

# China's Climb of Regional Value Chain under the Framework of RCEP: Based on the Perspective of Value-added in Trade

Anping Huang<sup>1,2,a</sup>, Tao Lyu<sup>1,2,b,\*</sup>, Qiuyan Liang<sup>1,2,c</sup>

<sup>1</sup>School of Economics, Guangxi University, Nanning, China

<sup>2</sup>China Frontier Economic Research Institute, Guangxi University, Nanning, China

<sup>a</sup>annhap@foxmail.com, <sup>b</sup>taolv@gxu.edu.cn, <sup>c</sup>2501309134@qq.com

\*Corresponding author

**Abstract:** Based on the perspective of value added in trade, we analyze the commodity trade between China and RCEP member countries from the perspectives of domestic value added and foreign value added, and measures the participation index and status index of 15 member countries in the global value chain and RCEP regional value chain. To explore ways for China to build RCEP regional value chains to break the "low-end lock-in" in global value chains. The results show that: (1) Trade between China and RCEP members is increasingly close and China is in a dominant position. (2) China's position in the RCEP regional value chain is higher than its position in the global value chain. Building RCEP regional value chains will help China enhance its competitiveness in the medium and high-end sectors.

**Keywords:** RCEP; Regional value chain; Trade in goods; Value-added in trade

## 1. Introduction

Nowadays, the global value chain controlled by Western countries is at risk because of the tide of anti-globalization, trade protectionism and the outbreak of COVID-19. As globalization deepens, the economy and production of enterprises of all countries are not isolated islands. Under the impact of COVID-19, the negative impact of the disruption of the value chain and supply chain on a country's production has multiplied through the upstream and downstream chains.

In the past, most research on value chains focused on the field of global value chains. Hummels (2001)<sup>[1]</sup> proposed the concept of vertical specialization (VS), which was defined as the import input of a country's export, and proposed the single country input-output model for the first time, which laid the foundation for future research on GVC based on the perspective of value added. Koopman (2010)<sup>[2,3]</sup> decomposed the added value of a country's exports into nine parts and proposed a specific method to quantify a country's participation and status in the global value chain. Wang et al. (2013)<sup>[4]</sup> extend the KWW method from bilateral trade to bilateral sectoral trade, and decomposed the value added of a country's exports more finely into 16 components. China has actively participated in the global trade activities since it entered the WTO. Although China is deeply involved in GVC, the intermediate goods that China exports contain a large amount of foreign value added, which can skew China's economic contribution to other economies<sup>[5]</sup>.

China still faces the dilemma of "low-end lock-in" in GVC, because the West still has a firm grip on GVC. The regional transformation of GVC is a developing trend in recent years. Baldwin (2012)<sup>[6]</sup> was the first to discuss global value chain and regional value chain together. The industrial complementarity between China and the countries along the Belt and Road is strong but the competition is weak, and China has advantages in high value-added links, which means China has the conditions to lead the regional value chain of the Belt and Road<sup>[7]</sup>. China is also an important participant in the Asia-Pacific value chain. The RCEP will come into effect in 2022, providing a new path for China to build a RVC. RCEP economies enjoy promising prospects for cooperation in high-end manufacturing, and RVCs are the future direction of China's manufacturing industry<sup>[8]</sup>. The RCEP member countries enjoy tiered economic development and complementary factor endowments, which will enable China to obtain raw materials and technologies from member countries and open up a bigger market for Chinese goods. Meanwhile, the RCEP RVC is an important part of the "international cycle" for China.

Based on the perspective of value added in trade, we makes a comparative analysis of the differences

between China and other member countries in the position of GVC and RCEP RVC, and then discusses how China can upgrade its industrial structure by building and leading RCEP RVC.

## 2. Theoretical analysis and measurement methods

### 2.1 Theoretical analysis

With the deepening of economic globalization, countries participate in the global division of labor by virtue of their factor endowment and industrial comparative advantages. The trade of intermediate goods has replaced the traditional trade of final products and become the mainstream of international trade. Therefore, taking value-added as the statistical caliber of international trade accounting can reflect the real situation of international trade more accurately.

There are two main ways to calculate import and export trade based on value added: Value Added in Trade (VAiT) and Trade in Value Added (TiVA). The former only considers the place of value creation rather than the place of value absorption, and focuses on the scale of domestic value added in export. The latter considers both the place of value creation and the place of value absorption. Only the domestic added value absorbed by foreign consumption can be called trade in value-added [3]. Domestic value added can be divided into two parts: one is the domestic value added (DVA) absorbed by foreign countries. The other is the domestic value added (RDV) returned and absorbed by domestic countries. Foreign value added is the value added input from other countries included in a country's commodity export. It reflects the dependence of a particular industry on intermediate goods from other countries.

If a country's export of final products accounts for a large proportion of its total export and contains a large amount of foreign added value, it indicates that the country is likely to be at the lower end of the GVC.

### 2.2 Measurement methods

Based on the method of Wang et al. (2013) [4], we divide the total trade flow into 16 parts. Indirect export added value DVA\_INT can be expressed as:

$$DVA\_INT = (V^s L^{ss})^T \# \left[ A^{sr} \sum_{t \neq s, r}^G B^{rt} Y^{tt} + A^{sr} B^{rr} \sum_{t \neq s, r} Y^{rt} + A^{sr} \sum_{t \neq s, r} B^{rt} \sum_{u \neq s, t} Y^{tu} \right] \quad (1)$$

Foreign value added FVAs\* can be expressed as:

$$FVA_s^* = \left[ (V^r B^{rs})^T \# Y^{sr} + \left( \sum_{t \neq s, r}^G V^t B^{ts} \right)^T \# Y^{st} \right] + \left[ (V^r B^{rs})^T \# (A^{sr} L^{rr} Y^{rr}) + \left( \sum_{t \neq s, r}^G V^t B^{ts} \right)^T \# (A^{sr} L^{rr} Y^{rr}) \right] \quad (2)$$

GVC upstream participation is defined as the proportion of a country's indirect domestic added value in its total export; downstream participation is defined as the proportion of foreign added value in a country's total export; and the sum of upstream and downstream participation is a country's global value chain participation. The higher the forward participation, the more value added of a country is contained in intermediate goods and exported to the third country, and the country is more inclined to export intermediate goods. The higher the backward participation, the more dependent a country is on the supply of foreign intermediates, which are used for domestic assembly.

The formula for GVC participation and position is as follows:

$$GVC\_Participation = DVA\_INT/E + FVA/E \quad (3)$$

$$GVC\_Position = \ln \left( 1 + \frac{DVA\_INT}{E} \right) - \ln \left( 1 + \frac{FVA}{E} \right) \quad (4)$$

On this basis, the measurement indicators are processed regionally to measure the participation and position of RCEP members in the regional value chain within the RCEP region.

$$RVC\_Participation = DVA\_INT_r/E_r + FVA_r/E_r \quad (5)$$

$$RVC\_Position = \ln \left( 1 + \frac{DVA\_INT_r}{E_r} \right) - \ln \left( 1 + \frac{FVA_r}{E_r} \right) \quad (6)$$

DVA\_INT<sub>r</sub> is the domestic value added of intermediate products exported by Member A to Member

B and absorbed by Member C;  $FVA_r$  is the foreign value added from Member States in the products exported from Member States A to Member States B;  $E_r$  is the total exports of Member A to other member states.

### 2.3 Data source

The data of our study come from UIBE GVC Indicators database of University of International Business and Economics. RVC related indexes narrow the statistical scope from the global scope to the RCEP scope according to the WWZ measurement method.

## 3. Analysis of goods trade between China and RCEP member countries from the perspective of Value added in trade

### 3.1 China's domestic value added

As shown in Table 1, in China's export trade of goods to the world as a whole, the amount of domestic added value contained in goods shows a trend of fluctuating growth. Among China's commodity exports to RCEP member countries, trade with Japan contains the highest domestic value added, but the proportion has been declining year by year, while trade with South Korea and Australia contains the second largest domestic value added. It can be seen that countries with a higher level of economic development have strong domestic demand and are China's "big customers". However, Chinese exports to Brunei, Laos and Cambodia contain relatively little domestic value added compared with the large trade flows between developed countries. Laos and Cambodia have a low level of economic development. Most of their exports to China are primary agricultural products and primary mineral products with low added value, and they import electronic products, machinery parts, vehicles and other high added value products from China. On the whole, the domestic added value of China's exports to RCEP member countries also shows a trend of fluctuating growth, which is consistent with China's export trade to the world as a whole. Therefore, the proportion of the domestic added value of China's exports to RCEP member countries in the domestic added value of the exports to the rest of the world basically stays within the same range.

Table 1: China's domestic value added in export commodity trade with the world and RCEP members.

	2010	2012	2014	2016	2018
world	846521.36	1138922.89	1351545.82	1235393.61	1496340.47
AUS	20725.52	33129.00	35165.29	31460.65	35956.09
NZL	2322.11	3443.06	4421.94	4025.78	5040.86
JPN	84291.62	113004.09	121202.08	101428.28	118157.41
KOR	39190.96	56853.25	60595.42	56050.20	69453.54
THA	15179.09	23182.86	27656.02	25625.53	32657.80
MYS	8533.39	13989.13	18653.66	15159.69	19211.91
VNM	11855.09	15442.98	24880.26	29877.11	43311.28
IDN	14057.05	20415.01	22358.02	21813.81	32004.78
SGP	5410.20	7339.40	8272.54	8266.61	9820.32
MMR	907.02	1572.54	3776.86	4903.76	3695.75
BRN	159.24	327.07	261.77	238.74	1088.59
LAO	187.07	625.78	502.65	601.32	957.40
KHM	764.87	1848.80	2673.87	3322.99	4340.10
PHL	2849.23	4730.18	7354.19	11094.22	15444.07
RCEP members	211842.67	303242.56	346047.10	322135.31	400960.21
proportion	25.03%	26.63%	25.60%	26.08%	26.80%

### 3.2 China's foreign value added in RCEP member countries' exports

As shown in Table 2, the exports of RCEP member countries contain a large amount of foreign value added, and the proportion of foreign value added from China in the total foreign value added increased from 2010 to 2018. Among them, Australia, New Zealand and Singapore's foreign value added from China accounted for a relatively low proportion, but also showed a trend of fluctuating growth, especially in New Zealand, which increased by more than 3 percentage points. For member countries with a lower level of economic development, such as Cambodia and Myanmar, although the scale of international trade is small, the foreign value added from China accounts for a large part and is increasing year by year. As a "transfer station" between China and ASEAN countries and even other countries in the world, on

the one hand, Vietnam directly consumes products made in China, on the other hand, it imports intermediate products from China and exports them to other countries. Therefore, Vietnam has absorbed a large amount of domestic added value attributable to China. In addition, the proportion of foreign value added from China in the total foreign value added of Japan and South Korea's export trade also increased with fluctuations.

Intermediate goods originating in China are increasingly having a profound impact on production activities and value creation in the RCEP region, which will help China climb the value chain in the RCEP region.

Table 2: Foreign value added from China in RCEP member countries' exports.

	2010		2012		2014		2016		2018	
	FVA from China	proportion	FVA from China	proportion	FVA from China	proportion	FVA from China	proportion	FVA from China	proportion
AUS	1244.11	4.33%	2098.70	6.34%	2505.91	7.30%	1954.53	6.74%	2594.41	6.86%
NZL	271.56	6.95%	361.48	7.87%	465.72	9.69%	387.90	9.98%	513.58	10.92%
JPN	9815.14	14.59%	11326.53	14.23%	14307.91	15.93%	12151.00	19.10%	15544.83	16.10%
KOR	14641.45	11.13%	21808.94	11.72%	23311.13	14.02%	19088.97	16.94%	23030.51	15.86%
THA	6420.07	11.62%	9353.19	13.13%	11516.87	17.19%	11048.44	19.05%	13465.65	19.01%
MYS	4646.23	10.30%	6410.12	13.33%	7563.76	16.79%	6076.10	17.02%	7856.85	17.63%
VNM	5262.96	21.17%	8030.06	22.00%	13583.25	27.25%	17483.46	27.27%	25778.75	28.95%
IDN	2172.90	13.58%	2855.06	14.99%	3292.69	17.07%	2945.23	20.89%	4291.13	21.74%
SGP	3115.63	5.52%	4560.27	6.20%	5481.38	7.44%	5192.41	9.74%	6323.50	8.68%
MMR	123.41	25.41%	119.31	27.52%	243.49	29.27%	431.12	30.71%	542.77	30.76%
BRN	45.22	9.17%	76.61	8.75%	66.67	9.43%	27.81	10.89%	58.71	20.80%
LAO	30.44	10.24%	63.05	15.27%	72.48	12.14%	51.27	13.45%	81.11	16.76%
KHM	352.68	30.40%	599.64	38.23%	830.48	41.16%	1035.61	49.30%	1262.99	46.96%
PHL	667.61	7.68%	756.48	10.20%	1063.84	14.92%	1320.07	17.50%	1893.23	17.96%

#### 4. China's position in the RCEP regional value chain

##### 4.1 Analysis of China's position in GVC

Table 3: Participation Index of RCEP member countries in GVC.

	2008			2013			2018		
	GVCpt f	GVCpt b	GVCp	GVCpt f	GVCpt b	GVCp	GVCpt f	GVCpt b	GVCp
CHN	0.1270	0.1824	0.3094	0.1302	0.1612	0.2914	0.1436	0.1461	0.2896
AUS	0.3706	0.0981	0.4687	0.4041	0.0917	0.4958	0.4674	0.0770	0.5445
NZL	0.1827	0.1667	0.3495	0.2131	0.1425	0.3556	0.2174	0.1464	0.3639
JPN	0.2889	0.1254	0.4143	0.2898	0.1396	0.4294	0.2948	0.1507	0.4455
KOR	0.1983	0.3123	0.5106	0.2263	0.2974	0.5237	0.2817	0.2444	0.5262
THA	0.1789	0.3374	0.5163	0.1756	0.3513	0.5269	0.1919	0.3150	0.5070
MYS	0.2376	0.3167	0.5543	0.2646	0.2808	0.5453	0.3030	0.2733	0.5762
VNM	0.1914	0.3485	0.5399	0.1841	0.3634	0.5475	0.1870	0.4086	0.5956
IDN	0.3369	0.1207	0.4575	0.4028	0.1103	0.5131	0.4006	0.1149	0.5155
SGP	0.1500	0.3992	0.5492	0.1400	0.4194	0.5594	0.1640	0.3945	0.5585
MMR	0.4313	0.0741	0.5054	0.4706	0.0842	0.5547	0.4483	0.1197	0.5680
BRN	0.4415	0.0433	0.4848	0.4261	0.0789	0.5050	0.7377	0.0429	0.7806
LAO	0.4549	0.1359	0.5908	0.4779	0.1466	0.6245	0.5316	0.1045	0.6361
KHM	0.1654	0.3353	0.5006	0.1700	0.3011	0.4710	0.1954	0.2565	0.4520
PHL	0.2774	0.2064	0.4838	0.3209	0.1593	0.4802	0.3032	0.1997	0.5029

As shown in Table 3, from 2008 to 2018, China's forward participation in GVC kept rising, while its backward participation kept declining, and the decline of the latter was greater than the increase of the former, showing a downward trend in GVC participation on the whole. Myanmar, Laos, Brunei and Australia all had high forward participation and continued to rise over the 11-year period. These countries mainly export raw materials, which are processed by importing countries and then exported to third countries.

Overall, China's participation in GVC is lower than that of most RCEP members. However, by analyzing the sources of indirect value-added of export products of each member country, it can be seen that China obtains indirect value-added by relying more on intermediate products of manufacturing industry, as well as countries with better economic development such as Japan and South Korea. Therefore, in terms of the types of export products, China's participation and position in the value chain of RCEP are not as low as shown in the numerical value. ASEAN countries have a great demand for China's industrial products. In addition, China's development and breakthrough in the high-end field in

recent years, China's control in the value chain of RCEP should be in the middle position.

As shown in Table 4, from 2008 to 2018, the GVC position index of China has been negative, indicating that China is in a low position in the GVC. However, the absolute value of this negative value is decreasing, indicating that China's position in the GVC is rising. Myanmar, Laos and Brunei also have higher forward participation by exporting raw materials, so their GVC position index is higher.

Both South Korea and Malaysia have achieved a leap from negative to positive in the GVC position index in 11 years, and both countries have a good prospect of manufacturing development. In the past 11 years, Japan's position in the GVC has been declining, possibly because the rise of China, South Korea and other developing countries in the field of high technology has to some extent squeezed Japan's global market in related fields.

Table 4: GVC position index of RCEP member countries.

	2008	2013	2018		2008	2013	2018
CHN	-0.0480	-0.0271	-0.0022	THA	-0.1262	-0.1393	-0.0983
AUS	0.2216	0.2516	0.3093	MYS	-0.0620	-0.0127	0.0231
NZL	0.0136	0.0599	0.0601	VNM	-0.1239	-0.1410	-0.1711
JPN	0.1357	0.1238	0.1180	IDN	0.1764	0.2338	0.2281
KOR	-0.0909	-0.0563	0.0295	SGP	-0.1962	-0.2193	-0.1806
				MMR	0.2871	0.3048	0.2573
				BRN	0.3233	0.2790	0.5105
				LAO	0.2475	0.2538	0.3269
				KHM	-0.1361	-0.1062	-0.0498
				PHL	0.0572	0.1306	0.0828

#### 4.2 Analysis of China's position in RCEP regional value chain

As shown in Table 5, from 2008 to 2018, when the statistical scope was narrowed from the global scope to the regional scope of RCEP, the value chain participation values of RCEP member countries all decreased. Except for China, the participation in the RVC was less than 0.1, and the participation of other member countries in the RVC mainly concentrated in the range of 0.1 to 0.26. Except for China, New Zealand and South Korea, the participation of other member countries in the RVC has increased to some extent in the past 11 years. China's forward participation in the RVC has been slightly increasing, while backward participation has been slightly decreasing. By 2018, the forward participation has exceeded backward participation, which indicates that China is constantly adjusting its industrial structure and participating more in the upstream production of the RCEP region, which is consistent with the analysis results under the framework of GVC.

Table 5: Participation index of RCEP member countries in RVC.

	2008			2013			2018		
	GVCpt f	GVCpt b	GVCp	GVCpt f	GVCpt b	GVCp	GVCpt f	GVCpt b	GVCp
CHN	0.0411	0.0555	0.0966	0.0440	0.0492	0.0932	0.0485	0.0447	0.0932
AUS	0.3810	0.0276	0.4086	0.0784	0.0285	0.1069	0.0970	0.0280	0.1250
NZL	0.0538	0.0731	0.1270	0.0552	0.0599	0.1151	0.0521	0.0549	0.1069
JPN	0.0692	0.0401	0.1092	0.0845	0.0516	0.1361	0.0738	0.0597	0.1334
KOR	0.0384	0.1018	0.1403	0.0402	0.0962	0.1364	0.0494	0.0823	0.1317
THA	0.0428	0.1521	0.1949	0.0399	0.1641	0.2040	0.0433	0.1619	0.2052
MYS	0.0613	0.1199	0.1812	0.0684	0.1191	0.1876	0.0763	0.1169	0.1932
VNM	0.0520	0.1619	0.2139	0.0466	0.1832	0.2298	0.0351	0.2218	0.2569
IDN	0.0814	0.0496	0.1309	0.0995	0.0440	0.1434	0.0943	0.0525	0.1468
SGP	0.0628	0.1138	0.1766	0.0641	0.1357	0.1998	0.0707	0.1375	0.2082
MMR	0.0926	0.0181	0.1107	0.0966	0.0570	0.1535	0.0747	0.0705	0.1452
BRN	0.1025	0.0195	0.1220	0.1037	0.0371	0.0622	0.1750	0.0207	0.1957
LAO	0.1028	0.0232	0.1260	0.0877	0.0846	0.1723	0.0904	0.0676	0.1580
KHM	0.0616	0.1224	0.1840	0.0705	0.1336	0.2040	0.0706	0.1449	0.2155
PHL	0.0720	0.0792	0.1512	0.0914	0.0666	0.1580	0.0888	0.1042	0.1930

As shown in Table 6, the value chain position index of some RCEP members showed significant changes when we focus on RCEP region. The RVC position index of China, Singapore and Vietnam is higher than the GVC position index, indicating that these countries have more advantages in the division of labor and cooperation in the RCEP RVC compared with the GVC. The further deepening of economic and trade cooperation among the RCEP members is conducive to the economic development of these countries. The RVC position index of Australia, Japan and New Zealand is lower than the GVC position index, in particular, New Zealand has a negative RVC position index, indicating that developed countries have more advantages in the division of labor and cooperation in the GVC. Myanmar, Laos and Brunei

also have lower RVC position than GVC, possibly because they still export a significant portion of raw materials and agricultural products to countries outside the RCEP region. When the focus is only on the RCEP region, value-added gains from import and export trade fall significantly.

Table 6: RVC position index of RCEP member countries.

	2008	2013	2018		2008	2013	2018
CHN	-0.0137	-0.0050	0.0036	THA	-0.0996	-0.1128	-0.1077
AUS	0.2956	0.0474	0.0650	MYS	-0.0538	-0.0463	-0.0370
NZL	-0.0182	-0.0045	-0.0026	VNM	-0.1239	-0.1410	-0.1711
JPN	0.0276	0.0308	0.0132	IDN	0.0298	0.0518	0.0389
KOR	-0.0593	-0.0525	-0.0309	SGP	-0.0469	-0.0651	-0.0605
				MMR	0.0707	0.0368	0.0039
				BRN	0.0783	0.0622	0.1408
				LAO	0.0749	0.0028	0.0211
				KHM	-0.0557	-0.0573	-0.0671
				PHL	-0.0067	0.0231	-0.0141

It is worth noting that after the focus of international cooperation and division of labor shifted from the global to the RCEP region, China's position in the value chain improved significantly. Especially in 2018, the global value chain position index was negative -0.0022 while the RCEP value chain position index was positive 0.0036. This indicates that China is deeply embedded in low-end links in the GVC and is difficult to get rid of. However, after the division of production is placed in the RCEP area, the proportion of domestic value in exports will increase, and China will climb from low value-added links to high value-added links

## 5. Conclusion

We analyzed China's trade with RCEP member countries and its participation and position in the value chain by decomposing the value added. We also discussed the importance of China in the RCEP region and the feasibility of China climbing the value chain of RCEP and breaking out of the "low-end lock-in" in the global value chain. The results show that: (1) Trade between China and RCEP member countries is close and the relationship is getting closer and closer, and China is in a dominant position in the trade relationship. (2) China is at the low end of the GVC, but it has the opportunity to climb the middle and high end of the RCEP RVC and realize the transformation of the industrial structure.

## Acknowledgments

This study was funded by National Natural Science Foundation of China (42161030).

## References

- [1] Hummels D. Ishii J. Yi & K. M. (2001). *The Natural and Growth of Vertical Specialization in World Trade*. *Journal of International Economics*. (1), 75-96.
- [2] Koopman R., Powers W., Wang Z., & Wei S. J. (2010). *Give Credit Where Credit Is Due: Tracing Value Added in Global Production Chains*. *NBER Working Papers*.
- [3] Koopman R. Wang Z. & Wei S. J. (2014). *Tracing Value-Added and Double Counting in Gross Exports*. *Social Science Electronic Publishing*, 104(2), 459-494.
- [4] Wang Z., Wei S. J. & Zhu K. F (2013). *Quantifying International Production Sharing at the Bilateral and Sector Levels*. *NBER Working Papers*.
- [5] Cheng Dazhong. (2015). *China's Integration into the Global Value Chains: A Transnational Input-output Analysis*. *Economic Research Journal*, 50(09), 4-16+99.
- [6] Baldwin R. (2013). *Trade and Industrialization after Globalization's 2nd Unbundling: How Building and Joining a Supply Chain are Different and Why it Matters*, National Bureau of Economic Research, Inc.
- [7] Wei Long. & Wang Lei. (2016). *From Embedding Global Value Chains to Leading Regional Value Chains: The Economic Feasibility Analysis of the "One Belt and One Road" Strategy*. *Journal of International Trade*, (05), 104-115.
- [8] Zhang Yan. (2020). *Reconstruction of RCEP Regional Value Chains and China's Policy Choice: Based on the B & R Construction*. *Asia-pacific Economic Review*, (05), 14-24+149.