Research on Anti-poverty Effect of Government Fiscal Expenditure

-- Evidence from China

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Abstract. This paper aims to explore the impact of fiscal expenditure on rural poverty. In this study, MPI index and FGT index are used to measure the degree of rural poverty in the east and west respectively, and the impact of fiscal expenditure scale and structure on rural poverty is studied. The results show that the scale of fiscal expenditure has a significant negative impact on multidimensional poverty in rural areas. Various projects of productive fiscal expenditure have alleviating effects on the incidence and depth of poverty in rural areas, while the impact of special poverty alleviation expenditure on rural poverty is different to some extent. In this regard, we should further expand fiscal expenditure and improve the structure to achieve better results in poverty reduction in rural areas.

Keywords: anti-poverty; China; fiscal expenditure scale; fiscal expenditure structure.

1. Introduction

Since reform and opening, the incidence of rural poverty in China has dropped from 30% to 3%, and remarkable achievements have been made in poverty reduction. At present, China's poverty alleviation has entered the stage of overcoming challenges and difficulties. In its 19th national congress, the communist party of China identified targeted poverty alleviation as one of the three major battles that must be fought to complete building a well-off society in all respects. It has made important arrangements and provided a guide for action in winning anti-poverty war. "The guideline of the central committee of the communist party of China and the state council on the three-year action plan for winning the anti-poverty war" comprehensively sets out the task of poverty alleviation in 2018-2020, which is the action plan for winning the anti-poverty war in the next three years. In 2018, the central government will allocate 106.095 billion yuan of special financial funds for poverty alleviation, an increase of 20 billion yuan over 2017. This will create favourable conditions for local governments to accelerate the implementation of their budgets and effectively fight targeted anti-poverty war. Therefore, research on the impact of fiscal input on anti-poverty is conducive to accelerating the pace of poverty alleviation and realizing the interaction between government, market and society, as well as the linkage of special poverty alleviation, industrial poverty alleviation and social poverty alleviation at an early date. We will make new progress each year and complete our tasks in an all-round way in three years to ensure that poor areas and people in poverty will join the people of the whole country in building an all-round well-off society by 2020, laying a solid foundation for the implementation of rural revitalization strategy.

The data in this paper are from household data in "China rural poverty monitoring report", "China statistical yearbook" and China nutrition and health survey (CHNS). Three provinces in the east (A, B, C) and five provinces in the west (D, E, F, G and H) are selected as the research objects. MPI index and FGT index are respectively used to measure the degree of rural poverty in the eastern and western regions, and the impact of fiscal expenditure scale and structure on them is studied.

2. Poverty Measurement

2.1 FGT Index

Foster Greer and Thorbecke (1984) proposed FGT index as formula (1):

$$P_\alpha(y,z)=\frac{1}{n}\sum_{i=1}^{q}\left(\frac{z-y_i}{z}\right)^\alpha \quad (1)$$

Where n is the total population, q is the number of poor people, z is the poverty line, and y_i is the income of rural residents. α is the FGT measurement level, which requires non-negative. So, this index is a decreasing function of the income of the poor, and the lower the income, the higher the value. When α=0, $P_0(y,z)=\frac{1}{n}\times q=H$, it is called poverty incidence, which reflects the proportion of poor people in the total population. When α=1, $p_1(y,z)=\frac{1}{n}\sum_{i=1}^{q}\left(\frac{z-y_i}{z}\right)=HI$, that is, poverty incidence times poverty gap rate, which is called poverty depth indicator. It reflects the gap between the income of the poor and the poverty line. The incidence and depth of poverty in the five western provinces are calculated according to the "China statistical yearbook". As shown in table 1, both the rural poverty rate and poverty depth in the western provinces show a downward trend.

2.2 Multidimensional Poverty Index MPI

AF method is used to calculate the MPI value and a row vector X= (X_1, X_2, ...X_d) is established according to every household, and d represents the number of dimensions. First, identify whether the family is deprived in any dimension. In each dimension j (j=1, 2, …, d), define a poverty standard or deprivation critical value z_j . Define the deprivation matrix $g^o=[g_j^o]$, weight vector is w, each element w_j represents the weight of dimension j, and $\sum_{j=1}^{d} w_j=d$. When $x_j<z_j$, $g_j^o= w_j$. When $x_j\geq z_j$, $g_j^0=0$. Define $c=\sum_{j=1}^{d} g_j^0$. In the second step, given the second critical value k>0, whenc≥k, we consider the individual to be poor. When c<k, this individual is not poor. This paper uses four dimensions of income, education, health and asset status, including family per capita income, the minimum education years received by non-school members of the family, medical insurance and drinking water, toilet type, lighting, housing, and assets, respectively. The poverty rate of all dimensions and multidimensional poverty rate in rural areas of the three eastern provinces are shown in table 2.

From the perspective of various-dimensional poverty and multidimensional poverty in rural areas of the three provinces, there are differences between the multidimensional poverty rate and the single-dimensional income poverty rate, which to some extent underestimates the poverty situation in rural areas. But the long-term trend shows that the gap between the multidimensional poverty rate and the single-dimensional poverty rate tends to widen. Both income poverty and asset poverty tend to decrease year by year. Education poverty rate remains stable. The health poverty rate does decrease year by year. The two provinces, B province and C province, reached a local maximum in 2010, then decreased a little, and then had small fluctuations in 2015. The possible reason is the impact of the (H1N1) influenza epidemic.

3. Empirical Analysis

3.1 The Impact of the Scale of Productive Fiscal Expenditure on Poverty

Establish a regression model, in which the rural poverty rate is measured by the incidence and depth of poverty respectively, and the fiscal expenditure is productive fiscal expenditure.

The panel data of five western provinces are regressed. Hausman test is carried out first, and the results are shown in table 3. Therefore, the fixed model is adopted for regression. As shown in table 4, the effect of productive fiscal expenditure on the reduction of rural poverty is significant at the level of 5%, and the effect on the incidence of poverty is greater than the depth of poverty.

Table 1. FGT index of five western provinces

	D province		E province		F province		G province		H province	
	H	HI	H	HI	H	HI	H	HI	H	HI
2006	18.2511	5.8036	32.6067	14.1494	15.572	5.9754	8.654	3.9892	4.0059	0.9084
2007	15.9545	5.2714	19.9546	6.9755	13.4231	5.1313	16.8702	7.9815	2.8052	0.6692
2008	17.5175	5.6514	14.3621	4.8025	10.025	3.7762	15.8674	7.5292	3.1322	0.7985
2009	10.2607	3.1482	12.5069	4.4434	20.1168	7.3572	1.9634	0.6573	3.5093	0.9144
2010	9.4468	2.8273	8.1336	2.3979	10.5992	4.6208	1.4963	0.5732	2.8715	0.6482
2011	9.2304	2.5933	6.4726	1.8428	7.7077	2.1865	1.0584	0.3065	2.183	0.5519
2012	8.7573	2.6685	5.6789	1.9519	5.0726	1.4306	0.4900	0.1621	2.3339	0.8305
2013	7.1192	2.3204	6.0571	2.1256	3.3687	1.1082	0.4895	0.1797	2.653	1.1937
2014	9.9342	2.6915	11.8311	5.8043	8.2864	2.7203	0.6597	0.1548	5.0796	1.6554
2015	9.9038	3.3278	11.8919	4.9054	6.1951	1.8627	1.3096	0.3063	3.5878	0.9255
2016	8.9051	3.1347	10.0355	4.2952	5.8689	1.4926	1.5531	0.4125	2.7398	0.6772
2017	8.6484	3.2137	9.6255	5.5112	6.2993	2.4311	1.4214	1.2616	3.8125	2.3876

As can be seen from table 5, productive fiscal expenditure of the five provinces has a significant alleviating effect on the incidence of rural poverty, among which G province has the best poverty reduction effect. The productive fiscal expenditure of F province, G province and H province has a significant negative impact on the depth of rural poverty.

3.2 The Impact of Productive Fiscal Expenditure Structure on Poverty

Productive fiscal expenditure mainly includes three expenditures, namely, supporting agriculture, agricultural infrastructure construction and agricultural science and technology.

Rural poverty rate = $\beta_0+\beta_1$ expenditure for supporting agriculture =$+\beta_2$, expenditure for agricultural infrastructure construction= $+\beta_3$, expenditure for agricultural technology and technology =$+\varepsilon$.

Firstly, the stationarity test is carried out for all variables, then Hausman test is carried out, and the fixed effect is selected for regression. As shown in table 6, expenditure on supporting agriculture and rural infrastructure construction projects have significantly reduced the incidence and depth of poverty in rural areas, and have a better effect on the depth of poverty. However, the three expenditures on agricultural science and technology have no significant reduction effect on the incidence of rural poverty, but have significant reduction effect on the depth of poverty. The reasons are as follows: most poor areas are in remote areas such as mountainous areas, with poor natural environment, insufficient resources and poor production and living conditions. Therefore, expenditure on supporting agriculture and agricultural infrastructure construction can improve transportation, communications, production conditions and living environment, promote economic development in poor areas and benefit poor farmers. Investment in agricultural science and

technology helps increase agricultural productivity, increase agricultural output and promote economic growth in rural areas, so it helps alleviate the relative poverty level in rural areas.

Table 2. Poverty rate of all dimensions and multidimensional poverty rate in rural areas of the three provinces

Province	Year	Number of research objects	Income poverty rate (%)	Education poverty rate (%)	Health poverty rate (%)	Asset poverty rate(%)	Multidimensional poverty rate(%)
A province	2006	319	10.97179	9.04762	5.66038	18.18182	21.5859
	2010	322	18.9441	6.52174	16.45963	12.8125	27.98742
	2012	319	13.7931	11.91223	11.91223	9.71787	27.97428
	2015	328	8.53659	8.84146	12.19512	6.70732	22.57053
	2017	323	5.88235	8.97833	12.3839	3.71517	17.14286
B province	2006	331	14.50151	22.22222	10.60606	32.8125	31.86813
	2010	327	3.0581	20.0000	21.23077	18.15385	27.8626
	2012	331	9.96979	23.18841	14.58967	11.17825	28.57143
	2015	327	3.36391	25.0000	29.66361	5.8104	27.77778
	2017	324	4.62963	25.54745	19.19505	5.53846	26.47059
C province	2006	316	27.53165	22.86689	7.64331	52.7972	43.89313
	2010	324	25.0000	17.32852	21.5625	34.27673	39.4052
	2012	308	18.83117	24.31373	11.43791	23.7013	35.29412
	2015	331	10.57402	25.0000	13.7500	20.30303	27.91519
	2017	324	8.02469	23.86364	9.59752	14.86068	22.90076

Table 3. Hausman test results

	H	HI
random	3.6412*	1.8340**

Note: *, **, and *** are respectively significant at 10%, 5%, and 1% significance levels

Table 4. Overall regression results in five provinces

Poverty rate	Cofficient	Std.Error	T
H	-0.4277**	(0.1081)	-7.6603
HI	-0.3912**	(0.1216)	-5.6822

Note: *, **, and *** are respectively significant at 10%, 5%, and 1% significance levels

Table 5. Regression in five provinces

Province	H	HI
D province	-0.3819***	-0.3295
	(0.1696)	(0.2170)
E province	-0.4949***	-0.3791
	(0.2259)	(0.2890)
F province	-0.4210*	-0.3751*
	(0.1587)	(0.2030)
G province	-0.6599**	-0.61617**
	(0.1462)	(0.1871)
H province	-0.6278**	-0.6233**
	(0.1628)	(0.2082)
R-square	0.7161	0.8335

Note: the values in () are standard deviation statistics; *, **, and *** are respectively significant at 10%, 5%, and 1% significance levels.

Table 6. Influence of productive fiscal expenditure structure on rural poverty

Fiscal expenditure structure	H	HI
Expenditure for supporting agriculture	-0.7582***	-0.8596*
	(0.1821)	(-0.4616)
Expenditure for agricultural infrastructure	-0.4966*	-0.5474*
	(0.1157)	(0.1070)
Three expenditures for agricultural technology and technology	0.005	-0.1435*
	(0.1644)	(0.1342)

Note: the values in () are standard deviation statistics; *, **, and *** are respectively significant at 10%, 5%, and 1% significance levels

As can be seen from table 7, expenditure for supporting agriculture of F province, E province and H province has a significant reduction effect on the incidence of rural poverty, of which H province is the most prominent. The expenditure on supporting agriculture in H province has a significant side effect on the depth of poverty, while no other provinces show a significant effect. The expenditure of agricultural infrastructure construction in E province and G province has a significant negative effect on the incidence of poverty. The rural infrastructure expenditure of G province has a significant negative effect on the depth of poverty, while the other four provinces have no significant effect. Agricultural science and technology expenditure of D province, F province and G province has a significant negative effect on the incidence of rural poverty, and F province and D province have a negative impact on the depth of poverty.

Table 7. Regression results of sample provinces

Province	Expenditure for supporting agriculture		Expenditure for agricultural infrastructure		Three expenditures for agricultural technology and technology	
	H	HI	H	HI	H	HI
D province	0.2146 (-0.3168)	0.2174 (-0.4607)	0.0284 (-0.1865)	0.1977 (-0.2143)	-1.3535* (-0.5043)	-1.2175* (-0.6532)
E province	-0.4966* (-0.3211)	-0.4868 (-0.4182)	-0.0107* (-0.1975)	0.2045 (-0.2569)	-0.3731 (-0.2989)	-0.4932 (-0.3807)
F province	-0.6570* (-0.3559)	0.7479 (-0.4627)	0.025 (-0.2229)	0.2276 (-0.2898)	-2.9171* (-0.5595)	-2.2761* (-0.7275)
G province	-0.5346 (-0.342)	-0.6559 (-0.4447)	-0.3777** (-0.2505)	0.4077** (-0.3257)	-1.0133* (-0.7673)	-1.2031 (-0.9977)
H province	-0.8181* (-0.308)	-0.6001** (-0.4004)	-0.3907 (-0.3153)	-0.3484 (-0.4099)	0.635 (-0.4897)	1.0677 (-0.6344)
R-square	0.7651	0.8189	0.8837	0.6987	0.9293	0.7375

Note: the values in () are standard deviation statistics; *, **, and *** are respectively significant at 10%, 5%, and 1% significance levels

3.3 The Influence of Special Poverty Alleviation Expenditure Structure on Rural Poverty

Special poverty alleviation expenditure refers to the fiscal expenditure used by the government to support poverty-stricken areas, mainly including special poverty alleviation loan funds, financial poverty alleviation development funds, and work-relief funds. National data are obtained from “China rural poverty monitoring report”, and VAR co-integration and impulse response function are used to analyse the impact of special poverty alleviation expenditure structure on poverty. In order to eliminate the price factor, all variables are logarithmic. First, ADF unit root test is conducted, and the results are shown in table 8.

The impulse response function is used to analyse the dynamic relationship. In figure 1, the impact of special poverty alleviation loan expenditure on the incidence of poverty is positively responded, reaching a maximum value in the first phase, and then gradually declining. The impact of special poverty alleviation loan on the depth of poverty shows that it reaches a positive peak in the second phase and a negative peak in the third phase, and then fluctuates around the horizontal axis. The trend is negative, indicating that the more distant the poor are from the poverty line, the more dependent they are on poverty alleviation policies.

Table 8. Unit root test results

Variable	Test type (c,t,p)	ADF test value	Mackinnon critical value	Result
LnDK	(c,0,2)	-1.343	-2.144	Non-stationary
ΔLnDK	(c,0,2)	-3.126*	-1.974	Stationary
LnFZ	(c,0,2)	2.013	-1.119	Non-stationary
ΔLnFZ	(c,0,2)	-1.834*	-3.175	Stationary
LnDZ	(c,t,0)	1.009	-2.950	Non-stationary
ΔLnDZ	(c,t,0)	-4.017*	-1.934	Stationary
LnH	(c,t,0)	-1.3955	-2.6461	Non-stationary
ΔLnH	(c,t,0)	-2.0545*	-2.6584	Stationary
LnHI	(c,t,0)	-0.5210	-3.175	Non-stationary
ΔlnHI	(c,t,0)	-0.3298**	-1.4983	Stationary

Note: Δ represents the first order difference; C is the constant term; T is the trend term; P is the lag order; *, **, and *** are respectively significant at 10%, 5%, and 1% significance levels.

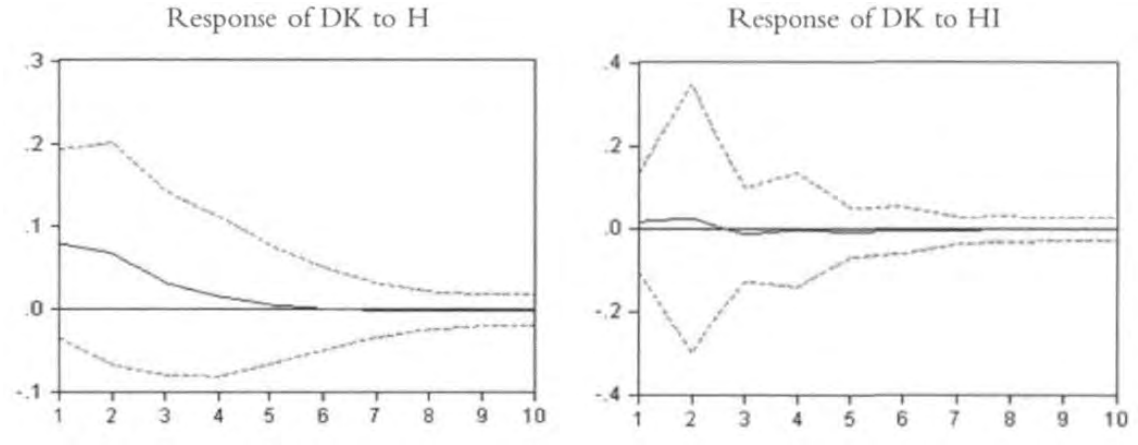

Figure 1. Impulse response of special loan funds to poverty

Figure 2 shows that the impact of poverty alleviation development expenditure on the incidence of poverty has a positive response before the fifth phase, followed by a negative response and gradually increased, indicating that poverty alleviation development funds have a certain lag. The impact on poverty intensity shows a significant negative response after the first phase and gradually increased. It shows that poverty alleviation development expenditure helps to reduce the incidence of poverty at the beginning of the input, and then gradually weakens its role. The existence of the following phenomena can also explain this problem to some extent. After the input of poverty development expenditure, many poor people become more and more dependent on government subsidies, and those who are close to the poverty line may even return below the poverty line in order to get government subsidies.

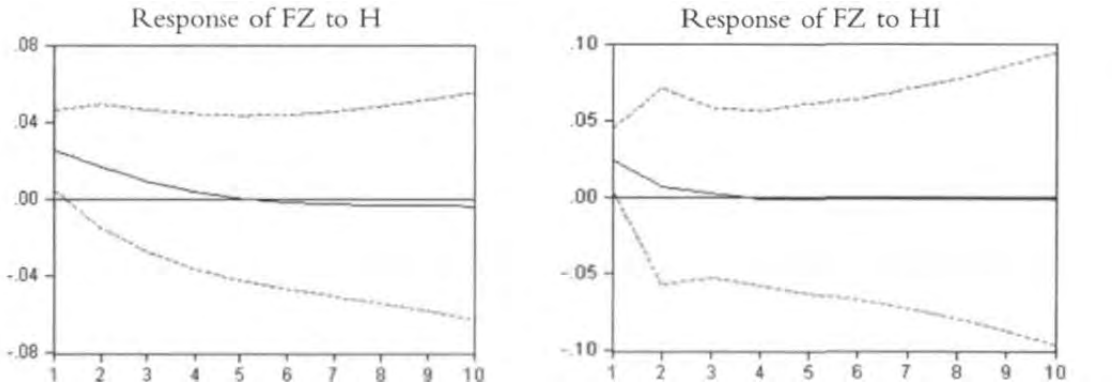

Figure 2. Impulse response of poverty alleviation development funds to poverty

Figure 3 shows that the impact of work-relief expenditure on the incidence of rural poverty has a positive response. In the second phase, it reaches a peak and then gradually weakens. The impact of work-relief expenditure on the depth of rural poverty is positively responded, and reaches a maximum value in the second phase, and then shows a second maximum positive effect in the fourth phase, after which it gradually weakens. Work-relief funds can enable poor people to benefit from infrastructure projects such as road construction, basic farmland and small water conservancy projects. In the initial stage of investment, it can reduce poverty, but its effect will gradually fade.

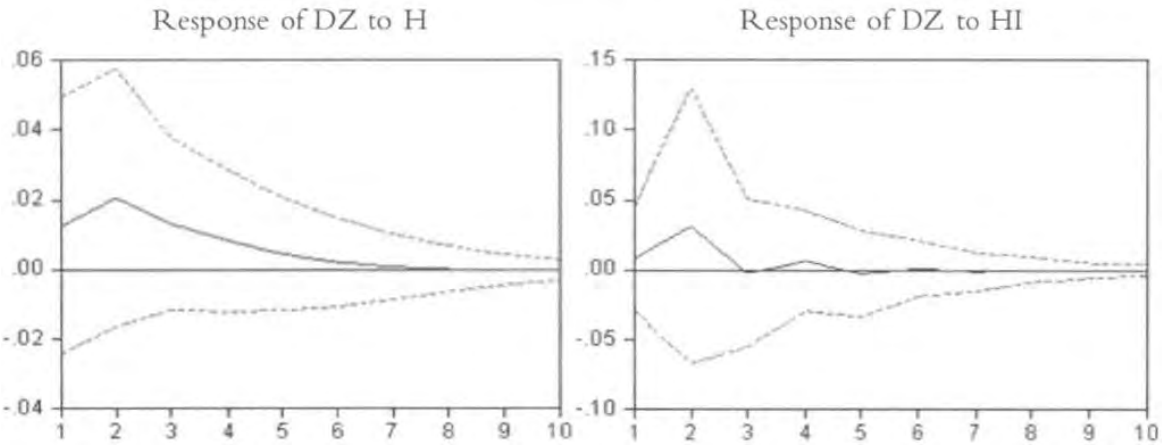

Figure 3. Impulse response of work-relief funds to poverty

In summary, there are differences in the direct reduction effects of special poverty alleviation expenditure on rural poverty among various projects. Special loans for poverty alleviation have reduced the incidence of poverty in rural areas. Poverty alleviation development expenditure can reduce the depth of rural poverty. Work-relief expenditure has a decreasing effect on the incidence and depth of rural poverty.

3.4 The Influence of Fiscal Expenditure on Multidimensional Poverty Index

Empirical model: $MPI_{ijt}=\alpha+\beta gov_{it}+\gamma R_{it}+\delta F_{ijt}+\varepsilon$

Among them, MPI_{ijt} is the multidimensional poverty index of family i in area j in period t. GOVit refers to government fiscal expenditure, which is used to examine the role of government expenditure in poverty reduction. It is measured by the ratio of local government expenditure in regional GDP. R_{it} is used to control variables related to the region where the family lives, including per capita net income, average regional income growth rate, and per capita social relief cost in rural areas. F_{ijt} is used to control the family characteristics, including education degree of the householder, the number of labour force, the occupation nature of the householder, the per capita land of the household, the age of the householder, and the square of the age of the householder.

Table 9. Statistical properties of samples

Variable	Description	Sample amount	Mean	Standard deviation	Minimum	Maximum
MPI	Multidimensional poverty index	1564	0.1567	0.2065	0	0.95
increate	Average regional income growth rate	1564	0.1116	0.0603	-0.0581	0.2016
lnantip	Rural per capita social relief cost	1564	1.0456	2.1211	-2.4832	4.0055
hhedu	Education years for the householder	1564	6.8030	3.3619	0	15
hhage	The householder age	1564	49.2845	11.5053	18.92	84.47
landpj	The per capita land of family	1564	1.50475	1.6271	0	23.3333
dum_occu	Virtual variable, householder profession property	1564	0.0892	0.2851	0	1

Considering that the multidimensional poverty index may be related to the previous phase, the dynamic GMM method can be used to add the lagging phase of the multidimensional poverty index to the right side of the regression equation. The regression results are shown in table 10. Fiscal expenditure has a significant negative impact on MPI. The larger the proportion of fiscal expenditure in GDP, the smaller the multi-dimensional poverty index of households. That is, the less deprived the family, the better off it is in reducing poverty. The growth rate of regional per capita income has a significant negative impact on the multidimensional poverty of families, that is, the faster the growth of regional per capita income, the smaller the multidimensional poverty index of families. Rural per capita social relief expenditure index also has a significant negative effect. That is, the higher the per capita social relief cost, the greater the government's poverty alleviation policy, the smaller the multi-dimensional poverty value of rural families, and the poverty situation in rural areas will be improved. The coefficient of the family control variable is within the expectation. The higher the education degree of the householder, the larger the per capita land area of the family, and the more likely the family is to stay away from poverty. The age of householder has nonlinear effect on family poverty index. With the increase of the age of the householder, the poverty index of the family becomes smaller, and the less poverty there is. However, if the householder is older than a certain age (44.8), the family poverty index will be larger and larger, and the family will be more and more likely to be poor. The calculation process of turning point 44.8 years old is as follows: take the derivative of hhage and get the point where the first order derivative is equal to 0. It is worth noting that age 45 is also the distinction between youth and middle age by the United Nations world health organization. People under 44 are young, and those between 45 and 59 are middle-aged. Two virtual variables dum_occu and dum_self that control the householder information represent the householder professional nature and whether to belong to the self-employed. CHNS divides the profession into 16 classes, this article will classify senior researcher/professor, junior researcher/professor, government official, manager and other management personnel and skilled workers as a catetory to build a virtual variable dum_occu.

Table 10. OLS and SYS-GMM regression results of samples from rural areas

	Explained variable:MPI	
	OLS	SYS-GMM
MPI_lag	0.2264 *** (0.0170)	0.0760*** (0.0246)
gov	-0.3806*** (0.1082)	-0.2080 ** (0.0939)
lnantip	-0.0261 * (0.0148)	-0.0243 ** (0.0119)
hhedu	-0.0228*** (0.0012)	-0.0283*** (0.0010)
hhage	-0.0068*** (0.0021)	-0.0377*** (0.0117)
hhage2	0.00007*** (0.0002)	0.0003 *** (0.0001)
landpj	-0.0022 (0.0017)	-0.0044 *** (0.0015)
dum_occu	-0.0141 (0.0110)	-0.0259 *** (0.0098)
Dum_local2	-0.0050 (0.0111)	-0.0038 (0.0084)
Dum_local3	0.0289 * (0.0183)	0.0521 *** (0.0145)
Dum_year2		-0.5455** (0.2782)
Dum_year3	-0.0225 (0.0298)	-0.6373 ** (0.2914)
Dum_year4	-0.0079 (0.0248)	-0.6377** (0.2921)
Dum_year5	-0.0088 (0.0386)	-0.6241 ** (0.2924)
obs	2672	2672
R-squared	0.3926	

If the householder profession belongs to one of the four categories, assign a value of 1, otherwise 0. Variable dum_occu coefficient is significantly negative, meaning that if the householder profession belongs to the above four, the lower the corresponding multidimensional poverty value of the family, the lower the degree of deprivation. The virtual variable Dum_local that distinguishes the regions is established as follows. There is total of three regions, A province, B province and C province, and A province is selected as the control group. If the family belongs to province B, assign 1 to Dum_local2, otherwise 0. If the family belongs to province C, assign 1 to Dum_local3, otherwise 0. The coefficient of Dum_local2 is not significant, and the coefficient of Dum_local3 is significantly positive. This shows that there is no statistically significant difference between the multi-dimensional poverty of families in rural areas of B province and A province, and the multi-dimensional poverty of families in C province is significantly higher than that in A province.

4. Conclusion and Policy Recommendations

It can be concluded from the empirical results that fiscal expenditure mainly acts on poverty reduction from the following two aspects: one is to directly increase the income level of the poor and alleviate rural poverty by improving agricultural productivity and increasing output. Second, rural poverty can be alleviated indirectly by increasing farmers' non-agricultural income. Infrastructure, science and technology, social security and other fiscal expenditures can not only affect the non-agricultural income of the poor in rural areas by improving agricultural production, but also increase aggregate demand by expanding consumption, thus driving economic growth and alleviating rural poverty.

Combined with the above research conclusions, this paper puts forward the following policy recommendations: first, we should strengthen expenditure on supporting agriculture and rural infrastructure construction, to improve the characteristics of poor agricultural production conditions, underdeveloped transportation and communication, and poor living environment, promote agricultural growth, and improve the income level of the poor. Second, we will vigorously develop special poverty alleviation loan projects and work-relief projects to alleviate the shortage of funds and difficulties in accumulating agricultural production capital in poor rural areas. The project of special loan for poverty alleviation provides funds for planting and breeding industry for the poor in rural areas, as well as discount interest loans for agricultural product processing enterprises, to promote the expansion of industrial scale, reduce the interest burden of agricultural product processing enterprises, increase employment opportunities in poor areas, and enable the poor people to gain real benefits in financial services. Local employment opportunities will be created by improving rural transportation, irrigation and water conservancy facilities, and drinking water facilities for people and animals. Third, we should accelerate the development of agricultural science and technology, in order to solve the relatively backward level of investment in agricultural science and technology, and low capacity of agricultural research and development. We should extensively apply and popularize new technologies to promote agricultural growth, give full play to the spill over effects of science and technology, and strengthen protection of agricultural intellectual property rights.

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