The Calculation and Impact of Specific Factors about China's "Trade in Value-Added" to U.S

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Abstract. Based on the input and output database, first of all, we accounted overall manufacturing and 14 subdivision industries' "Trade in value-added" of China to the United States in 2000-2011. Compared with the traditional trade volume method, China's trade interests has fallen dramatically. According to the calculation results, we analyzed the present situation of the "Trade in value-added" in manufacturing industry to United States. By using panel data, from the upstream, industry scale, R&D input and foreign capital, we carried on the empirical research to analyze influencing factors of "Trade in value-added". The results showed that the industry scale and R&D investment have positive influences on promoting "Trade in value-added", and foreign capital and upstream degrees has negative correlation. China's international division of labor is relatively low.

Introduction

China's trade deficit with the United States has been increasing, the United States insists that China has seriously damaged its trade interests through unfair trade competition and has become China's largest trade deficit country. But China believes that it is at the low end of the global value chain, and the actual benefits obtained are few. So what is the true interest of China's manufacturing trade with the United States, and what factors are affected by it? Therefore, it is of great significance to correctly measure the trade interests of China and the United States to provide empirical support for the domestic value-added of China's manufacturing industry. At the same time, it is of practical significance to analyze the domestic influencing factors to provide ideas for the transformation and upgrading of China's foreign trade and even industrial structure.

China's Export Value Added to the US Manufacturing Industry

Basic principle of value added accounting: This paper draws on Koopman et al. (2012) to measure the domestic value added of China's manufacturing exports to the US based on the value-added decomposition method of total exports. The method is now introduced as follows:

It is assumed that there are G countries and N departments, all products can be used as intermediate inputs and final consumption products are used by domestic and foreign countries. A country's total output can be broken down into intermediate inputs and final consumption. The intermediate inputs can be divided into domestic intermediate inputs and foreign intermediate inputs. The final consumption is divided into domestic end use and foreign end use:

$$x_s = a_{ss}x_s + \sum_{r\neq s}^{G} a_{sr}x_r + y_{ss} + \sum_{r\neq s}^{G} y_{sr},\ \ r、\ s = 1,2,\cdots G \qquad (1)$$

Where and represent the total output of the s and r countries; a_{ss} indicates the direct consumption coefficient of national output in the production process of the country, $a_{ss}x_s$ indicates the consumption of domestic output during the production process; a_{sr} indicates the direct consumption coefficient of intermediate products produced by country r in the production process, $\sum_{r\neq s}^{G} a_{sr}x_r$ represents the total consumption of intermediate products produced by G countries in the

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production process of the country, y_{ss} indicates the final use of the country by the country; $y_{sr,}$ represents the final use of products by country r, $\sum_{r\neq s}^{G} y_{sr}$ represents the final use of G countries to the s. The sum of the first two terms on the right side of the Eq.1 is the part of the domestically produced medium-sized input that meets the domestic and foreign production, and the sum of the latter two represents the final demand part of the domestic and foreign countries.

Accounting and comparison of China's manufacturing export value added to the US: This paper refers to Jiang Xi and Liu Xiangchen (2014),and gives a unified comparison table between National Economic Classification Standard (GB) and International Standard Industrial Classification (ISIC3.0) to Tiemei and Huang Jingbo (2008).

Table 1 Manufacturing Industry Classification

Serial number	GB2002	ISI/Rev3(WIOD)	Industry name
1	3、14、15、16	15、16	Food, beverage and tobacco processing
2	17、18	17、18	Textile and Apparel
3	19	19	Leather
4	20	20	Wood products
5	22、23	21、22	Paper, paper products, publishing, print
6	25	23	Processing of coke, refined petroleum products ,nuclear fuel
7	26、27、28	24	Manufacture of chemical raw materials and chemicals
8	29、30	25	Manufacture of rubber and plastic products
9	31	26	Manufacture of other non-metallic products
10	32、33、34	27、28	Manufacture of basic metals and metal products
11	35、36	29	Manufacture of general purpose and special equipment
12	39、40、41	30、31、32	Electronics, instrumentation, instrumentation equipment manufacturing
13	37	34、35	Manufacturing of transportation equipment
14	21、43	36、37	Manufacturing recycling

This paper selects the world input-output database from 2000 to 2011,which has carried out value-added accounting on the scale of China's manufacturing exports to the United States, the results show, compared to traditional methods of total trade statistics, using the value-added trade accounting method, the profit of China's manufacturing industry to the United States has been greatly reduced.

Analysis of Factors Affecting Export Value Added

International division of labor: Continuous global refinement of production division、increasing production process and growing industry chains make different production links separate in different countries, each country produces products with varying degrees of intermediate products from other countries, formed a "global value chain". Under the current international division of labor, international division of labor refers to the position of a country in the global value chain, different value chain positions represent different levels of value appreciation.

Industry size: The specific mechanism of the industry's scale of trade value added to exporting countries mainly has the following aspects: first, the expansion of the industry scale reduces the production costs per unit of product, formed internal economies of scale, occupying a larger international market through price differences in the global market to gain more profits. Second, the scale of the industry is expanding along with the gathering of enterprises in the same industry, enables enterprises to gain advantages in commodity sales, logistics materials transportation and information acquisition, and enhance the external economies of scale of enterprises.

Technological innovation: Technological innovation affects the domestic value added of exporting countries through the following mechanisms of action: first, high-tech industries are the main source of added value in exporting countries, it also promotes the development of other industries; second, in global production and in a free trade environment, transnational trade also has technology spillover effects in developed countries; third, by introducing high technology into

traditional industries, production efficiency can be increased, thereby increasing the added value of exporting countries.

Foreign direct investment: The specific mechanism of the domestic value added of foreign capital and export trade mainly has the following aspects: first, capital exporting countries can get cheap labor factors. For the host country, in addition to bringing capital, foreign capital can also upgrade domestic production technology and promote its domestic enterprises to enter the international market. The inflow of foreign capital accompanied by the introduction of a large number of foreign-funded enterprises has created a large number of jobs for the host country, which can promote the improvement of employment level, labor compensation and labor skills, thus improving the level of export commodities and labor compensation.

An Empirical Analysis of the Factors Affecting China's Export Value Added to Manufacturing Industries

Model construction: According to the theory introduced above, this paper selects the four indicators of international division of labor status, industry scale, technological innovation, and foreign capital as explanatory variables, analyse their impact on trade value added, and for the panel analysis of the export value-added data of 14 sub-manufacturing industries from China to the United States from 2000 to 2011, this paper establishes the following panel data model:

$$TIVA_{it} = \alpha_i + \beta_{i1} USN_{it} + \beta_{i2} SCA_{it} + \beta_{i3} RD_{it} + \beta_{i4} FDI_{it} + \mu_{it} \quad (1)$$

Indicator description and data source.

Export domestic value added: $TIVA_{it}$ indicates the value added to the export country, Calculated according to the WIOD national input-output table.

International division of labor:this paper selects the upstream degree of the USN industry to measure the status of international division of labor.

Industry size:this paper selects the industrial sales value (the current year price) of industrial enterprises above SCA scale as the reference index of the industry scale, and the data comes from the China Industrial Statistical Yearbook.

Technological innovation:this paper selects the internal expenditure of R&D funds of enterprises above designated size as the reference indicators for scientific and technological innovation. The data comes from the China Science and Technology Statistical Yearbook.

Foreign direct investment:this paper selects the actual investment of foreign capital of enterprises above designated size as the reference index of foreign capital, and the data comes from the National Bureau of Statistics of China. μ indicates other factors that can affect the value added of exports. Due to the problem of statistical caliber, only the annual industrial data since 2000 are included on the website of the National Bureau of Statistics of China, the WIOD national input and output is currently only updated to 2011, therefore, the sample interval of this paper is from 2000 to 2011.

Quantitative analysis.

Unit root test:in order to avoid pseudo-regression, this paper uses Eviews6.0 to perform Levin, Lin & Chu (LLC) test. The results are shown in the following figure:

Table 2 Unit root test result

Variable	Statistical value	P value
D(TIVA)	-6.90656	0.0000
D(UPN)	-3.03599	0.0012
D(SCA)	-12.0452	0.0000
D(RD)	-8.31264	0.0000
D(FDI)	-10.7791	0.0000

Unit root of the TIVA、UPN、SCA、RD、FDI are not present in the first-order difference, so

the panel data is smooth.

Model selection:use Hausman to test whether the model is a random effect model, p value is 0.0005, less than 0.05. Therefore rejecting the null hypothesis, a fixed effect model should be established.

Regression result: take the natural logarithm of the relevant variables, the regression results are as follows:

Table 3 Empirical Results

Variable	Coefficient	Statistical value	P value
C	-4.439197	-7.474300	0.0000
USN	-0.817001	-4.888222	0.0000
SCA	0.664205	-4.354450	0.0000
RD	0.524265	9.380851	0.0000
FDI	-0.272101	-2.104378	0.0325
R^2	0.978319	P	0.000000
F	398.1522	DW	1.318327

The regression results show that the industry size (SCA), industrial upstream (USN), and R&D inputs (RD) all passed the 1% significance level test, Foreign Capital (FDI) passed a test with a 5% level of significance. The regression fit coefficient is 0.978, it shows that the regression results have a good fit to the equation, P=0.0000, indicating that the model passes the 1% significance test.

Analysis Conclusion

Under the global value chain division system, a large number of imported parts and raw materials are used in China's exported products, forming a division of labor for downstream low-value-added processing and assembly of imported intermediate products. At the same time, the United States relies on its technological advantages to engage in upstream high value-added production links, forming a trade pattern for exporting high-value-added products to import final products. Therefore, under the traditional total trade statistics mode, the trade surplus between China and the United States has continuously expanded. This paper selects the export trade value-added measurement model, uses the world input-output table, eliminates the value of foreign intermediate inputs in exports, and estimates the actual trade benefits of China's manufacturing industry and 14 sub-sectors exported in 2000-2011. Based on this, the panel data is used to empirically study the factors affecting the domestic value added of China's export trade from the status of international division of labor, industry scale, R&D investment, and foreign capital.

First, calculate the overall value-added and value-added rate of manufacturing export trade, the results show that compared with the traditional method of total trade statistics, the use of value-added trade accounting method has greatly reduced the profitability of China's manufacturing exports to the United States. However, after eliminating the scale effect, from the perspective of relative indicators, the export value-added rate has not yet reached 50%, and it is stable between 40% and 50%, with an average of only 42.34%. This shows that only 42.34% of China's trade exports to the US manufacturing industry are China's real export trade interests, and the benefits are less than half of the total trade volume. In recent years, the export value-added rate has been declining overall, from 2000. 47.08% fell to 39.86% in 2011. In the sub-sectors, China’s exports of high-tech equipment such as electronics, instruments and meters are increasing. The added value of the industry is much higher than other industries, but its ratio of total value added is decreasing. 37.59% of 2000 dropped to 32.10% in 2011, From the perspective of international division of labor, China is in a position where the global product value chain has a low division of labor. Actually, it is only engaged in the processing and assembly of these high-tech products, while the R&D and design parts with high added value of products are completed by developed countries. This explains why China's manufacturing industry is increasing its export of technical products while its overall value-added ratio is declining. In general, the contribution rate of export value of various industries to the value-added of the overall manufacturing industry tends to be stable.

Secondly, in the empirical analysis of the factors affecting the value-added of domestic exports, the rate of change in industrial scale plays the most important role. For every 1% increase in industrial scale, the value added of exports will rise by 0.664%, China has been relying on the expansion of industrial scale to increase China's export domestic value added, and empirical evidence shows that economies of scale are an effective method. The investment in scientific research funds of enterprises above designated size also has an obvious pulling effect. For every 1% increase in investment in scientific research, the value added of trade increases by 0.524%. The investment in research funding provides an innovative platform to support the research and development of new industrial technologies. There is a strong negative correlation between industrial upstream and foreign capital and domestic value added. For every 1% increase in industrial upstream, export value added will fall by 0.817%. This shows that it is more advantageous to produce industries with lower upstream levels (downstream industries with closer final demand). In addition, for every 1% increase in foreign capital, the value added of exports will fall by 0.272%, indicating that foreign capital inflows will run through some of the original domestic investments. Due to the limitation of technology level, the main input of China's product production is labor factor and resource element. Domestic enterprises rely heavily on imports when purchasing production equipment and intermediate products. In addition, international capital tends to complete the assembly chain with low added value in the value chain, making it difficult for China to increase the added value of export trade.

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