Impact of Land Certification on Rural-Urban Migration in China

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Abstract

This study examines the influence of land certification on the rural-urban migration dynamics in China, amidst significant rural land use policy reforms and the extensive implementation of a land certification program in the 2010s. Utilizing household-level data from various Chinese communities, the research hypothesizes that land certification encourages rural inhabitants to migrate to urban areas seeking employment. By analyzing data from the China Health and Retirement Longitudinal Study (CHARLS) spanning 2011, 2013, 2015, and 2018 through a Difference-in-Differences approach and a two-way fixed effect model, the study uncovers a notable positive effect of land certification on rural-urban migration. The findings suggest that land certification provides the necessary security and economic leverage for rural residents to pursue labor mobility. This research contributes significantly to understanding the complex relationship between land certification and migration, offering insights for policy development and further investigation into land use and migration patterns.

1   Introduction

China's post-1978 reforms set the stage for significant changes in rural land use

policies, reshaping the nation's socio-economic fabric. A pivotal element in this transformation has been the large-scale land certification program initiated in the 2010s, designed to stabilize land rights and, potentially, act as a catalyst for rural-urban migration. In China's context, since land is owned by the state, land certification refers to the confirmation and determination of the use rights and the content of other rights of land within a certain area (a piece of land) in accordance with the provisions of laws and policies. The core essence of confirming the right is to define the land contract management right of farmers in the form of the right to use certificate. Confirmation of rights on a per-household basis safeguards the property rights of farmers, stabilizes and improves the land contract relationship, and lays an important foundation for revitalizing land resources and improving the efficiency of rural land use. This paper examines the influence of land certification on the propensity of rural households in China to migrate to urban areas in search of employment opportunities, thereby bridging the gap between agricultural stability and urban economic opportunities.

Our hypothesis posits that land certification provides rural households with the security and economic leverage necessary to migrate to urban areas. Drawing from the robust China Health and Retirement Longitudinal Study (CHARLS), we leverage a Difference-in-Differences (DID) approach coupled with two-way fixed effect models to analyze panel data, aiming to distill the causal effects of land certification on migration patterns.

This study contributes to the growing body of literature on migration and land rights who focus on migration decisions in the context of agricultural policy shifts. However, our research diverges by delving into the interplay between land certification and access to urban employment markets, thereby addressing a gap in understanding the full socio-economic repercussions of land policy reform. We combine rich individual- and household-level panel data from China for 2011-2018 and a structural model to

quantify the importance of land security for labor mobility and structural change.

We aim to elucidate the intricate relationship between land certification and migration—a phenomenon that not only affects the livelihoods of millions but also stands as a testament to the shifting paradigms in a nation's march towards modernization and economic diversification. Our findings promise to offer fresh insights into the role of policy in shaping labor dynamics across the rural-urban divide, highlighting a critical intersection of land rights and economic development.

2 Literature Review

The interplay between land certification and rural-urban migration in China presents a complex and multifaceted subject that intersects various fields of study. This literature review synthesizes findings from recent studies, focusing on how land certification affects labor allocation, agricultural productivity, and the propensity of rural dwellers to migrate to urban areas.

Land Certification and Agricultural Productivity

Land certification in China, aimed at providing secure land titles to farmers, is a significant reform that has reshaped agricultural productivity and labor dynamics. Gao et al. [2021] demonstrate that land certification leads to well-defined property rights, enhancing land and labor reallocation to more efficient farms with positive aggregate effects. Chari et al. [2021] and Jin and Deininger [2009] also present how Land Certification Programs (LCPs) affect aggregate output through the land rental market. These findings align with earlier research that robust property rights are instrumental in fostering economic growth, as secure property rights incentivize investment and trade, contributing to better overall economic performance [Yao, 2000].

Land Certification and Labor Reallocation

The impact of land certification on labor allocation is particularly noteworthy. Studies have shown that certification programs encouraging more secure property rights result in a notable shift in labor from less productive agricultural sectors to more productive non-agricultural sectors. This shift, evidenced by the increase in rural out-migration, is a phenomenon observed not only in China but also in other developing countries undergoing similar land reforms [Mullan et al., 2011][Giles and Mu]. Secure land tenure has been linked to increased output in various ways, such as changing land-use patterns and fostering participation in land rental markets, which can indirectly influence labor allocation and migration patterns [De Janvry et al., 2015]. An increased land property security is akin to a reduction of the tax on migration through decreasing the probability of expropriation, which boosts migration incentives [Tao and Xu, 2007]. However, this positive effect is counterbalanced by a negative effect due to the complementarity between land and farm labor. A decrease in the overall probability of expropriation means that the household will keep more land, which necessitates farm labor and decreases migration incentives. Conversely, a high probability of expropriation raises the relative return to migration. Hence, in our simple model, the development of land rights associated with an increase in tenure security may have a positive or negative net effect on migration [Mullan et al., 2011].

Land Certification Program in China

The current state of land certification in China, especially the new round initiated in 2009 and starting large-scale implementation in 2013, responds to the challenges posed by insecure land tenure and inefficiencies in the land rental market. This program, more comprehensive than its predecessors, focuses on detailed land information, including location, size, and boundaries, thereby enhancing the security of land tenure and encouraging participation in the farmland rental market [Gao et al., 2021]. This comprehensive approach has led to a notable increase in the rate of land certification,

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aiming to stabilize long-term land contract relationships and facilitate the use of tenure security in renting and mortgaging land.

Literature Implications

Our research directly links land certification and migration patterns in China. The data used in previous studies are limited geographically and within cross-sectional or in a short period. For instance, the 2012 China Health and Retirement Longitudinal Study (CHARLS) used by Wang et al. [2018] only incorporates examples from two pilot provinces each in eastern, central, and western China; Zheng et al. [2023] cover 450 villages and 10257 households, but they only use 2011 CHARLS data; Zhang et al. [2022] gathered their data, covering only approximately 2000 households among five provinces in China; Gao et al. [2021] uses CFD data from 2015 to 2017. This paper draws on more nationally representative data. Therefore, We use the China Health and Retirement Longitudinal Study (CHARLS), which provides a robust data source for examining the effect of land certification and further mechanisms in depth. We will use 4 years data in total (2011, 2013, 2015, 2018) to examine the exact effects of the land certification program through the difference-in-difference method and will explore more effects of land certification on land transfer efficiency and household income.

3 Brief Theoretical Sketch

In contrast to developed countries where land rights are established by title deeds, in many developing countries, they are established by contingent use of the land. In this case, security of access requires evidence of productive use by the occupant, with the implication that leaving the land idle or renting it to others creates a substantial risk of loss of rights. This can be inefficient because it constrains labor on the land but ignores the potential returns to labor in alternative activities. Additionally, the limitations on

land transactions combined with insecure land use rights prevent the transfer of land from less productive users to more productive users. Therefore, researchers argue for a land certification program that ensures land rights based on certificates rather than use-based property rights, which require the owner's presence on the land and active use. The land certification policy could alleviate the distortion and inefficiency caused by tying labor to the land, thereby allowing for a more efficient allocation of labor across agriculture and other sectors.

In China, rural land is managed under the Household Responsibility System (HRS), through which households are allocated land-use rights. Under this system, land officially remains under collective ownership, but is allocated among village households to cultivate as they choose. When the HRS was initially introduced, land could not be transferred between households, and was subject to periodic reallocation at the discretion of the village leader. The property insecurity over agricultural land under the HRS is exacerbated by the risk of land expropriation for urban expansion and infrastructure developmentTao and Xu [2007]. A household considering whether to allocate labor to migration will account for the high risk of land expropriation in a future period, resulting from the reduction in household size. The effect of this increased risk may be viewed as similar to the effect of a tax on migration, and reduces the likelihood of migration. Land certification can be seen as a factor that potentially increases the security of land property, which may encourage households to reallocate labor or lease out their land, thus freeing up labor for urban migration.

However, there are multiple channels through which land certification could affect rural-urban labor mobility in the context of our study: First, after land rights are confirmed, the land rights and interests of farmers are safeguarded, and the security of land rights will stabilize farmers' expectations of land income, thereby encouraging investment in land and stimulating agricultural production, potentially suppressing non-farm

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labor migration. Secondly, the stability of farmers' land rights after confirmation has a legal basis, reducing the risk of land loss due to illegal appropriation or reallocation, thus lowering the cost of leaving the farm to work elsewhere and promoting non-farm labor migration. Thirdly, after land rights are confirmed, farmers can use their land management rights as collateral to obtain loans from financial institutions for productive investments, or they can join land cooperatives to receive dividends in the form of management rights or contracted cultivation, thus providing financial support for labor migration and improving the feasibility of rural labor transfer.

Our main hypothesis is that land certification provides rural households with the security and economic leverage needed to migrate to urban areas in search of employment opportunities. The unit of analysis is the household level, focusing on rural households across various communities in China. The primary variation comes from whether a household has received land certification or not. The assignment of land certification to households is assumed to be random across years, making the treatment (land certification status) exogenous to the outcome (migration decision). Households were categorized based on whether they have received land certification or not. To measure this variable, we use the China Health and Retirement Longitudinal Study (CHARLS) database from 2011, 2013, 2015, and 2018, whose household questionnaire collects land certification information from across the country. We define the treatment group as households receiving land certification in different years. The outcome variable of interest is the migration decision to urban areas, indicating whether any household member has migrated to an urban area for employment purposes.

4   Data

We utilized the China Health and Retirement Longitudinal Study (CHARLS) database from 2011, 2013, 2015, and 2018. The database has household and individual questionnaires where land certification is documented at the household level through questions such as: "Did your family receive land certificates? If so, when did you receive them?". Based on this information, we constructed a binary certification variable indicating whether a household received a land certificate in a specific year. Similarly, migration information is captured by questions like: "Are you employed by an employer outside of your residence area? On what scale?". This question indicates migrant workers' information at the individual level. To construct a household-level dummy variable, we merged the individual database and household database using the common household ID in both, and generated a binary migration variable indicating if at least one household member is a migrant worker in that family.

The description of the variables and data summary statistics is shown in Table 1, while Table 2 includes descriptive statistics for the mean, maximum, minimum, and standard deviation of some of the main variables.

Table 1: Variable Description

Variable	Description
Migrate	At least one family member in household i migrate to urban for seeking jobs in year t (=1)
Certification	Household i get land certificate in year t (=1)
Income	Household i annual non-agricultural income in year t (yuan)
Land	Land area household i owns in year t (mu)
Crop production	The value of crop produced by household i in year t (yuan)
Cost	The investment in all agricultural activities d by household i in year t (yuan)
Age	Household i has efficient labor aging from 20-60 in year t (=1)
Gender	Household i has male family member in year t (=1)

Table 2: Summary Statistics

Variables	Mean	Max	Min	SD	Count
Migrate	0.12	1	0	0.32	15712
Certification	0.19	1	0	0.39	15712
Income	6740.58	700000	0	18641.07	15712
Land	11.31	3706	0.03	68.57	15712
Crop production	3330.41	130000	0	7856.80	15712
Cost	1475.97	300000	0	5244.08	15712
Age	0.05	1	0	0.21	15712
Gender	0.11	1	0	0.32	15712

After cleaning, merging, and combining data for 4 years, we obtained 15,712 observations which track the variation of the same set of 3,928 households per year. From the data summary statistics, we found high standard deviation (SD) values for income, investment in agricultural activities, and crop production, suggesting that the standard deviation is high relative to the mean for these variables. This can indicate that the data may not be normally distributed and might be skewed. Therefore, we take the logarithms for our continuous variables *Income*, *Land*, *Cropproduction*, and *Cost* to normalize the distribution and stabilize variance, and also to handle potential outliers.

Our motivation plots show an overall trend for the treatment groups and control groups. From Figure 1, we can tell that people in households with land certificates have a higher probability of migrating to urban areas for employment than those in households without certificates. In Figure 2, an obvious switch in migration decision before and after treatment can be observed, indicating that the land certification policy could have some effects.
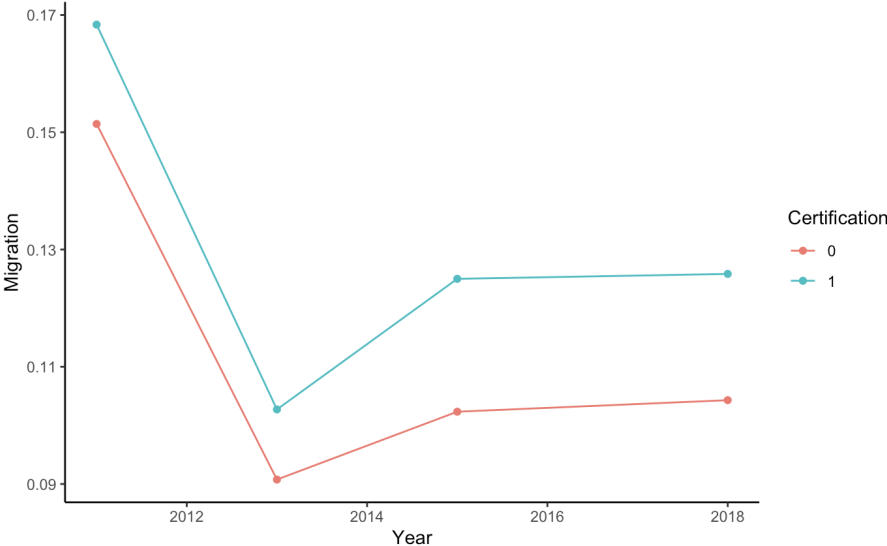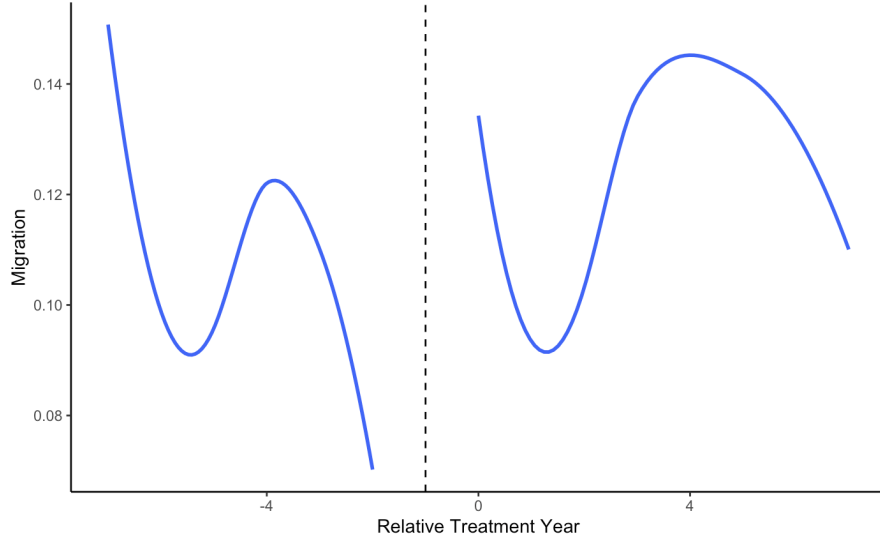

Figure 1

Figure 2

5 Empirical methodology

A Difference-in-Differences (DID) approach and a two-way fixed effect model are used to estimate the causal effect of land certification on rural-urban migration by comparing the changes in migration patterns of households with and without land certification before and after the implementation of the policy in different years.

Since the land certification policy was implemented in communities in different years, we use multiple periods of DID with two-way fixed effects at the household and year levels, and cluster the standard errors at the household level. We carefully examined parallel trends and found common trends between treatment and control groups before the treatment was implemented. The model is shown below:

$$Migrate_{it} = \alpha_i + \gamma_t + \beta_1 Certification_{it} + \beta_2 X_{it} + \epsilon_{it}$$

Where $Migrate_{it}$ is a binary indicator of whether any member of household i mi-

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grated to an urban area in year t, $Certification_{it}$ denotes whether household i received land certification in year t, α_i captures year fixed effects to control for temporal macroeconomic factors, γ_t embodies household fixed effects, accounting for time-invariant characteristics of each household. The control variables bundle X_{it} includes all household-year level variables in social and economic dimensions.

This model will allow us to estimate the effect of the treatment (land certification) on the probability of migration, holding constant unobserved household characteristics and time-specific effects that could confound our results. We contend that the variation in the timing of policy implementation across different localities and years offers a quasi-experimental setup that strengthens the identification of the causal relationship.

Nonetheless, we acknowledge potential limitations. The staggered implementation of the certification program may introduce challenges in the interpretation if the effects of certification evolve over time. Moreover, while we assume the exogeneity of land certification given its randomized nature across households, we cannot completely rule out selection bias if unobservable factors correlated with certification also drive migration decisions. Despite these concerns, our research design, featuring a comprehensive set of control variables and a rigorous methodological framework, sets the stage for a compelling investigation into the transformative effects of land policy on rural labor migration in China.

6   Results

Baseline Regression

We first used two-way fixed effects to estimate dynamic DID effects. The event study plot (Figure 3) indicates significantly positive effects from the treatment (certification) on the outcome (migration) after 3 years of the policy implementation. Since we are

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using unevenly distributed annual data (2011, 2013, 2015, and 2018), some treatment times are missed, and we used relative treatment year equals -2 as the comparison baseline. We can see that before treatment time less than -2, there is no significant difference between the treatment group and the control group, which is a good signal indicating no violation of the parallel trend assumption.
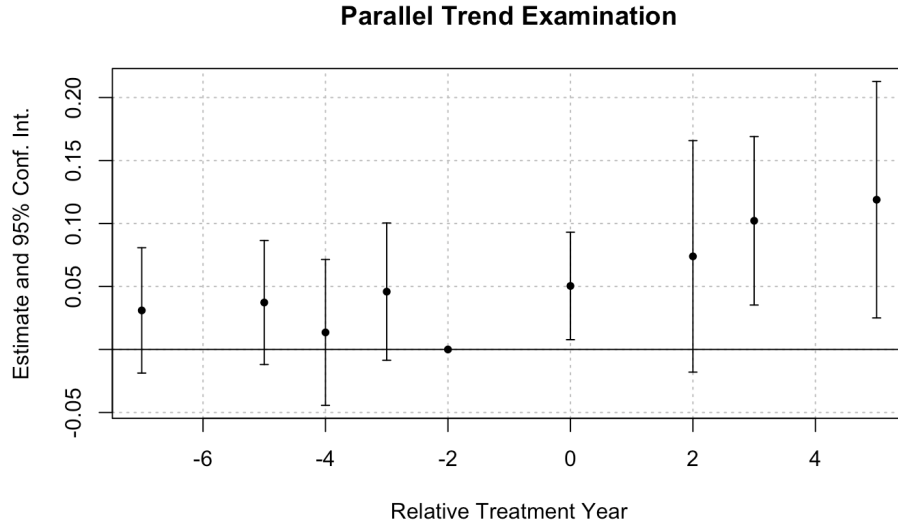
Parallel Trend Examination

Figure 3

Then we use different empirical models to explore the relationship between land certification and migration decision, and include household income, crop production, agricultural investment (cost), age and gender structure, and owned land area as proxies for the family's economic and social control indicators. In our regression results (Table 3), column 1 shows the results for pooled OLS. We tried to control for all family characteristics and found a positive effect from land certification, indicating an overall positive effect on pushing people to migrate to urban areas for employment. In columns 2 and 4, we used a two-way fixed effect Ordinary Least Squares (OLS) estimation, which controls for household and year fixed effects, suggesting we are comparing the effects of land certification within the household-year variation. The difference between these

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columns is whether or not household-year level control variables (X_{it}) are included. The results suggest that with all household and year conditions being the same, family members in households with land certificates have a 0.02 percentage point higher probability of migrating to urban areas for non-agricultural employment, which aligns with our initial hypothesis. Columns 3 and 5 use maximum likelihood estimation (MLE) rather than ordinary least squares (OLS) to obtain our regression results since our dependent variable $Migrate_{it}$ is binary, and the research is interested in the probability of migration given changes in the independent variables.

Table 3: EFFECTS OF CERTIFICATION ON MIGRATION (HOUSEHOLD)

Dependent Variable:			migrate		
	POLS	FE-OLS	FE-Logit	FE-OLS	FE-Logit
Model:	(1)	(2)	(3)	(4)	(5)
	OLS	OLS	Logit	OLS	Logit
Variables					
Constant	0.12***				
	(0.006)				
Certification	0.01**	0.02**	0.44**	0.02**	0.45***
	(0.006)	(0.009)	(0.17)	(0.009)	(0.17)
log(crop production)	-0.0006			-0.0004	-0.01
	(0.002)			(0.002)	(0.04)
log(land area)	-0.01***			-0.006	-0.12
	(0.003)			(0.004)	(0.09)
Age	-0.03**			0.006	0.22
	(0.01)			(0.01)	(0.26)
Gender	-0.01			0.008	0.19
	(0.010)			(0.01)	(0.19)
log(income)	0.005***			0.002*	0.02
	(0.0007)			(0.0008)	(0.01)
log(cost)	0.002			0.002	0.03
	(0.002)			(0.002)	(0.04)
Fixed-effects					
year		Yes	Yes	Yes	Yes
householdID		Yes	Yes	Yes	Yes
Fit statistics					
Observations	15,712	15,712	4,119	15,712	4,119
Squared Correlation	0.00688	0.48029	0.15175	0.48075	0.15408
Pseudo R^2	0.01173	1.1127	0.11683	1.1142	0.11894
BIC	9,210.7	43,791.2	14,550.5	43,835.0	14,588.7

Clustered (householdID) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Heterogeneity Analysis

Additionally, we conducted a heterogeneity analysis on whether the scale of land area owned by households will affect the outcome of labor mobility. Our pooled OLS model has indicated some negative effects from land area, suggesting that if a family owns a large land area, it tends to invest more labor in its agricultural production rather than migrating to urban areas for non-agricultural employment. However, we want to further explore the heterogeneous influences of land certification on households owning small, medium, and large scales of land area. We defined small, medium, and large-scale land groups based on the 4 quantiles of our data (land area less than 2 mu, land area larger than 2 but less than 4 mu, land area larger than 4 but less than 7 mu, and land area larger than 7 mu), and regressed certification on migration through two-way fixed effect OLS (Table 4) and Logit (Table 5) models. Interestingly, certification has significantly positive effects for those owning more land, and the group with 4¡land area¡7 has the highest coefficient (0.07) on certification. The results are reasonable because more property risks are reduced by land certification. This situation could also be explained by the separation of operation rights and land use rights. While land certificates consolidate land use rights, farmers could rent out the operation rights of their land for more efficient and collective agricultural production, while simultaneously obtaining financial profits. Since the land certification policy often comes with relaxation on land transactions within communities, households owning more land are more willing to rent out their land to gain more economic leverage to migrate to urban areas for potentially higher income.

Table 4: EFFECTS OF CERTIFICATION ON MIGRATION FOR DIFFERENT
SCALES OF LAND AREA (OLS)

Dependent Variable:		migrate		
	Land Area<2	2<Land Area<4	4<Land Area<7	Land Area>7
Model:	(1)	(2)	(3)	(4)
Variables				
Certification	0.01	0.02	0.07**	0.05*
	(0.03)	(0.03)	(0.03)	(0.03)
Fixed-effects				
year	Yes	Yes	Yes	Yes
householdID	Yes	Yes	Yes	Yes
Fit statistics				
Observations	2,776	2,876	2,783	3,921
R^2	0.70030	0.70637	0.73218	0.58671
Within R^2	0.00012	0.00031	0.00396	0.00208

Clustered (communityID) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Table 5: EFFECTS OF CERTIFICATION ON MIGRATION FOR DIFFERENT
SCALES OF LAND AREA (LOGIT)

Dependent Variable:		migrate		
	Land Area<2	2<Land Area<4	4<Land Area<7	Land Area>7
Model:	(1)	(2)	(3)	(4)
Variables				
Certification	0.07	0.45	1.5**	1.0*
	(0.59)	(0.64)	(0.67)	(0.57)
Fixed-effects				
year	Yes	Yes	Yes	Yes
householdID	Yes	Yes	Yes	Yes
Fit statistics				
Observations	426	402	371	655
Squared Correlation	0.16639	0.14327	0.14979	0.12434
Pseudo R^2	0.13199	0.10594	0.11206	0.09612
BIC	1,444.6	1,453.0	1,286.8	2,214.1

Clustered (communityID) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

7 Robustness check

For the robustness check, we first use Fixed Effects Counterfactual Estimators and regress the lagged treatment on the outcome to explore if the certification policy has lagged effects on rural-urban migration. In Figure 4, we found there are also significantly

positive effects from land certification on migration that occurs two years after the treatment.

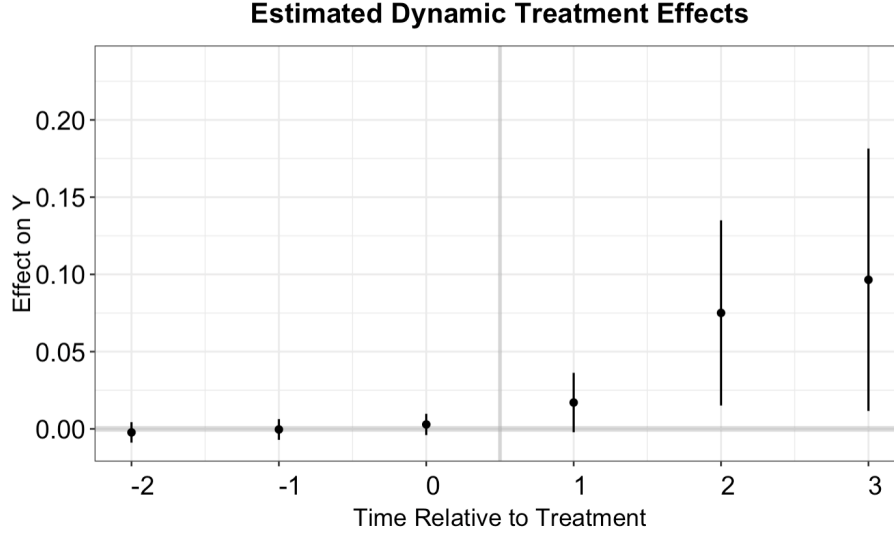**Estimated Dynamic Treatment Effects**

Figure 4

To further check for parallel trends before the treatment, which is a key assumption in difference-in-differences and related causal inference methods, we then used a placebo plot (Figure 5) displaying the Estimated Average Treatment Effect on the Treated (ATT) over time leading up to the treatment. From the plot, the placebo test p-value of 0.387 suggests that when comparing the pre-treatment trends to zero, there is not a statistically significant difference, which is good for the validity of our empirical method.

Finally, through our study, we found that the land certification policy is implemented on different levels across the country. The relevant authorities have not made uniform provisions on the collective ownership land should be certificated licensed to the township, village/community or to the household groups which belong to the local community. According to the requirements of the relevant laws and official documents, land belonging to community-level collectives should be certified to community-level collectives, land belonging to household group collectives should be certified and reg-

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Estimated ATT (FE)

Placebo test p-value: 0.387
Placebo equivalence test p-value: 0.000

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Effect on migrate
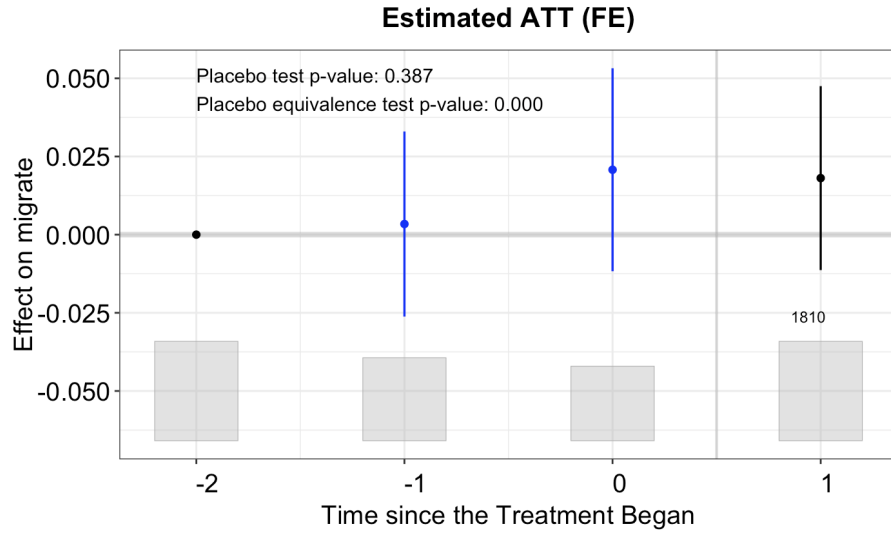
Time since the Treatment Began

Figure 5

istered to household group-level collectives, and land belonging to township collectives should be certified and registered to township collectives. In practice, the scope of land certification depends on the scope of land ownership which is caused by different local conditions and historical reasons. This provides basis for analyzing the land certification within different variation and fixed effects. to an entire village or community. In other words, households in the same community tend to receive the treatment in the same period. Therefore, we include a two-way fixed effect model at the community-year level in Table 6, and we also found similar positive results.

8 Conclusion

In summary, our investigation into the impact of land certification on rural-urban migration in China has uncovered compelling evidence that land certification acts as a catalyst for labor mobility. The robustness checks and empirical analyses consistently demonstrate that securing land rights through certification provides rural inhabitants with both the security and the economic leverage needed to migrate to urban centers in search of employment opportunities. This aligns with the central hypothesis of our study and reflects a broader trend of socioeconomic transformation fueled by policy reforms in land management.

The evidence from the China Health and Retirement Longitudinal Study (CHARLS) and the use of the Difference-in-Differences (DID) methodology solidify our confidence in these findings. The positive effects of land certification on migration, particularly after three years of policy implementation, underscore the importance of property rights security in facilitating labor reallocation across China's rural and urban divides. Importantly, this study's robustness is reinforced by the placebo test, which indicates that the pre-treatment trends do not significantly deviate from zero, suggesting that the treatment effect is not merely an artifact of pre-existing trends.

One clear result is that households with more extensive land holdings, especially those within the 4 to 7 mu range, exhibit the strongest response to land certification in terms of migration decisions. This suggests that land certification has differential impacts across landholding sizes, which policymakers must consider.

Our study recommends that policymakers continue to support and expand land certification programs, considering the significant potential of such initiatives to promote rural-urban migration and, by extension, economic development. However, policymakers should also be cautious about increasing rural-urban gap that could be caused by labor force drain in rural areas. Efforts should also be made to address the complexities

of land transactions, especially in providing access to credit markets for rural households.

Future research should investigate the long-term socioeconomic impacts of migration induced by land certification, such as changes in household income, the welfare of left-behind family members, and the effects on urban labor markets. Additional studies could also explore the impacts of land certification across different regional contexts within China, accounting for variations in local economic conditions and migration patterns. Especially under the context that land property security could have ambiguous effects on migration. Lastly, considering the positive effects of land certification on labor mobility, further exploration into the relationship between land rights, agricultural productivity, and overall economic growth would be valuable. This study lays the groundwork for a deeper understanding of land policy's role in shaping China's future labor landscape and economic trajectory.

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Table 3: EFFECTS OF CERTIFICATION ON MIGRATION (HOUSEHOLD)

Dependent Variable:		migrate	
	POLS	FE-OLS	FE-Logit
Model:	(1)	(2)	(3)
	OLS	OLS	Logit
Variables			
Constant	0.12***		
	(0.007)		
Certification	0.01*	0.02**	0.18**
	(0.007)	(0.008)	(0.08)
log(crop production)	-0.0006		
	(0.002)		
log(land area)	-0.01***		
	(0.003)		
Age	-0.03**		
	(0.01)		
Gender	-0.01		
	(0.009)		
log(income)	0.005***		
	(0.0007)		
log(cost)	0.002		
	(0.002)		
Fixed-effects			
year		Yes	Yes
communityID		Yes	Yes
Fit statistics			
Observations	15,712	15,712	14,196
Squared Correlation	0.00688	0.07984	0.06658
Pseudo R^2	0.01173	0.14147	0.07770
BIC	9,210.7	11,606.1	13,051.7

Clustered (communityID) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*