Analysis of Factors Influencing the Growth of Export of Agricultural Products in Yunnan Province: An Empirical Study Based on CMS Model

Dongmei LI[1*], Jianxing LU[2], Zhiwen XIAO[1], Bo LI[1]

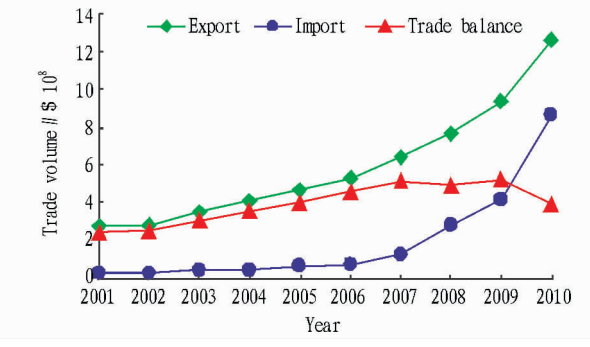
1. Institute of Agricultural Economics and Information, Yunnan Academy of Agricultural Sciences, Kunming 650205, China; 2. Tea Research Institute, Chinese Academy of Agricultural Sciences, Hangzhou 310008, China

Abstract Yunnan Province is the bridgehead for the opening of the southwest region in China, and the economic frontier of China - ASEAN economic cooperation, where the export of agricultural products plays an important role in promoting the openness of the southwest region and strengthening China - ASEAN economic cooperation. In this paper, we use CMS model to analyze causes of the increase in the exports of agricultural products in Yunnan Province during the period 2001 - 2010. It is found that the expanded import scale of agricultural products in the world, improvement in the export competitiveness of products and the adaption of product export structure to the changes in the structure of world import demand, are the main factors responsible for increase in the exports of agricultural products in Yunnan Province. In recent years, the improvement of competitiveness of the export of agricultural products becomes a key factor for the growth of the export of agricultural products in Yunnan Province. In terms of the products classified, strong export competitiveness has promoted the export of plant products, such as beverages and tobacco, while weak export competitiveness and unreasonable export structure has impeded the export of animal products, plant and animal oil and fat products.

Key words Agricultural products, Growth causes, CMS model, Yunnan Province

1 Introduction

Yunnan Province is the bridgehead for the opening of the southwest region in China and the economic frontier of China - ASEAN economic cooperation, where the export of agricultural products plays an important role in promoting the openness of the southwest region and strengthening China - ASEAN economic cooperation. Since the official establishment of the China - ASEAN Free Trade Area in 2010, the China - ASEAN trade has developed by leaps and bounds, and especially the annual growth rate of agricultural trade has reached nearly 20%[1]. Yunnan Province boasts superior endowment of natural resources, which is a major agricultural province with plateau characteristics. Since 2001, the export of agricultural products in Yunnan Province has experienced rapid growth (Fig. 1). According to statistics, the exports reached $ 1.258 billion in 2010, 4.6 times of the exports in 2001, with the average annual growth rate of 16.49%. The export of agricultural products is of great significance to promoting coordinated regional development, ensuring the driving force of economic development in Yunnan Province, and raising the income level of the majority of farmers. However, with continuous rise in the export of agricultural products in Yunnan Province, there has been a large trade surplus. Does this mean that the export of agricultural products in Yunnan Province has great comparative advantage? This article uses CMS model to analyze the export growth of agricultural products in Yunnan Province during the period 2001 - 2010, to explore the source of growth of export of agricultural products in Yunnan Province.



Note: Data are from Shanghai Customs; agricultural products include HS01 - HS24.

Fig. 1 The import and export of agricultural products in Yunnan Province during the period 2001 - 2010

2 Research methods and data sources

2.1 Research methods CMS model (Constant Market Share) was originally developed by Tyszynski (1951)[2], and afterwards, many researchers revised and extended it[3-6], now becoming one of the classical models for the research of trade export fluctuations, sources of growth, and international competitiveness of products. In this paper, on the basis of the classical model, we utilize the related researches by some scholars as a source of reference[2, 6-9], to analyze factors influencing the growth of the export of agricultural products in Yunnan Province. The specific steps are as follows:

Decomposition of the first layer:

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* Corresponding author. E-mail: ldm0106@163.com

$$\begin{aligned}\Delta V = & \sum_i MS_i^0 \times \Delta IM_i + \\ & (Import\ demand\ effect) \\ & \sum \Delta MS_i \times IM_i^0 + \\ & (Export\ competitiveness\ effect) \\ & \sum \Delta MS_i \times \Delta IM_i \\ & (Structure\ cross\ effect)\end{aligned} \quad (1)$$

Decomposition of the second layer:

$$\begin{aligned}\Delta V = & MS^0 \times \Delta IM + \\ & (Demand\ scale\ effect) \\ & \left(\sum_i MS_i^0 \times \Delta IM_i - MS^0 \times \Delta IM\right) + \\ & (Demand\ structure\ effect) \\ & \Delta MS \times IM^0 + \\ & (Comprehensive\ competitiveness\ effect) \\ & \left(\sum_i \Delta MS_i \times IM_i^0 - \Delta MS \times \Delta IM^0\right) + \\ & (Product\ competitiveness\ effect) \\ & \left(\frac{IM^1}{IM^0} - 1\right) \sum \Delta MS_i \times IM_i^0 + \\ & (Stationary\ cross\ effect) \\ & \left(\sum \Delta MS_i \times \Delta IM_i - \left(\frac{IM^1}{IM^0} - 1\right) \sum_i \Delta MS_i \times IM_i^0\right) \\ & (Dynamic\ cross\ effect)\end{aligned} \quad (2)$$

where ΔV is the variable exports of agricultural products in Yunnan Province; MS is the share of Yunnan's agricultural products in the world import market of the agricultural products; IM is the world's total imports of agricultural products; i is the category of agricultural products; 0 and 1 signify the base period and the final period, respectively.

Decomposition of the first layer: Import demand effect refers to the change in the exports of a country or region arising from change in the import scale and import structure of world agricultural markets; export competitiveness effect is the change in the exports of agricultural products in a country or region arising from change in the competitiveness of the export of agricultural products; structure cross effect is change in the exports of agricultural products in a country or region arising from change in the export structure of the exporting country or region and change in the world import structure.

Decomposition of the second layer: Demand scale effect is change in the exports of agricultural products in a country or region due to the expansion of world agricultural imports; demand structure effect is change in the exports of agricultural products in a country or region due to change in the world import structure; comprehensive competitiveness effect refers to change in the exports of agricultural products in a country or region due to change in the share of a country or region's imports in total world imports; product competitiveness effect is change in the competitiveness of a country or region's specific products in the world market of specific products imported; net cross effect is change in the exports arising from the interaction between change in a country or region's export structure of agricultural products and change in the world import scale of agricultural products; dynamic structure effect refers to change in the exports arising from the interaction between change in a country or region's export structure of agricultural products and change in the world import structure of agricultural products.

2.2 Data sources and description We conduct the analysis of dynamic growth of the export of agricultural products in during the period 2001 – 2010. The data of Yunnan Province are from Kunming Customs, and the data of world agricultural products are from the UN COMTRADE database. In accordance with the HS classification, HS01 – HS24 are agricultural products, and according to the nature of agricultural products under Chapter 24, the agricultural products can fall into four categories: (1) Live animals and animal products, including agricultural products in Chapter 01 – 05; (2) Plant products, including products in Chapter 06 – 14; (3) Animal and vegetable oils, fats and refined edible oils and fats, only including the products in Chapter 15; (4) Food, beverages, spirits, vinegar, tobacco and tobacco substitutes, including products in Chapter 16 – 24.

According to the export of agricultural products in Yunnan Province during the period 2001 – 2010 (Fig. 1), by measuring the growth rate, it can be divided into four periods: the first period (2001 – 2002), the second period (2003 – 2006), the third period (2007 – 2009) and the fourth period (2010). The changes in the first period and second period are classified as the first stage; the changes in the second period and third period are classified as the second stage; the changes in the third period and fourth period are classified as the third stage.

3 Estimation results and analysis of CMS model

3.1 Analysis of the growth of total exports

3.1.1 Decomposition of the first layer. The main reason for the increase in the exports of agricultural products in Yunnan Province lies in the expansion of the import scale and import structure of world agricultural imports, improvement of export competitiveness, and optimization of the export structure of agricultural products in Yunnan Province.

At the first stage, the exports of agricultural products in Yunnan Province in the second period were $ 157.2850 million more than that in the first period. The import demand effect accounted for 58.27%, export competitiveness effect accounted for 30.75%, and structural cross effect accounted for 10.97%, indicating that the main reason for rapid growth of export of agricultural products in Yunnan Province at this stage lies in the expansion of world import demand; the improvement of product competitiveness and export structure in line with world import demand also promote the growth of export of agricultural products in Yunnan Province.

At the second stage, China signed "zero tariff" agreement with Thailand on the fruits and vegetables in 2003. The exports of agricultural products in Yunnan Province experienced a significant increase, and the exports in the third period were $ 344.5017 million more than that in the second period. The import demand effect accounted for 48.98%, export competitiveness effect accounted for 37.56%, and structural cross effect accounted for

13.46%. At this stage, although the expansion of the import demand made the largest contribution to the growth of agricultural exports in Yunnan Province, its share declined, while the proportion of the export competitiveness of agricultural products increased, and the proportion of cross effect also increased, indicating that the expansion of world import demand at this stage is the main reason for increase in the exports of agricultural products in Yunnan Province, and the improvement of product competitiveness played an increasing role in promoting the export of agricultural products.

At the third stage, since the formal foundation of China – ASEAN Free Trade Area in 2010, the bilateral trade was developed more rapidly, the exports of agricultural products in Yunnan Province in the fourth period were $ 475.6733 million more than that in the third period. The most important role was the export competitiveness effect whose proportion accounted for 73.99%, while the world import demand shrank relatively, only accounting for 17.59%, and the proportion of structural cross effect dropped to 8.43%, indicating that the role of world import demand and export structure in promoting the exports of agricultural products in Yunnan Province was gradually declined.

3.1.2 Decomposition of the second layer.

(1) In terms of the decomposition of import demand effect, the demand scale effect was positive in the three phases, indicating that the exports of agricultural products in Yunnan Province at this stage showed a synchronized growth trend with world market import demand, but the proportion of demand scale effect showed a rapidly declining trend, from 75.02% at the first stage to 59.49% at the second stage, even to 14.58% at the third stage, indicating that the role of world import demand in promoting the exports of agricultural products in Yunnan Province. The demand structure effect was negative at the first two stages, but positive at the third stage, indicating that the export structure of agricultural products in Yunnan Province was not consistent with the world import demand in the first two phases, inhibiting the export of product. At the third stage, the demand structure effect was positive, indicating that the export structure meshed with the world demand, enhancing the export of product.

(2) In terms of the export competitiveness effect, the improvement of comprehensive competitiveness enhanced the export of agricultural products in Yunnan Province, and the comprehensive competitiveness was gradually promoted, from 17.54% at the first stage to 27.60% at the second stage, 78.47% at the third stage, but the product competitiveness was declining. In the first two phases, the product competitiveness was positive, with the proportion of 13.22% and 9.96%, respectively, indicating that the product competitiveness promoted the exports of agricultural products in Yunnan Province; in the third phase, the product competitiveness was negative, with the proportion of 4.48%, indicating that the structural changes in the exports of agricultural products in Yunnan Province during this period was not suited to the world market demand changes, inhibiting the export of agricultural products.

(3) In terms of decomposition of structural cross effect, the net cross effect was positive, but there were some fluctuations, with the proportion of 13.05%, 17.57% and 6.56%, respectively, indicating that the structural changes in the exports of agricultural products in Yunnan Province can adapt to changes in the scale of world imports, and promote the growth of the exports of agricultural products; the dynamic cross effect was negative in the first two phases, indicating that during this period, the changes in export structure of agricultural products in Yunnan Province can not adapt to the changes in world import structure, hindering product exports; the dynamic cross effect was positive in the third phase, indicating that Yunnan Province adjusted the export structure of agricultural products, to make it adapt to changes in the structure of world imports.

Table 1 Growth analysis of CMS model of the export of agricultural products in Yunnan Province ($ 10^4, %)

	The first stage The first period – the second period		The second stage The second period – the third period		The third stage The third period – the fourth period	
	The absolute amount	Proportion	The absolute amount	Proportion	The absolute amount	Proportion
Actual export growth	15 828.50	100.00	34 450.17	100.00	47 567.33	100.00
Decomposition of the first layer						
Import demand effect	9 223.96	58.27	16 875.01	48.98	8 365.41	17.59
Export competitiveness effect	4 867.84	30.75	12 938.84	37.56	35 192.77	73.99
Structural cross effect	1 736.70	10.97	4 636.31	13.46	4 009.15	8.43
Decomposition of the second layer						
Demand scale effect	11 874.43	75.02	20 494.76	59.49	6 934.46	14.58
Demand structure effect	–2650.48	–16.74	–3 619.75	–10.51	1 430.95	3.01
Comprehensive competitiveness effect	2 775.79	17.54	9507.12	27.60	37 325.25	78.47
Product competitiveness effect	2 092.05	13.22	3 431.73	9.96	–2 132.48	–4.48
Net cross effect	2 066.31	13.05	6 053.96	17.57	3 118.65	6.56
Dynamic cross effect	–329.60	–2.08	–1 417.65	–4.12	890.49	1.87

Note: The data come from the UN COMTRADE and Kunming Customs.

3.2 Export growth analysis of classified products

3.2.1 The first category of products (animal products). At the first stage and second stage, the export of animal products in Yunnan Province grew rapidly, but experienced negative growth at the third stage. The main reason for rapid growth of export at the first two stages lies in the expansion of world import scale, the improvement of the competitiveness of animal products in Yunnan Province, and export structure's better adaptation to the changes in the structure of world imports; the main reason for the negative growth of export at the third stage lies in the decline of the competitiveness of the export of animal products and animal product export structure's inconsistency with the changes in world import structure.

3.2.2 The second category of products (plant products). Plant products are the agricultural products exported most in Yunnan Province, and especially vegetables (HS07), fruits (08), coffee, tea and other products (HS09) are experiencing rapid export growth. The expansion of the world import market demand, the improvement of export competitiveness, and export structure's adaptation to changes in the import demand of the world market is the main reason for export growth of plant products in Yunnan Province; at the first two stages, the main reason for export growth lies in the expansion of the world market import demand, while the significant improvement of product export competitiveness at the third stage is the main reason for the increase of exports.

3.2.3 The third category of products (animal and vegetable fats and oils). There is little import and export of such products in Yunnan Province. The export experienced negative growth at the first two stages, but positive growth at the third stage. The main reason for the negative growth is that these products in Yunnan Province do not have export competitiveness, and the export structure is not in line with the structure of world import demand. At the third stage, the improvement of the competitiveness of these products, and the adjustment of the export market structure promotes the export of such products in Yunnan Province.

3.2.4 The fourth category of products (drinks, alcohol and tobacco products). Such products are the major products Yunnan Province, and the most principal products are tobacco and its products (HS24). The main reason for the export growth of beverages and tobacco and alcohol products in Yunnan Province lies in the expansion of the demand for imports, improvement of export competitiveness and matching between the export structure in Yunnan Province and the world market import demand, but the main reason at the first two stages lies in the expansion of the world market import demand, while the main reason at the third stage lies in the improvement of product export competitiveness.

Table 2 Growth analysis of CMS model of the export of classified agricultural products in Yunnan Province ($ 10^4$, %)

	The first stage The first period – the second period		The second stage The second period – the third period		The third stage TThe third period – the fourth period	
	The absolute amount	Proportion	The absolute amount	Proportion	The absolute amount	Proportion
The first category of products (animal products)						
Actual export growth	685.25	100.00	1 983.42	100.00	−756.67	100.00
Import demand effect	216.64	31.62	404.56	20.40	303.95	−40.17
Demand scale effect	2 648.06	386.44	3 782.52	190.71	1 730.26	−228.67
Demand structure effect	−2 431.41	−354.82	−3 377.96	−170.31	−1 426.31	188.50
Export competitiveness effect	351.65	51.32	1 114.87	56.21	−951.30	125.72
Comprehensive competitiveness effect	749.79	109.42	2434.56	122.75	8 707.29	−1 150.74
Product competitiveness effect	−398.14	−58.10	−1 319.69	−66.54	−9 658.59	1 276.47
Structural cross effect	116.96	17.07	463.98	23.39	−109.32	14.45
Net cross effect	149.27	21.78	521.64	26.30	−84.30	11.14
Dynamic cross effect	−32.31	−4.71	−57.66	−2.91	−25.02	3.31
The second category of products (plant products)						
Actual export growth	8 618.50	100.00	20 906.83	100.00	35 787.67	100.00
Import demand effect	5 099.91	59.17	10 104.30	48.33	5 783.72	16.16
Demand scale effect	3 479.26	40.37	7 726.47	36.96	1 938.74	5.42
Demand structure effect	1 620.65	18.80	2 377.82	11.37	3 844.98	10.74
Export competitiveness effect	2 458.26	28.52	7 686.83	36.77	26 504.90	74.06
Comprehensive competitiveness effect	839.08	9.74	2847.57	13.62	12 101.44	33.81
Product competitiveness effect	1 619.18	18.79	4 839.26	23.15	14 403.46	40.25
Structural cross effect	1060.33	12.30	3 115.71	14.90	3 499.05	9.78
Net cross effect	1043.48	12.11	3 596.59	17.20	2 348.77	6.56
Dynamic cross effect	16.85	0.20	−480.88	−2.30	1 150.28	3.21
The third category of products (animal and vegetable fats and oils)						
Actual export growth	−9.75	100.00	−2.42	100.00	14.67	100.00
Import demand effect	46.82	−480.19	25.66	−1 061.74	5.33	36.34
Demand scale effect	1 030.25	−10 566.68	1482.23	−61 333.60	649.62	4 429.25
Demand structure effect	−983.43	10 086.48	−1 456.57	60 271.86	−644.29	−4 392.88

(Table 2)

	The first stage The first period – the second period		The second stage The second period – the third period		The third stage TThe third period – the fourth period	
	The absolute amount	Proportion	The absolute amount	Proportion	The absolute amount	Proportion
Export competitiveness effect	-29.35	301.07	-17.23	712.87	8.19	55.86
Comprehensive competitiveness effect	110.27	-1 130.95	510.93	-21 141.76	2 226.98	15 183.93
Product competitiveness effect	-139.62	1 432.02	-528.15	21 854.63	-2 218.78	-15 128.07
Structural cross effect	-27.21	279.12	-10.85	448.87	1.14	7.77
Net cross effect	-12.46	127.80	-8.06	333.55	0.73	4.95
Dynamic cross effect	-14.75	151.32	-2.79	115.32	0.41	2.82
The fourth category of products (drinks, alcohol and tobacco products)						
Actual export growth	6 534.50	100.00	11 562.33	100.00	12 521.67	100.00
Import demand effect	3 860.58	59.08	6340.49	54.84	2272.41	18.15
Demand scale effect	4 716.87	72.18	7 503.54	64.90	2 614.24	20.88
Demand structure effect	-856.28	-13.10	-1163.04	-10.06	-341.84	-2.73
Export competitiveness effect	2 087.29	31.94	4 154.37	35.93	9 630.97	76.91
Comprehensive competitiveness effect	1 076.66	16.48	3 714.06	32.12	14 289.54	114.12
Product competitiveness effect	1 010.63	15.47	440.31	3.81	-4 658.57	-37.20
Structural cross effect	586.63	8.98	1067.47	9.23	618.29	4.94
Net cross effect	886.01	13.56	1 943.79	16.81	853.46	6.82
Dynamic cross effect	-299.39	-4.58	-876.32	-7.58	-235.18	-1.88

Note: The data come from the UN COMTRADE and Kunming Customs.

4 Conclusions

Through the CMS model decomposition of the export growth of agricultural products in Yunnan Province, we can draw the following conclusions:

(1) The expansion of the world import scale and import structure of agricultural products, and product export structure's adaptation to the changes in the world import demand structure, are the key factors promoting increase in the exports of agricultural products in Yunnan Province.

(2) In recent years, the increase in the exports of agricultural products in Yunnan Province changes the previous situation of relying on the world import demand to rely on competitiveness improvement.

(3) In recent years, the main reason for the negative growth in the export of animal products in Yunnan Province is the decline in competitiveness of exports, and export structure's inconsistency with the changes in the structure of world imports.

(4) The main reason for the increase in exports of plant products, beverages alcohol and tobacco products lies in the expansion of the import demand of the world market, improvement of export competitiveness, and export structure optimization. And the improvement of product export competitiveness in recent years is also an important cause.

(5) The main reason for the change of negative growth to positive growth of export of animal and vegetable fats and oils is the improvement of the competitiveness of products and the adjustment of the export market structure.

Based on the above conclusions, we believe that further improving the competitiveness of agricultural products is the key to maintaining the continued growth of the exports of agricultural products in Yunnan Province; adjusting the export product structure of agricultural products and adapting to the changes in the import demand of the world market is also an effective means to maintain its export growth. At the same time, it is necessary to continue to maintain the export growth of agricultural products with comparative advantage; improve the product export structure, improve the export competitiveness, and grasp the foreign market consumption trends to meet the diversified consumer demand in the world market.

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