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Gains and losses: Does farmland expropriation harm farmers' welfare?

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Based on the data of China Household Income Project 2013(CHIP 2013), this paper empirically studies the impact of land expropriation on the objective and subjective welfare of farmers and explores its influence mechanisms. We firstly estimate the net effect of land expropriation on land-lost farmers' individual income and happiness. The result shows that although the land expropriation improves their individual income, it significantly reduces their happiness scores. After we use another dataset CFPS2010 to solve endogeneity of geographical selection and apply propensity score matching (PSM) method to solve self-selection bias, the results are also robust. Then, the mechanism analysis shows that off-farm employment plays a mediation effect role so that land expropriation promotes rural labor transfer to non-agricultural employment market and increase their income, but higher occupation switching costs and the lack of social security is one of the important reasons resulting in the decrease of the landless farmers' happiness. To trace the institutional reason, China 's splitted land system and its characteristic land expropriation compensation system not only deprived of farmers' land value-added income opportunities, but also failed to fully consider the occupational transformation and long-term security of landless farmers.

Acknowledgment: The main funding source for the research is the National Natural Science Foundation of China(71673241).Thanks to Prof. Lu Ming for giving us advice during the research.

JEL Codes: D04, D04

#1597



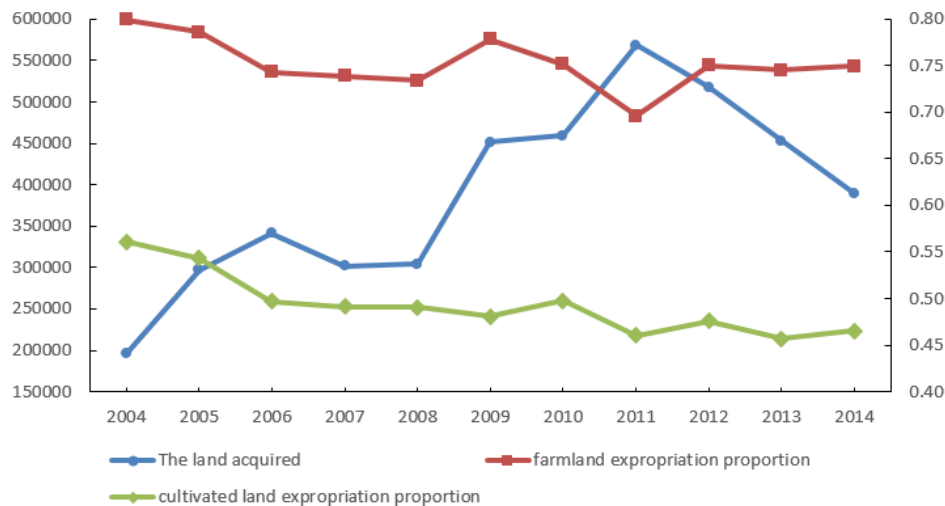
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Key words: Land expropriation system farmers' welfare urbanization land property rights
Land system reform

1 Introduction

In the past few decades, China has experienced a rapid urbanization at a low starting point but unprecedented speed. The urbanization rate has risen from 17.92% in 1978 to 57.35% in 2016, and the urban built-up areas increased from 17,605 square kilometers to 40,941 square kilometers from 2001 to 2015. The prominent feature of China's urbanization is the government leading, large-scale planning and overall promoting, especially the land acquisition system has played an essential role in the Chinese rapid economy growth by relying on high investment, loose land supply and government-led regional competition.



However, it is worthwhile to note that China's rapid urbanization takes place under the constraints of vague land transfer rights. China has experienced a large-scale land expropriation and there emerged a large number of land-lost farmers. Figure 1 shows that although the land expropriation area has continued to decline since 2011, the proportion of farmland and cultivated land acquired has still maintained at a higher level. The “2011 China's urban development report”, which was published by Chinese academy of social sciences, pointed out that China's land-lost farmers has reached about 40 million to 50 million, and still increasing at a speed of about 3 million people a year, maybe about 110 million people by 2030. The land-lost farmers' interests and livelihood has caused great concern and controversy among academics and policymakers.

Land has been in the focus of policy debates among scholars, politicians, policy makers, and urban managers worldwide. Land is not only considered essential to life support for farmers but it also becomes one of the most important assets that can be a principal source of wealth and power (Mattingly, 1993). In essence, farmland expropriation means that farmers can only obtain a lump sum cash compensation and lose the long-term property rights attached to the land. The stability of land rights and the security of property rights, especially the transferability and tradability of rights, are very important. If the property is not transferred, there is no opportunity to achieve the highest value (Yao, 2000; Cheung, 1970). More importantly, in China, once the farmland usage change from agricultural to non-agricultural, the transfer right will no longer be recognized by the current law (Zhou, 2004). In addition, in China, rural land has functioned as social security such as pension and employment except its productive economic functions and property functions (Yao, 2000), so whether to guarantee the rights and interests of land expropriated peasants largely determines their short-term living standards and long-term career development. Then, an

interesting question is: does farmland expropriation harm farmers' welfare? This is what this study mainly focuses on.

This paper uses CHIP2013 rural household data to empirically study the welfare effects of land acquisition by analyzing the impacts on peasants' income and happiness and their mechanisms. Specifically, the study firstly comprehensively evaluated the net effect of land acquisition on peasants' income and happiness. The results show that land acquisition significantly increased farmers' personal income, but significantly reduced their happiness. Propensity score matching (PSM) was used to eliminate self-selection bias and the results remained robust. Secondly, this paper explores the mechanisms. The results show that land expropriation increases their income by promoting rural labor force transfer to the non-agricultural employment market, but higher occupation switching costs and the lack of social security is one of the important reasons resulting in the deterioration of the landless farmers' happiness.

This study has some theoretical and policy implications. First, assessing the net effect of land acquisition helps us to better understand the importance of the land rights and interests in China. Second, the study helps to better clarify the impact of land acquisition on the welfare of peasants. It can not only identify how farmers respond and make decisions after they are requisitioned, but also understand more about the possible benefits and potential risks of land acquisition. Thirdly, this study may provide an important evidence base for the reform of the land expropriation system and the land system change in China, and thus has important practical significance.

The rest of the paper is organized as follows. Section 2 provides institutional background on China's land acquisition system. Section 3 introduces the measurement methods, data sources and definitions of variables. Section 4 empirically studies the income effect and mechanism of land acquisition. Section 5 empirically tests the effect on subject happiness and its mechanism ; Section 6 is the conclusion and discussion.

2 Institutional background in China

Many land-use problems in Chinese cities were deeply rooted in the land tenure system. According to Chinese Constitution in 1982, all land in China is the constitutional property of either the state or the collectives: urban land was state-owned whereas farmland was collectively owned with a few exceptions (Yang and Wu, 1996; Zhang, 1997; Zhao et al., 1998). This type of land ownership remains to the present day and intensifies the so-called dichotomous urban-rural land structure in which rural collectives do not have the right to covert land for non-agricultural usage by selling or leasing land to non-State agencies. So when socioeconomic development plans called for land development, municipal governments increased their land supply through land acquisition.

Land acquisition is the primary means used by governments to meet increasing land demand driven by rapid economic and urban growth in China. In the current institutional framework, there are two distinctive features on Chinese land acquisition system: One is the scope of acquisition was widely defined. According to Chinese Constitution, the government uses its eminent domain to seize land for public interests and must compensate farmers for their land, but there is no clear definition with regard to what public interests represent. Also, there exists a legal terms conflict between the Land Administration Law (LAL) and the Constitution. The article 43 of LAL says that

‘any organizations or individuals needing land for construction purposes¹ must apply for the usage rights of land owned by the State’, among which the “Land owned by the State” includes both the land owned by the State and the land originally owned by rural collectives, but later expropriated by the State. This suggests that land acquisition is the only legal way to convert collective land into state-owned land and the elastic scope of “public interest” has already stretched to various developments such as infrastructure projects, urban renewal, housing development or industrial cluster zones etc. The ambiguous definition of ‘public interest’ has created the conditions for the deprivation of farmers’ land rights by the State power.

The other distinctive feature of land acquisition is that the compensation is based on the agricultural value of the land, not determined by market principles. In western countries where property rights and markets are well developed, they develop constitutions or laws that require government to compensate farmers based on market values of the land taken. However, in China, just and fair compensation is defined to be sufficient to warrant non-worse-off living standards. It seems to be arbitrary for land-lost farmers. According to the current LAL, the affected farmers are entitled to three types of compensation: land compensation, resettlement subsidies, and compensation for young crops and attachments on land. The former two should be retained in collective communes that should use funds for development and resettlement of affected labors. The combined amount of resettlement and land compensation can increase but be no greater than 30 times the derived land productivity if needed to maintain constant living standard for affected farmers. In recent years, land acquisition has brought about several rural conflicts and many disputes stem from delayed compensation and opaque requisition procedures. Undercompensated farmers become a norm in the process of land requisition and they sometimes resort to unfair compensation distribution. The current compensation standard makes it difficult for the land-lost farmers to fully share the value-added benefits arising from the change of land use in the process of urbanization and industrialization.

In fact, early in the pre-reform era, peasants were compensated with a package that include job offers in which farmers would work for the enterprises established on the acquired land, housing compensation referred to as resettlement fees, compensation for the loss of crops and belongs connected to the land, and urban residency license (hukou). Granting a city hukou to affected farmers made them eligible for the social welfare services like medical insurance, pension, high-quality schools, and subsidized agricultural goods. Comparing direct compensation package of resettlement, these intangible benefits may be more appealing. However, the LAL passed in 1998 raised compensation levels but is silent on labor settlement except it encourages the development of village-owned enterprises, leaving many affected farmers unemployed. The tightening labor market has forced the replacement of job resettlement with cash compensation. Rather than only providing cash compensation to land-lost farmers, many cities have recently promised farmers a monthly pension payment if they reach retirement age or give them opportunity to become a citizen.

In this legal framework, local governments expropriated land at low cost, and then sell it to developers at much higher prices. The monopoly of local governments on the first-level land market helps them to control land prices to guarantee sufficient revenues from land acquisition and leasing, it can strengthen fiscal conditions for local governments, promote economic and

¹ One exception is that rural collectives can use land they own for community uses, such as township and village enterprises, public infrastructure, or resident houses for collective members.

industrial developments, and encourage urban encroachment into rural areas. Nevertheless, the fair market value of the land and the impacts of land acquisitions on farmers' livelihood have not been sufficiently considered by the government. Therefore, this paper will explore the welfare effect of land acquisition and its mechanism, trying to find some implications on how to reform the land acquisition system which can both coordinate the structural transformation of Chinese economy and land-lost farmers' livelihood.

3 Methodology, data and variables

3.1 Method

The main purpose of this paper is to try to identify the net effect of land acquisition on peasant income and happiness. Referring to Rubin (1974) potential outcome framework, this paper regards the land acquisition as a quasi-natural experiment and evaluates the average treatment effect by establishing the following basic regression equation.

$$lnind_inc_i = \beta_0 + \beta_1 land_expro_j + X_i' \delta + Z_j' \theta + \sigma_k + \mu_{ij} \quad (1)$$

$$happiness_i = \gamma_0 + \gamma_1 land_expro_j + P_i' \varphi + Z_j' \omega + \sigma_k + \tau_{ij} \quad (2)$$

The $lnind_inc_i$ and $happiness_i$ are the main dependent variables of interest to this paper. The dummy variable $land_expro_j$ indicates whether the household j is requisitioned, which is the core independent variable of interest. X_i , P_i , Z_j denote the control variables at the individual and family level, σ_k is the region fixed effects, μ_{ij} , τ_{ij} are random error terms. If land acquisition has nothing to do with the potential outcome, the parameters can accurately measure the causal effect of land acquisition on income and happiness.

The estimation method is as follows. The income equation is estimated by OLS since it is a continuous variable. Due to happiness is an ordered choice variable, it is more appropriate to choose an ordered Probit model to estimate. The ordered Probit model was first developed by Mckelvey and Zavoina (1975), which assumes that there is a latent variable that can represent an interpreted variable but can not be directly observed. It is determined by the following formula:

$$happiness_i^* = \gamma_1 land_expro_j + P_j' \varphi + \sigma_k + \tau_{ij} \quad (3)$$

The latent variables must meet the following selection rules: when $\rho_{j-1} < y^* < \rho_j$, $y = j$ ($j = 1, 2, 3, 4, 5$), where $\rho_0 \sim \rho_5$ is the threshold, then $\rho_0 = -\infty$, $\rho_5 = +\infty$, $\rho_1 \sim \rho_4$ is the estimated parameter, which is called the cutoff points. Assuming that the error term in Eq. (3) obeys the standard normal distribution $N(0, 1)$ and uses the cumulative distribution function $\Phi(\cdot)$ that represents the standard normal distribution, then the conditional probability density function of happiness of happiness is:

$$\begin{aligned} \Pr(\text{happiness} = j | X) &= \Pr(\rho_{j-1} < happiness^* < \rho_j | X) \\ &= \Phi[\rho_j - f(X) | X] - \Phi[\rho_{j-1} - f(X) | X] \end{aligned} \quad (4)$$

Using the maximum likelihood method (ML) to estimate the coefficients. It is noteworthy that Ferrer-i-Carbonell and Frijters (2004) found that the OLS and the ordered Probit model are consistent in the direction and significance of parameter estimation, while OLS is more intuitive and convenient to interpret. Many studies have used OLS to study ordered selection of variables such as happiness (Brockmann et al., 2008; Knight et al., 2009; Jiang et al., 2012).

Nevertheless, land acquisition may also be the result of peasants' self-selection, making the land-expropriation endogenous and non-random. In order to partially eliminate the endogeneity problems caused by self-selection, this paper will use the PSM method to make a robust test of the

baseline regression. The PSM method was originally proposed by Rosenbaum & Rubin (1983). The method builds a matching estimator based on the conditional probability that an individual i enters the treatment group, ie, propensity scores (p-scores). Compared with the simple linear regression model, PSM has the following advantages: On the one hand, this method mainly constructs the propensity score of multidimensional factors that represent individual features through dimension reduction, and compresses the information contained in vector X , which can overcome the difficulty of matching caused by the multidimensional problem (Heckman et al., 1997),and improve the accuracy and efficiency of matching. On the other hand, the PSM method does not require prior assumptions about the form of functions, parameter constraints, and distribution of error terms (Heckman and Vytalil, 2007) and therefore gives greater flexibility.

3.2 Data

The data used in this paper are derived from the rural household part of the 2013 China Household Income Survey (CHIP 2013). CHIP 2013 Rural Household Sample covers 11,013 rural households and 37,763 rural individuals in 122 cities in 14 provinces including Beijing, Shanxi, Liaoning, Jiangsu, Shandong, Guangdong, Anhui, Henan, Hubei, Hunan, Chongqing, Sichuan, Yunnan and Gansu provinces. The survey includes basic information on household time allocation, land and agricultural operations, employment, household expenditures, assets and subjective questions about living standards. CHIP2013 Rural Household Questionnaire has set up a special land acquisition module to investigate in detail the land acquisition experience of rural households, the time and total area of land acquisition, the compensation for land acquisition, the participation of pension insurance and medical insurance when land expropriation. This data-set provides important support for the in-depth analysis and clarification of micro-mechanism of the land acquisition welfare effect.

3.3 Variables and Descriptive Statistics

(1)Dependent variables : income and happiness

This paper will mainly use individual income for measurement. According to the CHIP2013 questionnaire , we define the individual income as the total annual income (Yuan / year) obtained by household members engaged in main work in 2013. We use the natural logarithm of income to make the income variable closer to the normal distribution and reduce the heteroskedasticity.

Another explanatory variable is happiness. The question of measuring happiness in CHIP2013 is stated as "Do you feel happy considering all aspects of life?" We deleted "do not know" sample (0.6% of the total sample), and redefined happiness using the Likert's five-point scale, "very unhappy = 1", "not too happy = 2", "generally = 3", " Relatively happy = 4 ", " Very happy = 5 ".

(2) Independent variable of interest: land expropriation

The core explanatory variable of this study is whether or not the household j has had experienced land acquisition. According to CHIP2013, we defined it as a dichotomous variable, that is, "land acquired= 1, Land not acquired= 0 ". At the same time, this paper will use the share of farmland acquired in the total area of land, to capture the intensity of land acquisition and its impact on the land-lost farmers' welfare. According to statistics, 14.1% of farmers had land acquisition experience. From the intensity of land acquisition, 24.53% of households have been completely requisitioned, while the remaining 75.47% have experienced different degrees of land expropriation.

(3) Control variables. Firstly, a large number of empirical studies confirm that health and basic education are the core human capital variables that affect farmer's income. Therefore, this paper controls the years of formal education and self-rated health status (very bad = 1, bad = 2, normal = 3, good = 4, very good = 5) in the income equation. Secondly, in the happiness equation, we control the income and unemployment (unemployment = 1, employment = 0). In addition, this paper also controls other personal characteristics and family characteristics related to income and happiness. Personal characteristics include gender, age, age square, marital status. Family characteristics include the family size and the proportion of elderly, respectively. Further, we also use region dummy variables to control the regional fixed effects.

Then we simply compare the differences between the household with and without land acquisition experience in the main variables and carries out T test on the significance of the mean differences. The results are shown in Table 1.

Table 1 Differences between farmers with land acquired and without land acquired

Variables	Farmers with land acquired		Farmers without land acquired		differences
	Mean	Std	Mean	Std	
Income	26264	20884	24772	21204	1542***
Logarithm income	9.893	0.856	9.827	0.873	0.066***
Happiness	3.579	0.819	3.567	0.824	0.012
Gender	0.515	0.4998	0.523	0.4994	-0.008
Age	38.373	20.027	38.432	20.259	-0.059
Experience	1873.528	1610.722	1887.390	1637.906	-13.862
Marital status	0.661	0.473	0.637	0.481	0.024***
Education	8.410	3.743	7.761	3.616	0.649***
Health status	3.998	0.857	3.983	0.918	0.015
Unemployment	0.018	0.134	0.011	0.104	0.007***
Family size	4.251	1.377	4.329	1.454	-0.078***
Elderly proportion	0.162	0.262	0.169	0.261	-0.007*

4 Income effect: Empirical results and mechanism

4.1 Results

After controlling the personal characteristics, family characteristics and regional fixed effects, Table 2 shows the baseline results of the impact of land acquisition on farmer's income. Model 1 and Model 2 respectively report the net income effect of land acquisition and land acquisition intensity. The results show that the land acquisition significantly increased the income of land-lost farmers, the coefficient of which was significantly positive at the level of 1% and increased by 7%. Meanwhile, the contribution of land acquisition intensity to peasants' income is 20.4%. There is an inverted U-shaped relationship between the age and their income. Higher education years and better health have a significant positive impact on farmer's income, but the effect of education years on the farmers' income is relatively limited. From the perspective of regional fixed effects, the eastern region has a greater role in promoting the non-agricultural income of peasants than in the central region.

Table 2 The impact of land acquisition on farmer's income

	Model 1	Model 2	Model 3	Model 4
Variables	Log income	Log income	Log income	Log income
Land acquisition	0.0700*** (0.0216)		0.1414*** (0.0479)	0.1401*** (0.0486)
Acquisition intensity		0.204*** (0.0342)		
Gender	0.360*** (0.0131)	0.360*** (0.0139)	0.7888*** (0.0272)	0.7801*** (0.0278)
Age	0.0659*** (0.0047)	0.0656*** (0.0050)	0.0708*** (0.0073)	0.0680*** (0.0074)
Age square/1000	-0.938*** (0.0555)	-0.944*** (0.0587)	-0.9732*** (0.0807)	-0.9460*** (0.0811)
Marital status	0.0716*** (0.0228)	0.0533** (0.0240)	0.1801*** (0.0440)	0.1872*** (0.0448)
Education	0.0438*** (0.0029)	0.0420*** (0.0032)	0.0691*** (0.0041)	0.0662*** (0.0043)
Self-reported health	0.0905*** (0.0109)	0.0900*** (0.0115)	0.1105*** (0.0163)	0.1112*** (0.0168)
Family size	0.0129** (0.0064)	0.0157** (0.0067)	-0.0041 (0.0090)	-0.0015 (0.0092)
Elderly proportion	0.206*** (0.0407)	0.232*** (0.0432)	0.1329 (0.0884)	0.0788 (0.0904)
East	0.182*** (0.0170)	0.163*** (0.0179)	0.3206*** (0.0464)	0.3232*** (0.0486)
West	-0.118*** (0.0229)	-0.124*** (0.0238)	-0.2030*** (0.0488)	-0.1716*** (0.0502)
Distance from village to the town				-0.0050*** (0.0015)
Observation	14,778	13,336	11185	10571
R Square	0.152	0.152	0.217	0.215
F/Wald Chi2	177.11	157.43	230.92	205.18

Note: ① *** p <0.01, ** p <0.05, * p <0.1; ② brackets in the cluster to the family level robust standard error. ③ Models 1 and 2 are based on CHIP regression results, and models 3 and 4 are based on CFPS regression results.

Although we have already controlled the regional fixed effects, we also concern about that land acquisition may still be influenced by the location, and the geographical location will affect the non-agricultural individual income, thus resulting in endogeneity caused by missing variable bias. Specifically, the households closer to the urban areas are more likely to be requisitioned, and more likely to engage in non-agricultural employment, the difference in non-farm income may be completely attributed to geographical differences. When uncontrolling geographic location variables, the baseline results in Table 2 may be a false conclusion. Since there is no geographic variables in CHIPS 2013, this paper uses another data-set 2010 China Family Panel Studies (CFPS2010) to make a robust test of the baseline regression results. CFPS2010 rural household data covers 24 provinces and includes land acquisition and related geographical location variables.

According to statistics, the proportion of land-expropriated samples in different geographical areas in CFPS is 2.2% in urban areas, 6.1% in suburban areas and 91.7% in rural areas. Model 3 and Model 4 reported the results of the robustness test. The results show that after controlling the distance from the village committee to the town, the land acquisition still significantly increases the individual income of peasants. The result is still robust.

Furthermore, the PSM method is used to further test the robustness. The average treatment effect of land acquisition is estimated by using the nearest neighbor matching method, the radius matching method and the kernel matching method (Heckman et al., 1997). The results are shown in Table 3. Comparison of estimated results found that using three matching methods to estimate the direction and significance of ATT consistent with OLS.

Table 3 The average treatment effect after PSM

Matching method	Treated	Controlled	ATT	S.E.	T-stat
Nearest neighbor matching(n=4)	9.8944	9.8294	0.0650***	0.0209	3.11
Radius matching(r=0.005)	9.8944	9.8208	0.0736***	0.0232	3.18
Kernel matching(width=0.01)	9.8944	9.8136	0.0808***	0.0189	4.27

Note: ① *** p <0.01, ** p <0.05, * p <0.1; ② The standard error reported in this table does not consider the propensity score as the estimated income. This article uses the solution given by Abadie and Imbens (2016) Correction bias, ATT results are still significant.

Table 4 Balance test results

Variable	Matching status	Mean		bias (%)	Reduct bias (%)	T—test	
		Treated	Control			t	p> t
Gender	Unmatched	0.6003	0.6644	-13.3	99.8	-6.20	0.000
	Matched	0.6003	0.6005	-0.0		-0.01	0.992
Age	Unmatched	40.958	39.418	12.2	94.7	5.60	0.000
	Matched	40.958	41.039	-0.6		-0.23	0.819
Age square/1000	Unmatched	1.8359	1.7139	11.5	94.1	5.31	0.000
	Matched	1.8359	1.8432	-0.7		-0.24	0.809
Marital status	Unmatched	0.8386	0.7787	15.3	99.7	6.75	0.000
	Matched	0.8386	0.8384	0.0		0.02	0.985
Education	Unmatched	9.4910	9.0715	14.5	93.4	6.93	0.000
	Matched	9.4910	9.4635	1.0		0.34	0.733
Parties	Unmatched	0.0768	0.0652	4.5	97.6	2.13	0.033
	Matched	0.0768	0.0765	0.1		0.04	0.970
Health	Unmatched	4.1074	4.1549	-6.3	90.1	-2.87	0.004
	Matched	4.1074	4.1027	0.6		0.22	0.824
Family size	Unmatched	4.1748	4.2608	-6.3	87.0	-2.86	0.004
	Matched	4.1748	4.1636	0.8		0.30	0.768
Elderly proportion	Unmatched	0.1214	0.1258	-2.1	93.8	-0.95	0.341
	Matched	0.1214	0.1211	0.1		0.05	0.964

Then, the balance test is used to ensure the effectiveness and quality of propensity score matching. Table 4 reports the results of the balance test. The results in the table show that the absolute values of the standard deviations after matching are less than 5%, and the standard deviations are significantly reduced compared with those before matching, indicating that the

matching is better. At the same time, we can see from the t-test results that there is no significant difference between the matched variables in the land-expropriated group and the non-expropriated group, which meets the balance hypothesis and shows that the regression result is relatively robust.

4.2 mechanism

If the above result is reliable, then a more important question is: What are the mechanisms that affect the income of peasants through land acquisition? In our opinion, off-farm employment may play a mediation effect role so that land expropriation promotes rural labor transfer to non-agricultural employment market and increase the probability of non-agricultural employment:

On one hand, land acquisition implies a reduction in the land endowment and the loss of key natural resources, and the land endowment status of the households directly determines the amount of labor demand for agricultural production. Studies by Zhao (1990a; 1990b) and Cai et al. (2002) showed that the area of cultivated land is negatively correlated with the decision-making behavior of rural labor migration. For farmers with little land or no land, they have to migrate for survival in the face of limited agricultural labor demand (Eills, 1998). On the other hand, land tenure security is the premise of sustainable economic development (Coase, 1960). Land expropriation is changing collectively-owned land in rural areas into state-owned land. Therefore, land acquisition may affect the land investment behavior and labor market participation of land-expropriated peasants by affecting the farmers' psychological expectations of the stability of land ownership (Besley, 1995; Mullan et al., 2011). This instability of property rights is expected to reduce farmers' agricultural productive investment (Jacoby et al., 2002), reducing land use efficiency (Nizalov et al., 2016), resulting in the phenomenon of temporary migrant workers in rural areas (Yang, 1997; de la Rupelle et al., 2009), seeking non-farm employment opportunities (Giles and Mu, 2014). In summary, land acquisition will change the employment status of peasants and reconstruct their sources of income sources, making the wage income or non-farm income become the main component of the land-lost farmers' income.

The most common way to test for mediation effect is to test the regression coefficients step by step (Baron & Kenny, 1986), using the stepwise approach. Then we choose employment options as the mediating variable and set them as three dummies: "non-farm employment = 1, agricultural production and operation = 2, part-time = 3." Among them, non-agricultural employment was defined as 2013 only engaged in wage work or non-agricultural production and operation activities; agricultural production and management is defined as engaging in domestic agriculture, forestry, animal husbandry and fishery production locally only in 2013; and part-time is defined as engaging in agricultural production operations in 2013 or engaged in non-farm employment.

Table 5 Mediation effect test results

	Model5	Model6	Model7	Model8	Model9	Model10	Model11
Variables	mlogit	mlogit	mediation	mlogit	mlogit	mediation	OLS
Land acquisition	1.591*** (0.0920)	0.671*** (0.0943)	-0.00593 (0.0211)				
Acquisition intensity				3.074*** (0.1802)	1.162*** (0.1946)	0.0643* (0.0340)	
Non-farm employment			0.786***			0.775***	

			(0.286)			(0.281)	
Part-time			0.313			0.305	
			(0.286)			(0.281)	
Acquisition duration							0.00707***
							(0.00192)
Male	1.109***	1.508***	0.387***	1.145***	1.513***	0.383***	0.360***
	(0.0351)	(0.0399)	(0.0129)	(0.0368)	(0.0405)	(0.0136)	(0.0131)
Age	0.0408***	0.167***	0.0734***	0.0406***	0.168***	0.0738***	0.0656***
	(0.0144)	(0.0146)	(0.0046)	(0.0150)	(0.0148)	(0.0049)	(0.00469)
Age square/1000	-1.430***	-2.302***	-0.970***	-1.477***	-2.318***	-0.978***	-0.935***
	(0.1645)	(0.1605)	(0.0549)	(0.1736)	(0.1633)	(0.0581)	(0.0555)
Married	-0.548***	-0.00252	0.100***	-0.550***	0.0178	0.0844***	0.0734***
	(0.0815)	(0.0925)	(0.0223)	(0.0834)	(0.0937)	(0.0235)	(0.0228)
Education	0.166***	0.0733***	0.0380***	0.158***	0.0758***	0.0374***	0.0440***
	(0.0094)	(0.0084)	(0.0029)	(0.0098)	(0.0086)	(0.0031)	(0.0029)
Health	0.156***	0.122***	0.0858***	0.168***	0.123***	0.0839***	0.0910***
	(0.0310)	(0.0298)	(0.0108)	(0.0322)	(0.0300)	(0.0114)	(0.0109)
Family size	0.0167	-0.126***	0.0018	0.0372*	-0.132***	0.00241	0.0121*
	(0.0184)	(0.0184)	(0.0062)	(0.0191)	(0.0186)	(0.0066)	(0.00633)
Elderly proportion	1.027***	0.147	0.112***	1.183***	0.158	0.127***	0.205***
	(0.1190)	(0.1155)	(0.0401)	(0.124)	(0.117)	(0.0428)	(0.0408)
Region fixed effect	YES	YES	YES	YES	YES	YES	YES
Observation	20,778	20,778	14,356	19,238	19,238	12,954	14,778
R-squared	0.2154	0.2154	0.208	0.2233	0.2233	0.2077	0.153
F/Wald chi2	5045.27	5045.27	205.76	4935.21	4935.21	185.63	177.27

Table 6 Robustness test results

Variables	Model 12	Model 13	Model 14
Land acquisition	0.544***	0.0289	
	(0.106)	(0.0461)	
Acquisition duration			0.0096**
			(0.0041)
Off-farm employment		0.927***	
		(0.0324)	
Distance from village to town	-0.00847*	-0.00312**	-0.00505***
	(0.00488)	(0.00154)	(0.00152)
Personal characteristic	YES	YES	YES
Household characteristic	YES	YES	YES
Region fixed effect	YES	YES	YES
Observation	8,914	6,876	10601
R-square	0.235	0.325	0.215
F/Wald chi2	1485.58	206.88	206.29

Model 5 to Model 10 in Table 5 report the regression results of mediation effect. The results show that land acquisition significantly increases the probability of non-farm employment and

part-time employment, and non-farm employment also has a significant positive impact on personal income. After controlling for the employment choice variables, the income effect of land acquisition decreases from 0.07 to -0.00593, and became insignificant, indicating that the mediation effect of off-farm employment does exist. Model 11 show the duration effect of land acquisition, the longer time the land requisitioned, the higher the non-agricultural income. Table 6 uses the CFPS data to conduct a robust test on the mediating effect of non-agricultural employment after controlling the geographic distance. The results of Models 12 and 13 show steadily that land expropriation improves peasant's personal income by promoting non-agricultural employment and Model 14 prove the duration effect of land acquisition on the income over time.

To sum up, the result of the mediation effect shows that on the one hand, when facing land acquisition, farmers will enter the non-agricultural labor market with a higher probability. Specifically, the reduction of cultivated land led to a drastic reduction of the number of labor carried on limited land, resulting in a large number of rural surplus labor and the phenomenon of hidden unemployment. On the other hand, the land has played an important role in migrant workers' return and has become the ultimate guarantee for the survival and development of migrant workers (Chen et al., 2012). Land acquisition may weaken employment guarantee function so that farmers have to allocate a large amount of time in the non-agricultural labor market and maintain their basic livelihood and long-term livelihood by increasing their non-agricultural income. Therefore, compared with those who have not been requisitioned, the landless peasants have relatively longer time to enter the non-agricultural labor market. The absorption effect and time effect of the non-agricultural labor market may accumulate more working experience and social relations for the land-expropriated peasants so as to make them more familiar with the local labor market and promote the increase of non-agricultural income.

5 Happiness effect: Empirical results and mechanism

5.1 Results

Table 8 reports the impact of land acquisition on the happiness of farmers. Model 15 and 16 show the results of the ordered probit model, and model 17 and 18 are the OLS estimates. It is found that the estimated results of ordered probit and OLS are basically the same in terms of the significance of variables and the direction, which shows that the model results are very robust. The results showed that on average, land acquisition significantly reduced the happiness of farmers compared with those of landless farmers at the significance level of 5%. The PSM method is used to test the happiness effect of land acquisition. The matching results in Table 9 still prove to be robust, and the matching passes the common support test and the balance test.

Table 8 The results for impact of land acquisition on happiness

Variables	Model 15	Model 16	Model 17	Model 18
Land acquisition	-0.0957** (0.0428)		-0.0658** (0.0301)	
Acquisition intensity		-0.231*** (0.0702)		-0.159*** (0.0493)
Log income	0.118*** (0.0195)	0.110*** (0.0205)	0.0832*** (0.0138)	0.0778*** (0.0145)
Gender	-0.211*** (0.0420)	-0.193*** (0.0450)	-0.147*** (0.0295)	-0.134*** (0.0317)

Age	-0.0459*** (0.0122)	-0.0433*** (0.0129)	-0.0331*** (0.00864)	-0.0312*** (0.00921)
Age square/1000	0.585*** (0.134)	0.541*** (0.142)	0.420*** (0.0950)	0.389*** (0.101)
Marital status	0.551*** (0.0712)	0.592*** (0.0771)	0.403*** (0.0518)	0.435*** (0.0566)
Unemployment	-0.394** (0.165)	-0.384** (0.187)	-0.288** (0.124)	-0.278** (0.140)
Education	0.0160** (0.00716)	0.0138* (0.00768)	0.0118** (0.00504)	0.0102* (0.00542)
Health	0.271*** (0.0221)	0.275*** (0.0229)	0.191*** (0.0154)	0.193*** (0.0160)
Family size	-0.0157 (0.0128)	-0.0187 (0.0134)	-0.00978 (0.00901)	-0.0118 (0.00952)
Elderly proportion	-0.130 (0.0852)	-0.0897 (0.0906)	-0.0894 (0.0606)	-0.0606 (0.0647)
East	0.111*** (0.0377)	0.128*** (0.0398)	0.0778*** (0.0264)	0.0901*** (0.0280)
West	-0.0115 (0.0446)	-0.0268 (0.0465)	-0.00877 (0.0318)	-0.0196 (0.0332)
Observation	4,435	3,952	4,435	3,952
R-squared	0.040	0.042	0.091	0.095
F-stat/Wald Chi2	371.91	345.52	28.5	26.69

Table 9 The average treatment effect after PSM

Matching method	Treat	Control	ATT	S.E.	T-stat
Nearest neighbor matching(n=4)	3.5890	3.6654	-0.0764**	0.0342	-2.23
Radius matching(r=0.005)	3.5895	3.6981	-0.1086**	0.0433	-2.51
Kernel matching(width=0.01)	3.5892	3.6505	-0.0613**	0.0313	-1.96

5.2 Mechanism

This paper will further explore the mechanism of how land acquisition reduces happiness. The model 19 and model 20 of Table 10 report the trend of the happiness effect of land acquisition over time. The results show that there is a U-shaped relationship between the land expropriation and the happiness of farmers at the 5% significance level. The turning point is about 13.5 years. We find that 86.67% of the land-expropriated samples fell on the left side of the U-shaped curve, indicating that peasants' happiness during 2001-2014 showed a declining trend year by year.

Table 10 Empirical results of influencing factors of landless farmers' happiness

Variables	Model 19	Model 20	Model 21	Model 22
Acquisition duration	-0.00401 (0.00250)	-0.0136** (0.0058)		

Acquisition duration squared		0.000509**		
		(0.00024)		
Acquisition intensity				-0.229**
				(0.0977)
No employment arrangement				-0.506**
				(0.220)
No housing arrangement				-0.348*
				(0.186)
Log income	0.0825***	0.0831***	0.0752*	0.0189
	(0.0138)	(0.0138)	(0.0390)	(0.0457)
Gender	-0.146***	-0.147***	-0.182***	-0.109
	(0.0295)	(0.0295)	(0.0685)	(0.0830)
Age	-0.0328***	-0.0332***	-0.0308	-0.0109
	(0.00863)	(0.00864)	(0.0212)	(0.0258)
Age square/1000	0.416***	0.420***	0.398*	0.158
	(0.0949)	(0.0950)	(0.237)	(0.289)
Marital status	0.401***	0.403***	0.380***	0.325**
	(0.0518)	(0.0518)	(0.118)	(0.144)
Unemployment	-0.294**	-0.291**	-0.267	0.150
	(0.123)	(0.123)	(0.229)	(0.233)
Education	0.0117**	0.0116**	0.0235**	0.0260*
	(0.00505)	(0.00505)	(0.0117)	(0.0140)
Health	0.190***	0.190***	0.218***	0.237***
	(0.0154)	(0.0154)	(0.0375)	(0.0423)
Other control variables	YES	YES	YES	YES
Observation	4,435	4,435	820	584
R-squared	0.091	0.091	0.084	0.100
F-stat	28.27	26.72	5.01	4.01

This paper suggests that one of the possible influencing mechanisms of happiness reduction may be the short-term nature of land acquisition compensation and settlement. At present, the compensation method for land-expropriated peasants in our country is still dominated by lump sum cash compensation, which fails to take full account of the peasants' employment restructuring and social security. Therefore, we suggest that in the long run, with the compensation for land acquisition consumption, the positive impact of land acquisition compensation on happiness will be weakened year by year. We will use model 21 and model 22 to verify this possible mechanism. Model 21 is the regression result of happiness of land-expropriated farmers on their income, health, employment status, personal characteristics, family characteristics and regional effects. Based on this, model 22 adds the intensity of land acquisition, the government's housing settlement and employment arrangement. The corresponding CHIP 2013 questionnaire questions are "whether the government will arrange housing when it is requisitioned" and "whether the government will offer employment when it is requisitioned." Comparing the coefficient changes of key variables in model 21 and model 22, we can draw the following three important results:

First, the intensity of land acquisition significantly negatively affects the happiness of peasants. The possible explanation is that the farmland in rural areas is an important asset. It not only defines peasants' identities, but also its resource attributes make peasants important life support and income sources. As the intensity of land acquisition increases, the land-expropriated peasants expect the decrease of their happiness due to the decline of property income obtained from the land and the lack of protection in the long-term life.

Second, the negative effect of the government's failure to provide job placement on happiness is greatest with a coefficient of -0.506. This fully shows that employment is the fundamental way to protect the peasants' livelihood. After land acquisition, peasants may face the transformation of human capital and occupation. In this study, the farmers whose land was requisitioned were generally poorly educated and had an average education of 8.4 years. Although they could meet the skill needs of agricultural production, it is difficult to quickly realize the transformation of the labor force. The shortage of human capital and social capital is the main factor restricting the occupation of land-expropriated peasants. Informal employment, employment mobility and lack of sustainability of professional development, some land-expropriated farmers even occupational decline or even unemployment, resulting in a decrease of happiness.

Thirdly, the government's non-placement of employment and housing all have a significant negative impact on the happiness of land-expropriated farmers. Meanwhile, the positive effect of personal non-farm income on happiness is diluted and the coefficient is reduced from 0.0752 to 0.0189. Thus, compared with the long-term benefits such as employment and housing security, the non-agricultural income contributed by non-agricultural employment by land acquisition is not enough to ensure the long-term livelihood of farmers. The impact of self-rated health on happiness has always been significantly positive. This shows that land-expropriated farmers care more about whether employment and long-term livelihoods are sustainable.

This paper argues that another mechanism that may affect the reduction of happiness is the the shortage of existing land acquisition compensation. At present, China's land requisition system is a kind of unequal property transaction with compulsory and unequal rights, and farmers can only get compensation for land expropriation based on original land use after losing their land rights and interests. On the surface, the damage to peasants' rights and interests seems to be only a matter of the level of compensation for land acquisition obtained by peasants. In essence, it is an issue of unfair distribution of land appreciation. It is difficult for land-expropriated peasants to fully share in the added value generated by land-use changes. Specifically, on the one hand, the dichotomous land market structure in urban and rural areas and the asymmetric land rights structure have shaped the unbalanced distribution of land interests. The fuzzy system of property rights has enabled local governments to grasp the actual residual claims of land, blocking the realization of farmers' land property rights channels. On the other hand, the loss of peasants' rights and interests in the process of land acquisition is also related to the motivation of local governments to rely on land finance. The current economic growth model in China is a model of growth characterized by "regional competitions". Local government officials tend to push down the original land acquisition price and sell more land at higher price in order to political promotion. Therefore, we infer that the more cities depend on land finance, the more the government tends to obtain high returns by lowering the cost of land acquisition, the less happier land-expropriated farmers.

Table 11 Results for the land finance

	Model 23	Model 24
Variables	land conveyance fee $\leq 66\%$	land conveyance fee $> 66\%$
Land acquisition	-0.0410 (0.0471)	-0.0943*** (0.0397)
Personal characteristic	YES	YES
Household characteristic	YES	YES
Region fixed effect	YES	YES
Observation	1,698	2,737
R-squared	0.103	0.092
F-stat	12.68	19.21

Note:① *** p <0.01, ** p <0.05, * p <0.1; ② brackets are clusters to the family level cluster standard error; ③ 66% is the median of the share of land conveyance fee;

In order to test this conclusion, this paper matches the rural household data with the statistical data at the urban level according to the administrative code provided by the National Bureau of Statistics in accordance with CHIPS 2013's city (county) code and adopts the urban-level land transaction price) And local fiscal revenue (RMB10,000) represents the degree of dependence of the local government on land finance. The data on the transaction value of the land transfer come from the 2014 China Land and Resources Statistical Yearbook. The general budget revenue data comes from 2014 China City Statistical Yearbook. In this paper, the proportion of conveyance fee is greater than 66% of the city divided by sub-sample regression, Table 11 reported the results. The results show that the happiness of land-expropriated farmers is significantly lower for the cities whose land transfer fees proportion is greater than 66%. This may indicate that the stronger the local government's dependence on land finance, the more they tend to push down the cost of land acquisition by administrative pricing and attract more manufacturing investment through various preferential policies such as providing cheap land and subsidized infrastructure. In fact, the unreasonable and legal dilemmas of compensation standards for land expropriation at this stage have exacerbated the dependence of local governments on land finance. On the one hand, compensation for land expropriation based on the agricultural output can not reflect the scarcity of land resources, but could cause the "financial illusion" of local government departments, resulting in over-expansion of the public sector by local governments (Wang Hui, 2013); On the other hand, due to the fact that the current law does not strictly define the scope of public interest, the government has greater discretion in the process of land acquisition and has incentives to expand the scale of land expropriation. This is a violation of farmers' rights and interests in land acquisition. In other words, this system of land expropriation characterized by "low compensation and no limited land expropriation scope" makes the collectives and individuals of peasants in a passive and disadvantaged position in land acquisition, undermining the most basic principles of fairness and social justice ,deprived of their land rights and interests, resulting a decrease in their happiness.

6 Conclusion and discussion

In the context of land urbanization being faster than population urbanization, the long-term welfare of land-expropriated farmers has drawn much attention. In this paper, we mainly use

CHIP2013 rural household data to empirically study the impact of land acquisition on farmer's income and happiness, and explore its impact mechanism. The conclusions are as follows: (1) Land expropriation significantly increased the personal income of peasants, but significantly reduced peasants' happiness. (2) Although land acquisition increased income by promoting non-agricultural employment, higher vocational conversion costs and lack of social security is the main factor for the reduction of happiness. The underlying cause is that the existing compensation system for land expropriation not only deprives the peasants of the opportunity to gain land value-added income, but also fails to take into account the employment transformation and long-term livelihood security. Therefore, how to take into account the land property rights and the long-term life guarantee of land-expropriated peasants is an important direction for the land system reform in China while pursuing the efficiency of land expropriation.

Local governments should be prepared to adjust policies and programs to correspond with their population's changing needs. An increase in cash compensation may help to reduce social uneasiness, but it fails to address the fundamental issue: the rights and interests of farmers attached to land. A radical and fundamental change such as property rights is required.

Practice has proved that the reform of land requisition system also needs the reform of related systems. First of all, the reform of land requisition system needs to be combined with the reform of rural land ownership system. It is necessary to clarify the ownership of land property, give land-expropriated farmers more property rights, and explore ways for peasants to increase their property income. Secondly, we should promote linkage between Reform of Land Requisition System and Household Registration System. Grant a city hukou and promote the effective linkage of urban and rural social security system so that land-expropriated peasants can enjoy equal public service and social security benefits as urban residents, and narrow the welfare gap between them. Finally, we should adjust and deepen the reform of the fiscal and taxation system, giving local governments more tax rights that match the power of attorney, enabling the government to participate in the distribution of land value increment through land tax revenue and effectively restrain the abuse of land ownership by local governments.

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