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Impact of Agricultural FDI on China's Agricultural Green Total Factor Productivity

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Abstract: The introduction of agricultural foreign direct investment (FDI) is of great significance to improve China's agricultural green total factor productivity (GTFP) and promote high-quality agricultural development. This paper measures the agricultural GTFP of 23 provincial samples in China from 2006 to 2018 and makes an empirical study on the impact of agricultural FDI on agricultural GTFP. The basic results show that agricultural FDI has promoted the growth of China's agricultural GTFP, and this impact shows non-equilibrium characteristics in the main grain-selling regions, the main grain-producing regions, and the grain production and marketing balance regions. Moreover, the regression results of the threshold effect show that the agricultural FDI has a threshold effect on the level of economic development of China's agricultural GTFP. In regions with a high level of agricultural economic development, the introduction of agricultural FDI can be conducive to agricultural GTFP. On the contrary, the effect is not obvious or even inhibition. Therefore, China should actively introduce foreign direct investment, further optimize the layout of regional opening up, and implement differentiated agricultural investment policies.

Keywords: agricultural foreign direct investment; green total factor productivity; panel threshold effect

JEL Classification: Q01; Q56; Q58

1. Introduction

Since the reform and opening-up, China's agricultural economic development has made brilliant achievements. From 1978 to 2019, the added value of the primary industry increased from 101.85 billion yuan to 704.67 billion yuan, and the actual average annual growth rate (excluding price factor) reached 4.3%. However, the extensive agricultural growth model, which has long relied excessively on the input of production factors, has caused serious problems such as tighter agricultural resources, prominent environmental issues, and ecological environmental degradation. These problems have become the constraints that restrict the sustainable development of agriculture. The results of the Second Pollution Source Census in China showed that the chemical oxygen demand and total nitrogen emissions of agricultural water pollutants in 2017 were 1,067.13 million tons and 141.49 million tons, accounting for 49.77% and 46.52% of the total emissions. It can be seen that agricultural pollution has become one of the most severe environmental pollution problems in China. The deterioration of the agricultural ecological environment not only affects agricultural

production but also threatens the quality of agricultural products and human health. Therefore, promoting the mode of agricultural economic growth from high carbon extensive to green intensive is the crucial measure to realize the green development of agriculture. And the core of promoting the transformation of agricultural economic growth mode is to improve agricultural GTFP.

At the same time, with the deepening of China's agricultural opening to the outside world, agriculture has gradually integrated into the international division of the labor system. This situation has promoted the continuous expansion of FDI in China, which makes foreign agricultural investment become an essential factor affecting China's agricultural environmental pollution and productivity growth. According to the data released by the United Nations Conference on Trade and Development (UNCIAD), China's agricultural FDI has averaged 2.456 billion USD since 2016, ranking first in developing countries.

So, does the growing scale of China's agricultural FDI promote the growth of GTFP? If so, are there any characteristics of regional heterogeneity? Is this effect linear or non-linear? It is an urgent issue to be revealed. Answering these questions will help to improve the quality of agricultural FDI and agricultural GTFP in China. In addition, it is of great significance to promote the green and coordinated development of China's agriculture.

Therefore, based on the provincial panel data of China from 2006 to 2018, this paper uses the directional distance function and the global Malmquist-Luenberger index to measure the provincial agricultural GTFP. On this basis, we use the two-way fixed effect model to examine the impact of agricultural FDI on agricultural GTFP. Considering the difference in regional economic development level, this paper further uses Hansen's non-linear threshold model to test the non-linear effect of agricultural FDI on agricultural GTFP.

2. Literature Review

2.1. The Impact of FDI on GTFP

On the relationship between FDI and GTFP, the existing literature has done a lot of research and achieved many valuable results. On the one hand, some scholars have found that FDI promotes GTFP growth by transferring production technology and constructing supervision mode. Yang and Wang (2016) claimed that FDI could promote GTFP through technology spillover and pollution halo effect, Jing and Chen (2018) also reached similar conclusions. By using the spatial econometric model, Wang et al. (2021) found that FDI significantly promoted GTFP growth in local and surrounding areas. By using panel data from seven industries in China, Li et al. (2021) found that FDI has a positive impact on the GTFP of China's equipment manufacturing industry. On the other hand, some scholars hold opposing views that FDI will produce congestion effect, crowding-out effect, and pollution haven effect, which is not conducive to GTFP growth. According to Li and Fan (2019), China's ability to absorb and introduce re-innovation is weak, which makes China introduce FDI with high pollution intensity for a while, resulting in FDI hindering the growth of GTFP. Ren and Zuo (2021) also claimed that FDI suppresses the growth of GTFP, which confirms

the pollution paradise hypothesis. In addition, some scholars consider that FDI does not have a significant direct impact on China's GTFP, but promotes the growth of GTFP through positive interaction with environmental regulation and fiscal decentralization (Yuan & Xie, 2015; Li et al., 2016). Based on the spatial econometric model, Feng et al. (2021) found that the impact of FDI on China's GTFP is not statistically significant. FDI can only promote the growth of China's GTFP without considering the dynamic effect of China's GTFP and under the assumption of the human capital matrix.

2.2. The Impact of Agricultural FDI on Agricultural TFP

In recent years, whether agricultural FDI can effectively promote TFP growth has attracted wide attention in academia. However, scholars have not reached a consensus on the impact of agricultural FDI on agricultural GTFP. Specific views or propositions can be summarized into three categories. First, FDI significantly promotes agricultural TFP growth. Based on data from 28 African countries from 1980 to 2014, Adom (2018) found that FDI was conducive to improving agricultural production efficiency in African countries. By measuring the TFP of 24 provincial samples in China from 2004 to 2016, Wang et al. (2019) also concluded that agricultural FDI has a significant promoting effect on agricultural TFP. Based on China's provincial panel data, Li and Huang (2021) pointed out that agricultural trade liberalization has a significant positive impact on China's agricultural TFP. Chen et al., (2021) also reached similar conclusions. Second, FDI inhibits agricultural TFP growth. Yin (2017) considered that agricultural FDI reduced agricultural TFP by using China's provincial panel data from 1997 to 2012. Third, the effect of FDI on agricultural TFP is not obvious. Based on bilateral FDI flows from 108 host countries and 240 home countries from 1990 to 2012, Demir and Duan (2018) showed that bilateral FDI flows had no significant effect on agricultural productivity growth in host countries.

3. Methodology

3.1. Theoretic Mechanism

Agricultural FDI promotes GTFP growth through demonstration imitation effect, competition effect, human capital effect, and correlation effect. First, the introduction of agricultural FDI can transfer advanced science and technology, high-yield and high-quality varieties, and modern management organization system to China, which has a demonstration and imitation effect on local agricultural business entities. This effect can not only enhance the technical level and management level of China's agricultural business entities, but also promote agriculture to the high-end value chain. Second, the entry of foreign agricultural enterprises will intensify the local internal market competition, forcing local agricultural enterprises to increase investment in agricultural science and technology, using more efficient agricultural production equipment. This competitive effect helps to promote agricultural technological progress and improve technical efficiency. Second, the entry of foreign agricultural enterprises can intensify market competition. This competitive effect makes local agricultural enterprises increase investment in agricultural science and

technology (Han et al., 2021), thereby promoting agricultural technological progress and improving technical efficiency. Third, agricultural FDI is conducive to expanding the scale of local agricultural employment. To make better use of the labor resources of the host country, agricultural foreign-funded enterprises increase agricultural knowledge training for employees and promote the level of rural human capital to increase, thus improving the production efficiency of local agricultural enterprises. Finally, foreign agricultural enterprises have more advanced environmental governance technology and pollution prevention experience. Foreign agricultural enterprises can effectively promote the transformation of the pollution control mode of local agricultural enterprises by strengthening the links between the front and rear ends of the industrial chain (Poelhekke & Ploeg, 2015). It can improve local environmental quality.

Furthermore, the difference in regional development level leads to the non-linear effect of agricultural FDI on agricultural GTFP. The technological digestion and absorption capacity of local enterprises are related to regional economic development (Ma et al, 2016). When the level of regional economic development is low, the ability of local enterprises to digest and absorb technology is limited. At the same time, the entry of foreign capital will inevitably intensify industry competition, and some mainland enterprises will be squeezed out of the market. On the contrary, when the regional economic development reaches a certain level, local enterprises will have strong competitive capacity and technology learning ability, to internalize the advanced technology brought by FDI and promote the growth of agricultural GTFP. It means that only when the level of regional economic development reaches a certain level, local enterprises have the primary conditions to internalize foreign advanced technology, to play the positive role of agricultural FDI on agricultural GTFP.

Based on theoretical analysis, the following hypotheses are proposed:

1. The introduction of agricultural FDI can promote the growth of China's agricultural GTFP

2. The impact of agricultural FDI on China's agricultural GTFP may exist threshold effect based on the level of economic development

3.2. Model Establishment

To examine the impact of agricultural FDI on agricultural GTFP, this paper constructs the following model:

$$LnAGTFP_{it} = \alpha + \beta LnAFDI_{it} + \theta X_{it} + \mu_i + \gamma_t + \varepsilon_{it} \quad (1)$$

Among them, the subscript i and t represent province and year respectively, $LnAGTFP_{it}$ and $LnAFDI_{it}$ stand for the agricultural GTFP and the agricultural FDI in each province, respectively. The β is the influence coefficient of agricultural FDI on agricultural GTFP. Furthermore, the control variable X_{it} indicates other control variables that affect agricultural GTFP apart from agricultural FDI, μ_i represents all other province fixed effects that are not included in the model but may have an impact on the explained variable, γ_t stands for time fixed effect, and ε_{it} is the error term.

Furthermore, through the above theoretical analysis, this paper found that agricultural FDI may have a nonlinear impact on agricultural GTFP growth. Thus, it is necessary to examine the threshold effect of agricultural FDI on agricultural GTFP growth. Based on the study of Hansen, this paper selects the level of economic development as the threshold variable to construct the panel threshold model of agricultural FDI on agricultural GTFP. The model is set as follows:

$$LnAGTFP_{it} = \alpha + \beta_1 LnAFDI_{it} \times I(Thr \leq \phi) + \beta_2 LnAFDI_{it} \times I(Thr > \phi) + \theta X_{it} + \mu_i + \gamma_t + \varepsilon_{it} \quad (2)$$

Among them, $I(\cdot)$ is the threshold indicator function, Thr is the threshold variable, ϕ is the specific threshold value, and the remaining variables have the same meaning as above.

3.3. Data Source and Variable Selection

This paper selects the data of 23 provinces in China from 2006 to 2018 as samples. The data of this paper mainly comes from the Statistical Yearbooks of China's provinces, China Agricultural Statistics Yearbook, China Statistical Yearbook, China Economic Network statistical database, and China Human Capital Index Report (2019).

The explained variable in this paper is agricultural GTFP. This paper uses the directional distance function considering undesirable output and the global Malmquist-Luenberger productivity index to measure the GTFP of each province in China from 2006 to 2018. On the one hand, this paper measures agricultural input from six aspects: labor, land, mechanical power, fertilizer, water, and livestock. Specifically, we use the number of workers in the primary industry as the proxy variable of labor input, the crop planting area as the proxy variable of land input, the total power of agricultural machinery as the proxy variable of mechanical power input, the amount of agricultural chemical fertilizer application as the proxy variable of chemical fertilizer input, the agricultural water consumption as the proxy variable of water input, and the number of end-of-year livestock stock as the proxy variable of livestock input. On the other hand, this paper measures agricultural output from the perspective of expected output and undesirable output. This paper measures the expected output of agriculture by referring to Gao's (2015) approach, that is, the added value of the primary industry at constant prices in each province from 2005 to 2018. Besides, this paper uses the method of Li (2011) to estimate agricultural carbon emissions in each province of China and uses agricultural carbon dioxide emissions as undesirable outputs.

Agricultural FDI is the core explanatory variable of this paper. This paper uses the proportion of actual agricultural use of foreign capital to the added value of the primary industry to express the level of agricultural use of foreign capital in each province. Due to the lack of data on the actual use of FDI in agriculture in some provinces, the final sample adopts the data of 23 provinces except Shanxi, Jilin, Fujian, Hainan, Sichuan, Tibet, Qinghai, and Ningxia.

Our research takes the level of economic development (LnAPGDP) as the threshold variable. This variable measures the level of economic development by calculating the actual

value-added of the primary industry per capita by the actual value-added of the primary industry/rural population.

Five control variables are selected in our research. First, this paper uses the proportion of agricultural expenditure to the added value of the primary industry to measure agricultural expenditure (GOV). Second, we use the ratio of crop planting area to total crop planting area to describe the agricultural structure adjustment (AS). Third, we reflect the agricultural natural disaster rate (DR) by the ratio of the affected area to total crop acreage. Fourth, urbanization (Urban), which uses the ratio of urban population to resident population in each region to represent the urbanization rate. Fifth, industrialization (Ind) is measured by the proportion of industrial added value to GDP.

The descriptive statistics of variables are shown in Table 1.

Table 1. Descriptive statistics of variables

Variables	Mean	St.d	Min	Max	N
LnAGTFP	0.648	0.376	-0.013	1.7267	299
AFDI	0.662	0.927	0.001	6.075	299
LnAPGDP	38.984	63.784	1.275	485.291	299
GOV	54.983	15.228	26.960	89.610	299
AS	55.578	12.399	21.240	86.090	299
DR	0.647	0.376	-0.013	1.727	299
Urban	0.725	0.441	-0.018	1.738	299
Ind	-0.079	0.173	-0.750	0.264	299

4. Results

4.1. Preliminary Results

Before the regression of the benchmark model, this paper analyzes the possible collinearity problem and spurious regressions problem. The panel data model form as follows: First, variance expansion factor (VIF) is used to test the possible multicollinearity. The test results show that the values are less than 5, indicating that there is no severe multicollinearity problem between variables. Second, the LLC and IPS tests are used to test the stability of the main variables. The panel data unit root test results show a single first-order integral I(1) between the main variables. Further panel cointegration test results show a long-term cointegration relationship between the main variables. Third, the traditional fixed-effect model only considers the differences between individuals but does not consider the influence of the time effect. The missing variables may lead to estimation bias. Therefore, to eliminate the estimation bias of the model, this paper uses the two-way fixed effect model to estimate the impact of agricultural FDI on agricultural GTFP.

In Table 2, columns 1 and 2 are the impact of agricultural FDI on agricultural GTFP without and with control variables, respectively. It shows that regardless of whether the control variables are added or not, the estimated coefficients of AFDI are positive at the 1% significant level, indicating that agricultural FDI has a positive promoting effect on improving agricultural GTFP. Specifically, for every 1% increase in the proportion of agricultural FDI, the agricultural GTFP will increase by 0.04%, which also verifies Hypothesis 1 of this paper. The Chinese government has long attached great importance to

improving the quality and level of FDI in agricultural utilization. The government limits the entry of agricultural projects with high pollution and high energy consumption by setting a negative list of agricultural foreign investment access. At the same time, the government encourages foreign investment in high-tech agricultural industries, biomass energy, energy conservation, and environmental protection industries. To achieve the goal of promoting agricultural industrial structure adjustment and promoting agricultural sustainable development. Besides, through the foreign investment projects, agricultural germplasm resources, modern agricultural equipment technology, agricultural environmental protection technology, foreign professional and technical talents, and advanced management concepts can be introduced. It can be seen that the introduction of agricultural FDI is conducive to global green technology transformation, to improve agricultural production efficiency and agricultural GTFP.

Table 2. The impact of agricultural FDI on agricultural GTFP: basic results

Variables	All regions	All regions	Main grain-producing regions	Main grain-selling regions	Grain production and marketing balance regions
	(1)	(2)	(3)	(4)	(5)
AFDI	0.040***	0.035***	-0.012	0.038***	-0.006
	(5.508)	(4.945)	(-0.791)	(3.089)	(-0.126)
Constant	0.076***	-0.616***	-0.751***	-2.363**	-1.909***
	(4.503)	(-3.388)	(-3.542)	(-2.033)	(-6.296)
Observations	295	295	142	65	88
R^2	0.951	0.957	0.977	0.954	0.983
Controls	NO	YES	YES	YES	YES
Individual	YES	YES	YES	YES	YES
Time	YES	YES	YES	YES	YES

Notes: The superscripts ***, **, * are significant at the level of 1%, 5%, and 10%, respectively. The t-statistic is in brackets.

To further investigate the regional differences in the impact of agricultural FDI on agricultural GTFP, this paper divides the national samples into three sub-samples according to the grain function zoning. These three sub-samples are the main grain-producing region, the main grain-selling region, and the grain production and marketing balance region. Specifically, the main grain-producing regions include Liaoning, Jilin, Heilongjiang, Henan, Hebei, Hunan, Hubei, Jiangxi, Anhui, Sichuan, Jiangsu, Inner Mongolia, and Shandong. The main grain-selling regions include Beijing, Shanghai, Tianjin, Zhejiang, Guangdong, Fujian, and Hainan. And the grain production and marketing balance regions include Guangxi, Chongqing, Yunnan, Guizhou, Shanxi, Shaanxi, Qinghai, Gansu, Ningxia, Xinjiang, and Tibet.

In Table 2, columns 3 to 5 show the regression results of three sub-samples. It can be found that, on the one hand, the agricultural FDI in the main grain-selling regions promotes the improvement of agricultural GTFP at a significant level of 1%. For every 1% increase in the proportion of agricultural FDI, the agricultural GTFP will increase by 0.038%. The possible reason is that the main grain-selling regions have a high level of economic development, and their capital is sufficient. In the process of introducing foreign investment,

these regions pay more attention to the quality of agricultural FDI rather than quantity. On the other hand, the introduction of agricultural FDI in the main grain-producing regions and the grain production and marketing balance regions will hinder agricultural GTFP. But, the result is not significant. The reason is that the primary purpose of agricultural FDI in these regions is to seek resources, and foreign-funded enterprises have blocked and protected their core technologies. At the same time, due to the lack of human capital, it is difficult to absorb and transform advanced agricultural technologies. Thus, there is no adequate technology spillover in these regions.

4.2. Results of the Threshold Effect

Before the panel threshold analysis, it is necessary to test a threshold effect and the number of thresholds. To this end, according to Hansen's bootstrap method, repeated sampling 1,000 times to calculate the corresponding P-value and threshold value. The test results are shown in Table 3. It can be found that when the level of economic development is used as a threshold variable, the impact of agricultural FDI on agricultural GTFP has passed a single threshold test, and the threshold value is 8.685.

Table 3. The impact of agricultural FDI on agricultural GTFP: basic results

Threshold variable	Hypothesis testing	P-value	Threshold	95% Confidence interval
LnAPGDP	Single threshold	0.000	8.685	[8.653, 8.689]

Table 4. The impact of agricultural FDI on agricultural GTFP: threshold model regression results

Variables	Estimated Coefficient
LnAPGDP ≤ 8.685	-0.089***
	(-4.589)
LnAPGDP > 8.685	0.036***
	(3.943)
Constant	-2.731***
	(-16.022)
Observations	260
R^2	0.919
Controls	YES
Individual	YES
Time	YES

Notes: The superscripts ***, **, * are significant at the level of 1%, 5%, and 10%, respectively. The t-statistic is in brackets.

Table 4 reports the estimation results with the level of economic development as the threshold variable. It can be found that when the actual per capita added value of the primary industry is lower than the threshold value of 8.685, agricultural FDI has a significant negative impact on agricultural GTFP. When the actual per capita added value of the primary industry crosses the threshold value of 8.685, agricultural FDI promotes the growth of agricultural GTFP. It shows that in the process of absorbing foreign investment in agriculture if the local economic development is low, the ability of local enterprises to digest

and absorb technology is limited, and cannot produce a technology spillover effect. On the contrary, the entry of foreign capital will inevitably intensify competition in the industry, which will squeeze some mainland enterprises out of the market and lead to the decline of agricultural GTFP. When economic development reaches a certain level, the local agricultural enterprises will have strong competitive capacity and technology digestion and absorption capacity. At this time, these enterprises can internalize the advanced technology brought by FDI, thereby promoting the growth of agricultural GTFP, which verifies Hypothesis 2.

4.3. Results of the Robustness Test and Endogenous Treatment

This paper conducts the following robustness tests. First, the calculation method of agricultural GTFP is replaced. The directional distance function and Sequential Malmquist-Luenberger productivity index recalculate the agricultural GTFP. On this basis, the benchmark regression model is estimated. Second, replace the proxy variable of agricultural FDI. The logarithm of the absolute value of agricultural FDI is used as the proxy variable of agricultural FDI. Based on this, the two-way fixed effect model is used for estimation. Third, control the fixed effect of province and time interaction. Although the individual fixed effect and the time fixed effect have been controlled in the benchmark regression, the sample still faces the problem of different time trends. That is, agricultural GTFP in different regions may show different trends over time. To this end, this paper uses Bai's (2009) proposed interaction fixed effect model to re-estimate. The results of the robustness test are shown in columns 1 to 3 of Table 5.

Table 5. The impact of agricultural FDI on agricultural GTFP: robustness test and endogenous treatment

Variables	**Robustness test**			**Endogenous treatment**	
	(1)	(2)	(3)	(4)	(5)
AFDI	0.035***		0.015***	0.081***	0.032*
	(4.945)		(4.159)	(4.698)	(1.882)
LnAFDI		0.012***		0.001***	0.001***
		(2.597)		(2.874)	(4.058)
Constant	-0.616***	-0.619***	-0.012	0.638**	-0.623***
	(-3.388)	(-3.239)	(-0.067)	(2.409)	(-3.303)
Observations	295	295	295	270	295
R^2	0.957	0.954	-	0.945	0.957
Controls	YES	YES	YES	YES	YES
Individual	YES	YES	YES	YES	YES
Time	YES	YES	YES	YES	YES

Notes: The superscripts ***, **, * are significant at the level of 1%, 5%, and 10%, respectively.
The t-statistic is in brackets.

In addition, there is an endogeneity problem caused by reverse causality between agricultural FDI and agricultural GTFP, resulting in biased and inconsistent estimation results. Therefore, this paper uses the method of an instrumental variable to re-estimate to control and solve endogenous problems. It should be noted that this article selects tool variables from two aspects: First, this paper uses the lag phase of agricultural FDI as the

instrumental variable of current value. In general, agricultural FDI in the lag period strongly correlates with the current value, which affects agricultural GTFP through the current value. In contrast, the current agricultural GTFP has no effect on agricultural FDI in the previous period. Second, based on the method of He and Liu (2016), this paper uses the geographical distance between each province and its nearest port to construct the instrumental variable. On the one hand, the geographical distance between the provinces and their nearest ports is fixed and not affected by external factors, thus meeting exogenous conditions. On the other hand, the geographical distance between provinces and their nearest ports can reflect the cost of trade and transportation to a certain extent, thus affecting the trade of agricultural products. Therefore, there is a close correlation between geographical distance and FDI. The results of the endogenous treatment are shown in columns 4 to 5 of Table 5.

5. Discussion

This paper expands the existing research from the following aspects: First, the current literature mainly focuses on the impact of agricultural FDI on agricultural TFP (Jing & Chen, 2018; Li et al., 2021; Ren & Zuo, 2021), but the research on the impact of agricultural FDI on agricultural GTFP is slightly insufficient. The realization of high-quality agricultural development is not limited to improving agricultural TFP, but emphasizes the coordinated development between economic growth and environmental protection. Second, the existing research mainly examines the overall impact of agricultural FDI on agricultural TFP, without fully considering the differences among regions (Yang & Wang, 2016; Demir & Duan, 2018; Li & Fan, 2019; Feng et al., 2021). In fact, there are great differences in regional economic development in China. This difference will affect China's internalization of foreign advanced agricultural technology, and thus lead to a non-linear impact of agricultural FDI on China's agricultural TFP (Chen et al., 2021).

6. Conclusions and Recommendations

In this paper, we tried to prove that, firstly, agricultural FDI promotes the growth of agricultural GTFP in China. Besides, the impact of agricultural FDI on agricultural GTFP presents regional non-equilibrium characteristics. Specifically, the agricultural FDI in the main grain-selling regions has promoted the growth of agricultural GTFP. In contrast, the agricultural FDI in the main grain-producing regions and the grain production and marketing balance regions have no significant influence on agricultural GTFP. Thirdly, there is a threshold effect of agricultural FDI on agricultural GTFP. In regions with a high level of agricultural economic development, the introduction of agricultural FDI will be more conducive to agricultural GTFP. On the contrary, the effect is not obvious or even inhibition.

Based on the conclusions of this research and combined with the current situation of agricultural development in China, the policy recommendations of this paper include the following three aspects:

(1) The current agricultural FDI still plays a positive role in promoting green agricultural development. Introducing foreign investment is still an essential choice for China to promote agricultural technology progress and realize agricultural modernization.

Therefore, based on ensuring food security, on the one hand, we should steadily promote the opening up of the agricultural sector, reduce restrictions on the investment, and optimize the negative list of agricultural foreign investment access. On the other hand, it is necessary to expand the scale of foreign agricultural investment and attract high-tech agricultural enterprises to invest in China.

(2) We should continuously optimize the layout of regional opening, broaden the financing channels of foreign-invested enterprises, and reduce their logistics costs. Through these measures, agricultural FDI flows to areas with a low agricultural development level, thus narrowing the regional gap of China's agricultural GTFP.

(3) Local governments should rationally treat agricultural FDI and implement differentiated agricultural investment policies. For regions with a high economic development level, we should optimize the orientation of foreign investment and support the development of the foreign investment. At the same time, these regions should actively introduce high-quality agricultural FDI and advanced technology management experience. For regions with a low level of economic development, on the one hand, it is necessary not only to look carefully and comprehensively at the role of foreign agricultural investment, but also to introduce foreign investment targeted and selective. On the other hand, these regions should play the role of technology spillover of agricultural FDI by improving technological innovation ability.

Conflict of interest: none

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