Original Research Article

Impact of Income Diversity on Export Trade in RCEP Countries

Abstracts: Industrial structure has become an important factor affecting a country's export trade. With the signing of RCEP, it is necessary to analysis the impact of industrial structure on export trade for those RCEP countries. Through two-way fixed effects approach, this study constructs an income diversity index to measure the diversity of industrial structure and uses a panel data of 14 RCEP countries (excluding Brunei) from 2006 to 2019 to analyze the impact of income diversity on export trade. This study found that: (1) The income diversity of RCEP members has a significant positive effect on their export trade performance; (2) A sub-sample analysis shows that the income diversity of lower-middle and high-income economies has a significant positive effect on their export trade, while the upper-middle-income economies did not show a significant impact. In order to achieve the ambitious goal of high-quality economic development, members at various stages of development should their own formulate development strategies based on their own industrial economic characteristics and expand international trade competitiveness.

Keywords：income diversity; export trade; RCEP

1. Introduction

On November 15, 2020, Regional Comprehensive Economic Partnership (RCEP) was signed by China, Japan, South Korea, Australia, New Zealand and ten ASEAN countries. This agreement comes into effect since January 2022. The signing of RCEP is important to maintain a multilateral trading system, which is of great significance for promoting the reconstruction of global trading system in the post-epidemic period. Among the RCEP member countries, there are developed countries with high income levels (such as Japan and South Korea), and also exist developing countries with less developed economies (such as Laos and Myanmar). The economic scale and industrial structure of RCEP members are quite different and diverse. In the context of rising trade protectionism and the impact of epidemic on the world economy, it is necessary for RCEP members to make full use of the opportunity of RCEP signing to promote the optimization of industrial structure and the diversification of industrial income, which in order to enhance its own competitiveness and expand their export trade (Chika, 2018; Ray, et al, 2021). Therefore, it is important to have an analysis for the impact of income diversity on export trade for RCEP countries.

With the officially signing of RCEP in 2020, it marks the formation of the world's largest free trade zone with a population over 2 billion and total GDP over 25 trillion U.S. dollars. The RCEP membership structure is diversified, therefore it is considered to be the regional trade agreement with the most development potential. From 2006 to 2019, the total GDP and per capita GDP of RCEP members have grown steadily. Among them, the average annual growth rate of China, Laos, Myanmar and Vietnam is more than 10%. From the perspective of total GDP (2019), there is a large difference in scale, from China's 14 trillion U.S. dollars to Brunei's

13.4 billion U.S. dollars. The RCEP members include large economics such as China and Japan, as well small economies such as Myanmar and Laos. From the perspective of per capita GDP (2019), from Singapore's 65,640 U.S. dollars to Myanmar's 1,477 U.S. dollars, the national income is diversified. Divide the per capita GDP of each country in 2019 according to the country classification standard of the World Bank income level in 2020, RCEP members include Singapore, Brunei, Australia, New Zealand, Japan, South Korea and other high-income economies (above 12,535 U.S. dollars), there are also low-middle-income economies (US $ 1,036 to US $ 4,045) such as Laos, Cambodia, Myanmar, Vietnam and Philippines, there are also upper-middle-income economies such as China, Thailand, Malaysia and Indonesia (US $ 4,046 to US $ 12,535), but there is no low-income economy (less than US $ 1,036). Since RCEP was proposed in 2012, research on RCEP has continued to emerge, while most are qualitative research, especially the importance of restructuring regional value chains. Therefore, in this study, we would like to carry out an empirical study to analysis the impact of income diversity on export trade in RCEP countries.

The rest of the article is as follows: section 2 is the literature review; section 3 introduces framework of methodology; section 4 presents the overview of RCEP member countries' export trade; section 5 presents the result of empirical analysis, followed by conclusion in section 6.

2. Literature Review

RCEP will help promote healthy competition and improve the layout of the industry, which can promote technological innovation through cooperation, and then achieve a breakthrough in the "low-end lock-in" of developing economies in the global value chain (Ou and Yi, 2021). In recent years, some studies using the method of economic simulation to study the expected effect of RCEP, especially the impact of RCEP on the division of labor and export trade in the global manufacturing industries. Based on the quantifiable general equilibrium model (CGE model), it found that RCEP would significantly increase member direct investment between countries with a net trade creation effect (Li, et al, 2017). Taking China and South Korea as examples, using the CGE model, Li and Hee (2018) found that RCEP can increase the trade volume between China and South Korea, as well their income. Based on the GTAP mode, Du and Liu (2020) conducted a simulation study of RCEP and found that RCEP can promote the development of manufacturing industry in most member countries, promotes the growth of their manufacturing export trade and enhances their status in the global manufacturing industry.

As we all know, the industrial structure and economic scale of RCEP member countries are one of the important factors that determine their core competitiveness in the international market, which affects the scale and speed of growth for a country's foreign export trade. Nevertheless, the current research on the impact of industrial structure of RCEP members on the scale of their export trade is rare. Therefore, this study hopes to put forward specific

countermeasures and suggestions for promoting the high-quality development of regional economy and building a new higher-level open economy system by conducting an empirical study on the relationship between industrial structure and export trade volume.

3. Methodology

For individuals, income diversity refers to diversification of income source. While for a country, income diversity refers to the concentration of various industries in GDP. Herfindahl-Hirschman Index (HHI) is one of the approaches for measuring industrial concentration, which with larger value means smaller income diversity [7]. HHI is mainly used to measure the income diversity of individuals or the competition condition between companies.[8],[9],[10]

Based on the definition of HHI, this study uses the reciprocal of HHI to measure the diversity of RCEP countries' industrial structure and named it the Income Diversity Index (IDI).

$$HHI_{it} = \frac{I}{GDP_{it}}$$

IDI of country *i* at year *t* =1 / [(ratio of added value of the primary industry to GDP at year *t* of country *i*)^2 +(ratio of added value of the secondary industry to GDP at year *t* of country *i*)^2 + (ratio of added value of the tertiary industry to GDP at year *t* of country *i*)^2]. Here, the primary industry refers to agriculture, etc., the secondary industry refers to industrial industry, etc., and the tertiary industry refers to service industry, etc. IDI of each country is calculated and shown in Table 1. Since Brunei's population is small and its main source of economy is too different from other member states, it is excluded from empirical analysis in this study.

Table 1 Income Diversity Index of RCEP Member Countries (2006-2019)

		2006	2007	2009	2011	2013	2015	2017	2019
High income	Singapore	1.937	1.939	1.868	1.851	1.800	1.824	1.818	1.792
	Australia	2.116	2.081	2.062	2.043	1.986	1.964	1.980	1.997
	New Zealand	2.131	2.181	2.089	2.164	2.168	2.075	2.126	2.093
	Japan	1.765	1.706	1.712	1.719	1.771	1.782	1.757	1.765
	South Korea	2.426	2.405	2.368	2.393	2.359	2.348	2.369	2.345
Upper-middle-	China	2.425	2.415	2.394	2.375	2.364	2.317	2.263	2.230

income	Thailand	2.343	2.344	2.353	2.427	2.398	2.269	2.223	2.179
	Malaysia	2.400	2.457	2.411	2.501	2.399	2.352	2.371	2.278
	Indonesia	2.513	2.540	2.579	2.661	2.688	2.731	2.758	2.751
Lower-middle income	Laos	3.503	3.283	3.023	3.198	3.276	3.303	3.398	3.323
	Cambodia	3.238	3.348	3.230	3.235	3.268	3.269	3.252	3.216
	Myanmar	2.735	2.771	2.899	2.988	2.966	2.930	2.857	2.826
	Vietnam	2.731	2.728	2.738	3.608	3.419	3.364	3.275	3.207
	Philippines	2.424	2.424	2.431	2.405	2.313	2.235	2.186	2.127

Data source: Data collected from the World Bank database and collated by the author.

Specifically, among high-income economies, South Korea has the highest IDI at 2.426 in 2006 and slipped to 2.345 in 2019 but remains the highest among high-income economies. New Zealand and Australia have the second and the third, respectively. Singapore is with the largest decline in IDI among high-income economies, from 1.936 in 2006 to 1.792 in 2019. Overall, Japan has the lowest IDI among high-income economies with no significant change, remaining around 1.75. Among the four upper-middle-income economies, Indonesia has the highest IDI at 2.513 in 2006 and rose to 2.751 in 2019, which is the only increasing one among the upper-middle income economies. In addition, the IDI of Malaysia, China and Thailand ranked second, third and fourth among the upper-middle-income economies respectively. Among the lower-middle-income economies, Laos has the highest IDI, which was 3.503 in 2006 and dropped to 3.323 in 2019, but it is still the highest among low-middle-income economies. Cambodia's IDI is second only to Laos, which is 3.238 in 2006 and fluctuated to a certain extent, but the change is not large. Among the lower-middle-income economies, Philippines has the lowest IDI, which was 2.424 in 2006 and has fell to 2.127 in 2019.

Overall, the IDI of lower-middle-income economies is higher than that of upper-middle-income economies and high-income economies. As far as 2019, among the RCEP member countries, the tertiary industry accounted for 70% of total GDP in high-income economies (except Brunei), while the primary industry accounted for less than 2% (except New Zealand). The economy of high-income economies mainly relies on the tertiary industry, the secondary and primary industries account for a small proportion, and the IDI is the lowest. In upper-middle-income economies, the tertiary industry generally accounts for more than 50% of total GDP and slightly higher than the secondary industry, the IDI is in the middle. In the lower-middle-income economies, the tertiary industry generally accounts for about 40% of total GDP, and the primary industry accounts for less

than 20%. In lower-middle-income economies, the tertiary and secondary industries account for the same proportion of GDP, and the primary industry accounts for a large proportion, and the IDI is the highest among member countries. It can be concluded that with the development of the economy, the IDI of various countries shows a downward trend.

4.Overview of RCEP Member Countries' Export Trade

RCEP was the first initiated by the ten ASEAN countries in 2012. Since China and the ten ASEAN countries occupy 11 seats in its 15 member countries and the ten ASEAN countries have always been one of China's major trading partner, RCEP can be regarded as an upgraded version of the China-ASEAN Free Trade Area. Now, as a major member of RCEP, it is believed that China, ASEAN and other four countries will strengthen cooperation and achieve high-quality development in international trade and international business.

Table 2 shows the export trade profile of RCEP member countries (except Brunei) from 2006 to 2019. As shown, China is the economy with the largest export trade volume. From 2006 to 2019, the export trade grew rapidly from US $991.73 billion in 2006 to US $2,641.27 billion in 2019, with an average annual growth rate of 7.83%. Among the RCEP member countries, Japan's export trade scale ranks second. Singapore and South Korea's export trade volume in 2019 was comparable in scale, with an average growth rate of 5.24% and 4.41%, respectively. Australia and Thailand had comparable export volumes in 2019, second only to Singapore and South Korea, followed by Vietnam, Malaysia, Indonesia and Philippines. The countries with export trade volume less than US$ 100 billion in 2019 were New Zealand, Myanmar, Cambodia and Laos. Although export trade is determined by multiple factors, increment in export trade means the improvement of its comprehensive competitiveness in international market.

Table 2 Export Trade of RCEP Member Economies Between 2006 and 2019

(Unit: Billion US dollars)

		2006	2007	2009	2011	2013	2015	2017	2019
High-income	Singapore	338.93	385.01	370.53	568.00	600.01	549.43	587.41	658.52
	Australia	148.42	172.36	213.44	299.39	314.55	270.13	281.86	336.73
	New Zealand	33.03	40.16	34.88	51.15	55.01	49.61	56.56	56.44
	Japan	719.10	789.87	655.02	919.00	820.55	773.03	863.96	888.89
	South Korea	375.22	438.47	426.52	668.44	703.11	630.13	664.73	657.83
Upper-middle-	China	991.7	1258.1	1262.7	2006.3	2354.3	2362.1	2424.2	2641.3
	Thailand	152.29	181.09	181.53	262.74	282.34	271.42	304.27	323.77

income	Malaysia	182.52	205.49	184.90	254.02	244.49	209.29	223.42	237.85
	Indonesia	113.14	127.23	130.36	235.10	218.31	182.16	204.92	206.43
Low-m	Laos	1.32	1.42	1.75	3.53	4.56	4.89	5.33	5.60
iddle-in	Cambodia	4.99	5.64	5.12	6.94	9.50	11.14	13.46	16.55
come	Myanmar	0.02	0.04	0.04	0.05	11.42	13.85	19.04	22.39
	Vietnam	44.94	54.59	66.37	107.61	143.19	173.49	227.35	279.72
	Philippines	52.65	59.29	53.23	68.17	74.32	83.38	97.07	106.95

Data source: World Bank database.

5. Empirical Analysis

(1) Model and data description

Based on the definition of HHI index, this paper constructs IDI and studies the impact of income diversity on its export trade in RCEP member countries. The main explained variables and explanatory variables are the export trade volume (EX) and the income diversity index (IDI), other control variables include the total GDP of each country (GDP), the trade openness of each country (Open, the ratio of total import and export value to the country's total GDP), and the level of informatization development (Internet, mobile phone ownership per 100 people). The indicator data used in this paper is from 2006 to 2019. The data are mainly from the statistics database of Guoyan Net and the World Bank database.

In order to reduce the interference of heteroscedasticity, all variables in this paper are in the form of natural logarithms. Basic equation for regression analysis:

$$LnEX_{it}=C+\beta_1 LnIDI_{it}+\beta_2 LnControl_{it}+\phi_i+\varphi_t+\varepsilon_{it} \quad (1)$$

Specifically, $LnEX_{it}$ is the logarithm of export trade volume of RCEP member *i* in year *t*, $LnIDI_{it}$ is the logarithm of the diversity index of RCEP member *i* in year *t*, LnX_{it} is the logarithm of the value of relevant control variable for RCEP member *i* in year *t*. In addition, ϕ_i is the individual effect, φ_t is the time effect, ε_{it} is the error term, *C* is the constant term. The coefficient β_1 is the degree to which the export trade of each RCEP member is affected by the change of the IDI, the coefficient β_2 is the degree to which the export trade of each member of the RCEP is affected by the changes of the relevant control variables. The control variables (Control) involved in this study include the total GDP (GDP), trade openness (Open) and the level of information development (Internet).

(2) Empirical Analysis Results

In order to test the impact of income diversity of the 14 RCEP member countries (except Brunei) on their export trade from 2006 to 2019, this paper uses the Stata 15.0 to analyze it.

Research methods in this study are OLS mixed regression, two-way fixed effect analysis (FE) and sub-sample analysis. The specific analysis results are shown in Table 3.

OLS regression in column (1) shows that IDI of RCEP countries has no significant correlation with the scale of export trade, GDP and Open are significantly positively correlated with the scale of export trade, while the level of informatization development is significantly negatively correlated with the scale of export trade. However, considering the potential endogeneity problem, two-way fixed effects should be more reliable. The results of two-way fixed-effect analysis as shown in column (2), and the income diversity of RCEP countries has a significant positive effect on its export trade. At the 5% significance level, for every 1% increment in a country's IDI, export trade volume increase by 0.398%. Among the control variables, the coefficients of GDP and trade openness are positive and significant at 1% level, while the coefficients of informatization development are negative but not statistically significant.

In order to understand the impact of income diversity of different economies on their export trade, this study uses two-way FE method to conduct a sub-sample analysis. The results of sub-sample analysis are shown in column (3), (4) and (5). For lower-middle-income economies, every 1% increment IDI, export trade volume will increase by 0.563%. For upper-middle-income economies, the impact of income diversity on export trade is not statistically significant. For high-income economies, every 1% increment in the IDI, the export trade volume increase by 0.64%. Therefore, among the RCEP member countries, the increment in the income diversity of lower-middle-income and high-income economies will significantly increase their export trade volume, but the export trade of upper-middle-income economies will not significantly change.

For control variable, according to the results of sub-sample analysis, the coefficient of GDP and trade openness is positive and significant at 1% level, indicating that with the increment of a country's GDP and trade openness, scale of export trade will increase. The signs of the coefficients of information development level (Internet) of different economies are inconsistent and statistically insignificant, indicating that with the change of a country's information development level, the scale of export trade does not change significantly.

Table 3 Estimation of Export Trade Regression (full sample and sub-sample)

	OLS	FE			
Variables	(1) Full sample	(2) Full sample	(3) Low-middle	(4) Upper-middle	(5) High
LnIDI	-0.050	0.398**	0.563**	-0.394	0.640*
	(0.034)	(0.172)	(0.183)	(0.298)	(0.270)

LnGDP	1.021*** (0.004)	0.991*** (0.035)	1.042*** (0.152)	0.949*** (0.046)	1.225*** (0.121)
LnOepn	1.016*** (0.007)	0.975*** (0.011)	0.977*** (0.018)	1.128*** (0.088)	1.189*** (0.115)
LnInternet	-0.045*** (0.008)	-0.023 (0.017)	-0.030 (0.030)	0.041 (0.068)	0.006 (0.005)
Observations	196	196	70	56	70
R^2 within	0.999	0.997	0.999	0.993	0.989

Note: ***, ** and * indicate significance at 1%, 5% and 10% levels, respectively, with standard errors in parentheses.

6. Conclusion

This paper uses the panel data of income diversity and export trade of 14 RCEP member countries (exclude Brunei) from 2006 to 2019 to analyze the impact of income diversity on export trade. The full sample analysis shows that income diversity of RCEP member countries has a significant positive effect on their export trade. At 5% significance level, for every 1% increment in a country's IDI, its export trade volume increases by 0.398%. The sub-sample analysis shows that the income diversity of low-middle-income and high-income economies has a significant positive impact on their export trade, but the income diversity of upper-middle-income economies has no significant effect. For low-middle-income economies, at 5% significance level, for every 1% increment in IDI, their export trade volume increases by 0.563%. For high-income economies, at 10% significance level, each 1% increment in IDI increases their export trade volume by 0.640%. It is particularly pointed out that the sub-sample analysis shows that the impact of income diversity of upper-middle-income economies on its export trade is negative, but not significant. Mainly because at this stage of development, the proportion of the primary and secondary industries in GDP showed a downward trend and the tertiary industry was inclined, then the IDI showed a downward trend. With the decline of its IDI, the country's economic structure is going through a difficult period, striving to realize the transformation and upgrading of industrial structure and expand the scale of export trade, but the results of this paper do not reflect its significant impact.

This study puts forward the following suggestions for RCEP member countries to use income diversity to promote high-quality development of foreign export trade. First of all, for lower-middle-income economies, it is necessary to in-depth study of China's successful experience. While embedding the global value chain through the manufacturing industry, encourage the development of modern service industry and realize the diversification of

industrial structure, thereby enhancing its own competitiveness and expanding the proportion of export trade in international market. Secondly, for upper-middle-income economies, it is necessary to comprehensively deepen the structural reform of the supply side as a means to promote the high-quality development of modern service industry. Third, for a high-income economy, they must continue to maintain their advantages in industrial structure and lead the middle-income economies to continue to achieve economic development. Economies at various stage of development should formulate development strategies according to their own industrial and economic characteristics, in order to expand their international trade competitiveness and ultimately achieve high-quality development of RCEP community.

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