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What Affects Participation in the Farmland Rental Market in Rural China? Evidence from CHARLS

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Abstract: Land fragmentation and the small size of land parcels are still the major bottlenecks for agriculture sustainable development in rural China, and an efficient land rental market could consolidate land plots and realize agricultural management at a moderate scale. However, transaction cost is still the main obstacle of land transfer. It is, therefore, essential to reduce the excessive transaction costs in the process of transfer; the primary task is to identify the roots of transaction costs. In order to accurately identify the sources of transaction costs, a generalized ordered Logit model with thresholds that allowed transaction costs to affect different directions of land transfer was developed using the China Health and Retirement Longitudinal Survey in 2015. The results suggested that the roots of transaction costs presented significant differences regarding the supply and demand of cropland. For the supply of land, the land titling program, land transfer intermediaries, and well-planned roads were the three most important factors that reduced transaction costs. For the demand of land, the three critical measures for reducing the transaction costs were well-planned roads, land consolidation, and the land titling program. The government should continue to push forward the land titling program and land consolidation projects in rural China, especially in hilly and mountainous areas. The infrastructure that greatly restricted agricultural development should be improved at a moderate level and the system of land circulating intermediary services at the township level should be established.

Keywords: farmland rental market; transaction cost; influencing factor; generalized ordered logit model; rural China; CHARLS

1. Introduction

In the last 30 years, although China has achieved substantial economic growth, a proportion of the rural population remains in poverty. According to the World Bank, China's urban residents' per capita disposable income was estimated at \$4385.23 in 2014, which is classified as a high-income level (i.e., above \$4086). In contrast, rural residents' per capita disposable income was \$1476.42, which is just across the low-income level (i.e., below \$1035). In the 21st century, as non-agricultural wages continue to rise, large-scale rural labor forces were transferred to the cities for non-agricultural employment and it led to agricultural recession [1,2], which urgently improved the productivity of agricultural labor and expanded the scale of agricultural management [3]. In reality, China's per capita arable land area is 0.08 hm² (1 hm² = 15 mu), which is less than half of the global average of 0.197 hm². Land fragmentation and small scale of land parcels are problematic for the agriculture development in China [3,4]. In order to raise peasants' income, the government has implemented a variety of stimulus

programs that cultivate the land rental market and encourage peasants to participate in cropland transfer, with the aim of realizing effective large-scale management.

Related policies to develop the land rental market have been put forward in recent years. Land transfer was encouraged by both in 1998 and 2002. In 2008, related documents stated that peasants should have a fully guaranteed right to contract cropland, with these land contracts remaining stable for a long period. In the same year, the government began to implement land registration and certification, i.e., the land titling program. In 2011, the land titling program was implemented nationwide [5]. It is clear that the adoption of these policies has created favorable conditions to foster an effective land rental market.

However, with the exception of some individual regions, the ratio of land transfer to total land area is still very low in most areas and less than 10% in 20% of provinces in China [6]. The high transaction costs are the root of the inefficient operation of the land rental market [7–9], together with the uncertainty of tenure [10,11] and the unwillingness of small-scale peasants to enter into contracts [12]. The existence of these transaction costs has severely dampened the enthusiasm to take part in the land rental market, particularly in Ethiopia, Vietnam, China, Europe, America, and other regions [7,13–15]. There is no doubt that such high transaction costs are the roots of inefficiency of the land rental market [16,17].

Unfortunately, the question about transaction costs leading to the low efficiency of the land rental market in China did not receive enough attention both from theoretical and empirical aspects [5,18], let alone identify and mine the sources of transaction costs owing to the limitations of technology, methods, and data [7,19]. There is an urgent need to identify the roots of the failure in the land rental market and to take effective measures to reduce unnecessary transaction costs. Therefore, a theoretical model was built and a generalized ordered Logit model with shifting thresholds was developed using the China Health and Retirement Longitudinal Study (CHARLS) in 2015. Our findings will help to improve the understanding of the inefficiency of the cropland rental market, and will also help to improve the vitality of the cropland rental market in order to promote the efficient use of cropland in rural China.

2. Land Tenure Reform in China

The formation of China's rural land system has occurred in two stages: the establishment of the Household Contract Responsibility System (HCRS) from 1978 to 1993; and the improvement of the stability of the market-oriented land property and cropland rental market since 1993.

2.1. Establishment of the HCRS

In 1979, village collective land was assigned to the individuals in Xiaogang village, Anhui province, China. Afterwards, HCRS, in two main forms, began to be implemented in China. The core of the HCRS is that the village collective retains the land ownership and peasants have the right to the contracted management of land that has been reallocated based on family sizes and labor forces. By the end of 1984, the HCRS had been implemented in more than 99% of village collectives. Land productivity rapidly improved due to the HCRS, which greatly improved peasants' production enthusiasm [20].

With the improvement in land productivity, however, three problems associated with the HCRS appeared. First, peasants' contracts for the management of land were not defined clearly in a legal format. Second, the HCRS allowed the village collective to reallocate land due to an increase or decrease in the village population, but it could not guarantee the long-term stability of land rights. Third, the HCRS was only applicable to village residents; thus, peasants who were engaged in non-agricultural employment faced the risk of losing their rights to the contracted management of land [21]. Frankly speaking, the HCRS faced many challenges and the development of agriculture has entered a bottleneck, which did not materialize as an increase in peasants' income.

2.2. Improvement of the Tenure Security

Document No. 1 in 1984 stated that the period of contracted management of land should be not less than 15 years, and the earliest implementation of the HCRS occurred in Xiaogang village [22]. In 1993, the first 15-year land contract period for Xiaogang village had arrived. Therefore, Document No. 1 in 1993 introduced a further regulation in which the period of contracted management of land was extended for 30 additional years once the original land contract expired. The aim was to stabilize land contract relations and improve cropland productivity. In 2002, the Rural Land Contracting Law was introduced, and it aimed to maintain the long-term stability of land contracting rights. The Property Law was passed in 2007 and it defined the right of land contract as usufruct right. This further strengthened the legal status of the right to land contracted management, thus ensuring the stability of the cropland rental market and system in rural China [22].

As massive labor forces in villages flow from rural to urban areas, a series of changes have taken place in rural land use such as the extensive operation of cropland [23]. What is more, the phenomena of abandoned cropland or idle cropland occurred in some areas and this objectively requires to expand the rural land management scale [24]. Therefore, land transfer was encouraged in Document No. 1 in 1993 and Rural Land Contracting Law in 2002. In reality, peasants were still reluctant to undertake land circulation owing to land adjustment issues, as well as the existence of phenomena such as the infringement of contracted management. In 2008, the government established that the existing land contract system should remain stable for a long period, which gave peasants a fully guaranteed right to contract land. Meanwhile, the pilot work on the land titling program was carried out nationwide since 2008. Since the implementation of HCRS in rural areas of China in the 1980s, the ownership of cropland has been owned by the village collective and the contracted management right is owned by each farm household. The reform of the three rights separation in 2014 makes the management right of cropland separated from the farm household, and the management right can be transferred in the land rental market and the peasants can obtain the rent [25].

It is worth noting that a series of beneficial conditions have been created for the development of the rental market, especially since 2008 when the land titling program greatly improved tenure security and the land rental market subsequently boomed. The total proportion of cropland in circulation was close to 30% in 2015, but the proportion was still less than 10% in ten provinces. Approximately 70% of peasants did not take part in the cropland rental market. The proportion of non-participation remained high, such as 37% in Bangladesh and 54% in India [26,27]. Furthermore, in recent years, the phenomenon about cropland being left idle or seasonally abandoned became more prominent, for example, the ratio of idle cropland was 13.5% in 2011 and 15% in 2013 in China, indicating that transaction costs were high [28,29]. Therefore, the priority in improving the situation is to accurately identify the roots of transaction costs and to make efforts to reduce them in the cropland rental market.

3. Materials and Methods

3.1. Data

The CHARLS was used for empirical analysis and CHARLS was conducted in 30 provinces of Chinese Mainland by the China Center for Economic Research at the Institute of National Development of Peking University from October 2017 to November 2017, and the data included 17,708 individuals in 10,257 households distributed in 450 villages, which was distributed in 150 prefecture-level cities, with 52.67% and 47.33% in rural and urban areas, respectively. In order to ensure that the sample is highly representative, there were four stages in the sampling process, i.e., the prefecture-level city, village, household, and personal levels. In the city-level sampling stage, the probability proportional to size was used based on the number of population and gross domestic product in cities in 2013 and about 150 prefecture-level cities were extracted from the 30 provinces in mainland China. At the village-level sampling stage, according to the Participatory Rural Evaluation (PRE) method, three villages or communities in every city were randomly selected, and finally obtained 450 villages or communities.

The data applied in this study mainly came from the rural samples and included 6026 farm households in 237 villages distributed in 101 prefecture-level cities in the CHARLS (Figure 1). In addition, the data contained village, household, and population databases. The village database contained land use, agricultural operation, village collective, and other related information. The household database included land transfer, agricultural input–output and household income. The population database contained details of education, work history, health history, and other demographic information. More importantly, the details about land circulation were included in these databases, which enabled the study to be successfully implemented.

To prevent the influence of noises in the samples on the empirical analysis, sample cleaning was conducted. First, the individual and household databases were combined, to produce a total of 5952 samples. Second, households in which the number of effective laborers was more than the total population were eliminated (17 samples; 0.28% of the total). Third, peasants who both rented-in and rented-out land were eliminated (25 samples, 0.41% of the total). Fourth, samples in which important indexes were missing were also eliminated. Finally, there were 5792 valid farm households in this study, accounting for 96.12% of the total samples.

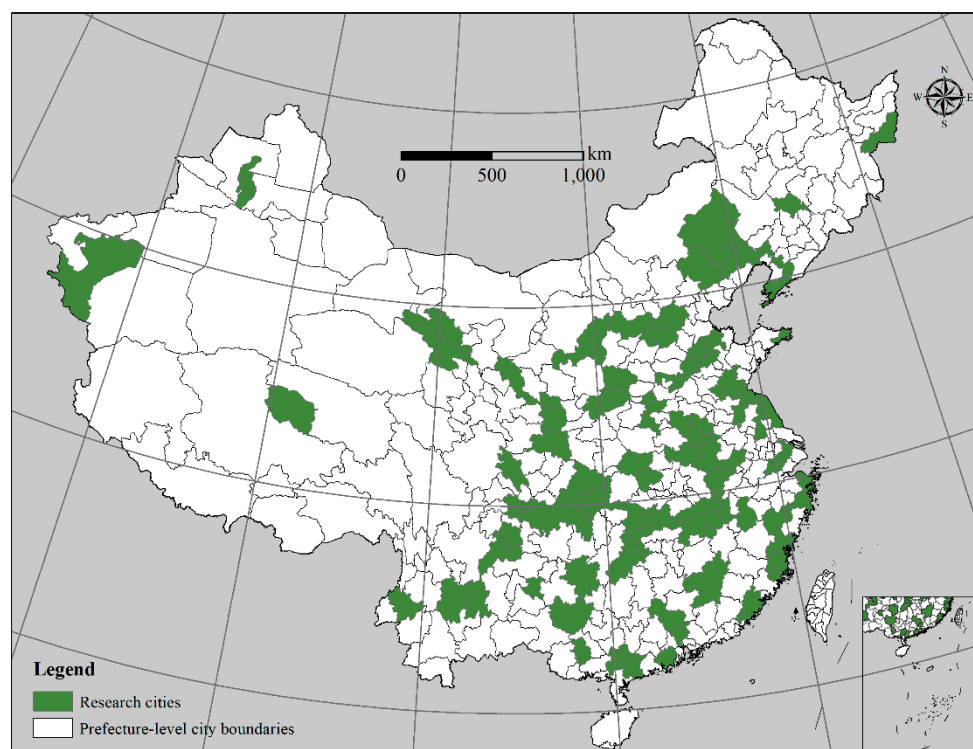


Figure 1. Distribution of research areas based on prefecture-level cities.

3.2. Model Specification

In the presence of transaction costs associated with land transfer, the rent paid due to renting-in cropland does not equal the rent received due to renting-out cropland. There is a significant difference between the rent to be paid due to renting-in land and the rent earned due to renting-out land, and it creates a price band. There are two thresholds in the land rental market [7]. When the marginal product value (πf_A) of cropland is greater than the rent (R_h^i) paid due to renting-in land, households are inclined to rent-in cropland. When the rent (R_h^o) received due to renting-out land is greater than the marginal product value (πf_A) of cropland, households tend to rent-out cropland [7,14,30,31]. Otherwise, households are not involved in land transfer. It is worth noting that whether a household is involved in the rental market is influenced by cropland marginal production and transaction costs, although the two latent variables cannot be accurately measured. Fortunately, the household choices involved in

the cropland rental have been examined so as to further identify the root of transaction costs in the rental market.

The theoretical model showed that there were three mutually exclusive choices (i.e., renting-out, autarkic referring to peasants who neither rent out nor rent in cropland, and renting-in) of the land rental market, and they could be ranked in order of πf_A for farm household h . These choices could be tied to πf_A by a nonlinear probability model for ordinal outcomes [16]. The choices equation of rental market was as follows:

$$S_h = \begin{cases} 1, & \pi f_A < R_h^o \\ 2, & R_h^o \leq \pi f_A \leq R_h^i \\ 3, & \pi f_A > R_h^i \end{cases} \quad (1)$$

where S_h is an index function with values of 1, 2, 3 in order and R_h^o and R_h^i are two thresholds. It is noteworthy that the differences between two levels of ordering scale (i.e., the renting-out versus the autarkic; the autarkic versus renting-in) is not the same on the scale of πf_A . The factors that affect the potential cropland marginal production value (f_A) are complex. f_A can be regarded as the linear expression based on a series of factors according to the above theory. The formula is as follows:

$$f_{Avh} = \alpha + \beta_1 X1_{vh} + \beta_2 X2_{vh} + \beta_3 X3_v + \varnothing D + \varepsilon_{vh} \quad (2)$$

where f_{Avh} is the dependent variable of farm household h in village v ; $X1_{vh}$ denotes the householders' characteristics such as age, education level, marital status, and health status of the head of the household; $X2_{vh}$ denotes the family characteristics, including the family effective workforce, the dependency ratio, cropland area, productive assets, and occupation; $X3_v$ refers to village characteristics such as terrain, infrastructure, population information, and rural endowment insurance. In addition, D , which denotes regional dummy variable and represents the provincial factors such as climate, culture, and other invisible factors are included in the model. The parameter ε_h denotes the level of disturbance. The definition and description of the variables are given in Table 1.

According to Table 1, about 8.72% of households rented out cropland and 10.2% of households rented-in cropland in 2013. The results show that the ratio of farm households who rented-in land is greater than that renting-out [26,31], mainly because some farm households who rented-out land do not live in the survey areas [31]. For the householders' characteristics, average age of the householders renting-in cropland is 57.16, which is less than that renting-out (60.67) and the autarkic (60.49). On average, effective labor forces represent significant differences in three groups; the number of effective labor forces in households that rented-in cropland is 3.27, which is greater than other groups (3.11 and 3.16). Also, the average productive assets for the households that rented-in land is 7555 yuan, while the assets are 5061 yuan for households that rented-out land. Obviously, the head, household, and village characteristics were quite remarkable for households in different rental choices.

Considering the existence of transaction costs in the cropland rental market, the rent thresholds for renting-out and renting-in cropland were expressed as linear functions of the form:

$$\begin{cases} R_h^o = k_h^o - k^o \cdot X_{TC}^o \\ R_h^i = k_h^i + k^i \cdot X_{TC}^i \end{cases} \quad (3)$$

where X_{TC}^o and X_{TC}^i are the vectors of proxy variables for transaction costs assumed to affect the threshold levels for household h , with an associated κ^o and κ^i . The superscripts o and i indicate renting-out and renting-in land, respectively.

The theory of Williamson identified the transaction costs from three dimensions, namely, the asset specificity, transaction frequency, and uncertainty [32]. Firstly, the critical dimension for characterizing transaction is the asset specificity, which denotes the degree of durable transaction-specific investments. In China, tenure security and the basic cropland protection system are two key factors generating transaction costs in the process of cropland circulation. In this study, the critical indicator for measuring

the degree of tenure security is the land titling program [5,33,34]. In addition, the crop zoning index, was measured as the proportion of the total sown areas of wheat, corn, and rice, three main crops, which captured the rising transaction costs from the specificity of cropland assets in different regions [7]. Secondly, the transaction frequency also affects the transaction costs. This study selects [30] d proxy variables for characterizing transaction frequency, which included land fragmentation, land consolidation, land circulation intermediary, convenience stores in village, well-planned roads, and household assets, such as motor vehicle and mobile phone [35]. It was worth mentioning that land fragmentation led to higher transaction costs in the land rental market [36], and the number of land parcels captured the transaction costs due to higher transaction frequency [37]. The number of convenience stores in village captured the declining transaction costs due to information transmission [8]. Thirdly, the uncertainty of transaction is widely conceded to be a critical attribute. Land readjustment and the incidence of natural disasters were selected, such as drought, flooding, typhoon, and earthquake, to measure the uncertainty [32]. In China, although the HCRS has been implemented for more than 30 years, land readjustment that increased the uncertainty and investment risk of agricultural management often occurred within the villages. The definition and description of the above variables for transaction costs are given in Table 2.

To estimate the threshold parameters in Equation (3), a generalized ordered Logit model (GOLM), with a shifting threshold, was used to estimate order response probabilities for the choices in Formula (1). The form of the model was expressed as follows:

$$pr(S_h > j|X) = \frac{\exp(Xb)}{1 + \exp(Xb)} \quad (4)$$

$$Xb = -R_h^j + \beta_1 X1_{vh} + \beta_2 X2_{vh} + \beta_3 X3_v + \emptyset D \quad (5)$$

This model overcame the limitations of a standard ordered Logit model and allowed the thresholds to be affected by a number of proxy variables for transaction costs, which can substitute Equations (2) and (3) into Equations (4) and (5). The threshold parameters (κ^0, κ^i) are identified by GOLM [38].

Table 1. Summary statistics for the variables affecting land rental market participation.

Variable	Definitions	Renting-out N = 505		No participation N = 4696		Renting-in N = 591	
		Mean	S.D	Mean	S.D	Mean	S.D
Householder's Characteristics							
Householder's age	The householder's age (years.)	60.67	10.98	60.49	10.43	57.16	9.06
HUKOU	Agricultural HUKOU (yes = 1, no = 0)	0.96	0.20	0.96	0.20	0.99	0.09
Education level							
Middle school	Level of schooling (middle school = 1, no = 0)	0.17	0.38	0.18	0.38	0.20	0.40
High school	Level of schooling (high school = 1, no = 0)	0.05	0.23	0.05	0.21	0.05	0.22
College degree	Level of schooling (college degree = 1, no = 0)	0.03	0.16	0.01	0.11	0.01	0.07
Marriage of household head	Marital status (married = 1, no = 0)	0.71	0.45	0.77	0.42	0.90	0.30
Health of household head	Self-assessment health for body (healthy = 1, no = 0)	0.61	0.41	0.61	0.41	0.63	0.44
Family Characteristics							
Effective labor force	The amount of adult equivalent labor	3.11	1.24	3.16	1.26	3.27	1.23
Dependency ratio	Family dependency ratio	0.20	0.32	0.20	0.30	0.24	0.34
Productive assets	The total value of productive assets in family (yuan)	5061	27,074	7431	57,242	7555	24,441
Farm area in family	The number of cultivated land (hm ²)	0.41	0.78	0.42	0.85	0.53	0.96
Occupation	Multiple occupations (yes = 1, otherwise = 0)	0.87	0.54	0.92	0.47	0.91	0.49
Village Characteristics							
Terrain							
Plains	Located in plains (yes = 1, no = 0)	0.34	0.47	0.33	0.47	0.36	0.48
Hills	Located in hills (yes = 1, no = 0)	0.35	0.48	0.32	0.47	0.39	0.49
Distance to bus stop	Distance from the village to bus stop (km)	5.91	4.27	5.64	4.51	5.49	4.16
Ratio of emigration	The ratio of outflow population in the village	0.35	0.28	0.36	0.28	0.39	0.29
Ratio of the elderly	The ratio of population aged 65 in the village	0.17	0.13	0.17	0.12	0.16	0.11
ORPS	Has old rural pension insurance (yes = 1, no = 0)	0.24	0.42	0.15	0.35	0.17	0.37
Average income per capita	Net income per capita in 2010 (yuan)	4319	3907	3563	3546	3925	3424
CPI	The price of rice per kilogram (yuan/kg)	2.23	0.48	2.27	0.46	2.27	0.45

Table 2. Summary statistics for the variables determining transaction costs.

Variable	Definitions	Renting-out N = 505		No Participation N = 4696		Renting-in N = 591	
		Mean	SD	Mean	SD	Mean	SD
Asset specificity							
Land titling program	<i>Tenure security</i> Land titling in past five years (yes = 1, no = 0)	0.38	0.49	0.29	0.45	0.34	0.42
Crop zoning index	<i>Basic cropland protection system</i> Ratio of the total sown areas of wheat, corn, and rice crops	0.89	0.27	0.86	0.28	0.90	0.31
Transaction frequency							
Number of land parcels ***	The number of land parcels in farm households	4.28	3.82	3.97	3.51	4.45	3.33
Land consolidation	Has conducted land consolidation (yes = 1, no = 0)	0.19	0.40	0.12	0.32	0.17	0.37
Land circulation intermediary	Has land circulating intermediaries in township (yes = 1, no = 0)	0.23	0.17	0.15	0.14	0.20	0.17
Well-planned roads	Has well-planned roads (yes = 1, no = 0)	0.92	0.27	0.89	0.31	0.93	0.26
Convenience stores	The number of convenience stores in village	6.59	4.93	5.38	4.64	5.66	4.64
Motor vehicle ownership	Has owned a motorized vehicle (yes = 1, no = 0)	0.52	0.50	0.51	0.50	0.64	0.48
Mobile phone ownership	Has owned a mobile phone (yes = 1, no = 0)	0.71	0.45	0.69	0.46	0.77	0.42
Uncertainty							
Land readjustment	Has reallocated cropland in decade (yes = 1, no = 0)	0.21	0.41	0.19	0.39	0.21	0.41
Incidence of natural disaster	The probability of natural disasters including drought, flooding, typhoon, and earthquake in decade	0.27	0.48	0.41	0.50	0.43	0.50

Notes: ***, Number of land plots was the missing variable in CHARLS; this paper used the number of land parcels in a rural fixed observation points system conducted by the Chinese Ministry of Agriculture to replace the number of land parcels in CHARLS based on China's eastern, central, and western regions, respectively.

4. Results

4.1. Development Level of the Land Rental Market in China

The two types of indicators that include the ratio of land transfer to total land area by land area and the ratio of land transfer by the number of households in different provinces were used to estimate the development level of the cropland rental market. Table 3 shows the statistical results. First of all, from the perspective of land transfer area statistics, about 50% of provinces where the ratio of cropland has been transferred out were less than 10% and, in all provinces, where the ratio of cropland has been transferred out, it was less than 30%, except Heilongjiang, and the national average was 10.54%. The ratio of cropland that has been transferred into was less than 30% in all provinces, except for Zhejiang and Heilongjiang.

Table 3. Development level of land transfer market based on area and number of peasants.

Province	Ratio of Land Transfer by Land Area/%		Ratio of Land Transfer by the Number of Farm Households/%	
	Has Been Transferred out	Has Been Transferred in	Has Transferred out	Has Transferred in
Anhui	10.26	20.89	14.96	18.52
Fujian	12.19	12.36	18.37	12.48
Gansu	4.33	7.54	5.83	14.17
Guangdong	11.42	10.46	11.50	7.71
Guangxi	6.23	4.37	8.75	4.58
Guizhou	11.14	22.78	8.83	12.63
Hebei	7.42	7.51	8.90	6.16
Henan	7.76	12.31	8.61	9.27
Heilongjiang	30.01	31.65	28.59	15.54
Hubei	10.29	16.76	14.77	13.86
Hunan	12.02	26.68	15.68	23.04
Jilin	14.34	26.88	14.70	18.35
Jiangsu	9.29	13.87	19.35	14.49
Jiangxi	19.43	27.52	18.48	19.39
Liaoning	9.13	25.13	9.83	16.64
Inner Mongolia	11.09	17.84	9.68	14.65
Shandong	7.51	16.85	8.43	16.53
Shanxi	5.78	15.04	4.56	11.97
Shaanxi	6.39	13.51	6.02	12.05
Sichuan	4.53	11.72	5.55	8.78
Qinghai	5.68	9.87	8.20	9.75
Yunnan	9.86	11.75	14.08	11.18
Zhejiang	19.95	63.07	33.83	20.57
Chongqing	7.12	3.75	8.11	5.30
National average	10.54	17.92	12.73	13.23

Notes: Some of the provinces are not listed in the above Table because of the small number of samples.

Secondly, from the perspective of the number of households, Table 3 shows that more than 50% of provinces where the ratio of the number of households that transferred out cropland was less than 10%, and it did not exceed 30% in any provinces except Zhejiang. The ratio of the number of households that transferred in cropland did not exceed 30% in any provinces. It is obvious that the development level of the rural land rental market was still at a low level, regardless of whether from the perspective of land transfer area and the number of farm households in rural China.

4.2. Determinants of Cropland Rental Market Participation

A global test of the parallel-lines assumption was conducted using the Brant and Likelihood ratio tests. The results indicated that the parallel-line assumption was violated. Therefore, this study favored the generalized ordered Logit model at the 1% significance level. In addition, the multicollinearity of independent variables was tested using the Variance Inflation Factor (VIF). All of

the independent variables had a VIF that was less than 3. Therefore, there is no serious collinearity problem between variables.

The empirical results are presented in Table 4, it was noteworthy that the dependent variables that complied with the orderly rising represented the household rental choices, and took on values of 1, 2, and 3 for renting-out, the autarkic, and renting-in, respectively. When explanatory variables were significantly positive, farm households were inclined to rent-in cropland due to higher cropland marginal production values. In contrast, explanatory variables were significantly negative, indicating that farm households tended to rent-out cropland due to the lower cropland marginal production values.

Table 4. Simulation results of determinants of land rental market participation.

Variables	Estimated Coefficient		T-Value	
Householder's Characteristics				
Householder's age	−0.007 *		−1.77	
HUKOU	0.278		1.47	
Middle school	−0.079		−0.83	
High school	−0.254		−1.57	
College degree	−0.869 ***		−2.95	
Marriage of household head	0.470 ***		5.03	
Health of household head	0.137 *		1.78	
Family characteristics				
Effective labor force	0.051 *		1.71	
Dependency ratio	0.120		1.04	
Log of productive assets	0.137 ***		9.75	
Farm area in family	0.002		0.60	
Occupation	−0.229 *		−1.78	
Village characteristics				
Plains	0.148		1.19	
Hills	0.138		1.35	
Distance to bus stop	−0.002*		−1.88	
Ratio of emigration	−0.790 **		−2.05	
Ratio of the elderly	−0.836 **		−2.53	
ORPS	−0.215 **		−2.12	
Log of average income per capita	−0.051		−1.17	
CPI	−0.045		−0.51	
Variables determining transaction costs with thresholds				
	Renting-out threshold		Renting-in threshold	
	Coefficient	T-value	Coefficient	T-value
Asset specificity				
Land titling program	−0.527 ***	−4.64	0.159 **	2.23
Crop zoning index	0.051	1.37	0.023	0.65
Transaction frequency				
Number of land parcels	0.052	0.44	−0.079	−0.71
Land consolidation	−0.378 ***	−2.84	0.443 ***	3.39
Land circulation intermediary	−0.425 ***	−3.18	0.097 *	1.74
Well-planned roads	−0.339 *	−1.91	0.399 **	2.32
Convenience stores	−0.035 ***	−3.32	0.007	0.67
Motor vehicle ownership	−0.120	−1.07	0.243 **	2.31
Mobile phone ownership	−0.133	−1.13	0.112	0.98
Uncertainty				
Land readjustment	−0.141	−1.10	0.162	1.34
Incidence of natural disasters	0.215 **	2.02	−0.118	−1.21
Cut points	2.603 ***	4.07	−3.184 ***	−4.98
Pseudo R-square			0.0931	
Log likelihood			−3343.50	
Observations			5792	

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. The dependent variable is the household rental choice, which takes on values of 1, 2, and 3 for renting-out, the autarkic, and renting-in, respectively; T-statistics are corrected for heteroscedasticity and clustered by village. Regional dummies have been included in the model; their coefficients are not reported in the Table 4 due to space limitation.

First of all, from the perspective of the householder's characteristics, the householder's age was negative at the 10% significance level, indicating that peasants were inclined to rent-out cropland as the

age of the head of the household increased. The educational level was negative at the 1% significance level, and it suggested that farm households were more likely to rent-out cropland when the head of the household had a higher level of education, especially the head who had a college degree. Marriage and Health of household head were positive at the 1% and 10% significance levels, respectively, indicating that the farm households with more stable marriages and the peasants who were in good health were inclined to rent-in cropland. Clearly, the empirical results implied that the rental market transferred cropland from relatively labor-poor and educationally high-achieving farm households to those with relatively more healthy and stable families. The evidence supported the view that, to a certain extent, the cropland rental market can improve the land use efficiency and the allocation of labor forces.

Secondly, from the perspective of the household characteristics, effective labor forces and productive assets were significantly positive at the 10% and 1% levels, respectively, suggesting that farm households that are relatively labor-rich and asset-sufficient are more willing to expand the scale of agricultural management. However, the coefficient of occupation was negative at the 10% significance level, indicating that farm households engaged in non-agricultural employment or having part time jobs were more inclined to rent-out cropland. Therefore, the results also supported the view that the cropland rental market resulted in an efficient allocation of cropland resources at the household level.

Thirdly, from the perspective of the village characteristics, the coefficients of ratio of the emigration, ratio of the elderly, and old rural pension system (ORPS) were negative at the 5% significance level, which suggested that the households lived in villages that had a higher rate of outflow population and a higher proportion of the elderly were more inclined to rent-out cropland. The coefficients above also suggested that an efficient allocation of cropland resources was achieved by the cropland rental market. All of the evidence supported the view that the cropland rental market to some extent transferred cropland from relatively inefficient farm households to efficient farm households [31].

The study was more interested in the root of transaction costs hindering the development of the land transfer, which was determined from a series of proxy variables for transaction costs. The effects of the proxy variables on transaction costs in the households' rental choice are reported in the lower half of Table 4. The unstandardized estimation coefficients and partially standardized estimation coefficients of proxy variables for transaction costs based on threshold equations were presented in Table 4. In addition, the relative importance of the sources of transaction costs affecting the land rental market was also presented in Table 5.

Table 5. Importance of the roots of transaction costs affecting land rental market participation.

Variable	Renting-out Threshold			Renting-in Threshold		
	Estimated Coefficient	Standardized Estimates	Rank	Estimated Coefficient	Standardized Estimates	Rank
Asset specificity						
<i>Tenure security</i>						
Land titling program	−0.527 ***	−0.0581	2	0.159 **	0.0177	7
<i>Basic cropland protection system</i>						
Crop zoning index	0.051	0.0019	10	0.023	0.0008	10
Transaction frequency						
Number of land parcels	0.052	0.0061	9	−0.079	−0.0087	9
Land consolidation	−0.378 ***	−0.0503	4	0.443 ***	0.0578	2
Land circulation intermediary	−0.425 ***	−0.0565	3	0.097 *	0.0127	6
Well-planned roads	−0.339 *	−0.0603	1	0.399 **	0.0688	1
Convenience stores	−0.035 ***	−0.0004	11	0.007	0.00007	11
Motor vehicle ownership	−0.120	−0.0133	8	0.243 **	0.0255	3
Mobile phone ownership	−0.133	−0.0159	7	0.112	0.0129	5
Uncertainty						
Land readjustment	−0.141	−0.0180	6	0.162	0.0194	4
Incidence of natural disasters	0.215 **	0.0237	5	−0.118	−0.0115	8

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. The standardized coefficient of each variable was not determined in accordance with the ordinary least squares (OLS) method; to solve this problem, an estimation method was followed using the formula ($\hat{\eta} = \eta * \sigma$) [38]; T-statistics are corrected for heteroscedasticity and clustered by village.

For the farm households who rented-out cropland (the supply side), there were three important factors that significantly reduced the transaction costs and improved the ratio of participation in the land rental market, i.e., well-planned roads, the land titling program, land circulation intermediaries. First of all, the coefficient of the land titling program was -0.527 , which was significantly negative at 1% significance level. A land titling program that improved the stability of tenure and weakened the asset specificity of cropland could reduce the transaction costs in the process of land circulation, resulting in the incentive of prospective renting-out to take part in the land rental market [21]. In addition, well-planned roads and land circulation intermediaries that reduced the transaction costs by saving costs on transportation, information searching, negotiation, supervision, and contract management as the increase in transaction frequency, encourages farm households to participate in the rental market [39]. In contrast, the incidence of natural disasters and the number of land parcels were key roots of transaction costs that significantly reduced the willingness to take part in the land rental market. High incidence of natural disasters, such as drought, flooding, typhoon, and earthquake, increased the risk of agricultural operation and transaction uncertainty and hindered participation in the land rental market. Similarly, land fragmentation, that is to say, the number of land parcels, increased transaction frequencies or frequencies of signing a contract in the process of land circulation and also reduced the ratio of participation in land transfer.

For the farm households who rented-in cropland (the demand side), well-planned roads also had the highest rank order and positively impacted the prospective renting-in or tenants by reducing transaction costs. Land consolidation ranked second and significantly reduced the cost of searching for and screening participants, and also reduced management costs and encouraged prospective tenants to rent-in cropland [33]. Motor vehicle ownership ranked third and significantly improved the probability of participation in the land rental market by reducing the cost of searching for and screening participants, and reducing management costs. It is obvious that these results are consistent with existing research about Vietnam [7].

Therefore, the results presented in Table 4 support the interpretation of these variables as determinants of transaction costs and not as determinants of cropland productivity. For the supply side of cropland, well-planned roads, the land titling program and land circulation intermediaries were the three most important factors that reduced transaction costs; meanwhile, the incidence of natural disasters and the number of land parcels were the two most important factors that increased transaction costs. In contrast, well-planned roads, land consolidation, and the land titling program were the most important factors that reduced transaction costs associated with the demand side of cropland and encouraged prospective renting-in to rent-in cropland.

5. Conclusions, Policy Applications, and Limitations

To explore what affects participation in the cropland rental market, a theoretical model was built and a generalized ordered Logit model, with shifting thresholds that allowed transaction costs to effect on renting-out and renting-in differently, was developed and estimated using CHARLS in 2015. In addition, this paper further identified the roots of transaction costs from the supply and demand of land. The findings suggested that the land rental market, to a certain extent, improved the efficient allocation of cropland resources. Specifically, the land rental market transferred cropland from farm households with a higher educational level and relatively labor-poor to those with a relatively stable marriage, asset-abundant and more effective labor resources based on individual and household level. Furthermore, farm households who lived in villages with a higher proportion of emigration and the elderly were inclined to rent-out cropland.

More importantly, the findings also revealed that high transaction costs can hamper the development of the land rental market. What is more, this study effectively identified the roots of transaction costs that affected renting-out and renting-in in different ways and estimated the relative importance of their impacts. For the supply side of cropland, well-planned roads, the land titling program and land circulation intermediaries were the three most important factors that significantly

reduced the transaction costs. It is notable that the incidence of natural disasters and land fragmentation were key factor that increased transaction costs. For the demand for cropland, well-planned roads, land consolidation, and the land titling program were key factors that reduced transaction costs.

There is an urgent need to reduce transaction costs and encourage potential participants to enter the cropland rental market. The government should continue to push forward the land titling program and guarantee the long-term stability of land rights. Land consolidation and infrastructure construction in undeveloped areas should be a priority for the government, especially in hilly and mountainous areas. In addition, information diffusion services associated with the land rental should also be improved, such as the establishment of land transfer service intermediaries at the township level.

It is worth mentioning that this study may have some limitations. To our knowledge, cross-sectional data with no control over these factors that change over time were used in this study, and panel data may reduce the potential bias in parameter estimates, but it would face a greater challenge in estimating the generalized ordered Logit model. The cross-section data that are used for empirical analysis in this paper is still a reasonable choice.

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