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Fiscal Support to Agriculture, Financial Assistance to Agriculture and Farmers' Income Growth

-- An Empirical Study based on a Spatial Panel Model

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Abstract

Based on the panel data of 30 provinces in mainland China from 2010 to 2020, this paper conducts a spatial correlation test by constructing an adjacency weight matrix, and verifies that there is a high spatial correlation between financial support to agriculture, financial assistance to agriculture and farmers' income level, and then constructs Spatial econometric model to empirically analyze the direct impact and spatial spillover effects of fiscal support for agriculture and financial assistance to farmers on increasing farmers' income. The research results show that the spatial spillover effect is obvious, and each province's financial support to agriculture and financial assistance to agriculture have a significant positive effect on the increase of farmers' income in their own provinces and those in spatially related provinces. The level of urbanization, the ability of farmers to allocate resources and the level of agricultural production technology have a significant positive impact on the income level of local farmers, and the increase in the ratio of the added value of the primary industry to GDP will inhibit the improvement of farmers' income level. The research results will provide data support and theoretical basis for policy formulation and optimization suggestions to increase farmers' income and promote rural revitalization.

Keywords

Financial Support to Agriculture; Financial Assistance to Agriculture; Farmers' Income; Spatial Dubin Model.

1. Introduction

The improvement of farmers' income level is the core of solving the "three rural" problems, directly related to the realization of rural revitalization and urban-rural integration development, and has a "ballast" and "stabilizer" effect on economic and social development. For the nineteen years since 2004, the central government has continuously issued the No.1 document with the theme of "agriculture, rural areas, and farmers", emphasizing the important position of increasing farmers' income in the process of achieving socialist modernization. As an important macroeconomic regulation tool of the country, finance and finance play an irreplaceable role in increasing farmers' income and solving the "three rural" problems. Fiscal expenditure increased from 812.96 billion yuan in 2010 to 2394.85 billion yuan in 2020, and agricultural insurance increased from 13.59 billion yuan in 2010 to 81.49 billion yuan in 2020.

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During the same period, the per capita disposable income of rural residents increased by 173%, reaching 17131 yuan in 2020, and achieving the elimination of absolute rural poverty. However, due to the long-standing dual economic and social system mechanism between urban and rural areas, there are shortcomings in the supply of infrastructure and basic public services in rural areas of China. At the same time, there is a shortage of financial services in rural areas, a serious shortage of funds, and difficulties in obtaining loans from farmers and small and medium-sized enterprises. These constraints restrict the return of talents, capital, and other factors to rural areas, greatly reducing the contribution of financial support to the restoration of rural economic and social value. In recent years, the support scale of fiscal and financial policies for rural areas has continued to grow, has it effectively promoted the increase of farmers' income? According to the first law of geography, will there be spatial heterogeneity in fiscal and financial support for agriculture due to differences in resource endowments? The answers to these questions are of great significance for improving fiscal and financial policies, promoting farmers' income growth, and achieving rural revitalization.

The fiscal support for agriculture policy, as the most direct way for the government to support the development of agriculture, rural areas, and farmers, optimizes agricultural production conditions and improves agricultural comprehensive output capacity through financial investment, in order to promote the modernization and industrialization of agricultural management, and ultimately achieve the growth of farmers' income [1][2]. Financial support for agriculture is an important factor affecting the growth of per capita disposable income of farmers [3][4], and there are spatiotemporal differences in the effectiveness of income increase [5]. The efficiency of fund utilization also urgently needs to be improved [6]. Zou Wenjie and Feng Linjie (2015) [7], Gao Yuandong et al. Wang Chaocai (2011) [9] holds the opposite view, believing that the financial support for agriculture funds are scattered and difficult to form a joint force, let alone leverage private capital investment, and the effect on increasing farmers' income is not significant. However, Wang Haiyang et al. (2014) [10] believe that fiscal support for agriculture lacks a long-term mechanism to ensure the improvement of utilization efficiency, and there is a "leakage" effect in the utilization process, which weakens the income increasing effect of fiscal support for agriculture policies.

Financial assistance to agriculture refers to the rational arrangement and disposal of financial resources by various financial entities such as governments, banks, insurance companies, etc., using financial tools, financial markets, and financial policies to provide various support for the improvement of rural residents' income and industrial development, thereby meeting the demand for financial services and products in rural areas. Gao Yuandong et al. Wen Tao and He Qian (2020) [12] believe that at different stages of reform, increasing financial support for agriculture in one province will have different impacts on the income of farmers in neighboring provinces, from inhibition to promotion, and gradually show a positive effect. That is, the impact of rural finance on farmers' income has time and space limitations, and only at high quantiles, it positively affects farmers' income. Agricultural loans and insurance are important ways of financial support for agriculture. Research by Nguyen Guilin and Meng Weidong (2016) [13] shows that the income increase effect of agricultural insurance is second to that of agricultural loans. Due to factors such as imbalanced allocation and insufficient utilization of rural financial resources, as well as imperfect financial systems, the average performance of financial support for agriculture is relatively low. However, the low efficiency of financial support for agriculture can hinder farmers' income growth, which is not conducive to balancing the urban-rural income gap [14] [15].

The vast majority of existing research separates fiscal support for agriculture from financial assistance for agriculture, and studies the impact on farmers' income separately. With practical application and development, exploring the synergistic effect of fiscal and financial support for agriculture becomes more meaningful. Although there is a small amount of research on the

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synergy between finance and finance, a unified conclusion has not yet been formed. Huang Shoufeng (2016) [5] used data from 1997 to 2013 to conclude that fiscal and financial linkage has no significant impact on farmers' income growth. Jiang Song et al. (2013) [15] used the DEA Malmquist index and GARCH model to find that the coordination of fiscal and financial support for agriculture in China is gradually improving, but the spatiotemporal differences are significant, showing a pattern of "clustering" and "asymmetry". The regions with high to low coordination are ranked in the western, eastern, and central regions, respectively. Wang Yongcang et al. (2021) [1] considered the impact of agricultural credit and agricultural insurance, believing that finance and agricultural insurance have coordination and promote farmers' income growth, while the coordination between agricultural credit and finance is insufficient, so the synergistic effect is not significant or may even have a inhibitory effect. The financial support for agriculture has played a leverage role, promoting the development of financial services such as rural agricultural loans and agricultural insurance, but the impact on farmers' income has not moved towards the expected development. The solution to the "three rural" problem urgently requires the government to improve the collaborative mechanism of financial assistance for agriculture. The existing research has laid a solid theoretical foundation for this article, but in the measurement indicators of financial assistance to agriculture, the emphasis on agricultural loans neglects the growth of agricultural insurance, and the analysis of the impact of fiscal and financial collaboration on agriculture ignores the possible nonlinear relationship. Therefore, this article intends to use a spatial panel threshold model and introduce agricultural insurance and agricultural loans as indicators of financial assistance to agriculture, in order to more objectively and accurately evaluate the impact of fiscal and financial policy coordination on farmers' income.

2. Theoretical Mechanism and Research Hypothesis

Financial support for agriculture refers to the various support provided by the national finance to agriculture, rural areas, and farmers' undertakings, mainly manifested in the investment of financial funds and various fiscal and tax preferential policies. Firstly, the government provides necessary funds for rural construction and industrial development through fiscal transfer payments, especially increasing investment in relatively underdeveloped areas, which can increase farmers' income; Among them, special transfer subsidies such as education, healthcare, and social security can help improve the quality of life and health level of relatively poor residents, further increase rural residents' income, narrow regional income disparities, and achieve common prosperity. Secondly, the government's investment in infrastructure construction in rural areas, such as water conservancy, roads, and communication facilities, helps to reduce production and transportation costs, sell products in rural areas through low-cost and fast transportation methods, and significantly reduce the production and operation risks of rural residents, thereby increasing farmers' income. Once again, the government will invest funds in rural science and technology expenditures to promote the specialization and technological transformation of rural industries, increase employment rates in rural areas, promote the transformation and upgrading of rural industries, and create an industrial foundation for sustained and stable income growth of farmers. In recent years, the total amount of financial investment in agriculture, rural areas, and farmers in China has been continuously increasing, and support has been continuously strengthened. According to existing statistical standards, the national fiscal expenditure on supporting agriculture increased from 812.96 billion yuan in 2010 to 2394.85 billion yuan in 2020. During the same period, the per capita disposable income of rural residents in China increased from 6272 yuan to 17131 yuan. Based on this, this article proposes the first hypothesis:

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H1: Financial support for agriculture has a significant promoting effect on increasing farmers' income.

Agricultural financial services promote the coordinated development of urban and rural financial resources, narrow the financial gap, and promote the economic development and income increase of rural areas. As an important financial product in rural areas, agricultural loans can be directly issued to farmers, providing financial support for their production and operation. Especially for farmers who grow agricultural products with long production cycles, high initial investment, and slow repayment, agricultural loans can solve the temporary shortage of funds during the production cycle. At the same time, farmers can invest their disposable funds in fields such as education, medical care, and social security, playing a role in expanding consumption, improving the living welfare of rural families, and enabling them to engage in production and life with security, To ensure that farmers have a reliable source of income. In addition, another beneficiary of agricultural loans is rural enterprises. Through the application and issuance of agricultural loans, while reducing the financial pressure on rural enterprises, it can increase rural industrial output, promote industrial transformation and upgrading in rural areas, and thereby increase farmers' labor productivity and employment opportunities, playing a positive promoting role in increasing local farmers' income. As another important financial product in rural areas, agricultural insurance can enable farmers to receive compensation after external shocks to agricultural production, reduce losses suffered by farmers due to natural disasters, support their subsequent resumption of production, and ensure the stability of farmers' income. Rural resident insurance can provide economic compensation after farmers' healthy lives are affected, reduce income losses caused by health and accidents, share economic pressure, and prevent farmers from being unable to treat, losing labor ability, and income sources due to insufficient funds. Based on the above content, this article proposes a second hypothesis:

H2: Financial assistance to agriculture has a promoting effect on farmers' income.

The intervention of financial policies helps to coordinate the development of urban-rural financial resources and narrow the financial gap. Currently, the economic development in rural areas of China is relatively weak, and farmers lack idle funds to purchase financial products, resulting in a relatively insufficient demand for financial products; However, financial institutions pursue profits in order to reduce costs while considering risk management factors, and their willingness to provide financial services in rural areas is weak. In view of this, in the process of solving the "three rural" problems, it is necessary to support fiscal policies and funds, leverage the role of fiscal funds, use national fiscal policy measures, lower the threshold of rural finance, encourage financial funds to flow to rural areas, so that farmers can obtain high-quality financial products, and facilitate their production and development. At the same time, fiscal funds are invested in rural infrastructure, education, healthcare and other fields, further facilitating the entry of financial institutions into the rural market, promoting the coordinated development of fiscal support for agriculture and financial assistance for agriculture, and driving the increase of farmers' income. However, due to differences in economic, social, and natural conditions between and within regions, the effectiveness of fiscal and financial support for agriculture varies. According to the first law of geography, various economic variables have spatial correlations. Therefore, when studying the impact of fiscal and financial support for agriculture on farmers' income, this article considers the possible regional differences, that is, a certain indicator in a province will affect the fiscal support for agriculture, financial support for agriculture, and farmers' disposable income in adjacent provinces. Based on this, this article proposes a third hypothesis:

H3: The coordination of fiscal and financial assistance to agriculture has spatial spillover effects on farmers' income regulation.

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3. Variable Selection, Data Sources and Model settings

3.1. Variable Selection and Data Source

The dependent variable is the income level of farmers, measured by the per capita disposable income of rural residents. This indicator covers changes in rural residents' income and consumption levels, while excluding the impact of price factors.

The explanatory variables are fiscal support for agriculture and financial support for agriculture policies. Among them, fiscal support for agriculture policy (cz) is measured by the expenditure on agricultural, forestry, and water affairs. To eliminate the impact of population factors, the expenditure on agricultural, forestry, and water affairs in each province is divided by the number of rural population for per capita processing. Financial assistance to agriculture, taking into account agricultural financial means, mainly measures the strength of financial assistance to agriculture from two aspects: loans and insurance, represented by per capita agricultural loans (dk) and per capita agricultural insurance (bx).

The control variables specifically include: (1) the capacity of farmers to allocate resources (zc), which is measured by the average investment of farmers, and expressed by the ratio of farmers' fixed assets investment excluding housing to the total rural population. (2) The productive input (hf) of farmers is measured by the average amount of agricultural fertilizers used. The amount of fertilizer required per unit of planting area is reflected by dividing agricultural fertilizers by the total planting area of crops. (3) The industrialization process (yc) is expressed as the ratio of the added value of the primary industry to GDP. Generally, the larger the value, the higher the proportion of the primary industry, the more restricted the economic development, and the lower the income of farmers. (4) The level of agricultural production technology (jx) is measured by the average power of agricultural machinery, which is expressed by dividing the total power of agricultural machinery by the total planting area of crops. (5) The level of urbanization (rk), expressed as the proportion of urban permanent population to the total population, also indirectly reflects the process of rural development in China.

The data is sourced from the "China Statistical Yearbook", "China Rural Statistical Yearbook", "China Financial Yearbook", "China Rural Financial Services Report", and EPS database. The sample period is from 2010 to 2020, and the sample includes 30 provinces in mainland China (with significant data loss in Tibet and exclusion). In order to make the data more linear and reduce the impact of heteroscedasticity, the explained variables were logarithmized, and some missing data in certain years were interpolated and completed using the moving average method. The descriptive statistical analysis of each variable is shown in Table 1.

Table 1. Descriptive Statistics of Variables

Variable	observation	Mean	S.D.	Min	Max
lnincome	300	9.2484	0.4428	8.1388	10.4102
cz	300	0.3928	0.3219	0.0708	2.1029
lndk	300	1.3238	0.6439	-0.1805	3.0859
bx	300	0.8508	0.8760	0	5.505321
zc	300	0.0532	0.0335	0	0.1612903
hf	300	0.0370	0.0129	0.0112	0.0800
yc	300	0.0987	0.0518	0.0030	0.2630
jx	300	0.6328	0.2393	0.2595	1.3860
rk	300	0.5706	0.1247	0.3381	0.8960

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3.2. Model Settings

Firstly, in order to facilitate the smooth development of the study, the global Moran index is used to test the spatial correlation between the explanatory variable and the dependent variable. The principle of constructing a spatial weight matrix is spatial adjacency, and the matrix is as follows:

$$W_{ij} = \begin{cases} 1, \text{region i is adjacent to region j;} \\ 0, \text{region i is not adjacent to region j.} \end{cases} \quad (1)$$

Moran'I $= \frac{\sum_{i=1}^{n}\sum_{j=1}^{n}(xi-\bar{x})(xj-\bar{x})}{S^2\sum_{i=1}^{n}\sum_{j=1}^{n}W_{ij}}$. The value of Moran'I is between [-1, 1]. If the spatial correlation distribution is positive, it takes a positive value, otherwise it takes a negative value. When the spatial distribution is correlated, the value is not zero. The greater the general spatial correlation, the greater the absolute value of Moran'I. Using the sample period from 2010 to 2020, Moran'I was used to test the correlation between fiscal support for agriculture, financial assistance for agriculture, and farmers' income levels. The results are shown in Table 2.

Table 2. Spatial global autocorrelation of fiscal support for agriculture, financial assistance for agriculture, and farmers' income from 2010 to 2020

Year	Fiscal support for agriculture		Financial assistance for agriculture				Farmers' income	
			Agricultural loans		Agricultural insurance			
	Moran'I	Z	Moran'I	Z	Moran I	Z	Moran' I	Z
2010	0.134**	1.694	0.356***	3.554	0.024	0.544	0.453***	4.419
2011	0.144**	1.730	0.366***	3.620	0.018	0.504	0.456***	4.431
2012	0.129*	1.611	0.370***	3.660	0.068	0.943	0.459***	4.461
2013	0.133**	1.732	0.364***	3.601	0.106*	1.308	0.459***	4.455
2014	0.132**	1.725	0.374***	3.676	0.086	1.145	0.460***	4.494
2015	0.146**	1.882	0.374***	3.687	0.120*	1.443	0.461***	4.506
2016	0.156**	1.881	0.342***	3.412	0.028	0.595	0.459***	4.496
2017	0.098*	1.336	0.285***	2.92	0.202***	2.188	0.454***	4.449
2018	0.104*	1.399	0.217***	2.353	0.222***	2.343	0.458***	4.488
2019	0.096*	1.290	0.132*	1.573	0.257***	2.716	0.454***	4.459
2020	0.098*	1.367	0.186***	2.532	0.236***	2.259	0.456***	4.475

Note: * * *, * * and * represent significant levels at 1%, 5%, and 10%, respectively.

From the data Moran'I and critical value Z, it can be seen that the Moran'I of fiscal support for agriculture, financial assistance for agriculture, and rural residents' income levels are all greater than 0 and the significance level is not low. The financial support for agriculture indicators have passed the test at a significance level of 5% in most years, while the remaining years have passed the significance level test at 10%. Almost all agricultural loan indicators for financial assistance to agriculture in various years have passed the significance level test of 1%. The agricultural insurance indicator of financial assistance to agriculture, Moran I normal statistic Z value, has only been above the critical value at the 0.01 level since 2017. Prior to this, there were only critical values above the 0.1 level in 2013 and 2015. Taking into account the selection of financial assistance to agriculture indicators, agricultural insurance variables were excluded. From 2010 to 2020, the Moran'I normal statistic Z value of the per capita disposable income indicator for rural residents passed the significance level test of 1%. This indicates that the spatial autocorrelation level of finance, financial support for agriculture, and rural

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residents' income is relatively high, which means that a certain indicator in a province will affect the financial support for agriculture, financial support for agriculture, and the disposable income level of rural residents in adjacent provinces. However, traditional panel models do not take into account spatial interaction effects and have certain errors, so it is necessary to choose a suitable spatial econometric model.

Model selection based on LM, LR, and Wald tests (see Table 3). The test results of spatial error and spatial lag models have both passed the significance level test, and the statistics of LM Error and Robust LM Error are larger and the results are more significant, so the SEM model is superior to the SLM model. For comprehensive and rigorous consideration, in order to reduce interference such as lag and residual autocorrelation, LR (likelihood ratio) and Wald (Wald) tests were conducted, and the corresponding statistics passed the significance level test. Therefore, a spatial Durbin model that includes both types of lag was ultimately selected.

Table 3. LM Inspection, LR Inspection, and Wald Inspection

Verification model	Statistic	P
LM Error	199.867	0.0000
Robust LM Error	202.466	0.0000
LM Lag	23.391	0.0000
Robust LM Lag	25.990	0.0000
LR Spatial Lag	26.45	0.0004
LR Spatial Error	34.09	0.0000
Wald Spatial Lag	12.55	0.0840
Wald Spatial Error	59.21	0.0000

The spatial econometric model is as follows:

$$\text{lnincomeit} = C + \rho W^{*}\text{lnincomeit} + \alpha 1\text{czit} + \alpha 2\text{lndkit} + \alpha 3\text{zcit} + \alpha 4\text{hfit} + \alpha 5\text{ycit} + \alpha 6\text{jxit} + \alpha 7\text{rkit} + \beta 1 W^{*}\text{czit} + \beta 2 W^{*}\text{lndkit} + \beta 3 W^{*}\text{zcit} + \beta 4 W^{*}\text{hfit} + \beta 5 W^{*}\text{ycit} + \beta 6 W^{*}\text{jxit} + \beta 7 W^{*}\text{rkit} + \mu_i + \upsilon_t + \varepsilon_{it} \quad (2)$$

Among them, β1W*czit, β2W*lndkit are the spatial Durbin term, μi represents spatial effects, υt represents the period effect, εit is a random error term, and W* represents the spatial weight matrix. Equation (2) is the spatial Durbin model (SDM) of the impact of fiscal and financial agricultural policies on farmers' income in this article.

4. Analysis of Spatial Spillover Effects

4.1. Regression Results of Spatial Durbin Model

The Hausman test was conducted using Stata software, and the results passed the 1% significance level test. Therefore, the original hypothesis of random effects should be rejected, and a fixed effects model should be selected to continue the study and obtain the standard error of the estimated model. Table 4 shows the estimation results of fixed effects for the spatial Durbin model. By comparing the size of R2, it can be seen that the value of spatial fixed effects is the highest, indicating the highest degree of fit; Spatial correlation coefficient ρ has passed the 1% significance level test again, it means that the spatial correlation of farmers' income level is high, and the income level of rural residents in adjacent areas will have an impact on the income of farmers in that area. The SDM model above has an interaction term between the spatial weight matrix and the core explanatory variables, which creates a correlation between

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different regions. That is, fiscal support for agriculture and financial assistance for agriculture have an impact on the income of farmers in both the province and neighboring provinces, while neighboring provinces have indirect feedback on the income of farmers in the province.

Table 4. Spatial Durbin Model Estimation Results

Variable	Spatial fixed effect	Time fixed effect	Double fixed effect
cz	0.108***(0.0166)	-0.138***(0.0292)	0.079***(0.0167)
lndk	0.027*(0.0146)	0.044**(0.0204)	0.011(0.0142)
zc	0.331***(0.1022)	0.134(0.2550)	0.271***(0.1046)
hf	-0.908(0.5779)	-0.103(0.6410)	-0.786(0.5548)
yc	-0.366**(0.1525)	0.258(0.2416)	-0.225(0.1490)
jx	0.058***(0.0217)	0.120***(0.0392)	0.052**(0.0207)
rk	1.528***(0.1761)	1.920***(0.1424)	1.599***(0.1745)
W*cz	0.024(0.0291)	-0.250***(0.0606)	-0.046(0.0333)
W*lndk	0.025(0.0228)	0.074*(0.0395)	-0.020(0.0254)
ρ	0.747***	0.239***	0.293***
σ^2	0.001***	0.010***	0.001***
R^2	0.886	0.757	0.700

Note: * * *, * * and * represent significant levels at 1%, 5%, and 10%, respectively; Standard error in parentheses.

From the perspective of variable regression coefficients, the coefficient of fiscal support for agriculture (cz) is 0.108, which is positive and significant at the 1% confidence level. The coefficient of financial support for agriculture (lndk) is 0.027, which is also positive and significant at the 10% confidence level. Based on the comprehensive analysis of the two situations, fiscal support for agriculture and financial support for agriculture have certain benefits in improving farmers' income. From the regression coefficient of the control variable, the coefficient of farmers' ability to allocate resources (zc) is 0.331, which is positive and significant at a 1% confidence level. Simply understood, it means that the average investment of farmers increases by 1%, resulting in a 0.331% increase in farmers' income. The coefficient of farmers' productive input (hf) is -0.908, which may be due to the increased cost caused by excessive use of agricultural fertilizers, thereby reducing farmers' net income. However, the statistical significance has not been passed. The coefficient of industrialization process (yc) is -0.366, which is negative and significant at a 5% confidence level. This means that an increase in the ratio of the added value of the primary industry to GDP will be detrimental to the increase in farmers' income. The coefficients of agricultural production technology level (jx) and urbanization level (rk) are both positive and significant at a confidence level of 1%, indicating that an increase in the average power of agricultural machinery and urbanization level will promote an increase in farmers' income. Finally, the spatial lag coefficients of the core explanatory variables are not significant, thus requiring decomposition of spatial effects.

4.2. Effect Decomposition of Spatial Durbin Model

Based on the analysis of the total effect of fiscal support for agriculture and financial assistance for agriculture on increasing farmers' income, and drawing on the research of LeSage & Pace (2009) [17], the total effect is further decomposed into direct and indirect effects (Table 5). The direct effect includes two aspects: firstly, the support of local fiscal and financial policies for local farmers' income; Secondly, neighboring areas have a negative impact on the income of local rural residents by learning local policy methods. The indirect effect refers to the spatial

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spillover effect, which reflects the spillover effect of fiscal and financial policies in neighboring regions on agricultural assistance, thereby affecting the income level of local rural residents.

Table 5. Effect decomposition of spatial Durbin model

Model	Variable	Direct effect	Indirect effect	Total effect
Spatial fixed effect	cz	0.143***(0.0187)	0.375***(0.0882)	0.518***(0.0967)
	lndk	0.042***(0.0140)	0.167***(0.0563)	0.209***(0.0601)
	zc	0.292**(0.1274)	-0.552(0.6789)	-0.261(0.7699)
	hf	0.159(0.6563)	11.873***(3.4698)	12.032***(3.8357)
	yc	-0.332(0.2063)	0.369(1.2525)	0.037(1.4111)
	jx	0.076***(0.0252)	0.188(0.1301)	0.264*(0.1447)
	rk	1.791***(0.1855)	2.798***(0.8453)	4.588***(0.9188)
Time fixed effect	cz	-0.154***(0.0304)	-0.355***(0.0685)	-0.509***(0.0828)
	lndk	0.049**(0.0197)	0.109**(0.0450)	0.158***(0.0507)
	zc	0.039(0.2368)	-2.604***(0.5478)	-2.564***(0.5258)
	hf	-0.659(0.6634)	-11.229***(2.3783)	-11.888***(2.7284)
	yc	0.294(0.2433)	0.934(0.8020)	1.227(0.9221)
	jx	0.129***(0.0372)	0.147*(0.0791)	0.276***(0.0878)
	rk	2.008***(0.1312)	1.879***(0.3439)	3.887***(0.3503)
Double fixed effect	cz	0.078***(0.0176)	-0.032(0.0421)	0.045(0.0489)
	lndk	0.010(0.0134)	-0.020(0.0325)	-0.010(0.0338)
	zc	0.272***(0.1047)	-0.154(0.2929)	0.119(0.3430)
	hf	-0.544(0.5394)	4.552***(1.5561)	4.008**(1.6522)
	yc	-0.180(0.1473)	0.810*(0.4592)	0.630(0.5254)
	jx	0.059***(0.0203)	0.095*(0.0536)	0.153***(0.0577)
	rk	1.679***(0.1719)	1.313***(0.3810)	2.992***(0.4156)

From Table 5, it can be seen that the direct effect regression coefficient of the two core explanatory variables of fiscal and financial support for agriculture is positive, indicating that the implementation of fiscal policies and capital investment provide production capital, and rural financial reform further reduces agricultural loan costs. These are greatly beneficial to agriculture, forestry, animal husbandry, and fishery, improving the overall environment for rural economic development, and thus increasing farmers' income. Adjacent regions see economic development and then imitate local fiscal and financial policies, forming a positive reaction force. The indirect effect regression coefficient of the core explanatory variables is also positive. Financial assistance in agriculture, advanced agricultural technology promotion in financial assistance, land improvement, and inter provincial loans for farmers can not only increase local farmers' income, but also have a role model and demonstration effect, affecting the income of farmers in adjacent areas, once again confirming the spatial spillover of the two variables. In the process of policy implementation, spatial spillover effects can be fully utilized to enhance the support of fiscal and financial support for rural areas, and improve the coupling of fiscal and financial services, especially for areas with multiple provinces gathering and relying more on spatial spillover effects.

From the perspective of other factors that affect the income of rural residents, the regression coefficients for the direct and indirect effects of urbanization level are 1.791 and 2.798, respectively, passing the significance test at the 1% level, indicating that the local urbanization rate has a significant positive impact on the income level of farmers in both the local and

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adjacent regions. Secondly, the impact of farmers' resource allocation ability and agricultural production technology level on farmers' income is smaller than that of urbanization level. The estimated direct effects are 0.292 and 0.076, with significance of 5% and 1%, respectively. The indirect effects are not significant. Finally, the direct effect of farmers' productive inputs is not significant, while the indirect effect and total effect are both significantly positive. This indicates that the use of fertilizers has caused problems such as increased costs and environmental damage, and the effect on local farmers' income is not significant. On the contrary, it will bring beneficial effects to farmers in surrounding areas.

5. Conclusion and Suggestions

5.1. Conclusion

The article is based on provincial panel data in China from 2010 to 2020, and uses the Spatial Durbin Model (SDM) to analyze the direct and spatial spillover effects of fiscal support for agriculture and financial aid for agriculture on farmers' income levels. The following conclusions are drawn: firstly, the spatial autocorrelation level of fiscal support for agriculture, financial aid for agriculture, and rural residents' income is relatively high, that is, a certain indicator in a province will affect the financial aid for agriculture in adjacent provinces Financial support for agriculture and the level of disposable income of rural residents confirm spatial spillover. Secondly, the direct and indirect regression coefficients of the two core explanatory variables of fiscal support for agriculture and financial assistance for agriculture are both positive, indicating that the increase in fiscal and financial expenditures has a significant positive impact on the income increase of farmers in both the local and spatially related regions. The level of urbanization, the ability of farmers to allocate resources, and the level of agricultural production technology all have a significant positive impact on the income of local farmers, but the impact of farmers' ability to allocate resources and the level of agricultural production technology is relatively small.

5.2. Suggestions

(1) Continue to strengthen financial support for agriculture. Implement the national fiscal support for agriculture policy, clarify the policy objectives of rural revitalization, prioritize both investment and management, and maximize the efficiency of fund utilization. Establish and improve the guarantee mechanism for fiscal supply to rural areas, so that the proportion of "agriculture, rural areas, and farmers" expenditure in total fiscal expenditure increases with economic growth. Make good use of spatial spillover effects, focus on cultivating regions with exemplary role models, and provide financial subsidies for the spillover of benefits in these regions, fully leveraging their positive externalities.

(2) Innovate and reform rural financial services. Implement the national policy of financial assistance to agriculture, innovate and reform the policy measures of financial assistance to agriculture, fully leverage the direct and indirect effects of financial assistance to agriculture, and increase the intensity of financial support to agriculture. In economically underdeveloped rural areas, invest more financial support in agricultural production and operation projects; In economically developed rural areas, allocate agricultural credit reasonably and establish a diverse and complete rural financial system. Fully popularize financial knowledge, lead the development of rural internet finance, and achieve digital inclusive finance.

(3) Strengthen the synergy of fiscal and financial support for agriculture policies. The current financial support for agriculture funds and financial support for agriculture funds are two independent individuals with overlapping functions, which can easily lead to resource waste or mutual blame. Therefore, improving the coupling of finance and finance is of great significance, especially in regions with multiple provinces gathering and relying more on spatial spillover

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effects. By building a fiscal and financial interactive guarantee system that shares agricultural loan risks, cultivates agricultural insurance subsidies, and tax incentives, we aim to achieve sustainable income growth for farmers.

(4) Appropriately increase the level of urbanization, average investment for farmers, and average driving force for agricultural machinery, reduce the proportion of added value in the primary industry to GDP, and continue to deepen research on the average amount of fertilizer used. Establish a sense of overall situation, seize the opportunities of urbanization and technological advancement, strengthen spatial connections, achieve cross provincial sharing of high-quality resources, and promote agricultural modernization. Control the average amount of agricultural fertilizers, actively respond to national low-carbon environmental protection requirements, and build a good environment for the development of agriculture, rural areas, and farmers.

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