 doi:10.20944/preprints202208.0456.v1

Article

The Impact of Rural Land Right on Farmers' Income in Under-developed Areas: Evidence from Micro-survey Data in Yunnan Province, China

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Abstract: Based on data from the Yunnan Province farm household survey, we examine the effect of rural land rights policy on farmers' income. The regression results show that right significantly raises the total income of farmers, with farm income serving as the primary source of total income. After performing numerous robustness tests, using instrumental variables to handle endogeneity and arriving at the same conclusion, the result is still valid. According to the heterogeneity analysis, in the sample of households with long-term migrant workers, the confirmation of rural land rights significantly increases total and nonfarm income while decreasing farm income. Furthermore, total income includes nonfarm income, which reflects the effect of different farmers' optimal labor allocation based on the external market environment. According to the impact mechanism analysis, right can increase farmers' total income by promoting land transfer, and farmers in less developed areas are more willing to increase their income by land transfer out.

Keywords: Rural land right; farmers' income; farm income; non-farm income; land transfer

1. Introduction

As industrialization and urbanization speed up, a large number of rural people quit agricultural output in favor of non-agricultural production. The overall number of migrant workers in China will reach 290 million by 2021, according to the National Bureau of Statistics' study on migrant worker detection. The continued expansion in non-agricultural work force has hampered further advances in agricultural output. The degree of land fragmentation and decentralized land management has delayed agricultural productivity development in China, and farmers' income and welfare have not increased. To ensure the long-term preservation of rural land management rights, the definition of farmers' land property rights must be explicit, consistent, and institutionalized. In 2009, China launched a fresh round of confirmation and registration of rural land contractual management rights. Around 2012, all provinces and towns in the nation began to confirm land rights, and the process was mostly completed in 2019. Land is the fundamental method of production for farmers and the cornerstone of their livelihood. The system of land property rights is the fundamental economic system of rural economic operation. Its restrictive circumstances may have an impact on the distribution of land resources and associated factors, altering farmers' income levels.

Farmers' economic engagement is today broad, as indicated by the diversity of their labor structure. Thus, farmers' income is influenced not only by their own factors, but also by rural institutional innovation and policy reform. Scholars look at the link between rural land rights and farmer income from the following angles. First, land rights promote agricultural labor reallocation. When agricultural returns are high, rural land right expands

 doi:10.20944/preprints202208.0456.v1

farm labor inputs; when the non-agricultural sector is more efficient, rural land right expands nonfarm income[2],[10]. Second, rural land right lowers land transaction costs and stimulates land transfer. Farmers with various transfer behaviors may choose to engage in appropriate activities as a result of the unrestricted land transfer market, greatly raising their income level[2],[4],[9]. Third, by reducing financial restraints and therefore raising agricultural labor income, rural land rights might stimulate agricultural investment or entrepreneurship[1],[3],[7],[11]. In addition, some researchers discovered no significant effect of rural land right on increasing farmers' income[5]-[7],[13] .Do and Iyer (2008)[9] found that the confirmation of rural land right increased the non-agricultural employment time of farmers, but did not increase the income of farmers when studying the implementation of rural land rights confirmation policy in Vietnam in 1993. Zhang et al. (2020) [14] found that rural land right has no significant impact on the income of planting industry, but it has significantly increased the operating income of farmers.

However, existing research has not reached a clear conclusion on whether confirming rural land rights helps farmers enhance their income. Moreover, few studies on the impact of land ownership confirmation on farmer income in less developed economic areas have been done. Yunnan Province lies in China's southwest. It is located in the region known as the "hub of three Asia," which comprises East Asia, Southeast Asia, and South Asia. It is an important part of the Yangtze River economic belt and the national pilot free trade zone. The overall land area of the province is 394100 square kilometers, representing for 4.1% of China's total area, with 94% being mountainous and semi-mountainous terrain and 6% being flat dams and river valleys. In 2021, the province's resident population will be 46.9 million, with 23 million farmers, and land rights registration for 5.53 million mu will be finished. Land transfer farmers account for almost 2 million households, or 20% of farming households in the province. The area of family contracted arable land has grown to more than 12 million mu, and the proportion of transferred area to the province's arable land has reached around 16%, boosting the intrinsic vigor of the basic rural management system and driving farmer income growth. We will use Yunnan Province, a less developed economic region, as an example to assess the contribution of rural land rights confirmation policy implementation to rural development through the lens of the relationship between rural land rights confirmation and farmers' income as measured by micro-survey data.

The rest of this paper is organized as follows: Section 2 introduces the research data, variable selection, and benchmark model; and further carries out stability test, heterogeneity and mechanism analysis to discuss the research results; Section 4 summarizes the conclusions.

2. Materials and Methods

2.1. Data sounces

The research data comes from a questionnaire survey of farming households in more than 100 counties and districts in 16 cities and towns in Yunnan Province conducted by the research group of Yunnan University of Finance and Economics in January 2021. The questionnaire used stratified sampling to select villages and towns at the upper, middle, and lower levels as sample areas, essentially covering the entire province and collecting a sample of 3032 households with reliable data quality. Yunnan Province issued opinions on the work of confirmation, registration, and certification of rural land contractual management rights on July 30, 2014, and launched the pilot work of confirmation and registration in 19 counties and districts. We chose questionnaires from farmers whose rights have been confirmed since August 1, 2014, for a total of 2478 valid questionnaires. The questionnaire primarily consists of the respondents' basic information, the confirmation and registration of agricultural land, the transfer of agricultural land, and the farmers' household income.

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Table 1. Rural land right of investigation samples.

Region	Number of samples	Number of land rights	Percentage (%)
Yunnan	2478	1933	78.01
Kunming	197	156	73.60
Qujing	420	340	71.90
Yuxi	146	122	77.40
Zhaotong	327	275	79.51
Baoshan	233	217	90.99
Lijiang	60	52	81.67
Pu'er	116	100	81.90
Lincang	108	87	78.70
Dehong	54	39	62.96
Nujiang	33	26	78.79
Diqing	16	12	68.75
Dali	259	225	83.40
Chuxiong	133	109	75.19
Hani-Yi	157	116	70.70
Wenshan	186	162	80.11
Xishuangbanna	35	30	71.43

Yunnan Province is an economically underdeveloped region in the west where land contracting rights are generally divided into households through land titling and titling, and the boundaries and sizes of the land are clarified before obtaining land titling certificates. As shown in Table 1, the percentage of surveyed farmers who received a certificate of land titling is 78.81%, which is relatively high in general. The percentage of farmers who completed land rights is highest in Baoshan at 90.99% and lowest in Diqing at 68.75%. There are regional variations in land right. On the one hand, Yunnan Province confirmed three rounds of rural land rights in 2014, 2015, and 2018, and the time for each state and city to confirm rights is inconsistent. However, propaganda and the implementation of the power confirmation policy are insufficient. According to the farmer survey, some of the farmers who have not received the confirmation certificate have already begun the confirmation work, while others have completed the land measurement work but have not received the confirmation certificate.

Table 2. Distribution of farmers' income.

Indicators	Revenue interval (RMB)	Confirmation sample (%)	Unconfirmed sample (%)	Total sample (%)
Total income	10000-200000	20.11	22.94	21.11
	20000-40000	21.59	25.32	21.63
	40000-60000	21.42	20.00	21.51
	60000-80000	18.52	17.06	18.20
	80000-100000	13.09	9.36	12.27
	More than 100000	5.28	5.32	5.29
Farm income	Less than 10000	49.51	56.33	51.01
	10000-200000	26.33	24.40	25.91
	20000-40000	14.74	11.93	14.12

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	40000-60000	6.41	4.04	5.89
	60000-80000	2.02	2.12	2.20
	80000-100000	0.98	1.28	1.05
Non-farm income	Less than 10000	17.28	15.60	16.91
	10000-200000	17.18	19.63	17.72
	20000-40000	27.52	30.28	28.13
	40000-60000	19.30	18.35	19.09
	60000-80000	10.29	9.36	10.09
	80000-100000	6.00	4.59	5.69
	More than 100000	2.43	2.20	2.38

As shown in Table 2, the total income of farm households is primarily concentrated in the range of 20000-40000, accounting for 21.63% of total income, followed by the range of 40000-60000. In terms of classification, the proportion of farmer income in the range of 20000-40000 is 3.73 percentage points higher in the non-confirmed sample than in the confirmed sample. With 51.01%, farm households' farm income was primarily concentrated below 10000, and the proportion of farm households with farm income below 10000 in the non-confirmed sample was 6.82 percentage points higher than in the confirmed sample. The proportion of farm income between 10,000 and 20,000 was 1.93 percentage points higher in the confirmed sample than in the non-confirmed sample, and the proportion of farm income between 20000 and 40000 was 2.81 percentage points higher in the confirmed sample than in the non-confirmed sample. Non-farm income of farm households can be seen to be distributed in four intervals, with the highest proportion of 28.13% in the 20000-40000 interval. The proportion of people in the 20000-40000 range is highest in both the confirmed and unconfirmed samples, with the unconfirmed sample being 2.76 percentage points higher.

2.2. Model setting and variable selection

To analyze the impact of land right on farmers' income, we constructed the following benchmark model.

$$\mathrm{income}_i = \alpha_0 + \alpha_1 \mathrm{right}_i + \alpha_i \mathrm{control}_i + \varepsilon_i$$

Where income_i represents the income level of farmers, including total income, farm income and non-farm income. right_i represents the status of land right, if the confirmation certificate has been obtained, then $\mathrm{right}_i = 1$, otherwise $\mathrm{right}_i = 0$. $\mathrm{control}_i$ represents a set of control variables that may have an impact on farmers' income level, including household head characteristics variables (gender, age, education level, health level), household variables (family size, number of laborers, average education level), and land right variables (knowledge of land right policy, contracted land ownership, satisfaction with land right policy). α_0 is constant, α_1 is the parameter to be estimated, α_i represents the coefficient of the control variable parameter, and ε_i is the random disturbance term. For a more intuitive understanding of the indicators that have an impact on the farmers' income level, the statistical descriptions of all indicators are summarized in Table 3.

Table 3. Descriptive statistics of relevant variables

Variable Name	Definition	Mean	Standard deviation

 doi:10.20944/preprints202208.0456.v1

Total income	10000-20000=2; 20000-40000=3; 40000-60000=4; 60000-80000=5; 80000-100000 =6； More than 100000=7	3.939	1.490
Farm income	Less than 10000=1；10000-20000=2; 20000-40000=3; 40000-60000=4; 60000-80000=5; 80000-100000 =6	1.851	1.102
Nonfarm income	Less than 10000=1；10000-20000=2; 20000-40000=3; 40000-60000=4; 60000-80000=5; 80000-100000 =6; More than 100000=7	3.143	1.524
Rural land right	Confirmed rights=1，Unconfirmed rights=0	0.780	0.414
Gender	Male=1，Female=2	1.131	0.337
Age	Age of the respondent	1.642	0.740
Education	Primary school and below = 1; Junior high school = 2; High school and technical secondary school = 3; Junior college or above = 4	48.301	6.078
Health	Good health = 1; Average body = 2; Poor health= 3	1.486	0.580
Family size	Family total population	3.68	0.849
Labor force	Number of household labor force	2.523	0.781
Student	Number of family student	1.008	0.9
Average education	Average education level of family members	2.165	0.607
Understanding of power confirmation policy	Completely unknown = 1; General knowledge = 2; Very well understood = 3	1.897	0.489
Ownership of contracted land	Self = 1; Collective = 2; Country = 3	2.513	0.77
Satisfaction with rights confirmation policy	Dissatisfied = 1; Generally satisfied = 2; Very satisfied = 3	2.407	0.538

3. Results and Discussion

This section first discusses the effects of rural land rights on farmers' income levels, then moves on to stability tests, endogeneity tests, and heterogeneity analyses, before delving into the mechanisms underlying the effects of willingness and behavior of land transfer on farmers' income.

3.1. Rural land right and farmers' income

We used OLS to run preliminary regressions on the equations, and the estimation results are shown in Table 4. After controlling for basic household head characteristics and basic household information factors, the total income and farm income of confirmed farmers were 14.2 and 11.2 percentage points higher, respectively, than those of non-rights-confirmed farmers, both of which were significant at the 5% confidence level. After controlling for regional heterogeneity, farmers' total income and farm income of confirmed farmers are 18.4 and 10.8 percentage points higher than unconfirmed farmers', respectively, which is significant at the 5% confidence level. Columns (5) and (6) show that land right has no significant effect on non-farm income, implying that non-farm income is determined by their own characteristics rather than by land right. As can be seen, land right in less developed areas has a significant positive impact on total income, with farm income accounting for the majority of the growth. Furthermore, other factors influencing farmer income levels are in line with expectations. Higher income for the head of the household with better health and education. Increased family labor force participation has

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a significant positive effect on farmer income. The greater the farmers' understanding of the policy of rights confirmation, the greater their income.

Table 4. Benchmark regression of rural land right and farmers' income

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Income	Income	Farm	Farm	Nonfarm	Nonfarm
Right	0.142**	0.184***	0.112**	0.108**	0.047	0.102
	(0.069)	(0.071)	(0.054)	(0.055)	(0.071)	(0.072)
Gender	-0.008	-0.017	-0.015	0.004	0.006	-0.023
	(0.084)	(0.083)	(0.066)	(0.064)	(0.086)	(0.084)
Education	0.149***	0.150***	0.081**	0.068*	0.117**	0.127***
	(0.048)	(0.048)	(0.038)	(0.037)	(0.049)	(0.049)
Age	-0.015***	-0.014**	-0.002	-0.003	-0.013**	-0.010*
	(0.005)	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)
Health	-0.359***	-0.342***	-0.166***	-0.134***	-0.291***	-0.307***
	(0.050)	(0.050)	(0.039)	(0.039)	(0.051)	(0.051)
Family	0.031	0.013	-0.047	-0.059	0.101	0.094
	(0.068)	(0.068)	(0.054)	(0.052)	(0.070)	(0.069)
Labor	0.561***	0.563***	0.164***	0.164***	0.524***	0.529***
	(0.075)	(0.075)	(0.059)	(0.058)	(0.076)	(0.075)
Student	-0.103	-0.101	0.055	0.080	-0.172**	-0.191**
	(0.078)	(0.078)	(0.061)	(0.060)	(0.080)	(0.078)
Average	0.209***	0.173***	-0.030	-0.052	0.269***	0.240***
	(0.060)	(0.061)	(0.047)	(0.047)	(0.061)	(0.061)
Understand	0.117**	0.097	0.102**	0.095**	0.060	0.043
	(0.060)	(0.060)	(0.047)	(0.047)	(0.061)	(0.061)
Ownership	-0.072*	-0.048	0.004	-0.007	-0.081**	-0.042
	(0.037)	(0.037)	(0.029)	(0.029)	(0.038)	(0.038)
Satisfied	0.053	0.078	-0.096**	-0.070*	0.164***	0.169***
	(0.054)	(0.054)	(0.042)	(0.042)	(0.055)	(0.055)
Constant	2.811***	2.684***	1.792***	0.934*	1.572***	2.049***
	(0.352)	(0.697)	(0.276)	(0.538)	(0.360)	(0.703)
Fixed county	no	yes	no	yes	no	yes
Observations	2,478	2,478	2,478	2,478	2,478	2,478
R-squared	0.131	0.233	0.022	0.165	0.129	0.252

3.2. Stability test

3.2.1. Inclusion of economic control variables at the county level

To study the effects of land right on farmer income, economic indicators such as per capita GDP, value added of secondary industry, increase in service industry, and total social consumption at the county level were introduced, and the results are shown in Table 5. The estimates in columns (1)-(4) show that land right has a significant positive effect on total income and farm income at the 10% significance level, indicating that the conclusion that land right increases total income and farm income is robust. Columns (5)-(6) show that land right has no significant effect on nonfarm income and that macroeconomic

 doi:10.20944/preprints202208.0456.v1

variables have no significant effect on nonfarm income, meaning that nonfarm income is only related to their own characteristics.

Table 5. Stability test of macroeconomic control variables.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Income	Income	Farm	Farm	Nonfarm	Nonfarm
Right	0.136*	0.130*	0.087*	0.126**	0.066	0.025
	(0.070)	(0.070)	(0.055)	(0.054)	(0.072)	(0.071)
Gender	-0.004	-0.011	-0.004	-0.006	-0.001	-0.008
	(0.084)	(0.084)	(0.066)	(0.065)	(0.086)	(0.085)
Education	0.152***	0.147***	0.086**	0.068*	0.116**	0.126***
	(0.048)	(0.048)	(0.038)	(0.037)	(0.049)	(0.048)
Age	-0.015***	-0.014***	-0.002	-0.002	-0.013**	-0.012**
	(0.005)	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)
Health	-0.357***	-0.354***	-0.160***	-0.158***	-0.296***	-0.297***
	(0.050)	(0.050)	(0.039)	(0.039)	(0.051)	(0.050)
Family	0.033	0.030	-0.055	-0.046	0.112	0.103
	(0.069)	(0.068)	(0.054)	(0.053)	(0.070)	(0.069)
Labor	0.561***	0.555***	0.173***	0.149**	0.515***	0.529***
	(0.075)	(0.075)	(0.059)	(0.058)	(0.077)	(0.075)
Student	-0.099	-0.105	0.068	0.063	-0.181**	-0.183**
	(0.078)	(0.078)	(0.061)	(0.060)	(0.080)	(0.079)
Average	0.208***	0.177***	-0.031	-0.025	0.270***	0.224***
	(0.060)	(0.060)	(0.047)	(0.047)	(0.061)	(0.060)
Understand	0.122**	0.120**	0.106**	0.086*	0.062	0.076
	(0.060)	(0.059)	(0.047)	(0.046)	(0.061)	(0.060)
Ownership	-0.070*	-0.079**	0.006	0.003	-0.081**	-0.089**
	(0.037)	(0.036)	(0.029)	(0.028)	(0.038)	(0.037)
Satisfied	0.052	0.047	-0.096**	-0.077*	0.162***	0.145***
	(0.054)	(0.054)	(0.042)	(0.042)	(0.055)	(0.054)
Ln GDP	0.028	0.035	0.069	0.096	-0.042	-0.059
	(0.078)	(0.085)	(0.061)	(0.066)	(0.079)	(0.086)
Industry	-0.462	-0.482	-0.645**	-0.091	0.072	-0.375
	(0.366)	(0.408)	(0.287)	(0.318)	(0.375)	(0.413)
Service industry	0.066	0.510	-0.535*	-0.551	0.646	1.001**
	(0.389)	(0.467)	(0.305)	(0.363)	(0.398)	(0.472)
Ln consumption	-0.029	-0.039	-0.070***	-0.071***	0.037	0.022
	(0.026)	(0.027)	(0.021)	(0.021)	(0.027)	(0.027)
Constant	2.697***	2.778***	1.721**	1.626**	1.553*	1.895*
	(0.913)	(1.006)	(0.714)	(0.782)	(0.934)	(1.017)
Fixed city	No	Yes	No	Yes	No	Yes
Observations	2,478	2,478	2,478	2,478	2,478	2,478
R-squared	0.133	0.160	0.029	0.071	0.131	0.178

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3.2.2. Endogenous test

Given that there could be a causal relationship between land ownership confirmation and household income level, we use two-stage least squares estimation (2SLS) to control the endogeneity and further regress the equation. As the tool variable, select the proportion of farmers in other surveyed villages other than the village in the township where the farmers are located to receive the certificate of rural land ownership confirmation. The reason for this is that the status of farmers receiving the certificate in other villages in the same Township reflects the status of farmers in the township, which is related to whether the villagers receive the certificate. However, because the farmers in this village are excluded, there is no direct relationship between their family income and the family income of other farmers in the surveyed village. The results are shown in Table 6. The coefficients of rights in columns (1)-(4) are larger than the coefficients of the benchmark regression in Table 4, implying that the effect of rural land rights on total income and farm income of farmers was previously underestimated. The conclusion that total income and farm income are significantly positive is based on strong evidence.

Table 6. Stability test of tool variables.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Income	Income	Farm	Farm	Nonfarm	Nonfarm
Right	1.577**	1.538**	2.301***	2.297***	-0.185	-0.199
	(0.644)	(0.653)	(0.615)	(0.643)	(0.588)	(0.612)
Gender	0.007	0.040	0.043	0.072	-0.028	-0.016
	(0.087)	(0.092)	(0.082)	(0.086)	(0.084)	(0.089)
Education	0.133**	0.133**	0.041	0.047	0.130***	0.128**
	(0.054)	(0.055)	(0.052)	(0.051)	(0.050)	(0.052)
Age	-0.015***	-0.015***	-0.006	-0.004	-0.010*	-0.011**
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Health	-0.354***	-0.363***	-0.153***	-0.171***	-0.305***	-0.295***
	(0.054)	(0.054)	(0.048)	(0.049)	(0.050)	(0.050)
Family	-0.011	0.019	-0.095	-0.062	0.099	0.105
	(0.076)	(0.075)	(0.067)	(0.066)	(0.067)	(0.067)
Labor	0.567***	0.538***	0.171**	0.123*	0.528***	0.532***
	(0.082)	(0.082)	(0.070)	(0.069)	(0.075)	(0.075)
Student	-0.093	-0.105	0.094	0.063	-0.193**	-0.183**
	(0.085)	(0.085)	(0.075)	(0.073)	(0.077)	(0.077)
Average	0.285***	0.290***	0.125	0.149*	0.217***	0.206***
	(0.084)	(0.085)	(0.081)	(0.082)	(0.078)	(0.080)
Understand	-0.093	-0.089	-0.205*	-0.236**	0.082	0.109
	(0.111)	(0.116)	(0.109)	(0.115)	(0.100)	(0.108)
Ownership	-0.049	-0.089**	-0.008	-0.012	-0.042	-0.087**
	(0.039)	(0.039)	(0.037)	(0.036)	(0.037)	(0.037)
Satisfied	0.033	-0.002	-0.140**	-0.152***	0.179***	0.152***
	(0.060)	(0.062)	(0.057)	(0.058)	(0.057)	(0.059)
LnGDP		0.010		0.058		-0.055
		(0.095)		(0.089)		(0.085)
Industry		0.082		0.778*		-0.465

 doi:10.20944/preprints202208.0456.v1

		(0.507)		(0.468)		(0.471)
Service industry		1.484**		0.950		0.846
		(0.663)		(0.622)		(0.614)
Lnconsumption		0.003		-0.006		0.015
		(0.035)		(0.033)		(0.033)
Constant	2.421**	1.497	2.243***	-0.349	1.409	2.099*
	(0.993)	(1.207)	(0.710)	(1.099)	(1.523)	(1.111)
Fixed county	Yes	NO	Yes	NO	Yes	NO
Fixed city	NO	Yes	NO	Yes	NO	Yes
Observations	2,478	2,478	2,478	2,478	2,478	2,478
R-squared	0.108	0.020			0.247	0.175

3.2.3. Narrowing the sample

Yunnan Province began confirming and registering rights in 19 counties and districts in 2014, expanded the number of pilots in 2015, and completed the overall registration of land right in 50 counties and districts in 2018, while fully promoting the registration and certification of rural land rights. Therefore, we chose a sample of 1,909 rural land contracting rights certificates obtained after 2018 to investigate the impact of agricultural land titling on farm households' household income levels, and the results are shown in Table 7.The regression results show that land right has a significant positive effect on total income at the 10% significant level, and land right also has a significant positive effect on farm income at the 1% significant level, but land right fails the test on non-farm income, and the source of total income is primarily determined by farm income. It means that the benchmark regression's results are stable.

Table 7. Stability test of confirmed samples after 2018.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Income	Income (IV)	Farm	Farm (IV)	Nonfarm	Nonfarm (IV)
Right	0.135*	1.624**	0.154**	2.632***	-0.006	-0.405
	(0.078)	(0.638)	(0.060)	(0.620)	(0.079)	(0.596)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Constant	2.665**	1.110	1.849**	-0.738	1.388	1.805
	(1.175)	(1.434)	(0.903)	(1.394)	(1.193)	(1.342)
Fixed city	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,909	1,909	1,909	1,909	1,909	1,909
R-squared	0.172	0.011	0.091		0.184	0.173

3.3. Heterogeneity analysis

Farmers' income varies due to differences in the allocation of household labor, that is, the confirmation of rights in the allocation of family labor has different effects on farmers' income. We will investigate whether there are differences in the effect of rural land ownership confirmation in labor force groups based on whether families have long-term migrant workers. The dependent variable in this paper is multiplied by the binary variable (0-1) of whether the family has a long-term migrant labor group to form an interactive term that reflects the adjustment effect of the family labor resource allocation on the rural land ownership confirmation policy. Table 8 displays the regression results. Columns (1), (3), and (5) show that confirming rural land rights in the group without long-term migrant

 doi:10.20944/preprints202208.0456.v1

workers has no significant impact on total income, farm income, and non-farm income. Columns (2), (4), and (6) show the impact on farmers' income of family with long-term migrant labor. At the 1% statistical level, the confirmation of rural land rights has significantly increased farmers' total income and non-farm income while significantly decreasing farm income. Moreover, the positive impact of confirming rural land rights on non-farm income is much greater than the impact of confirming rights on farm income. The increase of farmers' total income mainly comes from the increase of farmers' non-farm income.

Table 8. Heterogeneity analysis.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Income	Income	Farm	Farm	Nonfarm	Nonfarm
Right*no-migrant	0.011		0.036		-0.015	
	(0.036)		(0.028)		(0.036)	
Right*migrant		0.531***		-0.227***		0.836***
		(0.038)		(0.030)		(0.036)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Constant	2.894***	2.344**	1.735**	1.976**	1.920*	1.050
	(1.004)	(0.967)	(0.781)	(0.773)	(1.015)	(0.919)
Fixed city	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,478	2,478	2,478	2,478	2,478	2,478
R-squared	0.159	0.221	0.069	0.089	0.178	0.327

3.3. Mechanism analysis

Previous empirical findings show that land right has a significant positive effect on total income and farm income. The results of the land right test on land transfer and transfer behavior are shown in Table 9. Controlling for other variables and fixed municipal effects, land right has a significant positive effect on willingness to transfer land and transfer out behavior, and it is significant at least at the 10% confidence level, indicating that after land property rights are clarified, farmers' willingness to transfer land increases, as does the rate of farmers who transfer out land.

Table 9. Impact of rural land right on land transfer.

	(1)	(2)	(3)
VARIABLES	Transfer	Out-transfer	In-transfer
Right	0.058**	0.040*	0.016
	(0.024)	(0.021)	(0.016)
Control variables	Yes	Yes	Yes
Fixed city	Yes	Yes	Yes
Observations	2,478	2,478	2,478
R-squared	0.028	0.025	0.026

Based on the results in Tables 4 and 9, the following explains how land right affects farmer income in terms of willingness to transfer land and transfer-out behavior. Table 10 shows the estimation results using instrumental variables to mitigate the endogeneity of land right. The baseline regression result of land right on total income is shown in column (1) of Table 6. The baseline regression result of land right on farm income is shown in

 doi:10.20944/preprints202208.0456.v1

column (4) of Table 6. When controlling for relevant influences and urban effects, the coefficients of willingness to transfer land and transfer out behavior are significantly positive at the 5% level, as shown in columns (2) and (3) of Table 10, indicating that willingness to transfer land and transfer out behavior increase total income to some extent. When compared to the baseline regression in column (1) of Table 10, the estimated coefficient of Right decreases by 0.047 and 0.054, respectively, or 3.06% and 3.51%. It means that willingness to transfer land and transfer-out behavior account for 3.06% and 3.51% of the effect of rural land rights on total income, respectively, indicating that rights increased total income significantly.

Table 10. Mechanism analysis.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Income	Income	Income	Farm	Farm	Farm
Right	1.538**	1.491**	1.484**	2.297***	2.319***	2.363***
	(0.653)	(0.658)	(0.656)	(0.643)	(0.655)	(0.658)
Transfer		0.139**			-0.065	
		(0.069)			(0.065)	
Out-transfer			0.158**			-0.193***
			(0.077)			(0.071)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed city	Yes	Yes	Yes	Yes	Yes	Yes
Observations		2,478	2,478		2,478	2,478
R-squared		0.031	0.032			

When controlling for relevant influencing factors and urban effects, as shown in columns (5) and (6) of Table 10, willingness to transfer land has no significant effect on farm income, and the coefficient of land transfer out behavior is significantly negative at the 5% level. This demonstrates that land transfer out behavior has limited the increase in farm income to some extent. Furthermore, the estimation coefficient of right in column (6) rises to 2.363, a 2.87% increase over the reference regression clock's 2.297. The land transfer out behavior is a negative transmission mechanism of rural land right confirmation affecting family farm income, with a 2.87% mediating effect, indicating that rural land right confirmation has a restraining effect on the increase of family farm income to some extent.

4. Conclusion

Using survey data from 2478 farm households in more than 100 counties across 16 cities and states in Yunnan Province, we empirically investigate the impact of land right on farmers' income. The study discovers that, first, land right increases farm households' total income directly and significantly, and that the increase in total income is primarily due to farm income. After controlling for variables and reducing the sample size, the regression results show that land right significantly increases total income, with farm income being the primary source. Moreover, after controlling for endogeneity with instrumental variables, the positive contribution of land right to total income and farm income is discovered to be overestimated. Second, we divide the total sample into two groups: households with outworkers and households without outworkers. Land right significantly increases total income and nonfarm income of farm households in the sample with permanent outworkers, but has a significant negative effect on farm income, and farm income is primarily determined by nonfarm income. In contrast, the sample of households with no outside employment shows no significant effect of land right on total income, farm income, or nonfarm income, and the results remain consistent after regression using

 doi:10.20944/preprints202208.0456.v1

the instrumental variables method, indicating that farmers in different regions optimally allocate labor factors based on the external market environment. Third, to investigate the channels through which land right affect farmer income, we insert the willingness and behavior of land transfer into the benchmark regression equation to observe the coefficient changes of land right, and discovers that both the willingness and behavior of land transfer play significant roles in the impact of land right on total income, but only the behavior of land transfer plays a significant role in the impact of land right on farmer income. Willingness to transfer land and transfer-out behavior are both positive mechanisms for total income, while land transfer-out behavior is a negative mechanism for farm income; however, the positive mechanism of land transfer-out behavior is relatively more significant for total income. Thus, land right increased farmer income significantly. In general, clarification of land contracting rights reduces the risk of property rights transactions, assists farmers in making rational decisions on land transfer, and motivates them to choose agricultural production or transfer their land out to work based on their own factors to improve their income. In short, clarifying rural land right can encourage the flow of land resources to farmers who are more willing to demand land and have stronger agricultural management ability, improving resource allocation efficiency and achieving an increase in the income level of both sides of the flow.

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