social and policy pressure. On the other hand, the opinions of neighboring groups, such as neighbors or family and friends, may exert pressure on farmers' decisions on transfer transactions, prompting them to make decisions consistent with their opinions; family members' opinions are generally more consistent and are more likely to arise through the influence of external opinions.

### 4.2.3. The effect of PBC on farmers' willingness to enter the forestry property market

Perceived behavioral control refers to the ability, resources, or implementation barriers that farmers perceive when they perform certain behaviors, which can promote or hinder the willingness and behavior of farmers to some extent (Elsawah et al., 2017). The load coefficient of the effect of perceived behavioral control on farmers' willingness to enter the forestry property market was 0.341 and statistically significant, indicating that perceived behavioral control has a large effect on farmers' willingness and is an important aspect of willingness formation. The load coefficient of the effect of perceptual behavioral control on farmers' behavior was 0.367 and statistically significant, indicating that perceptual behavioral control had a large impact on farmers' behavior, i.e., an important reason why farmers' intentions were not effectively translated into behavior to a large extent was due to the influence of perceptual behavioral control. As reviewed by Jones et al. (2011), literature has focused on the dynamic capacities and abilities of mental models.

Perceived behavioral control includes the ability, resources, or barriers (external factors) to the farmer's choice, which largely constrain the farmer's choice behavior. Among them, the PBC2 factor loading is the largest, at 0.796, indicating that the government's propaganda for the forestry property market is not yet in place, hindering the willingness of farmers to enter. One of the important reasons why forestry property market transactions are insufficient and the function of property rights transactions cannot be effectively played is that farmers do not know much about the stability of forestry reform policy, the function and operation process of forestry property market. The PBC4 factor loading is 0.696, indicating that there are still irregularities in the current forestry property trading market, the forestry property trading process requires forestry departments to provide forestry property registration, change procedures, and other related services, and good and sound market conditions play a positive role in farmers' decision making. The loading of PBC1 factor is 0.667, indicating that farmers' own risk tolerance is one of the important factors in their choice of forestry property trading method. Most farmers are risk-averse (Duan et al., 2021), and forestry property trading faces many uncertain risks, so if farmers perceive that forestry property trading activities through the forestry property market can improve the safety of trading, then their willingness will be higher. The PBC3 factor loading was 0.657, indicating that the support from the state policy has an important guiding effect on farmers' decision making, and the state's support policy can effectively enhance farmers' enthusiasm to participate in the early stages of forestry property trading market establishment. The factor loading of PBC5 is 0.549, which indicates that the information asymmetry between the two sides of the transaction in the forest in rights trading market is prominent, and the forestry property market helps to promote farmers to enter the forestry property market transaction by releasing information about forestry property trading.

### 4.2.4. Interaction of AB, SN, and PBC

The three latent variables of behavioral attitudes, subjective norms, and perceptual behavioral control are bipartite and interact with each other (Senger et al., 2017). The interaction between behavioral attitude and perceived behavioral control is the strongest, with a loading coefficient of 0.89 between the two latent variables. Farmers who have greater ability and resources to adopt positive attitudes toward forestry property markets have a stronger perception of behavioral control. And farmers with higher perceptions of behavior control expect safer and more secure transaction services and have a more positive attitude toward the forestry property market. The influence between behavioral attitudes and subjective norms is the second most important, with a loading coefficient of 0.84. The choice of forestry property trading method is a rational behavior, which is not only influenced by objective conditions, but also swayed by subjective factors. Farmers' attitudes toward entering the forestry property market interact with subjective norms. The more positive farmers' behavioral attitudes are, the more likely they are to feel pressure from surrounding groups or organizations, and the greater this social pressure is, the greater the influence on their attitudes (Borges and Lansink, 2016). The loading coefficient between subjective norm and perceived behavioral control is 0.82. The stronger the perceived behavioral control, the more adequate the

farmers' conditions are, and the more they want the forestry property trading policy to be recognized by more people, so the subjective norm and perceived behavioral control also influence each other.

## 5. Study limitations

It is acknowledged that there are some limitations to this study. Firstly, this paper only analyzes the factors influencing farmers' willingness to enter the forestry property market according to the theory of planned behavior. The selected factors are not comprehensive enough, for example, the model does not take the difference of forest land management scale into account. Secondly, due to the large geographical area of China, each province has a different degree of market development. This study only selects Fujian, Jiangxi, and Zhejiang provinces for research, which has certain limitations. Therefore, many future studies can extend this research to provide a research basis for the sustainable development of forestry property market, as well as Chinese experience for the development of forestry property market in other countries in the world.

## 6. Conclusion and policy recommendations

### 6.1. Conclusion

This paper combines the theory of planned behavior and structural equation modeling to analyze the psychological decision-making process of farmers' entry into the forestry property market from the perspective of psychological characteristics. The research results show that: (1) Three psychological cognitive factors of farmers' behavioral attitudes, subjective norms, and perceptual behavioral control play an important role in influencing their psychological decision willingness, and the three factors do not independently affect farmers' choice willingness, but have a large interactive effect. (2) An important reason why farmers' willingness is not effectively transformed into behavior is that they are constrained by their own ability and resource endowment, as well as the interference of external factors such as an imperfect forestry property trading market and inadequate policy publicity. (3) Reducing the risk of transfer and protecting the rights and interests of both parties constitute the main factors of behavioral attitudes, and the greatest external pressure on farmers' willingness to enter the forestry property market comes from the opinions of village collectives. (4) Perceptual behavior control has an important restraining effect on behavior, among which unfamiliarity with the forestry property market is the main factor affecting farmers' perceptual behavior control. Farmers are micro subjects of forestry property market, and it is of great practical significance to study farmers' behavioral decisions to enter the forestry property market and to improve farmers' market participation behavior for the healthy development of the forestry property market.

### 6.2. Policy recommendations

Based on the findings of the study, we propose the following policy recommendations.

First, improve and perfect the service system of forestry property market, and combine multiple supporting policies to protect the vital interests of farmers. Simplify the procedure of forest rights trading, reduce the transaction cost, improve the efficiency of the transaction, and effectively consider the farmers' interest demands on forest rights trading.

Second, cultivate and enhance farmers' awareness of the forestry property market. First of all, we should strengthen the publicity of forestry property market, through the government with the help of public media such as TV, radio, newspapers and magazines, or use modern network, set up websites and other forms to increase the publicity in order to enhance the influence and attractiveness of the market. Secondly, popularize the information related to the forestry property market and enhance the farmers' awareness of the forestry property market.

Third, strengthen the policy guidance to encourage policies to promote the flow of forest rights trading toward standardization. Encourage forest farmers to participate in forest land and forest management and transfer in various ways, such as through forest rights participation, joint operation, development of forestry cooperatives and forest rights mortgage and other forms of property rights transfer. Respect the farmers' right to choose, guide farmers to enter the forestry property market and gradually internalize off-site transactions. In addition, because of the prominent role of village collectives in regulating the flow, the development of forest rights trading policies should also emphasize the power of grassroots organizations.

## Data availability statement

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

## Author contributions

YH and QW: conceptualization, validation, formal analysis, investigation, resources, and data curation. YH and YW: methodology, software, writing—original draft preparation, review and editing, visualization, supervision, project administration, and funding acquisition. All authors have read and agreed to the published version of the manuscript.

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## Conflict of interest

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

## Publisher's note



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