

Research on the Interactive Relationship between Agriculture and Logistics Industry in Guangdong Province from the Perspective of Supply Side Reform

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Abstract. To study the interaction between agriculture and logistics, selecting agricultural output value data and logistics industry data from 2000 to 2017 in Guangdong Province, this paper makes an empirical analysis of these two industries by using Eviews 6.0 and based on Co-integration theory, it is concluded that there is a long-term equilibrium relationship between agriculture and logistics in Guangdong Province. On this basis, the VAR model is constructed and analyzed by Granger test and impulse response function. It shows that the logistics industry is the Granger cause of agriculture, giving the logistics industry a positive impact, which can bring long-term significant positive to the development of agriculture. Impact; but agriculture is not the Granger cause of the logistics industry, giving a positive impact on agriculture has no significant impact on the logistics industry.

1. Introduction

General Secretary Xi implemented the strategy of Rural Revitalization in the report of the Nineteenth National Congress of the CPC in 2017.^[1] The structural reform of agricultural supply side is an important part of rural revitalization. The main purpose of structural reform of agricultural supply side is to increase farmers' income and realize agricultural modernization. The development of modern agriculture will inevitably integrate agricultural production, logistics and sales. Over the years, the rural economic development process has been greatly affected by the circulation of agricultural products. The troubles of agricultural products such as long cycle and high loss have caused difficulties for farmers to increase their income, and the development of rural economy has been hindered. As a production service industry, the logistics industry has a very important support and guarantee for the development of agricultural economy. Studying the linkage development relationship between logistics industry and agricultural industry has important significance and influence on regional agricultural development and determining the industrial direction of logistics development. In 2017, the added value of agriculture in Guangdong Province increased by 3.5%. The added value of transportation, warehousing and postal industry reached 358.115 billion yuan, an increase of 9.2% over the previous year. Among them, the turnover of goods transportation was 289.990 billion tons kilometers, an increase of 28%^[2]. Both the agricultural and logistics industries have experienced rapid growth. In October 2017, Guangdong Province issued the "*Guangdong Province to promote the agricultural supply side structural reform implementation plan*" proposed to vigorously develop the processing and circulation of agricultural products^[3]. Agricultural development in Guangdong Province is not balanced, and the Pearl River Delta is economically developed, but the agricultural industry is weak, and the demand for agricultural products mainly depends on the supply from other places. As an agricultural product producing area in Guangdong Province, the eastern, western and northern mountainous areas of Guangdong Province have a small population and limited demand for agricultural products. A large number of agricultural products need to flow to cities, the Pearl River Delta region and other places, the current agricultural product logistics capacity in agricultural production areas leads to high agricultural product logistics costs, agricultural products reaching the consumer market is not fresh enough, agricultural products circulation process can not be traced, agricultural products are depleted, agricultural products are not

guaranteed, and other problems seriously restrict healthy development of agricultural industry. This is also a key issue that needs to be resolved in the structural reform of the agricultural supply side in Guangdong Province.

This paper collects and uses the data of Guangdong agricultural industry output value and logistics industry output value, uses Eviews9.0, builds VAR model based on co-integration theory, studies and analyzes the interaction between agriculture and logistics industry in Guangdong Province, puts forward the coordinated development strategy of agriculture and logistics industry in Guangdong Province from the perspective of supply-side structural reform.

2. An Empirical Analysis of the Interactive Relationship between Agriculture and Logistics Industry in Guangdong Province

2.1 Selection of indicators and data sources

2.1.1 Indicator selection

Agricultural indicators select the total output value of agriculture, forestry, fishery and animal husbandry, and record it (NY). The total amount of agricultural, forestry, animal husbandry and fishery products expressed in currency and the value of various supporting service activities for agricultural, forestry, animal husbandry and fishery production activities, which reflects the total scale and total results of agriculture, forestry, animal husbandry and fishery production in a certain period of time. Logistics industry indicators select the total output value of transportation, warehousing and postal industry commonly used by academia and record it as (WL), which reflects the monetary performance of the final results of logistics activities for the society in a certain period of time.

2.1.2 Data source and processing

The original data selected for empirical analysis are from the data of *Guangdong Statistical Yearbook* for 17 years from 2000 to 2016. Eviews9.0 shows that the correlation coefficient of the two sets of data is 0.972442. It shows that the total agricultural output value and the total output value of the logistics industry are highly correlated. In order to eliminate the possibility of violent fluctuations in time series data and the existence of heteroscedasticity, the two sets of data are first processed naturally. The transformed data sequences are respectively recorded as $\ln NY$, $\ln WL$, and all data analysis is performed by Eviews9.0.

2.2 Empirical analysis

2.2.1 ADF test

In order to avoid the possibility of pseudo-regression in data sequence analysis, ADF test is used to test the stationarity of all data sequences. The test results are shown in Table 1. The test results show that $\ln NY$ and $\ln WL$ are first-order stationary series at 5% significant level, which indicates the possibility of long-term equilibrium relationship between the two variables.

Table 1 $\ln NY$, $\ln WL$ Unit Root Test Result Table

Variable	Test Form (C,T,K)	1%critical value	5%critical value	10% critical value	ADF value	smooth
$\ln NY$	(C,0,3)	-4.004425	-3.098896	-2.690439	-0.627693	Not stable
$d\ln NY$	(C,0,3)	-4.004425	-3.098896	-2.690439	-4.294265	Smooth
$\ln WL$	(C,0,3)	-3.920350	-3.06585	-2.673459	-0.265146	Not stable
$d\ln WL$	(C,0,3)	-3.959148	-3.081002	-2.681330	-4.641552	Smooth

2.2.2 Co-integration test

The variables analyzed in this paper are only the total agricultural output value and the total output value of the logistics industry. Therefore, the E-G two-step method is used to co-integrate the relationship between the two. First, the total output value of agriculture is the dependent variable, and

the total output value of logistics is the independent variable. For regression analysis, the following regression equation is obtained:

$$\text{LNNG} = 0.7493 + 0.827795 \cdot \text{LNWL}$$

$$T=132.3959 \quad 11.79153$$

$$P=0.2053 \quad 0.0000$$

$$R^2=0.902623 \quad F \text{ statistic}=139.0401$$

The regression correlation coefficient is $R^2=0.902623$, and the F statistic= 138.0401, which indicates that the equation fitting degree is good, and the regression coefficient of total logistics output value is greater than zero, which is 0.827795, indicating that the logistics industry has a positive effect on the growth of agricultural output value. For every 1% increase of the logistics output value, the total agricultural output value increases by about 0.83%.

The second step of the E-G test is to test the residual. The test form does not contain a constant term or a trend term. The test results are shown in Table 2. The test results show that at a significant level of 5%, the residual series is a stationary order, indicating that there is a long-term equilibrium relationship between the agricultural and logistics industries.

Table 2 ADF test results of residuals

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.307223	0.0245
Test critical values: 1% level	-2.717511	
5% level	-1.964418	
10% level	-1.605603	

2.2.3 Construction of VAR Model

The ADF test and the E-G test prove that there is a cointegration relationship between the agricultural development and the logistics industry, and it has a long-term equilibrium relationship. Based on this, a vector auto-regressive model VAR model is constructed, which can reflect the dynamic relationship of joint endogenous variables. The lag period of the VAR model is determined by AIC-SC criterion, and its characteristic roots are tested. Finally, the lag period of the VAR model is determined to be 2, that is VAR (2). And all the characteristic root modes are less than 1, and the model's $R^2=0.988809$, indicating that the constructed VAR(2) model is stable and has good fitness.

2.2.4 Granger test

Through the construction of the VAR(2) model, the lag period is determined to be 2, so the Granger test is performed with a lag period of 2. The test results are shown in Table 3. The Granger test results show that under the significant level of 5%, the logistics industry is the Granger causal relationship of the agricultural industry. Agriculture is not the Granger causal relationship of the development of the logistics industry, which proves that the development of the logistics industry can drive the development of the agricultural industry.

Table 3 Granger test results

Null Hypothesis:	Obs	F-Statistic	Prob.
LNWL does not Granger Cause LNNG	15	4.18440	0.0478
LNNG does not Granger Cause LNWL		0.22858	0.7997

2.2.5 Impulse response analysis

On the basis of the constructed VAR model, a positive impact is given to the agricultural industry and the logistics industry respectively. The lag period is 20, and the impulse response function graph is

obtained, as shown in Figure 1. The dynamic changes of the logistics industry and the agricultural industry during the lag period are shown respectively. The dotted line indicates that the positive and negative two standard deviations deviate from the band, and the solid line indicates the pulse corresponding function.

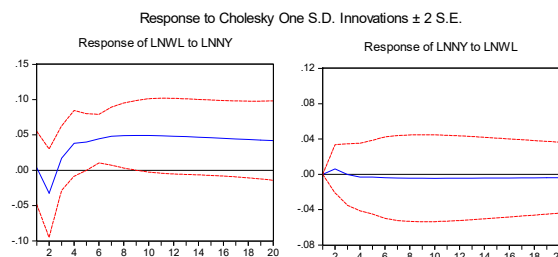


Fig. 1 Correspondence diagram of pulse function

Fig. 1 illustrates the positive impact on the logistics industry in Guangdong Province during the current period. At the beginning, a negative reaction to agriculture reached the lowest point in the second period, then began to rise, and began to play a positive role in the third period, and continued to maintain a significant positive impact. Its growth rate has remained at around 0.04, with a maximum of 0.493. This shows that the development of the logistics industry can bring lasting and stable positive effects to the agricultural industry. After a positive impact on agriculture, the impact on the logistics industry is very weak. This shows that the impact of agriculture on the logistics industry is small, and it also verifies the results of the Granger test: Agriculture is not the Granger cause of logistics.

3. Conclusion and suggestion

3.1 Conclusion

Based on the co-integration analysis of agricultural and logistics data from 2000 to 2016 in Guangdong Province, the VAR model is established, and then the Granger test and impulse corresponding analysis are carried out. It is found that the development of the logistics industry in Guangdong Province can promote the development of the agricultural industry to a greater extent. For every 1% increase in the logistics industry, the agricultural industry will increase by 0.83%. The logistics industry is the Granger cause of agricultural development. The 20-phase impulse response analysis shows that the logistics industry has no significant impact on agricultural development in the short term, but in the long run it can bring significant positive effects to agricultural development. But agriculture can not promote the development of logistics industry, nor is it the Granger cause of logistics industry. The impulse response analysis proves that agriculture can not bring long-term significant positive effect to the development of logistics industry.

3.2 Suggestion

The agricultural product logistics links mainly involve transportation, warehousing, distribution processing, packaging, and information. At present, good agricultural products in mountainous areas cannot be transported out. Farmers' good agricultural products cannot be sold, and the agricultural products produced cannot be reasonably stored, resulting in large loss of products and impaired quality of agricultural products. However, it is difficult for consumers to solve problems such as the demand for fresh food materials, original ecological agricultural products and concerns about the safety of agricultural products. All of these need to put forward new requirements for agricultural products logistics from the supply side. Based on the empirical results, the following suggestions are put forward for the reform of agricultural circulation supply side in Guangdong Province.

3.2.1 Improving the construction of rural logistics infrastructure and increasing cooperation between logistics enterprises and agricultural enterprises.

On the one hand, the government needs to strengthen the construction of logistics infrastructure such as rural roads, cold storage, cold chain transportation, and agricultural product wholesale distribution

centers. Ensuring that villages and villages are connected to highways, widening existing village-level highways for villages with good economic conditions, ensuring that large trucks and container trucks can reach all agricultural production sites, and solving the transportation problems; Agricultural products logistics enterprises should be encouraged to build refrigeration storehouses and introduce advanced refrigeration technology. Subsidies for the construction of refrigerators and the construction of electricity are given. Logistics enterprises and transport practitioners are encouraged to purchase refrigerated transport vehicles and give certain purchase subsidies to increase their investment enthusiasm so as to increase the supply of cold chain. To increase the construction of wholesale markets for agricultural products, we should ensure that there are wholesale markets for agricultural products in towns and towns to ensure timely trading of agricultural products. On the other hand, it is necessary to support the development of agricultural product logistics leading enterprises, encourage logistics enterprises to strengthen cooperation with agricultural production enterprises and rural cooperatives, realize bulk transportation and circulation of agricultural products, specialize agricultural logistics, and reduce logistics costs. It is necessary to promote the construction of rural agricultural products logistics service stations and realize the effective connection between logistics service stations and rural agricultural products wholesale market.

3.2.2 It is necessary to vigorously develop the processing of agricultural products and promote the standardization of agricultural products logistics.

The processing of agricultural products not only benefits the effective circulation of agricultural products, but also helps to enhance the value of products. We will vigorously promote and implement the standardization of agricultural production and processing. The standardization will be carried out throughout the production and processing of agricultural products, and the whole process of agricultural product production standardization, packaging standardization, processing standardization, and product testing standardization will be realized. Firstly, farmers, agricultural production cooperatives and agricultural production enterprises are encouraged to adopt international logistics barcodes for commodity signs by means of encouragement and financial support to realize commodity standardization. For product packaging, the logistics modulus standard is adopted to realize the standardization of commodity packaging. Secondly, we should strengthen the promotion of logistics standardization and teach standardization knowledge to farmers and logistics enterprises, and let farmers and agricultural enterprises understand the role and significance of commodity standardization. Through the standardization of agricultural production, processing and circulation, the standardization of logistics transportation, Loading and unloading can be realized, and the rationalization of logistics activities is realized.

3.2.3 Establishing traceability management mechanism of agricultural products to improve the quality and safety of agricultural products.

The government needs to promote the establishment of agricultural product traceability system, intelligent logistics and agricultural product circulation management information system, and improve the traceability management mechanism of agricultural products. Introducing the Internet, Internet of Things, big data technology, GIS, GPS, RFID, blockchain technology into the traceability management system of agricultural products. The agricultural products will be traced back from the source of agricultural production, and the whole process of production, processing and circulation of agricultural products will be monitored. Through timely collection, reading, storage, analysis, and tracking of agricultural production information, inventory control information, logistics information, agricultural product preservation and other data, through real-time monitoring and feedback on the production and marketing of agricultural products, we can better improve the quality and safety level of agricultural products through real-time monitoring and feedback of the production and marketing process of agricultural products, so that consumers can buy and eat the agricultural products at ease.

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