OPEN ACCESS Freely available online

ISSN 2737-5331
Volume 3, Issue 1
https://www.iikii.com.sg/journal/IJBSI
International Journal of Business Studies and Innovation

Article

Research on Measurement of Intra-industry Trade Level and Influencing Factors between China and Regional Comprehensive Economic Partnership Member Countries

Ya-Xuan Jiang

Xiamen University Tan Kah Kee College, Xiamen 363105, China; 13872118687@163.com

Received: Jan 26, 2023. **Revised:** Feb 15, 2023. **Accepted:** Feb 26, 2023. **Published:** Mar 30, 2023

Abstract: With the effective implementation of the Regional Comprehensive Economic Partnership (RCEP) on January 1, 2022, the world's largest free trade area was officially launched. Based on the data from 2001 to 2021, a panel regression analysis was conducted using the intra-industry trade G-L measurement method based on indicators such as per capita income level, factor endowment difference, economic development level, foreign direct investment, geographical location, and cultural difference. With the result, the intra-industry trade level and influencing factors between China and RCEP member countries were studied to provide a reference for the development of intra-industry trade between China and RCEP. The results show that the level of economic development and foreign direct investment has a positive impact on intra-industry trade between China and RCEP members, and the level of demand similarity and the geographical and cultural differences have the opposite impact. It is suggested in this study that China needs to actively promote the implementation of RCEP-related policies, continuously reduce tariffs and trade barriers between member countries to achieve trade liberalization, and encourage new countries to join RCEP to promote global integration.

Keywords: Regional comprehensive economic partnership, Intra-industry trade, G-L index, Overlapping demand theory

1. Introduction

The regional comprehensive economic partnership (RCEP) is a regional free trade agreement centered on developing economies, which is a high-standard free trade agreement integrating trade in goods, services, and investments. RECP is the largest and most important free trade agreement in the Asia-Pacific region. The agreement was initiated by the 10 ASEAN countries in 2012 with 15 ASEAN countries, China, Japan, South Korea, Australia, and New Zealand. The agreement was signed on November 15, 2020, and came into effect on January 1, 2022, officially launching the world's largest free trade area. RCEP covers about 30% of the world's GDP and 30% of the population, and more importantly, RCEP includes several large economies in the signatories, and its impact extends far beyond the Asia-Pacific region. RCEP plays a positive role in defending the multilateral trading system and opposing unilateralism and protectionism, which becomes a milestone in the development of new forms of globalization (Chang, 2022). The signing and entry into force of RCPE are of great significance to China as RCPE is to open a "new window" for China's global economic and trade pattern and highlight the importance of reshaping world economic and trade rules. This promotes China's domestic reform, consolidates the domestic economic cycle while promoting globalization development, and helps China join other high-level economic and trade cooperation negotiations. This is also the first time that China and Japan have reached a free trade agreement, expanding China's free trade network.

There has been considerable research on the content of intra-industry trade, and RCEP is also attracting research interest recently. Li (1998) studied and measured the formation of intra-industry trade as an early analysis of the influencing factors of intra-industry trade in China. Cheng and Yang (2020) proposed that Regional Trade Agreements (RTAs) and their terms have a greater impact on intra-industry trade in China. Cheng and Tu (2022) examined the specific international status of China's manufacturing industry trade index from the perspective of value-added trade. Regarding the research on the intra-industry trade effect of different free trade zones, Liu (2020) constructed a panel regression model to study the influencing factors of horizontal and vertical intra-industrial trade in 20 Eastern European countries and concluded that the difference in per capita income and the degree of trade imbalance had a restraining effect on intra-industrial trade in horizontal and vertical industries. Liu (2020) also highlighted that for market size and trade openness, foreign direct investment (FDI) promotes intra-industry trade, and market size differences and R&D investment have a restraining effect on horizontal intra-industry trade but promote intra-vertical intra-industry trade. Geng et al. (2021) used G-L and GHM index calculation methods to study the intra-industry trade level between China and the 10 ASEAN countries and claimed that the market size positively affected the intra-trade level of the fruit industry, while the difference in per capita income and the geographical distance between the two countries harmed the intra-trade level of the fruit industry. Song (2022) conducted a comparative study of the development of intra-industry trade in manufactured goods in North America and the China-ASEAN FTA as well as the analysis of the similarities and differences of influencing factors. The results showed that the difference in per capita income level has a restraining effect on the intra-trade of manufactured goods, and the technological level, digital infrastructure, and industrial import and export scale promote the intra-trade of manufactured goods in the North America and China-ASEAN FTA, respectively.

On the influencing factors of intra-industry trade, Dai et al. (2022) used the Grey Correlation Analysis method to study the influencing factors of intra-industry trade between China and other RCEP member countries. The results showed that the difference in per capita income level had the most significant impact. Zhuang et al. (2022) found that market size differences, per capita income differences, OFDI, and geographical distance had a negative impact on intra-agricultural product trade, while IFDI and trade openness had positive effects on them. Wang et al. (2022) used the data of China's trade in mechanical and electrical products with countries along the "Belt and Road" and found that the per capita income gap, China's OFDI1, and the technology level gap improved the level of intra-industry trade. Through the analysis of the China-EU agricultural trade industry Kang and Huang (2022) found that the degree of foreign direct investment and trade imbalance have a negative impact on intra-industry trade. Regarding the correlation between factor endowment and intra-industry trade. Hu (2020) discussed the influencing factors and development trends of intra-high-tech trade between China and G20 member countries from the perspective of intra-industry trade and found that factor endowment had a positive impact on static intra-industry trade index. Liang (2014) used the Ordinary Least Squares method and the Weighted Least Squares method to study the main factors affecting intra-industry trade and claimed that the difference in factor endowments effectively promotes intra-industry trade. The difference in development degree also has an impact on intra-industry trade. Xu and Zhang (2021) used the improved G-L index to measure the level of intra-industry trade between China and BRICS countries and concluded that the difference in market size and market openness had a greater impact on intra-industry trade between China and BRICS countries. Yang (2021) constructed a Gravity model for regression analysis and showed that the influence of trade openness and industrial structure differences was not significant. Geographical proximity generally negatively affects intra-industry trade. Hoang (2021) constructed an econometric model of the influencing factors of intra-industry trade in agricultural products and found that geographical distance has a restraining effect on intra-industry trade between Vietnam and RCEP member countries. Kang and Huang (2022) empirically found that market size, trade openness, seaside geographical location, and intra-Chinese and EU agricultural trade have a positive impact. Regarding the research on intra-industry trade in RCEP, Cheng and Tu (2021) used the perspective of innovative value-added trade to study the level of intra-industry trade between China and RCEP countries and empirically tested the factors affecting the development of intra-industry trade. Liu and Guo (2021) used the relevant data on cultural goods trade from 2011 to 2020 to empirically study the intra-industry trade level, trade competitiveness, and the relationship between China and RCEP countries in cultural products. Dai et al. (2022) measured the G-L index, BI index, and MIIT index of agricultural trade between China and other RCEP member countries and studied the factors influencing the trade between China and other RCEP member countries with the Grey Correlation Analysis method.

The related literature showed that scholars researched intra-industry trade theory and proposed the factors affecting intra-industry trade relatively and comprehensively. However, research on intra-industry trade between China and RCEP has not been enough and is not concentrated in a certain industry. Thus, we study the level of intra-industry trade between China and RCEP member countries and investigate influencing factors. The result provides ideas for the development of intra-industry trade between China and RCEP and suggestions for China's better participation in post-epidemic trade, which help to accelerate the promotion of RCEP and promote integrated development.

We first sort out the relevant literature on intra-industry trade and its influencing factors and select 15 countries that have signed the RCEP agreement: China (C), Japan (J), South Korea (K), Australia (A), New Zealand (N), and ASEAN (AS). Then, we explore the influencing factors of intra-industry trade between China and RCEP member countries based on the theory of intra-industry trade. Specifically, taking the intra-industry trade index (IITI) as the explained variable, and per capita income level (GNID), factor endowment difference (PGCF), economic development level (INDVUADD), FDI, geographical location and cultural difference (ASIA) as the explanatory variables, the data from 2001 to 2021 are analyzed to find the influencing factors of RCEP intra-industry trade. Targeted countermeasures and suggestions are provided for the development of intra-industrial trade in China's RCEP free trade zone.

2. RCEP and Current Trade Status

RCEP originated from a variety of regional integration arrangements and ideas in the Asia-Pacific region. The Asian financial crisis in 1997 broke out amid the rapid economic development of Asia. During that period, many large enterprises collapsed and the political situation in countries was turbulent, which made East Asian countries realize the huge risks brought by global integration. Thus, they sought regional economic cooperation to cope with risks and challenges. In December of the same year, ASEAN invited the leaders of China, Japan, and South Korea to hold an informal dialogue and cooperation meeting in Malaysia, thus opening the “10+3” dialogue. In 2001, experts and scholars from the “10+3” countries proposed the establishment of the East Asian Free Trade Area (“10+3” model, FTAAP) based on ASEAN, China, Japan, and South Korea, and the formation of an “East Asian Community” through long-term cooperation. Feared by China’s growing influence in East Asian economic cooperation, Japan rejected China’s initiative to launch the East Asian Free Trade Area in 2006, and instead invited India, Australia, and New Zealand to join in establishing the “10+6” model (CEPEA), thus blocking the process of regional cooperation in East Asia. In 2009, the Obama administration announced that the United States formally participated in and led the Trans-Pacific Partnership (TPP) negotiations, in which only four ASEAN members joined, leaving the remaining six excluded. Against this backdrop, in November 2011, ASEAN accepted the ASEAN-led joint proposal of RCEP.

On May 9, 2013, the first round of RCEP negotiations officially opened, although all countries were generally optimistic about the broad prospects of RCEP. Due to the large number of member countries participating in the negotiations, the difference in economic development levels and other factors resulted in larger disagreements between member countries. Coupled with the increasing number of negotiation topics and negotiating teams, the progress of negotiations was extremely slow. On the other side of RCEP’s slow progress, was the conclusion of TPP negotiations in October 2015 with the signing of the agreement in February 2016. ASEAN has been committed to enhancing the cohesion of the 10 ASEAN countries and safeguarding ASEAN’s core position and influence in the East Asian regional economy. However, in addition to Singapore, Malaysia, Brunei, and Vietnam among the 10 ASEAN countries, which joined the TPP negotiations, Thailand has also shown its willingness to join the TPP. This means that the TPP not only threatens ASEAN’s economic dominance in East Asia, leading to ASEAN’s marginalization but also threatens ASEAN’s integrity. As a result, the pressure of the TPP accelerated the RCEP negotiation process, holding two ministerial meetings and six rounds of negotiations in 2016, and holding the first RCEP negotiator leaders meeting in 2017. On January 20, 2017, Trump took office as US president and three days later, announced that the United States officially withdrew from the TPP agreement. This means that the Trump administration began to use bilateral negotiations to maximize US interests, and the wave of anti-globalization and trade protectionism followed. To deal with US economic sanctions and weaken the impact of the TPP, RCEP negotiators decided to accelerate the process of RCEP negotiations. On August 2–3, 2018, Beijing held the first RCEP ministerial meeting, and more than two-thirds of the negotiations in the bilateral market have been completed. In 2019–2020, the RCEP held two more summit meetings and seven rounds of consultations. Finally, on November 15, 2020, the leaders of 15 countries participated in the signing ceremony of RCEP online. The RCEP agreement was finally signed and trade cooperation in the Asia-Pacific region entered a new stage. RCEP is now the world’s largest FTA, the main purpose of which is to reduce tariffs between countries, establish a systematic trade and investment mechanism, and promote the long-term development of trade (Hoang, 2021).

Based on the import and export trade between China and RCEP member countries from 2001 to 2021 (Table 1 and Fig. 1), we explore the changes in trade between China and member countries in the process of the RCEP agreement. The data are obtained from the United Nations database for the analysis. Table 1 and Fig. 1 show that the export of China and RCEP member countries was 95.542 billion USD in 2001 and increased to 994.007 billion USD in 2021 (an increase of 9.4 times) with an average annual growth rate of 23.73%. China’s import from RCEP member countries was 79.840 billion USD in 2001 and 873.145 billion USD in 2021 (an increase of 9.4 times) with an average annual growth rate of 24.29%. Total trade volume between China and RCEP member countries increased from 175.481 billion USD in 2001 to 1867.152 billion USD in 2021 (an increase of 9.6 times) with an average annual growth rate of 23.98%. In addition, although the trade deficit between China and RCEP members fluctuated in 2008, 2015–2016, and 2019–2020, an expanding trend was observed, increasing from 15.702 billion USD in 2001 to 120.863 billion USD in 2021 (an increase of 6.7 times). China’s trade to RCEP member countries remained relatively stable at about 30% despite little fluctuation in China’s total exports.

China’s trade with RCEP fluctuated in 2008, 2015–2016, and 2021. Due to the global economic crisis in 2008, China and RCEP member countries’ trade decreased slightly in 2008–2009. Due to the impact of the signing of the TPP agreement, RCEP accelerated the negotiation process, showing a trend of stabilization with a small increase from 2009 to 2016. In 2019, the RCEP negotiation process accelerated. The RCEP free trade area agreement was signed in 2020, and the trade between China and RCEP member countries increased sharply in 2021.

Table 1. Bilateral trade between China and RCEP member countries.

Year	Value (hundred million US$)				Share of China's total trade (%)
	Export	Import	Total trade	Net export	
2001	955.42	798.40	1,753.81	157.02	34.41
2002	1,198.85	927.34	2,126.19	271.51	34.25
2003	1,729.28	1,174.96	2,904.24	554.31	34.13
2004	2,324.94	1,541.36	3,866.30	783.58	33.49
2005	2,697.42	1,868.76	4,566.18	828.66	32.11
2006	3,155.61	2,227.01	5,382.62	928.60	30.58
2007	3,735.51	2,733.71	6,469.22	1,001.80	29.73
2008	4,190.68	3,291.38	7,482.06	899.30	29.19
2009	3,821.19	2,806.19	6,627.38	1,015.00	30.03
2010	5,346.21	3,579.55	8,925.76	1,766.66	30.02
2011	6,379.54	4,389.11	10,768.65	1,990.42	29.57
2012	6,328.08	4,851.74	11,179.82	1,476.34	28.91
2013	6,520.85	5,270.23	11,791.08	1,250.61	28.35
2014	6,684.06	5,656.54	12,340.61	1,027.52	28.69
2015	5,919.77	5,594.19	11,513.96	325.58	29.13
2016	5,789.88	5,210.21	11,000.09	579.67	29.85
2017	6,836.98	5,660.04	12,497.02	1,176.95	30.43
2018	7,715.81	6,279.13	13,994.94	1,436.68	30.29
2019	7,615.21	6,676.96	14,292.17	938.25	31.22
2020	7,794.92	6,982.69	14,777.61	812.23	31.72
2021	9,940.07	8,731.45	18,671.52	1,208.63	30.88

Source: Calculated and collated from United Nations databases.

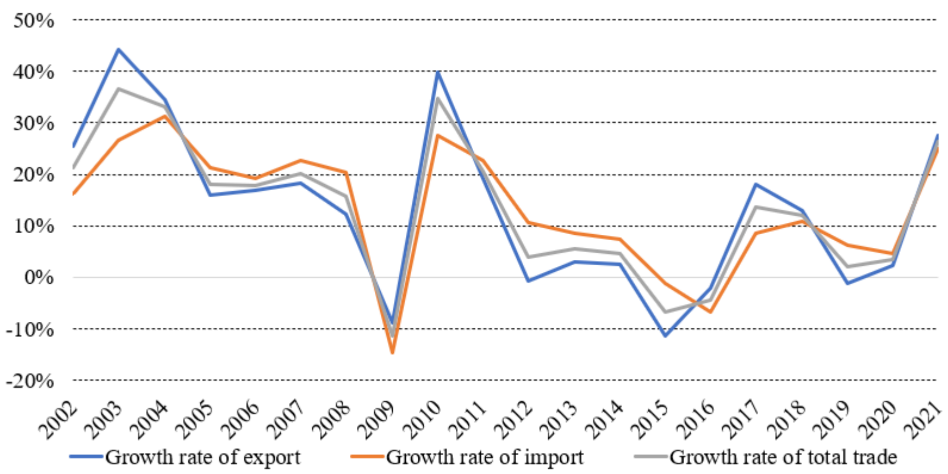

Fig. 1. Changes in trade between China and RCEP members from 2002 to 2021.

3. Intra-industry Trade between China and RCEP Member Countries

3.1. Selection of Intra-industry Trade Measurement Indexes

Intra-industry trade (IIT) refers to the trade behavior of a country that imports and exports similar products, or that the two sides of international trade exchange products manufactured in the same industry. The intra-industry trade index is used to measure the degree of intra-industry trade in an industry, which refers to the different quality of trade exchanges between two countries in the same industry. The statistical data shows the volume of products imported and exported at the same time for complementary trade demand in the industry. The higher the classification, the more convincing the intra-industry trade index is displayed. There are three types of intra-industry trade indexes: the Barassa index, the Grubel-Lloyd index (G-L index), and the standard intra-industry trade index. Among them, the G-L index is more accurate and used more. We also use this index to measure intra-industry trade (Eq. (1)).

$$GL = \left(1 - \frac{|X-M|}{|X+M|}\right) \times 100\% \tag{1}$$

where GL represents the level of intra-industry trade between China and other RCEP member countries, X represents the export value between the two countries and regions, and M represents the import value between the two countries and regions. The GL index is between 0 and 1. When GL = 0, a country has only imports or exports for inter-industry trade. When GL = 1, the import of a commodity is equal to the export. When GL is close to 1, the country's imports and exports are closer to intra-industry trade, and the degree of intra-industry trade is high. When GL is closer to 0, the degree of intra-industry trade is small.

3.2. Calculation of Index

The import and export data for China and other RCEP members from 2001 to 2021 are used to calculate the IIT indicator with Eq. (1). The data are obtained from the United Nations database. Table 2 shows the intra-industry trade index of trade between China and RCEP members. The intra-industry trade level between China and RCEP member countries is relatively high, and the value of each year is greater than 0.50. This indicates that China's trade with RCEP member countries is mainly intra-industry trade. The intra-industry trade level between China and South Korea fluctuated between 0.60–0.85 from 2001 to 2021, and the average annual intra-industry trade value was 0.7049. China's intra-industry trade level with Australia fluctuated between 0.55–0.95, with an average annual intra-industry trade value of 0.6994. The intra-industry trade level between China and New Zealand fluctuated between 0.60–1.00, and the average annual intra-industry trade value was 0.7951. The intra-industry trade level of China, Japan, and the 10 ASEAN countries was stable above 0.8, the average annual intra-industry trade value of China and Japan was 0.9054, and that of China and the 10 ASEAN countries was 0.9106. The fluctuation of the intra-industry trade level was relatively large in China and Australia and China and New Zealand, while China and the ten ASEAN countries had the highest intra-industry trade level, reaching 1.00 in 2009 and showing completely intra-industry trade. China's intra-industrial trade with Japan and the 10 ASEAN countries was relatively stable, reflecting the development of two-way trade between China and Japan and China and the 10 ASEAN countries. The reason is that China's products are relatively suitable for consumers in these two countries, and the commodity structure between the countries is highly complementary. This implies that Chinese products have a greater opportunity to enter the markets of Japan and the 10 ASEAN countries.

Table 2. Intra-industry trade index between China and RCEP member countries from 2001 to 2021.

Year	Japan	South Korea	Australia	New Zealand	ASEAN
2001	0.9755	0.6975	0.7936	0.7423	0.9355
2002	0.9506	0.7045	0.8787	0.8518	0.8899
2003	0.8896	0.6357	0.9236	0.8789	0.8154
2004	0.8760	0.6177	0.8669	0.8652	0.8322
2005	0.9109	0.6273	0.8117	0.9898	0.8719
2006	0.8840	0.6633	0.8270	0.8959	0.8901
2007	0.8649	0.7046	0.8218	0.8314	0.9232
2008	0.8708	0.7947	0.7455	0.8598	0.9681
2009	0.8557	0.6872	0.6872	0.9141	1.0000

Table 2. *Cont.*

Year	Japan	South Korea	Australia	New Zealand	ASEAN
2010	0.8130	0.6641	0.6164	0.8470	0.9627
2011	0.8650	0.6751	0.5818	0.8573	0.9257
2012	0.9205	0.6839	0.6171	0.7989	0.9486
2013	0.9612	0.6649	0.5502	0.6672	0.9056
2014	0.9567	0.6909	0.5724	0.6653	0.9062
2015	0.9738	0.7345	0.7083	0.8553	0.9818
2016	0.9403	0.7417	0.6893	0.8002	0.9634
2017	0.9058	0.7329	0.6074	0.7039	0.9063
2018	0.8974	0.6940	0.6181	0.6851	0.9421
2019	0.9095	0.7800	0.5690	0.6271	0.8436
2020	0.8989	0.7877	0.6248	0.6678	0.8846
2021	0.8931	0.8217	0.5770	0.6927	0.8250

4. Establishment and Empirical Analysis of Econometric Models

4.1. Influencing Factors of Intra-industry Trade

According to the literature review, the main influencing factors on intra-industry trade are selected considering GNID, PGCF, INDVUADD, FDI, and geographical location and cultural difference (ASIA).

4.1.1. Per Capita Income Level

Linder's "Overlapping Demand Theory" states that if the per capita income levels of two countries are closer, the greater the overlap in the structure of demand between them, and thus the closer the trade relationship between the two countries. Per capita income level is usually used to measure a country's consumption level and consumption structure as an important indicator. Generally speaking, the change in per capita income level and consumer demand for products is positively correlated. Thus, the higher the per capita income level, the greater the consumer demand for differentiated products, thereby promoting the differentiated manufacturing of products in a country. Since China's per capita income level is lower than that of most RCEP partner trading countries, we use the difference in GNID between China and other RCEP trading partners to measure the difference in demand levels between the two sides. Since the value of GNID is generally negative, we speculate that GNID is negatively correlated with the IIT index.

4.1.2. Difference in Resource Endowments

According to the Heckscher-Ohlin theory of resource endowments, when countries possess the same level of technology to manufacture a product, the difference between them causes different product costs which come from different costs of manufacturing factors. The difference in such costs depends on the relative abundance of manufacturing resources in countries, that is, the difference in relative endowments, which leads to international trade and division of labor. If a country has relatively abundant capital, cheap prices but relatively scarce and expensive labor, the country is suitable for manufacturing and exporting capital-intensive products and importing labor-intensive products. On the contrary, if labor is relatively abundant and cheap, and capital is relatively scarce and expensive, the country is suitable for manufacturing and exporting labor-intensive products and importing capital-intensive products. If there is a large difference in the factors between the two countries, then the trade between the two countries is mainly inter-industry trade, and if the difference between the two countries is small, then the trade between the two countries is mostly intra-industry trade. The difference in factor endowment is negatively correlated with intra-industry trade. The factor endowment is well reflected by a country's capital/labor indicators. Thus, we select the indicator of the GDP of RCEP member countries from the World Bank database, the United Nations database, and the National Bureau of Statistics. Then, we replace the capital-labor ratio K/L with the product of the GDP indicator and the per capita GDP. The final data show that China's capital/labor is lower than that of other RCEP member countries because these member countries are developed countries and newly industrialized countries. We then use the share of gross capital formation in the total population as a measure of PGCF, that is, gross capital formation per capita. The difference between the two countries is obtained as the difference in factor endowments. When the difference in per capita gross capital formation is smaller, the more likely it is to occur intra-industry trade. It is predicted that PGCF is negatively correlated with intra-industry trade.

4.1.3. Level of Economic Development

The higher the degree of economic development of a country, the higher the proportion of the country's manufacturing industry in the industrial structure. Since intra-industry trade mainly occurs in manufacturing, intra-industry trade, a country's economic development degree is positively correlated with the intra-industry level. We use industrial value-added GDP (INDVUADD) to express a country's level of economic development. Under normal circumstances, the level of economic development is positively correlated with intra-industry trade where the higher the degree of economic development, the higher the per capita national income level, and the higher the degree of intra-industry trade. However, there are situations in which the per capita national income level is high but the level of international economic development is not high. For example, in countries that export oil, their trade is monotonous and is mainly based on inter-industry trade. Although the level of economic development for them may not be high, their per capita income relying on crude oil exports even exceeds that of several developed countries. However, there are few countries with such economic development characteristics in the study, so the estimated level of economic development is still positively correlated with the intra-industry trade index.

4.1.4. Foreign Direct Investment

FDI has substitution and creative effects on trade depending on its types. If there are no trade barriers between the two countries (the factors of manufacturing flow freely) and trade links between the two countries naturally form, no investment occurs. If there are trade and tariff barriers between the two countries (factors of manufacturing do not flow freely), then direct investment bypasses tariffs. TNCs often choose OFDI as a substitute for trade to compensate for market losses, which leads to a substitution effect. To reduce their export costs and increase the added value of their products, multinational companies generally choose to develop processing trade and participate in the international division of labor system, which causes trade creation effects and promotes trade. When the type of FDI from China is not known, it is not possible to judge whether it is a substitution effect or a creation effect on trade between the two countries. Therefore, we do not predict the positive and negative relationship between international direct investment and the intra-industry trade index.

4.1.5. Geographical Location and Cultural Differences

Geographical location directly determines the size of trade and transportation costs between countries, and the impact on intra-industry trade is much greater than the impact of inter-industry trade. The closer the country, the higher the intra-industry trade index, while the farther away the country, the lower the intra-industry trade index. Correspondingly, cultural differences also determine the degree of communication between the two countries. The smaller the cultural differences, the more similar consumption concepts, and the easier it is to consume alternative heterogeneous goods. Since geography is a qualitative indicator and difficult to measure with specific values, we set it as a dummy variable (AISA). If the member country is in Asia, the AISA value is 1. If the member country is not in Asia, the AISA value is 0. When both trading countries are Asian countries and close to each other, they are to promote intra-industry trade, and geo-cultural differences are expected to be positively correlated with intra-industry trade. To sum up, by sorting out the major national factors influencing trade in the above industries, Table 3 is obtained as follows.

Table 3. Meaning of variables and the expected sign.

Factor	Variable	Meaning of variables	Expected sign
Difference in demand level	GNID	Difference in per capita income level	−
Difference in resource endowments	PGCF	Gross capital formation per capita	−
Level of economic development	INDVUADD	industrial value added/GDP	+
Foreign direct investment	FDI	Foreign direct investment	+/−
Geographical location and cultural differences	ASIA	Asia country or not	+

4.2. Data Sources and Sample Selection

According to the literature review, the national influencing factors on intra-industry trade are selected as follows: difference in GNID, difference in PGCF, INDVUADD, FDI, and ASIA. According to the analysis of the trade volume of the 10 ASEAN countries, that of Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam is relatively large, and that of Brunei, Cambodia, Laos, and Myanmar is relatively small. To ensure the number of cross-sectional data in the panel data, we group the 10

ASEAN countries into two cross-sections: 6 (AS6) and 4 ASEAN countries (AS4). In this study, RCEP member countries are used as sample countries: Japan (J), South Korea (K), Australia (A), New Zealand (N), ASEAN 6 (AS6) and ASEAN 4 (AS4). The sample period is 2001–2021 with a size of 66 observations.

We collect trade data between China and RCEP member countries from the United Nations database and measure the value of GL variables using the G-L calculation method. The difference in demand level (GNID) data comes from the World Bank database. The difference in resource endowments (PGCF) is derived from the product of the indicator of gross capital formation/GDP and GDP per capita which are derived from the World Bank database. INDVUADD is calculated from industrial value added/GDP, and that of each country is derived from the World Bank database. All data on FDI comes from China's National Statistical Offices.

4.3. Model Construction

In summary, the index factors affecting intra-industry trade between countries are selected as GNID, PGCF, INDVUADD, and FDI. The basic econometric model is constructed as Eq. (2).

$$\mathrm{IIT_{kt}} = \mathrm{a_0} + \mathrm{a_1 GNID_{kt}} + \mathrm{a_2 PGCF_{kt}} + \mathrm{a_3 INDVUADD_{kt}} + \mathrm{a_4 FDI_{kt}} + \mathrm{aAISA} + \varepsilon_{\mathrm{kt}} \tag{2}$$

where a_0 is the constant term, a_i is the estimated coefficients, k is other RCEP members, t is the time (2001–2021), and the ε_{kt} is the random error term.

4.4. Results

Through the correlation and collinearity test of the data, it is found that there is no serious problem with multicollinearity interference results. The Hausman test is performed using Eviews 10.0 before panel regression to determine whether a fixed-effect model or a random-effects model must be chosen. The test results show that the P value is close to 0, which is less than the significance level of 0.05, so the null hypothesis of the random-effect model is rejected and the fixed-effect model is selected. Eviews 10.0 is used to perform Ordinary Least Squares regression analysis on Model 1, and the results are shown in Table 4. The results of Model 1 are not satisfactory as PGCF and FDI in Model 1 are calculated as expected but the P values of ASIA, PGCF, and FDI are lower than the significance level of 0.05. The signs of GNID and INDVUADD are expected to be opposite, and the P values of GNID and INDVUADD are greater than the significance level of 0.05. This means that they cannot pass the significance test, which proves that the model needs further improvement.

Table 4. Multiple regression model results (Model 1).

Variable	Expected sign	Coefficient	t-value	p-value
C	/	0.8210	6.3512	0.0000
ASIA	+	−0.0875	−2.0471	0.0433
GNID	−	4.42×10^{-6}	1.5762	0.1181
PGCF	−	-2.03×10^{-5}	−3.8552	0.0002
INDVUADD	+	−0.1503	−0.5494	0.5840
FDI	+/−	3.57×10^{-7}	3.9932	0.0001
Adjusted-R^2		0.3747		
F-statistic		15.2560		
Prob(F-statistic)		0.0000		

After adjusting the model through trial and error, the interaction term ASIA × GNID is added to the model to obtain Model 2 as Eq. (3).

$$\mathrm{IIT_{kt}} = \mathrm{a_0} + \mathrm{a_1 ASIA} + \mathrm{a_2 ASIA} * \mathrm{GNID_{kt}} + \mathrm{a_3 GNID_{kt}} + \mathrm{a_4 PGCF_{kt}} + \mathrm{a_5 INDVUADD_{kt}} + \mathrm{a_6 FDI_{kt}} + \varepsilon_{\mathrm{kt}} \tag{3}$$

where a_0 is a constant, a_i is the estimated coefficients, k is other RCEP members, t is the time (2001–2021), and the ε_{kt} is the random error term.

Eviews10.0 is used to perform the Hausman test on Model 2, and the test results show that the P value is close to 0 (less than the significance level of 0.05), so the null hypothesis of the random-effect model is rejected, and the fixed-effect model is selected in this study. The results are shown in Table 5.

Table 5. Multiple regression model results (Model 2).

Variable	Expected sign	Coefficient	t-value	p-value
C	/	1.0236	8.4001	0.0000
ASIA	+	−0.9151	−5.5463	0.0000
GNID	−	3.02×10^{-5}	5.1557	0.0000
PGCF	−	-1.81×10^{-5}	−3.5947	0.0005
INDVUADD	+	-2.13×10^{-6}	−0.3641	0.7166
FDI	+/−	0.9156	2.8616	0.0051
Adjusted-R^2			0.5020	
F-statistic			5.8472	
Prob(F-statistic)			0.0000	

The regression results in Model 2 indicate that the model is fitted with adjusting $R^2 = 0.5020$. The value of the F-test statistic is 5.8472, and its *p* value is 0 (less than the significance level of 0.05), indicating that the model is statistically significant. The AISA indicator of geo-cultural difference is negatively correlated with the expectation, and the *p* value passes the significance test. Theoretically, geographical and cultural differences have a positive impact on intra-industry trade, and geographical location directly determines the size of trade costs between countries. The closer the distance, the lower the costs. Cultural differences also determine the degree of communication between the two countries. Countries with smaller cultural differences have more similar consumption concepts, so it is easier to trade within the industry between two countries owing to closer geographical locations and small cultural differences. However, the opposite symbol in the results is found in RCEP countries in Asia. Unlike developed countries, most Asian countries are mainly based on the trade of product processing and agricultural product. The similarity of products is high among the countries so the distance has no positive impact on intra-industry trade. Another reason is that the world's logistics technology system has been mature and perfect. Countries around the world through the Internet are also more connected. Cultural differences and language exchanges, therefore1, have no longer become a huge obstacle to trade. Logistics technology has also made the transportation of goods more convenient and faster, which results in relatively more intra-industry trade among non-Asian countries and China.

The sign of the GNID indicator of demand similarity is negative, which is consistent with expectations, and the P value passes the significance test. According to Linder's theory, the smaller the gap between the per capita income levels of the two countries, the greater the overlap in the demand structure between them. When the trade relationship between the two countries is close, the degree of intra-industry trade becomes large. That is, the degree of the demand similarity of GNID is negatively correlated with the intra-industry trade index. The regression results show that GNID does affect the development of intra-industry trade. The ASIA × GNID coefficient sign of the interaction is positive, and the P-value shows passing the significance test. The sign of the PGCF indicator of factor endowment difference is negative, which is consistent with expectations but the P value does not pass the significance test. When the difference in factor endowments is great, inter-industry trade often occurs. The smaller the difference in factor endowments, the more intra-industry trade occurs. The coefficient of PGCF of factor endowment difference is positive, which indicates that PGCF has a positive impact on the development of intra-industry trade. However, the variable fails the test, which suggests that the indicator is not strong in explaining the level of intra-industry trade in this case.

The sign of the INDVUADD index of economic development level is positive, which is consistent with expectations and the P value passes the significance test. It is generally believed that the higher the level of economic development, the higher the per capita national income level and the higher the level of intra-industry trade. The regression result of INDVUADD is indeed positive, indicating that the level of economic development has a positive effect on the level of intra-industry trade. In theory, the impact of FDI on intra-industry trade is uncertain and its effect needs to be determined according to the type of FDI. The sign of the FDI indicator is positive but the coefficient is small, which indicates that there are trade substitution and creation effects in FDI in China. On the one hand, China has been actively attracting FDI, developing processing trade, and constantly participating in the international division of labor system. On the other hand, with the continuous development of China's economy, the per capita income level continues to increase, and the market potential is constantly emerging, attracting many multinational companies to invest in China.

5. Analysis of Countermeasures for Development of Trade between China and RCEP Members

Taking the G-L index as an indicator to measure the level of intra-industry trade, the current status of trade between China and RCEP countries is investigated by measuring the intra-industry trade level between China and RCEP countries. The influencing factors of intra-industry trade between China and RCEP member countries are also explored. The results show that the level of economic development and FDI has a positive impact on intra-industry trade between China and RCEP members, while the level of demand similarity and geographical and cultural differences undermines trade between China and RCEP members. RCEP reduces tariffs and trade barriers between member countries as well as non-tariff barriers so that the goal of liberalization of trade in all products is going to be achieved soon. Therefore, it is necessary to accelerate the implementation of relevant policies and regulations to promote trade between China and RCEP members. In the future, it is required to actively strive for more countries to join the RCEP agreement, deepen Asia-Pacific economic integration, promote win-win cooperation among countries and regional economic development, and meet people's yearning for a better life. Therefore, we propose the following countermeasures and suggestions to promote the development of trade between China and RCEP members.

5.1. Investment in Industrial Chain and Participation of Enterprises in RCEP

The government must implement special action plans to encourage enterprises to participate in RCEP economic and trade cooperation. First, it is necessary to strengthen the exemplary role of enterprises. Due to the wide range of topics and detailed regulations of RCEP, it is difficult for enterprises to formulate systematic development strategies based on the open cooperation opportunities brought by RCEP. Thus, it is recommended to select leading import and export enterprises, use the cumulative rules of certification of origin and tariff reduction policies, and provide a model for foreign trade enterprises. Second, FDI must be invited. It is necessary to make full use of the trade and investment liberalization opportunities brought by RCEP and attract multinational companies from Japan, South Korea, Singapore, and other member countries to invest in China. At the same time, local governments need to strictly implement the foreign investment law in government procurement, motivate local governments to actively absorb the experience of opening up in other regions, and accelerate the popularization of the results of the "first mover and first pilot" nationwide. Third, the industrial chain needs to improve and be empowered for the role of market players. Enterprises must be encouraged to "go global" to improve the level of openness and development of China's financial industry and digital economy industry and bring new development opportunities to related enterprises.

5.2. Government Policy Support for Zero Tariffs and Opening up

The result of this study on the potential economic effects of liberalization and improving the connectivity and facilitation of trade in goods and services among ASEAN member countries show that reducing trade barriers has a significant positive impact on economic welfare. Relevant government policies and regulations are required to support them. First, it is demanded to promote the introduction of zero-tariff measures for trade in goods and reduce tariffs and trade barriers. In terms of trade, intraregional trade must be increased to achieve zero tariffs and make the RCEP FTA fulfill its commitment to free trade in a relatively short period. With unified rules for origin, customs procedures, inspection and quarantine, and technical standards, the superposition of the effects of the elimination of tariff and non-tariff barriers releases the trade creation effect of RCEP and benefits enterprises and consumers in countries. Second, the commitment to new opening-up and improving the level of opening-up is required. It is suggested to strengthen interdepartmental coordination, open up trading in goods, trade in services, investment, movement of natural persons and other fields, and implement higher standards and rules in trade and investment liberalization and facilitation, intellectual property protection, trade remedy, e-commerce, government procurement, small and medium-sized enterprises, and economic and technical cooperation. The entry of more countries helps to shape and upgrade the development level of China's modern service industry, while the accelerated flow of bilateral investment integrates Chinese enterprises into the regional industrial chain and accelerates the integration and upgrading of the industrial ecology, and enhances international competitiveness.

5.3. National Infrastructure and Free Trade Zones

By strengthening China's infrastructure, the economic gap between China and other countries can be narrowed. Through the development of transportation networks such as railway networks, aviation networks, road networks, and the Internet, the interconnection between China and RCEP member countries can be improved. On this basis, digital economic cooperation is built to promote big data, 5G communications, cloud computing, and cross-border e-commerce as examples, establish a modern, intelligent, and integrated RCEP big data network trade platform, and create a multi-level comprehensive transportation network. Secondly, the government needs to open pilot free trade zones near the border such as Guangxi and Yunnan between China and other RCEP member countries. The pilot free trade zones are a new opportunity for innovative development and opening up more space for reform. They also provide effective assistance to accelerate new development with domestic and international economic circulation, which promotes China to achieve a higher level of opening up and then participate in regional integration and development for the integrated market and the reform of international economic and trade rules (Wang et al., 2021).

5.4. Principle of Peace and Integration Process of RCEP

As a major country in East Asia, China takes the initiative to shoulder the arduous historical responsibility of promoting regional cooperation and integration. Although the negotiations in RCEP are led by ASEAN, China also actively coordinates all parties on issues, emphasizes peaceful diplomacy, and promotes the sustainable development of RCEP. China properly handles its relations with Japan and other countries to avoid adverse effects from historical and political factors on friendly relations and trade exchanges between RCEP countries. At the same time, China needs to increase trade ties with member countries, exert the power of RCEP, and jointly resist trade protectionism by reducing dependence on the single market. When the global situation is turbulent, the implementation of the relevant policies of the RCEP agreement needs to be promoted further to encourage more countries to join the RCEP. Then, global economic integration can be continuously promoted for mutual benefit and win-win results and Asia-Pacific economic cooperation in a more inclusive direction.

Funding: This research received no external funding

Data Availability Statement: The data are obtained from the UNCTADSTAT, the World Bank Open Data, the National Bureau of Statistics of China and other public data websites.

Conflicts of Interest: The author declares no conflict of interest.

References

1. Chang, Y.C. (2022). Accelerating Domestic and International Dual Circulation in the Chinese Shipping Industry-An Assessment from the Aspect of Participating RCEP. *Marine Policy*, *135*(1), 104862.
2. Cheng, H., & Yang, L. (2020). Influence of Regional Trade Agreement and the Term Depth on China's Intra-industry Trade. *Journal of Zhejiang Shuren University (Humanities and Social Sciences)*, *20*(4), 52–60.
3. Cheng, Z.H., & Tu, Y.Y. (2022). Measurement and Comparison of Intra-industry Trade in China's Manufacturing Industry. *Statistics & Decision*, *38*(5), 116–120.
4. Dai, Q.L., Hou, J.Y., & Gao, D.Y. (2022). Research on the Factors Affecting Intra-industry Trade in Agricultural Products between China and Other RCEP Member Countries: Based on Grey Relation Analysis. *Journal of Wuxi Vocational Institute of Commerce*, *22*(6), 43–54.
5. Geng, X.H., Wei, X.Y., & Peng, S.G. (2021). Study on Intra-industry Trade of Fruits between China and ASEAN and Its Influencing Factors. *China Fruits*, *215*(9), 102–108.
6. Hoang, T.T. (2021). Research on Influencing Factors of Intra-industry Trade of Agricultural Products between Vietnam and RCEP Member Countries. Master's Thesis, Central China Normal University, Wuhan, China, Unpublished.
7. Hu, Z.Y. (2020). A Study on the Influencing Factors of Intra-industry Trade in High-tech Products between China and G20 Member States. Master's Thesis, Zhongnan University of Economics and Law, Wuhan, China, Unpublished.
8. Kang, C.W., & Huang, W.K. (2022). Analysis of Factors Influencing Intra-industry Trade of Agricultural Products between China and the European Union. *Journal of Commercial Economics*, *857*(22), 157–161.
9. Li, J. (1998). Theory and Verification of Intra-industry Trade. *Finance & Trade Economics*, *9*, 40–43.
10. Liang, H.J. (2007). Intra-industry Trade Theory and the Empirical Analysis based on China. Master's Thesis, Nankai University, Nanjing, China, Unpublished.
11. Liu, Y.Y. (2020). Research on the Measurement and Influencing Factors of Intra-industry Trade between China and Eastern European Countries. Master's Thesis, Inner Mongolia University, Hohhot, China, Unpublished.
12. Liu. Z. X., & Guo, Y.X. (2022). Research on Intra-industry Trade and Trade Competitiveness of Cultural Products between China and RCEP Countries. *Practice in Foreign Economic Relations and Trade*, *402*(7), 62–68.
13. Song, Y. (2022). Comparative Analysis on the Influencing Factors of Intra-industry Trade of Manufactured Goods in CHINA-ASEAN: Free Trade Area and North American Free Trade Area. Master's Thesis, Liaoning University, Shenyang, China, Unpublished.
14. Wang, Q.H., Kong, X.X., & Wang, Y.L. (2022). Research on the Influencing Factors of Intra-industry Trade of Mechanical and Electrical Products between China and Countries along the Belt and Road. *Research on Development*, *5*, 112–120.
15. Wang, Z.F., Zhao, Y.L., & Zhang, D. (2021). Path and Prospects of the International Development Cooperation of China within the Framework of RCEP. *Journal of Northeast Asia Studies*, *4*, 16–28 and 145–146.

16. Xu, Y.L., & Zhang, Y. (2021). Measurement and Influencing Factors of Intra-industry Trade Level between China and BRICS. *Journal of Hebei University (Philosophy and Social Science)*, *46*(4), 116–127.
17. Yang, Z.B. (2021). Research on the Influencing Factors of Intra-industry Trade of Industrial Manufactured Products between China and South Korea. Master's Thesis, Capital University of Economics and Trade, Beijing, China, Unpublished .
18. Zhuang, P.F., Zheng, N.X., & Zhou, Z.X. (2022). A Research on the Influencing Factors of the Intra-industry Trade of Agricultural Products Among China and the "the Belt and Road" Countries. *Journal of Ningde Normal University (Philosophy and Social Sciences)*, *3*, 38–48.