Proceedings of the 3rd International Conference on Business and Policy Studies
DOI: 10.54254/2754-1169/67/20241304

Decomposition of Extensive and Intensive Trade Margin Impacts of China's Agricultural OFDI

Shuling Huangfu[1,a,*], Jingwu Zhu[1,b], Hanyun Zou[1,c] ,Yingchun Wang[1,d]

[1]School of Economics, Beijing Wuzi University, Tongzhou District Beijing, China
a. shulinghf @gmail.com, b. zhujingwulive@163.com, c. zhy110223@163.com,
d. wyccrs7100@163.com
**corresponding author*

Abstract: Economic theory indicates that some ambiguity in the relationship between outward foreign direct investment (OFDI)and trade. This paper estimate the impact of OFDI on the extensive and intensive agricultural import margins of at HS 6-digit commodity level over the sample period from 2012-2020 with the top ten trade partners. We find that standard gravity variables provide good explanatory power for bilateral trade on extensive margin. The empirical results show that the scale of OFDI has a positive impact on the total imports of agricultural products by diversifying product varieties rather than increasing the price of agricultural products, i.e. the impact of OFDI is concentrated exclusively on the extensive margin of China agricultural imports rather than intensive margin. Importantly, based on specific categories of agricultural products, our results suggest that OFDI almost works on food processing and animal products. Additionally, in order to further investigate the motivation of China`s agricultural OFDI, we construct expanded gravity model. The empirical results show that agricultural-related OFDI exhibits characteristics of seeking labor-intensive factors. Overall, our results support that OFDI promotes the diversification of China`s agricultural imports and contributes to the improvement of the welfare of Chinese residents.

Keywords: OFDI, agricultural product imports, intensive margin, extensive margin

1. Introduction

In recent years, China's scale of agricultural product imports has continued to grow rapidly, making it a major global importer of agricultural products and highly reliant on international markets. Ensuring a stable supply of agricultural product imports is of significant importance for safeguarding food security and even national security [1]. Faced with the objective reality of a tight balance between supply and demand for Chinese agricultural products and the rapid growth of agricultural product imports, along with increasing uncertainty and instability in the international environment, finding more diverse and stable sources for agricultural product imports is crucial for ensuring national food security and the supply of essential agricultural products. Utilizing foreign direct investment (FDI) is a practical choice for China to ensure the continuous and stable supply of agricultural products [2].

In terms of domestic and international research on the relationship between outward foreign direct investment and agricultural product trade, there are currently two main research approaches [3]. The

DOI: 10.54254/2754-1169/67/20241304

first approach uses case analysis to examine China's agricultural-related OFDI behavior. Guo Haiyue conducted a qualitative analysis of the characteristics of different types of agricultural-related enterprises' OFDI behavior based on typical case studies, concluding that an increase in OFDI by agricultural-related enterprises at the micro level would lead to an increase in the production of agricultural products in the host country. The second approach involves empirical analysis of the impact of OFDI on agricultural product exports [4]. For instance, Wu Qilong (2016) studied the impact of Chinese agricultural-related enterprises' OFDI on exports, while Liang Danhui and Zhang Xuebiao (2021) found that China's agricultural-related OFDI could lead to agricultural products produced abroad being sold back to the domestic market [5]. However, research on the dual margins of agricultural products is limited, with only a few scholars exploring this area. Liapis (2009) analyzed the growth structure of agricultural product exports in 69 countries and found that the growth of agricultural product exports in developing countries mainly resulted from an increase in the extensive margin. the growth patterns of agricultural product exports in the BRICS countries and concluded that the growth of agricultural product exports in these countries was mainly driven by intensive margin expansion [6; 7; 8].

Furthermore, some scholars have explored the factors influencing the location choice of China's agricultural OFDI. For instance, Gao Daoming et al. (2020) analyzed Chinese enterprise agricultural OFDI from both traditional economic factors and institutional perspectives, suggesting that Chinese enterprises' agricultural OFDI is primarily motivated by resource-seeking, and they are insensitive to institutional risks in host countries. institutional distance increases the adaptation costs of overseas investment, thus having a negative impact on enterprise OFDI [9].

In conclusion, existing research has primarily focused on the relationship between OFDI and agricultural product exports, with limited attention given to agricultural product imports, especially the study of agricultural-related OFDI and import dual margins[10; 11; 12; 13].Therefore, this paper selects the top 10 trading partner countries of China's agricultural-related outward investment as sample countries and empirically investigates the impact of OFDI on China's agricultural product import scale and dual margins, while also exploring the moderating effects of host country resource endowments and institutional distance in promoting agricultural OFDI and imports[14; 15; 16].

2. The Current State of Chinese Ofdi and Agricultural Product Import Trade

2.1. Trends in China’s Outward Foreign Direct Investment (OFDI)

From 2012 to 2020, China's total OFDI to the sample countries increased year by year, rising from 53.358 billion US dollars to 191.059 billion US dollars. The annual average growth rate was 15.23%, indicating a trend of expansion in China's outward foreign direct investment scale. Furthermore, China's OFDI flow in the agricultural sector to the sample countries[1] increased significantly, from 2.499 billion US dollars in 2012 to 22.63 billion US dollars in 2019, which was a nine-fold increase. However, in 2020, due to the impact of the global COVID-19 pandemic, there was a certain decrease in agricultural OFDI [17].

2.2. Current Status of China’s Agricultural Product Import Trade

The overall situation of China's agricultural product imports from the 10 sample countries from 2012 to 2020 is depicted in Figure 1. Overall, China's share of agricultural product imports from the sample countries as a percentage of the world total showed an upward trend. When categorized by type, the import of processed food products was the most noticeable. In 2012, the import value of processed

[1] Sample countries: Australia, Brazil, Cambodia, Indonesia, Laos, Myanmar, New Zealand, Russia, Singapore, and Thailand.

DOI: 10.54254/2754-1169/67/20241304

food products was 3.988 billion US dollars, which increased to 7.635 billion US dollars in 2020, with an average annual growth rate of 8.45%

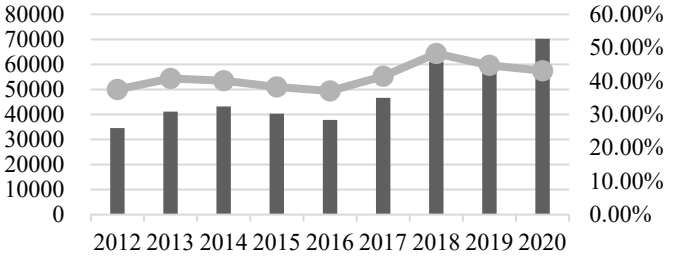


Figure 1: Total Value and Percentage of Agricultural Product Imports from Sample Countries to China, 2012-2020.

3. Dual Margins Calculation

3.1. Calculation Formula for Dual Margins

In this paper, the definition of dual margins at the product level, as conducted by Hummels and Klenow (2005), is referenced. The formula for calculating import dual margins is as follows [18]:

$$IM_{ci} = \frac{\sum_{n \in N_{ci}} P_{ci} Q_{ci}}{\sum_{n \in N_{ci}} P_{cw} Q_{cw}} \tag{1}$$

$$EM_{ci} = \frac{\sum_{n \in N_{ci}} P_{cw} Q_{cw}}{\sum_{n \in N_{cw}} P_{cw} Q_{cw}} \tag{2}$$

In formulas (1) and (2), IM_{ci} represents the intensive margin of imports, and EM_{ci} represents the extensive margin of imports. Subscripts c, i and w respectively denote China, the importing country, and the world. P and Q represent the price and quantity of imported goods. N_{ci} represents the number of product categories that China imports from country i. The numerator of IM_{ci} represents the total value of products that China imports from country i, and the denominator represents the total value of products within the set N_{ci} that China imports from the world. N_{cw} represents the number of product categories that China imports from the world. The denominator of EM_{ci} represents the total amount imported by China from the world. According to the formulas, it is evident that a larger IM_{ci} value indicates a deeper level of imports from country i, while a larger EM_{ci} indicates that China has expanded its imports from country i in terms of product categories. Both IM_{ci} and EM_{ci} fluctuate between 0 and 1.

The calculations above primarily describe bilateral dual margins. To analyze the overall level of China's import margins, it is necessary to calculate a weighted average based on the proportion of China's agricultural product imports from country i to the total agricultural product imports from all sample countries. Formulas (3) and (4) represent the summation formulas for the dual margins of China with all sample countries. In these formulas, α_ci represents the weight, indicating the proportion of China's agricultural product imports from country i to the total agricultural product imports from all sample countries.

$$IM_c = \prod_{i \in I} (IM_{ci})^{\alpha_{ci}} \tag{3}$$

DOI: 10.54254/2754-1169/67/20241304

$$EM_c = \prod_{i \in I} (EM_{ci})^{\alpha_{ci}} \quad (4)$$

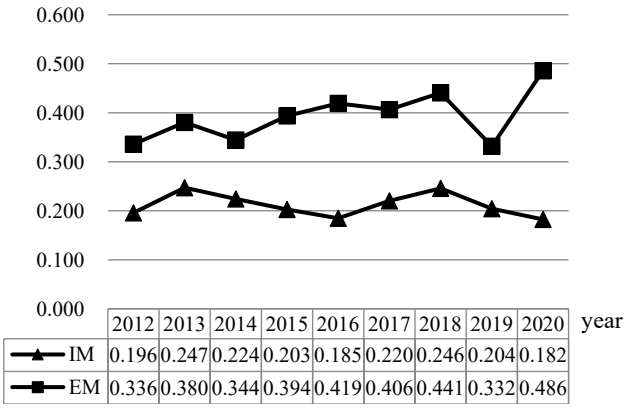
3.2. Dual Margins Characteristics of Chinese Agricultural Product Imports

Using customs data based on the HS6-digit code level for the classification of agricultural products, we calculated the intensive margin and extensive margin of China's imports of agricultural products from the sample countries. The results show that China imports a relatively large proportion of the same products from Brazil, Indonesia, and New Zealand compared to its imports of similar products from the rest of the world. Furthermore, China's imports of agricultural products from Russia, Brazil, and Australia have a relatively large extensive margin, indicating that the number of product categories imported from these countries accounts for a significant share of China's total agricultural product imports.

From 2012 to 2020, China's intensive margin of agricultural product imports from the ten sample countries remained relatively stable, hovering around 0.2. During the same period, the extensive margin of agricultural product imports into China showed an overall upward trend, with only brief declines in 2013 and 2019, and an average annual growth rate of approximately 4%. An overall analysis of China's agricultural product import dual margins suggests that the proportion of agricultural products imported from sample countries remains relatively stable compared to global imports of similar agricultural products, while the number of product categories continues to increase.

3.3. IM and EM Calculation Results

Table 1 and Table 2 show the situation of China's agricultural products imported from 10 sample countries from 2012 to 2020 in terms of the margin of agglomeration and the margin of expansion. From Table 1, it can be found that China's agricultural products imported from Brazil, Indonesia, and New Zealand are located in the forefront of the sample countries in terms of the margin of agglomeration, which is stable at the levels of 0.3 to 04, 0.2 to 0.3, and 0.1 to 0.2, respectively. This indicates that China's imports from these countries account for a larger proportion of China's imports of the same products from the world. And from Table 2, it can be found that the expansion margin value of China's imports of agricultural products from Russia, Brazil and Australia is large and basically stabilized at more than 0.4, and even once reached the level of 0.7, which indicates that the number of types of products imported from these countries accounted for a heavier proportion of the total agricultural products imported by China.



	2012	2013	2014	2015	2016	2017	2018	2019	2020
IM	0.196	0.247	0.224	0.203	0.185	0.220	0.246	0.204	0.182
EM	0.336	0.380	0.344	0.394	0.419	0.406	0.441	0.332	0.486

year

Figure 2: Dual Margins Total Imports of Chin's Agricultural Products.

DOI: 10.54254/2754-1169/67/20241304

Figure 2 shows the overall situation of the binary margin of China's imports of agricultural products from the 10 sample countries from 2012 to 2020. It can be seen that the proportion of agricultural products imported by China from the sample countries to the proportion of agricultural products of the same type imported from the world is basically stable, and the number of types is increasing.

Table 1: IM Impacts of China's Agricultural OFDI from Sample Countries.

year / country	2012	2013	2014	2015	2016	2017	2018	2019	2020
Australia	0.120	0.121	0.126	0.130	0.114	0.133	0.123	0.123	0.109
Brazil	0.351	0.409	0.375	0.357	0.332	0.401	0.506	0.434	0.332
Cambodia	0.003	0.008	0.008	0.013	0.011	0.022	0.012	0.015	0.028
Indonesia	0.240	0.173	0.180	0.179	0.152	0.187	0.142	0.142	0.120
Laos	0.007	0.010	0.014	0.015	0.017	0.014	0.019	0.023	0.027
Myanmar	0.014	0.014	0.016	0.015	0.014	0.013	0.012	0.018	0.021
New Zealand	0.170	0.213	0.229	0.130	0.129	0.145	0.146	0.156	0.145
Russia	0.030	0.028	0.026	0.029	0.033	0.029	0.042	0.042	0.039
Singapore	0.046	0.039	0.024	0.037	0.030	0.020	0.013	0.014	0.011
Thailand	0.168	0.182	0.138	0.149	0.124	0.124	0.117	0.111	0.133

Table 2: EM Impacts of China's Agricultural OFDI from Sample Countries.

year / country	2012	2013	2014	2015	2016	2017	2018	2019	2020
Australia	0.265	0.337	0.305	0.389	0.359	0.383	0.441	0.475	0.440
Brazil	0.552	0.538	0.563	0.523	0.558	0.532	0.511	0.261	0.639
Cambodia	0.065	0.042	0.074	0.078	0.099	0.053	0.130	0.124	0.082
Indonesia	0.209	0.197	0.177	0.213	0.239	0.212	0.287	0.293	0.297
Laos	0.055	0.056	0.044	0.068	0.066	0.077	0.075	0.064	0.065
Myanmar	0.144	0.131	0.093	0.110	0.118	0.122	0.027	0.190	0.181
New Zealand	0.206	0.232	0.222	0.281	0.310	0.330	0.363	0.387	0.365
Russia	0.555	0.552	0.563	0.555	0.581	0.612	0.608	0.670	0.644
Singapore	0.091	0.111	0.138	0.115	0.137	0.013	0.182	0.170	0.181
Thailand	0.241	0.226	0.138	0.308	0.327	0.314	0.376	0.434	0.356

4. Model Specification and Data Sources

This paper draws inspiration from studies by Helpman, Chaney, Wei Hao, and others, and we employs a gravity model to investigate the dual margins impact of China's agricultural product imports from sample countries. In addition to controlling for traditional gravity model factors such as geographical distance, exchange rates, and the presence of common borders, this paper constructs the following econometric model to examine the influence of economic development levels, agricultural production efficiency, agricultural land area of the ten sample countries, as well as China's outward investments in these countries i on China's agricultural product imports:

DOI: 10.54254/2754-1169/67/20241304

4.1. Equations

$$ln(M_{it}) = \alpha_0 + \alpha_1 \cdot ln(OFDI_{it}) + \alpha_3 \cdot ln(GDP_{it}) + \alpha_4 \cdot ln(DIS_{ci}) + \alpha_5 \cdot BOR_{ci} + \alpha_6 \cdot ln(AGPRE_{it}) + \alpha_7 \cdot ln(AAL_{it}) + \alpha_8 \cdot ln(OFDI_{it}) \times \ln(AGPRE_{it}) + \alpha_9 \cdot ln(OFDI_{it}) \times ln(AAL_{it}) + \alpha_{10} \cdot E_{it} + D_{it} + \varepsilon_{it} \quad (5)$$

In this model, subscripts i, c, and t represent the exporting country, China, and time, respectively. M_{it} represents the import structure, including the trade volume of agricultural product imports, the extensive margin (EM), and the intensive margin (IM). D_{it} represents the fixed effects of the exporting country, and ε_{it} is the random error term. The data sample period for this study is from 2012 to 2020. $OFDI_{it}$is the core explanatory variable, representing China's stock of outward foreign direct investment in country i in year t. GDP_{it} represents the market size of the host country, measured as the logarithm of the ratio of the GDP of country i to China's GDP in year t. $AGPRI_{it}$ is agricultural production efficiency in country i in year t, measured as the ratio of agricultural value-added to the number of agricultural laborers in country i in year t. AAL_{it} represents the agricultural land area in country i in year t. DIS_{ci} is the geographical distance between China and the capital of country i. BOR_{ci} represents a shared border between China and country i. E is the exchange rate of the Chinese Renminbi in year t. Data sources include the "Statistical Bulletin of China's Outward Investment" by the Ministry of Commerce of China, the "China Agricultural Outward Investment Report", World Bank WDI, CEPII, and UNCTAD.

Regarding the core explanatory variables, firstly, holding other conditions constant, an improvement in agricultural production efficiency implies an increase in agricultural value produced per unit of agricultural labor, leading to an overall increase in total output. This, in turn, results in an increase in the quantity of agricultural products that can be traded by a country. However, the specific market share may not necessarily increase as the trade volume of agricultural exports from the exporting country increases. Secondly, China's agricultural import scale can be influenced by the natural resource endowment of the exporting country. Therefore, the model also considers the agricultural land area of the exporting country to examine how these two variables affect China's agricultural product imports. The descriptive statistics of each explanatory variable are shown in the table below.

Table 3: Descriptive statistics of independent variables.

variable	N	Mean	SD	Min	Max
ln*OFDI* $_a$	90	13.370	1.048	10.220	15.610
ln*OFDI* $_n$	73	11.110	0.940	8.196	13.740
ln*AAL*	90	9.316	3.641	-0.416	12.870
ln*AGPRE*	90	8.531	1.626	6.083	11.700
ln*GDP*	90	-3.741	1.732	-6.730	-1.242
distance	90	6374	4413	2779	16948
contig	90	0.400	0.493	0	1
E	90	405.9	659.7	0.153	2155

OFDIa refers to full scale outward direct investment, while OFDIn refers to agricultural outward direct investment.

4.2. Data Source

The explanations and sources of each explanatory variable are shown in Table 4.

DOI: 10.54254/2754-1169/67/20241304

Table 4: The explanations and sources of each explanatory variable.

variable	Explanation of independent variables	source
$\ln(OFDI_{it})$	China's stock of OFDI during period "t"	World Bank (WDI)
$\ln(GDP_{it})$	The logarithm of the ratio of China's GDP to "i" country's GDP during period "t" to measure the relative economic development levels of each country	China Agricultural Outward Investment Report
$\ln(AGPRE_{it})$	Agricultural value added in "i" country during period "t" divided by the number of agricultural laborers, to measure agricultural production efficiency	World Bank WDI
$\ln(AAL_{it})$	Land area used for agriculture in "i" country during period "t"	World Bank WDI
$\ln(OFDI_{it})\times\ln(AGPRE_{it})$	The interaction term between agricultural production efficiency in "i" country and China's stock of outbound foreign investment in "i" country during period "t"	by the authors' calculations
$\ln(OFDI_{it})\times\ln(AAL_{it})$	The interaction term between the land area used for agriculture in "i" country and China's stock of outbound foreign investment in "i" country	by the authors' calculations
$\ln(distcap_{ci})$	The logarithm of the geographic distance between China and the capital of "i" country	CEPII
$contig_{ci}$	Whether there is a common border between China and "i" country: Yes = 1; No = 0	CEPII
E_{it}	Official exchange rates of the Chinese Renminbi (RMB) with the currencies of the RCEP member countries	UNCTAD

5. Empirical Analysis

5.1. Baseline Results and Analysis

Table 5 reports the regression results of the equations. Columns (1), (3), and (5) control for exporter fixed effects, relative economic development levels of trading partners, agricultural production efficiency, agricultural land area, geographic distance, and common borders to analyze the impact of Chinese OFDI on the structure of agricultural product imports. Columns (2), (4), and (6) introduce interaction terms on top of the baseline specifications.

From the results, several findings emerge. Firstly, Chinese outward foreign direct investment (OFDI) has a significantly positive impact on the import scale and extensive margin of agricultural products, with a less pronounced effect on the intensive margin. Secondly, agricultural production efficiency has a positive effect on both import scale and extensive margin, with an uncertain impact on the intensive margin. An increase in the extensive margin indicates a greater variety of imported agricultural products, enhancing the substitutability of agricultural product imports (Xu Fen, 2020). Thirdly, by introducing interaction terms, we explore the role of host country agricultural production efficiency and agricultural land area in influencing the effect of increased Chinese OFDI on import structure. In columns (2) and (6) with interaction terms, an improvement in host country agricultural production efficiency exerts a certain restraining effect on the increase in Chinese OFDI on the import scale and extensive margin. This may be due, in part, to the fact that increased Chinese OFDI encourages the host country to specialize in the production of certain agricultural products, thus negatively impacting the extensive margin. Moreover, Chinese OFDI may lead to increased local agricultural production, with the additional output being directed towards exports to other trading partners or local sales.

Fourthly, agricultural land area has a negative impact on China's import trade value, with no significant effect on the extensive margin. This might be attributed to the fact that Chinese OFDI includes investments not only in primary agricultural production but also in agribusiness and processing industries. Fifthly, the coefficient for lnGDP is significantly positive, indicating that China's agricultural OFDI is motivated by market-seeking objectives. This finding is consistent with research by Shao Yujia (2020), Asiedu (2006), Zhang (2011), and others, who also established that host country market size attracts Chinese OFDI.

DOI: 10.54254/2754-1169/67/20241304

Table 5: Baseline Regression Results.

variable	Import scale		intensive marginal		expansion marginal	
	（1）	（2）	（3）	（4）	（5）	（6）
ln*OFDI* $_a$	0.491**	2.118***	0.0214	0.0965	0.199***	1.198***
	(2.69)	(3.83)	(0.14)	(0.16)	(5.09)	(3.83)
ln*AAL*	0.153	-1.052*	0.0773	-1.064**	0.0555	0.117
	(1.15)	(-1.99)	(0.74)	(-2.94)	(1.77)	(0.47)
ln*AGPRE*	0.151	4.117***	0.0129	1.494	0.0708	1.592**
	(0.43)	(4.04)	(0.04)	(1.61)	(0.71)	(2.76)
ln*GDP*	0.286	0.670***	0.304	0.512***	0.209***	0.247***
	(1.29)	(4.41)	(1.57)	(4.07)	(4.18)	(8.71)
ln*OFDI*$_a$*ln*AGPRE*		-0.318***		-0.116		-0.119*
		(-3.82)		(-1.60)		(-2.48)
ln*OFDI*$_a$*ln*AAL*		0.0927*		0.0794**		0.000644
		(2.43)		(3.04)		(0.03)
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects in exporting countries	Yes	Yes	Yes	Yes	Yes	Yes
cons	11.92**	-5.612	-3.220	-2.047	-4.728***	-17.74***
	(3.27)	(-0.80)	(-0.88)	(-0.25)	(-4.61)	(-4.67)
N	90	90	90	90	90	90
R2	0.7447	0.9341	0.7518	0.9005	0.8662	0.9801

5.2. Robustness Test

To verify the robustness of the estimated results, we use the lagged one-period explanatory variable as a proxy variable and conduct regression analysis, as shown in Table 6. The lagged one-period OFDI has a significant positive impact on the current agricultural product imports in China in terms of both expansion margin and import trade volume. Other results are also generally consistent with the baseline regression results, thus confirming the robustness of the baseline regression results.

Table 6: Robustness Test Results.

Independent Variable	Lnimports (Import scale)		Lnim(intensive marginal)		Lnem(expansion marginal)	
	（1）	（2）	（3）	（4）	（5）	（6）
L.lnOFDI $_a$	0.440*	1.837***	-0.0220	-0.118	0.174***	1.155***
	(2.51)	(4.86)	(-0.17)	(-0.29)	(3.78)	(3.78)
*L.(lnOFDI*lnAGPRE)*		-0.299***		-0.124**		-0.124**
		(1.04)		(1.81)		(1.81)
*L.(lnOFDI*lnAAL)*		0.101**		0.00967		0.00967
		(2.76)		(0.52)		(0.52)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
cons	13.18***	-1.622 (-0.31)	-2.742	0.586	-4.197***	-16.89***
	(4.19)		(-0.88)	(0.10)	(-3.85)	(-4.52)
N	80	80	80	80	80	80
R^2	0.7824	0.9400	0.8261	0.9120	0.8773	0.9787

5.3. Differential Analysis on the Product Dimension

The baseline regression results essentially validate the promotional effect of China's outward foreign direct investment (OFDI) on the scale and extensive margin of agricultural product imports in China. Next, we will further verify this from the perspective of agricultural product differentiation, subdividing agricultural products into animal products (HS2: 01-05), fruits and vegetables (06-15), and food processing products (16-24). We will replace the extensive margin with the number of

DOI: 10.54254/2754-1169/67/20241304

imported product categories at the HS2 digit level and conduct regression analysis at the agricultural level for OFDI data.

The results, as shown in Table 7, indicate that China's OFDI has a positive impact on the import volume of fruits and vegetables as well as food processing products. The impact is particularly significant for food processing products, with a notable effect on the increase in the number of product categories within this category. The extensive margin impact on the other two categories remains uncertain. On the other hand, agricultural OFDI has a significantly positive impact on the import volume and extensive margin of animal products and food processing products, with a greater influence on the import volume of food processing products.

Table 7: The Impact of OFDI on the Import Scale of Different Agricultural Products.

Product Categories	Animal Category				Fruit and Vegetable Category				Food Processing Category			
	Import Scale (1)	expansion marginal (2)	Import scale (3)	expansion marginal (3)	Import scale (5)	expansion marginal (6)	Import Scale (7)	expansion marginal (8)	Import Scale (9)	expansion marginal (10)	Import scale (11)	expansion marginal (12)
ln$OFDI_a$	0.00826 (0.04)	7.125 (1.43)			0.593*** (3.59)	6.488 (1.62)			0.934** (2.59)	8.441* (2.42)		
lnOFD_n			0.372** (3.25)	7.005* (2.02)			0.109 (0.90)	2.343 (1.80)			0.445** (2.80)	3.409* (2.30)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
cons	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	85	90	69	73	90	90	73	73	90	90	73	73
R^2	0.8275	0.8025	0.8512	0.8049	0.4950	0.2863	0.4301	0.1749	0.6455	0.3331	0.8436	0.3112[1]

5.4. Motivation for China's Outward Foreign Direct Investment in Agriculture

Labor force and natural resources are important factors influencing agricultural production. In order to further investigate the motivation for China's outward foreign direct investment (OFDI) in agriculture, the following expanded gravity model has been constructed.

The dependent variable Y_{it} represents the total amount of China's OFDI, and the core explanatory variables N, L, F, and C respectively represent natural resource endowment, labor force endowment, infrastructure composite index, and institutional distance. Q represents the interactions between pairs of natural resource endowment, labor force resource endowment, infrastructure composite index, and institutional distance. Specifically, natural resource endowment is measured as the ratio of the host country's agricultural exports to total exports; labor force resource endowment is measured as the host country's agricultural value added divided by the number of agricultural labor force; the infrastructure composite index is determined using the principal component analysis method, incorporating aspects such as air cargo volume, container port throughput, internet penetration rate, and the number of commercial bank branches; institutional distance is assessed based on six dimensions of institutional quality in a country, including voice and accountability, political stability and absence of violence, government effectiveness, control of corruption, regulatory quality, and rule of law. εit represents the random error term.

$$\ln(Y_{it}) = \alpha_0 + \alpha_1 \cdot N_{it} + \alpha_2 \cdot L_{it} + \alpha_3 \cdot F_{it} + \alpha_4 \cdot C_{it} + \alpha_5 \cdot Q_{it} + \alpha_6 \cdot distance_{ci} + \alpha_7 \cdot BOR_{ci} + \alpha_8 \cdot E_{it} + \varepsilon_{it} \quad (6)$$

The regression results, as shown in Table 8, column (1), represent the outcomes when only the primary explanatory variables are considered. Columns (2) and (3) present the results after incorporating the moderating variables separately. It can be observed that natural resource endowment is not statistically significant in relation to China's OFDI outcomes. On the other hand,

DOI: 10.54254/2754-1169/67/20241304

there is a positive correlation between labor force endowment and China's OFDI, indicating that China's agricultural OFDI to the sample of ten countries is more oriented towards seeking investments based on labor force endowment. Agricultural foreign direct investment encompasses primary agricultural production investments and agribusiness investments, both of which require an ample labor force to ensure production efficiency. Furthermore, higher labor force endowment leads to lower labor costs, which, in turn, aids in reducing overall business costs. As labor costs rise in China, the host country's labor force resource endowment becomes an important factor to consider for China's agricultural OFDI. Infrastructure shows a positive correlation with China's agricultural OFDI, suggesting that countries with higher levels of infrastructure development are better able to attract Chinese agricultural direct investment. Institutional distance, on the other hand, exhibits a primarily negative correlation with China's agricultural OFDI. This implies that when Chinese companies decide on the location for agricultural foreign direct investment, they tend to prefer countries with institutional environments similar to China's. The closer the host country's institutional distance to China, the higher the OFDI investment amount. Smaller institutional distance suggests that the host country can provide a relatively favorable business environment for Chinese companies, thereby reducing their operational costs. Looking at the motivation from labor force endowment perspective, the coefficient of the interaction term between labor force endowment and infrastructure is significantly negative. This means that the richness of the host country's labor force endowment attracts Chinese corporate OFDI, but the level of infrastructure in the host country somewhat inhibits China's labor force endowment-seeking OFDI.

Table 8: Analysis on the Motivation of China's Agricultural OFDI.

Variable	ln$OFDI_a$		
	(1)	(2)	(3)
ln N	-0.615	1.297	-0.581
	(-0.55)	(0.25)	(-0.12)
ln L	1.606	3.326*	4.067**
	(0.85)	(2.29)	(2.84)
ln F	0.407***	59.04*	52.66*
	(6.20)	(2.29)	(2.07)
ln C	-0.0923	-113.7*	-102.3*
	(-0.54)	(-2.19)	(-2.04)
lnN*lnF		8.524*	7.939*
		(2.28)	(2.16)
lnN*lnC		-16.51*	-14.98*
		(-2.19)	(-2.06)
lnL*lnF			-3.363**
			(-2.94)
lnL*lnC			0.995
			(0.49)
Other Control variables	Yes	Yes	Yes
cons	Yes	Yes	Yes
N	80	80	80
R2	0.4489	0.4489	0.5130

Over the years, China's agricultural growth has primarily relied on resource development and inputs. However, an analysis of specific agricultural product categories indicates that Chinese OFDI

DOI: 10.54254/2754-1169/67/20241304

has promoted the importation of food processing products in terms of both scale and variety. This suggests that as China's "going out" policy in agriculture develops and domestic labor costs rise, Chinese agricultural enterprises are diversifying their ways and motivations for going global, shifting from seeking complementary resources to seeking cost-effective labor.

6. Conclusion

The growth in the extensive margin of agricultural imports can also account for an important component of that country's productivity growth. In order to explore how the China`s agricultural OFDI impact agriculture trade, we decompose the extensive and intensive trade margin of imports in China with the top 10 partner countries from 2012 to 2020. The results indicate:

Firstly, China's overall imports from sample countries have shown an upward trend, with only occasional decreases in some years. At the same time, intensive margins have remained relatively stable, while extensive margins have steadily increased.

Secondly, China's OFDI has had a positive impact on the increase in the scale of agricultural product imports, primarily achieved through extensive margins. Further analysis reveals that China`s OFDI promotes the growth of imports, particularly in the categories of food processing products, and through expanding margins. Agricultural-related OFDI significantly influences the import scale, particularly in the categories of animal products and food processing. Additionally, Chinese agricultural OFDI exhibits characteristics of seeking labor endowments, with factors such as a higher level of host country infrastructure and smaller institutional distance playing a significant role in attracting Chinese agricultural OFDI [19].

Therefore, OFDI contributes to the diversification of agricultural products in China, enhances the well-being of residents, and allows trading entities to enjoy more preferential and convenient trade policies [20]. In China's strategy for agricultural product imports, the promotion of improved agricultural production efficiency in target countries, the expansion of overseas granaries, and the advancement of a diversified import strategy for Chinese agricultural products are encouraged.

References

[1] *Adenaeuer, L., & Heckelei, T. (2011). Foreign Direct Investment and the Performance of European Agribusiness Firms. Journal of Agricultural Economics, 62(3).*

[2] *Alamirew, B., Grethe, H., Siddig, K. H. A., & Wossen, T. (2015). Do land transfers to international investors contribute to employment generation and local food security? International Journal of Social Economics, 42(12).*

[3] *Anríquez, G., Daidone, S., & Mane, E. (2013). Rising food prices and undernourishment: A cross-country inquiry. Food Policy, 38(1), 190–202.*

[4] *Arnold, J. M., & Hussinger, K. (2010). Exports versus FDI in German Manufacturing: Firm Performance and Participation in International Markets. Review of International Economics, 18(4), 595-606.*

[5] *Brutigam, D., & Zhang, H. (2013). Green Dreams: Myth and Reality in China's Agricultural Investment in Africa. Third World Quarterly, 34(9).*

[6] *Cai, H., & Liu, Q. (2009). Competition and Corporate Tax Avoidance: Evidence from Chinese Industrial Firms. Economic Journal, 119(537), 764-795.*

[7] *Fairbairn, & Madeleine. (2015). Foreignization, Financialization and Land Grab Regulation. Journal of Agrarian Change, 15(4), 2039-2049.*

[8] *Friis, C., & Nielsen, J. S. (2016). Small-scale land acquisitions, large-scale implications: Exploring the case of Chinese banana investments in Northern Laos. Land Use Policy, 57(67Part2), 117-129.*

[9] *Froot, K. A., & Stein, J. C. (1991). Exchange Rates and Foreign Direct Investment: An Imperfect Capital Markets Approach. Quarterly Journal of Economics, 106(4), 1191-1217.*

[10] *G., Anastassopoulos, and, W., B., & Traill. (1998). Determinants of foreign entry strategies in Greek food industry. Agribusiness.*

[11] *Goldsmith, P. D., & Sporleder, T. L. (2010). Analyzing Foreign Direct Investment Decisions by Food and everage Firms: An Empirical Model of Transaction Theory. Canadian Journal of Agricultural Economics/Revue canadienne d agroeconomie, 46(3), 329-346.*

DOI: 10.54254/2754-1169/67/20241304

[12] *Haller, S. A. (2014). Do Domestic Firms Benefit from Foreign Presence and Import Competition in Irish Services Sectors? The World Economy, 37(2).*
[13] *Hartlandsberg, M. (1990). Asia's Next Giant: South Korea and Late Industrialization.*
[14] *Jin, S., Tokunaga, S., Akune, Y., & Kageyama, M. (2006). Agglomeration Effects and Japanese Food Industry Investment in China: Evidence from the Cities. Studies in Regional Science, 36(4), 899-908.*
[15] *Jin, S., & Zhang, Y. (2015). The Value of 'Product of USA': Impact of Chinese Acquisition of a US Company on Consumer Willingness-to-Pay. Paper presented at the 2014 Annual Meeting, July 27-29, 2014, Minneapolis, Minnesota.*
[16] *Jr, R. A. J., & Kenney, M. (1993). Japanese investment in United States food and agriculture: Evidence from California and Washington. Agribusiness.*
[17] *Kang, Y., & Jiang, F. (2012). FDI location choice of Chinese multinationals in East and Southeast Asia. Journal of World Business, 47(1).*
[18] *Kiminami, L. Y., & Kiminami, A. (2005). Intra-Asia trade and foreign direct investment. Papers in Regional Science, 78(3), 229-242.*
[19] *Ronald, F. (1978). Relative Backwardness, Direct Foreign Investment, and the Transfer of Technology: A Simple Dynamic Model. Quarterly Journal of Economics, 92(1), 1-16.*
[20] *Stojadinovic-Jovanovic, S., & Dasic, B. (2015). The importance of foreign direct investment for South East European countries' agriculture. Ekonomika Poljoprivrede, 62(3), 661-675.*