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Gains or Losses? The Impact of China's land Tenure Reform on Farmers' Livelihood Capital

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Abstract: ***To address the challenges of population loss, vacant housing, and the single-source livelihood income in rural China, the government has initiated a reform of the rural homestead system, to curb rural hollowing-out and population aging, and has significant impacts on rural development and farmers' livelihoods. Based on the Sustainable Livelihood Framework (SLF) and survey data from typical pilots, this study explores the underlying mechanism of the rural homestead system reform and examines how the transfer of homestead use rights (THUR) influences farmers' livelihood capital. We found that THUR has a significant positive impact on farmers' livelihood capital. Besides, different transfer modes have distinct impacts on farmers' livelihood capital. Overall, this study provides a new theoretical and empirical perspective on the relationship between rural land reform and farmers' livelihood capital, filling the research gap in this field, and offering solutions for other developing countries to improve rural families' livelihood capital through land reform.***

Keywords: Transfer of Homestead Use Rights (THUR); Land Reform; Rural Livelihood Capital; Government Role.

1. INTRODUCTION

Rapid industrialization and urbanization are reshaping urban landscapes while unintentionally disrupting rural areas (Vista et al., 2012; Netshipale et al., 2020; Totin et al., 2021; Li et al., 2024; Appelt et al., 2024). Urban-rural income disparities have driven significant rural outmigration, leaving much rural land increasingly 'uninhabited' and 'uncultivated' (Zhou et al., 2020). For those remaining, rising living costs, limited access to education and healthcare, and declining agricultural incomes have exacerbated livelihood insecurity. According to the United Nations Human Settlements Programme (UN-Habitat, 2024), as of 2024, 2.8 billion people globally are facing some form of housing inadequacy, 1.1 billion people are living in informal settlements, and at least 318 million people are homeless. This challenge is more severe in the rural areas of developing countries. In many developing countries, rural-to-urban migration has further intensified these issues, weakening traditional rural structures, threatening agricultural sustainability, and contributing to social instability (Brown et al., 2002; Fabusoro et al., 2008; Cramb et al., 2009; Cai et al., 2020).

Land rights are widely regarded as the cornerstone of farmers' livelihood security, directly influencing resource access, investment decisions, and income generation (Abdulai et al., 2012; Pandey et al., 2017; Liu et al., 2021; Totin et al., 2021). Globally, land reforms have demonstrated transformative potential. For example, Deininger and Squire (1998) found that secure land ownership enhances agricultural productivity and reduces poverty. Fabusoro et al. (2008) and Cao et al. (2019) highlighted a strong connection between land tenure, farmers' livelihoods, and housing usage. Guo et al. (2019) found that land transfer significantly enhances farmers' livelihood capital. Netshipale et al. (2020), in their study of land reform in South Africa, concluded that such reforms positively contribute to the livelihoods of beneficiaries. Wu et al. (2021), using the Grain-for-Green program as a case study, examined changes in farmers' income and livelihood diversity, emphasizing that this policy has hindered the sustainability of rural livelihoods.

To address these challenges, the Chinese government introduced the 'separation of three rights' reform in 2018. This policy divides homestead (rural residential land) land rights into ownership, qualification, and use rights, enabling the transfer of homestead use rights (THUR). Theoretically, THUR provides a way to make rural land use more efficient, boost industrial growth, and increase farmers' income.

Since the inception of the homestead reforms, numerous scholars have focused on the impact of homestead system reform on farmers' livelihood income and household welfare. Liu et al. (2021) demonstrated that homestead withdrawal significantly influences farmers' resource endowment and argued that strengthened perceptions of

mortgage rights enhance household security. Finally, Wang et al. (2024), based on survey data from Yiwu, Zhejiang Province, China, analyzed the effects of homestead reform on farmers' welfare, further exploring variations across villages and farming households. Additionally, some studies have examined homestead transfer behavior or willingness from the perspectives of livelihood capital composition and strategy combinations (Wang & Li, 2024). However, existing research has yet to incorporate the dynamic changes in livelihood capital into a systematic analytical framework.

This study is based on nationwide survey data collected in 2022, comprising approximately 2,000 questionnaires from 10 pilot regions involved in homestead reform. The analysis considers the significant regional differences across China and integrates theoretical insights with empirical verification. First, we conducted participatory interviews with farmers to gather a comprehensive set of livelihood-related indicators, including household income sources, human capital status, and homestead usage patterns, such as occupancy and transfer status. Second, we held discussions with grassroots government officials to gain an in-depth understanding of village-level conditions, including locational characteristics, economic development, population distribution, and the vacancy rates of rural housing. Finally, based on these field investigations, we categorized and summarized the key issues, identified research directions from practical challenges, and employed various econometric methods to examine how the transfer of homestead use rights impacts the improvement of farmers' livelihood capital.

This study offers a fresh perspective on the relationship between rural land reform and farmers' livelihood capital, exploring the differentiated impacts of various transaction modes. It provides policy support and empirical evidence for governments aiming to optimize rural livelihood strategies. Unlike previous research, this study is grounded in the empirical data of developing countries characterized by high population density and limited arable land. It examines the potential of rural land reform to improve farmers' livelihoods amidst accelerating urbanization and continuous rural population outflow.

Specifically, this study makes contributions in the following areas: (i) It integrates China's rural land reform into the sustainable livelihood framework (SLF), systematically investigating farmers' and their families' behavioral patterns to maximize livelihood capital against the backdrop of shifting property rights, widening urban-rural disparities, and increasingly diversified livelihood strategies. The findings provide reform insights for developing countries that are similarly grappling with large populations and rural decline. (ii) The study examines the unique impacts of different transaction modes on livelihood capital, particularly the top-down government-led transaction model and the collective transaction model influenced by the 'herd effect.' By analyzing the motivations and objectives of various stakeholders in institutional reforms, the study reveals the superior effectiveness of the government-led model in enhancing livelihood capital. This research not only provides evidence supporting the mediating role of governments in rural land transfers but also offers valuable references for developing countries seeking to mitigate urban slum proliferation driven by large-scale rural-to-urban migration.

The structure of this paper is as follows: Section 2 reviews the background and theoretical framework. Section 3 outlines the methodology and materials. Section 4 presents the empirical results and analysis, followed by a discussion in Section 5. Finally, the conclusion summarizes the study's key contributions.

2. BACKGROUND AND THEORETICAL ANALYSIS

2.1 The Homestead Land System in China

China's rural land system, particularly the management of homestead land (Zhaijidi), has undergone significant transformations to address the demands of rural development and urbanization (Zhou et al., 2020). Homestead land refers to the residential land allocated to rural households for habitation, a system rooted in the collective farming model of the 1950s and 1960s. During this period, land ownership was vested in rural collectives, while households were granted long-term use rights for residence (Lu et al., 2020). These use rights, however, were nontransferable and could not be rented or sold, a restriction intended to maintain rural stability but which often resulted in inefficiencies and inequities in land resource utilization (Cao et al., 2019).

Over the decades, several challenges have emerged within the rural homestead system. Factors such as rural depopulation, aging populations, urban-rural income disparities, and abandoned homesteads have strained the system's effectiveness (Cai et al., 2020; Wu et al., 2020; Liu et al., 2021; Li et al., 2024; Wang & Li, 2024). Urbanization has intensified these issues, prompting calls for reform to improve land use efficiency and enhance rural livelihoods. One of the most pressing concerns has been the inability of rural residents to legally sell or lease

their homestead land under the current legal framework, which limits its economic potential (Gu et al., 2020).

In response to these challenges, China initiated pilot reforms in 2014 to create a more market-oriented approach to homestead management. These reforms aimed to address homestead abandonment, optimize land use, and improve rural residents' livelihoods through the monetization of homestead use rights (Kong et al., 2018; Kan, 2021). The initial pilot programs involved 15 counties, where local governments experimented with legalizing the transfer, leasing, and rental of homestead land while maintaining collective ownership. By 2017, the program expanded to 33 counties, further exploring mechanisms for land use rights transfer within a collective ownership framework.

The reform process reached a critical stage in 2020 with the launch of new pilot initiatives focusing on rural land-use rights and urban-rural integration. These initiatives were extended to 103 counties, reflecting the government's commitment to addressing rural land challenges on a broader scale. The overarching goal was to promote efficient homestead use, revitalize rural areas, and narrow the urban-rural income gap by enabling the transfer of homestead use rights (Kong et al., 2018; Tian et al., 2025).

The pilot reforms from 2014 to 2020 have laid a solid foundation for future policy development, providing valuable insights into the potential of market-oriented homestead systems to address rural inefficiencies, support rural revitalization, and foster equitable development.

2.2 The Sustainable Livelihood Framework and Farmers' Livelihood

The Sustainable Livelihood Framework (SLF), introduced by the UK's Department for International Development (DFID) in the 1990s, provides a robust analytical tool for understanding rural poverty and the factors that shape farmers' livelihoods (Chambers & Conway, 1992; DFID, 1999; Pandey et al., 2017). Widely used in both research and policymaking, the SLF evaluates the impact of rural land reforms and other interventions on the resources and resilience of farming households (Vista et al., 2012; Netshipale et al., 2020; Totin et al., 2021). At its core, the SLF categorizes the resources available to households into five types of livelihood capital: human, natural, financial, physical, and social (Scoones, 1998; Pandey et al., 2017). These capitals form the foundation of rural livelihoods, each contributing uniquely to farmers' well-being and adaptive capacity (Ellis, 2000). Human Capital encompasses farmers' health, skills, knowledge, and labor capacity, which are essential for agricultural productivity and diversification (Becker, 2009). Natural Capital includes access to and the quality of resources such as land, water, vegetation, and livestock, which directly support farming activities (Missemer, 2018). Financial Capital refers to cash, savings, credit, and other economic assets that enable investment and mitigate risks (Sen, 1997). Physical Capital involves infrastructure, machinery, tools, and other physical assets that enhance productivity and living standards (Moser, 1998). Social Capital represents the networks, trust, and reciprocal relationships within families, communities, and organizations that facilitate cooperation and support (Jackman & Miller, 1998).

Recent research has expanded the scope of livelihood capitals to include additional dimensions, reflecting the evolving complexities of rural livelihoods (Natarajan et al., 2022). For instance, cultural capital captures local knowledge, traditions, and identities that influence decision-making (Bourdieu, 1986; Ma et al., 2021), while mental (Psychological) capital considers psychological well-being and resilience. Political capital reflects access to and influence over decision-making processes and institutional frameworks (Ribot & Peluso, 2003; Li et al., 2020; Chipfupa et al., 2021). Furthermore, information capital, including access to knowledge and communication technologies, has become increasingly vital in modern rural contexts (Ostrom, 2000; Chowdhury, 2021). These expanded categorizations highlight the dynamic and interconnected nature of livelihood capitals, demonstrating that no single capital functions independently. Instead, their interactions collectively shape the vulnerability and adaptive capacity of rural households. For instance, access to financial capital can facilitate investments in physical and human capital, while robust social networks can help buffer the risks posed by environmental shocks.

The Sustainable Livelihoods Framework (SLF) offers a comprehensive approach to analyzing these interactions, providing a nuanced understanding of how rural land reforms and policy interventions influence farmers' livelihoods. By incorporating multiple dimensions, we can not only examine the immediate effects of policy changes, such as property rights adjustments but also shed light on their potential long-term implications. This holistic perspective enables policymakers to better anticipate and address the multifaceted impacts of policy shocks on farmers' livelihood capitals, ultimately guiding the development of more effective and sustainable interventions.

3. METHODOLOGY AND MATERIAL

3.1 Data Source

In this study, data were collected through an extensive field survey conducted between July and September 2022. The survey encompassed ten strategically selected pilot regions across China, designated for rural homestead reforms. These regions were chosen based on their diverse socio-economic development stages and varied topographical features, ensuring a comprehensive representation of rural contexts. To achieve a holistic understanding, the survey sites were diversified, encompassing both traditional, remote agricultural villages and rapidly developing communities on the urban periphery.

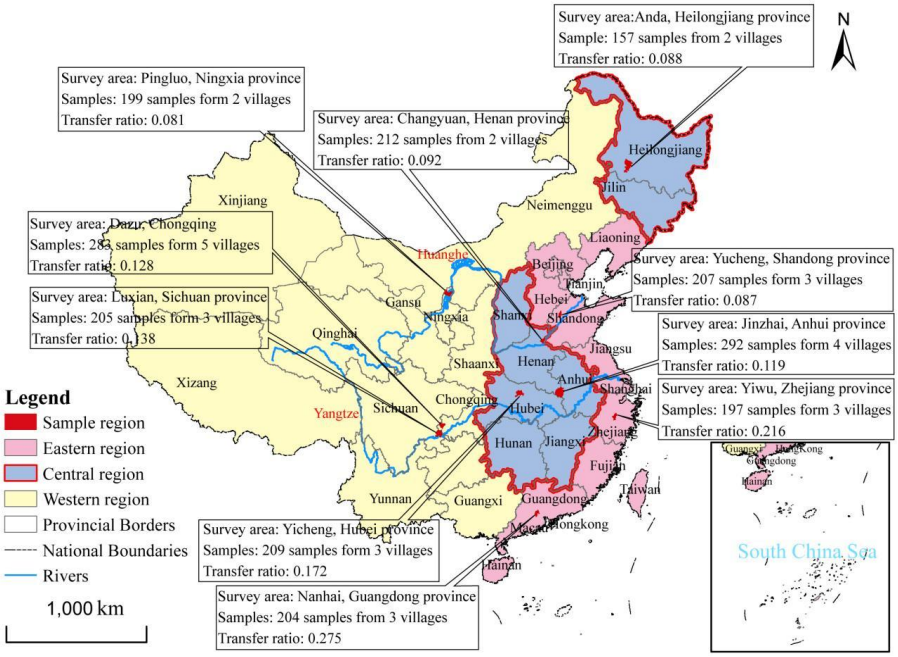

Figure 1: Survey areas in China

Note: These regions span the diverse geographical and socio-economic landscapes of the country, with Luxian, Dazu, and Pingluo representing the western provinces; Yicheng, Jinzhai, Changyuan, and Anda epitomizing the central territories; and Yucheng, Yiwu, and Nanhai exemplifying the eastern zones.

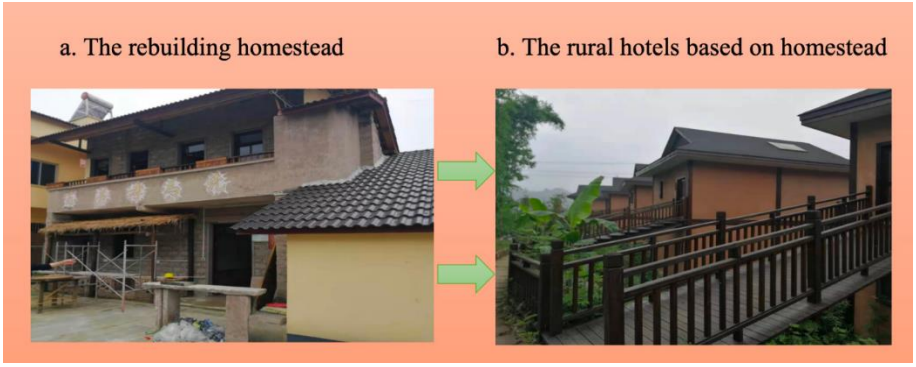

Figure 2: A sample case of homestead 'transfer-rebuild-profit'

Note: Figure 2 illustrates a representative case of the homestead 'transfer-rebuild-profit' model, showcasing how idle homestead land is transferred, rebuilt into value-added assets, and generates economic returns for stakeholders.

In the preliminary phase, extreme outlier samples were identified and excluded to maintain data integrity. Follow-up telephone interviews were conducted to resolve discrepancies, such as incomplete or incorrectly selected samples. To further ensure the reliability of the dataset, rigorous reliability and validity assessments were performed, reinforcing the scientific rigor of the findings. As a result of this meticulous process, the study achieved a robust sample size of 2,165 with an impressive effective response rate of 98.4%.

3.2 Model

3.2.1 Propensity Score Matching (PSM)

The Propensity Score Matching (PSM) method is extensively employed in econometric researches (Abadie and Imbens, 2016). In this study, we utilized the PSM method to examine the impact of THUR on farmers' livelihood capital. The influence of THUR is modulated by a multitude of latent factors, including psychological dimensions, livelihood dynamics, external conditions, and prevailing policies. By conducting a comparative analysis of the livelihood capital across these groups, we elucidate the Average Treatment Effect (ATT) of THUR on farmers' livelihood capital.

$$ATT = E\{E[Y_1|Trans = 1, P(X)] - E[[Y_0|Trans = 0, P(X)]]\} \quad (1)$$

The Propensity Score Matching method involves four crucial steps: (1) Defining covariates and generating propensity scores using the Logit model. (2) Employing four matching methods—neighborhood, caliper, caliper neighborhood, and kernel—to assess consistency and effectiveness. (3) Conducting balance and common support tests for result evaluation. (4) Get the Average Treatment Effect (ATT).

3.2.2 Moderation effect model

In this study, the transfer mode is conceptualized as a moderating variable. It is categorized into three distinct classifications: government-led (1), collective-led (2), and self-led (3). This classification framework enables an empirical evaluation of the differential impacts associated with each mode. The analytical model is structured to systematically investigate these effects.

$$LC = \alpha_0 + \alpha_1 Trans + \alpha_2 Mode + \alpha_3 Trans \times Mode + \alpha_4 Control + \delta \quad (2)$$

$Mode$ means the transfer mode, $Trans$ is the transfer of homestead use right (THUR), LC is farmers' livelihood capitals, $Trans \times Mode$ is the interaction term of THUR and transfer mode, and the rest are the coefficients to be estimated, control variables and residuals. In addition, the moderating effect exists if α_3 passes the significance test.

3.2.3 Instrumental variable (IV) approach

The IV-Two-Stage Least Square (IV-2SLS) regression is used to solve the endogenous problems in this research. Firstly, the first-stage estimation equation is as follows:

$$Trans = \rho_0 + \rho_1 IV_1 + \rho_2 IV_2 + \rho_3 Control + \varepsilon \quad (3)$$

Secondly, the second-stage estimation equation is established:

$$LC = \lambda_0 + \lambda_1 \hat{T}rans + \lambda_2 Control + \xi \quad (4)$$

Where Eqs. (3) is the first-stage estimation equation, the $Trans$ is the dependent variable, and the instrumental variables are the independent variables of this equation; Eqs. (4) is the second-stage estimation equation, the farmers' livelihood capital is the dependent variable, and the $\hat{T}rans$ is the independent variable. The remaining are the coefficients to be estimated and the residuals.

3.3 Variables

3.3.1 Farmers' livelihood capitals

In line with prior studies (Bourdieu, 1986; Chambers et al., 1992; Fang et al., 2014; Xu et al., 2017; Xu et al., 2019; Guo et al., 2019; Chipfupa, 2021; Wu et al., 2021; Ghazali et al., 2023), We constructed a measurement index system of farmers' livelihood capital, including 6 dimensions and 19 indicators, and used the TOPSIS method to calculate the weight of variables in farmers' livelihood capital. The results are as follows (Table 1).

Table 1: Index of farmers' livelihood capital

Variable	Indicator	Definition	Weight
Livelihood Capital	-	-	1

	Labor force	The number of individuals aged 15 to 65 in a household	0.079
Human Capital	Education	Average years of schooling	0.031
	Health	Scale 1(very poor) - 5(very good)+	0.026
	Employment	Scale 1(very poor) - 5(very good)+	0.056
Natural Capital	Farmland size	Area of agricultural land	0.106
	Farmland quality	Scale 1(very poor) - 5(very good)+	0.086
	Agricultural machinery	Total value of agricultural machinery	0.059
Physical Capital	House	Scale 1(very poor) - 5(very good)+	0.051
	Infrastructure	Scale 1(very poor) - 5(very good)+	0.059
	Relationship with authorities	Scale 1(very poor) - 5(very good)+	0.097
Social Capital	Location	The distance between residence and town	0.081
	Relationship with neighbors	Scale 1(very poor) - 5(very good)+	0.080
Financial Capital	Available loans	Loans that can be obtained from financial institutions	0.008
	Family savings	Household savings	0.032
	Government subsidies	Annual government subsidy	0.071
Mental Capital	Policy understanding of the THUR	Yes=1; No=0	0.005
	Distribution intention of the THUR	Yes=1; No=0	0.021
	Planning to settle in towns	Yes=1; No=0	0.042

3.3.2 Transfer of homestead use rights (THUR)

The core explanatory variable is the transfer of homestead use right (THUR), measured by the question: 'Was your homestead transferred to others in the past year?' This variable is a binary dummy variable.

3.3.3 Control variables

Based on previous literature (Fang et al., 2014; Yu et al., 2016; Missemer, 2018; Scoones, 2018; Kuang, 2019; Guo et al., 2019; Chowdhury, 2021; Ghazali et al., 2023), we select three sets of covariates as control variables. The first set comprises individual-level variables, including the age, sex, and education level of the household head, as well as official position, low-income subsidy, off-farm work, and rural endowment insurance. The second set pertains to household characteristics, such as housing cost, homestead area, family size and income, urban housing ownership, housing security, and per capita arable land area. The third set encompasses village-level characteristics, including the village's economic status and infrastructure.

3.3.4 Instrumental variable

This paper employs instrumental variables (IV) to address the issue of endogeneity. The two instrumental variables used are: (i) whether their neighbors have transferred their own homestead use rights (IV1), and (ii) the geographical location of the homestead (IV2). On the one hand, farmers in the same locality exhibit strong imitative behavior, with similar transfer decisions influenced by 'herd behavior' (Singh et al., 2023). On the other hand, livelihood capital is typically dependent on individual and family capabilities and thus lacks a direct correlation with the homestead usage and location of surrounding farmers.

3.3.5 Moderating variable

The modes of THUR include: (i) Government-led, (ii) Collective-led, and (iii) Self-led. The selection of these modes correlates with the development of the local homestead market and farmers' risk awareness. Farmers with a high-risk preference tend to transfer by themselves, while risk-neutral farmers are influenced by village collective behavior, as collective-led transfers can reduce uncertainty. Risk-averse farmers prefer government-guided transfers.

Table 2: Descriptive statistic of variables

Variables	Description	Mean	St.D
	Explained variable		
Livelihood capital	Farmers' livelihood capital (Human, Natural, Physical, Social, Financial, Mental capital)	0.453	0.263
	Core explanatory variable		

THUR	(yes or no)	0.316	0.465
	Control Variable		
Age	Age of household's head	52.135	13.117
Sex	Sex of household's head, male=1; female=0	0.710	0.454
Education	Education of household's head①	1.891	0.927
Official position	Having the official position? Yes=1; No=0	0.085	0.279
Low-income subsidy	Having the five guarantees②? Yes=1; No=0	0.069	0.254
Off-farm work	Off-farm work time per year	6.507	4.823
Rural endowment insurance	Yes=1; No=0	0.651	0.477
Housing cost	Cost of building (10^3 RMB)	1.856	1.803
Homestead area	Area of homestead (m^2)	168.066	103.147
Family size	Number of family members	4.370	1.577
Family income	Family income per year (10^3 RMB)	9.640	7.419
Urban housing	Having a urban housing?Yes=1; No=0	0.359	0.480
Housing security	Considering homestead as housing security? Yes=1; No=0	0.715	0.452
Farmland size	Per capita cultivated land area (hm^2)	0.217	0.235
Village's economy	Scale 1(very poor) - 5(very good)+	2.195	0.591
Village's infrastructure	Scale 1(very poor) - 5(very good)+	2.271	0.619
	Instrumental Variable		
IV_1	Whether their neighbors have transferred their own homestead use rights? Yes=1; No=0	0.302	0.459
IV_2	Geographical location of the homesteads	0.416	0.493
	Moderating Variable		
Mode	Government-led = 1; Collective-led = 2， Self-led = 3	1.948	0.468

Notes: (i) Education level: 1=Primary school, 2=Junior high school, 3=High school, 4=University, and 5=Graduate school. (ii) In China, five guarantees refer to individuals in rural areas who are unable to support themselves through their own labor or by receiving care from relatives. These individuals, such as solitary elderly, disabled persons, and minors, receive government-provided financial support.

4. RESULTS

4.1 Results of PSM method

By adding the control variables, this study employed various matching methods such as neighbor matching, caliper matching, caliper neighbor matching, and kernel matching to get the matching score. Specifically, neighbor matching with k=4 was exemplified.

Table 3 presents the factors that significantly impact the THUR. Firstly, family size has a significantly negative effect on THUR. Larger families have higher housing demands, resulting in a lower probability of homestead transfer. Secondly, the education level of the household head also negatively impacts THUR. Farmers with lower education levels are generally more inclined towards short-term gains rather than long-term benefits, leading them to transfer out their homesteads. Thirdly, urban housing has a significantly positive effect on the THUR indicating that farmers with rural properties are more likely to settle in urban areas. Additionally, family income shows a significantly positive impact on THUR; higher-income families are more inclined to work and live in the city and exhibit a stronger willingness to transfer their homesteads. Finally, farmers with rural endowment insurance are less likely to transfer out their homesteads. This is because participants in rural endowment insurance programs often settle in rural areas, lack income diversity, and have limited opportunities for homestead transfer.

Table 3: Results of PSM method (Logit model)

Variable	Coefficient	p>z
Age	-0.0006	0.942
Sex	-0.1156	0.513
Education	-0.3959	0.000***
Official position	0.1753	0.559
Low-income subsidy	0.3437	0.269
Off-farm work	-0.0226	0.217
Rural endowment insurance	-0.3723	0.042**

Housing cost	0.0042		0.496
Homestead area	-0.0013		0.123
Family size	-0.0987		0.077*
Family income	0.0575		0.000***
Urban housing	0.9915		0.000***
Housing security	0.0032		0.986
Farmland size	0.1302		0.321
Village's economy	0.2053		0.266
Village's infrastructure	0.1395		0.435
Constant	-0.7609		0.274
LR-value		120.52	
P-value		0.000	
Obs.		2,165	

Note: VIF < 10; *** P<1%, **P<5%, *P<10%, the same as below.

4.2 Test of matching effect

4.2.1 Overall test of matching effect

As shown in Table 4, the LR statistic significantly decreased to a range of 4.03 to 20.96, and the pseudo-R^2 value significantly dropped to a range of 0.005 to 0.03. These results indicate that the propensity score matching effectively screened the control group and treatment group samples, reducing the differences between the groups and resulting in higher matching quality.

Table 4: Results of Overall Test

	Pseudo-R^2	LR	P Value	Standardized Bias(%)
Before matching	0.109	118.26	0.000	15.8
Nearest neighbor matching	0.017	12.30	0.723	4.7
Caliper nearest neighbor matching	0.013	9.42	0.895	4.9
Caliper matching	0.030	20.96	0.180	6.6
Kernel matching	0.005	4.03	0.999	3.7

4.2.2 Balance test

A balance test was conducted to ensure the robustness of the matching results. The standardized bias of explanatory and most control variables dropped below 10% after matching, and all t-tests failed to reject the null hypothesis, indicating no systematic differences between the treatment and control groups. These results confirm that the PSM method effectively balanced the sample groups, providing a solid basis for analyzing the impact of THUR on farmers' livelihood capital.

4.2.3 Common support test

Evaluating the common support area is essential for reliable matching results. Figure 3 shows substantial overlap in propensity scores between the control and treatment groups after matching, with most values falling within the common range, and only seven samples falling outside of a total sample size of 2,165. This small loss is well within acceptable limits, confirming the validity of the matching process.

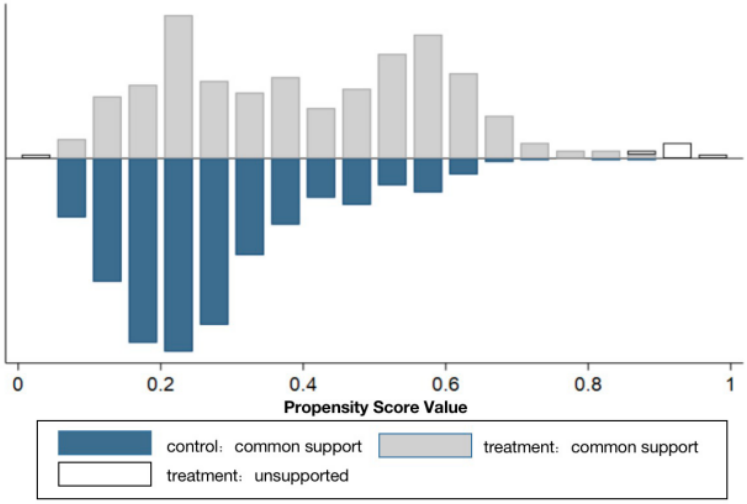

Figure 3: Common support test

Figure 4 presents kernel density plots before and after propensity score matching. Post-matching, the disparity between the treatment and control groups is significantly minimized, with the density distributions showing greater alignment. This demonstrates a notable improvement in group comparability, indicating high matching quality. Additionally, the results support the common support assumption, confirming that propensity score matching effectively balances group characteristics.

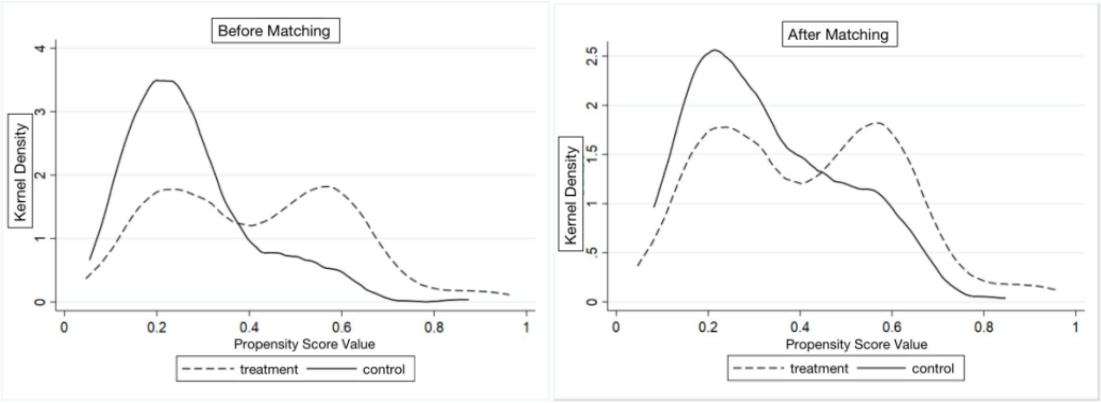

Figure 4: Kernel Density Map of PSM

4.3 Results of Average Treatment Effect

4.3.1 The average treatment effect of THUR on livelihood capital

Table 5 presents the results showing that the impact of THUR on farmers' livelihood capital remains consistent across all four matching methods. The robustness of the findings is confirmed by the statistical significance of the coefficients, both before and after matching. However, post-matching, the coefficient decreases from 0.1514 to a range of 0.1176-0.1373, suggesting that direct estimation using the sample data without accounting for bias would lead to an overestimation of the effect of THUR on farmers' livelihood capital.

Table 5: ATT of THUR on livelihood capital

	Before matching (1)		Nearest neighbor matching (2)		Caliper nearest neighbor matching (3)		Caliper matching (4)		Kernel matching (5)	
	ATT	T Value	ATT	T Value	ATT	T Value	ATT	T Value	ATT	T Value
Livelihood Capital	0.151***	8.17	0.131***	5.31	0.118***	4.85	0.125***	4.24	0.137***	6.09
Natural Capital	0.028**	5.23	0.022***	3.12	0.020**	2.93	0.018**	2.15	0.023***	3.51
Human Capital	0.031**	6.52	0.033***	5.18	0.029***	4.68	0.028***	3.68	0.033***	5.77

Financial Capital	0.019**	6.01	0.014***	3.35	0.014***	3.53	0.017***	3.67	0.016***	4.27
Social Capital	0.045**	6.24	0.037***	3.90	0.031***	3.40	0.037***	3.35	0.038***	4.40
Physical Capital	0.023**	4.91	0.023***	3.71	0.019***	3.28	0.022***	3.05	0.021***	3.82
Mental Capital	0.006**	3.52	0.003	1.16	0.002	1.11	0.002	0.78	0.004**	2.05

Columns (1) show that the THUR significantly enhances livelihood capital, with an improvement ranging from 11.76% to 13.73%. This positive impact can be attributed to two key factors. First, THUR enables farmers to generate rental income from their homesteads, providing a stable source of earnings. Second, large-scale homestead transfers stimulate the rapid development of local industries, creating more employment opportunities and driving higher wages for farmers.

4.3.2 The average treatment effect of different livelihood capital

The influence coefficient of natural capital decreases from 0.0281 to a range of 0.0181- 0.0233 after matching, indicating that sample bias led to an overestimation of farmers' natural capital levels. Transfer activities can accelerate infrastructure development and improve the ecological environment through industries such as tourism and healthcare. As rural homesteads are transferred, farmers relocate, shifting away from traditional scattered agriculture to mechanized, large-scale farming. This transition reduces the use of chemical fertilizers and pesticides, thereby enhancing the quality of cultivated land.

THUR significantly enhances human capital. The income generated from transfers supports family education, healthcare, and vocational training. Additionally, the transfer process improves employment opportunities, fostering human capital development.

The transfer also significantly boosts farmers' financial capital by increasing their property income. While the coefficient slightly declines post-matching, suggesting some bias in the original estimates, transfers remain a vital means of raising financial capital through rents, dividends, or wages. Additionally, reinvesting transfer income into rural agricultural production helps expand farmers' interpersonal networks and increases their available financial resources.

Social capital sees a notable improvement following the THUR. Increased business opportunities strengthen farmers' social and economic ties, while reforms to the homestead system enhance internal village relations. These changes foster stronger economic connections and social interactions among rural households.

Physical capital levels also rise significantly after the transfer, although the coefficient slightly declines post-matching. After the THUR, homesteads are often repurposed for business development. Improvements to existing houses enhance family housing quality, while transfer income is often invested in production tools, boosting agricultural output and accelerating material capital accumulation.

Mental capital shows a significant impact before matching, but this effect becomes statistically insignificant after matching, suggesting that bias may have overestimated the transfer's influence on mental capital. Overall, farmers' perception of the equitable distribution of homestead income remains poor, limiting the transfer's ability to significantly enhance mental capital.

4.4 Robustness Tests

4.4.1 Substitution of estimation model

This paper employs a robustness test using the Tobit model to analyze the impact of THUR on farmers' livelihood capital. The regression results, presented in Table 6, reveal that THUR has a significant effect on livelihood capital and successfully passes the significance test, further supporting the robustness of the findings.

Table 6: Results of Tobit model

	Llivelihood Capital (1)	Natural Capital (2)	Human Capital (3)	Financial Capital (4)	Physical Capital (5)	Social Capital (5)	Mental Capital (6)
THUR	0.129***	0.051***	0.031***	0.016***	0.031***	0.064***	0.004**

	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.049)
Control Variables	√	√	√	√	√	√	√
LR	124.09	68.89	77.15	69.48	81.84	111.34	43.3
P - Value	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pseudo R^2	0.853	0.214	0.003	0.023	0.105	0.301	0.01
Obs.	2,165	2,165	2,165	2,165	2,165	2,165	2,165

Note: P - value is in parenthese, the same as below.

4.4.2 Endogenous Analysis

To address potential endogeneity, instrumental variables were selected based on existing practices and literature, and the Instrumental Variable-Two-Stage Least Squares (IV-2SLS) method was employed for estimation. The instrumental variables used are whether neighbors transfer their homestead use rights (IV1) and the geographical location of the homestead (IV2). The identification test for the instrumental variables yielded an F value of 16.324, which exceeds the critical value at the 5% significance level, indicating strong instrument relevance. Furthermore, the over-identification test results show P-values of 0.9016 and 0.9027, confirming the validity of the instruments.

Columns (3) and (4) in Table 7 present the IV-2SLS estimation results. After incorporating the instrumental variables, the influence coefficient remains significantly positive, increasing from 0.15 to 0.42. This indicates that, even after addressing potential endogeneity, THUR significantly improves farmers' livelihood capital levels. These findings highlight the robustness of the conclusion, underscoring the substantial impact of THUR on enhancing farmers' livelihoods.

Table 7: Regression results of IV-2SLS

	OLS		IV-2SLS	
	(1)	(2)	(3)	(4)
THUR	0.151***	0.129***		0.425***
	(0.00)	(0.00)		(0.00)
IV_1			0.171***	
			(0.00)	
IV_2			0.039**	
			(0.03)	
Control Variables		√	√	√
Constant	0.405***	0.408***	0.283**	0.313***
	(0.00)	(0.00)	(0.03)	(0.00)
F	66.67	7.68	9.43	
R2	0.071	0.133	0.166	0.149
P - value			0.902	
Obs.	2,165	2,165	2,165	

5. HETEROGENEOUS EFFECT BASED ON TRANSFER MODES

Farmers, traditionally characterized by their risk-averse nature, often adhere to a 'safety-first' approach in agricultural production management (Yu et al., 2016; Wang & Li, 2024). This cautious strategy prioritizes minimizing perceived risks over pursuing potential benefits, frequently resulting in the forfeiture of opportunities for growth. Such tendencies can hinder the adoption of innovative technologies and policies, limiting prospects for capital development and livelihood enhancement. Farmers' psychological risk preferences play a critical role in shaping their decision-making processes, particularly regarding the Transfer of Homestead Use Rights (THUR). Based on the interplay between autonomy and risk preference, THUR modes can be categorized into three distinct types: government-led, collective-led, and self-led modes.

The government-led mode involves the government taking the lead in THUR, supported by market mechanisms. Methods such as the 'land ticket trading system' and 'increase-decrease linkage' (Kong et al., 2018; Huang, 2018) aim to overcome land market restrictions and integrate urban and rural land resources. In contrast, the collective-led mode facilitates THUR through cooperative efforts, using supervision and coordination fees to enhance efficiency and boost farmers' income. Lastly, the farmer-led mode offers higher returns but comes with significant risks. Farmers independently sign contracts with urban enterprises to earn transfer income, but they face potential issues such as contract breaches, housing quality degradation, loss of development rights, and reduced livelihood income.

The government-led mode involves more active participation by the government than other modes. It also provides comprehensive follow-up support, focusing on rural economic stability and policy implementation (Kong et al., 2018; Huang, 2018; Zhang, 2018). In the collective-led approach, the collective serves as a supervisor and mediator. It collects a predetermined fee during transfers, conducts holistic assessments of transfer objects and scales, oversees the formulation and execution of transfer contracts by involved parties, and enhances the harmonious growth of the homestead market and other economic sectors by reinforcing the development of village collective functions.

To adjust rural industries and integrate village land resources, governments frequently undertake comprehensive planning of homestead land for entire villages (Lu et al., 2020; Liu et al., 2024). Regardless of the economic status of the area, the government often offers a price that exceeds the market value due to the high demand for consolidated housing land. Additionally, given the specific role of the government, provisions are made to ensure sustainable livelihood protection for farmers after the THUR.

To evaluate the impact of different transfer modes on farmers' livelihoods, this study incorporates an interaction term between transfer modes and THUR into the base model. The results, presented in Table 8, reveal that transfer modes significantly affect livelihood capital. Specifically, transfer modes with lower constraints and greater autonomy are associated with higher risks and reduced livelihood capital. In contrast, modes with stricter adherence to policy arrangements and less transfer autonomy demonstrate that structured participation in homestead transfers better safeguards livelihood capital.

The government-led transfer mode emerges as particularly effective in protecting farmers' primary living and development rights. This mode helps mitigate livelihood risks and promotes capital accumulation by implementing supportive policies that encourage participation while ensuring stability for settlement and elder care. Furthermore, it reduces transaction and contract enforcement costs, minimizes the risk of buyer-seller defaults, and addresses information asymmetries. By fostering security and reducing resistance, the government-led mode significantly enhances farmers' livelihood capital.

Table 8: Estimation results of the transfer modes

	OLS		Tobit	
	(1)	(2)	(3)	(4)
THUR	0.127**	0.238***	0.127***	0.238***
	(6.54)	(4.71)	(6.61)	(4.76)
Mode	0.018*	0.038***	0.018*	0.038***
	(1.71)	(2.81)	(1.73)	(2.85)
Mode * THUR		-0.052**		-0.052***
		(-2.38)		(-2.41)
Control Variables	√	√	√	√
Constant	0.358***	0.314***	0.358***	0.314***
	(4.53)	(3.89)	(4.58)	(3.93)
R^2	0.136	0.142		
Wald χ^2			127.09	132.86
Pseudo R^2			0.873	0.9131
Obs.	2,165	2,165	2,165	2,165

6. CONCLUSION

In 2018, the Chinese government implemented the 'separation of three rights' reform for rural homestead land. This policy aims to remove restrictions on the 'non-transferability' of rural homestead land within the current legal framework, transforming it into a fixed asset with property value. Whether for farmers who have settled in urban areas or those engaged in seasonal urban employment, this reform offers significant potential to improve livelihoods and promote sustainable rural housing management.

This study, for the first time, uses survey data from China to examine the impact of the THUR on farmers' livelihood capital. The findings reveal that THUR can enhance farmers' livelihood capital by 15%. Specifically, THUR provides stable rental income and improves housing quality for low-income households, enhancing their social impact and participation. Additionally, it supports eco-friendly tourism and sustainable agriculture, reducing the use of fertilizers and pesticides.

Empirical results indicate that the government-led mode significantly enhances farmers' livelihood capital. By prioritizing social stability and farmers' welfare, the government plays a vital role in mitigating risks and fostering capital accumulation. Additionally, the government actively engages in regulating and planning homestead use, providing financial support for rural housing renovations and upgrades. These measures underscore the critical role of government support in safeguarding and enhancing farmers' livelihood capital. The Coase theorem suggests that when transaction costs are negligible, and property rights are clearly defined, Pareto optimal outcomes can be achieved. In the context of homesteads, initial property rights are clearly allocated to farmers. However, the practical conditions for a complete market as envisioned by the theorem are rarely met. In reality, significant transaction costs—such as those associated with information gathering, negotiation, and contract enforcement—persist during the transfer process. A government-led transfer model helps address these challenges by reducing transaction costs and improving market efficiency, ultimately optimizing farmers' livelihood capital through structured support and oversight.

Although the rural homestead land system is a unique feature of China, its study carries significant academic and practical relevance. First, this system directly impacts the livelihoods of over 600 million rural residents in China, making it a vital area of research for understanding livelihood dynamics in rural contexts. Second, China's reform experiences offer valuable lessons for other developing countries, demonstrating how limited rural land resources can be converted into productive assets that generate economic benefits for farmers. Finally, this study provides a potential strategy for addressing slums and homelessness in the context of urbanization: government intervention in rural housing transactions can effectively safeguard farmers' livelihoods while promoting sustainable development.

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