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Study on the impact of hometown resource endowment on farmers' rural-urban migration decisions against the background of "dual carbon"

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This study investigates the impact of hometown resource endowment on farmers' rural-urban migration decisions within the context of "Dual Carbon" policies. It aims to understand the factors influencing migration decision-making amidst the dynamics of urban and rural land occupation, particularly focusing on the role of hometown resource endowments led by homesteads. Using data from the China Migrants Dynamic Survey (CMDS), this study analyzes the influence of hometown resource endowment, primarily residential land, on farmers' migration decisions. Ownership of homesteads and contracted land significantly affects farmers' settlement in cities, while the dividend effect from village collectives is negligible. Additionally, the administrative level of the hometown serves as a significant factor in migration decision-making, particularly in family migration. Homestead and contracted land ownership negatively impacts both household and individual migration decisions. Specifically, owning homesteads exerts a greater influence on whole family migration decisions, reducing the probability of settling in cities by 21.1%. Regional comparative analysis reveals varying effects of owning homesteads and contracted land. While it positively influences household migration to cities in the eastern region, it inhibits migration in the central and western regions. The findings highlight the complex interplay between hometown resource endowment, land use patterns, and rural-urban migration decisions. Understanding these dynamics is crucial for designing effective policies to address migration challenges in the context of environmental and socioeconomic transitions.

KEYWORDS

land use, rural-urban migration, carbon emission, resource endowment, homesteads

1 Introduction

The growth of urban population, the expansion of construction land and the spread of urban space have become important factors for the growth of land use carbon emissions. Against the background of rapid urbanization, a large number of rural people have moved from the countryside to the city, but rural construction land has increased rather than

decreased. The data from the seventh national population census reveals that, as of 2020, the urban population in China accounts for 63.89% of the total population. Compared to 2010, the urban population has increased by 236 million people, while the rural population has decreased by 164 million people. Interestingly, despite the reduction in rural population, the total residential construction land area in rural areas has increased by 203 million square meters. According to statistics, the mobile population in the country has grown by 69.73% over the past decade. Nearly 200 million farmers have settled in urban areas for long-term work, maintaining residences in both urban and rural areas, leading a lifestyle characterized by “dual residence” and “dual profession” (Xia and He, 2017). China’s rural population and labor flow have entered the “second generation of farmers” era, with typical characteristics such as leaving the land and village, alienation from the relationship with land and agriculture, non-return of people and capital, urbanization of occupation, lifestyle and communication rules (Liu, 2017). The land use of rural residential areas did not decline in line with the growth in the level of urbanization, mainly because the phenomenon of “amphibious land use” in urban and rural areas occurred during the flow of rural population to cities, thus wasting valuable land resources (Fu and Liu, 2013). According to the sampling survey data from the Ministry of Agriculture and Rural Affairs, the vacancy rate of rural homesteads in China was 18.1% in 2019. In some areas, the vacancy rate of farmhouses exceeded 35%. At least 70 million sets of farmhouses nationwide are in idle status, and a large number of them have become “dormant resources” (Zhao and Lin, 2018). The annual increase in idle farmhouses due to rural labor migration reaches 594 million square meters, equivalent to a market value of about 400 billion yuan (Rural Development Research Institute of the Chinese Academy of Social Sciences, 2017). Under the background of the “dual carbon” strategy, there is an urgent need to alleviate the occupation of land by households in both urban and rural areas and optimize land use structure.

How is it possible to alleviate the current situation of farmers’ land use in both urban and rural areas? To answer this question, it is necessary to analyze the logic of farmers’ land use in both urban and rural areas. Considering the multiple functions of rural residential land, it serves not only as the basic means of production and livelihood for farmers but also as their most important asset. China’s urban-rural dual structure is a protective structure for farmers who are in a weak position in the market economy (He, 2013). Farmers shuttle between urban and rural areas, occupying land on both ends but unwilling to vacate it (Lv and Zhang, 2020). At the same time, the traditional form of production organization has changed while the basic function of the homestead has gradually changed from the function of housing security to the function of an asset and its property attributes have been gradually enhanced (Zhang and Fu, 2017). However, outdated land and household registration systems restrict the manifestation of farmers’ property rights, leading to the inability of rural and urban factors to move freely. The immobility of residential land and houses, coupled with the asynchronous nature of population movement between rural and urban areas, results in an imbalance in the relationship between people and land.

Using data from the China Migrants Dynamic Survey (CMDS), this paper explores the influence of the hometown resource

endowment of the homestead on migration decisions and further examines its influence on different migration patterns and heterogeneity in a number of regions. The main conclusions of this paper will be helpful to make policies to alleviate land occupation in both urban and rural areas, helping to, respectively improve the efficiency of land use, optimize the land use structure, achieve the carbon emission reduction targets, and improve carbon sink capacity.

2 Literature review

2.1 Urbanization, land-use, and carbon emissions

An increasing number of studies have found that rural-urban migration has a significant effect on carbon emissions. Zhang and Xu (2017) pointed out that China’s rapid urbanization brings some economic, social and environmental problems, most of which are related to land use. The results show that land use and land finance have a significant impact on carbon emissions. Urbanization has greatly increased carbon emissions (Zhang et al., 2016), and large-scale population migration and related production and consumption activities have a significant impact on the spatial transfer of carbon emissions (Gao et al., 2021). Ahmad et al. (2021) confirmed the data of one-directional positive effect on environmental degradation in 31 provinces in China. Zhang et al. (2018) found that land use and landscape patterns were significantly associated with transportation-related carbon emissions. Li et al. (2022) examines the relationship between land supply and carbon emissions. Their results show that the cities with high land supply and carbon emissions were mainly resource-based or economic priority development cities. Xia et al. (2023) have found that the impact of land use patterns on carbon emissions is mainly affected by the long-term urban land use management. In addition, Li et al. (2023) and Wang et al. (2020) also found that construction land scale, industrial land marketization and land finance have a direct or indirect impact on carbon emissions.

2.2 Rural-urban migration, land use and carbon emissions

2.3 In general, rural to urban migration is often driven by multiple factors, and land is one of the most important considerations. Selod and Shilpi (2021) summarized through a review of relevant literature that rural-to-urban migration is driven by numerous factors, and the returns and costs associated with migration are both very high. Takahashi et al. (2021) analyzed that the migration from rural to urban was mainly natural, house and food, and the factors considered by different groups also varied. Mullan et al. (2011) explored the role of incomplete land ownership in the decision-making of rural family migration. Zhao and Jiang (2022) analyzed the impact of urban and rural migration and migrant workers’ income on land efficiency, and found that seasonal and permanent migration had a negative impact on land efficiency. Hu et al. (2011) distinguished permanent migration from circular migration and noted that due to current “hukou”

TABLE 1 Definition of urban-rural amphibious land occupancy groups.

Household subdivision	Migration subject	Migration mode	Migration stage	Household registration status	Urban living conditions (employment, income, housing, Children's education)	Rural house and homestead vacancy status	Urbanization status	Settlement goals and policy directions
Type I	Whole-family Migration	Permanent Migration	Full Urbanization	Urban Hukou	Stable Occupation and Income	Self-purchased Commercial Housing	Children Receiving Urban Education, Elders Cared Separately	Long-term Complete Vacancy, Loss of Residential Value
Type II	Whole-family Migration	Permanent Migration	Basic Urbanization	Rural Hukou	Stable Occupation and Income	Self-purchased Commercial Housing	Children Receiving Urban Education, Elders Cared Separately	Long-term Complete Vacancy, Basic Loss of Residential Value
Type III	Core Family Migration	Circular Migration	Drifting Period	Rural Hukou	No Stable Occupation and Income	Renting Housing	Children Studying in the City, Elders Remaining in Hometown	Long-term Partial Vacancy
Type IV	Individual Migration	Temporary Migration	Non-Urbanization	Rural Hukou	No Stable Occupation and Income	Renting Housing	Children and Elders Remaining in Hometown	Long-term Partial Vacancy

Note: This study focuses on the subjects of urban-rural amphibious land occupancy, primarily "rural-to-urban" migrants. The "urban-to-rural" migration observed in developed countries during the deurbanization phase does not align with the current situation in China.

restrictions and the lack of a rural land rental market, those with more land at home are more likely to undergo circular rather than permanent migration. Similar migration has an impact on energy consumption and carbon emissions, thereby increasing the resistance to carbon reduction in net outflow areas (Bu et al., 2022). Determinants of rural-urban migration decision.

Han (2020) has traced the migration process of rural and urban population in China since the founding of the People's Republic of China and found that population migration is mainly within the province, with significant regional differences. The migration mode of the rural and urban population is based mainly on family migration, which tends to settle in small and medium-sized cities. Sheng (2016) pointed out that family reunification, one of the reasons for population migration, its seeing its importance increasing with growing levels of urbanization. Family factors such as family income, family size, children's education, parental support (Li, 2020), and housing, have a significant impact on the migration of rural and urban populations (Zhu and Leng, 2018). The registered residence system (Wang and Cai, 2008), rural land system (Chen and Liu, 2013; Huang and Du, 2014), while the impact of urban public service systems on migration behavior have received attention (Xia and Lu, 2015; Liu and Yan, 2016). Some scholars have also studied the influence of psychological capital on the behavior of migrant families, and believe that it has a positive impact on the integration of rural and urban migrant populations into cities.

3 Methodology

3.1 Theoretical foundation

According to the stochastic utility decision model developed by Chen and Zhai (2015), whether rural-urban amphibious farmers will continue to maintain their "amphibious" status or achieve a transition from "amphibious to monoculture" in the future depends on the size of the utility gap between living in urban and rural areas. In order to more accurately grasp the characteristics of the amphibious groups, we provide a detailed definition based on existing research (see Table 1).

Assuming farmers continue to maintain an amphibious state, the utility is U_0 , and the utility of changing the *status quo* (urbanization) is U_1 . Therefore, the difference in utility between the two options is T^* . Only when the following conditions are met:

$T^* = U_1 - U_0 > 0$, farmers are willing to change their amphibious status. Although the utility difference T^* is difficult to observe and quantify, it can be represented by a series of observable variables. Hence, the decision model for farmers whether to keep their amphibious status or not can be defined as:

$$T^* = g(X) + u, T = \begin{cases} 1, & T^* > 0 \\ 0, & T^* < 0 \end{cases}$$

where T is a binary variable. If farmers settle in cities achieving citizenship ($T^* > 0$), then $T = 1$; otherwise, it will be equal to 0; X is a series of exogenous variable vectors that affect whether farmers can achieve urbanization; u is the random error term. According to Stark and Taylor (1991) and Cai and Du (2002), the definition of the household utility function for farmers depends on two indicators, namely, absolute income and the position of their household income

in the reference group. Based on this, the household utility function can be expressed as:

$$U_i = U(y, RD),$$

where, y represents absolute income, and RD represents the degree of relative poverty. Therefore, the utility U will increase with the increase of y and decrease with the increase of RD . If there is a difference in the overall utility level between maintaining amphibious and settled cities, then farmers will make favorable decisions to achieve a higher level of utility. At this point,

$$U_i^A(y_i^A, RD_i^A) < U_i(y_i^B, RD_i^B).$$

Next, taking into account relative income, amphibious farmers tend to change the current situation when $y_i^A < y_i^B, RD_i^A > RD_i^B$.

In reality, migration comes with high costs that cannot be ignored. This study assumes that amphibious farmers, due to their commuting between urban and rural areas, will have higher migration costs than urban settlers. At the same time, urban settlers often have strong advantages in employment, income, housing, and other aspects, as well as higher urban development capabilities. According to Stark and Taylor (1991), the urban-rural utility difference of one farmer can be expressed as:

$$\Delta\delta^A = \int_0^T e^{\delta t} [p_u(t)y_u - y_r(t)]dt - c,$$

where $p_u(t)$ represents the probability of stable employment in the city, y_u is the income obtained in city, and correspondingly, $y_r(t)$ is the earnings obtained in rural areas. c denotes a series of migration costs including transportation, living, and psychological costs. δ denotes the discount rate. Next, an indicator of urban development capacity is constructed. The urban development capacity index is a function of urban employment rate, income, and migration cost, and is influenced by the discount rate. Under the condition of a certain level of income from farming, the greater the income disparity obtained by rural households through migration, the stronger is considered their development capability in the city.

Furthermore, according to Yang (2018) and Deng (2020), migration also depends on whether the connection with a hometown is close, especially in terms of the degree of dependence on land. Based on existing research and combined with practical research information, farmers' dependence on rural land and housing is introduced into the migration decision model. The migration decision of farmers depends on the combined force of urban development capacity as well as the dependence on homesteads and rural houses as core observation variables. Migration is the result of the combined push and pull forces of the inflow and outflow areas. The two functions of homestead land will produce two effects. One is the guarantee effect, which allows farmers to advance and retreat while defending, the other is the asset effect. If stranded rural houses and homesteads can be revitalized and brought into the city with investment, this will help further urbanization. When the welfare benefits are dominant, the pulling force of relocation will make urban farmers more inclined towards non-urbanization. On the contrary, when the asset effect is dominant, the pulling force of the destination will be beneficial for its urbanization.

On the basis of the above analysis, this paper proposes the following hypotheses to be tested.

Hypothesis 1: Hometown resource endowment plays a significant role in the decision-making process of rural households regarding migration from rural to urban areas.

Farmers rely on the welfare and security functions of rural houses and residential land, creating a pull factor from the place of origin. This, in turn, inhibits the process of urbanization for dual-residence farmers. When the social security and welfare functions of homestead and rural housing are dominant, the resource endowment of the hometown will play an inhibitory role in the migration of farmers. When the asset effect is dominant, the resource endowment of the hometown will accelerate the process of citizenization by improving its urban development capacity. If the asset effects of rural houses and residential land can be realized, farmers will be able to bring capital into the city. This will help enhance the urban development capability of amphibious farmers and assist them in transitioning out of the amphibious status, achieving complete urbanization.

Hypothesis 2: The role of hometown resource endowment on urban and rural migration decisions varies according to the migration mode.

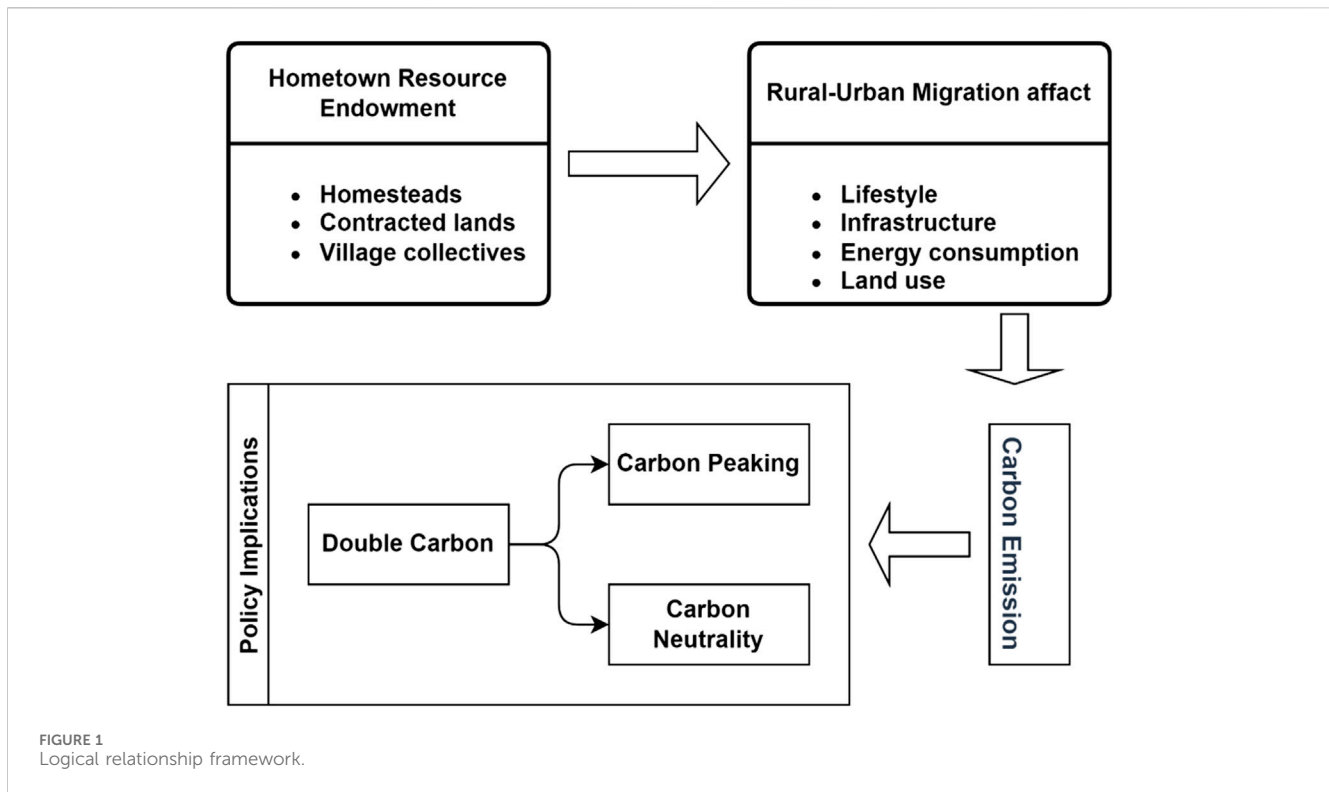
Compared with individual migration, farmers will be more cautious in their family migration decisions while considering the influence of multiple factors. The influence of hometown resource endowment on migration decisions will also be different in two different migration modes: individual migration and family migration.

Hypothesis 3: There are regional differences in the role of hometown resource endowment on urban and rural migration decisions.

From the perspective of regional and degree of economic development, the homestead in the eastern region is more efficient and has more circulation conditions, hence its asset effect is easier to manifest. On the contrary, in the central and western regions, farmers are more dependent on hometown resource endowment such as homestead and contracted land, mainly showing a lock-in effect. The relationship between rural-urban migration, land use and carbon emissions are depicted in Figure 1, which shows how migration-driven changes in land use contribute to carbon emissions and how these dynamics align with the broader goals of carbon peaking and carbon neutrality would be helpful in terms of drafting effective policies and strategies to promote sustainable and low-carbon urbanization.

3.2 Data and variables

This study uses the data of the China Migrants Dynamic Survey (CMDS) in 2017 as the basis for its analysis. The data covers a wide range and has a large sample size (169,989 respondents), which mainly involves the statistical characteristics of the floating population, homestead, contracted land, village dividends and other information, as well as the survival and development status of the inflow area, migration characteristics, and other key information. It is convenient for us to study the effect of hometown resource endowment on rural household migration decisions. Since the main target of this study is the amphibious



population, we use two criteria to achieve sample screening: (1) have bought a house in the city; (2) still have an agricultural household registration. First, the non-agricultural household registration samples were removed and 37,434 samples were deleted. Secondly, only those buyers who were already in the city were retained, and another 109,603 samples were deleted. Finally, we obtained an observable sample size of 22,952 for the amphibious population.

We use the willingness to settle in the city as the dependent variable. In the CMDS questionnaire, farmers were asked, “If conditions are met, would you be willing to move your household registration locally?” We consider the farmers’ responses as an indicator of their migration decision. If the farmer answers affirmatively, the dependent variable is assigned a value of 1; if not, it is assigned a value of 0. Additionally, in the subsample regression, we further distinguish between individual migration and household migration as subcategories. If three or more family members live together in the city, we consider it as a household migration, assigning a value of 1; otherwise, it is assigned a value of 0.

The key explanatory variable is homestead ownership. In addition, the influence of local resource endowments such as contracted land and village dividends on migration decisions is also investigated. The geographical location of the hometown is also regarded as a special resource endowment of the hometown. Compared with the rural areas, the administrative level of the hometown is above the township, which will have additional advantages in terms of resource acquisition, while this advantage may also have an impact on the migration decision. In the CMDS questionnaire, there are questions asking “Does the hometown have a homestead?”, “Does the hometown have contracted land?”,

and “Is there a collective dividend distributed by the village?” Thus, this paper can investigate the role of resource endowment in the migration decision of amphibious farmers.

Based on previous studies, this paper adds three variables as control variables, namely, an individual characteristic variable, an urban development ability variable, and a regional variable. Among these, the individual characteristic variables include age, gender, education level, marital status and health status. Regional dummy variables include the east, middle and west regions, all of which are bicategorical variables. The main variable assignment and statistical description are shown in Table 2.

4 Empirical results and discussion

4.1 Estimation results

Based on the OLS, Logit and Probit models, the influence of hometown resource endowment on rural households’ urban settlement intention was estimated, and the results are shown in Table 3. First, we employed the Ordinary Least Squares (OLS) empirical analysis model for the baseline regression. Secondly, considering the dependent variable is a binary categorical variable, using a linear model to model discrete variables poses various challenges. Subsequently, through some transformations, we adjusted the value ranges on both sides of the model to be roughly consistent. We introduced Logit and Probit models for regression, which are more practical and provide a more convenient way to observe the influence of hometown resource endowment on farmers’ migration intentions within different value ranges. In terms of hometown resource endowment, the influence of contracted land,

TABLE 2 Variables description.

	Variables	Description	Mean	Standard deviation
Migration decision	Urban settlement	Willingness to settle down in city	0.39	0.49
	Family migration	Whether or not family migration	2.32	0.76
Individual characteristics	Age	Age of respondents at survey time	36.66	11.07
	Gender	Dummy; male = 1; female = 0	0.52	0.50
	Education	Education level	3.44	1.16
	Marital	Dummy; Married = 1; Otherwise = 0	0.81	0.39
	Health	Health condition	0.82	0.38
Resource endowment of hometown	Grade	Administrative level of hometown	1.42	0.90
	Contracted land	Whether or not have contracted land	0.44	0.50
	Homestead	Whether or not have homestead	0.57	0.50
	Collective dividends	Whether or not have collective dividend	0.02	0.14
Regional characteristics	Eastern	Whether or not in eastern area	0.43	0.50
	Central	Whether or not in central area	0.29	0.45
	Western	Whether or not in western area	0.28	0.45

TABLE 3 Results of regression analysis.

Variables	Urban settlement		
	OLS model	Logit model	Probit model
Homestead	-0.050*** (0.007)	-0.231*** (0.031)	-0.143*** (0.019)
Contracted land	-0.108*** (0.007)	-0.497*** (0.031)	-0.301*** (0.019)
Collective dividends	-0.023 (0.019)	-0.112 (0.092)	-0.065 (0.055)
Grade	0.043*** (0.006)	0.185*** (0.027)	0.114*** (0.017)
Age	0.001*** (0.000)	0.005*** (0.002)	0.003*** (0.000)
Gender	-0.015** (0.006)	-0.071** (0.030)	-0.042** (0.018)
Education	0.035*** (0.003)	0.164*** (0.015)	0.099*** (0.009)
Marital	-0.013 (0.011)	-0.060 (0.052)	-0.036 (0.032)
Health	0.058*** (0.008)	0.293*** (0.040)	0.175*** (0.024)
Eastern	0.088*** (0.008)	0.345*** (0.035)	0.209*** (0.021)
Central	0 Omitted	-0.062* (0.037)	-0.040* (0.022)
Western	0.013** (0.008)	0 Omitted	0 Omitted
_cons	0.138*** (0.025)	-1.568** (0.115)	-0.949*** (0.070)
R2	0.048		
Pseudo R2		0.039	0.038
Number of obs		22952	

Note: *, **, and *** represent significance levels at 10%, 5%, and 1%, respectively. Values in brackets are robust standard errors.

homestead and village dividend on farmers' willingness to settle in the city is significantly negative, and the influence of hometown geographical location is significantly positive. This means that at the current stage, hometown resources such as residential land continue

to primarily serve the basic functions of meeting the welfare and housing security needs of most farmers. Due to restrictions on transferability, it is challenging for the asset and wealth effects of residential land to be fully realized. No matter whether the OLS,

TABLE 4 Results of heterogeneity test.

Variables	(1) Migration patterns		(2) Regional difference	
	Family migration	Individual migration	Eastern area	Central and western areas
Homestead	-0.237*** (0.034)	-0.175** (0.082)	0.149*** (0.051)	-0.479*** (0.040)
Contracted land	-0.471*** (0.034)	-0.659*** (0.083)	-0.635*** (0.051)	-0.399*** (0.040)
Collective dividends	-0.117 (0.099)	-0.047 (0.253)	-0.102 (0.142)	-0.134 (0.123)
Grade	0.164*** (0.031)	0.271*** (0.061)	0.282*** (0.044)	0.119*** (0.036)
Individual characteristics	control	control	control	control
Constant	-1.586*** (0.128)	-1.259*** (0.280)	-2.045*** (0.186)	-0.946*** (0.148)
Sample size	19,662	3290	7,992	14,960

Note: 1) ***, ** and * represent significance levels of 1%, 5% and 10% respectively; 2) Standard error in parentheses; 3) only estimated parameters for key explanatory variables are reported.

Logit or Probit models are used, the results show that owning a homestead has a locking effect on the migration behavior of farmers, forming a pull from the relocation place, thus inhibiting the migration decision of farmers to settle in the city. Age, sex, education level, marital status, health status, and the geographical location of the eastern and central regions of rural households have significant effects on their intention to settle in the city. From the perspective of individual characteristics, female, educated, married and healthy farmers have a stronger intention to settle down. The effect of rural resource endowment on the migration of rural households is mainly manifested as a locking effect, while the resource endowment of hometown has an inhibitory effect on the migration decisions of rural households.

4.2 Heterogeneity test

In addition, in order to investigate the heterogeneity of resource endowments of homesteads in rural households' migration decisions, we further distinguish two migration modes: family migration and individual migration. Under the condition that individual characteristics and urban characteristics are controlled and other conditions remain unchanged, this paper examines the heterogeneity of resource endowments such as homestead ownership in rural households' migration decisions (the results are shown in Table 4). According to the number of households

living together in the CMDS survey as a reference, more than three people living together are considered as constituting family migration, and other cases are considered as individual migration. From the perspective of sample composition, family migration accounted for 85.7% of the total sample size. According to the regression results, whether it is for the family or individual migration of farmers, owning a homestead and contracted land has an inhibitory effect on their willingness to settle in the city. Compared with farmers without homestead, the probability of moving their families to settle in cities is reduced by 21.1%. Farmers who own contracted land (as opposed to those who do not) are 37.6% less likely to move their families to cities. The location of hometown has a significant positive impact on the migration of rural households. Compared with remote rural areas, rural households living in towns, counties, cities and above are more willing to migrate and settle in cities. For every step up in the administrative rank of the hometown, the probability of the family moving to the city increased by 17.8 percent. For individual migrants, the probability of rural households with homestead migrating to cities decreased by 16%. The probability of rural households with contracted land moving to the city decreased by 48.3%. The probability of moving to a settled city increased by 31.1% for every level of administrative rank in the hometown. At the same time, whether to enjoy the village dividend has no significant effect on both family and individual migrants, which is consistent with the baseline regression results. Hypothesis 2, that the effect of

TABLE 5 Results of robustness test.

Variables	Family migration (Eastern area)	Family migration (Central and western areas)
Homestead	0.112** (0.055)	-0.468*** (0.043)
Contracted land	-0.562*** (0.055)	-0.403*** (0.043)
Collective dividends	-0.136 (0.155)	-0.115 (0.130)
Grade	0.264*** (0.050)	0.104*** (0.040)
Individual characteristics	control	control
constant	-2.200*** (0.210)	-0.870*** (0.164)
sample size	6,671	12,991

Note: 1) ***, ** and * represent significance levels of 1%, 5% and 10% respectively; 2) Standard error in parentheses; 3) only estimated parameters for key explanatory variables are reported.

hometown resource endowment on rural households' rural-urban migration decisions is different according to migration patterns, has been verified.

In addition, this paper further examines regional differences in terms of the impact of resource endowments such as homestead ownership on farmers' migration decisions (as shown in Table 5). The results show that rural households with homestead in the eastern region are more likely to migrate to the city with their families, while the influence of homestead on migration decision is significantly positive. In the eastern region, compared with farmers without homestead, the probability of migrating to the city with their families increased by 16.1%. However, in the central and western regions, the influence of homestead on the migration of rural households still shows a significant negative inhibitory effect, and the probability of rural households with homestead to migrate and settle in the city is reduced by 38.1%. There is no significant regional difference in the influence of owning contracted land on the migration and settlement of farmers' families. No matter whether they are located in the eastern, central and western regions, owning contracted land has a locking effect on farmers. Whether they have a village dividend, the impact is still not significant. The administrative level of the hometown has a significant positive effect on the decision of rural households to move to the city. When the administrative level of the hometown goes up by one level, the probability of families moving to the city increases by 32.6% in the eastern region and 12.6% in the central and western regions. Explanation 3 of this paper verifies the role of regional differences in the effect of hometown resource endowment on rural households' rural-urban migration decisions. Our research findings further support the discovery by Qi and Li (2020) that non-Hukou migration in China increased national residential carbon emissions. The largest transfer flows mainly originate from the central and eastern regions.

From the perspective of individual characteristics, education level and health status have a positive effect on the migration of rural households, while the ratio of well-educated and healthy rural households to migrate to the city is greater. Marital status has no significant effect on rural households' urban migration decisions. In most cases, age and sex had little or no significant effect.

4.3 Robustness test

In order to verify the robustness of the results, this paper further reduces the sample in order to verify the heterogeneity of resource endowments such as homestead on rural households' migration and settlement, as shown in Table 5. The result indicates that owning a homestead in the eastern region has a significant positive effect on rural households moving to cities to settle down, while the probability of rural households with a homestead moving to cities to settle down increases by 12.7%. For the central and western regions, the rate of rural households with homestead land settling in the city decreased by 37.4%. This result further supports Hypothesis 3, that is there are regional differences in the effect of resource endowments of homesteads on rural households' rural-urban migration decisions. In the eastern region, there is a positive asset effect, while in the central and western regions there are mainly inhibition and locking effects.

5 Conclusion

The endowment of hometown resources, especially homesteads and contracted land, is the most valuable asset for farmers and has a significant impact on their migration behavior. Using the CMDS data, this paper analyzes the influence of resource endowment of hometown on the migration decision of rural households based on a logic regression analysis. The main findings are: 1) The ownership of a homestead and contracted land has a significant impact on the settlement of rural households in cities, while the dividend from the village collective is not significant. In addition, this paper uses the hometown administrative level to measure whether it has special convenience in terms of location, which is also regarded as a special "resource endowment" in regression analysis, and the results show that it also has a significant positive effect on family migration decision-making. 2) The homestead is the primary hometown resource endowment for farmers. Whether for households migrating as a whole or individual migrants, it has a significant negative impact on their willingness to settle in the city. Moreover, this impact is more pronounced for households migrating as a whole. The locking effect demonstrated by homesteads reduces the probability of households migrating as a whole settling in the city by 21.1%. 3) Through the comparative analysis of regions, this paper finds that owning a homestead and contracted land in the eastern region has a significant positive effect on the settlement of rural families, while in the central and western regions it has a negative inhibitory effect. To some extent, this means that, in the eastern region, the economy is developed and the level of urbanization is high, which provides better conditions for the manifestation of homestead assets. Moreover, after adjusting the sample, the conclusions remained robust.

The conclusions of this study will help to formulate active policies to show the value of resource endowment in rural areas, improve their urban development ability, and promote the amphibious groups between urban and rural areas to realize the goal of moving their families to settle in cities. Especially in the central and western regions, it is necessary to further optimize the circulation, mortgage and paid exit policies of residential land while further demonstrating the value of residential land assets so that farmers who have moved to the city with their families can realize the value of "citizenization". This study also contributes to a comprehensive understanding of the relationship between land use and urban-rural migration behavior against the dual carbon background while pointing out a path for carbon reduction by reducing amphibious land occupation and improving land use efficiency (Wang et al., 2022).

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

PG: Writing—original draft, Writing—review and editing. SS: Writing—review and editing. ZY: Writing—review and editing. ZJ: Writing—review and editing

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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