

Research on Performance Evaluation of Global Value Chain of Manufacturing Industry in China and the United States

Zuchang Zhong^{1,a}, Shiyun Li^{2,b}, Xiaoxia Ji^{2,c}, Zhuanghong Zheng^{3,d} and Fanchao Meng^{2,e}

¹Guangdong Institute of International Strategy, Guangdong University of Foreign Studies, Guangzhou510000, China;

² Guangdong University of Foreign Studies, Guangzhou510000, China;

³ UNCTAD/WTO International Trade Centre, Guangzhou510000, China

^azhongzuc@163.com, ^b1161058953@qq.com, ^c976224056@qq.com, ^d154497293@qq.com, ^e1153481969@qq.com

Abstract. Using the latest value-added trade data of the OECD-TIVA database, we estimate the position and participation mode of the manufacturing industry and its sub-industries in the two countries in the GVC division of labor. The results show that : (1) since 2005, the division of labor in the global value chain of China's manufacturing industry has been gradually improving, while the United States has been gradually declining. (2) China's position in the global value chain of manufacturing industry is getting closer to that of the United States. China's total participation in manufacturing industry has been higher than that of the United States for a long time. (3) China's manufacturing industry is becoming less and less dependent on the US. On the contrary, the US is becoming more and more dependent on China.

Keywords: Sino-US Manufacturing Industry; Global Value Chains; Division of Labor; The Embedded Mode; Performance Evaluation.

1. Introduction

In today's highly globalized world, the GVC division of manufacturing process has become an important driving factor for the development of the world economy. Judging from the development of manufacturing in China and the United States and the results of their respective performance evaluations, China has now become the largest manufacturer in the world. In addition, the proportion of Sino-US manufacturing in the world has risen from 30.88% in 2004 to 43.39% in 2016. Therefore, maintaining long-term and stable cooperation between China and the US economy is essential for the healthy and stable development of the world economy.

In recent years, global value chains (GVCs) become the focus of many scholars' research. Such as Daudin(2011) used the Global Trade Analysis model (GTAP) to build a calculation formula to measure the added value of industries or countries, reflecting the value appreciation of final consumer goods or intermediate goods. Based on the multi-regional input-output (MRIO) model of the world, Koopman(2010) constructed GVC status index and GVC participation index respectively to reflect a country's status in the GVC division of labor and its participation degree in the GVC division of labor from the perspective of quality and quantity.

Many domestic scholars use the above index to analyze the international competitiveness of manufacturing industries in China and the United States. Yu Jue(2017) used KPWW algorithm to calculate the dominant comparative advantage, intermediate dominant comparative advantage and embedded GVC in 19 sample manufacturing industries between China and the United States from 2000 to 2014, and concluded that China lags behind the United States in the position and participation degree of embedded GVC in most manufacturing industries. Li yuan and Kim Dianchen used the GVC division of labor index proposed by Koopman et al. to compare and analyze the international competitiveness of Chinese and American manufacturing industries.

Early scholars mainly focused on the internal connections and external dependencies formed by the transnational economic community in the process of embedding the GVC. Wang et al. (2009) examined the internal dependence of the East Asian region on value-added trade. Pan Wenqing et al. (2016) analyzed the added value of NVC and GVC participation in various regions in China from

the perspective of value-added performance. Li Shantong et al. (2018) analyzed the status of different regions in China participating in GVCs and domestic value chains.

About performance evaluation, Liu Yanhua (2021) deployed various management work of the enterprise based on the evaluation results by building a complete performance evaluation system; Liu Lei et al. (2021) and the distribution of performance evaluation results in discipline attributes and project host characteristics; Zhang Tao et al (2021) build a performance evaluation model of travel security system for low driving power population based on matter-element analysis.

Based on the above research, this paper makes a comparative analysis of the international competitiveness and division of labor of Chinese and American manufacturing industries by using the TIVA database jointly released by WTO and OECD and the GVC status index and GVC participation index proposed by Koopman (2010,2014).

2. Research Methods and Data Sources

2.1 Research Methods

2.1.1 Use the added value of trade to measure the status of product GVC upgrading from another perspective

From the perspective of added value of trade, Koopman (2010) constructed two indicators, GVC Participation and GVC Position, to fully and truly reflect the changes and trends of GVC and regional value chains. This topic of typical developed countries mainly from Koopman status of

global value chain division of labor (2010) measurement, $GVC_Participation = \frac{IV_{ir}}{E_{ir}} + \frac{FV_{ir}}{E_{ir}}$, and

IV representatives Country r's intermediate goods trade, export i to other countries, FV on behalf of Country r's industry i that is contained in the final product of imported products' value. E representatives Country r's industry i in terms of the added value of exports, IV_{ir} / E_{ir} is the former to the participation to the vertical specialization ratio (ahead), is used to reflect the degree of one country in the middle of the product to the contribution of the foreign supply chain, FV_{ir} / E_{ir} is the participation rate for the following (to the vertical specialization ratio), is used to reflect a country's imports of intermediate goods to foreign dependence of the supply chain.

$GVC_Position = \ln(1 + \frac{IV_{ir}}{E_{ir}}) - \ln(1 - \frac{FV_{ir}}{E_{ir}})$, the higher the value is, the higher the country is located in the upstream of GVC and the higher the division of labor status in GVC.

2.1.2 Measure the interdependence between the typical developed country and other countries

We refer to Zhang Huiqing (2018) to design the forward dependence index: $BiDVA_{cj} (= RDVA_{cj} / RDVA_{jc} = (DVA_{cj} / DVA_c) \div (DVA_{jc} / DVA_j))$ and backward dependence index $BiFVA_{cj} (= RFVA_{cj} / EFVA_{jc} = (FVA_{cj} / FVA_c) \div (FVA_{jc} / FVA_j))$ to measure the characteristics of the dependence between the typical developed countries and the major economies in the global value chain, and focus on the evolution of the bilateral relations between the typical developed countries and the major economies. Among them, subscript c represents a typical developed country, and j represents a partner country of trade added value. $RDVA_{cj}$ is the proportion of the value added of exports from typical developed countries to Country j in the total value added of exports from typical developed countries, and measures the forward dependence of typical developed countries on Country j. $RDVA_{jc}$ is the proportion of the domestic value added of Country j's exports to typical developed countries in the total value added of Country j's exports to typical developed countries, and measures the forward dependence of Country j on typical developed countries. If $BiDVA_{cj}$ is greater than 1, it indicates that the forward dependence of a typical

developed country on Country j is higher, and the value added export of a typical developed country is more dependent on the market of Country j ; otherwise, it indicates that the value added export of Country j is more dependent on the market of a typical developed country. The meaning of backward dependence index is the same.

2.2 Data Sources

All the indicators are calculated using the TIVA statistics jointly released by WTO and OECD from 2005 to 2015. The data on the factors affecting the location of GVCS are all from the world bank's development indicators database. At the same time we reference WIOD database for industry classification method, and the OECD development rule of density in the database, manufacturing can be divided into low technology manufacturing, middle technology manufacturing, high technology manufacturing, of different types in different development stages of manufacturing embedded GVC model for further analysis.

Table 1 Manufacturing Industry Classification Table

Industrial Category	Industry Code	Specific Industry
Low-tech Manufacturing	D10-18	food, drink and tobacco; textiles, clothing, leather and related products; wood and wood and cork products; paper products and printing
Middle-tech Manufacturing	D19-25	coke and refined petroleum products; chemicals and pharmaceutical products; rubber and plastic products; other non-metallic mineral products; base metals; metal products
High-tech Manufacturing	D26-30	computer, electronic and optical products; electrical equipment; mechanical equipment; transportation equipment

3. Analysis and Discussion of Empirical Results

3.1 Comparative Analysis of the Division of Labor in the Global Value Chain Between China and the United States

Table 2 Position Table of Global Value Chain Division Between China and the United States

	Overall Manufacturing Sector		Low-tech Industry		Middle-tech Industry		High-tech Industry	
	U.S.	China	U.S.	China	U.S.	China	U.S.	China
2005	0.178	0.111	0.299	0.234	0.171	0.161	0.153	0.028
2006	0.163	0.118	0.286	0.238	0.151	0.170	0.143	0.037
2007	0.162	0.140	0.291	0.261	0.153	0.179	0.140	0.068
2008	0.149	0.164	0.288	0.267	0.123	0.180	0.135	0.113
2009	0.183	0.210	0.308	0.297	0.158	0.222	0.170	0.167
2010	0.161	0.180	0.302	0.269	0.137	0.184	0.144	0.142
2011	0.139	0.174	0.299	0.258	0.110	0.164	0.123	0.142
2012	0.152	0.198	0.307	0.275	0.125	0.201	0.134	0.159
2013	0.174	0.206	0.318	0.279	0.155	0.215	0.150	0.166
2014	0.175	0.219	0.314	0.285	0.165	0.229	0.142	0.183
2015	0.190	0.252	0.317	0.314	0.186	0.286	0.158	0.209

The position of the US manufacturing industry in the GVC division of labor has shown a trend of first decreasing and then rising since 2005, but the overall volatility is not large. In the past 10 years, the GVC index of the U.S. manufacturing industry is positive and has a large value, which shows that it is still in the upstream position of the GVC and has a high international division of labor

because of the high yield. However, with the rapid rise of China, the importance of US manufacturing in the division of labor in the GVC is declining. The position of China's manufacturing industry in the GVC division of labor has been rising, from 0.111 in 2005 to 0.252 in 2015, an increase of 0.141 in 11 years. The position of the division of labor in the technology industry has surpassed the United States and has been in the lead since 2006. It is worth noting that the high-tech industry showed a significant growth trend from 2005 to 2009. In 2009, the position index of China's manufacturing industry in the GVC division of labor surpassed that of the United States for the first time. The added value of China's manufacturing industry also surpassed the United States for the first time in 2010, becoming the world's largest manufacturing country.

3.2 Comparative Analysis of GVC Participation Models Between China and the US

Table 3 Comparison of Overall Participation Modes of the Manufacturing Industry

	Forward Participation		Backward Participation		Total Participation	
	China	U.S.	China	U.S.	China	U.S.
2005	0.436	0.391	0.284	0.165	0.720	0.556
2006	0.439	0.383	0.279	0.175	0.718	0.558
2007	0.457	0.389	0.266	0.181	0.723	0.570
2008	0.468	0.390	0.246	0.198	0.713	0.589
2009	0.493	0.387	0.210	0.155	0.703	0.541
2010	0.469	0.383	0.226	0.177	0.695	0.560
2011	0.467	0.383	0.233	0.204	0.700	0.586
2012	0.490	0.395	0.223	0.199	0.713	0.594
2013	0.496	0.409	0.218	0.184	0.714	0.593
2014	0.505	0.406	0.209	0.181	0.715	0.586
2015	0.528	0.399	0.187	0.156	0.714	0.555

Since 2005, the overall participation of manufacturing industries in China and the United States has not changed much. The United States has maintained between 55% and 60% in most years, while China has maintained around 70%, which shows that China plays the role of both a major importing country and an exporting country, and its pivotal role and intermediary role in the division of labor in the GVC of manufacturing are constantly increasing. From the perspective of the embedded model of the GVC of manufacturing, since 2005, the forward participation of the manufacturing industries in China and the United States has been much higher than the backward participation, and there is a trend of rising fluctuations. The difference increased from 0.045 in 2005 to 0.129 in 2015, which also illustrates China's important position in global manufacturing.

3.3 Backward Participation of China and the United States

Table 4 Comparison of Participation of Manufacturing Industries

	Low-tech Industry		Middle-tech Industry		High-tech Industry	
	Total Participation					
	U.S.	China	U.S.	China	U.S.	China
2005	62.90	64.32	58.22	69.26	52.75	76.87
2006	61.53	63.71	59.07	69.89	52.93	76.94
2007	63.01	64.11	60.30	70.12	53.97	77.22
2008	64.52	62.22	63.17	69.51	54.66	76.47
2009	59.95	60.46	56.39	68.61	51.34	75.98
2010	62.80	58.48	59.80	67.98	51.53	75.27
2011	66.44	59.49	62.85	69.00	52.91	75.64
2012	67.08	60.08	62.82	69.81	54.53	77.01
2013	66.71	59.60	62.92	70.69	54.08	77.01
2014	66.34	59.76	60.94	70.78	54.74	77.03
2015	64.42	61.19	55.35	70.35	53.42	76.39

From the perspective of GVC participation of different industries, the participation of low-tech industries in the United States is higher than that of medium and high-tech industries from 2005 to 2015. The participation of the technology industry is the lowest, and there is no major fluctuation in 10 years. This shows that the structure of the US manufacturing industry is dominated by high-tech industries, and the main manufacturing industries are computers, electronics, and optical products. Development mainly focuses on high-end links in the GVC such as design, branding, and marketing. Most of the manufacturing links take the form of outsourcing. Their reliance on foreign value chains is high, and the embedding of GVCs in low-tech industries is gradually increasing. The trend is that low-tech industries are more closely linked to GVCs, while middle- and high-tech industries, especially high-tech industries, are less dependent on foreign value chains. Compared with the United States, China's situation is exactly the opposite. China's low-tech industry's participation is lower than that of the medium-tech industry and the high-tech industry. The low-tech industry mainly plays the role of pure export, and its GVC embedding degree is continuously decreasing. Foreign value chains are less dependent, while high-tech industries play a dual role of imports and exports. Their links with foreign value chains are closer, and their degree of embedding in GVCs remains basically unchanged. Comparing the total participation of low-tech industries in China and the United States, the United States began to surpass China in 2008. China's total participation in the manufacturing industry has shown a downward trend, indicating that the United States is increasingly relying on the production model of OEMs in other countries. In terms of technology manufacturing, both China and the United States have stabilized. This shows that both China and the United States have shown good development momentum in the high-tech industry.

Table 1 Comparison of Participation Modes of Manufacturing Industries by Industry

	Forward dependence	Forward dependence	Backward dependence	Backward dependence	Forward dependence	Forward dependence	Backward dependence	Backward dependence	Forward dependence	Forward dependence	Backward dependence	Backward dependence
	U.S.	China	U.S.	China	U.S.	China	U.S.	China	U.S.	China	U.S.	China
2005	50.93	47.58	11.97	16.74	40.15	45.43	18.07	23.84	36.02	40.38	16.73	36.49
2006	49.33	47.47	12.20	16.25	39.29	46.38	19.79	23.52	35.51	41.05	17.43	35.89
2007	50.52	49.17	12.49	14.94	40.08	47.12	20.22	22.99	35.84	43.30	18.13	33.92
2008	51.17	48.51	13.35	13.71	39.68	46.85	23.49	22.66	35.90	46.01	18.76	30.46
2009	49.87	49.43	10.08	11.02	38.28	49.18	18.11	19.43	36.31	49.49	15.04	26.49
2010	51.09	46.54	11.71	11.94	38.76	46.26	21.04	21.72	34.79	47.38	16.74	27.89
2011	53.00	46.41	13.45	13.08	38.63	45.52	24.22	23.48	34.21	47.57	18.70	28.07
2012	53.88	47.78	13.20	12.29	39.63	48.43	23.19	21.38	35.79	49.50	18.74	27.50
2013	54.36	47.81	12.36	11.79	41.61	49.83	21.31	20.86	36.55	50.00	17.53	27.01
2014	53.89	48.27	12.45	11.48	41.23	50.85	19.71	19.93	36.39	51.12	18.35	25.91
2015	52.97	50.94	11.45	10.25	39.53	54.36	15.82	16.00	36.68	52.59	16.74	23.80

Judging from the embedding models of different industries, the low-tech industry mainly uses the forward embedding model to participate in the GVC division of labor. The forward participation rate accounts for over 80% of the overall participation rate. The medium-tech industry and the high-tech industry present the results of the joint promotion of forward participation and backward participation. China's low-tech industry's forward participation rate has slightly increased, and its backward participation rate has dropped significantly, making the low-tech industry's GVC division of labor position continuously rising. Similar to the situation in the United States, China mainly uses forward participation to integrate into the GVC division of labor, and the forward participation rate accounts for more than 80% of the overall participation rate. The proportion of China's mid-tech industry's forward participation rate in the overall participation rate has gradually increased, reaching 77.3% in 2015, while the backward participation rate in the overall participation rate has decreased year by year. This shows that as the industry continues to upgrade, the degree of dependence of industrial exports on foreign value chains has gradually decreased, and independent production capacity has continued to increase. The embedding model of China's high-tech industry has changed greatly in the past 10 years, and the forward participation rate has been greatly improved, while the backward participation rate has dropped significantly. This shows that China's high-tech industry has achieved rapid development, industrial technology level and industrial innovation ability have been greatly improved. The development of high-tech industry has changed from relying heavily on imported intermediate products in the past to reducing intermediate import dependence and independent innovation. Industry will become the main direction of the transformation and upgrading of China's manufacturing industry and the focus of future economic development.

3.4 Synergy analysis of Sino-US GVC

3.4.1 Comparison of the regional structure of the sources of value added of manufacturing exports abroad between China and the United States

The proportion of U.S. manufacturing export value added from China increased from 8.64% in 2005 to 18.94% in 2015, an increase of 10.3 percentage points in 11 years. The value added of China's manufacturing exports abroad from the United States has only increased by 1.27 percentage points in 11 years. This shows that the dependence of U.S. manufacturing exports on China is increasing. From the perspective of the source structure of China's manufacturing industry's export value-added abroad, the value added of US manufacturing industry's export value-added from East and Southeast Asia is the highest. Followed by the Americas, Europe and the rest of the world, the proportion of value added from East Asia and Southeast Asia shows a gradual increase, and the proportion of the value added from Europe and other regions of the world has decreased, which shows that US manufacturing exports to East Asia, Southeast Asia and the Americas have strong dependence on the value chain. East and southeast Asia accounted for the highest proportion of the added value of China's manufacturing exports abroad, reaching 41.59 percent in 2015, followed by the rest of the world, the Americas and Europe. The proportion from other parts of the world increased by a large margin, the proportion from the Americas increased by a small margin, and the proportion from east Asia and southeast Asia gradually declined. This shows that China's manufacturing exports are more dependent on the value chain in east Asia and southeast Asia.

Table 6 Comparison of the regional structure of sources of value added of manufacturing exports from China and the United States

	The regional structure of American manufacturing export value added abroad (%)					The regional structure of China's manufacturing export value added abroad (%)				
	China	Europe	the Americas	East and southeast Asia	other regions	U.S.	Europe	the Americas	East and southeast Asia	other regions
2005	8.64	26.09	27.59	27.67	18.65	9.86	16.88	14.75	51.56	16.80
2006	9.33	24.60	28.16	26.50	20.74	10.05	16.25	15.06	49.59	19.10
2007	9.95	24.09	28.44	26.25	21.22	9.64	16.70	15.70	47.31	20.29
2008	10.58	21.90	27.36	24.02	26.72	9.23	17.37	15.62	41.29	25.72
2009	11.04	21.48	29.22	25.15	24.15	9.30	16.87	16.29	43.97	22.87
2010	10.26	19.89	30.32	23.71	26.08	8.95	15.09	16.55	41.66	26.69
2011	10.35	19.01	31.15	22.41	27.42	8.41	15.71	16.49	37.70	30.10
2012	11.25	18.83	30.38	23.83	26.96	8.74	16.49	16.17	37.81	29.53
2013	13.22	18.59	30.89	25.39	25.13	9.27	16.08	16.30	37.91	29.70
2014	14.69	19.57	30.47	27.64	22.31	9.51	17.41	16.48	37.70	28.42
2015	18.94	21.52	29.19	33.28	16.01	11.13	17.64	17.86	41.59	22.91

3.4.2 Proportion of foreign added value of Chinese and American manufacturing exports

Since 2005, the proportion of China's foreign added value in exports from Europe, the Americas, Asia and other regions of the world has gradually increased, with the largest increase in the Americas, reaching 15.45 percentage points, mainly from the United States' contribution. China's contribution to the value chain of east and southeast Asian countries is the largest, this shows that most countries and regions in the world are importing more intermediate products from China, and their dependence on China's manufacturing value chain is increasing. Comparing the changes of China from the United States, the proportion of the United States in the value added of exports from East Asia and Southeast Asia, the Americas and other parts of the world fell by 3.59%, 2.6% and 0.28% respectively from 2005 to 2015, it is a sign of weakening demand for American-made goods in southeast Asia and the United States. From the perspective of absolute contribution, the American countries have the largest contribution to the value chain, followed by Europe, East Asia, and Southeast Asia, which has the smallest contribution to the value chain of the rest of the world.

Table 7 Proportion of foreign added value of Chinese and American manufacturing exports

Time	Proportion of U.S. manufacturing value added in China and other regions (%)					Proportion of China's manufacturing value added in the U.S. and other regions (%)				
	China	Europe	East and southeast Asia	the Americas	other regions	U.S.	Europe	East and southeast Asia	the Americas	other regions
2005	9.86	22.30	22.51	47.04	12.94	8.64	8.88	15.85	11.75	7.60
2006	10.05	21.19	21.26	46.27	13.05	9.33	9.58	16.39	13.24	9.05
2007	9.64	20.34	19.32	44.12	12.59	9.95	11.47	18.19	14.30	9.95
2008	9.23	19.62	16.35	43.84	12.66	10.58	11.83	17.95	15.32	11.24
2009	9.30	24.11	18.25	44.89	13.73	11.04	12.09	19.88	16.86	11.83
2010	8.95	20.80	16.62	44.41	13.60	10.26	12.61	18.61	16.32	12.62
2011	8.41	18.92	14.68	42.73	13.22	10.35	12.54	19.15	16.63	13.30
2012	8.74	19.02	14.34	41.64	13.55	11.25	12.97	19.88	17.96	13.90
2013	9.27	20.15	14.76	44.38	13.09	13.22	14.21	21.14	20.69	15.53
2014	9.51	20.78	15.39	46.42	12.60	14.69	15.97	23.30	22.70	17.27
2015	11.13	23.90	18.92	44.44	12.66	18.94	18.15	29.21	27.30	20.37

3.4.3 Analysis of the dependence of GVCs on manufacturing industries in China and the United States

Table 8 Dependence of GVCs on manufacturing industries in China and the United States

	The proportion of China's manufacturing DVA exports to the U.S.	The proportion of American manufacturing DVA exports to China	China's manufacturing industry's forward dependence on the U.S.	The share of China's manufacturing exports of foreign value added to the U.S.	The share of the added value of us manufacturing exports to China	The backward dependence of China's manufacturing industry on the U.S.
2005	30.52	5.38	5.68	9.86	8.64	1.14
2006	28.58	6.07	4.71	10.05	9.33	1.08
2007	26.00	6.47	4.02	9.64	9.95	0.97
2008	22.87	6.51	3.51	9.23	10.58	0.87
2009	22.67	7.19	3.16	9.30	11.04	0.84
2010	21.39	7.85	2.73	8.95	10.26	0.87
2011	19.79	8.67	2.28	8.41	10.35	0.81
2012	20.38	8.79	2.32	8.74	11.25	0.78
2013	20.49	10.82	1.89	9.27	13.22	0.70
2014	20.75	12.05	1.72	9.51	14.69	0.65
2015	22.50	13.40	1.68	11.13	18.94	0.59

The proportion of China's manufacturing DVA exports to the United States declined from 30.52 in 2005 to 22.50. However, the proportion of added value of China's manufacturing exports in other regions is significantly increasing, which indicates that the direction of China's manufacturing exports is changing. Since 2005, the proportion of DVA exports to China in the manufacturing industry of the United States has been steadily increasing year by year, increasing from 5.38 in 2005 to 13.40 in 2015, and the share of US exports to China has increased significantly in the past 10 years, indicating that China is gradually becoming one of the US countries that focus on manufacturing exports, and trade is getting closer.

4. Conclusions and Suggestions

The results are as follows: First, China's manufacturing industry in the GVC division of labor status rise ceaselessly, annual export growth is much higher than the United States. However, the performance shows that China's manufacturing industry has the first export structure, mainly low technology manufacturing. Second, the added value of China's manufacturing industry and the export structure of the United States to Europe and Southeast Asia are large, while the manufacturing export structure increases. It shows that the two countries all take a fancy to the market in these countries. Third, China's manufacturing industry status in GVC and the United States is increasingly closer to total involvement in manufacturing is higher than the United States for a long time, China and the United States and China manufacturing total participation are stable, mainly manufacturing low technology. Fourth, China is gradually changing its export direction, while the degree of dependence of the United States on China has been steadily increasing.

With the improvement of industrial level and degree of opening to the outside world, along with China's policies issued and implemented, the scale of China's manufacturing industry is rising steadily, becoming the world's largest exporter of manufactured goods. At the same time their participation in GVC are also growing, technology in the manufacturing industry and high-tech manufacturing industry exports and engagement also increased significantly. However, the division of labor status of GVC has not increased significantly. Moreover, it is not difficult to find that there is still a gap between the manufacturing industries of China and the United States by comprehensively comparing the division of labor status of Chinese and American manufacturing industries in the GVC.

The suggestions based on the above conclusions are as follow. First, on the premise of steadily improving manufacturing overall participation ascend emphatically forward participation, especially in technology manufacturing and high technology manufacturing prior to engagement. Second, it's necessary to continue to strengthen the overall participation in the manufacturing industry in east Asia and southeast Asia, combine the strategy of "One Belt And One Road" to actively build the domestic value chain, extend the domestic value chain to neighboring countries and even the world. Third, the two countries should make efforts to build a good market environment and clearly recognize the dependent relationship between the two countries, break the trade barriers, strengthen cooperation and exchanges, and realize collaboration so as to reduce the trade friction in different ways.

Acknowledgements

The research is supported by the National Natural Science Foundation of China (Grant:71673064;71974039), the National Natural Science Foundation of Guangdong(2019A1515011475;2022A1515011866),2021 college students' innovation and entrepreneurship training program of Guangdong University of Foreign Studies(S202111846028).

References

- [1] Daudin, G., C. Riffart, D. Schweisguth, Who produces for whom in the world economy? Canadian Journal of Economics/Revue canadienne d'économie, Vol. 44 (2011) No. 04, p. 1403-1437.
- [2] Koopman, R., et al. Give Credit Where Credit is Due: Tracing Value Added in Global Production Chains. NBER Working Paper Series. (2010).
- [3] Yu Jue. A comparative study of the US-China manufacturing industry embedded in the global value chain under the background of US reindustrialization. Economist. (2017) No. 11, p. 88-96.
- [4] Li Yuan, Jin Dianchen. Comparison of International Competitiveness of Manufacturing Industries between China and the United States-Analysis Based on GVC Participation Index and GVC Status Index. Business Research. (2017) No. 02, p. 79-87.

- [5] Wang Lan, The influence of integration into the global value chain on the status of China's manufacturing industry in the international division of labor. *Statistical Research*. Vol. 31 (2014) No. 05, p. 17-23.
- [6] Liu gravity, Zhao Ying. The dependence of East Asia in the division of labor in the global value chain-an empirical analysis based on TiVA data. *Nankai Economic Research*. (2014) No. 05 p. 115-129.
- [7] Li Genqiang, Pan Wenqing. How domestic value chains are embedded in global value chains: A perspective of value added. *Management World*. (2016) No. 07, p. 10-22+187.
- [8] Li Shantong, He Jianwu, Liu Yunzhong. Research on China's Domestic Value Chain Division of Labor from the Perspective of Global Value Chain. *Management Review*. Vol. 30 (2018) No. 05, p. 9-18.
- [9] Liu Yanhua. Research on the construction of enterprise R & D team performance evaluation system [J] *Shandong human resources and social security*. (2021) No. 12, p. 28-29.
- [10] Liu Lei, Liu Zuoyi, Li Jiangtao. Performance evaluation analysis of fund supported projects of the Ministry of Management Science in 2020. *Journal of management*. Vol. 18 (2021) No. 12, p. 1750-1755.
- [11] Zhang Tao, sun fan, Yang Yang, et al. Cheng Gang Performance evaluation of travel security system for people with low driving power under epidemic situation. *Journal of Wuhan University of technology*. Vol. 43 (2021) No. 10, p. 27-33.
- [12] Zhang Huiqing. The Impact of Asymmetric Changes in Major Currency Exchange Rates on Trade-A Study Based on the Global Vector Autoregressive Model. *International Trade Issues*. (2018) No. 12, p. 135-148.