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Does Land Transfer Improve Farmers' Quality of Life? Evidence from Rural China

Qiang He [1], Xin Deng [1], Chuan Li [1], Fangxia Kong [2] and Yanbin Qi [1,*]

[1] College of Economics, Sichuan Agricultural University, Chengdu 611130, China; heqiangklcf@stu.sicau.edu.cn (Q.H.); dengxin@sicau.edu.cn (X.D.); 2020108003@stu.sicau.edu.cn (C.L.)
[2] College of Economics and Management, Southwest University, Chongqing 400715, China; kfx000015@email.swu.edu.cn
* Correspondence: qybin@sicau.edu.cn; Tel.: +86-028-8629-0896

Abstract: The topic of quality of life has long been a focus of global research and the public. The land transfer policy implemented by the Chinese government affects farmers' quality of life (FQOL); however, the extent of this effect remains unclear. As land transfer may be a self-selection behaviour, it may be subject to selection bias such that traditional measurement methods are unable to effectively estimate its quantitative impact. This study used data from a questionnaire given to 5668 rural households in 25 provinces of mainland China. It sought to quantify the impact of land transfer on FQOL by using endogenous switching regression (ESR) models to correct selection bias. The results show: (1) for farmers who choose to transfer land, if they choose not to transfer land, FQOL may decrease by 64.11%; (2) for farmers who choose not to transfer their land, if they go on to choose to transfer their land, FQOL may increase by 0.75%; (3) land transfer can improve the quality of life of the older generation of farmers but will reduce the quality of life of the newer generation. The results of this study provide research support for China and other countries seeking to effectively implement land policies and improve the FQOL, helping to provide practical strategies for the sustainable development of rural areas.

Keywords: land transfer; FQOL; ESR model

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1. Introduction

The topic of quality of life has long been a focus of global research and the public [1–3]. Countries around the world have introduced a series of policies and measures to improve the quality of life of their citizens. For example, in 1970, the UK enacted the Chronic Disease and Disability Act and promised to provide services to all disabled people (although it ultimately failed; [4]). In 2004, Germany implemented the Law of Modernisation of Legal Medical Insurance, with the main goal of improving the economic efficiency and quality of medical insurance, thus reducing the proportion of premiums paid and the additional cost of wages [5]. The public Long-term Care Insurance (LTCI) scheme was launched in Japan in 2000 and South Korea in 2008 to help the elderly lead more independent lives and reduce the burden on family caregivers [6,7]. Improving quality of life is a common goal pursued by China and other countries. Since the beginning of its reform and development, China has experienced a period of rapid development in which production became more important than life. However, it is now entering a new stage in which quality of life is considered more important [8–10]. The 19th National Congress of the Communist Party of China (CPC) in 2017 pointed out that the principal contradiction facing Chinese society has evolved into one between unbalanced and inadequate socioeconomic development and the people's ever-growing needs for a better life. The pursuit of a better life and the improvement of quality of life have gradually become the consensus of Chinese society and basic requirements for sustainable development.

China is one of the largest developing countries in the world [11], with more than 500 million people living in rural areas in 2020 (about one-fourteenth of the world's total

population). Improving the quality of life of rural residents and narrowing the gap between urban and rural development are critical to China's sustainable development. However, most rural Chinese people face worse living conditions than their urban counterparts. For example, Ding et al. [12] pointed out that protein intake in rural areas of China is generally lower than in urban areas. Wang [13] found significant health inequality between urban and rural children in China, with urban children being healthier. Fan [14] pointed out that the dual economic model causes a huge gap between urban and rural social security projects, levels and coverage rates in China. In addition, the levels of public services, employment opportunities and income in China's rural areas are significantly lower than those in urban areas [15–17]. Therefore, the Chinese government has introduced a series of policies and measures to narrow the gap between urban and rural areas and improve the quality of life of rural residents. For example, in 2006, the Chinese government abolished the Regulations on Agricultural Tax, marking the end of a 2000-year-old tradition of taxation in China and ushering in a new stage of development in which industry supports agriculture and cities support the countryside. The rural revitalisation strategy put forward in 2017 aims to make agriculture a more promising industry, give farmers an attractive career and make rural areas a beautiful place for people to live and work in. These policies and measures have also effectively improved the quality of life of farmers [18–20]. However, is the same true when China implements land policy, such as land transfer, which is the basis for the inheritance and survival of farmers from generation to generation?

Land circulation refers to the system of transferring the management rights of land to others on the basis of keeping the land contract relationship unchanged. In 2004, the State Council of China issued the Decision on Deepening Reform and Strict Land Management, stipulating that the right to use construction land collectively owned by farmers can be transferred in accordance with the law. In 2014, the Chinese government issued the Opinions on Guiding the Orderly Transfer of Rural Land Management Rights and Developing Moderate Scale Agricultural Operations, calling for the vigorous development of land transfer, moderate-scale agricultural operations and confirmation of contracted management rights within five years. In 2019, the Chinese government deliberated and adopted a decision on amending the Land Administration Law, which came into force on 1 January 2020. As shown in Figure 1, the area of farmland transferred in China rose from 3.6449 million hectares in 2005 to 35.934 million hectares in 2018—an increase of nearly 10 times. The farmland circulation area as a proportion of the total arable land area increased from 2.80% in 2005 to 26.65% in 2018—an increase of nearly 9.5 times (not including the Tibet Autonomous Region due to a lack of data [21]). Considering that land circulation can be divided into land transfer and land inflow, this study focuses on "land-lost farmers". Therefore, this study mainly discusses the impact of land transfer on farmers' quality of life (FQOL).

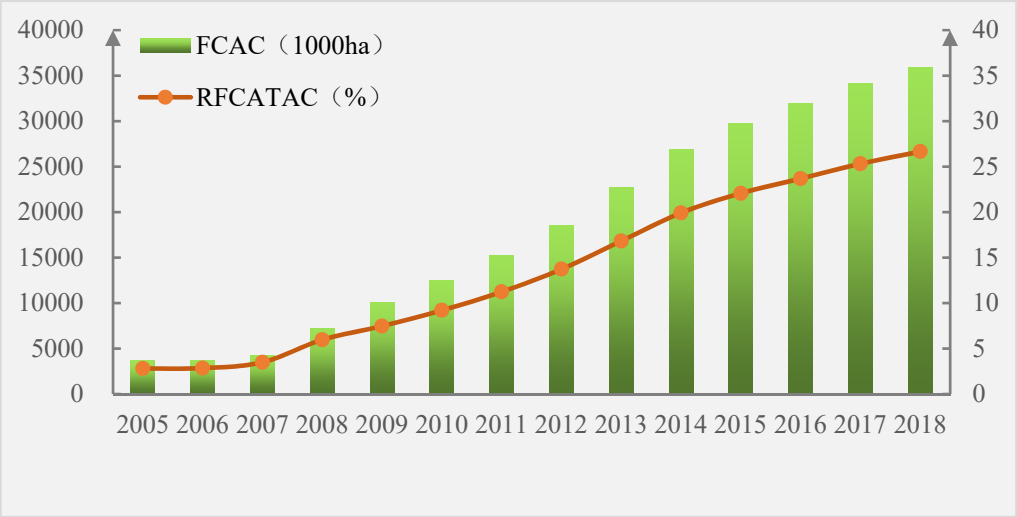

Figure 1. Farmland circulation area in China (FCAC); ratio of farmland circulation area to total area in China (RFCATAC).

2. Literature Review

The concept of "quality of life" first appeared in the economist Galbraith's book, The Affluent Society [22]. Quality of life is a complex multidimensional concept and is one of the important and challenging social issues in the 21st century [23,24]. Scholars have not reached a consensus on its definition, but most define quality of life from subjective and objective perspectives. For example, Ferrans [25] defined it from four aspects: physical health, life satisfaction, social and economic satisfaction and family factors. Rejeski and Mihalko [26] measured the quality of life of the elderly from two aspects: life satisfaction and physical health. Sandau et al. [27] defined quality of life in five important life areas: physical, emotional, social, cognitive and spiritual. In addition, some scholars believe that the definition of quality of life should include not only subjective factors but also more objective factors. For example, Felce and Perry [28] believed quality of life should include five dimensions: physical health, material health, social welfare, emotional health, development and activity. Sun et al. [29] constructed an index of the quality of life of the elderly based on five aspects: cognitive ability, demographic characteristics, health status, behavioural factors and social psychological factors. Eslami et al. [30] found the realms of material and non-material life are two important determinants of overall quality of life. In addition, some scholars have constructed life quality evaluation systems at the national level, social level and community level [31–33]. Although there is no completely unified standard for measuring quality of life, most studies have constructed indices based on multiple dimensions, such as life, work, income, health and cognition, and carried out their analysis and evaluation on that basis.

For studies researching internal factors, the living environment, working environment and health status are the main factors affecting quality of life. Ng et al. [34] pointed out the living environment is an important predictor of life quality. Gou et al. [35] found that housing was the most important factor affecting the quality of life of low-income people. In terms of the working environment, Liang and Xu [36] found the strongest positive correlation between the working environment and job satisfaction, which has a significant impact on the quality of life of migrant workers. Ahmad et al. [37] found that stress related to the work environment was an important factor affecting quality of life. In addition, most literature agrees that health status is an important factor affecting quality of life [38–40]. Of the external factors investigated, governance capacity, management models and policy interventions all have a certain influence on quality of life. For example, De Guimarães et al. [41] found in the context of smart cities, smart governance factors have a significant positive impact on residents' quality of life. Vogt et al. [42] pointed out

a sustainable community management model can effectively improve residents' quality of life. Gottvall et al. [43] found the implementation of public health interventions and policies helped improve the quality of life of Syrian refugees. In addition, regional security, public administration efficiency, acculturation strategies and climate change also affect people's quality of life to a certain extent [44–47]. As a result, policies that have a direct or indirect impact on people's livelihoods or perceptions are likely to affect their existing quality of life.

The Land is the foundation of farmer households. It is not only the basic material guarantee but also a spiritual support that allows farmer households to settle down [48]. Therefore, land transfer has a significant impact on farmers' income, pension security, land use efficiency and labour productivity. In terms of income and pension security, analysing the influencing factors of farmers' land transfer, Peng et al. [49] found land transfer can improve farmers' income and strengthen their pension security. They also found the income effect has positive feedback on farmers' decisions about land transfer. Bingqian et al. [50] found the per capita net income, per capita wage income and per capita rent income of farmers who participated in the land transfer increased significantly compared with farmers who did not participate in the land transfer. In terms of land use efficiency, Lu et al. [51] pointed out land transfer is an important approach to farmland management and intensive crop production in China and, further, it promotes the development of agriculture through more efficient and sustainable resource use. Hai-xiab [52] believes farmers' land transfer behaviour has obvious positive significance for improving land-use efficiency. Wang et al. [53] found that land transfer had a positive effect on total household labour productivity and non-agricultural labour productivity. Zhang [54] found that land transfer can result in higher land productivity, cost–profit margins and total factor productivity. Land-transfer behaviour is a self-selection process by farmers. They choose to transfer their land, transfer their family labour force, land quality and desire for a better life, in the hope that this choice can improve their current situation [55–57]. The question remains: does land transfer improve the quality of life of these landless farmers?

The review of the above literature suggests that the changes brought to farmers by land transfer are mainly reflected in material and spiritual aspects. For example, in terms of material aspects, the rent brought by land transfer will improve farmers' income, free them from the time spent working the land and indirectly improve their non-agricultural income. In terms of spiritual aspects, the land is of special significance to farmers. To a certain extent, owning land is the biggest guarantee for farmers [58]. For example, groups who voluntarily become "land-lost farmers" face greater risks of unemployment and their social risk perception will become more sensitive [59–62]. Therefore, as shown in Figure 2, land transfer may improve the quality of life of farmers in material aspects while reducing it in spiritual aspects. Their overall quality of life may depend on a trade-off between the two.

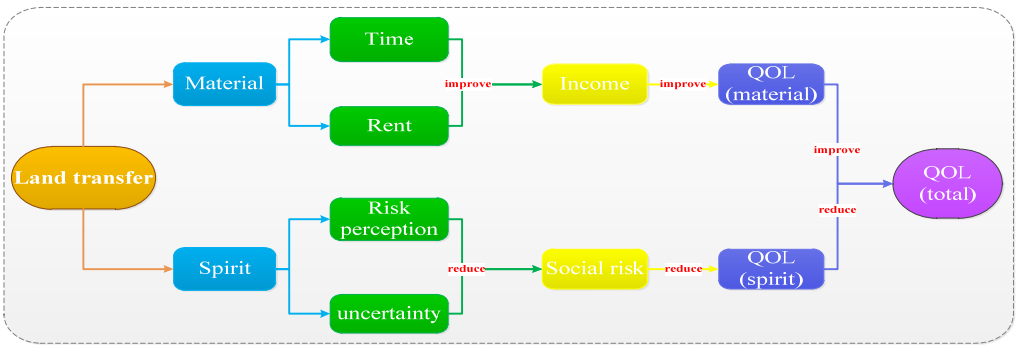

Figure 2. The impact mechanism of land transfer on farmers' quality of life.

3. Data, Variables and Method

3.1. Data

This study used data from the 2018 China Family Panel Studies (CFPS) conducted by The Chinese Center for Social Science Surveys (ISSS) at Peking University. The CFPS has been conducting surveys every second year since 2010. The survey assesses families, adults and children. The CFPS focuses on the economic and non-economic wellbeing of Chinese residents, as well as a wide range of research topics including economic activity, educational outcomes, family relationships and dynamics, population migration and health. The CFPS is a national-level, large-scale, multidisciplinary social tracking survey covering 25 provinces. The target sample size is 16,000 households and the survey subjects include all members of the sampled households. In 2018, the CFPS completed interviews with approximately 15,000 households and collected approximately 44,000 individual questionnaires. According to the needs of this study on FQOL in relation to land transfer, agricultural household registration samples and the financial managers of families were selected. After handling the missing data and any outliers present, 5668 valid cases were finally selected.

3.2. Variables

3.2.1. Dependent Variable

In this study, FQOL was taken as the dependent variable. Quality of life involves many factors; accordingly, existing studies measure it by constructing a composite index system [63–65]. Similarly, the present study divided FQOL into six categories, namely life satisfaction, life happiness, job satisfaction, income status, health status and future confidence. As shown in Table 1, life happiness was scored on an 11-point scale from 0 to 10, while the other categories were scored on five-point scales from 1 to 5. Finally, this study used the entropy weight method (EWM) to calculate farmers' willingness to participate in environmental governance (see Appendix A for details).

Table 1. Evaluation Index System of Farmers' quality of life.

One-Level Indicators	Two-Level Indicators	Three-Level Indicators	Attributes	Weights	Mean
FQOL	Life satisfaction	How satisfied would you rate your life?	+	0.083	3.986
	Life happiness	How happy do you think you are?	+	0.069	7.249
	Job satisfaction	How satisfied are you with this job?	+	0.113	3.619
	Income status	How do you rate your income?	+	0.231	2.967
	Health	How do you consider your health?	+	0.433	2.606
	Confidence in the future	How confident would you rate yourself for the future?	+	0.071	4.137

3.2.2. Key Variable

This study takes land transfer as the core independent variable. Land transfer is the act of transferring land management rights to others under the premise of maintaining the same land ownership. In this study, land transfer is set as a binary variable, indicating whether farmer households have transferred land. To determine this, the survey questionnaire asked, "Has your family leased the land allocated by the group to others in the past 12 months?" Among the existing research samples, 17.94% of farmer households had transferred land.

3.2.3. Control Variables

This study referred to existing literature to determine the control variables to be used [66–68]. The Characteristics of the farm head, Basic guarantee of the farm head, Characteristics of the farm family and Living conditions of the farm were selected as four Family dimensions, and a total of 16 indicators were used as control variables. At the same time, in the original questionnaire, whether the total value of household agricultural machinery exceeds 1000 yuan was taken as an instrumental variable. If the total value of household agricultural machinery exceeded 1000 yuan, the value was assigned as one; otherwise, it was zero. On the one hand, the higher the total value of agricultural machinery, the more dependent households are on the land and the less likely they are to transfer it. On the other hand, household agricultural machinery and equipment are durable goods in the broad sense and the range of changes in their total value may be small, which will not affect the quality of life of farmers in theory. Therefore, the selected instrumental variables meet the correlation conditions with the endogenous variables of this study. The model variables and summary statistics are described in Table 2.

Table 2. The definition and data description of the variables in the model.

Variables	Definition	Mean	S.D.	Maximum	Minimum
	Dependent variable				
FQOL	The score of farmers' quality of life	0.530	0.191	1.000	0.001
	Key variable				
Land transfer	1 if the farmer transferred the land last year, 0 otherwise	0.179	0.384	1	0
	Characteristics of farm head				
Age	The age of farmer head (years)	50.800	13.732	86	20
Gender	1 if farmer head is female, 0 otherwise	0.418	0.493	1	0
Education	1 if farmer has graduated from primary school or below, 2 if farmer graduated from junior middle school, 3 if farmer has a high school degree, 4 if farmer has a college degree, 5 if farmer has a Bachelor's degree, 6 if farmer has a graduate degree	1.640	0.836	5	1
Marriage	1 if farmer is married, 0 otherwise	0.881	0.324	1	0
Political parties	1 if farmer is in the Communist Party, 0 otherwise	0.081	0.272	1	0
	Basic guarantee of farm head				
Pension	1 if farmer has a pension, 0 otherwise	0.774	0.418	1	0
Medical insurance	1 if farmer has medical insurance, 0 otherwise	0.944	0.230	1	0
	Characteristics of farm family				
Size	The number of living together for farm family (num)	3.396	1.690	10	1
Income	The logarithm of farm family income last year (RMB)	10.576	1.094	15.093	5.299
Fixed assets	The logarithm of current house value (RMB)	11.605	1.337	17.504	4.605
Deposit	The logarithm of household deposits (RMB)	6.654	4.574	15.761	0
Car	1 if farm family owns cars, 0 otherwise	0.259	0.438	1	0
Work	1 if farm family is engaged in agricultural production, 0 otherwise	0.744	0.436	1	0
	Living conditions of farm family				
Drinking water source	1 if farm family drinks tap and filtered water, 0 otherwise	0.662	0.473	1	0
Fuel	1 if farm family uses fossil fuels, 0 otherwise	0.601	0.490	1	0
Num-books	Per capita collection of books in a farm family (num)	9.370	42.217	2000	0
	Instrumental variable				
IV	1 if total value of farm machinery in a farm family is greater than 1000, 0 otherwise (RMB)	0.178	0.383	1	0

3.3. Method

3.3.1. Model Setting

According to the stochastic utility decision model proposed by Ali and Abdulai [69] and Becerril and Abdulai [70], whether farmers choose to transfer land depends on the

difference between the utility (U1i) brought by transfer and the utility (U0i) brought by non-transfer. If $A_i^* = U_{1i} - U_{0i} > 0$, then farmers will choose land transfer.

This study defines the decision-making equation for farmers considering land transfer as:

$$A_i^* = \Phi(Z_i) + \mu_i, \text{ if} A_i^* > 0, \text{ then } A_i = 1; \text{ otherwise } A_i = 0 \quad (1)$$

In Formula (1), A_i^* is the latent variable, $A_i = 1$ indicates that farmer i chooses land transfer, $A_i = 0$ indicates that farmer i does not choose land transfer and Z_i is the vector of exogenous explanatory variables, including individual variables, basic security variables, family variables and living condition variables that affect interviewees. The specific variables are shown in Table 2. μ_i is a random perturbation term.

In order to measure the impact of land transfer on FQOL, an FQOL model was constructed as follows:

$$Y_i = X_i\beta_i + \delta A_i + \varepsilon_i \quad (2)$$

In Formula (2), the dependent variable Y_i is farmers' quality of life; X_i is the control variable vector; A_i represents the land transfer variable of farmer i and ε_i is a random perturbation term. Because farmers choose whether to transfer land according to their conditions, the transfer selection decision (A_i) can be affected by some unobservable factors and these factors can be related to the result variable (Y_i), leading to a correlation between A_i and ε_i in Formula (2). Therefore, direct estimation by Equation (2) may lead to estimation bias due to sample self-selection problems. Referring to the studies of Ma and Abdulai [71] and Deng et al. [72] and Deng et al. [73], this paper selected an endogenous switching regression (ESR) model to solve the sample self-selection problem.

The corresponding quality of life models of farmers who did and did not choose to transfer land are as follows:

$$Y_{ia} = X_{ia}\beta_a + \sigma_{\mu a}\lambda_{ia} + \varepsilon_{ia}, \ if \ A_i = 1 \quad (3a)$$

$$Y_{in} = X_{in}\beta_n + \sigma_{\mu n}\lambda_{in} + \varepsilon_{in}, \ if \ A_i = 0 \quad (3b)$$

In Equation (3a,b), Y_{ia} and Y_{in} represent the FQOL for farmers who chose land transfer and those who did not, respectively. X_{ia} and Y_{in} represent the factors influencing the FQOL of the two types of farmers, as shown in Table 1. Both ε_{ia} and ε_{in} represent random perturbation terms. To address the problem of sample selection bias caused by unobservable factors, the inverse Mills ratios, λ_{ia} and λ_{in}, and the covariances, $\sigma_{\mu a} = \text{cov}(\mu_i, \varepsilon_{ia})$ and $\sigma_{\mu n} = \text{cov}(\mu_i, \varepsilon_{in})$, were introduced. Further, the complete information maximum likelihood method was used to simultaneously estimate Equations (1) and (3a,b).

3.3.2. Treatment Effect Estimation Method

By comparing the quality-of-life expectations of farmers who chose land transfer and those who did not in real and counterfactual scenarios, the average processing effect of farmers choosing land transfer was estimated.

The expected FQOL of farmers who chose land transfer is:

$$E[Y_{ia}|A_i = 1] = X_{ia}\beta_a + \sigma_{\mu a}\lambda_{ia} \quad (4)$$

The FQOL expectation of selected land transfer is:

$$E[Y_{in}|A_i = 0] = X_{in}\beta_n + \sigma_{\mu n}\lambda_{in} \quad (5)$$

At the same time, we consider two counterfactual hypothesis scenarios, namely, the expected FQOL of farmers who chose to transfer their land without using it:

$$E[Y_{in}|A_i = 1] = X_{ia}\beta_n + \sigma_{\mu n}\lambda_{ia} \quad (6)$$

The expected FQOL of farmers who chose not to transfer their land under the situation of land transfer is:

$$E[Y_{ia}|A_i = 0] = X_{in}\beta_a + \sigma_{\mu a}\lambda_{in} \quad (7)$$

According to Equations (4) and (6), the treatment effect on FQOL of farmers who chose land transfer can be obtained as follows:

$$ATT_i = E[Y_{ia}|A_i = 1] - E[Y_{ia}|A_i = 1] = X_{ia}(\beta_\alpha - \beta_n) + (\sigma_{\mu a} - \sigma_{\mu n})\lambda_{ia} \quad (8)$$

Similarly, the FQOL treatment effect of land not transferred out is as follows:

$$ATU_i = E[Y_{ia}|A_i = 0] - E[Y_{in}|A_i = 0] = X_{in}(\beta_\alpha - \beta_n) + (\sigma_{\mu a} - \sigma_{\mu n})\lambda_{in} \quad (9)$$

The average values of ATT_i and ATU_i were used to evaluate the average treatment effect on the quality of life of the two types of farmers who chose to transfer their land.

4. Results

4.1. Mean Differences

Mean differences are helpful in analysing the difference between farmers who chose land transfer and those who did not. The mean difference test results are shown in Table 3. Except for the variables Age, Political parties, Pension and Medical insurance, all other variables passed the significance test at the 1% level, indicating there were significant differences between farmers who chose land transfer and those who did not. Among them, the mean difference in FQOL was 0.022, which passes the significance test at the 1% level, indicating that the quality of life of farmers who chose to transfer land is lower than that of farmers who did not. Although Table 3 intuitively reflects the significant differences in the mean values of some variables when considering whether farmers chose to transfer land or not, it does not indicate whether these differences were caused by the transfer of land. In order to accurately demonstrate the quality of life of farmers who transferred land, the selective bias caused by "self-selection" of samples must be fully considered; therefore, this study adopted a more scientific ESR model to conduct the empirical research.

Table 3. Mean differences in variables between.

Variables	Not Transfering Land		Transfering Land		Diff.	
FQOL	0.534	(0.192)	0.512	(0.185)	0.022	***
Age	50.691	(12.610)	51.296	(13.267)	−0.605	
Gender	0.410	(0.492)	0.454	(0.498)	−0.044	***
Education	1.619	(0.826)	1.735	(0.874)	−0.115	***
Marriage	0.889	(0.314)	0.844	(0.363)	0.045	***
Political parties	0.079	(0.270)	0.088	(0.284)	−0.010	
Pension	0.774	(0.418)	0.775	(0.418)	−0.001	
Medical insurance	0.946	(0.226)	0.935	(0.246)	0.011	
Size	3.447	(1.700)	3.161	(1.628)	0.286	***
Income	10.544	(1.097)	10.720	(1.069)	−0.176	***
Fixed assets	11.535	(1.327)	11.923	(1.342)	−0.388	***
Deposit	6.570	(4.564)	7.033	(4.603)	−0.463	***
Car	0.249	(0.432)	0.308	(0.462)	−0.059	***
Work	0.808	(0.394)	0.450	(0.498)	0.358	***
Drinking water source	0.644	(0.479)	0.745	(0.436)	−0.102	***
Fuel	0.569	(0.495)	0.747	(0.435)	−0.178	***
Num-books	8.566	(29.848)	13.046	(76.466)	−4.481	***
IV	0.199	(0.399)	0.082	(0.274)	0.117	***
Observation	4651		1017			

Note: Standard deviations are in parentheses; *** $p < 0.01$.

4.2. Determinants of FQOL and Land Transfer

Table 4 reports the simultaneous estimation results of the models of farmer land transfer choice and FQOL. The two-stage equation independence Wald test significantly rejected the null hypothesis, that the choice equation and outcome equation are independent of each other at the 1% level. The Wald test of the goodness-of-fit of the simulation was significant at the 1% level. The correlation coefficient of of the error term was significantly negative at the level of 1%, indicating the FQOL of farmers who did not choose to transfer land was lower than of ordinary farmers; that is, there is a selective bias in the FQOL model.

Table 4. the estimates for determinants of land transfer and FQOL.

Variables	Selection			FQOL					
				Transfering Land			Not Transfering Land		
Age	0.015	(1.37)		−0.009	(−2.70)	***	−0.008	(−4.36)	***
Age^2	−0.001	(−0.45)		0.001	(2.96)	***	0.001	(3.47)	***
Gender	0.099	(2.30)	**	−0.013	(−0.64)		−0.035	(−5.44)	***
Education	0.031	(1.07)		−0.020	(−2.26)	**	−0.016	(−3.69)	***
Marriage	−0.095	(−1.48)		0.029	(1.32)		0.039	(3.60)	***
Political parties	0.070	(1.00)		0.033	(1.37)		0.012	(1.12)	
Pension	0.099	(1.88)	*	0.008	(0.35)		−0.013	(−1.52)	
Medical insurance	−0.064	(−0.72)		−0.047	(−1.57)		−0.014	(−0.94)	
Size	−0.017	(−1.26)		−0.005	(−1.26)		0.002	(1.03)	
Income	0.037	(1.48)		0.021	(2.04)	**	0.006	(1.65)	*
Fixed assets	0.043	(2.36)	**	−0.003	(−0.33)		0.002	(0.63)	
Deposit	0.006	(1.35)		0.002	(1.03)		0.003	(3.49)	***
Car	0.065	(1.33)		0.026	(1.52)		−0.001	(−0.03)	
Work	−0.828	(−15.24)	***	0.022	(0.16)		0.095	(6.85)	***
Drinking water source	0.075	(1.63)		0.033	(1.86)	*	0.007	(1.00)	
Fuel	0.189	(3.96)	***	0.019	(0.54)		−0.007	(−0.91)	
Num-books	0.001	(1.17)		0.001	(1.14)		−0.001	(−2.30)	**
IV	−0.191	(−2.85)	***	–	–	–	–	–	–
Province dummies		YES			YES			YES	
Constant	−1.993	(−4.89)	***	0.631	(1.28)		0.537	(8.71)	***
σ_n				−1.726	(−7.99)	***			
ρ_n				−0.106	(−0.09)				
σ_u				−1.519	(−23.85)	***			
ρ_u				−1.396	(−3.96)	***			
Wald-chi2(39)					93.91 ***				
Wald test of indep.eqns.					15.67 ***				
Log likelihood					−758.880				
Observations					5668				

Note: T-values are in parentheses; * $p < 0.10$, ** $p < 0.50$, *** $p < 0.01$.

The Selection column in Table 4 represents the determinants of household land transfer estimated based on the ESR model. The significant variables promoting farmers' land transfer were Gender ($p < 0.1$), Pension ($p < 0.1$), Fixed assets ($p < 0.05$) and Fuel ($p < 0.01$). Compared with men, women have a better ability to accept new things and a stronger risk preference, so the probability of women choosing land transfer is higher. Farmers with endowment insurance have basic living security and are more willing to transfer their land out. The higher the property value and household fossil-fuel energy use, the better the household condition and the easier the transfer of land. The coefficient of the variable Work was significantly negative ($p < 0.01$), indicating that households engaged in agricultural production have a low probability of moving off their land. In addition, the coefficient of the instrumental variables was significantly negative ($p < 0.01$), meaning the higher the total value of household farm machinery, the less land will be transferred out.

The Transferring Land column in Table 4 represents the FQOL determinants affecting land transfer estimated based on the ESR model. The variables Age2 ($p < 0.01$), Income

($p < 0.05$) and Drinking water source (at the 10% level) significantly increased FQOL. The variables Age ($p < 0.01$) and Education ($p < 0.05$) significantly reduced FQOL. The Not Transferring Land column in Table 4 represents the FQOL determinants of choosing not to transfer land based on the ESR model. The variables Age2 ($p < 0.01$), Marriage ($p < 0.01$), Income ($p < 0.01$), Deposit ($p < 0.01$) and Work ($p < 0.01$) significantly improved FQOL. The variables Age ($p < 0.01$), Gender ($p < 0.01$), Education ($p < 0.01$) and Num-books ($p < 0.05$) significantly reduced FQOL. By comparing the results in the Transferring land and Not transferring land columns, it was found that women's quality of life is lower than men's in families where land is not transferred out, which may be because most men in rural areas work outside while women work at home. Having land is more restrictive for women than men and this is consistent with the conclusion that women are more willing to transfer land. Marriage, farming and household savings significantly improve FQOL. The more books a family collects per capita, the lower the FQOL, which may be due to the impact of land constraints, so that farmers are in a contradiction between "looking up at the stars" and "facing the loess". At the same time, using clean water significantly improved the FQOL of farmers whose land was transferred compared to those whose land was not transferred. In addition, the estimates of some variables are interesting. For example, the coefficient of Age in the columns of Transferring land and Not transferring land is significantly negative (at the level of 1%), and the coefficient of Age2 is significantly positive (at the level of 1%), which means that Age and FQOL have a positive "U"-type relationship. Finally, the estimation results in Table 4 cannot directly quantify the impact of land transfer on FQOL. It is necessary to construct a further counterfactual framework to evaluate the quantitative impact of land transfer on FQOL.

4.3. Estimating the ATT and ATU of FQOL

Table 5 reports the estimated results of the impact of land transfer on FQOL by constructing a counterfactual framework based on the ESR model. First, Factual FQOL is the FQOL predicted by the ESR model for farmers opting for land transfer (i.e., Factual FQOL, value 0.512) and Counterfactual FQOL is the FQOL of farmers who chose land transfer based on ESR prediction if they did not choose land transfer (i.e., the FQOL in the Counterfactual case, value 0.194). Second, Factual FQOL is the FQOL predicted by the ESR model for farmers who did not choose to transfer land (i.e., Factual FQOL, value 0.534) and Counterfactual FQOL is the FQOL predicted by the ESR model for farmers who did not choose land transfer (i.e., FQOL in the Counterfactual case, value 0.538). The value of ATT is 0.318, and its T-value is 137.109 which is significant at the 1% level, meaning that if farmers who choose to transfer land do not do so, their FQOL may decrease by 64.11%. The value of ATU is 0.004 and its T-value is 3.883, which is significant at the 1% level, meaning that if farmers who do not choose land transfer choose land transfer, their FQOL may increase by 0.75%. To sum up, land transfer significantly improves the quality of life of farmers.

Table 5. the impacts of land transfer on FQOL.

Groups	Factual FQOL	Counterfactual FQOL	ATT/ATU	T-Value	Change (%)
Transfering land	0.512 (0.002)	0.194 (0.002)	0.318 (0.002)	137.109 ***	62.109
Not transfering land	0.534 (0.001)	0.538 (0.001)	0.004 (0.001)	3.883 ***	−0.749

Note: Standard deviations are in parentheses; *** $p < 0.01$.

4.4. Age Heterogeneity

In this part, the samples were broken down according to age. Farmers were divided into groups born before 1978 and after 1978, as 1978 was when the household contract responsibility system started. The household contract responsibility system is a form of agricultural production responsibility system in which farmer households contract land and other means of production and tasks to collective economic organisations (mainly villages

and groups) with the family as the unit. The year 1978 was also when China's reform and development began. Farmers born after 1978 may have some significant differences in their feelings, cognition and experience of land to those born before 1978. For example, Deng, Xu, Zeng and Qi [11] pointed out that groups who experienced famine in their early years were less likely to transfer land out and, on the contrary, reduced the probability of land transfer. Therefore, this part focuses on the difference in the impact of land transfer on the quality of life of these two groups at different times. The specific empirical results are shown in Table 6.

Table 6. the heterogeneity of land transfer on FQOL.

Born after/before 1978	Factual FQOL	Counterfactual FQOL	ATT/ATU	T-Value	Change (%)
Transferring land	0.539 (0.006)	0.617 (0.004)	−0.078 (0.007)	−10.728 ***	14.471
Not transferring land	0.551 (0.002)	0.300 (0.003)	−0.251 (0.003)	−72.897 ***	−45.554
Transferring land	0.504 (0.002)	0.185 (0.002)	0.319 (0.003)	119.737 ***	63.294
Not transferring land	0.530 (0.001)	0.545 (0.001)	0.015 (0.001)	12.467 ***	−2.830

Note: Standard deviations are in parentheses; *** $p < 0.01$.

Table 6 reports the impacts of land transfer on the FQOLs of farmers born after and before 1978. For farmers born after 1978, the ATT value is −0.078 and its T-value is −10.728, which is significant at the 1% level, meaning that if farmers who choose to transfer land do not choose to transfer land, FQOL may increase by 14.471%. The ATU value is −0.251 and its T-value is −72.897, which is significant at the 1% level, which means that if farmers who do not choose land transfer choose land transfer, their FQOL may decrease by 45.55%. For farmers born before 1978, the ATT value is 0.319 and its T-value is 119.737, which is significant at the 1% level, which means that if farmers who choose to transfer land do not choose to transfer land, their FQOL may decrease by 63.29%. The ATU value is 0.015 and its T-value is 12.467, which is significant at the 1% level, which means that if farmers who do not choose land transfer choose land transfer, their FQOL may increase by 2.83%. By comparison, it was found that for farmers born after 1978, land transfer reduced their quality of life. For farmers born before 1978, land transfer improved their quality of life. According to the impact mechanism of land transfer on quality of life shown in Figure 2, the reason for this difference may be that farmers born before 1978 have lower risk perception and uncertainty than those born after 1978. In addition, due to their older age, their overall income level is generally lower than farmers born after 1978 and the rental income brought by land transfer has a strong marginal effect on improving their quality of life.

5. Discussion

This study used a comprehensive rural social survey data covering 25 provinces in mainland China to study the impact of land transfer on the quality of life of farmers. Compared with previous studies, the marginal contributions of this study are as follows: (1) this study mainly focuses on FQOL and discusses the theoretical mechanism of land transfer on FQOL; (2) this study uses an ESR model to correct the selection bias caused by observable and unobservable factors and evaluates the quantitative impact of land transfer on the quality of life of farmers; (3) this study compares and evaluates the quantitative impact of land transfer on FQOL in two different eras, finding that for farmers born after 1978, land transfer reduces their quality of life, while for farmers born before 1978, land transfer improves their quality of life. The results of this study will help provide research support for the effective implementation of land policies in China and other countries, as well as providing realistic strategies for the sustainable development of rural areas.

On the whole, land transfer can indeed improve FQOL; however, the mechanism of its impact cannot be ignored. Although the income and time increases brought by land transfer are important ways to improve FQOL, the invisible psychological effects brought about by the transfer of land management rights cannot be ignored. For example, land-lost farmers will face higher unemployment risks and uncertainties, including greater

social risks [62,74,75]. This research also provides new evidence for this view. In recent years, the Chinese government has issued many policies supporting land transfer to ensure that farmers enjoy the benefits they deserve after land transfer. However, once their land is transferred, farmers will lose their land management rights for a long time. The risks and consequences of land transfer cannot be ignored. For example, Heng-zhou [76] and Yu et al. [77] pointed out that land transfer poses certain threats to food security, rural ecological environment and rural characteristics. Liu et al. [78] pointed out that the phenomenon of land transfer harms the interests of farmers and has strengthened the social security function of land. In addition, the impact of climate change on agriculture and rural areas is complex and changeable, adding some unknown risks to land transfer [79,80]. Of course, the implementation of any policy is bound to be accompanied by risks and the most important thing is whether they are controllable. This study found that land transfer significantly improved FQOL, but for farmers born after 1978, this conclusion is exactly the opposite. The reason may be that the invisible psychological effects brought about by land transfer are greater than the welfare effects brought about by income and time which, in turn, lead to a decline in FQOL. For farmers born before 1978, the invisible psychological effects brought about by land transfer are smaller than the welfare effects brought about by income and time increases which, in turn, lead to an increase in FQOL. Two main reasons explain this outcome. First, the income of farmers through farming gradually decreases with age and the rent obtained from land transfer can bring higher income to the rural elderly, which can significantly improve their sense of security [81,82]. Second, land transfer can liberate the rural elderly from the shackles of traditional farming methods [83,84] without needing to find a new livelihood like young farmers, which reduces the social risk perception and uncertainty caused by land transfer. In general, there are differences between the social risks and uncertainties faced by the elderly and the young in rural areas after land transfer, which is the main reason the invisible psychological effects in the elderly brought by land transfer in rural areas are fewer than the welfare effects of increased income and time. In short, land transfer may not only deprive farmers of the opportunity to increase their income from the land but may also affect the professional transformation and long-term security of land-lost farmers. This provides a reference for the governments of China and other countries to implement land policies and improve the quality of life of farmers.

Land transfer promotes the processes of non-agriculturalisation and citizenisation of the rural population, creates good spatial support and human resources for urbanisation, and provides momentum for sustainable urbanisation. Land transfer is also a development trend in China's agricultural modernisation process, which will inevitably affect the livelihood capital and livelihood strategies of farmers. Formulating and solving the livelihood security issues of farmers is an urgent issue [85]. Particularly in an environment that does not provide safety guarantees for these land-lost farmers, speeding up land circulation can increase labour productivity. However, these farmers may not find a way out of their livelihood, which will bring about consequences and is risky. Although this study verified that land transfer improves FQOL, for farmers born after 1978 the transfer of land reduces their quality of life. This research explored the relationship between land transfer and FQOL and is a supplement to the existing research on FQOL. Most current studies focus on the impact of land transfer on farmers' income, satisfaction, happiness and other singular aspects. This research comprehensively studied the impact of land transfer on FQOL by constructing composite indicators. Therefore, this study is helpful as it provides a reference basis for relevant government departments to formulate land policies and measures with the goal of improving FQOL.

Of course, this study also has some shortcomings that could be resolved by further research. Although this article provides empirical evidence from rural areas of China that informs the study of the relationship between land transfer and FQOL, whether this relationship is applicable to other countries or regions remains to be discussed. At the same time, in the future, more extensive research can be carried out on other factors of

land transfer such as land quality, area and rent. Although this study is limited by the data obtained and did not explore this further, it is reasonable to expect that more interesting conclusions will be discovered and they will also have richer practical guiding significance.

6. Conclusions and Implications

This study used data from a large survey of rural Chinese residents to quantify the impact of land transfer on FQOL. This study found that after correcting for sample selection bias, land transfer significantly improves FQOL, as follows:

(1) For farmers who choose to transfer land out, if they choose not to transfer land out, FQOL may drop by 64.11%.
(2) For farmers who choose not to transfer their land, if they choose to transfer their land, FQOL may increase by 0.75%.
(3) For farmers born after 1978, if they choose not to transfer their land, their FQOL may increase by 14.471%; otherwise, FQOL may decrease by 45.55%.
(4) For farmers born before 1978, if they choose not to transfer their land, their FQOL may drop by 63.29%; otherwise, FQOL may increase by 2.83%.

The above research results also have some policy implications. Although, on the whole, land transfer improved the quality of life of farmers, the risks and challenges they face cannot be ignored. This requires government departments to implement land policies with precision and formulate comprehensive and systematic supporting policies. For example, building a unified social security system that integrates urban and rural areas and includes employment security, housing security, medical security and old-age security would further accelerate the citizenisation process of "land-lost farmers" and improve the quality of citizenisation. More importantly, it is necessary to improve relevant land transfer policies and measures to protect farmers' legitimate rights and interests.

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Appendix A

The entropy weight method (EWM) is to weigh the index by judging the degree of dispersion of the index, and what it measures is a type of uncertainty. The larger the entropy value, the larger the amount of information it contains, and the smaller the uncertainty, the smaller amount of information. EWM includes the following steps:

(1) The indicators of Life satisfaction, Life happiness, Job satisfaction, Income status, Health and Confidence in the future were standardised to achieve data homogenisation and eliminate the influence of dimensions and levels of data on the evaluation results. All variables are positive. The specific formula steps are as follows:

$$\text{Positive indicators}: {z'}_{ij} = \frac{z_{ij} - \min\{z_{1j}, \ldots, z_{nj}\}}{\max\{z_{1j}, \ldots, z_{nj}\} - \min\{z_{1j}, \ldots z_{nj}\}}$$

i = sample, j = relevant indicators, the standardised calculation method of each indicator is as follows:

$$\text{The standardised value of the } j \text{ index} = \frac{Z_j - Z_{\min(0)}}{Z_{\max(0)} - Z_{\min(0)}}$$

(2) Calculate the proportion of the j-th sample value under the i-th index in the index:

$$p_{ij} = \frac{z_{ij}}{\sum_{i=1}^{n} x_{ij}}, i = 1, \ldots, n, j = 1, 2, 3, \ldots m$$

(3) Calculate the entropy value of the j-th index:

$$e_j = -k \sum_{i=1}^{n} p_{ij} \ln(p_{ij}), j = 1, \ldots, m, \text{among them}, k > 0,$$
$$k = 1/\ln(n), e_j \geq 0$$

(4) Calculate information entropy redundancy (difference):

$$d_j = 1 - e_j, j = 1, \ldots, m$$

(5) Calculate the weight of each indicator:

$$w_j = \frac{d_j}{\sum_{i=1}^{m} d_j}, \; j = 1, \ldots, m$$

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