

Original Research

Households Production Factor Mismatches and Relative Poverty Nexus: A Novel Approach

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Abstract

Based on the data of China's household tracking survey, the relative poverty scale and government subsidies are used to measure the impact of relative poverty scale and government subsidies on restraining the continued relative poverty of families through the relative poverty measurement index and decomposition method, and the binary regression model is used to analyze family characteristics, factor allocation, risk protection, income. The relative poverty reduction effect of structure and further analyze the interaction of household urban-rural heterogeneity. The study found that the mismatch of household production factors will cause relative poverty to persist, but government guidance and the optimization of labor factor allocation can restrain the negative impact of factor mismatch; in the long run, the relative poverty reduction effect of household production factor allocation is dependent on the initial wealth of the family. low; the allocation of labor factors is relatively deprived by the heterogeneity of households in urban and rural areas. Based on this, policy suggestions are put forward, such as promoting the transformation of the government's poverty governance capacity, making up for the shortcomings of the factor market, and accelerating the process of urban-rural integration.

Keywords: agricultural factor endowment, relative poverty, rural poverty, government support, mismatch of production factors

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Introduction

Poverty is a chronic disease of human society and solving the relative poverty is the focus of China's poverty alleviation in the new era. Poverty alleviation ended the persistence of absolute poverty and started the journey of alleviating relative poverty. Faced with the changing situation of continuous poverty alleviation, studying the long-term mechanism to restrain relative poverty is an inherent requirement for the effective connection between poverty alleviation and rural revitalization. Relative poverty is a dynamic concept that is measured by the percentage of group resources owned by an individual or family, and is constantly changing with social progress [1].

With the passage of time, the definition of the average living standard given by the society is constantly updated, which leads to the generation of new needs of the family. When these needs cannot be fulfilled, the family is relatively deprived and hindered from obtaining the development opportunities [2]. Although there are differences in the resources required by each economic unit, it can be linked to the social average standard, and relative poverty is measured through the dynamic definition standards [3]. In the governance of relative poverty, to meeting the family's needs for the average living standard of the society, it should also meet the family's needs for comprehensive development [4], to receive good education opportunities, good health, obtain favorable information and achieve various social achievements [5-7]. By improving the ability of relatively poor families, can make them to obtain income, obtain self-happiness in the life cycle and gradually suppress the persistence of relative poverty [8].

Capital and labor are the main components of household productivity, and the mismatch between the two is the main reason for economic disparity and the persistence of relative poverty [9]. In the study of labor force, scholars have found that income does not show a normal distribution according to the individual ability, but it changes with the investment of human capital. Rational investment choices will reduce the impact of individual differences in labor force on the income distribution [10]. Even if the resource endowment owned by households is homogenized, the degree of relative poverty reduction is not ideal and the utility difference caused by the choice of household labor and the allocation of labor time still has a greater impact on relative poverty [11]. In the analysis of different choices, the impact of production technology and capacity differences on suppressing relative poverty is smaller than the factor mismatch [12]. The impact of capital factor mismatch on relative poverty mainly depends on the methods and difficulties in acquiring capital. Some scholars believe that the difference in capital stock is the main factor that causes

relative poverty to persist. The reason for the family economic gap is that, some families are unwilling or unable to use the advanced and high-cost business models. If this part of capital is given to the economic level as a compensatory change for low-income households, the rate of relative poverty reduction can be accelerated [13-14]. The long-term accumulation of capital factor mismatches will affect the unique steady-state distribution of household wealth and economic efficiency.

The mismatch of household production factors leads to differences in factor returns. After infinite iterations of the life cycle, the poverty reduction effects caused by differences in factor returns are significantly different. In this regard, scholars have conducted a lot of research on the poverty reduction effect of household production factor mismatch. Some scholars believe that when households allocate production factors, they are constrained by time, factor endowments and cannot suppress the persistence of relative poverty through the potential output [15]. The number of family members will also have an impact on the mismatch of production factors, and the increase in the production efficiency of some members will affect the distribution of production factors of the entire family. From the perspective of the adaptability of factor resource endowments, some scholars explore the general development law to improve the efficiency of production factor allocation to suppress the persistence of relative poverty [16], and focus on labor [17], capital [18] and land [19-20].

Several researchers have conducted research focusing on the impact of household production factor mismatch and persistence of relative poverty, and achieved fruitful outcomes. However, there are still few shortcomings exist as follows; when researchers simulate the general equilibrium of household production factors from mismatch to adaptation, the difference in household initial resource endowment significantly affects the mode and efficiency of factor allocation. After poverty alleviation, household livelihood needs are basically solved and the difference in factor allocation is significantly reduced and replaced by the difference in factor endowment caused by the heterogeneity of urban and rural households. Based on the above, this paper contributes in the existing literature by the following ways: firstly, by constructing the family production function and introduction of government support/guidance this study aims to analyze and verify its rationality. Secondly, this study intends to measure and decompose the relative poverty levels of urban and rural households. Thirdly, this study aims to estimate the mismatch of production factors caused by household heterogeneity in urban and rural areas and analyze the impact of household heterogeneity in relative poverty persistence.

Material and Methods

Theoretical Background of the Study

Household Production Function

Combined with the theory of time distribution, we analyze the allocation of household production factors. As a combination of production and consumption, households allocate labor by adjusting working hours. Rational economic people constantly adjust their expectations according to the cost per unit time, and compare the difference between the elasticity of time along with different allocation methods and the difference in unit elasticity to select the relative benefits. The higher configuration mode achieves Pareto improvement. For relatively poor families, government guidance is an important way of dealing with external risks and a source of funds. At the same time, the incompleteness of the factor market will offset the productivity and economic benefits of some households. As a result, the government needs to regulate the incomplete factor market to clear the obstacles for the flow of household production factors [21]. Therefore, combining the allocation of household production factors and government guidance to construct the household production function [22], is formulated as follows:

$$F(K, L) = G(L) \sum_{i=1}^n K_i^r \quad (1)$$

$$G(L) = \left[\alpha L_1^\beta + (1-\alpha) L_2^\beta \right]^{\frac{1-r}{\beta}}, \beta \in (-\infty, 1] \quad (2)$$

The factors that families can freely dispose of a mainly consist of capital and labor. For relatively poor families, the initial capital of each family is more heterogeneous. Therefore, when studying the persistence of relative poverty, it does not rely on a single initial capital, but depends on each family. The capital that is continuously invested in the period is the government's policy subsidies for relatively poor families. The form of the labor force dominated by the family is that the labor force is invested in different preferences through time allocation to obtain benefits. Accordingly, it is assumed that the household production function is a first-order homogeneous function, $G(L)$ is a sub-function of L , and a constant is used to replace the elastic production function, which is $(1-r)$ homogeneous, indicating that L_1 and L_2 are not completely replaced. L_1 represents the preference for labor force input to work, L_2 represents the preference for labor force input to agriculture. represents the output elasticity of , L_1 represents the output elasticity of L_2 , represents the substitution parameter. When approaches 1, it indicates that L_1 and L_2 approached complete substitution, and when β approached 0, it indicated that L_1 and L_2 approached

complete complementation. If the sum of capital K_i is raised to the power of r , the production function satisfies the first-order homogeneity, and at the same time, it means that the capital invested in each period can be completely replaced. The output elasticity of L_1 and L_2 is positively related to the working time. The longer the input labor time, the higher the output elasticity. The sum of labor time is defined as unit 1, and the labor time that can be invested in labor and farming is t_1 and $(1-t_1)$, respectively. Equation (3) is as follows:

$$F(K, L) = \left[t_1 L_1^\beta + (1-t_1) L_2^\beta \right]^{\frac{1-r}{\beta}} \sum_{i=1}^n K_i^r, \beta \in (-\infty, 1] \quad (3)$$

Hypothesis 1: Government guidance can restrain the relative poverty of households from continuing.

Capital Allocation and Relative Poverty

The family capital is exogenous, and the continuous investment of government subsidies is used to suppress the continued relative poverty, replacing the role of the family's own capital in suppressing relative poverty, and effectively avoiding the negative interference of family initial capital heterogeneity on relative poverty. Compared with the uncertainty and prudence of the family's own capital, government subsidies have the characteristics of stability and security. The rationale for this approach is demonstrated below.

$$F_K = \frac{rF(K, L)}{\sum_{i=1}^n K_i} \quad (4)$$

$$F_L = \frac{(1-r)F(K, L) \left[t_1 L_1^{\beta-1} + (1-t_1) L_2^{\beta-1} \right]}{t_1 L_1^\beta + (1-t_1) L_2^\beta} \quad (5)$$

$$F_{KK} = \frac{rF(K, L)(1-n)}{\sum_{i=1}^n K_i} \quad (6)$$

$$F_{LL} = \frac{(1-r) \left[t_1 L_1^{\beta+1} + (1-t_1) L_2^{\beta+1} \right] \left[(\beta-1) F_L \left[t_1 L_1^{\beta+2} + (1-t_1) L_2^{\beta+2} \right] - \beta F(K, L) \left[t_1 L_1^\beta + (1-t_1) L_2^\beta \right] \right]}{\left(t_1 L_1^\beta + (1-t_1) L_2^\beta \right)^2} \quad (7)$$

From Equations (4) and (5), both F_L and F_K are greater than 0, and both government subsidies and labor force have a positive effect on household production. It can be seen from formulas 6 and 7 that F_{LL} and F_{KK} are both less than 0, indicating that the family production function is monotonically increasing and marginally

decreasing with respect to government subsidies and labor.

$$F_{KL} = \frac{rGL}{\sum_{i=1}^n K_i} \tag{8}$$

It can be noticed from Equation (8) that F_{KL} is greater than 0, indicating that the effects of government subsidies and labor on the family production function are in the same direction and positive. Combining formulas 4 to 8, it can be observed that the family production function has good properties and is in the quasi-concave stage, and the corresponding isoquant curve is convex towards the origin, which is also called convexity production technology. If the household production technology is convex, it belongs to the mismatch of connotative factors. In the long run, the improvement of its economic level is not affected by the initial wealth conditions, but depends on the cross-sectional returns of the input factors due to the following reasons [23]. The dynamic iterative mapping of the production efficiency distribution in the household production function shows a monotonous increase, and the longer the iteration period can result in more obvious effect.

Hypothesis 2: In the long run, suppressing the persistence of relative poverty is less dependent on the initial household wealth.

Labor Allocation and Relative Poverty

After the capital factor is exogenous, the object of family production factor allocation is labor. Unlike labor allocation in a market economy, the amount of labor that can be allocated by a family is limited. Therefore, labor can only be linked to time, and labor allocation efficiency can be improved through time allocation. Derivation with respect to time is given as:

$$F' = \frac{(1-r) \sum_{i=1}^n K_i' [t_1 L_1^\beta + (1-t_1) L_2^\beta]^{\frac{1-r-\beta}{\beta}} (L_1^\beta - L_2^\beta)}{\beta} \tag{9}$$

$$F'' = \frac{(1-r)(1-r-\beta) \sum_{i=1}^n K_i' [t_1 L_1^\beta + (1-t_1) L_2^\beta]^{\frac{1-r-2\beta}{\beta}} (L_1^\beta - L_2^\beta)^2}{\beta^2} \tag{10}$$

For relatively poor families, the labor time is fixed, and they can freely choose to work, farm, or both within the time range. Therefore, L_1 and L_2 are complementary only if the substitution parameter β is less than 0, and the second derivative function is greater than 0. The first-order derivative function takes a value of 0 when L_1 and L_2 are equal. Based on this observation,

it can be seen that the allocation efficiency of the household production function depends on the investment returns of L_1 and L_2 . When the return on investment of L_1 is higher, the labor time should be invested in L_1 as much as possible to obtain higher returns, and vice versa.

Under the natural conditions, households do not perceive income gaps, or they perceive income gaps but uncertainty and risk reduce expected returns, making it impossible to change labor allocations based on income gaps. After government subsidies have solved the basic needs and risk protection of households, the scope of labor allocation has been broadened, and it is easier to accept the demonstration effect of wage attraction and high-income allocation, upgrade the allocation of household production factors, and allocate labor time reasonably to obtain higher income. At the same time, when labor time is allocated to higher-yielding options, the shadow price of leisure increases, and the opportunity cost of giving up work to consume leisure increases, and the change in opportunity cost forces irrational families to make rational choices, further inhibiting the persistence of relative poverty.

Hypothesis 3: Allocating family labor time to migrant workers can lead to higher returns, thereby inhibiting the persistence of relative poverty.

Research Methods

Relative Poverty Measure

With the transformation of the nature of poverty, the center of poverty governance has changed to suppress the persistence of relative poverty. The rural infrastructure is weak, the information channels are relatively narrow, and the economic strength is relatively low. Compared with the average living standard of the society, the relative deprivation degree is relatively high, which is the focus of relative poverty governance. In addition, the relative poverty in cities and towns cannot be ignored. With the advancement of urban-rural integration, a large number of rural people have poured into cities and towns, and they are facing the risk of falling into relative poverty due to the high cost of living and basic public services in cities and towns. Compared with rural areas, relative poverty in urban areas is not taken seriously. It not only lacks a unified relative poverty standard, but also lacks social attention and targeted governance, which has become a hidden danger in relative poverty governance [24-27]. Therefore, in the governance of relative poverty, both urban and rural areas should be given equal attention by carrying out comprehensive governance.

Therefore, in terms of relative poverty theory, the relative poverty standards are set separately for rural and urban areas. In terms of the definition of the relative poverty standard, there is a lot of controversy in the academic circle. Some scholars use the average income as the basis to define the relative poverty standard.

The income ratio has a greater impact on the scale of relative poverty. If the ratio is set too low, it is easy to underestimate the scale of relative poverty. If the ratio is too high, there is an over-identification problem. Setting three ratios of 40%, 50%, and 60% can not only avoid the interference of ratio differences on the scale of relative poverty, but also reasonably reflect the trend of changes in the scale of relative poverty. The specific measurement methods are as follows:

$$P_{at} = \sum_{i=1}^n b_{it} \left(\frac{Z_t - Y_{it}}{Z_t} \right)^{\alpha}; \quad \alpha \geq 0 \quad (11)$$

P_{at} is the relative poverty measure index, and Y_i represents the per capita income of the household. By dividing the time periods based on time sequence, there is $t = 1, 2, \dots, n$ in each time period $i_t = 1, 2, \dots, n_t$. Where representing the relative poverty unit income in non-decreasing order, Z_t representing the current relative poverty line and b_{it} representing the population ratio of the relative poverty unit. Lastly, $\alpha \geq 0$, $\alpha = 0, 1, 2$ represents the relative poverty line for Poverty unit population ratio and relative poverty gap for the square of the relative poverty gap. Drawing on Mishra's poverty decomposition idea [30], the government subsidy is separated from the relative poverty measurement index and the capital allocation is studied in order to verify the rationality of the hypothesis. The specific decomposition ideas are formulated as follows:

$$\Delta P_{ay} = \frac{1}{2} \left[(P_{at2|Rt1} - P_{at2|yt1}) + (P_{at1|yt2} - P_{at1|Rt2}) \right] \quad (12)$$

ΔP_{ay} Indicates the change in the relative poverty level of the family after the separation of government subsidies. If the ΔP_{ay} greater than 0, it means that the deduction of government subsidies is not conducive to suppressing the persistence of ΔP_{ay} relative poverty. By separating the changes before and after government subsidies, we compare the impact of capital allocation on restraining the continued relative poverty of households.

Interaction Term Regression

In order to verify the rationality of the above hypothesis, an econometric model was constructed for this research. The interaction term regression can greatly expand the interpretation of the dependence between variables by the regression model. For instance, how to measure the degree of influence of a variable on the explained variable changes under the action of another variable. The external environment faced by urban and rural areas is quite different and differences in basic public services, information sources, and employment opportunities interfere with the allocation of household production factors respectively. Therefore, household urban and rural heterogeneity is introduced into

the model. According to the sample data, household urban and rural heterogeneity affects household production factors. The influence of configuration sets interaction terms and forms a new control group to control the interference of trend differences on the identification of treatment effects, and further analyzes on how the configuration of household production factors inhibits the persistence of relative poverty under the influence of urban and rural heterogeneity. The model is formed as follows:

$$Y = \alpha_0 + \alpha_1 du + \alpha_2 dt + \alpha_3 du \times dt + \varepsilon \quad (13)$$

Y represents the change in relative poverty. The relative poverty level of the control group before the change in the allocation of production factors is represented by α_0 , whereas the α_1 represents relative poverty level of the treatment group before the change in the allocation of production factors. The α_2 represents the relative poverty level of the control group after the change in the allocation of production factors. The relative poverty level of the urban and the common trend of rural households in the changes in the allocation of production factors is represented by α_3 . The sum of the effects represents the allocation of production factors of households on suppressing the persistence of relative poverty under the influence of urban and rural heterogeneity.

Results and Discussion

Data Description

The data used in this study is obtained from the China Family Tracking Survey (CFTS). The database contains data in three levels: individual, family, and community, covering the changes in the economy, social relations, education, and health of the interviewed population. It has wide coverage, high access efficiency, and high data quality. Based on the principle of authenticity and effectiveness, the survey data from the years of 2014, 2016 and 2018 were selected for this research. Before analyzing data, the household economic survey and the relationship survey were matched and merged, and invalid samples were eliminated. A total of 8095 valid samples were obtained, including 3665 urban samples and 4430 rural samples. The elements with significant influence in the index system are selected for sample descriptive statistics (as shown in Table 1).

The number and proportion of each indicator in the sample changed to various degrees from 2014 to 2018. For instance, the urban households received less government subsidies, the preference for engaging in planting and breeding, and going out to work decreased, and those engaged in work and individual. The preference for the private sector has increased, and the number of households with savings has increased significantly. The rural households receiving government

Table 1. Descriptive Statistics.

Index	Area	Year 2014		2016		2018	
		Samples	Percentage	Samples	Percentage	Samples	Percentage
Engage in farming	Urban	1248	34.05%	1124	30.67%	933	25.46%
	Rural	3523	79.53%	3351	75.64%	3168	71.51%
Engaged in aquaculture	Urban	601	16.40%	491	13.40%	491	13.40%
	Rural	1659	37.45%	1419	32.03%	1577	35.60%
Engage in private work	Urban	430	11.73%	482	13.15%	488	13.32%
	Rural	303	6.84%	338	7.63%	328	7.40%
Do farm work	Urban	118	3.22%	56	1.53%	156	4.26%
	Rural	197	4.45%	126	2.84%	502	11.33%
Go out for work	Urban	1211	33.04%	1168	31.87%	1152	31.43%
	Rural	2228	50.29%	2398	54.13%	2299	51.90%
Working	Urban	1443	39.37%	1528	41.69%	1487	40.57%
	Rural	622	14.04%	618	13.95%	472	10.65%
Receive government subsidies	Urban	1485	40.52%	1195	32.61%	1059	28.89%
	Rural	3295	74.38%	2799	63.18%	2757	62.23%
Having bank deposit	Urban	1883	51.38%	2320	63.30%	2337	63.77%
	Rural	1850	41.76%	2456	55.44%	2443	55.15%

subsidies have decreased, the number of households with bank deposits have increased, the number of households engaged in planting and animal husbandry have decreased, and the number of households who have gone out to work and do farm work have increased slightly. The sample is basically consistent with the current economic development level and can correctly reflect economic facts such as the allocation of household production factors and changes in relative poverty.

Empirical Results and Discussion

Calculation of Relative Poverty

Based on the Chinese household tracking survey sample the 40 %, 50 % and 60 % of the per capita disposable income of urban residents and the median per capita disposable income of rural residents were substituted into the relative poverty measurement index and decomposition formula. To calculate urban and

Table 2. Relative poverty measurement of different vs same relative poverty standards.

Different relative poverty standards					
Years	Criteria for the classification	$P\alpha$	Urban relative poverty scale	$P\alpha$	Rural relative poverty scale
2014	40%	-0.110	26.23%	-0.944	17.78%
	50%	-0.035	32.14%	-0.353	20.93%
	60%	0.015	36.81%	-0.245	25.05%
2016	40%	-0.230	20.72%	-0.693	15.20%
	50%	-0.132	26.09%	-0.491	19.62%
	60%	-0.066	31.36%	-0.356	23.30%
2018	40%	-0.270	19.16%	-0.659	14.55%
	50%	-0.163	24.30%	-0.464	18.03%
	60%	-0.092	28.90%	-0.334	22.60%
$\Delta P_{\alpha y}$		0.099		0.328	

Table 2. Continued.

Same relative poverty standards					
Years	Criteria for the classification	$P\alpha$	Urban relative poverty scale	$P\alpha$	Rural relative poverty scale
2014	40%	-0.662	17.18%	-0.245	29.36%
	50%	-0.414	21.23%	-0.070	34.58%
	60%	-0.248	26.04%	-0.030	39.89%
2016	40%	-1.058	14.12%	-0.405	26.90%
	50%	-0.731	16.89%	-0.208	34.25%
	60%	-0.513	20.64%	-0.077	38.78%
2018	40%	-1.204	10.52%	-0.384	26.87%
	50%	-0.847	14.23%	-0.191	34.27%
	60%	-0.610	18.71%	-0.063	38.16%
ΔP_{ay}		0.15		0.176	

rural households, the relative poverty index and poverty scale results are shown in Table 2.

Overall, the relative poverty index under the 40 %, 50 % and 60 % standards showed a downward trend, and the corresponding relative poverty scale also decreased year by year indicating that the number of relatively poor families in urban and rural areas in the sample decreased significantly. However, for 60 %, the total number of relatively poor households are still relatively large. Horizontal comparison, the relative poverty index and relative poverty scale in the urban sample are larger than those in the rural sample indicating that the number of relatively poor households in the urban sample accounts for a larger proportion of the sample and the sense of relative deprivation caused by the average living standard in the urban sample is higher than that in the rural area. The scale of relative poverty under different standards varies greatly which showed a gradual decrease with the reduction of the relative poverty standard. This reflects the relative deprivation of families by different relative poverty standards. According to the degree of relative deprivation, the relative poverty standard can be reasonably distinct. By 2018, the relative poverty scale of urban and rural areas under the 40% standard was 19.16 % and 14.55 %. Most of them were in a relatively weak stage of relative poverty. The cost of continuing poverty is small, and it is suitable to be used as a relative poverty standard in the initial stage of relative poverty alleviation. After the separation of government subsidies, the net values of relative poverty indices in urban and rural areas are 0.099 and 0.328 respectively. This indicates the separation of government subsidies has a negative impact on the suppression of relative poverty, and the negative impact on rural households is greater than that of urban households. Hypothesis 1 confirms that the government guidance can restrain the relative poverty of households from continuing.

Based on the different standards of the median per capita disposable income of urban and rural residents, the calculated relative poverty index reflects the relative poverty level of urban and rural households under static conditions. With the advancement of urban-rural integration, urban and rural populations move to each other, the objective perception of average living standards changes and the resulting sense of relative poverty and deprivation is also different. Therefore, the national median per capita disposable income is introduced, and the urban and rural households are calculated separately. The relative poverty index and relative poverty level are calculated as shown in above Table 2.

After the unification of the relative poverty standards, the relative poverty index and relative poverty scale is significantly decreased in urban areas, while the relative poverty index and relative poverty scale in rural areas increased significantly. This reflects the gap of average living standards between urban and rural areas has formed a relative deprivation for rural families. After entering the town, there is still a sense of relative deprivation of the average living standard. Compared with urban areas, the scale of relative poverty in rural areas is higher. After unifying the relative poverty standards, the declining trend of the relative poverty scale of rural households slowed down, and the effect of government subsidies on restraining the persistence of relative poverty in rural families was reduced to 0.176 indicating the relative poverty level of rural families and government subsidies are less sensitive to high relative poverty standards. Higher the relative poverty standard results in the weaker role of government policy support, whereas the relative poverty in rural areas is higher.

Relative Poverty Reduction Effect

(a) The relative poverty reduction effect of each dimension

From the perspective of family characteristics, the relative poverty reduction effect of urban-rural division is the highest, and the relative poverty reduction effect of urban families is 0.792 higher than that of rural families. Cooking water and cooking fuel reflect the livelihood needs of relatively poor families. Families with stable access to clean water and energy are more likely to enhance the physical fitness of family members, increase family income, and enhance the relative poverty reduction effect. The number of books in the family reflects the spiritual needs of the family. Families with more than 25 books in the family are more likely to inhibit the persistence of relative poverty.

Material needs and spiritual needs together constitute the absolute core of restraining the persistence of relative poverty – feasible ability. Families that improve their ability have greater advantages in restraining the persistence of relative poverty. From the perspective of factor allocation, the relative poverty reduction effect of allocating labor to planting and aquaculture is not obvious, and the relative poverty reduction effect of allocating labor to self-employed and farming households is more obvious, which are 0.458 and 0.311 respectively. The relative poverty reduction effect of working outside the home and obvious working are 2.296 and 3.294 respectively. Hypothesis 3 proves that allocating labor to migrant workers and the work can achieve higher returns, thereby inhibiting the continued relative poverty of households.

Table 3. The relative poverty reduction effect of each dimension.

Dimensions	Index	P-Value	Relative poverty reduction effect
Family characteristics	Urban and rural division	0.000	1.792
	Number of family members	0.000	0.414
	Cooking water	0.020	1.159
	Cooking fuel	0.000	1.716
	Family book collection	0.000	1.472
Feature configuration	Engage in farming	0.000	0.519
	Engaged in aquaculture	0.003	0.814
	Engage in private	0.000	1.458
	Farm work	0.005	1.311
	Go out for work	0.000	3.296
	Working	0.000	4.294
Risk protection	Lease the land to others	0.491	1.055
	Government subsidy	0.012	1.985
	Retirement or pension	0.646	0.974
	Education grant	0.000	1.898
	Medicaid	0.344	0.950
	Insurance subsidy	0.000	1.442
Income structure	Bank savings	0.000	2.081
	Gross value of agricultural and sideline products as a percentage of total income	0.108	1.218
	Proportion of self-use agricultural and sideline products	0.000	2.682
	Part-time job income as a percentage of total income	0.033	1.044
	Salary income as a percentage of total income	0.589 _	1.000
	Pending bank loans	0.835 _	1.000
	Transfer income as a percentage of total income	0.000 _	0.360
	Government grants as a percentage of total income	0.002 _	1.285
Retirement or pension as a percentage of total income	0.007 _	1.299	

Table 2. Continued.

Relative poverty reduction effects of changes in factor allocation		
Index	P-Value	Relative poverty reduction effect
Engage in farming	0.231	0.821
Engaged in aquaculture	0.003	1.511
Engage in private	0.000	0.415
Do farm work	0.040	1.011
Go out for work	0.000	1.482
Working	0.000	1.396
Land lease	0.135	0.816
Government subsidy	0.105	1.177
Retirement or pension	0.431	0.914
Education grant	0.000	0.476
Medicaid	0.005	1.040
Insurance subsidy	0.699	0.925
Bank savings	0.000	0.597
Constant	0.000	28.874

From the perspective of risk protection, risk protection is mainly created by the government and the family's own capital. The government provides government subsidies, retirement and pensions, education subsidies, medical subsidies, and insurance subsidies for families. The relative poverty reduction effect of government subsidies is the most obvious, which is 0.985. The relative poverty reduction advantages of education subsidies and insurance subsidies are more obvious, i.e., 0.898 and 0.442. Households use bank deposits for risk protection, and the relative poverty reduction effect of households with bank deposits compared with households without savings is 1.081. From the perspective of income structure, the increasing proportion of working income, government subsidies, retirement and pensions in total income can increase the relative poverty reduction effect. Each 1% increase in the proportion of total income increases the relative poverty reduction effect by 0.044, 0.285 and 0.299 respectively. The relative poverty reduction effect of whether to receive retirement and pensions in risk protection is not obvious, because the indicator itself has receiving conditions, and some samples are identified as not receiving because their own objective conditions do not meet the receiving conditions. Pension is also an important indicator to protect family risk. The 50 % of the national median per capita disposable income as a standard for the relative poverty rate of change in 2014, 2016 and 2018 are measured as shown in Table 3.

(b) The relative poverty reduction effect of changes in factor allocation

From a static point of view, the relative poverty reduction effect of the family's own capital and the government's guidance is equally significant, and the relative poverty reduction is highly dependent on the family's own capital. It is necessary to verify the extent to which the dynamic changes of the family's own capital and the government's guidance have on the suppression of the persistence of relative poverty. Selecting a total of 14 indicators in the two dimensions of factor allocation and risk protection that have a significant impact on the relative poverty reduction effect, and regressing the relative poverty change rate and factor change rate of the sample in 2014, 2016 and 2018 respectively. Table 3 shows the calculated results.

Based on the above results, in the process of suppressing the continued relative poverty of households, engaging in animal husbandry, doing farm work, going out to work, engaging in work, government subsidies, and medical subsidies have a significant impact and the relative poverty reduction effect is more obvious, indicating that after optimizing the allocation of family production factors, the income increases. The factor return of, inhibits the persistence of relative poverty of households, and receiving government subsidies and medical subsidies further inhibits the persistence of relative poverty of households. The relative poverty reduction effect of the family's own capital in the change of relative poverty is not significant, but the impact on the identification of relative poverty is more significant. Hypothesis 2 proved that the family's own capital determines the family's initial wealth,

but it doesn't have a significant impact on the relative poverty changes of the family due to the incomplete and asymmetric factor market information reduces the expected return of the family's own capital allocation. Capital is only used for daily and practical needs that cannot be used as capital reserves for investment needs to make profits. Therefore, changes in relative poverty are less sensitive to households' own capital, and more sensitive to government subsidies and the optimization of household production factor allocation.

Conclusions

Based on the data of China's Household Tracking Surveys of 2014, 2016 and 2018, the relative poverty measurement index and decomposition method were used to measure the relative poverty scale and the impact of government subsidies on restraining the continued relative poverty of families. A binary regression model was used to analyze the family characteristics and factors. By analyzing the relative poverty reduction effects of allocation, risk protection and income structure this study firstly conclude that the mismatch of household production factors will cause relative poverty to persist, but government guidance and the optimization of labor factor allocation can restrain the negative impact of factor mismatch. In the analysis of the relative poverty reduction effect of each dimension, the relative poverty reduction effect of factor allocation varies significantly. Under the natural conditions, the unimproved low-efficiency factor allocation will cause the relative poverty of households to continue. However, after the introduction of government guidance and optimization of household labor allocation, the remuneration of household production factors has increased, and the relative poverty level has been significantly improved. Secondly, in the long run, the relative poverty reduction effect of household production factor allocation is less dependent on household initial wealth. In the binary choice regression, the family's own capital has a significant relative poverty reduction effect and increasing the amount of the family's own capital can effectively alleviate the relative poverty of a family. However, after the regression of relative poverty and the rate of change of the indicators, the relative poverty reduction effect of the family's own capital is not obvious. The reason is that the family's own capital is used for family risk mitigation instead of flowing in the factor market as a factor. Therefore, factor returns are not generated, while suppression of relative poverty persists insignificantly. The government should strengthen the close integration of government governance capacity and the income model of relatively poor households. It is essential to use the embedded governance model to stimulate relative poverty and the potential and vitality of the family's own development.

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Conflict of Interest

The authors declare no conflict of interest.

References

- PETER T. The meaning of poverty. *The British Journal of Sociology*, **61**, 85, **2010**.
- PETER T. A Sociological Approach to the Measurement of Poverty-A Rejoinder to Professor Amartya Sen. *Oxford Economic Papers*, **37**, 659, **1985**.
- PETER T. Poverty in the United Kingdom: A Survey of Household Resources and Standards of Living. University of California Press, **1**, 12, **1979**.
- AMARTYA S. Poor, Relatively Speaking. *Oxford Economic Papers*, **35**, 153, **1983**.
- AMARTYA S. A Sociological Approach to the Measurement of Poverty: A Reply to Professor Peter Townsend. *Oxford Economic Papers*, **37**, 669, **1985**.
- FAHAD S., WANG J. Farmers' risk perception, vulnerability, and adaptation to climate change in rural Pakistan. *Land Use Policy*, **79**, 301, **2018**.
- FAHAD S., WANG J. Climate change, vulnerability, and its impacts in rural Pakistan: a review. *Environ Sci Pollution Research*. **27**, 1334, **2020**.
- ANGUS D. What do self-reports of wellbeing say about life-cycle theory and policy? *Journal of Public Economics*, **162**, 18, **2018**.
- PAUL M.R. Human capital and growth: Theory and evidence. *Carnegie-Rochester Conference Series on Public Policy*, **32**, 251, **1990**.
- JACOB M. Investment in Human Capital and Personal Income Distribution. *Jacob Mincer*, **66**, 281, **1958**.
- KRISZTINA K., ROBERT S. Poverty, labor markets and trade liberalization in Indonesia. *Journal of Development Economics*, **117**, 94, **2015**.
- ABHIJIT V.B. New Development Economics' and the Challenge to Theory. *Economic and Political Weekly*, **40**, 4340, **2005**.
- KABOSKI J.P., TOWNSEND R.M. A Structural Evaluation of a Large-Scale Quasi-Experimental Microfinance Initiative. *Econometrica: journal of the Econometric Society*, **79**, 1357, **2011**.
- PHILIPPE A., PATRICK B. A Theory of Trickle-Down Growth and Development. *The Review of Economic Studies*, **64**, 151, **1997**.
- ASAF L., EINAT L., RONI S. Explaining the Factors Shaping the Likelihood of Poverty Among Working Families by Using a Concurrent Mixed Method Design. *Social Indicators Research*, **155**, 1, **2021**.
- ZHANG Z., ZHANG X., BAI H. Research on the "Industrial Project Poverty Alleviation" Mode in Poor Areas Based on the Perspective of Factor Resource Allocation. *Rural Economy*, **1**, 88, **2019**.
- WANG Y. Reform of the market-oriented allocation of labor factors and the efficiency of economic development: Taking the changes in the allocation of labor factors

- in urban and rural areas as an example. *Economics*, **7**, 67, **2020**.
18. JIANG G., HU H. Will industrial and commercial capital going to the countryside lead to the “non-grain” use of farmland? Empirical evidence from CLDS. *Finance and Trade Research*, **32**, 41, **2021**.
 19. WANG X., ZHU G., ZOU W. Farmers’ livelihood capital, flow of household elements and participation in farmland circulation. *Resources and Environment in the Yangtze River Basin*, **30**, 992, **2021**.
 20. FAHAD S., WANG J. Evaluation of Pakistani farmers’ willingness to pay for crop insurance using contingent valuation method: The case of Khyber Pakhtunkhwa province. *Land Use Policy*, **72**, 570, **2018**.
 21. DWAYNE B., LOREN B. Property rights, labour markets, and efficiency in a transition economy: the case of rural China. *Canadian Journal of Economics/Revue Canadienne d’économique*, **35**, 689, **2002**.
 22. ROMER P.M. Capital, Labor, and Productivity. *Brookings Papers on Economic Activity Microeconomics*, **24**, 45, **1992**.
 23. FAHAD S., BAID., LIU L., BALOCH Z.A. Heterogeneous impacts of environmental regulation on foreign direct investment: do environmental regulation affect FDI decisions?. *Environ Sci Pollution Research*. **29**, 5092, **2022**.
 24. WANG S., SUN J. China’s relative poverty standards, measurement and targeting after building a well-off society in an all-round way: Analysis based on the data of the 2018 Chinese household survey. *China Rural Economy*, **03**, 2, **2021**.
 25. SU F., SONG N., MA N., SULTANALIVE A., MA J., XUE B., FAHAD S. An Assessment of Poverty Alleviation Measures and Sustainable Livelihood Capability of Farm Households in Rural China: A Sustainable Livelihood Approach. *Agriculture* **11**, 1230, **2021**.
 26. OZTURK I. The Relationships among Tourism Development, Energy demand and Growth Factors in Developed and Developing Countries. *International Journal of Sustainable Development & World Ecology*, **23**, 122-131, **2016**.
 27. OZTURK I. The Dynamic Relationship between Agricultural Sustainability and Food Energy-Water Poverty in a Panel of Selected Sub-Saharan African Countries. *Energy Policy*, **107**, 289, **2017**.

