

Research on China's Interregional Trade in Value-Added from the Perspective of Value Chain

Runqing Ma*

School of Economics, Huazhong University of Science and Technology, Wuhan, 430074, Hubei, China

Abstract: The statistical accounting of international trade is often based on the gross value method of customs data. With the maturity of the global value chain, the international division of labor is becoming more specialized, and the trade of intermediate products is becoming more frequent. The gap between the statistical results of the traditional gross value trade accounting method and the real trade situation is widening. This paper uses the value-added trade statistical model and China's interregional input-output data to calculate the value-added trade volume of China's eight regions in 2002, 2007 and 2010, compares it with traditional statistical methods, and establishes an empirical model with value-added trade as the explanatory variable. The study found that the gross trade statistics method would distort the trade volume and exaggerate the degree of trade imbalance; Trade scale, R&D investment, fixed asset investment, employment scale and other factors will significantly affect the scale of value-added trade.

Keywords: Trade in value-added, Value chain, Input-output analysis.

1. Introduction

Developing and improving the global value chain is the main trend and feature of the global economic development today. Countries and regions have gradually become a part of the production of goods. The international division of labor is also more detailed than before. The production of goods often needs to go through several intermediate links, and the production of final products also needs more input of intermediate products. The proportion of intermediate goods trade in international commodity trade is increasing day by day. Therefore, the "double counting" part under the traditional gross trade accounting method cannot be ignored. At the same time, from the perspective of the value chain, the value added in each production link is not always consistent with the total output. There are high value-added links and low value-added links in the value chain. Only using the gross trade statistics method will cause distortion, overestimate or underestimate the position and actual income of some countries or regions in the value chain. Therefore, many scholars have also begun to seek trade statistics methods that are more in line with the actual status of international division of labor from the perspective of value chain appreciation, and recalculate the trade between countries and regions in the world.

Since the reform and opening up, China's economy has grown rapidly and actively participated in the international division of labor and international trade activities. It has rapidly grown into a manufacturing and trading power, known as the "factory of the world". However, due to the increase of trade surplus and the rapid economic growth, the "China threat theory" has been constantly publicized. Under the surface of the international trade surplus, China's actual added value and shared benefits in the international division of labor are rarely studied in detail. In recent years, some positive changes have taken place in China's foreign trade policy. Instead of pursuing excessive trade surplus, China wants to achieve trade balance and sustainable development of foreign trade. Therefore, in the process of participating in the global value chain, China is generally responsible for the low value-

added of the links created. A large number of intermediate products are used in the output, and a large part of them come from abroad. As a result, export products actually contain a large number of intermediate product values. While participating in global value chain activities, the gap between China's regions and provinces is gradually obvious, and there is a significant difference in the degree of participation in international trade and domestic trade. Therefore, focusing on the construction of domestic value chain and its docking with global value chain has become the development direction of current research.

As the international division of labor system is increasingly refined and developed, the domestic division of labor is gradually becoming specialized. Therefore, correctly measuring the value creation ability of a country or region in the division of labor system has become an important prerequisite for evaluating its competitiveness level. From the perspective of value-added trade, this paper applies statistical accounting methods to the measurement of China's interregional input-output data, analyzes it from the perspective of value chain, and explores its influencing factors, hoping to make contributions to the relevant research on value-added trade from the provincial level.

There are two possible innovations in this article:

(1) Calculate the value-added trade of China's regions. Previous literature studies often used the traditional gross trade accounting method to measure the scale of China's interregional trade, and then produced two new measurement methods of value-added trade and trade value-added[1-2]. However, most of the literature did not clearly distinguish the concept and accounting method of the two, and paid less attention to the value-added generated by China's domestic trade cycle. The measurement and empirical object of this paper is the data of China's regional and provincial participation in trade activities, which is different from the status of China in the global value chain that has been concerned by previous literature. It pays more attention to the analysis of China's regional and provincial participation in international and domestic trade and its status in the value chain.

(2) The empirical analysis of the impact factors of value-added trade is carried out, and the corresponding results and conclusions are obtained through the quantitative analysis, while the previous literature often stops at the measurement of indicators.

The main structure of this paper is as follows: Chapter 2 literature review, Chapter 3 research design and hypothesis, Chapter 4 empirical results and analysis, and Chapter 5 conclusion and inspiration.

2. Literature Review

"Competitive Advantage" published by Michael Porter in 1985[3], the concept of "value chain" was put forward for the first time. Its main emphasis was on the competitive advantage of a single enterprise. Later, Porter extended his research perspective to different companies and systematically put forward the concept of value system. This concept has something in common with the concept of global value chain commonly mentioned and applied now. Global Value Chains (GVC) refers to a global inter-enterprise network organization that connects various value-added links such as production, sales and services. Its purpose is to realize the value of goods or services, and it involves the whole process from raw material procurement and transportation to the production and distribution of semi-finished products and finished products, to final consumption and recycling.

The predecessor of the global value chain theory is the global commodity chain (GCC) analysis framework proposed by Gereffi and Korzeniewicz[4]. Because in the supply chain with intermediate products as the trading object, the term "commodity" is difficult to reflect the value appreciation process of each link in the supply chain, and value appreciation is an important factor that determines the status of international division of labor, so "global commodity chain" is questioned by scholars. At the Bellagio symposium in Italy in 2000, scholars such as Gereffi proposed that the "global commodity chain" was officially renamed "global value chain". Since then, the perspective of global production network has been introduced, and the original "linear" perspective in the value chain has been revised.

Corresponding to the global value chain, the national value chain (NVC) is essentially a division of labor system, but the difference from the global value chain is that its development is based on the needs of the domestic market, and the strategic links are controlled by local enterprises. Local enterprises can gain high-end competitiveness in the local market through these strategic links, and then gain the strength to enter the regional market and even the global market[5]. Since the reform and opening up, China has undertaken a large number of international industrial transfers to embed in the global value chain network, and has formed certain industrial clusters, but most industries still belong to the low value-added links in the global value chain.

In the process of China's integration into the global value chain, transnational corporations have played an important role in the allocation of domestic resource elements, objectively accelerating the flow and optimal allocation of resource elements in the domestic market. Since the development of the domestic value chain is based on the demand of the domestic and local market, and local enterprises have mastered the core links in it, this has actually promoted the development of the domestic value chain, which is conducive to gaining high-end competitiveness in the local market, and then entering the regional and even global

markets [5]. Therefore, compared with GVC, NVC is a regional division of labor carried out in a country, belonging to the domestic resource allocation integration. In this regard, most scholars agree that developing countries or regions should follow the development path from participating in GVC low-end links to developing NVC, and then climbing to GVC high-end links, and building a complete NVC is the premise and guarantee of fully embedding GVC .

In the process of value chain research, trade statistics is an important tool. The establishment of the traditional trade accounting framework began with the United Nations System of National Economic Accounting in 1953, which is the basis of the trade statistical accounting method. The system includes three principles, namely, the principle of residents and non-residents, the principle of cross-border goods and the principle of local. The international trade accounting method of gross statistics plays an important role in national trade research. It has long provided the data basis for the analysis of international trade development and trade status, and is also an important basis for formulating international trade policies. However, with the rapid development of the global economy and trade, economic globalization has made the international division of labor system gradually mature and complex, and the disadvantages of the traditional gross value accounting methods have gradually emerged.

Because the producers participating in the global value chain only participate in the international division of labor in one or some links, the traditional trade accounting system based on gross value will produce repeated statistics due to the multiple circulation of intermediate products between different countries, which distorts the actual situation of value creation and the distribution of benefits of the value chain participants in the division of labor system[6]. Today, the rapid progress of information and communication technology and the substantial reduction of logistics costs make intermediate products frequently cross national borders. Continuing to use the traditional gross trade statistics method to calculate the import and export scale of a country will have serious deficiencies, resulting in two problems, one is the distribution of product value, and the other is the large deviation between the traditional statistical method and the actual income and added value[7].

Therefore, scholars have proposed improved measurement methods, including Value Added in Trade (VAiT) and Trade in Value Added (TiVA). The main basis of trade value added is the non-competitive input-output table, which calculates the value added from the trade volume[8]. The value-added trade is redefined from the perspective of final demand by using the import and export of value-added. The value-added export is defined as the part of domestic value-added caused by foreign final demand, and the value-added import is defined as the foreign value-added caused by domestic final demand.

Limited by data and statistical methods, the early value-added trade accounting was mainly carried out through specific cases. With the gradual refinement of the international division of labor, its shortcomings in universality and accuracy are increasingly obvious. Hummel et al.(2001)[9] put forward the vertical specialization index (VS), which is defined as the import value contained in the export products of a country, or the intermediate input component (VS1) used by other countries in the export products of a country. However, this method has two major defects. First, it is too limited in the scope of global value

chain research because it is calculated based on a country's input-output table; The second is that the two assumptions of the model are too harsh, that is, the imported intermediate products are all added value from abroad and the proportion of import input between export goods and domestic consumer goods remains unchanged, which actually ignores the actual situation of re-import and re-export trade [10].

In order to make up for the deficiency of the HIY method, Daudin et al. (2011) [11] added the consideration of the re-import part, and the global value-added trade volume was divided into two parts: intermediate goods and final goods. Since then, the trade value added accounting system has developed on this basis in the two directions of defining new indicators to express vertical specialization and relaxing the HIY method to form a new statistical accounting system, and the integration of these two lines has formed the core method of measuring trade value added at present.

Although the trade value added index reflects the value-added process in the value chain, due to the industrial value transfer effect and the country value transfer effect, the trade value added still cannot accurately reflect the value export volume [12], so the value-added trade dimension is increasingly used to reflect the actual import and export scale.

The principle of the value-added trade statistics method based on input-output technology is to deduct the foreign part of a country's total trade, and calculate the remaining domestic value-added components, and analyze the income and trade volume of countries in the global value chain based on national economic accounting data and international trade data. Under the world input-output framework, the sources of added value of a country's total exports can be divided into four parts, namely, the domestic added value absorbed by foreign countries, the domestic added value returned to the country, the foreign added value in exports, and the pure double calculation caused by intermediate products, and further subdivided into nine parts according to the final destination of the value of export products[2]. Later, according to the different final absorption places, value sources and absorption channels, 16 different paths were distinguished[13]. Some scholars have carried out logical analysis on the quantitative relationship between the different dimensions of value-added exports, total export value and export domestic value-added, and constructed statistical models of import, export and trade balance under three accounting dimensions[12].

At the same time of theoretical research progress, the improvement of various input-output databases around the world also provides a data basis for the research and development of the value-added trade statistics system. In

2012, the value-added trade statistics system was officially established. It was jointly developed by the Organization for Economic Cooperation and Development (OECD) and the World Trade Organization (WTO). It aims to use the domestic value-added of each country to replace the traditional total import and export trade as a new standard to measure the actual situation of international trade and the status of international division of labor.

The accounting method of value-added trade is an improvement and supplement to the traditional gross value trade accounting method, which makes up for some of its defects. The main advantages are:

First, through the use of value-added trade accounting statistical methods, the change process of global value chain in international trade will be reflected more clearly. According to the theory of competitive advantage, the globalization and specialization of commodity production and more countries will participate in the production of value chain are the trend of development, which makes it necessary to use new methods to process trade data. The adoption of new statistical methods can more truly analyze the amount of value added in trade, which is more in line with the fact that the value added in each link of the value chain varies greatly.

Second, the new accounting method can effectively distinguish the double-counting part and the intermediate product input part in the trade circulation, help us eliminate the double-counting part and analyze the domestic and foreign parts of the intermediate input, and can actually reflect the actual contribution value of each country in the final consumption, the competitiveness of its export products and the degree of indirect export.

Since the value-added statistical method can correct the recalculated part of intermediate products and show the process of commodity circulation and value appreciation, this paper uses this method to calculate China's interregional trade data.

3. Research Design and Assumptions

3.1. Calculation method: value-added trade accounting in global value chain

For the calculation of value-added trade, this paper establishes a statistical model based on the ideas commonly used in the literature[1-2,12]. The accounting standard of value-added trade is based on whether the domestic value-added of domestic production is absorbed by other countries. Under the input-output framework, first take the two-country model as an example.

Table 1. Input-output framework (Two-country model)

	output input	Intermediate products		Final consumption		output
		country i	country j	country i	country j	
intermediate input	country_i	X_{ii}	X_{ij}	F_{ii}	F_{ij}	X_i
	country_j	X_{ji}	X_{jj}	F_{ji}	F_{jj}	X_j
Added value		V_i	V_j			
input		X_i	X_j			

Where X_{ij} represents the intermediate input value of country i included in the total output of country j, F_{ij} represents the final product of country i included in the final consumption of country j, V_i represents the added value of country i, and X_i represents the total output/total input of country i.

As shown in Table 1, the row vector of added value of each country is

$$V = (V_i \ V_j) \quad (1)$$

The total output column vector is

$$X = (X_i \ X_j)' \quad (2)$$

Therefore, the row vector of value-added rate of each country is

$$v = (v_i \ v_j) = \tau(I - A) \quad (3)$$

$$v_i = V_i/X_i \quad (4)$$

A is the direct consumption coefficient matrix, and the element A_{ij} represents the total output of country j and the direct consumption coefficient of country i's intermediate products, where

$$A_{ij} = X_{ij}/X_j \quad (5)$$

Therefore, Leontief inverse matrix is

$$B = (I - A)^{-1} \quad (6)$$

Identities can be obtained based on the input-output framework

$$X = AX + F = (I - A)^{-1}F = BF \quad (7)$$

F is the world final consumption matrix.

In the context of value-added trade accounting, the export volume of country i to country j in the two-country model is expressed as the value contribution from country i in the total consumption of country j, namely

$$EX_{ij} = v_i * BF_j = v_i B_{ii} F_{ij} + v_i B_{ij} F_{jj} \quad (8)$$

Similarly, the import amount can be expressed as

$$IM_{ij} = v_j * BF_i = v_j B_{ji} F_{ii} + v_j B_{jj} F_{ji} \quad (9)$$

According to the horizontal and vertical identities of the input-output table, the net trade can be obtained as

$$NET_{ij} = EX_{ij} - IM_{ij} = v_i * BF_j - v_j * BF_i = (X_{ij} + F_{ij}) - (X_{ji} + F_{ji}) \quad (10)$$

Under the gross trade accounting, the export volume of country i to country j in the two countries' model is the sum of the value of intermediate products of country i input in the production of country j and the products of country i included in the final consumption, namely

$$EX_{ij}^* = X_{ij} + F_{ij} \quad (11)$$

Similarly, the import amount can be expressed as

$$IM_{ij}^* = X_{ji} + F_{ji} \quad (12)$$

Net trade is

$$NET_{ij}^* = (X_{ij} + F_{ij}) - (X_{ji} + F_{ji}) = NET_{ij} \quad (13)$$

It can be inferred from the two countries' models that the net trade under the two accounting standards is consistent.

In order to make the model more general, consider the multi-sector model deduction in the case of three countries.

The basic assumptions of the model are as follows:

(1) Suppose that there are three countries participating in trade, namely country i, country j and country k, and each country has P sectors;

(2) The products produced by each sector of each country can be directly used as intermediate products produced by other products or as final consumer products. Trade liberalization, without trade barriers;

(3) X represents the total output vector of $3P * 1$ dimension, where each element represents the total output of a certain department in a certain country;

(4) A is the direct consumption coefficient matrix, where each element represents the value of products or services directly consumed by the unit total output of a sector in one country in the production and operation process corresponding to that of a sector in another country;

(5) B is the Leontief inverse matrix, which can be calculated from matrix A, where each element represents the total demand of one sector of a country for the corresponding sector when increasing the unit final consumption;

(6) F is the final consumption matrix, in which each element represents the output of the corresponding sector contained in the final consumption of one sector in one country.

According to the horizontal identity of the input-output table, that is, total output=intermediate products+final consumption

$$X = AX + F \quad (14)$$

It can be inferred that:

$$X = (I - A)^{-1}F = BF \quad (15)$$

Following the definition of the row vector of value-added rate in the two-country model, v is defined as the row vector of value-added rate, where each element represents the added value per unit of total output. According to the definition, when calculating the value added exports, we only care about the part of the value added produced by the country to meet the needs of other countries. Similarly, when calculating the value added imports, we only need to consider the value added and final products of other countries consumed by the country. Based on the above two countries' models and derived formulas, the formula of value-added exports and value-added imports of country i to other countries can be obtained:

$$EX_i^{**} = [v_i \ 0 \ 0] \begin{bmatrix} B_{ii} & B_{ij} & B_{ik} \\ B_{ji} & B_{jj} & B_{jk} \\ B_{ki} & B_{kj} & B_{kk} \end{bmatrix} \begin{bmatrix} F_{ij} + F_{ik} \\ F_{jj} + F_{jk} \\ F_{kj} + F_{kk} \end{bmatrix} \quad (16)$$

$$IM_i^{**} = [0 \ v_j \ v_k] \begin{bmatrix} B_{ii} & B_{ij} & B_{ik} \\ B_{ji} & B_{jj} & B_{jk} \\ B_{ki} & B_{kj} & B_{kk} \end{bmatrix} \begin{bmatrix} F_{ii} \\ F_{ji} \\ F_{ki} \end{bmatrix} \quad (17)$$

The calculation of net trade in value-added can be obtained by subtracting the two formulas, and the general model formula is obtained here.

3.2. Data source and calculation result analysis

The data source used in the calculation part of this paper is China's interregional input-output table. The above

accounting methods are applied to China's input-output data. The regional level data sources are 17 departments and 8

regional input-output tables in 2002, 2007 and 2010. The accounting results are shown below.

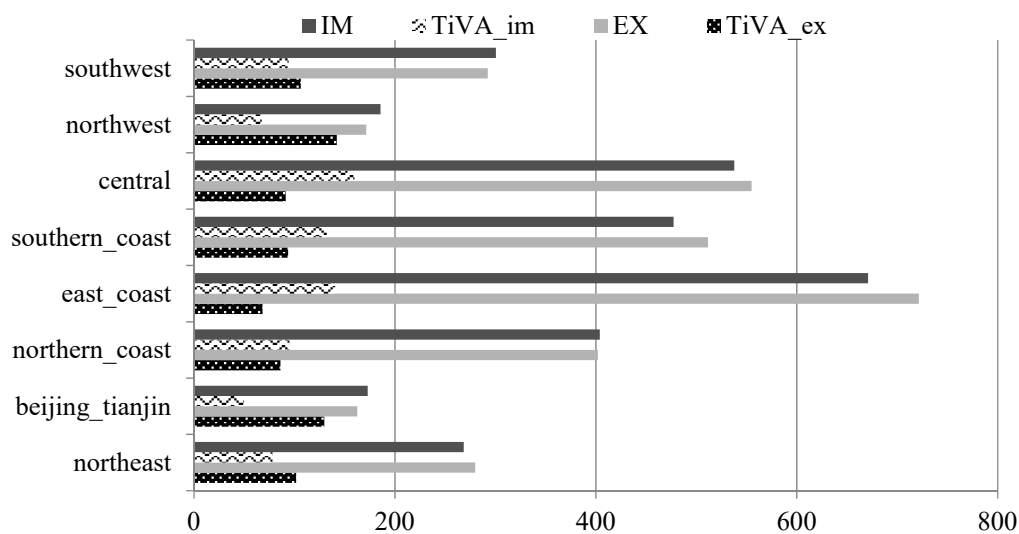


Figure 1. Comparison of imports and exports of eight regions in 2002 (Unit: 10 billion yuan)

The above figure shows the results calculated according to the input-output table of eight regions in China in 2002. The chart shows that there is a significant difference between the traditional gross value trade statistics method and the value-added trade measurement method from the perspective of value added, which indicates that there is a serious duplication

of statistics in regional trade and overestimates its actual position in the division of labor in the value chain. Comparing the trade data among regions, it can be found that the eastern coastal region, the central region, the northern coastal region and the southern coastal region were the most active regions in trade activities in 2002.

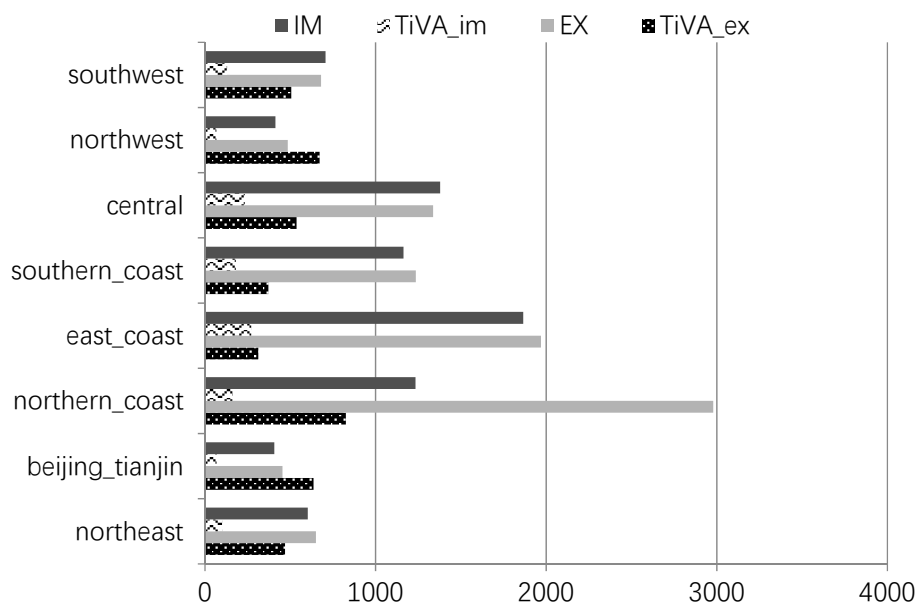


Figure 2. Comparison of imports and exports of eight regions in 2007 (Unit: 10 billion yuan)

The above figure shows the calculation results of value-added trade in 2007. It can be seen that there are still

significant differences between the accounting methods of gross value trade and value-added trade.

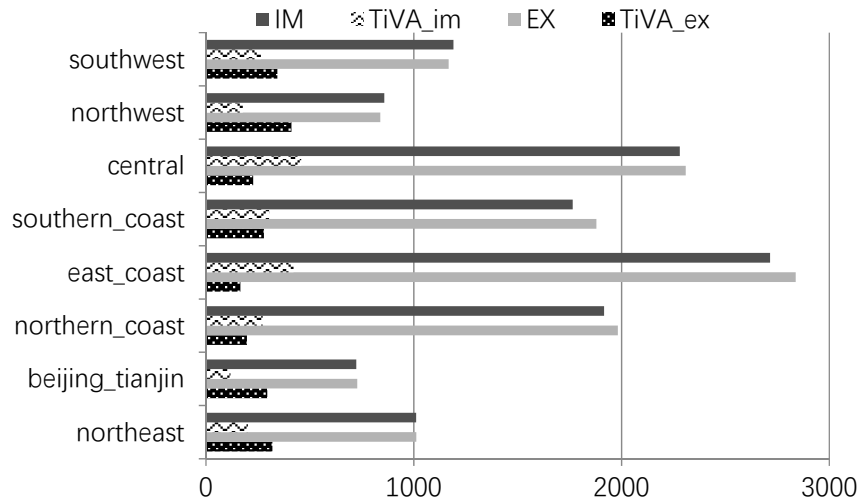


Figure 3. Comparison of imports and exports of eight regions in 2010 (Unit: 10 billion yuan)

The above figure shows the calculation results of trade in value-added in 2010. The gap between the gross value trade accounting method and the trade in value-added accounting method has further widened, which shows that with the rapid development of China's domestic industry, a large number of intermediate inputs cause a huge scale of double counting.

On the whole, the trade volume of each region has different degrees of distortion, mainly due to the repeated calculation and statistics of intermediate products. With the more balanced trade participation of each region, the more active and frequent interregional trade activities, but due to the detailed regional division of labor and the construction of the domestic value chain, the gap caused by the repeated statistical part in the middle has increased, the traditional gross trade accounting method is increasingly difficult to accurately reflect and measure the division of labor status of each region.

3.3. Research hypothesis and empirical model establishment

In fact, value-added trade is still an accounting method of trade activities, so the analysis of the factors that cause its changes and regional disparities still needs to start from the factors that affect trade activities. According to the relevant theories of modern international trade, both supply and demand act on the occurrence of trade. According to the theory of preference similarity, a region can export a large amount of certain goods due to its comparative advantage, while domestic demand is the basis of product export, and the growth and change of domestic demand is the primary driving force for the invention of new products and new technologies, and the products needed at home have greater comparative advantages. However, the theory of economies of scale believes that differences in technology or factor endowments do not necessarily lead to trade, and the increasing returns brought by economies of scale will also promote the production of trade. The theory of national competitive advantage put forward by Porter believes that national

competitive advantage depends on industrial competitive advantage. A country's competitive advantage is actually an advantage in the level of productivity development, and whether it has appropriate innovation mechanism and strong innovation ability is the key to obtain national competitive advantage.

In the global context, the impact factors of the trade in value-added volume are mainly considered from the aspects of intermediate input demand, final demand and output structure. Some scholars have analyzed the impact factors of domestic investment, household consumption, fixed asset formation, government consumption, etc [14-15]. Considering that all provinces and regions in China generally face similar international and domestic environments in the process of participating in the global value chain, and that factors such as policy differences, demand preferences and price levels have little impact, this paper proposes a hypothesis based on the actual situation of all provinces in China and the availability of data: the impact factors of value-added trade may include total trade scale, domestic economic development level, regional investment level and R&D investment Regional enterprises and employment status, etc.

Based on the previous model deduction and theoretical analysis, this paper constructs the following econometric models (18) and (19):

$$\begin{aligned} \text{TiVA}_{\text{EX}} = & \beta_1 \text{EX} + \beta_2 \text{GDP} + \beta_3 \text{INV} + \beta_4 \text{RD} \\ & + \beta_5 \text{COMPANY} + \beta_6 \text{EMPLOY} \\ & + \beta_7 \text{FOREIGN} + \alpha \\ & + \varepsilon \end{aligned} \quad (18)$$

$$\begin{aligned} \text{TiVA}_{\text{IM}} = & \beta_1 \text{IM} + \beta_2 \text{GDP} + \beta_3 \text{INV} + \beta_4 \text{RD} + \beta_5 \text{COMPANY} \\ & + \beta_6 \text{EMPLOY} + \beta_7 \text{FOREIGN} + \alpha \\ & + \varepsilon \end{aligned} \quad (19)$$

See Table 2 for the definition of variables. The data sources are China's interregional input-output tables and China's statistical yearbook in 2002, 2007 and 2010.

Table 2. Variable definition

Variable	Variable description
$TiVA_{EX}$	Trade in value-added outflow
$TiVA_{IM}$	Trade in value-added inflow
EX	Total exports
IM	Total imports
GDP	GDP growth rate
INV	Investment scale of fixed assets
RD	R&D investment
$COMPANY$	Number of listed companies
$EMPLOY$	Number of employed persons
$FOREIGN$	Foreign investment

4. Empirical Results and Analysis

variables are shown in Table 3.

4.1. Descriptive statistics

After logarithmization, the descriptive statistics of

Table 3. Descriptive statistics of variables

	$TiVA_{EX}$	$TiVA_{IM}$	EX	IM	GDP	INV	RD	$COMPANY$	$EMPLOY$	$FOREIGN$
average	19.313	18.872	20.476	20.439	12.729	17.125	10.191	3.599	5.698	8.156
standard deviation	0.720	0.598	0.786	0.756	2.280	1.169	2.808	0.795	1.010	1.465
median	19.504	18.888	20.397	20.377	12.700	17.269	10.700	3.497	5.805	8.215
minimum value	18.038	17.719	18.907	18.969	8.200	13.902	0.000	2.079	2.760	4.543
Maximum	20.533	19.944	21.815	21.722	19.200	19.266	15.105	5.684	9.956	11.448

4.2. Regression results and analysis

Based on the preliminary analysis of the previous model and variables, this paper further studies the factors affecting value-added trade. Table 4 and Table 5 report the regression results of model (18) and model (19) respectively. After controlling the annual fixed effect and regional fixed effect, the results show that the total volume of trade exports, the size of fixed asset investment and the size of regional employment

have significantly promoted the outflow of value-added trade, while the number of regional listed companies has a negative and significant impact on the outflow of value-added trade, GDP growth R&D investment and foreign investment have no significant impact on value-added trade outflow. The result shows that the expansion of regional production scale and trade scale will promote the region to climb to the high value-added link of the value chain.

Table 4. Influential factors of value-added trade outflow

VARIABLES	$TiVA_{EX}$
EX	0.604*** (0.0753)
GDP	0.00855 (0.0114)
INV	0.173** (0.0761)
RD	0.00404 (0.00645)
$COMPANY$	-0.244*** (0.0566)
$EMPLOY$	0.0410* (0.0227)
$FOREIGN$	-0.0331 (0.0403)
Constant	4.476** (1.829)
YEAR FE	YES
Cluster province	YES
Observations	85
Number of province	31
R-squared	0.985

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

In the process of value-added trade inflow, the results of Table 5 show that the total volume of trade imports, R&D investment and regional employment scale have significantly promoted the inflow of value-added trade, while GDP growth, fixed asset investment scale, number of listed companies and foreign investment have no significant impact on value-added trade inflow. The result shows that the expansion of regional production scale and trade scale will promote the inflow of value-added trade, and because the R&D link is often characterized by high investment and long cycle, more external resources are often needed when the region is committed to R&D investment and production.

Table 5. Influential factors of value-added trade inflow

VARIABLES	TiVA IM
IM	1.307*** (0.141)
GDP	0.00780 (0.00581)
INV	0.0592 (0.0697)
RD	0.00934** (0.00449)
COMPANY	0.0744 (0.0589)
EMPLOY	0.0209** (0.00921)
FOREIGN	0.00115 (0.0298)
Constant	-8.783*** (3.082)
YEAR FE	YES
Cluster province	YES
Observations	85
Number of province	31
R-squared	0.987

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

5. Conclusion and Enlightenment

The traditional gross trade statistics method will distort the international trade volume, seriously aggravate the imbalance of trade measurement, and cause the estimation deviation of the international status of countries in different links of the global value chain. The research and analysis in this paper shows that due to the problems such as the repeated calculation of intermediate products, there are errors that cannot be ignored in the trade volume under the gross value accounting. Therefore, it is very necessary to measure the trade volume from the perspective of value-added of the value chain. Compared with the development direction of accounting methods, value-added trade can more reflect the real situation of trade than value-added trade, which is helpful to eliminate duplicate statistics and form a more real understanding of the trade situation.

Through the deduction of the two countries' model, based on the structure of the input-output table, the statistical formula of the import and export volume of value-added trade can be obtained. Through the net calculation, it is found that the net trade volume will not change under the gross trade statistics method and the value-added trade statistics method,

but there is a large distortion in the specific import and export volume. In the more general three-country model, the general statistical formula applicable to the actual input-output table is deduced, and the conclusion that the net trade remains unchanged is verified. After calculating China's interregional input-output data in 2002, 2007 and 2010, it is found that the gap between the two methods is obvious, especially in regions with developed manufacturing industry and frequent participation in trade activities, due to frequent trade activities in intermediate products.

Based on the deductive conclusion of the model, this paper analyzes the influencing factors of the net trade in value-added with China's inter-provincial data as a sample, and draws the overall conclusion that trade scale, R&D investment, fixed asset investment, employment scale, etc. will have a significant impact. According to the comparative analysis of value-added trade, from the perspective of time span, China's provinces have significantly deepened their participation in the global value chain year by year, and the scale of income has also increased. From the regional level, although the income scale gap between provinces has increased, it has slowed down or even narrowed, indicating that the construction of domestic value chains can indeed alleviate the regional gap caused by participating in global value chains.

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