An Empirical Analysis of Direct Financing on Agricultural Economy

Kun Song

College of Economics, Sichuan Agricultural University, Chengdu, Sichuan, China

Keywords: Direct Financing; Agricultural Economy; Dynamic Spatial Panel Model; Spatial Spillover Effect

Abstract: A dynamic spatial panel econometrics model is built to analyze spatial spillover effect of direct financing on agricultural economy by adding lagged variables of agricultural economic development. It is found that direct financing has a significant positive impact on agriculture economic development. Conclusively, spatial externality of agricultural economic development could provide the condition and possibility for direct financing cooperation across the provinces of China.

1. Introduction

Direct finance can provide agricultural modernization with a large amount of long-term and stable funds. Agricultural enterprises also optimize the structures of their corporate governance and promote the upgrading of rural industrial structures. To solve problems that venture capital used for innovation was limited and capital channels were narrowed in the rural area of the United States, Drabenstott and Meeker (1997) proposed specific methods to grow secondary capital market in rural area. In the U.S. capital market, direct financing, such as enterprise bonds, venture capital (VC) and equity investment, accounts for 87.2% of all financing activities, which has been accelerating the transforming of agricultural technology from original innovation into scientific and technological achievements. By 2012, the proportion of direct financing has increased to 60%-70% in the middle-income countries (Zhou Yueqiu and Qiu Muyuan, 2016). But the financing structure in China has long been dominated by commercial banks. More than 85% of financing demands from agricultural business entities are satisfied by commercial banks (Ju Ronghua, 2009). Since China's economic development has come to the new normal state, there is an increasing number of suggestions about cultivating and developing rural capital market (Zhang Youfang, 2015). From the perspective of information economics, the real economy and demand for financial services, developing direct financing is supposed to be good for the rural economy.

2. Methodology

2.1 Spatial Econometric Models

We use SPM to analyze the spatial spillover effect of direct financing on agricultural economic development. SPM includes Spatial Autoregressive Model (SAR), Spatial Error Model (SEM) and Spatial Dubin Model (SDM). Among them, SEM is the static spatial model, and SAR and SDM has static and dynamic model respectively. The Dynamic Spatial Panel Model (DSPM) regards the lagged first-order dependent variable as one of the explanatory variables, and is generally expressed as:

$$y_t = \rho W y_t + \tau y_{i,t-1} + X_t\beta + dX_t\delta + \varepsilon_t + \gamma_t + u\,,\ \varepsilon_t = \lambda W\varepsilon_t + v_t\,, \tag{1}$$

where y is the dependent variable vector, W is the spatial weight matrix, ρ is the spatial autoregressive coefficient, τ reflects the influence of lagged dependent variables on the current dependent variables, X is the explanatory variable vector, β is the regression coefficient vector, $dX_t\delta$ is the spatial lag of the explanatory variable, λ is the coefficient of spatial autocorrelation that

  DOI: 10.25236/icebfm.2019.005

represents the impact of changes in one region on adjacent areas, and $\lambda \in [-1,1]$. ε, γ and v represents stochastic disturbance term vector, and the latter two obey independent identical distribution (i.i.d.).

2.2 Empirical Model Specification

The Dynamic Spatial Panel Model (DSPM) regards the lagged first-order dependent variable as one of the explanatory variables, which could analysis more deeply how lagged factor caused by time impacts dependent variable apart from other explanatory variables, compared with the static model. We construct DSPM to capture the influence of direct financing on agricultural economic development.

Dependent variable (agdp) represents the level of agricultural economic development, which is using the gross output value of farming, forestry, animal husbandry and fishery. In order to improve regional comparability and eliminate heteroscedasticity, we carry out logarithmic transformation on the data.

Main independent variable (df) represents direct financing, which is calculated using the sum of equity financing and bond financing of farming, forestry, animal husbandry and fishery industry listed companies, as well as agricultural products processing and manufacturing listed companies in China. The industry classification benchmark is based on guidelines for the classification of listed companies issued by China's Securities Regulatory Commission (CSRC) in 2012. We still carry out logarithmic transformation on the initial data for data stationary.

The development of agricultural economy is driven by a variety of factors apart from funds. Taking into account rationality of empirical model and data availability, we choose the following factors closely related to the development of agricultural as control variables. The variables are defined as follows:

Rural investment efficiency (ce) = rural fixed assets investment / (added value of primary industry + added value of township enterprises);

Rural labor (rl) = rural employment / (added value of primary industry + added value of township enterprises);

Fiscal fund expenditure for supporting agriculture (fs) = Government Expenditure for Agriculture / (added value of primary industry + added value of township enterprises).

In consideration of the inertia effect of agricultural economic development, we construct a dynamic spatial panel model with first-order lag, as shown in Eq. (2):

$$\begin{aligned} Lnagdp_{it} = C_{it} + \rho WLnagdp_{it} + \tau Lnagdp_{i,t-1} + \beta_1 Lndf_{\mathrm{it}} + \beta_2 ce_{\mathrm{it}} + \beta_3 rl_{\mathrm{it}} + \beta_4 fs_{\mathrm{it}} \\ + WLndf_{\mathrm{it}}\delta + Wce_{\mathrm{it}}\delta + Wrl_{\mathrm{it}}\delta + Wfs_{\mathrm{it}}\delta + \gamma_{it} + \varepsilon_{it} \end{aligned} \quad (2)$$

3. Data and Summary Statistics

The estimation draws upon a panel data set constructed for 30 provinces, autonomous regions, and independently administered cities of China in 7-year intervals over the period from 2009 – 2015, based on data availability. Data collection of equity financing of agriculture-related enterprises includes Shanghai Stock Exchange, Shenzhen Stock Exchange, Shenzhen Small & Medium Enterprise Board, New Third Board in China, and Chinese Growth Enterprises Market. Data collection of bond financing involves Debt Financing Instruments, Corporate Bonds, Small and Medium-Sized Enterprise Private Debt issued by agriculture-related enterprises, as well as Special Plan for Small Loans of Agriculture Related Projects. All data comes from National Bureau of Statistics of China, Statistical Year book of each province in China, China Rural Statistical Year book and Wind Information.

Table 1 Descriptive statistics of each variable

Variables	Number of Samples	Mean Value	Standard Deviation	Minimum Value	Maximum Value
agdp	210	7.6096	0.9746	5.0581	9.1642
df	210	1.6693	1.6807	-3.0200	5.5214
ce	210	0.2004	0.0908	0.0134	0.4491
rl	210	1.9270	0.9049	0.6757	6.2321
fs	210	0.3679	0.4025	0.1022	3.0296

4. Analysis and discussion of results

Firstly, ρ of SAR model, SEM model, SDM model and dynamic SDM model all show goodness of fit and are all positive at remarkable significant level. The result further shows that the agricultural economic development does exist positive spatial autocorrelation. Namely, agricultural economic development of neighboring provinces with similar spatial characteristics is helpful for one province.

Secondly, static spatial panel model ignores the influence of the first-lagged agricultural economic development, which can't be neglected in reality. Therefore, the dynamic spatial panel model is more suiTable for the interpretation of agricultural economic development.

Thirdly, although the above analysis shows we can better demonstrate the spatial spillover effect of the direct financing on the agricultural economic development, we choose the SDM model according to significance of the regression coefficient for all explanatory variables.

Table 2 Estimation results of static spatial panel model(SAR,SEM and SDM)

Variables	SAR			SEM			SDM		
	Spatial Fixed Effect	Period Fixed Effect	Spatial and Period Fixed Effects	Spatial Fixed Effect	Period Fixed Effect	Spatial and Period Fixed Effects	Spatial Fixed Effect	Period Fixed Effect	Spatial and Period Fixed Effects
df	-0.003	0.180***	-0.004	-0.001	0.186***	-0.003	-0.003	0.171***	-0.005*
	(-1.074)	-7.29	(-1.472)	(-0.273)	(7.575)	(-1.078)	(-1.278)	(7.008)	(-1.806)
ce	-0.241**	-0.143	-0.085	-0.202**	-0.059	-0.108	-0.12	-0.285	-0.029
	(-2.366)	(-0.286)	(-0.935)	(-2.538)	(-0.117)	(-1.208)	(-1.277)	(-0.563)	(-0.327)
rl	-0.158***	-0.114**	-0.141***	-0.153***	-0.144**	-0.145***	-0.166***	-0.201***	-0.152***
	(-12.672)	(-2.001)	(-12.421)	(-12.325)	(-2.289)	(-12.738)	(-13.379)	(-3.321)	(-12.961)
fs	-0.146***	-1.774***	-0.211***	-0.195***	-1.774***	-0.214***	-0.164***	-1.759***	-0.197***
	(-6.113)	(-17.829)	(-9.592)	(-9.009)	(-17.758)	(-9.813)	(-7.227)	(-18.575)	(-9.122)
$\rho(\lambda)$	0.676***	0.105*	0.130*	0.934***	0.170*	0.223**	0.725***	0.147	0.212**
	(21.422)	(1.654)	(1.859)	(58.183)	(1.732)	(2.259)	(15.395)	(1.62)	(2.21)
sigma2_e	0.002***	0.313***	0.002***	0.002***	0.311***	0.002***	0.002***	0.274***	0.001***
	(10.104)	(10.239)	(10.236)	(9.832)	(10.211)	(10.181)	(9.829)	(10.19)	(10.189)
R^2	0.164	0.624	0.331	0.306	0.626	0.338	0.164	0.562	0.289
LogL	334.5375	-176.2211	378.4091	328.4023	-176.0424	379.1086	354.6073	-162.1947	386.5658
Wald Test	Statistic						45.37	30.16	38.25
	P Value						(0.0000)	(0.0000)	(0.0000)
LR Test	Statistic						43.19	29.72	42.80
	P Value						(0.0000)	(0.0000)	(0.0000)

Note: *, **, ***indicates to reject the null hypothesis at the significance level of 10%, 5%, and 1% respectively. Data in parentheses is T statistic of the coefficients.

Main results

Juxtaposing the above findings, we think System GMM is the optimal econometrics model. Thus, we only analyze the estimation results presented in Table 3.

Firstly, the coefficient of first-lagged agdp is 0.915, and is significant at 1% level. It indicates that the development of agricultural economy in the previous period will have a positive effect in promoting that in the latter period. This is because productive factors for agricultural economy, such as capital, technology, talent, information, and resources, will facilitate the next phase of development. So the development of agricultural economy is a dynamic process with "superposition

effect".

Table 3 Estimation results of dynamic SDM model

Variables	Spatial Fixed Effect	Period Fixed Effect	Spatial and Period Fixed Effects	Diff GMM	SYS GMM
L1_agdp	0.532***	1.009***	0.623***	0.629***	0.915***
	(15.015)	(175.19)	(15.043)	(19.74)	(89.65)
df	0.003	-0.007***	0.004**	0.003	0.007***
	(1.587)	(-3.047)	(2.271)	(1.25)	(2.48)
ce	-0.303***	-0.108**	-0.332***	-0.294**	-0.255
	(-3.569)	(-2.425)	(-4.116)	(-2.41)	(-1.49)
rl	-0.123***	0.002	-0.114***	-0.136***	-0.023***
	(-10.989)	(0.300)	(-10.660)	(-8.89)	(-2.35)
fs	-0.129***	-0.028**	-0.118***	-0.104***	-0.137***
	(-8.608)	(-2.320)	(-7.978)	(-5.54)	(-10.46)
$\rho(\lambda)$	0.216***	0.012	0.166*		
R^2	0.951	0.996	0.964	0.970	0.995
LogL	412.3054	249.2708	395.6388	402.1733	342.2666

Note: *, **, ***indicates to reject the null hypothesis at the significance level of 10%, 5%, and 1% respectively.

Secondly, the coefficient of df is 0.007, and is significant at the 1% level. It illustrates that direct financing does have an active effect on agricultural economy. This result is in accordance with the policy of using Chinese capital market to serve modern agriculture. Meanwhile, direct financing has the spillover effect on the agricultural economy to the neighboring provinces.

Thirdly, as for control variables, the coefficient of ce shows that agricultural fixed investment is useful for improving development of agricultural economy. But it is not statistically significant. This may be due to agricultural fixed asset is infrastructure investment with long construction period, and is subject to limited impact on agricultural economy in a short term. The coefficient of rl is -0.023, and is significant at the 1% level. It shows that the decrease in rural labor is helpful for development of agricultural economy significantly. The coefficient of fs is -0.137, and is significant at the 1% level. It indicates that fiscal support to agriculture does not promote the development of agricultural economy in China.

5. Conclusions

Our analysis documents the impact of direct finance on agricultural economic development. In consideration of spatial heterogeneity and difference of agricultural economy for each of China's provinces from geography, we construct dynamic spatial model to exploiting this impact with a combination DIFF-GMM and SYS-GMM, even after a variety of controls are introduced. Taking the coefficients from Table 3, our results have provided the following important insights: Firstly, the agricultural economic development of each province is not independent from each other, it has significant spatial correlation. Agricultural economic development in the adjacent province will have spatial externality in this province. As we find the coefficient of first-lagged agricultural economy is significantly positive and value is largest among all variables, which shows that the continuity of agricultural economic development in each province should not be ignored. Thus, the established dynamic spatial panel data model can reflect reality of Chinese agriculture compared with static spatial model. Secondly, substantiation of spatial spillover effect of direct financing on agricultural economy is empirically consequential. The spatial externality of agricultural economic development provides conditions and possibilities for cooperation of direct financing across the provinces. Although it is evident from the estimations which show a significant positive effect of a direct financing on agricultural economic development, the possible impact is smallest. Thirdly, our results show that there is a decreasing impact of rural investment efficiency, fiscal fund expenditure

for supporting agriculture, as well as rural labor on agricultural economy.

References

[1] Ju Ronghua, Zong Chengfeng, Han Qing. Analysis of Finance Supply and Demand in Rural Financial Market of China. Journal of China Agricultural University, 2009, 14(4):137-142.

[2] Mark Drabenstott, Larry Meeker. Financing Rural America: A Conference Summary. Proceedings Rural Conferences, Federal Reserve Bank of Kansas City, 1997, 4(2):11-17.

[3] Zhang Youfang. Direct Financing: A New Engine for Developing Rural Capital Market. Jianghan Tribune, 2015, (4):25-29.

[4] Zhou Yueqiu, Qiu Muyuan. An Analysis of Chinese Financing Structure Transition-From the Perspective of Ecological Economy. Finance Forum, 2016, (10):3-12.