

*Original Research*

# Research on the Influencing Factors of Farmers' Land Transfer Behavior Based on the Framework of Technology Acceptance Model: the Evidence from Shaanxi, China

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## Abstract

Based on technology acceptance model, this paper uses 3500 samples of farmers in underdeveloped areas of Shaanxi Province to reveal the influence mechanism of farmers' land transfer behavior by using partial least squares structural equation model. The results show that: (1) Perceived usefulness and perceived ease of use have a positive impact on farmers' land transfer behavior. The effect of perceived usefulness is stronger than that of perceived ease of use, and the effect of economic perceived usefulness is the strongest. (2) Family environment, social environment and land environment indirectly affect farmers' land transfer behavior by affecting their perception of land transfer. (3) The decision-making path of farmers' land transfer behavior is: external environmental factors → perceived usefulness → land transfer behavior; external environmental factors → perceived ease of use → land transfer behavior; external environment → perceived ease of use → perceived usefulness → land transfer behavior. It can be seen that perceived usefulness and perceived ease of use based on specific environment will have a significant impact on land transfer behavior. Therefore, to promote land transfer, we should focus on increasing the economic benefits of land transfer and improving the convenience of transfer transactions based on local reality.

**Keywords:** land transfer, influencing factors, technology acceptance model, partial least squares structural equation model, underdeveloped areas

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## Introduction

Guiding reasonable and orderly land transfer is of great significance for alleviating abandoned farmland [1] and helping poverty alleviation [2]. The No.1 Central Document of 2021 and 2022 pointed out that land transfer should be promoted in a standardized and orderly manner, providing policy support for the development of land transfer. However, according to the data, China's current land transfer still needs to be vigorously promoted, and the regional differences are more obvious [3]. The transfer level of the eastern economically developed areas is much higher than that of the central and western underdeveloped areas. Therefore, studying the influencing factors of land transfer in underdeveloped areas is of great significance for improving the land transfer system and improving the level of agricultural modernization in underdeveloped areas.

At present, the academic circles have made a lot of useful explorations on the influencing factors of land transfer. Some scholars have carried out research from a specific perspective, deeply revealing the influence mechanism of the differentiation of specific factors such as farmers' personal characteristics [4-6], family characteristics [7, 8], circulation environment [9-11] and land characteristics [12-14] on land transfer. However, in order to more fully reflect the influencing factors of land transfer, some scholars use a comprehensive perspective to carry out research. Li et al. (2021) comprehensively analyzes the impact of transfer market, regional differentiation, farmer differentiation and other factors on land transfer behavior [15]. However, due to the complexity of the influencing factors of land transfer, in order to clarify the influence mechanism of land transfer behavior, Xu et al. (2021) introduces the theory of planned behavior, and systematically combs the influence of farmers' subjective cognition on land transfer behavior [16]. The above provides a solid foundation for the research in this paper, but there is still room for expansion: 1) The existing research needs to deepen the understanding of the interaction process among external environment, subjective perception and land transfer behavior. 2) The existing research pays more attention to the eastern region and less attention to the central and western underdeveloped areas.

According to the China Rural Statistical Yearbook (2022), the land transfer rate in Shaanxi Province in 2021 is only 14.28 %, far lower than the national average of 24.58 %. According to the data of the third agricultural census in Shaanxi Province, the land transfer rate of underdeveloped counties in Shaanxi Province is mostly below 10 %. Therefore, it is urgent to improve the land transfer level in underdeveloped areas of Shaanxi Province. As a typical underdeveloped loess hilly region, Shaanxi Province has complex terrain and diverse climate. The non-agricultural employment status and agricultural income of farmers are at a low level, which is very typical in the central and western

regions. Focusing on its land transfer characteristics is conducive to revealing the impact mechanism of the unique geographical environment and socio-economic conditions on land transfer in the region, enriching and improving existing research, and also providing reference for other regions in the central and western regions.

In view of this, based on 3500 survey data in underdeveloped areas of Shaanxi Province, this paper constructs a theoretical framework with the technology acceptance model, and reveals the influencing factors of land transfer behavior with the help of partial least squares structural equation model, in order to provide useful reference for improving land transfer policies in underdeveloped areas and consolidate the achievements of poverty alleviation.

## Theory and Hypotheses

As a rational economic man, farmers' land transfer decisions will be affected by the maximization of family income. The technology acceptance model is based on the assumption of 'rational behavior theory' [17]. At the same time, the technology acceptance model can systematically sort out the influence process of external environment and farmers' perception on land transfer behavior. Therefore, this paper attempts to construct a theoretical framework based on the technology acceptance model.

### Technology Acceptance Model

Technology Acceptance Model (TAM) is a model proposed by Davis based on the theory of rational behavior [18]. The model aims to study the influence of perceived usefulness and perceived ease of use on individual's behavioral intention, both of which are affected by external environmental variables.

However, TAM does not clearly define the content of external environmental variables [19]. Land transfer behavior is affected by various external environmental factors such as family characteristics [20], transfer environment characteristics [21], and land characteristics [22, 23]. Therefore, referring to the research of [24], the external environment variables are divided into family environment (FE), social environment (SE) and land environment (LE). Based on the above analysis, this study proposes the following five hypotheses:

Hypothesis 1a (H1a): Family environment has a positive impact on farmers' perceived usefulness.

Hypothesis 1b (H1b): Social environment has a positive impact on farmers' perceived usefulness.

Hypothesis 1c (H1c): Land environment has a positive impact on farmers' perceived usefulness.

Perceived ease of use (PEU) refers to the degree of convenience that individuals think of the use of a new technology, that is, the degree of difficulty that farmers think of land transfer [25]. Open and supportive family

environment will significantly reduce the difficulty of land transfer [26]; a sound circulation market will promote the smooth completion of circulation transactions [27]; the natural advantages of land environment can effectively reduce the difficulty of circulation negotiation.

Perceived ease of use has a positive effect on perceived usefulness. When the difficulty of land transfer is small, the expected benefits of transfer can be realized smoothly, thus enhancing the perceived usefulness of farmers [28]. Accordingly, the following hypothesis is proposed:

Hypothesis 2a (H2a): Family environment has a positive impact on farmers' perceived ease of use.

Hypothesis 2b (H2b): Social environment has a positive impact on farmers' perceived ease of use.

Hypothesis 2c (H2c): Land environment has a positive impact on farmers' perceived ease of use.

Hypothesis H3 (H3). Perceived ease of use has a positive impact on perceived usefulness.

### Land Transfer Behavior

According to TAM, farmers believe that the greater the benefits of land transfer for themselves, the more likely they are to implement land transfer behavior [29]. At the same time, the less difficult it is for farmers to carry out land transfer, the higher the incidence of land transfer behavior [30]. Accordingly, the following hypothesis is proposed:

Hypothesis H4 (H4). Perceived usefulness has a positive impact on farmers' land transfer behavior.

Hypothesis H5 (H5). Perceived ease of use has a positive impact on farmers' land transfer behavior.

Based on the above analysis, the theoretical model of farmers' land transfer behavior decision-making is constructed based on TAM (Fig. 1).

## Materials and Methods

### Data Sources

The data used in this paper comes from the 'rural land transfer survey' of the research group from April

2021 to March 2022,1) A total of 42 underdeveloped counties in 7 cities of Shaanxi Province were selected as the research area. 2) Based on the principle of 'combination of far and near, rich and poor, highlighting characteristics, random selection', the research group selected 3~4 townships in each county, selected 3~4 administrative villages in each township, and randomly selected 10~12 villagers in each administrative village for structured interviews. The questionnaire includes many contents, such as the basic situation of farmers' the endowment of cultivated land resources, the perception of farmers' land transfer, etc., with data representation and sample richness. A total of 3800 questionnaires were distributed in the survey, 300 invalid questionnaires such as missing data and confusion were eliminated, and 3500 valid questionnaires were finally obtained.

### Variables Measurement

Based on the TAM theoretical framework, this paper identifies six potential variables: 'family environment', 'social environment', 'land environment', 'perceived usefulness', 'perceived ease of use' and 'land transfer behavior'. Based on the existing research and the actual situation of the study area, a scale containing 6 potential variables and 22 observed variables was finally constructed (Table 1).

### Method

A typical PLS-SEM model consists of two parts: measurement model and structural model [31]. In the literature, there are many arguments about the advantages and disadvantages of covariance-based SEM (COV-SEM) and PLS-SEM [32]. PLS-SEM is usually considered as a complementary method to COV-SEM. According to the suggestion of Hair et al. (2019), PLS-SEM is generally used in the following cases: (1) the target is to predict the key target structure; (2) The construction of formal metrics is part of the structural model; (3) The structural model is complex, including many indicators / structures; (4) Small sample size; (5) The plan is to use latent variable scores in further analysis.

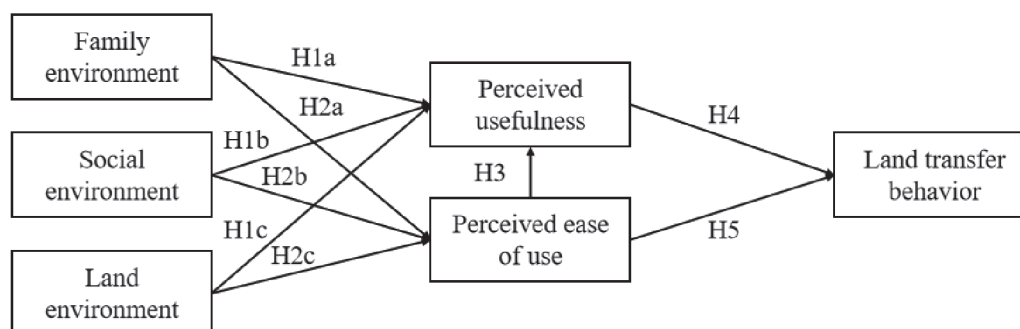


Fig. 1. Research Model.

Table 1. Design and identity of observation variables.

Variable	Observation variables
Family environment (FE)	Agricultural operating income (FE1)
	Educational level (FE2)
	Total household population (FE3)
	Pension Insurance Amount (FE4)
	Non-agricultural income share (FE5)
Social environment (SE)	Land Transfer Price (SE1)
	The influence of surrounding relatives and friends (SE2)
	Land transfer market perfection (SE3)
	Circulation risk occurrence (SE4)
Land environment (LE)	Contracted land area (LE1)
	Distance from farmland to village (LE2)
	Maximum cultivated land area (LE3)
	Minimum cultivated land area (LE4)
Perceived usefulness (PU)	Increase revenue (PU1)
	Promote mass production (PU2)
	Labor liberation (PU3)
Perceived ease of use (PEU)	The difficulty of obtaining circulation information (PEU1)
	Land transfer convenience (PEU2)
	Understanding of land transfer policy (PEU3)
Land transfer behavior (LTB)	Behavioral response positivity (LTB1)
	Land transfer Area (LTB2)
	The number of suggested others to transfer (LTB3)

### Reliability and Validity

In this paper, SmartPLS 3.0 was used to test the reliability and validity of the empirical data (Fig. 2). The Cronbach's  $\alpha$  values of the six potential variables in the model ranged from 0.802 to 0.888, all greater than 0.7, and passed the reliability test [33]. The KMO values of each dimension in the model ranged from 0.701 to 0.876, all greater than 0.7, and the p values of Bartlett's spherical test were less than 0.05, so the scale data were very suitable for factor analysis [34]. According to the principle of eigenvalue greater than 1, a total of 6 common factors were extracted, and the cumulative variance contribution rate was 65.617 %. The factor loading of the observed variables corresponding to each factor is 0.713~0.934, which passes the test. At the same time, the correspondence between dimensions and factors is consistent with the previous theoretical analysis, which also confirms the rationality of variable setting. The CR value of each latent variable

in the model is greater than 0.7, and the AVE value of each variable is greater than 0.5, indicating that the scale has good convergence validity. The square root value of AVE (diagonal value) is greater than the correlation coefficient between the variable and other variables (other values outside the diagonal), Heterotrait-Monotrait ratios (HTMT) (Underlined) are below 0.85, indicating that the scale has good discriminant validity (Fig. 3) [35].

### Results

The structural equation of partial least squares method was analyzed and verified by SmartPLS 3.0, and the standardized path coefficient diagram (Fig. 2) was drawn. The research hypothesis was tested according to the path coefficient. It can be seen from Table 4 that the standardized path coefficients among the latent variables all pass the significance test, which confirms that the hypotheses H1~H5 are valid, that is, the theoretical framework is verified.

(1) Family environment, social environment and land environment have a significant positive impact on perceived usefulness, confirming hypotheses H1a, H1b, H1c. Among them, the effect order of latent variables is: family environment (0.310) > land environment (0.226) > social environment (0.212).

1) Family status is the primary starting point of farmers' value judgment. If the family's agricultural income is considerable, farmers are more recognized for the economic benefits of land transfer. For part-time farmers and non-farmers, the advantages of land transfer in liberating labor and alleviating abandonment are more prominent.

2) The natural characteristics of land also have an impact on perceived usefulness. The study area is densely populated, ravines are vertical and horizontal, and the cultivated land is broken. The land inflow party needs to bear a large amount of production costs, thereby reducing the transfer income. However, the distance between cultivated land and village did not have a significant impact on land transfer behavior. Most of the land transfer in the study area is carried out within the village, and relatives and friends and 'neighbors' have become the priority objects of land transfer. Therefore, the distance is constrained by the scope of the village and the local customs, and has no significant impact.

3) Social environment also affects perceived usefulness. The transfer price in the study area is generally low, which reduces farmers' perception of the economic usefulness of land transfer. In recent years, the phenomenon of land inflow party abandoning farming and breaking contracts has occurred frequently, and risk disputes have further weakened farmers' recognition of usefulness.

(2) Family environment, social environment and land environment have a significant positive impact on perceived ease of use, confirming the hypothesis H2a,

Table 2. Reliability and validity.

Variables	Items	Loadings	Cronbach's $\alpha$	CR	AVE	VIF
Family environment	FE1	0.755	0.802	0.864	0.559	1.665
	FE2	0.725				1.599
	FE3	0.787				1.696
	FE4	0.713				1.568
	FE5	0.755				1.591
Land environment	LE1	0.804	0.806	0.873	0.632	1.624
	LE2	0.816				1.734
	LE3	0.775				1.562
	LE4	0.785				1.628
Land transfer behavior	LTB1	0.871	0.888	0.931	0.817	2.123
	LTB2	0.934				3.628
	LTB3	0.906				2.98
Perceived ease of use	PEU1	0.864	0.842	0.905	0.76	2.011
	PEU2	0.892				2.262
	PEU3	0.86				1.856
Perceived usefulness	PU1	0.915	0.879	0.925	0.805	2.279
	PU2	0.897				2.922
	PU3	0.88				2.352
Social environment	SE1	0.896	0.883	0.919	0.739	2.844
	SE2	0.902				3.038
	SE3	0.787				1.997
	SE4	0.849				2.427

Note: CR: Composite Reliability; AVE: Average Variance Extracted; VIF: Variance Inflation Factors.

Table 3. Discriminant validity-Fornell-Larcker Criterion and Heterotrait-Monotrait Ratio.

	1	2	3	4	5	6
1. Family environment	<b>0.748</b>	<u>0.659</u>	<u>0.605</u>	<u>0.644</u>	<u>0.517</u>	<u>0.382</u>
2. Land environment	0.533**	<b>0.795</b>	<u>0.708</u>	<u>0.800</u>	<u>0.596</u>	<u>0.419</u>
3. Land transfer behavior	0.509**	0.599**	<b>0.904</b>	<u>0.668</u>	<u>0.636</u>	<u>0.444</u>
4. Perceived ease of use	0.53**	0.658**	0.579**	<b>0.872</b>	<u>0.504</u>	<u>0.502</u>
5. Perceived usefulness	0.436**	0.503**	0.565**	0.436**	<b>0.897</b>	<u>0.304</u>
6. Social environment	0.326**	0.361**	0.396**	0.441**	0.278**	<b>0.86</b>

Note: \*\*Correlation is significant at the 0.01 level (2-tailed), Bold diagonal entries are square root of AVEs, Heterotrait-Monotrait ratios (HTMT)(Underlined) are below 0.85

H2b, H2c. Among them, the effect of each latent variable is ranked as follows: social environment (0.472) > family environment (0.212) > land environment (0.202).

1) The difficulty of land transfer is more affected by the local social environment. Due to the imperfect transfer market in most counties of the study area, it is difficult for farmers to obtain transfer information in time and reduce their perceived ease of use.

2) The family status of farmers will also have an impact on perceived ease of use. The open and supportive

family environment is conducive to the comprehensive collection of circulation information and channels in decision-making, enhancing and strengthening the confidence of land transfer, thus reducing the difficulty of land transfer.

3) The condition of the land itself is the main realistic factor affecting the difficulty of land transfer. The geographical characteristics of “ eight hills and two fields “ lead to the undulating terrain and serious fragmentation of cultivated land in Shaanxi Province,



Table 4. Results of hypothesis testing.

Hypothesis	Effect	Path	Path coefficient	STDEV	Lower (2.5%)	Upper (97.5%)	t-statistics	p-value	Decision
H1a	Direct	FE -> PU	0.310	0.061	0.155	0.512	6.270	0.001***	Accept
H1b	Direct	SE -> PU	0.212	0.06	0.122	0.453	3.754	0.000***	Accept
H1c	Direct	LE -> PU	0.226	0.081	0.144	0.465	3.829	0.000***	Accept
H2a	Direct	FE -> PEU	0.212	0.059	0.119	0.329	3.642	0.000***	Accept
H2b	Direct	SE -> PEU	0.472	0.061	0.346	0.585	7.774	0.000***	Accept
H2c	Direct	LE -> PEU	0.202	0.056	0.100	0.315	3.612	0.000***	Accept
H3	Direct	PEU -> PU	0.212	0.073	0.117	0.332	3.382	0.000***	Accept
H4	Direct	PU -> LTB	0.385	0.058	0.268	0.498	6.695	0.000***	Accept
H5	Direct	PEU -> LTB	0.412	0.063	0.280	0.530	6.521	0.000***	Accept

Note: Significant level:  $p < 0.10$ ; \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

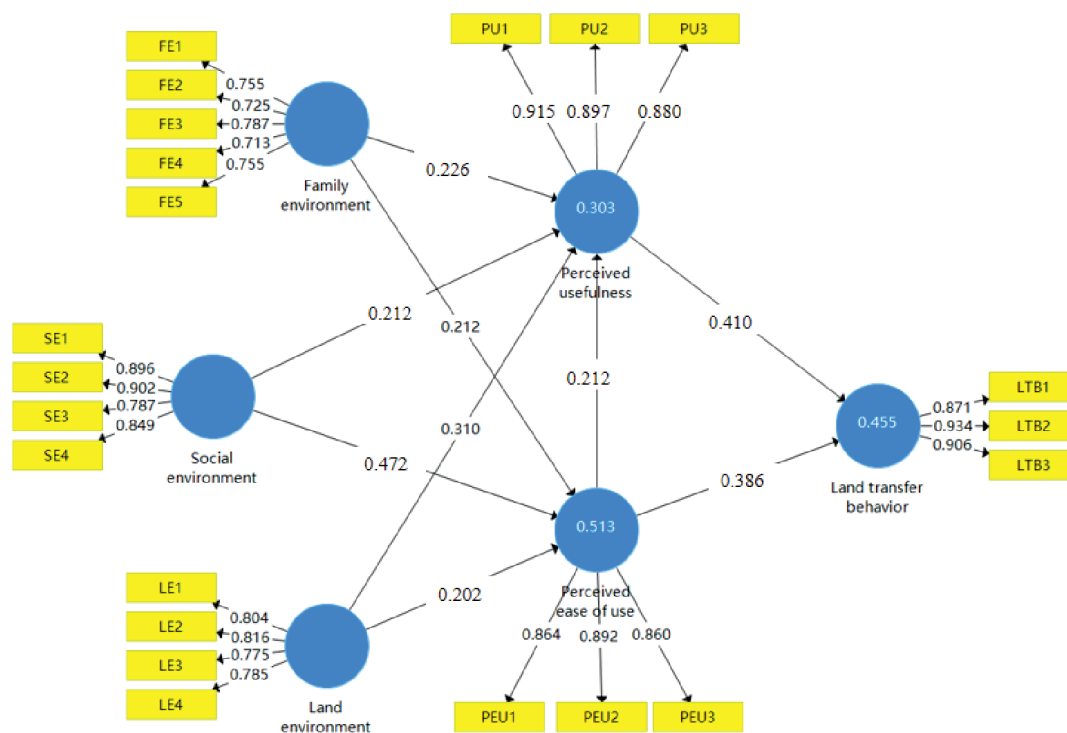


Fig. 2. Path diagram of modified model.

thus increasing the difficulty of mechanization and transfer negotiation.

(3) Perceived usefulness and perceived ease of use have a significant positive impact on farmers' land transfer behavior, confirming the hypothesis H4 and H5. Among them, the order of the effect of the two is: perceived usefulness (0.410) > perceived ease of use (0.386), indicating that perceived usefulness is the main factor affecting land transfer behavior.

Based on the purpose of maximizing income, farmers' perceived usefulness naturally becomes the most important factor in their behavioral decision-

making. As the most intuitive measure of perceived usefulness, economic income is the primary factor affecting land transfer behavior. The previous article also shows that the external environment mainly affects its behavioral decision-making by affecting the economic benefits of land transfer. The ranking of the effects of latent variables also confirms this assumption ( $PU1 > PU2 > PU3$ ). In addition, land transfer can liberate labor and promote the advantages of large-scale production, will also have an impact on land transfer behavior.

Perceived ease of use is also directly related to the smooth realization of land transfer behavior. In the study

area, due to the limitations of the external environment, land transfer needs to spend a lot of time and energy, and the concerns and obstacles faced by the transfer consultation are also large, which makes it difficult for farmers' land transfer willingness to be transformed into behavior.

In addition, perceived ease of use has a positive effect on perceived usefulness, confirming Hypothesis H3. Due to the difficulty of land transfer in the study area, the transfer efficiency is difficult to achieve, thus weakening the farmers' recognition of the usefulness of land transfer. The decision-making path of farmers' land transfer behavior can be summarized into the following three categories: external environmental factors → perceived usefulness → land transfer behavior; external environmental factors → perceived ease of use → land transfer behavior; external environmental factors → perceived ease of use → perceived usefulness → land transfer behavior.

In summary, perceived usefulness and perceived ease of use based on a specific environment will have a significant impact on land transfer behavior. The effect of perceived usefulness is stronger than that of perceived ease of use. Among them, the effect of economic perceived usefulness is the strongest, which shows that economic benefit is the decisive factor of land transfer. Therefore, when formulating land transfer policies, we should focus on the driving effect of economic benefits. At the same time, according to local conditions, according to different external environment, implement differentiated control measures.

## Discussion

The results show that farmers' perception based on specific environment has a significant impact on land transfer behavior, and different external environments have different effects on farmers' perception, which is consistent with [36]. The effect of economic perceived usefulness is the strongest, which clarifies that economic drive is the essential motivation of land transfer. As a rational economic man, farmers will choose the scheme of maximizing income after balancing the interests of circulation and self-cultivation. This point is consistent with the views of [37].

Compared with previous studies, TAM can integrate the external environment, farmers' perception and land transfer behavior into a unified theoretical framework to consider the influencing factors of land transfer more comprehensively [38]. Chaiyasoonthorn et al. (2019) researched the Technology Acceptance Model and further extended the same with additional aspects to study the factors affecting the real adoption of new technology on the mass scale as part of the Smart Cities implementation [39]. Based on the UTAUT model, Chaveesuk et al. (2021) empirically investigated the marketing perspective of retail purchase behavior

intention and the actual use of digital payment solutions in Thailand [40]. Chaveesuk et al. (2020) proposed the FTAM framework and identified the internal and external factors that affect farmers' behavioral intentions and attitudes [41]. Different from the comprehensive analysis of all factors, this paper systematically combs the relationship among the three, and abstracts the influence path of 'external environment → farmers' perception → land transfer behavior'. The results help decision makers to take reasonable measures according to the effects of different influence relations, so that the land transfer policy is more targeted, hierarchical and suitable. In addition, the underdeveloped areas in Shaanxi Province are selected as typical research areas. The research results have reference significance for the central and western regions, and have practical significance for consolidating the achievements of poverty alleviation and coordinating regional development.

## Conclusions

Based on TAM framework and 3,500 questionnaire data from less developed areas in Shaanxi Province, partial least square structural equation model was adopted to analyze the influencing factors of land transfer behavior, and the following conclusions were drawn:

(1) Perceived usefulness and perceived ease of use have a positive impact on farmers' land transfer behavior. The effect of perceived usefulness is stronger than that of perceived ease of use. Among them, the effect of economic perceived usefulness is the strongest, which highlights the driving effect of economic factors on land transfer.

(2) Family environment, social environment and land environment indirectly affect farmers' land transfer behavior by affecting their perception of land transfer. Among them, the effect of external environmental factors on perceived usefulness is ranked as follows: family environment > land environment > social environment; the effect of external environmental factors on perceived ease of use is ranked as follows: social environment > family environment > land environment, indicating that the influence of external environmental factors on land transfer behavior cannot be ignored. According to the degree of its effect, we should put forward adaptive countermeasures and suggestions.

(3) The decision-making path of farmers' land transfer behavior is: external environmental factors → perceived usefulness → land transfer behavior; external environmental factors → perceived ease of use → land transfer behavior; external environmental factors → perceived ease of use → perceived usefulness → land transfer behavior. It shows that perceived usefulness and perceived ease of use based on specific environment will have a significant impact on land transfer behavior.

## Limitations and Future Research Directions

There are still the following shortcomings in this paper: 1) This paper only analyzes the data of land transfer in a single year. In the future, panel data will be used to systematically analyze the influencing factors of land transfer. 2) Due to the model setting requirements of TAM, the external environment variables are temporarily used as the precursor variables of the structural model. In the future, the model needs to be improved to further explore the relationship between the two.

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## Conflict of Interest

The authors declare no conflict of interest.

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