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ANALYSIS OF THE IMPACT OF RCEP IMPLEMENTATION ON GLOBAL TRADE – A SIMULATION BASED ON THE DYNAMIC GTAP MODEL

ANALIZA WPŁYWU WDROŻENIA RCEP NA HANDEL ŚWIATOWY – SYMULACJA OPARTA NA DYNAMICZNYM MODELU GTAP

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Abstract

Subject and purpose of work: This paper divides the world into 10 countries or regions based on the member states of the Regional Comprehensive Economic Partnership Agreement (RCEP), and categorizes industries into 10 major sectors according to the International Standard Industrial Classification (ISIC).

Materials and methods: Using the dynamic GTAP model, it analyzes the macroeconomic and micro-industry effects on both regional and non-member countries when import tariffs are reduced to zero among RCEP member states.

Results: Imulation results indicate that after tariff reductions, member countries experience GDP growth, improved trade conditions, increased social welfare, and significant gains in member country benefits.

Conclusions: Each industry in member countries is affected to varying degrees, allowing countries to leverage their industrial advantages, enhance value-added products, and shift trade from outside the region to within the region.

Keywords*: RCEP, GTAP model, tariff reduction, economic effects

Streszczenie

Przedmiot i cel pracy: Niniejszy artykuł dzieli świat na 10 krajów lub regionów w oparciu o państwa członkowskie Regionalnego Kompleksowego Porozumienia o Partnerstwie Gospodarczym (RCEP) i kategoryzuje gałęzie przemysłu na 10 głównych sektorów zgodnie z Międzynarodową Standardową Klasyfikacją Przemysłową (ISIC).

Materiały i metody: Korzystając z dynamicznego modelu GTAP, przeanalizowano makroekonomiczne i mikroprzemysłowe skutki zarówno dla krajów regionalnych, jak i krajów niebędących członkami, gdy cła importowe zostaną zredukowane do zera między państwami członkowskimi RCEP.

Wyniki: Wyniki symulacji wskazują, że po obniżeniu ceł kraje członkowskie doświadczają wzrostu PKB, poprawy warunków handlowych, wzrostu dobrobytu społecznego i znacznych korzyści dla krajów członkowskich.

Wnioski: Każda branża w krajach członkowskich jest dotknięta w różnym stopniu, co pozwala krajom wykorzystać ich przewagę przemysłową, ulepszyć produkty o wartości dodanej i przenieść handel spoza regionu do regionu.

Słowa kluczowe: RCEP, model GTAP, redukcja taryf, skutki gospodarcze

Introduction

Amidst the rise of trade protectionism and the tide of anti-globalization, regionalism has emerged as a response to the complex international environment. According to the World Trade Organization's Regional Trade Agreements Database, as of 2023, a total of 367 regional trade agreements have been implemented. Among them, the Regional Comprehensive Economic Partnership (RCEP) is jointly signed by 15 countries including the ten Association of Southeast Asian Nations (ASEAN),China, Japan, South Korea, Australia, and New Zealand. On June 2, 2023, the RCEP agreement officially took effect in the Philippines, marking its comprehensive implementation among all 15 signatory countries. The aim of the agreement is to gradually eliminate tariffs and non-tariff barriers, promoting trade liberalization and economic integration within the region. RCEP is currently the world's largest free trade agreement in terms of population, economic scale, and development potential.

In 2023, intra-regional trade within RCEP reached USD 5.6 trillion, attracting USD 234.1 billion in greenfield investments, which is 2.2 times higher than the levels in 2021 before the agreement took effect. The implementation of the RCEP agreement represents a significant milestone for the economic development of the Asia-Pacific region, fostering a new phase of regional cooperation aimed at shared dividends and mutual development, and promoting high-quality regional economic development. Therefore, to study the economic effects brought about by the implementation of RCEP, this paper uses the scenario where all goods trade barriers under RCEP are completely eliminated as a benchmark. It employs the Global Trade Analysis Project (GTAP) and the GTAP10 database to simulate and assess the economic effects of RCEP implementation, with a focus on its impact on China.

Literature review

Since its proposal by the ASEAN ten countries, the Regional Comprehensive Economic Partnership (RCEP) has garnered significant attention from scholars both domestically and internationally. Studies on RCEP employ various research methods, encompassing both qualitative and quantitative analyses using Computable General Equilibrium (CGE) models and Global Trade Analysis Project (GTAP) models. Many studies examining the impacts of RCEP also compare it with agreements like the Trans-Pacific Partnership (TPP) and Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), offering multifaceted analyses of RCEP's economic effects.

Itakura (2014) utilized a CGE model to analyze the impact of RCEP on ASEAN countries, suggesting substantial benefits for ASEAN member states. Li et al. (2016) employed CGE models to simulate the effects of the China-Japan-Korea Free Trade Agreement, TPP, and RCEP, finding that member countries benefit while non-member countries incur losses. Jun Zhang and Jinyong Zhan (2018) used a CGE model to simulate various scenarios and their macroeconomic impacts on trading nations, demonstrating positive effects on GDP, social welfare, and trade under reduced trade barriers within the RCEP framework.

Shumei Chen and Juhua Ni (2014) utilized the GTAP model to simulate the economic effects of fully implementing RCEP on major countries and regions both within and outside the region, revealing significant positive impacts on industry sectors while also noting considerable disruptions in mining, machinery, electronics, transportation, and services sectors. Linqing Xu and Shaomei Jiang (2021) employed a dynamic GTAP model to analyze the economic effects of tariff and non-tariff barrier reductions under RCEP and

CPTPP, suggesting that RCEP's liberalization efforts partially offset the strategic impacts of CPTPP. Yunsu Du and Yanping Liu (2020) analyzed the impact of RCEP from the perspective of global manufacturing division of labor, concluding that RCEP enhances the position of Asian value chains globally, facilitating upward movement in member countries' industrial chains and achieving industrial upgrading. Shuijun Peng and Lamei Wu (2022) evaluated the effects of RCEP on member countries from a value chain perspective, showing improvements in member countries' GVC trade and participation, with increased value-added trade shifting towards intra-regional transactions.

Through this review of literature, it is evident that many studies utilize CGE and GTAP models to quantitatively analyze the impacts of trade policy changes. While CGE models have limitations in terms of data matching with reality, this paper employs the GTAP model to assess the economic effects of RCEP implementation on both regional and non-regional economies. Utilizing the GTAP10 database and updating baseline years dynamically to 2021 will enhance the accuracy of research findings. Additionally, this paper focuses on the macroeconomic effects and micro-level impacts arising from the complete elimination of tariff barriers among RCEP member states.

GTAP model setting

GTAP model application

Johansen (1960) created the Computable General Equilibrium (CGE) model to analyze the impact of economic and political policy factors on economic growth, household income, consumption, and other aspects in one or multiple countries (Li Xinxing et al., 2020). It is a commonly used analytical tool for evaluating the effects of internal and external factors on economic activities. The GTAP model, developed by Hertel (1997) at Purdue University in the United States, is a CGE model designed based on neoclassical economic theory to address global economic and trade issues. By constructing sub-models for production, consumption, and government expenditure in individual countries or regions (Rosyadi and Widodo, 2018), it connects these sub-models through international trade relationships to form a multi-country, multi-sector CGE model (Walmsley, 2013). The GTAP model is primarily used for quantitative analysis of the economic impacts of specific foreign trade policies on various countries or regions and has proven to be highly effective.

Therefore, this study employs the multi-sectoral general equilibrium model developed by Purdue University to analyze the impact of the RCEP's implementation on the global economy, using the GTAP version 10 database, which encompasses 141 countries and 65 industrial sectors[1]. This database includes input-output data, trade and economic data, tax data, and other relevant information for various countries. Given the focus on the RCEP's impact on the global economy, the GTAPAgg2 software is utilized to categorize the world's 141 countries into China, Japan, Korea, Australia, New Zealand, ASEAN, India, the United States, the European Union, and ten other global regions. Industries are classified into 10 major categories based on the International Standard Industrial Classification System, detailed in Table 1: grains and crops, livestock and meat products, energy, processed food, textiles and clothing, light industry, heavy industry, public utilities and construction, transport and communications, and other services. In terms of production factors, skilled and unskilled labor are consolidated into the labor factor, resulting in four distinct categories: land, capital, labor, and natural resources.

Table 1. Industry Classification

Serial No.	Sector Classification	Scope of Coverage
1	Crops and Cereals	Rice, Wheat, Cereals and Other Related Products, Vegetables, Fruits, Nuts, Oil Crops, Sugar Crops,
2	Animal Husbandry and Meat	Cattle, Sheep, Horses, Livestock, Animal Products and Other Related Products, Milk, Wool, Silk Products, Beef, Horse Meat, Meat Products,
3	Natural Resources	Forests, Fisheries, Coal, Oil, Natural Gas, Minerals, and Related Products

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[1]   https://www.gtap.agecon.purdue.edu/products/packages.asp

4	Processed Food	Animal and Vegetable Fats, Dairy Products, Sugar, Food Products and Other Related Products, Beverages, and Tobacco Products
5	Textiles and Clothing	Textiles, Clothing
6	Light Industry	Leather Products, Water Products, Paper Products, Metal Products, Motor Vehicles, and Spare Parts
7	Heavy Industry	Petrochemicals and Coal Products, Ferrous (Iron) Metals, Non-ferrous Metals, and Related Products, Mineral Products, and Other Related Products, Chemical Rubber Products, Plastics, Electronic Equipment, Machinery Equipment and Other Related Products
8	Utilities and Construction	Water, Electricity, Natural Gas Production and Retail, construction
9	Transportation, and Communication	Tourism, Maritime, Air Transport, Communication, Transport and Other Related Services
10	Other Services	Financial and Other Related Services, Insurance, Business Services and Other Related Services, Entertainment and Related Services, Government/Courts/Healthcare/Education, Residential Housing

Source: The classification standard is based on the GTAPAgg2 database.

Research programme design

The GTAP Version 10 database uses 2014 as its base year, while the RCEP agreement came into effect on January 1, 2022. Therefore, this study adopts the dynamic recursive method proposed by Walmsley and Strutt (2010). Using the Econmap 3.1 database from the French Center for Economic Research (CPEII)[2], the growth rates of actual GDP, population, capital, and labor force indicators for 2021 relative to 2014 are calculated. The year 2021 is then used as the base year for policy simulations. Upon full implementation of the RCEP, achieving free trade among member states involves reducing import tariffs to zero among them, while maintaining existing tariffs on non-member countries. The simulation period reflects the attainment of a fully operational free trade area. The policy shock variable in this study is the import tariff reduction (TMS), aiming for a target import tariff of zero among RCEP member countries. The simulation is conducted using the RunGTAP software.

Table 2. Growth Rates of Macroeconomic Indicators for Countries or Regions Worldwide, 2014-2021

Region	GDP Growth Rate	Capital Growth Rate	Labor Force Growth Rate	Population Growth Rate
China	59.73%	75.27%	-0.89%	3.22%
Japan	10.09%	7.51%	1.98%	-1.65%
South Korea	21.36%	32.06%	4.37%	1.38%
India	76.44%	64.20%	7.42%	7.55%
Australia	18.01%	21.93%	9.29%	9.29%
New Zealand	23.72%	23.86%	9.52%	6.42%
USA	16.00%	17.79%	4.27%	4.47%
ASEAN	40.99%	41.92%	9.14%	7.93%
EU	12.49%	12.56%	0.46%	0.73%
Others	17.24%	21.55%	13.77%	12.42%

Source: Calculated based on data from CPEII.

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[2]   https://cepii.fr/CEPII/en/bdd_modele/bdd_modele_item.asp?id=11

Analysis of GTAP simulation results

To investigate the comprehensive global economic impact of the complete removal of trade barriers under the RCEP upon its full implementation, this paper analyzes the macroeconomic effects and microeconomic effects generated by the RCEP.

Macroeconomic effects of RCEP

The macroeconomic effects of RCEP are reflected in changes in GDP, import and export trade, terms of trade, and overall social welfare across countries and regions. As shown in Table3, when import tariffs on goods are reduced to zero, the GDP of RCEP member countries all experience varying degrees of increase. Japan, with a GDP growth rate of 4.31%, has the highest increase, followed by South Korea and ASEAN. Conversely, the GDP of countries or regions outside the region is negatively impacted to some extent, with the US and EU GDPs declining by 0.75% and 0.47%, respectively. This is because the implementation of RCEP leads to increased trade among member countries within the region, resulting in a decrease in trade with the EU and the US. Furthermore, the substantial economic size of RCEP contributes to the observed decrease in US and EU GDPs.

After the implementation of RCEP, import tariff barriers were significantly reduced to zero, leading to varying degrees of increases in exports and imports among member countries. Regarding exports, South Korea experienced the largest growth at 2.59%, followed by China at 1.39% and Australia at 0.9%. In terms of imports, South Korea and Japan saw substantial increases of 5.91% and 5.74%, respectively. India, not being part of RCEP, experienced declines in both exports and imports.

In terms of trade terms, non-RCEP member countries faced deteriorating trade conditions with negative impacts, while most RCEP member countries experienced improvements. Only China saw a slight decline in trade terms by 0.22%, whereas Japan and South Korea improved by 2.75% and 1.37%, respectively. The deterioration in China's trade terms can be attributed to the complete removal of tariff barriers under RCEP, resulting in lower prices for China's labor-intensive exports with lower value-added, and higher prices for imports of technology-intensive products from Japan and South Korea with higher value-added.

In terms of welfare levels, RCEP member countries generally experienced increases in welfare. Japan saw the largest increase in welfare by $51.628 billion USD, followed by South Korea and China with increases of $27.415 billion USD and $9.269 billion USD, respectively. Meanwhile, welfare levels in non-member countries varied, showing decreases to different extents.

Through analysis of macroeconomic effects, it is evident that upon the reduction of import tariff barriers to zero among RCEP member countries, all regional countries benefited, while non-member countries experienced varying degrees of economic impacts. India, due to its decision not to join RCEP, suffered negative effects across various macroeconomic dimensions.

Table 3. Macroeconomic impact of RCEP entry into force on each region

Region	GDP Change (%)	Export Change (%)	Import Change (%)	Terms of Trade Change (%)	Welfare Change (Billion USD)
China	0.02	1.39	2.16	-0.22	92.69
Japan	4.31	0.31	5.74	2.75	516.28
South Korea	3.99	2.59	5.91	1.37	274.15
India	-0.54	-0.31	-0.7	-0.28	-35.83
Australia	0.66	0.9	2.97	0.1	37.14
New Zealand	0.58	0.85	1.23	0.43	4.33
USA	-0.75	0.7	-1.19	-0.48	-198.78
ASEAN	0.71	0.75	1	0.39	86.63
EU	-0.47	-0.09	-0.44	-0.1	-150.65
Others	-0.49	-0.1	-0.64	-0.12	-188.42

Source: Based on the simulation results from the RUNGTAP software.

Microeconomic effects of RCEP

The impact of RCEP on the microeconomic level, focusing on industry output and trade in goods, is analyzed. When import tariff barriers are reduced to zero, the effects vary across different industries, as shown in Table 4. After the removal of tariff barriers, China's textile and apparel industry, grains, public utilities and construction, processed foods, and livestock sectors experience varying degrees of growth in output. Notably, the textile and apparel industry shows the highest growth, indicating that reduced tariffs benefit these sectors. However, compared to other regional countries, the increases in output for grains and livestock are significantly lower than those observed in Australia and New Zealand. Moreover, the growth rates in output for textile and apparel, public utilities, and construction, when compared with South Korea's 2.48% and 5.08%, respectively, still exhibit notable disparities. Similarly, the increase in output for transportation and communications does not match that of Japan's. In comparison with countries outside the region, the heavy industries in the United States and the European Union maintain significant advantages, showing substantial increases. There is a noticeable decline in output in energy and light industries within regional countries, while countries outside the region are experiencing growth, which warrants attention. Additionally, ASEAN countries have benefited considerably from RCEP, as evidenced by increases in output across most industries after joining the agreement.

Table4. Impact of RCEP Implementation on Various Regional Industries (unit: %)

	China	Japan	South Korea	India	Australia	New Zealand	USA	ASEAN	EU	Others
Crops and Cereals	0.34	-5.83	-9.87	-0.18	6.15	3.35	-0.48	0.23	-0.2	-0.08
Animal Husbandry and Meat	0.13	-9.46	-2.11	0.07	10.09	2.85	-0.24	0.61	-0.27	-0.11
Energy	-0.05	-1.02	-0.89	0.07	-0.39	-0.24	0.13	-0.04	0.07	0.08
Processed Food	0.26	-1.01	1.18	-0.26	1.52	2.19	-0.1	0.05	-0.2	-0.11
Textiles and Clothing	0.41	-2.75	2.48	-1.24	-10.97	-7.2	0.03	0.05	-0.75	-0.25
Light Industry	-0.08	-0.02	-1.82	-0.32	-3.38	-2.24	0.27	-0.5	-0.04	0.18
Heavy Industry	-0.07	-2.19	-0.06	-0.08	-1.38	-0.94	0.51	0.50	0.18	0.15
Utilities and Construction	0.27	3.44	5.08	-0.36	1.28	0.37	-0.8	0.38	-0.37	-0.49
Transportation, and Communication	-0.02	0.19	-0.04	-0.07	0.06	-0.14	0	0.09	0.07	0.03
Other Services	-0.08	0.2	-0.02	0.25	-0.04	-0.02	0.01	-0.34	0.01	0.03

Source: Based on the simulation results from the RUNGTAP software.

Next, using China as a case study, we analyze the changes in imports and exports across various industries, as shown in Table 5. China's exports to non-member regions show a declining trend, indicating a trade diversion effect following its accession to RCEP. This shift reduces China's reliance on foreign trade with the United States and the European Union, redirecting exports towards regional markets. Furthermore, the implementation of RCEP strengthens closer ties among China, Japan, and South Korea, with China's exports to regional countries primarily concentrated in Japan and South Korea. In terms of imports, the pattern mirrors that of exports, as shown in Table 6: China's imports of light and heavy industries have shifted from the United States and the European Union to RCEP member countries such as Japan, Australia, and ASEAN. Overall, China's imports across various industries have also shifted towards regional sources, although public utilities and construction, transportation and communications, and other service industries continue to import from the European Union and the United States. Through microeconomic analysis, it is evident that the implementation of RCEP has enhanced intra-regional trade among member countries, redirecting trade flows from regions such as the European Union and the United States towards the region, thereby bolstering resilience against global economic risks.

Table 5. Changes in China's exports by region (unit: %)

	Japan	South Korea	India	Australia	New Zealand	USA	ASEAN	EU	Others
Crops and Cereals	10.82	222.51	-3.79	1.53	1.38	-4.1	1.95	-3.61	-3.87
Animal Husbandry and Meat	24.1	3.06	-3.69	14.49	0.02	-4.49	16.8	-4.48	-4.86
Energy	20.87	76.85	-2.99	0.37	-3.56	-2.21	16.23	-2.65	-2.73
Processed Food	26.03	64.38	-2.22	6.34	0.31	-2.63	13.95	-2.29	-2.4
Textiles and Clothing	18.52	35	-2.75	23.43	6.03	-3.71	9.94	-2.56	-2.19
Light Industry	19.76	30.51	-0.74	13.63	-1.05	-0.92	9.37	-1.31	-0.57
Heavy Industry	7.19	14.23	-0.67	10.49	-0.25	-0.94	5.71	-1.16	-1.17
Utilities and Construction	13.63	12.63	-0.98	0.72	2.22	-1.96	0.22	-1.04	-1.12
Transportation and Communication	6.78	4.24	-1.87	0.52	0.33	-1.95	-0.91	-1.47	-1.7
Other Services	6.73	6.3	-1.78	0.73	0.34	-1.95	-1.14	-1.73	-1.87

Source: Based on the simulation results from the RUNGTAP software.

Table 6. Changes in China's imports by region and industry (unit: %)

	Japan	South Korea	India	Australia	New Zealand	USA	ASEAN	EU	Others
Crops and Cereals	27.72	58.37	2.17	7.65	17.52	2.82	0.81	1.44	2.02
Animal Husbandry and Meat	-1.45	44.52	2.19	28.97	5.84	-4.49	5.23	0.75	1.52
Energy	23.85	15.58	0.95	-0.28	0.4	0.13	0.78	0.68	0.71
Processed Food	38.1	58.16	-3.32	26.1	6.54	-2.59	14.88	-3.72	-3.37
Textiles and Clothing	50.93	51.68	-5.73	63.52	-10.73	-4.18	16.15	-6.1	-5.54
Light Industry	46.25	37.75	-4.55	12.57	-4.48	-2.72	5.04	-4.38	-4.22
Heavy Industry	7.94	12.18	-2.16	2.17	-5.9	-0.56	1.62	-1.86	-1.74
Utilities and Construction	-12.66	-8.31	2.35	-2.14	-1.35	3.64	2.41	2.4	2.54
Transportation and Communication	-13.85	-9.8	1.81	-2.57	-1.84	2.73	0.91	1.6	1.9
Other Services	-15.18	-14.69	1.76	-3.56	-2.45	2.5	0.28	1.35	1.69

Source: Based on the simulation results from the RUNGTAP software.

Conclusion and policy implications

Conclusion

This study employs the GTAP model and adopts a dynamic recursive method to update data up to 2021 as the baseline year, examining the macroeconomic and microeconomic impacts of reducing import tariffs to zero upon the enactment of RCEP. Simulation results indicate that full elimination of tariff barriers leads to varied economic growth among member countries, alongside improvements in social welfare and expansion of import-export volumes. These findings underscore the mutual benefits of RCEP participation for member states. Moreover, leveraging comparative advantages in specific industries enables substantial output growth, fostering interdependent industrial development among member states. The redirection of trade flows from non-member countries to regional counterparts enhances prospects for future cooperation among member nations. Notably, sectors such as transportation, communications, and other services in China continue to exhibit reliance on Europe and the United States.

Policy Implications

Based on the aforementioned conclusions, several policy implications arise: Firstly, expand RCEP membership to attract additional countries. Simulation outcomes demonstrate that broader membership

enhances overall benefits, promoting multilateralism. Secondly, capitalize on competitive industries to achieve economies of scale. RCEP facilitates specialization in key industries across member countries, enlarging market size and enabling economies of scale, cost reduction, and value-added enhancement, thereby driving industrial restructuring and upgrading. Thirdly, promote the establishment of a trilateral free trade agreement (FTA) among China, Japan, and South Korea to advance high-quality development in the Asian region. As pivotal pillars of the Asian economy, these nations significantly influence regional economic trends and global economic discourse. Given the absence of a trilateral FTA among them, leveraging RCEP provisions to refine and enhance a trilateral agreement would significantly promote advanced trade arrangements. Fourthly, deepen China's reform and opening-up efforts to foster industrial upgrading. As the world's foremost manufacturing power, China should seize opportunities afforded by RCEP, actively collaborating with South Korea and Japan in high-tech sectors to promote industrial advancement.

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