

Article

Migration and Rural Sustainability: Relative Poverty Alleviation by Geographical Mobility in China

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Abstract: Migration is an important way for rural labourers to break the uneven distribution of resources, earn more income and seek their own sustainable development. However, existing studies have focused more on rural–urban migration and less on geographical migration. Our study further enriches the existing research on poverty reduction and provides a theoretical reference for policy decisions to promote a balanced regional development. Using data from the China Family Panel Studies (CFPS) 2012–2020, we conduct benchmark estimates through linear probability models and estimate the impact of migration on the relative poverty of the rural labourer through binary probit models. The results show that migration could significantly reduce the likelihood of a relatively poor state of rural labourers by around 4%; the greater the distance of migration, the greater the effects; and migration of rural labourers in the central region has the largest and most significant relative poverty reduction effect. Furthermore, migration could also compensate for the disadvantages of rural labourers who are unemployed, less educated and in poor health, making them less likely to be relatively poor. We also use multiple linear models to examine whether migration has a significant income-boosting effect on the rural people and found a positive result in which the effect reaches its highest in the central region at 22.95%. Therefore, it is necessary to further break down the barriers to geographical migration of rural labourers, strengthen the public transportation system and pay greater attention to Central China in order to better promote balanced development among regions.



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1. Introduction

Poverty alleviation is directly related to income growth and is closely linked to social and economic sustainability [1]. In 2020, China fully escaped absolute poverty and made a great contribution to the cause of poverty reduction in the world, but the problem of relative poverty is still serious [2]. Relative poverty is widespread in both developed and developing countries [3]. Reflecting the disparity in wealth distribution, it is also related to the fairness of society and is closely related to a healthy and sustainable social development [4].

In recent years, China has been concerned with the issue of relative poverty [5] and has put forward the development demand of achieving common prosperity. Common prosperity means preventing polarisation, with a lower income gap and better social equity, raising people's income in a long-term, stable and sustainable manner. Similar to the eradication of absolute poverty, rural areas are still the main sites of relative poverty. The weaker the economic base is in rural areas, the greater the economic vulnerability of rural residents who have recently emerged from absolute poverty. Moreover, the inadequacy of social security and the unstable and more homogenous sources of income have resulted in rural areas facing greater relative poverty, occupying a larger proportion of the population below the relative poverty line. In current China, some rural residents are leaving their

hometowns to seek more employment opportunities or better living conditions elsewhere to improve their economic situation, which is closely related to the relative poverty in the countryside.

However, China is a vast country with different natural resource endowments and economic development levels among regions. This may make some regions richer first, but for others, the growing gap between the rich and the poor will seriously constrain the sustainability of development. Balanced development among regions is therefore important. The study of the impact of geographical migration on relative poverty will not only further enrich and develop existing research on sustainable regional development, but also provide a theoretical basis and guidance for policy decisions in China, which is of great academic and practical significance.

Scholars have explored this area to some extent, including but not limited to the connotation of relative poverty [6,7], the motivations for migration and the impact of migration on poverty [8,9]. In rural areas, some individuals migrate to other areas in search of resources to improve their economic level and status. This is well illustrated by the 'push-pull' theory. The theory states that there is a certain amount of push and pull in both the incoming and outgoing regions, and that people will only move spatially if the sum of the pulling force where people migrate in and the pushing force where they migrate out is higher than the sum of the pushing force where people migrate in and the pulling force where they migrate out [10]. One of the main reasons as to why people choose to move is the increase in expected income [11]. The self-selection theory of migration also suggests that the wage differences between the two places where people move into and move out of are also one of the key factors leading to migration [12]. However, due to the rapid development of urbanisation and the prominence of absolute poverty in the past, most of the existing studies have focused on the migration of rural labourers between urban and rural areas as well as the eradication of absolute poverty, while fewer studies have been conducted from the perspective of cross-regional, cross-provincial and cross-county migration, and little attention has been paid to the alleviation of relative poverty. This means that the existing studies are not yet able to provide strong theoretical support for a sustainable and balanced regional development, and there is still much room for research.

Scholars have not reached a consensus on the poverty-reducing effects of migration, with some believing that migration can alleviate poverty, while others believe that the poverty-reducing effects of migration are not significant, and some even believe that migration can exacerbate rural poverty. However, these conclusions may be due to the different perspectives of the studies, which lead to different conclusions. Moreover, there is a paucity of research on relative poverty, which is an issue also worthy of further study.

Therefore, we study the impact of geographical migration on relative poverty to promote the sustainability of the region. We focus on migration distance heterogeneity and regional heterogeneity to analyse the different effects of cross-regional, cross-provincial and cross-county migration on relative poverty, and how these effects manifest differently in the western, central and eastern regions. Additionally, we explore the interaction of migration with rural labour employment status and human capital through cross-sectional terms and further analyse the income growth effects of migration.

Using data from the China Family Panel Studies (CFPS) 2012–2020, we conduct a baseline regression using linear probability models and a systematic regression estimation using binary probit models and interaction terms, and we also use multiple linear models to analyse the underlying income mechanisms. Our results show the following observations: migration significantly reduces the likelihood of rural labourers being relatively poor, and the further they move, the greater this reduction; the effect is greatest and most significant in the central region; migration compensates well for the disadvantages of unemployment, low educational attainment and poor health; and migration has the greatest income-raising effect in the central region. Our main contribution is to analyse the relative poverty reduction effects of different migration distances based on regional heterogeneity and to provide a basis for decision-making for a balanced regional development.

The paper is organised as follows: Section 2 shows a review of the current literature; Section 3 presents the methodology we use and the data we apply; we present our regression estimation results in Section 4; Section 5 is our further discussion in response to the estimation results; and Section 6 is mainly about our conclusions and suggestions as well as future prospects for the study.

2. Literature Review

Poverty has a rich meaning and can be divided into either absolute poverty, which focuses on the maintenance of people's most basic needs, and relative poverty, which takes into account the general standard of living in the society in which they live. Based on the theory of relative deprivation, each society has a broad, general standard of living, but there are individuals or groups of people who, due to a lack of resources, find it difficult to live the life that their society has become accustomed to, and these are the relatively poor [13].

As urbanisation continues to grow, labour migration between urban and rural areas has received the attention of many scholars. In the dual economy model, as long as the wage rate in the modern urban sector is higher than that in the agricultural sector, the surplus labour in the rural areas will move to the cities [14]. The Todaro model further takes into account the subjective judgement of the labour force, arguing that the expected rural–urban income differences are a determinant of rural–urban labour migration [15]. Stark (1985) further enriches this explanation by arguing that wage or income differences alone are not sufficient to explain labour migration, and that inequitable income distribution and self-perceptions of relative poverty could facilitate the migration of individuals or households [16]. In addition, there is a natural and social theoretical basis for geographical migration. Scholars have found that a suitable geographic environment attracts a larger population and can better promote local employment [17]. Abundant precipitation and warm climate will increase local employment [18], while a high altitude is not conducive to income growth [19] and proximity to the coast is also associated with income growth [20]. These physical geographic features permeate the socio-economic development characteristics. If the location is close to a market or a large city, there will be more development opportunities and therefore more work opportunities [21,22]. However, this effect is also influenced by some factors, including “reverberation effects” and spill-over effects [23,24], and it has a more complex interaction.

Many scholars have researched the relationship between migration and poverty in different regions, especially among young migrants. Among the youth in the Middle East and North Africa, both the labour market and institutional circumstances are very important reasons for migration, with the youth from rich families being more likely to migrate through formal channels and those from poor families more likely to consider informal routes [25]. In Ethiopia, rural poverty and a lack of opportunities are the main drivers of migration for young rural people, and migration is an important way for them to overcome poverty [26]. In sub-Saharan Africa, migration is not merely a way for young people to overcome poverty; it is also linked to young people's self-esteem and self-confidence, status, and the acquisition of skills and adulthood [27]. Work-related migration and remittances reduced poverty in Nepal by 20 percent during 1995–2004, including not only international but also internal migrants [28]. Data from studies in Asia show that migrants remit a high proportion of their wages to their families, thereby significantly reducing the poverty levels of rural households [29]. Other scholars have researched relative poverty and migration in Poland and found that, with constant per capita income, the larger the Gini coefficient, the greater the immigration [30]. These studies show that migration is widespread in different countries and regions, and is also an important means for them to alleviate poverty. For young people, migration has moved beyond its economic meaning to a richer social meaning and is closely linked to the social poverty gap.

While rural people can migrate elsewhere because of their income or economic status, there is no uniform consensus on the impact. Some scholars argue that labour migration

could alleviate poverty [31–34]. Bertoli et al. (2014) suggest that rural-labourer migration could reduce poverty by a fifth [35]. Furthermore, an analysis of micro-data from poor areas in China shows that rural-people migration reduces the likelihood of poverty by around three-tenths [36]. Regarding the pathways through which the poverty reduction effect of rural-labourer migration works, Sun's (2020) findings show that human capital investment is one of the important transmission ways [37]. Rural people migrate to work in cities and remit their earned wages to their families, significantly alleviating rural poverty [38]. They find that labour migration not only reduces the likelihood of rural people living in relative poverty [39], but also reduces their subjective perceptions of relative poverty [40]. This relief is not only in the dimension of income but also in multidimensional poverty, such as health poverty and education poverty, with a comprehensive poverty reduction effect [41]. At the same time, the labour force, in the process of migration, reallocates resource factors and can further reduce the income gap [42].

However, some scholars have argued that rural-labourer migration has no significant impact on poverty alleviation. The study found that moving from agricultural production to non-farm employment was better to raise their income than moving elsewhere, so migration was not preferred [43,44]. Moreover, labour migration from rural to urban areas is a combination of positive and negative effects and should be viewed in a holistic manner [45]. Besides the benefits of migration, the costs of migration should also be taken into account, as some people may not be able to cover their costs in the process of migration and thus are unable to improve their poverty status [46]. As initial poverty levels are different for different people, it is difficult to guarantee that labour migration will help to lift them out of poverty [47].

It has also been found that rural-labourer migration is detrimental to the achievement of poverty eradication. The poverty-reducing effects of rural-labourer migration should be discussed on a case-by-case basis and not generalised, and in some cases, it does indeed have a negative effect [48]. Most of these studies take a household perspective and find that the greater the number of rural-labourer moves, the lower the net income per capita of rural households [49]. Rural labourers who migrate are relatively well-qualified, which results in the loss of human resources in rural areas, to the detriment of rural construction and agricultural production, thus reducing the income of rural households [50]. Furthermore, living and producing in one household can benefit from certain scale effects and share many resources, while labour migration entails more costs and does not allow for the sharing of scale effects, hence exacerbating poverty [51].

As mentioned above, relative poverty has a slightly different meaning from absolute poverty, which is defined as poverty due to a lack of the most universal standard of living. A suitable natural environment and proximity to cities tend to attract a greater inflow of labourers. Rural labourers migrate to cities for a higher income and status or richer resources, and this is also true for young migrants. As a result, many studies have shown that migration significantly reduces poverty, but some scholars have argued that this mitigation effect is not significant, or that migration exacerbates rural poverty. These controversies are analysed by scholars from different perspectives, but there is still more research in favour of poverty reduction. Scholars have studied the theoretical basis and causes of rural-labourer migration and its impact on poverty, but have mostly focused on migration between urban and rural areas and absolute poverty, rarely discussing migration among different regions and relative poverty. China is a vast country, and the problem of uneven development among regions is quite prominent. This uneven development problem, which is determined by geography, requires not only the improvement of social and economic levels but also the free flow of factor resources. Only then will the income gap between people be reduced and the fruits of development be shared. Labour is an important factor in production. What are the characteristics of rural-labourer migration across different geographical areas? Could migration alleviate relative poverty? Is this effect the same in all regions? Do different distances and directions of migration have different effects? Does it affect relative poverty together with other factors? What are

the mechanisms behind these? These are the questions that this article will explore. Our findings find that migration does significantly reduce the likelihood of rural residents falling into relative poverty and that the impact varies by region, distance travelled and direction of migration.

3. Methodology and Data

3.1. Methodology

Relative poverty is determined by income, which depends on employment, and therefore employment is an important variable apart from migration. Employment can translate the dividends of economic growth into poverty reduction and income gap reduction and is arguably the most important form of an economic-altering channel [52,53], not only increasing per capita consumption but also significantly reducing the economic vulnerability of rural households [54,55]. Gábos et al. (2015) cite the dynamic growth of employment in the country in general and the equitable distribution of employment growth across households as important determinants of poverty alleviation [56]. However, agricultural employment can be effective in achieving extreme poverty alleviation, and poverty under the general definition relies more on employment in high-value-added industries, such as manufacturing, communications and transport [57]. Non-farm employment accounts for a significant share of the income of the rural people, especially productive non-farm employment, and is an important source of income for the non-poor [58]. A study in Honduras found that income earned in the non-farm sector, as well as income earned from self-employment work, accounted for 16–25% of rural household earnings, and the higher the economic level of the family, the more important this part of the income is [59]. Non-farm employment also helps farming households mitigate negative shocks to agriculture, mitigate unexpected losses to agricultural production and reduce their vulnerability to poverty [60].

Human capital also plays an important role in poverty, and Schultz (1960) argues that to alleviate poverty, there should be a gradual shift from the accumulation of physical capital to the accumulation of human capital, as human capabilities and qualities are closely related to economic development and are becoming increasingly important in current society [61]. Education's key role is not only in the direct transfer of knowledge and skills to the workforce [62], but also indirectly in cognitive and social participation [63], and has an irreplaceable impact on the intergenerational transmission of poverty [64]. Furthermore, its positive externalities go far beyond the individual and also have a significant impact on the productivity of society as a whole [65]. Thus, education is important in the eradication of poverty in developing countries [66], mostly by increasing the labour productivity of the educated [67]. In addition to education, there is a corresponding poverty reduction perspective in health selection theory. Studies have found that people with good health are more likely to achieve upward social mobility, while those with poorer health are more likely to move downward [68]. Health choices also have a greater impact on those who work in manual occupations, increasing their economic vulnerability [69]. Workers will be at a greater risk of exiting the labour market if they are in poor health, but this risk is also influenced by a variety of other factors and is grouped heterogeneously [70]. Health plays a major role in both employment and the hours of work. Haan and Myck (2009) focus on the impact of health on employment participation [71], while Grossman's health demand model highlights the role of health on workers' working hours [72]. In short, health levels will cause changes in income [73,74].

Unlike absolute poverty, relative poverty can also measure the income gap in society to some extent. Cheng et al. (2015) found that human capital can significantly reduce the income gap [75]. According to Tan (2020), the "three-pillar" strategy—economic growth, human capital investment and social security—is now commonly used internationally to address relative poverty, which illustrates the role of the three pillars in relative poverty [76]. Therefore, besides employment and human capital, we also include variables related to social security as control ones. The key to this study, however, focuses on rural-labourer migration. Rural-labourer migration is a manifestation of social mobility as a branch,

related to the equalisation and opening of social opportunities and is an important way of activating and integrating urban and rural resources. In the view of scholars such as Luo et al. (2021), migration is also one of the paths through which China can effectively manage relative poverty [77].

Since the dependent variables are binary, the probit model will be used for analysis after the baseline regression using the linear probability model (LPM), which is designed as follows:

$$P(POV_i = 1|X_i) = \Phi(\alpha_0 + \alpha_1MIG_i + \sum_{j=1}^m \alpha_{2j}WORK_{ij} + \sum_{k=1}^n \alpha_{3k}CAP_{ik} + \sum_{l=1}^q \alpha_{4l}CON_{il} + \varepsilon_i) \quad (1)$$

where POV_i indicates whether the individual i is relatively poor, as measured by the relative poverty line. MIG_i indicates whether the individual i migrates; $WORK_i$ indicates the individual i 's work status, including the variables "In work" and "Industries"; and CAP_i indicates the individual i 's human capital, including the two variables "Education" and "Health". CON_{il} are control variables, including three categories: macro-finance, micro-security and individual characteristics. $\alpha_1, \alpha_{2j}, \alpha_{3k}, \alpha_{4l}$ are coefficients for whether geographical mobility occurs, work status, human capital and the control variables, respectively. ε_i is a stochastic disturbance.

Since the migration, work status and human capital all play a role in rural labourers' relative poverty, we further explore the interaction between migration and them, setting the models as:

$$P(POV_i = 1|X_i) = \Phi(\beta_0 + \beta_1MIG_i + \sum_{j=1}^m \beta_{2j}WORK_{ij} + \beta_3MIG_i \times WORK_{i1} + \sum_{k=1}^n \beta_{4k}CAP_{ik} + \sum_{l=1}^q \beta_{5l}CON_{il} + \mu_i) \quad (2)$$

$$P(POV_i = 1|X_i) = \Phi(\beta'_0 + \beta'_1MIG_i + \sum_{j=1}^m \beta'_{2j}WORK_{ij} + \beta'_3MIG_i \times WORK_{i2} + \sum_{k=1}^n \beta'_{4k}CAP_{ik} + \sum_{l=1}^q \beta'_{5l}CON_{il} + \mu'_i) \quad (3)$$

$$P(POV_i = 1|X_i) = \Phi(\lambda_0 + \lambda_1MIG_i + \sum_{k=1}^n \lambda_{2k}CAP_{ik} + \lambda_3MIG_i \times CAP_{i1} + \sum_{j=1}^m \lambda_{4j}WORK_{ij} + \sum_{l=1}^q \lambda_{5l}CON_{il} + \sigma_i) \quad (4)$$

$$P(POV_i = 1|X_i) = \Phi(\lambda'_0 + \lambda'_1MIG_i + \sum_{k=1}^n \lambda'_{2k}CAP_{ik} + \lambda'_3MIG_i \times CAP_{i2} + \sum_{j=1}^m \lambda'_{4j}WORK_{ij} + \sum_{l=1}^q \lambda'_{5l}CON_{il} + \sigma'_i) \quad (5)$$

where $MIG_i \times WORK_{i1}$ indicates the interaction term between migration and work or not; $MIG_i \times WORK_{i2}$ is the interaction term between migration and industries; $MIG_i \times CAP_{i1}$ is the interaction terms between migration and education; and $MIG_i \times CAP_{i2}$ indicates the interaction terms between migration and health. $\beta_3, \beta'_3, \lambda_3, \lambda'_3$ are the coefficients corresponding to these four interaction terms, respectively.

To analyse in depth the mechanisms by which geographical mobility contributes to relative poverty, we also use a multiple linear regression model to analyse the effect of geographical mobility on income growth, using individuals' income as the dependent variable, and the model is set up as follows:

$$LnINCOME_i = \gamma_0 + \gamma_1MIG_i + \sum_{j=1}^m \gamma_{2j}WORK_{ij} + \sum_{k=1}^n \gamma_{3k}CAP_{ik} + \sum_{l=1}^q \gamma_{4l}CON_{il} + \varepsilon'_i \quad (6)$$

where $LnINCOME_i$ is the logarithm of an individual i 's annual income, MIG_{ij} ; $WORK_{ij}$, CAP_{ik} , CON_{il} are the individual i 's migration, work status, human capital and control

variables, respectively; $\gamma_1, \gamma_{2j}, \gamma_{3k}, \gamma_{4l}$ are the coefficients corresponding to these variables, respectively; and ε'_i is a stochastic disturbance.

3.2. Data

The data used in this article are mainly from the China Family Panel Studies (CFPS), which was implemented by the China Social Science Survey Centre of Peking University, and has been conducted in 2012, 2014, 2016, 2018 and 2020 after collecting data at three levels of tracking: individual, household and community, reflecting social, economic, demographic, educational and health changes in China. As we focus on the rural labour force, only a sample of individuals who have a rural household registration, are of working age (16–60 years old for males and 16–55 years old for females) and are not enrolled students were screened, and missing values were processed, resulting in a final sample of 18,953. To take into account the impact of macro-policies in a comprehensive manner, the study screened the general budget expenditure data of local finance for each province in 2012, 2014, 2016, 2018 and 2020 from the database of the National Bureau of Statistics and calculated the general budget expenditure data per capita of local finance, which were included together in the database.

3.2.1. Dependent Variables

(1) Relative poverty

“Relative poverty” is the relative poverty status of an individual, measured by whether he or she is below the relative poverty line. For example, the European Union (EU) defines the relative poverty line as 60% of the median income of the population, and the Organisation for Economic Co-operation and Development (OECD) defines the relative poverty line as 50% of the median income of the population. In order to retain a larger sample size of relative poverty, this paper chooses 60% of the median income of rural residents as the relative poverty criterion. Table 1 shows the median income of rural residents and its corresponding values of 60% and 50% for the five years of 2012, 2014, 2016, 2018 and 2020. If the annual income of rural residents in 2012 is lower than RMB 12,000, it means that they are in relative poverty and the value is 1. If it is higher than or equal to RMB 12,000, the value is 0. The values of the explanatory variables in other years are assigned in the same way.

Table 1. The relative poverty line in rural areas, 2012–2020 (RMB).

Year	Median	60%	50%
2012	20,000	12,000	10,000
2014	25,000	15,000	12,500
2016	30,000	18,000	15,000
2018	36,000	21,600	18,000
2020	40,000	24,000	20,000

(2) Income

In studying the mechanisms underlying the effect of geographical mobility on relative poverty, the income of individuals in the year before the research was logarithmically processed for estimation and data analysis. This includes income from all work, including income received by rural workers for agricultural production and remuneration for other work.

3.2.2. Explanatory Variables

(1) Key explanatory variables

Given the different research objectives and levels of analysis, the key explanatory variables are divided into three categories. One is “Migration”, where this geographic mobility includes cross-regional migration, cross-provincial migration within the same

region, and cross-county migration within the same province, and if any of the above three occurs, it is considered to be geographically mobile and takes the value of 1, while if it has been in the county then it takes the value of 0. The second category is divided into cross-regional migration, cross-provincial migration and cross-county migration. The distance of mobility becomes smaller in order, and if yes then it is 1, while if otherwise it is 0. The third category is cross-regional migration directions in the western, central and eastern regions. If rural labourers in the west move across provinces to the western, central and eastern regions, it will take the values 1, 2 and 3, respectively; if they move across provinces from the central region to the central, western and eastern regions, it will take the values 1, 2 and 3, respectively; if they migrate from the east across provinces to the eastern, western and central regions, it will take the values 1, 2 and 3, respectively.

(2) Other explanatory variables

Work status and human capital are also explanatory variables that we are interested in. Work status is divided into “In work” and “Industries”, with 1 if the individual works (including agricultural work, wage-earning work, self-employment/private economic activity, etc.) and 0 for no work; and 1 for the primary industry, 2 for the tertiary industry and 3 for the secondary industry. In human capital, “Education” is measured by the level of education received, with values of 1 for primary school and below, 2 for junior high school, 3 for senior high school, 4 for college and undergraduate, and 5 for postgraduate. “Health” is measured by the individual’s self-assessment of his or her health status, with 1 being “very unhealthy”, 2 being “unhealthy”, 3 meaning “generally healthy”, 4 being “healthy” and 5 meaning “very healthy”.

3.2.3. Control Variables

The control variables in this study are divided into three categories, namely macro-finance, micro-security and individual characteristics. The macro-finance includes “Year” and “Region”, with the western region assigned a value of 1, the central region assigned a value of 2 and the eastern region assigned a value of 3. The micro-security includes the logarithm of local general budget expenditure and the logarithm of local per capita general budget expenditure. The micro-security mainly concerns individual security ownership, including “Medical insurance”, “Insurances” and “Housing funds”. For “Medical insurance”, the value is 0 if there is no medical insurance, 1 if there is no financial support, 2 if there is partial financial support, and 3 if there is full financial support. For “Insurances”, take the value 1 if the individual has insurance, otherwise take the value 0. Similarly, if they have a housing fund, “Housing funds” takes the value of 1, otherwise it takes the value of 0. Personal characteristics mainly include “Age”, “Gender” and “Married”. “Gender” is 0 for females and 1 for males; “Married” is 0 for unmarried and 1 for married (Table 2).

Table 2. Variable definitions and measurement.

Variable Type	Variable	Measurement
Dependent variables	Relative poverty	Yes = 1, no = 0
	Income	The logarithm of their annual income
	Migration	Yes = 1, no = 0
	Cross-regional migration	Yes = 1, no = 0
	Cross-provincial migration	Yes = 1, no = 0
	Cross-county migration	Yes = 1, no = 0
Key explanatory variables	Cross-regional migration directions in the west	Migration in the west = 1, Migration from the west to the centre = 2, Migration from the west to the east = 3
	Cross-regional migration directions in the central region	Migration in the centre = 1, Migration from the centre to the west = 2, Migration from the centre to the east = 3
	Cross-regional migration directions in the east	Migration in the east = 1, Migration from the east to the west = 2, Migration from the east to the centre = 3

Table 2. Cont.

Variable Type	Variable	Measurement
Other explanatory variables	In work	Yes = 1, no = 0
	Industries	The primary industry = 1, The tertiary industry = 2, The secondary industry = 3
	Education	Primary school and below = 1, Junior high school = 2, Senior high school = 3, College and undergraduate = 4, Postgraduate = 5
	Health	Very unhealthy = 1, Unhealthy = 2, Generally healthy = 3, Healthy = 4, Very healthy = 5
Control variables	Year	2012 = 1, 2014 = 2, 2016 = 3, 2018 = 4, 2020 = 5
	Region	The western region = 1, The central region = 2, The eastern region = 3
	Local general budget expenditure	Logarithm of local general budget expenditure
	Local general budget expenditure per capita	Logarithm of local general budget expenditure per capita
Micro-security	Medical insurance	No medical insurance = 0, No financial support = 1, Partial financial support = 2, Full financial support = 3
	Insurances	Yes = 1, no = 0
	Housing funds	Yes = 1, no = 0
Individual characteristics	Age	Number of their age
	Gender	Male = 1, female = 0
	Married	Married = 1, unmarried = 0

3.2.4. Descriptive Statistics of Variables

Table 3 shows the descriptive statistics of the variables. The mean value of “Relative poverty” is 0.26, indicating that 26% of the rural labour is in relative poverty. Among the key explanatory variables, the migration rate in China is 25%, with 7% moving across regions, 4% moving across provinces within the same region, and a higher proportion moving across counties within the same province at 15%. The average cross-regional flow in the west is 2.17, indicating that rural labour in the west is more inclined to move to the east, as is the central region, but some rural labour in the east also choose to move to the west. The average education level of China’s rural labour force is between the middle and high school, with a mean of 2.31; health status is generally preferred and 94% of the rural labour force is employed, with the majority of jobs in the secondary sector. Only 37% of the rural workforce has insurance, and even fewer, 14%, have housing funds. The average age of the sample was 32 years, 59% were male and 71% were married.

Table 3. Descriptive statistics of variables.

Variable Type	Variable	Observed Value	Mean	Standard Deviation
Dependent variables	Relative poverty	18,953	0.26	0.44
	Logarithm of income	18,893	10.09	0.97

Table 3. Cont.

Variable Type	Variable	Observed Value	Mean	Standard Deviation	
Key explanatory variables	Migration	18,953	0.25	0.43	
	Cross-regional migration	18,404	0.07	0.26	
	Cross-provincial migration	17,095	0.04	0.20	
	Cross-county migration	16,350	0.15	0.35	
	Cross-regional migration directions in the west	809	2.17	0.96	
	Cross-regional migration directions in the central region	788	2.76	0.59	
	Cross-regional migration directions in the east	457	1.32	0.68	
Other explanatory variables	In work	18,953	0.94	0.24	
	Industries	18,953	2.52	0.53	
	Education	18,953	2.31	0.84	
	Health	18,953	3.39	1.07	
Control variables	Year	18,953	2.88	1.48	
	Region	18,953	2.20	0.83	
	Macro-finance	Log of local general budget expenditure	18,953	8.58	0.52
		Log of local general budget expenditure per capita	18,953	9.15	0.40
	Micro-security	Medical insurance	18,953	1.64	0.70
		Insurances	18,953	0.37	0.48
		Housing funds	18,953	0.14	0.35
	Individual characteristics	Age	18,953	32.00	8.76
		Gender	18,953	0.59	0.49
		Married	18,953	0.71	0.46

4. Empirical Results and Discussion

4.1. Estimated Results of the Impact of Migration on Relative Poverty

4.1.1. Impacts of Migration on Relative Poverty

Table 4 shows the results of estimating the effects of geographical migration on relative poverty, with column (1) showing the results of the baseline regression using LPM, and columns (2) and (3) showing the results of the probit model and the marginal effects, respectively. As seen from the first two columns, all variables are significantly negative at the 1% level. With all other variables held constant, migration can significantly reduce the likelihood of relative poverty among rural labourers, with both the estimated coefficient of LPM and the marginal effect of the probit model being around 4%. This implies that geographical mobility reduces the likelihood of rural labourers being relatively poor by 4% compared to those who are not geographically mobile. This may be because rural labourers seek better job opportunities or sources of income through migration, thus raising their economic levels. Rural labourers who work are about 11% less likely to be relatively poor than those who do not work; they are less likely to be relatively poor in non-agricultural industries and are especially less likely to be relatively poor in secondary industries than in tertiary industries. It is easy to see that secondary industries, such as construction and manufacturing, account for a large proportion of the migrant labourers' work, and usually

Table 5. Cont.

	(1)	(2)	(3)	(4)	(5)	(6)
	LPM	Probit	LPM	Probit	LPM	Probit
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Constant	2.2674 *** (0.1304)	6.4880 *** (0.5075)	2.3523 *** (0.1325)	6.8056 *** (0.5181)	2.3956 *** (0.1353)	6.9725 *** (0.5288)
N	18,404	18,404	17,095	17,095	16,350	16,350
R ² /Pseudo R ²	0.11	0.10	0.11	0.11	0.12	0.11

Note: The average marginal effects are shown in square brackets; robustness standard errors are in brackets; ** and *** indicate significance at the 5% and 1% levels, respectively.

Cross-regional migration, cross-provincial migration within the same region and cross-county migration within the same province can all significantly reduce the likelihood of relative poverty. Compared to no mobility across regions, cross-regional mobility can reduce the probability of relative poverty by about 8%; in one region, rural labourers who move across provinces will be 3% less likely to be in relative poverty than those who do not move across provinces; and in one province, compared to the rural labour force that stays in the county, those who move across counties are less likely to become relatively poor, by about 2 percentage points. Cross-regional migration has the largest impact on relative poverty, followed by cross-provincial migration, and cross-county migration has the smallest impact. This indicates that an adequate mobility of labour resources could significantly reduce the likelihood of relative poverty and can also better compensate for the imbalance of various factors between regions, provinces and counties, improving the efficiency of the use of resource factors.

4.2. Estimates of the Impact of Migration on Relative Poverty Based on Regional Heterogeneity

4.2.1. Impacts of Migration on Relative Poverty

Table 6 presents the results of estimating the impact of migration on relative poverty in the western, central and eastern regions. Although the direction of the impact of each variable remains consistent across the three regions, there are some differences in the significance. Taking the estimation results of the probit model as an example, the migration of rural labour in the western region, although negative in sign, is not significant, and is only significantly negative at the 10% level in the LPM estimation results, with a coefficient of 0.0257. In the central region, compared to no migration, geographical mobility can significantly reduce the likelihood of relative poverty in rural areas by 8.04%. In the eastern region, geographical mobility can reduce the probability of relative poverty by 2.43%. The latter two are significant at the 1% and 5% levels, respectively. This suggests that the impact of migration is greater in the central and eastern regions and that it is more significant and has a larger marginal effect in the central region. This may be because the east has a higher level of economic development and the west has been treated with more favourable policies which have led to faster development and more opportunities. Compared to these two regions, the central region is facing the plight of “central collapse”, which is reflected in the labour market as the greater impact on the region’s relative poverty caused by the geographical mobility of the labour force.

Table 6. Estimates of the impact of migration on relative poverty based on regional heterogeneity.

	Western China		Central China		Eastern China	
	(1)	(2)	(3)	(4)	(5)	(6)
	LPM	Probit	LPM	Probit	LPM	Probit
Migration	−0.0257 * (0.0140)	−0.0232 (0.0428)	−0.0812 *** (0.0132)	−0.0804 *** (0.0458)	−0.0287 *** (0.0110)	−0.0243 ** (0.0434)
In work	−0.1070 *** (0.0285)	−0.0975 *** (0.0769)	−0.1117 *** (0.0240)	−0.1006 *** (0.0679)	−0.1608 *** (0.0253)	−0.1233 *** (0.0703)
Industries	−0.0424 *** (0.0132)	−0.0391 *** (0.0392)	−0.0249 ** (0.0118)	−0.0222 * (0.0378)	−0.0225 *** (0.0084)	−0.0194 ** (0.0316)
Education	−0.0160 * (0.0087)	−0.0152 * (0.0269)	−0.0314 *** (0.0085)	−0.0320 *** (0.0288)	−0.0170 *** (0.0058)	−0.0180 *** (0.0232)
Health	−0.0151 ** (0.0062)	−0.0143 ** (0.0184)	−0.0112 * (0.0058)	−0.0106 * (0.0184)	−0.0041 (0.0042)	−0.0027 (0.0154)
Other explanatory variables	Yes	Yes	Yes	Yes	Yes	Yes
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Constant	2.8835 *** (0.5659)	7.3265 *** (1.8458)	4.1759 *** (0.8342)	11.5145 *** (2.6961)	2.1256 *** (0.1572)	6.3476 *** (0.6221)
N	4958	4958	5231	5231	8764	8764
R ² /Pseudo R ²	0.09	0.07	0.11	0.10	0.10	0.11

Note: The probit coefficients in the table are their average marginal effects; robustness standard errors are in brackets; *, ** and *** denote 10%, 5% and 1% significance levels, respectively.

In terms of work, in the east, working will significantly reduce the likelihood of relative poverty by 12.33%, followed by the central region, and finally by 9.75% in the west. The impact of industries decreases in descending order in the western, central and eastern regions, all being significantly negative, indicating that compared to the primary sector, the tertiary and secondary sectors play the largest role in the west and the smallest role in the east. In terms of human capital, educational attainment is significantly negative in all three regions, with the largest marginal effect in the central region at 0.032, indicating that for every unit increase in educational attainment, the possibility of relative poverty in the central region decreases by 3.20%. However, the effect of health on relative poverty is not significant in the east, while the effect of health is greater in the western region, with each unit increase reducing the likelihood of relative poverty by 1.43%. This suggests that education in the central region and health in the West are two key areas of focus in reducing their rural relative poverty.

4.2.2. Impacts of Migration Distance on Relative Poverty

Table 7 presents the estimated results of the impacts of mobility distance on relative poverty based on regional heterogeneity. Columns (1)–(3), (4)–(6) and (7)–(9) show the results for the western, central and eastern regions, respectively. Columns (1), (4) and (7) show that cross-regional migration in the central region has the largest and most significant effect on the relative poverty of the rural population, being able to reduce the probability of relative poverty by 11.7% and significant at the 1% level; the western region comes second, being significantly negative at the 5% level and able to reduce the probability of relative poverty by 5.3 percentage points. The effect in the eastern region is not significant. These show that the central rural labour force tends to move to other regions in search of development opportunities to improve their economic status, and development is still very uneven among different regions, which further confirms the impact of the “central collapse” on the labour market. In the east, compared to rural people who do not move across provinces, those moving to other provinces are 4.1% less likely to become relatively poor, significant at the 10% level. The differences in development between the various

eastern provinces offer this possibility. However, the results for the western and central regions are not significant. Cross-county migration within the same province has the largest impact in the centre, with a significant negative effect at the 5% level and a marginal effect of 0.049, probably due to the relatively large imbalance in the distribution of resources between counties in this region. In the east, cross-county migration reduces the likelihood of relative poverty by 2.4%, but it is not significant in the western region.

Table 7. Estimates of the impact of distance migrated on relative poverty based on regional heterogeneity (probit).

	Western China			Central China		Eastern China			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Cross-regional migration	−0.161 ** (0.069) [−0.053]			−0.377 *** (0.063) [−0.117]			0.117 (0.158) [0.030]		
Cross-provincial migration		−0.133 (0.081) [−0.044]			0.138 (0.180) [0.044]			−0.159 * (0.085) [−0.041]	
Cross-county migration			0.009 (0.059) [0.003]			−0.155 ** (0.063) [−0.049]			−0.093 * (0.052) [−0.024]
Other explanatory variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	8.34 *** (1.93)	9.06 *** (2.05)	8.57 *** (2.11)	11.97 *** (2.76)	14.27 *** (2.89)	14.37 *** (2.91)	6.27 *** (0.63)	6.45 *** (0.63)	6.84 *** (0.65)
N	4771	4275	3962	5038	4314	4250	8595	8506	8138
Pseudo R ²	0.08	0.08	0.08	0.10	0.10	0.10	0.11	0.11	0.11

Note: The average marginal effects are in square brackets; robustness standard errors are in brackets; *, ** and *** denote 10%, 5% and 1% significance levels, respectively.

Cross-regional migration and cross-county migration have the largest and most significant impact in the central region, suggesting that adequate labour mobility among regions and among counties is important in reducing relative poverty in Central China. In the west, the relative poverty reduction effect of cross-regional rural labour mobility is much greater than that of cross-provincial and cross-county mobility. In contrast, rural labour mobility across provinces and counties in the east can reduce relative poverty more significantly. Each region has its pattern of development that is consistent with its characteristics.

4.3. The Impact of Cross-Regional Migration Directions on Relative Poverty

After examining the migration distances of rural labour, the directions of mobility across regions are equally important. Table 8 shows the results of cross-regional migration direction on relative poverty in the western, central and eastern regions. For the sake of the accuracy of the study, we only kept the samples of cross-provincial mobility and cross-regional mobility. Columns (1)–(2) are for the western region, columns (3)–(4) for the central region, and columns (5)–(6) correspond to estimates for the eastern region. The impact of cross-regional migration directions on relative poverty varies across the three regions. In the west, rural labour mobility to the central and eastern regions will reduce the probability of relative poverty, but not significantly; the impact of cross-regional mobility on the central region is significantly negative, which means that mobility from the central region to the western region will reduce the probability of relative poverty by about 5%, and will further reduce it by 5% if it goes to the eastern region. It is mainly due to the rapid development of the western region and the higher economic level of the east, which brings more opportunities. However, in the east, the cross-regional migration has a positive effect and is significant at the 10% level, which indicates that the eastern rural labour force will

likely increase their probability of relative poverty if they move to the western and central regions, so it is better to stay in the east.

Table 8. Estimates of the impact of cross-regional migration directions on relative poverty.

	Western China		Central China		Eastern China	
	(1)	(2)	(3)	(4)	(5)	(6)
	LPM	Probit	LPM	Probit	LPM	Probit
Directions of cross-regional migration	−0.0145 (0.0166)	−0.0139 (0.0524)	−0.0487 * (0.0269)	−0.0467 ** (0.0893)	0.0508 * (0.0297)	0.0461 * (0.0997)
In work	−0.1162 ** (0.0514)	−0.1122 ** (0.1503)	−0.1229 *** (0.0402)	−0.1172 *** (0.1478)	−0.0928 (0.0771)	−0.0749 (0.2516)
Industries	−0.0010 (0.0324)	0.0025 (0.0976)	0.0165 (0.0297)	0.0178 (0.1160)	0.0418 (0.0386)	0.0443 (0.1482)
Education	0.0028 (0.0235)	0.0042 (0.0725)	−0.0189 (0.0226)	−0.0182 (0.0863)	0.0090 (0.0299)	0.0046 (0.1043)
Health	−0.0249 * (0.0146)	−0.0240 * (0.0463)	−0.0194 (0.0131)	−0.0218 * (0.0523)	0.0097 (0.0175)	0.0108 (0.0676)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Constant	1.9873 (1.5016)	5.0258 (5.1667)	−0.2814 (2.4928)	−4.2355 (10.3344)	0.5251 (0.7048)	0.4251 (2.7489)
N	809	809	788	788	457	457
R ² /Pseudo R ²	0.09	0.08	0.11	0.11	0.09	0.09

Note: The coefficient of probit in the table is its average marginal effects; robustness standard errors are in brackets; *, ** and *** denote 10%, 5% and 1% significance levels, respectively.

This sub-sample differs from the total sample and has its characteristics. Work is significantly negative in the western and central regions, but not in the eastern region, suggesting that working rural labourers in the western and central regions can significantly reduce the incidence of relative poverty by around 11%, while industries are not significant in the three regions. For human capital, education is insignificant in all three regions, but health is significantly negative at the 10% level in the western and central regions, with a larger marginal effect in the western region, meaning that improving the health of the cross-provincial mobile group in the west can significantly reduce their likelihood of falling into relative poverty.

4.4. Robustness Tests

We use three methods to test the robustness of the above results: firstly, replacing the relative poverty line of 60% of the median income adopted by the OECD with the relative poverty line adopted by the EU, 50% of the median income, and then using the probit model for regression estimation; secondly, replacing the probit model with the logit model for regression; thirdly, selecting Guangdong province, Henan province and Gansu province from the eastern, central and western provinces, respectively, to form a new sample for regression.

Table 9 presents the estimation results of the robustness tests using the three methods. After replacing the relative poverty line with 50% of the median income of rural residents in that year, migration, cross-regional migration, cross-provincial migration and cross-county migration all have a negative effect on relative poverty. Migration and cross-regional migration are significant at the 1% level and cross-provincial migration is significant at the 5% level, meaning that geographical mobility can significantly reduce the likelihood of rural residents being in relative poverty.

Table 9. Robustness test results.

	(1)	(2)	(3)	(4)
A: The relative poverty line is replaced by 50% of the median income of rural residents.				
Migration	−0.1305 *** (0.0267)			
Cross-regional migration		−0.2770 *** (0.0472)		
Cross-provincial migration			−0.1491 ** (0.0602)	
Cross-county migration				−0.0492 (0.0343)
Other explanatory variables	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes
Constant	4.8484 *** (0.5249)	5.0328 *** (0.5343)	5.3931 *** (0.5452)	5.5320 *** (0.5570)
N	18,953	18,404	17,095	16,350
Pseudo R ²	0.09	0.09	0.10	0.10
B: The method is replaced by logit model				
Migration	−0.2489 *** (0.0435)			
Cross-regional migration		−0.4703 *** (0.0764)		
Cross-provincial migration			−0.2067 ** (0.0948)	
Cross-county migration				−0.1371 ** (0.0564)
Other explanatory variables	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes
Constant	11.0889 *** (0.8710)	11.4042 *** (0.8862)	11.9751 *** (0.9051)	12.2130 *** (0.9224)
N	18,953	18,404	17,095	16,350
Pseudo R ²	0.10	0.10	0.11	0.11
C: Select a province from each region to form a new sample				
Migration	−0.1065 *** (0.0391)			
Cross-regional migration		−0.2492 *** (0.0627)		
Cross-provincial migration			−0.0990 (0.0835)	
Cross-county migration				−0.0202 (0.0502)
Other explanatory variables	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes
Constant	9.0398 *** (2.5251)	9.5191 *** (2.5929)	8.7057 *** (2.6371)	8.9792 *** (2.6874)
N	6704	6490	5850	5528
Pseudo R ²	0.10	0.10	0.11	0.11

Note: Robustness standard errors are in brackets; ** and *** indicate significance at the 5% and 1% levels, respectively.

After replacing the probit model with the logit model, migration and cross-regional migration are significantly negative at the 1% level, and cross-provincial migration and cross-county migration are significantly negative at the 5% level, indicating that geographical mobility and mobility across regions, provinces and counties can significantly reduce the probability of rural labour falling into relative poverty.

In the regressions for Guangdong province, Henan province and Gansu province in the eastern, central and western regions, respectively, migration, cross-regional migration, cross-provincial migration and cross-county migration all have a negative effect on relative poverty, and the first two are significant at the 1% level, meaning that rural labourers who move, especially between regions, are less likely to be in relative poverty.

Consistent with the key explanatory variables, the estimates of the other variables, after applying the three methods of robustness testing, maintained a high degree of consistency with the estimates in the study, with similar signs and significance of the variables, providing a good validation of the robustness of the estimates.

4.5. The Interaction Effects of Migration with Work and Human Capital

Table 10 shows the results of estimating the interaction effects of migration with work and human capital in the total sample. As can be seen from column (1), before migration, rural labourers with jobs are less likely to be in relative poverty than those without jobs, with a significant marginal effect of -0.1446 . In other words, rural labourers without jobs are 14.46% more likely to be in relative poverty compared to those with jobs. Although the marginal effect of the interaction term is 0.0806 significantly, since this is a non-linear model, the marginal effect of the cross term cannot be applied directly, so by calculating the bias effect, it can be seen that after migration, rural labourers with jobs are 6.40% less likely to be relatively poor than those without jobs. In other words, rural labourers without jobs are 6.40% more likely to be relatively poor compared to those with jobs. Compared to the 14.46% before migration, the rural labour force without a job is 8 percentage points less likely to be in relative poverty, suggesting that migration reduces the risk of relative poverty for the unemployed rural labour force. In column (2), before migration, the shift of rural labourers from primary to tertiary industries and from tertiary to secondary industries both significantly reduced their likelihood of relative poverty, with a marginal effect of -0.0245 , significant at the 1% level. After migration, the marginal effect of industries is further strengthened, with labour shifting from primary to tertiary and from tertiary to secondary industries reducing their likelihood of being in relative poverty by 2.85%, suggesting that migration further strengthens the relative poverty alleviation effect of non-farm employment.

Table 10. Estimated results of the interaction effects of migration with work and human capital.

	(1)	(2)	(3)	(4)
Migration	-0.1160^{***} (0.0244)	-0.0331 (0.0378)	-0.1506^{***} (0.0229)	-0.0807^{***} (0.0252)
In work	-0.1446^{***} (0.0163)			
In work \times Migration	0.0806^{***} (0.0256)			
Industries		-0.0245^{***} (0.0071)		
Industries \times Migration		-0.0040 (0.0145)		
Education			-0.0328^{***} (0.0051)	

Table 10. Cont.

	(1)	(2)	(3)	(4)
Education × Migration			0.0484 *** (0.0097)	
Health				−0.0114 *** (0.0035)
Health × Migration				0.0110 (0.0070)
Other explanatory variables	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes
N	18,953	18,953	18,953	18,953
Pseudo R ²	0.10	0.10	0.10	0.10

Note: The coefficients in the table are marginal effects at the sample mean; robustness standard errors are in brackets; *** indicates significance at the 1% level.

Columns (3) and (4) show the interaction effects of educational attainment and health level, respectively. The results show that before migration, the likelihood of rural labourers falling into relative poverty decreases significantly by 3.28% for each higher level of education; after migration, the marginal effect of educational attainment decreases. This suggests that compared to more educated rural labourers, the likelihood of falling into relative poverty for the less educated reduces after migration. Health also shows similar changes. The marginal effects of health on the rural labour force before and after migration are 1.14% and 0.04%, respectively, suggesting that the likelihood of relative poverty decreases to a greater extent for the groups with lower levels of health than for those with higher levels of health. Although the interaction effect between migration and health is not significant, both results suggest that migration can compensate to some extent for the human capital deficiencies of the rural labour force, and that disadvantaged groups with low levels of education and health are less likely to fall into relative poverty.

Table 11 presents the interaction effects of migration distances with work and human capital estimated through the marginal effects at representative values (MER) method. Consistent with these results, migration, whether across regions, across provinces within the same region or across counties within the same province, could compensate to some extent for the disadvantages of no work, less educational attainment and poor health falling into relative poverty, and mitigate the risk of relative poverty for rural people engaged in agricultural production. In the dimension of work, the difference between the marginal effects after migration and before migration decreases in order with the distance of migration, 0.0399, 0.0161 and 0.0159, respectively, indicating that migration has a greater effect on compensating for the risk of the relative poverty of the group out of work as the distance of migration increases. The same change emerges for industries, but this difference is relatively small overall, less than 1%.

Table 11. Estimated interaction effects of distance migrated with work and human capital (MER).

	In Work (1)	Industries (2)	Education (3)	Health (4)
No cross-regional migration	−0.1282 *** (0.0135)	−0.0235 *** (0.0064)	−0.0249 *** (0.0046)	−0.0090 *** (0.0031)
Cross-regional migration	−0.0883 *** (0.0095)	−0.0174 *** (0.0051)	−0.0144 *** (0.0030)	−0.0068 *** (0.0023)
Difference	0.0399	0.0061	0.0105	0.0022

Table 11. Cont.

	In Work	Industries	Education	Health
	(1)	(2)	(3)	(4)
No cross-provincial migration	−0.1243 *** (0.0139)	−0.0258 *** (0.0065)	−0.0223 *** (0.0047)	−0.0080 ** (0.0031)
Cross-provincial migration	−0.1082 *** (0.0147)	−0.0226 *** (0.0065)	−0.0176 *** (0.0041)	−0.0075 *** (0.0029)
Difference	0.0161	0.0032	0.0047	0.0005
No cross-county migration	−0.1351 *** (0.0162)	−0.0259 *** (0.0070)	−0.0271 *** (0.0052)	−0.0088 *** (0.0034)
Cross-county migration	−0.1192 *** (0.0126)	−0.0251 *** (0.0063)	−0.0218 *** (0.0039)	−0.0080 *** (0.0029)
Difference	0.0159	0.0008	0.0053	0.0008

Note: The coefficients in the table are marginal effects obtained from MER; robustness standard errors are in parentheses; ** and *** indicate significance at the 5% and 1% levels, respectively.

In contrast to work status, human capital shows some variation. In both the education and health dimensions, the largest changes in marginal effects before and after migration continue to be across regions, while cross-county migration within the same province causes the second largest change in marginal effects, overtaking cross-province migration within the same region. Although the difference between the latter two is small, this small difference is more stable in human capital, indicating that for rural labourers with poor human capital who want to make up for their human capital disadvantage through migration, cross-regional migration is undoubtedly the first choice. For those who do not want to move long distances due to costs or other considerations, migrating across counties within the same province is a beneficial alternative.

The interaction of migration with work and human capital also varies to a certain degree across regions, as shown in Table 12, which presents the results of the estimation based on regional heterogeneity. The results show that the mitigating effect of migration on groups out of work falling into relative poverty is greatest in the western region, followed by the east, and is the least in the central region, and is also significant only in the west. This suggests that migration can compensate to a greater extent for the disadvantages of rural labour out of work in the west. The marginal effect of the interaction term suggests that migration strengthens the effect of non-farm employment on relative poverty in the eastern and western regions, but is not significant. In terms of educational attainment, migration has the largest compensating effect on the low-education group in the western region, followed by the central region, and the smallest effect in the eastern region, all of which are significant. In addition, migration can also significantly compensate for the poor health of the rural workforce in the east, making them less likely to fall into relative poverty to a greater extent.

Table 12. Estimated results of the interaction effects of migration with work and human capital based on regional heterogeneity.

Variables	Eastern China	Central China	Western China
	(1)	(2)	(3)
Migration	−0.0841 ** (0.0381)	−0.1348 *** (0.0418)	−0.1275 ** (0.0508)
(A) In work	−0.1471 *** (0.0228)	−0.1294 *** (0.0284)	−0.1583 *** (0.0370)
In work × Migration	0.0646 (0.0399)	0.0552 (0.0442)	0.1126 ** (0.0529)

Table 12. Cont.

	Variables	Eastern China	Central China	Western China
		(1)	(2)	(3)
(B)	Migration	0.0158 (0.0576)	−0.1362 * (0.0740)	−0.0174 (0.0714)
	Industries	−0.0174 * (0.0091)	−0.0286 ** (0.0141)	−0.0406 ** (0.0162)
	Industries × Migration	−0.0161 (0.0224)	0.0195 (0.0280)	−0.0029 (0.0277)
(C)	Migration	−0.1241 *** (0.0343)	−0.1997 *** (0.0454)	−0.1461 *** (0.0433)
	Education	−0.0261 *** (0.0067)	−0.0480 *** (0.0106)	−0.0320 *** (0.0108)
	Education × Migration	0.0438 *** (0.0142)	0.0512 *** (0.0194)	0.0555 *** (0.0186)
(D)	Migration	−0.1179 *** (0.0384)	−0.0762 (0.0491)	−0.0730 (0.0480)
	Health	−0.0077 * (0.0045)	−0.0105 (0.0069)	−0.0199 ** (0.0078)
	Health × Migration	0.0270 ** (0.0106)	−0.0029 (0.0137)	0.0144 (0.0136)
In each model	Other variables	Yes	Yes	Yes
	N	8764	5231	4958
	Pseudo R ²	0.11	0.10	0.07

Note: The coefficients in the table are marginal effects at the sample means; robustness standard errors are in parentheses; *, ** and *** denote 10%, 5% and 1% significance levels, respectively.

4.6. Estimated Results of the Impacts of Migration on Income

Relative poverty is measured by the relative poverty line, and the relative poverty line is determined by the income of the residents; therefore, relative poverty ultimately depends on income. To explore the mechanisms behind the impact of migration on relative poverty, it is of considerable significance and value to conduct a study on migration and income, which can better help to clarify the mechanism of migration on the relative poverty of rural residents. Therefore, this part focuses on the distance of migration and conducts an in-depth analysis in terms of both national and regional heterogeneity.

4.6.1. The Impacts of Migration Distances on Income

Table 13 shows the estimated results of the impacts of migration distances on the income growth of rural residents. The results show that both geographical migration and migration across regions, provinces and counties could raise the income levels of rural residents, significant at the 1% level. Geographical migration could raise residents' income by 14.17%; compared to staying in the region, cross-regional migration boosts the income of the rural labour force by 25.75%; in the same region, rural labourers who migrate across the province will earn 12.95% more than those who remain in the province; and in the same province, cross-county migration is able to generate a 7.82% increase in personal income. Therefore, the greater the distance of geographical mobility, the higher the growth rate of rural residents' income, indicating that adequate spatial mobility of labour resources could significantly bring about an increase in the rural residents' earnings. This may also be an incentive for rural labourers to migrate long distances. They will choose to move across regions and provinces only if the income they earn far exceeds the costs associated with moving long distances.

Table 13. Estimated impacts of geographical migration distance on income.

	(1)	(2)	(3)	(4)
Migration	0.1417 *** (0.0152)			
Cross-regional migration		0.2575 *** (0.0252)		
Cross-provincial migration within the same region			0.1295 *** (0.0337)	
Cross-county migration within the same province				0.0782 *** (0.0199)
Other explanatory variables	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes
Constant	4.4799 *** (0.2780)	4.3781 *** (0.2775)	4.1387 *** (0.2816)	4.0761 *** (0.2867)
N	18,893	18,345	17,039	16,297
R ²	0.24	0.24	0.25	0.25

Note: robustness standard errors are in brackets; *** indicates significance at the 1% level.

4.6.2. The Impacts of Migration on Income Based on Regional Heterogeneity

Table 14 presents the results of the estimated impacts of migration on income based on regional heterogeneity. The results show that migration has the greatest impact on the income of rural residents in the central region, with their income increasing by 22.95% as a result of migration; followed by the western region, where migration brings them an income increase of 9.99%; and similar to the west, the eastern region has an income growth rate of 9.42%. The comparison reveals that income growth in the central region is much higher than in the east and west, and that migration plays a significant income-pulling role for the central region, which is consistent with our above results and explains why migration has the largest relative poverty reduction effect in the central region.

Table 14. Impacts of migration on income based on regional heterogeneity.

Estimated	Western China	Central China	Eastern China
Migration	0.0999 *** (0.0283)	0.2295 *** (0.0265)	0.0942 *** (0.0251)
In work	0.2543 *** (0.0637)	0.2115 *** (0.0485)	0.3577 *** (0.0594)
Industries	0.0650 ** (0.0275)	0.0633 *** (0.0244)	0.0077 (0.0181)
Education	0.0575 *** (0.0169)	0.0743 *** (0.0166)	0.0999 *** (0.0120)
Health	0.0539 *** (0.0126)	0.0270 ** (0.0117)	0.0084 (0.0090)
Control variables	Yes	Yes	Yes
Constant	4.0410 ** (1.9561)	2.2222 (1.6211)	4.5563 *** (0.3377)
N	4943	5214	8736
R ²	0.19	0.23	0.25

Note: Robustness standard errors are in brackets; ** and *** indicate significance at the 5% and 1% levels, respectively.

Work is significantly positive in all three regions, and having a job increases the income of rural residents in the eastern region by 35.77%, followed by 25.43% and 21.15% in the western and central regions, respectively, compared to those who do not have a job. The

coefficient of industry is significantly positive at around 6% in both western and central regions, indicating that engaging in non-farm industries enable rural residents in western and central regions to achieve income growth. In terms of human capital, education is significantly positive in all three regions. The coefficient for education is highest in the east, with a 9.99% increase in income level for each higher grade of education, followed by the central and western regions. Health is significantly positive in the west and central regions, where income will increase by 5.39% and 2.70%, respectively for each level of health improvement, but not is significant in the east.

4.6.3. The Impacts of Migration Distances on Income Based on Regional Heterogeneity

Table 15 presents the results of estimating the effects of migration distances on income based on regional heterogeneity. Columns (1)–(3) present the estimated results for the western region, columns (4)–(6) for the central region, and columns (7)–(9) for the eastern region. The results show that cross-regional migration is significantly positive in all three regions and has the greatest impact on the income of rural residents in the central region, allowing an increase their income by 30.7%, which is much higher than the 16.7% in the east and the 14.1% in the west. In the east, the income of rural residents who move across provinces increased by 17.0%, which is higher than those who stay in the region. In the western region, cross-provincial migration can increase the income of rural residents by a significant 11.8%, but in the central region, the positive effect of migration is not significant. Within the same province, cross-county migration has the greatest impact in the central region, able to increase the income of rural residents by a significant 14.1%, followed by the eastern region with a significant increase of 6.1%, and a positive but insignificant effect in the western region.

Table 15. Estimated impacts of migration distances on income based on regional heterogeneity.

	Western China			Central China			Eastern China		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Cross-regional migration	0.141 *** (0.046)			0.307 *** (0.033)			0.167 * (0.088)		
Cross-provincial migration		0.118 ** (0.056)			0.052 (0.101)			0.170 *** (0.047)	
Cross-county migration			0.051 (0.037)			0.141 *** (0.037)			0.061 ** (0.031)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	2.30 ** (1.12)	2.04 * (1.15)	2.19 * (1.19)	2.04 (1.65)	0.25 (1.72)	0.15 (1.77)	4.62 *** (0.34)	4.50 *** (0.34)	4.39 *** (0.35)
N	4756	4261	3949	5021	4299	4236	8568	8479	8112
R ²	0.20	0.22	0.23	0.23	0.23	0.23	0.25	0.25	0.26

Note: The robustness standard errors are in brackets; *, ** and *** denote 10%, 5% and 1% significance levels, respectively.

It is clear from the above results that cross-regional migration and cross-county migration within the same province has the greatest impact in the central region and can significantly drive the growth of rural residents' income. Rural residents in the central region use cross-regional migration to achieve a more complete use and distribution of resources and thus increase their income, while the distribution of resources within the province in the central region is not balanced, with large differences between counties; therefore, the role of cross-county mobility is more prominent. In addition, the impact of migration across provinces is largest and most significant in the eastern region, indicating that within the eastern region, there is still a more obvious development gap between provinces, such as Beijing, Shanghai, Guangzhou and other mega-cities which are gathering more resources and advantages, and rural labourers from other provinces will improve their income levels by working in more developed provinces and cities.

5. Discussion

The results of this study suggest that migration could significantly reduce the likelihood of relative poverty among rural labourers, affirming the poverty-reducing role of migration. This supports to some extent the view of the poverty reduction effect of migration mentioned in the studies of Li (1999) [31], Yue and Luo (2010) [34], and Atnafu et al. (2014) [26]. Furthermore, because relative poverty reflects the gap between the rich and the poor to a certain extent, the results of this study are also consistent with the view that migration could reduce the income gap as mentioned by Nguyen et al. (2011) [42]. This study's validation of the compensatory role of migration not only confirms Sun's (2020) view on the human capital transformation channel [37], but also suggests that migration can compensate for rural labour unemployment. Unlike the studies by Bertoli et al. (2014) [35] and Han et al. (2018) [36], we only conclude that migration can significantly reduce the likelihood of relative poverty among rural labourers by 4%, which is much lower than the 20–30% reduction in absolute poverty mentioned in their research. This may be because the relative poor group is generally at a higher economic level than the absolute poor, which means that they have less room for upward mobility. In addition, as the 2020 household data have not yet been updated, we have analysed only individual rural labourers, not households, and therefore not the impact of remittances. However, the income-raising effect of migration is strongly confirmed. If we consider the distance and regional heterogeneity of migration from the perspective of rural households as well as rural macro development, we may come to more interesting conclusions.

6. Conclusions and Suggestions

Relative poverty is widespread in both developed and developing countries and is closely linked to income gaps and social equity. After escaping from absolute poverty, alleviating relative poverty has become an important issue in China's development. Similar to absolute poverty, rural areas remain the main battleground for relative poverty. Rural labour has migrated to developed regions and cities to obtain higher incomes and more employment opportunities. However, most existing studies focus on absolute poverty and less on relative poverty, and most focus on migration between urban and rural areas, with insufficient attention paid to cross-regional migration. As a vast country, China has uneven development among regions, which affects rural-labourer migration, and migration in turn affects regional imbalances. The study of relative poverty from the perspective of geographical balance can not only further enrich the existing literature and provide a new perspective for poverty-reduction research, but also provide theoretical guidance for policy decisions on promoting a balanced regional development and the long-term sustainability of poverty reduction.

We conduct baseline regressions using linear probability models, analyse the different effects of cross-regional, cross-provincial and cross-county migration on relative poverty using a binary probit model, and run group regressions for the western, central and eastern regions, respectively, to compare the differences in the effects of migration on relative poverty. To further consider the effects of migration on employment and human capital poverty reduction, we also introduced interaction terms to explore in depth the interaction between migration and employment and human capital, which is a novel aspect of our study. Multiple linear models with income as the dependent variable further corroborate our findings.

The main findings of this study are as follows: (1) Migration can significantly reduce the likelihood of relative poverty in the rural labour force by 4%. (2) The greater the distances of migration, the greater the alleviating effect on relative poverty. The role of cross-regional, cross-provincial and cross-county migration decreases in descending order. (3) The cross-regional and cross-county migration of rural labourers play the largest role in reducing relative poverty in Central China, and cross-provincial migration plays the largest role in Eastern China. The role of rural-labourer migration from Central China to the west and east increases in that order. (4) Rural labourers who are unemployed, less educated

and in poor health are more likely to be relatively poor, and migration could compensate well for this disadvantage. (5) Migration could significantly increase the income of rural labourers, especially in Central China, boosting income by 22.95%. The effects of cross-regional, cross provincial and cross-county migration decrease in that order, as is consistent with previous estimates. From the above findings, it is clear that Central China is a priority region for relative poverty management through the migration of rural labourers.

Therefore, to alleviate relative poverty, narrow the income gap and achieve sustainable economic and social development in rural areas, it is necessary to smooth the migration channels of rural labour, not only to break down the household registration and institutional barriers to the geographical mobility of labour, but also to increase the construction of public transportation systems and other infrastructure in villages so as to provide more convenience for them to move long distances. Great attention should be paid to the migration of the rural population in the central region, promoting their mobility across regions and counties, and helping to achieve more balanced and sustainable development between regions.

We should, on the one hand, strengthen investment in infrastructure, such as railways, motorways, ordinary national and provincial trunk lines and road passenger terminals, among the central, western and eastern regions and the eastern provinces, to ensure the smooth flow of national transport trunk lines among regions and provinces. On the other hand, we are supposed to further improve the effective connection between various rural villages and transport hubs, improve the layout of the rural transport network, strengthen the upgrading of the backbone road network and the extension of the basic road network to provide the most practical convenience for the rural labourer to migrate and help solve their “last mile” problem.

In addition, rural labourers who migrate across regions, provinces and counties can be given different gradations of transport subsidies or transitional living subsidies to reduce their migration costs, especially for long-distance migration. For migrating rural labourers from the western region, we suggest to strengthen their unemployment protection and provide free vocational skills training to help them smoothly pass the unemployment period. We also suggest to further improve the medical insurance for migrating rural labourers from the eastern region to alleviate the pressure to seek medical treatment. For migrant rural labourers starting their businesses, they should be given a certain amount of support in the form of loans, and incentives should be given to individuals who are better at their businesses.

It should be noted that our study still has some limitations. As the household data for the 2020 CFPS have not been updated, we have only conducted our analysis for individual rural labourers and have not considered the impact of household factors. Additionally, we have only studied the three traditional economic zones of China: western, central and eastern, without a more precise delineation of geographical regions. If we could take into account the economic status of rural households and further analyse geographical migration with more precision, we might obtain more interesting conclusions and findings.

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