The Impact of RCEP Tariff Concessions on Bilateral Agricultural Trade between China and the Republic of Korea

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Abstract. The Regional Comprehensive Economic Partnership (RCEP) has broadened the institutional framework for bilateral agricultural trade between China and the Republic of Korea. This study classifies agricultural products in Harmonized System (HS) Chapters 01-24 into nine groups and examines the scale, composition, competitiveness, and complementarity of bilateral trade from 2015 to 2023. It then estimates an extended fixed-effects gravity model of China's agricultural exports to 11 RCEP partners and uses a dynamic recursive Global Trade Analysis Project (GTAP) model to simulate the effects of fully implementing the bilateral zero-tariff commitments. Bilateral agricultural trade increased from USD 5.115 billion in 2015 to USD 7.687 billion in 2023, although annual growth was uneven. China's exports were concentrated in primary products, whereas Korea's exports were weighted toward processed foods and beverages. The preferred gravity specification yields a negative tariff coefficient and positive coefficients for economic scale, logistics performance, per-capita-income differences, and agricultural land. The GTAP simulation indicates that full tariff elimination would increase China's aggregate agricultural output by 0.31% and reduce Korea's by 0.97%. It would also expand China's agricultural trade surplus by approximately USD 5.922 billion and Korea's deficit by approximately USD 1.932 billion, while generating GDP and welfare gains in both economies. Tariff liberalization therefore expands trade mainly by reinforcing the existing pattern of specialization and complementarity without immediately transforming the bilateral trade structure.

Keywords: RCEP; tariff concessions; bilateral agricultural trade; gravity model; GTAP model.

1. Introduction

1.1. Research Background

1.1.1. Background to RCEP

RCEP was launched in 2012 and signed on 15 November 2020 by the ten ASEAN states together with China, Japan, the Republic of Korea, Australia, and New Zealand. The agreement covers a market of roughly 2.2 billion people and a substantial share of global output and trade. Agriculture is central to this regional market because its members include major exporters, resource-abundant producers, and large food-importing economies. RCEP consequently provides an institutional framework for matching differentiated supply conditions with rapidly changing regional demand.

The agreement provides for the progressive elimination of tariffs on more than 90% of intraregional goods trade over transition periods that commonly extend from 10 to 20 years. Caolin (2024) [1] argues that its cumulative rules of origin, disciplines on export subsidies and quantitative restrictions, and measures addressing non-tariff barriers further reduce the cost of regional exchange and are expected to generate trade-creation and terms-of-trade effects while deepening economic integration among the participating economies.

1.1.2. Background to China-Korea Agricultural Trade

Li Boying (2024) [2] describes China and Korea as geographically close economies with dense production, transport, and consumption linkages. Korea joined the World Trade Organization in 1995 and China in 2001; subsequent liberalization lowered barriers and supported rapid growth in bilateral agricultural trade. The China-Korea Free Trade Agreement entered into force in 2015, followed by

RCEP for both economies in 2022. The overlapping agreements have reduced selected tariff and non-tariff barriers and created a more predictable environment for agricultural exchange.

The first year of RCEP implementation coincided with a new high in bilateral agricultural trade. Nevertheless, the two economies remain asymmetrical: China supplies a broad range of primary products, whereas Korea exports a narrower set of processed and technology-intensive foods. This asymmetry creates both commercial opportunity and adjustment pressure, making the distributional effects of further tariff concessions an important empirical question.

1.1.3. Existing Problems in China-Korea Agricultural Trade

Sun Meihong et al. (2017) [3] identify three persistent problems in China-Korea agricultural trade. First, overlapping product categories, especially aquatic products, can generate trade friction when inspection, quarantine, and technical standards differ. Second, China's persistent bilateral surplus has encouraged tighter Korean technical and sanitary barriers, raising compliance costs for Chinese exporters. Third, despite substantial improvements, gaps remain in the standardization, traceability, green certification, and brand recognition of some Chinese agricultural products. These constraints can prevent nominal tariff preferences from translating fully into market access.

These difficulties do not eliminate the underlying complementarity of bilateral trade. China and Korea differ markedly in land, labor, technology, processing capacity, and consumer demand. The policy task is therefore to manage areas of direct competition while lowering avoidable regulatory costs in segments where the two production structures are complementary.

1.2. Research Methods and Data Sources

1.2.1. Research Methods

The analysis uses the entry into force of the China-Korea FTA in 2015 and RCEP in 2022 as institutional reference points. Agricultural products in HS chapters 01-24 are consolidated into nine groups. The study first describes the evolution of trade scale and structure, then evaluates competitiveness and complementarity through the RCA, TC, TCI, and IIT indices. It subsequently estimates an extended gravity model for China's agricultural exports to 11 RCEP partners and uses the fitted model to assess export potential. Finally, a dynamic recursive GTAP simulation evaluates the output, trade-balance, GDP, welfare, and terms-of-trade effects of the ultimate tariff schedule.

The gravity model identifies statistical associations between exports and tariffs, market size, income differences, logistics performance, agricultural land, and distance. The GTAP exercise addresses a different question: it traces the economy-wide adjustment to an exogenous tariff shock in a general-equilibrium setting. Using the two approaches together separates observed trade determinants from simulated long-run policy effects.

1.2.2. Data Sources

Trade values are drawn principally from the General Administration of Customs of China and UN Comtrade. Tariff information comes from the RCEP schedules and the World Trade Organization. GDP, per-capita GDP, the Logistics Performance Index, agricultural land, and population are obtained from the World Bank; bilateral capital-to-capital distance is taken from CEPII. The GTAP exercise uses the GTAP 10.0 database and RunGTAP. All monetary values and units are specified in the relevant table or figure note.

2. Literature Review and Research Assessment

2.1. Literature Review

The first strand of research evaluates RCEP at the regional level. Studies by Rosyadi and Widodo (2018) and Ahmad (2014) [4, 5] use GTAP models to show how tariff shocks propagate through production, demand, and welfare across interconnected economies. Zhangcheng and Yang Jiaqi (2023), together with Ren Tongyu et al. (2023) [6, 7], similarly argue that RCEP can reorganize

regional supply chains, expand trade in intermediate inputs, and produce heterogeneous welfare effects across provinces and industries. The findings of Chen Jiaqi and Xia Deren (2023) and Cuiyan (2024) [8, 9] likewise point to aggregate gains while showing that sectoral outcomes depend on initial comparative advantage and protection levels.

A second strand examines China-Korea agricultural trade. Li Pingrui et al. (2024) and Zhangxi (2023) [10, 11] report a negative association between Korean import tariffs and China's agricultural exports, with the relationship becoming more pronounced under the China-Korea FTA. Studies by Chenghui (2015) and Piao Yingai and Huang Guanqun (2017) [12, 13] find that China is more competitive overall in primary agricultural goods, whereas Korea has advantages in selected processed products; at the same time, the two trade structures remain substantially complementary.

A third strand uses GTAP to evaluate sector-specific liberalization. Cheng Yubo (2023) [14] distinguishes between announced tariff-transition schedules and an ultimate zero-tariff scenario. Zhu Zhiming and Ding Lihong (2016) [15] suggest that tariff reduction can raise Chinese agricultural exports and output while redistributing production among detailed product groups. Chen Xiaojuan (2015) [16] nevertheless shows that the direction and size of each effect depend on model aggregation, closure, the base year, and the treatment of dynamic variables.

2.2. Research Assessment

The literature provides useful evidence on RCEP-wide welfare, bilateral competitiveness, and trade potential, but three limitations remain. First, some studies examine China-Korea agricultural trade only before RCEP entered into force. Second, descriptive index analysis is often separated from econometric estimation, making it difficult to connect trade structure with the determinants of export performance. Third, many simulations report aggregate effects without relating them to the observed composition of bilateral agricultural trade. This study addresses these gaps by combining recent 2015-2023 trade data, four structural indices, a panel gravity model, and a product-group GTAP simulation within a single empirical framework.

3. Conceptual Definitions and Theoretical Foundations

3.1. Definitions of Key Concepts

3.1.1. Definition of RCEP

RCEP is a regional free trade agreement among the ten ASEAN members, China, Japan, Korea, Australia, and New Zealand. It combines market-access commitments with common rules on goods, services, investment, e-commerce, intellectual property, competition, government procurement, and economic cooperation. For the present analysis, its principal mechanism is the staged reduction of bilateral agricultural tariffs and the associated improvement in regional trade facilitation.

3.1.2. Definition of Tariff Concessions

Tariff concessions are binding reductions in the customs duties applied to imports from partner economies. Under RCEP, concessions may take the form of immediate elimination, staged elimination, partial reduction, or exclusion from commitments. Lower tariffs reduce the landed cost of imported goods, alter relative prices, and reallocate production and consumption. Their effects therefore extend beyond bilateral trade values to output, factor income, welfare, and the terms of trade.

In welfare terms, lower duties generally benefit consumers through lower prices and wider variety, but they also expose protected producers to stronger import competition. Liberalization may create trade by replacing costly domestic production with lower-cost partner supply, divert trade from a more efficient non-member toward a preference-receiving member, and change the terms of trade through shifts in import demand and export supply. The negotiated depth, timetable, and product exclusions therefore determine how the gains and adjustment costs are distributed.

3.1.3. Definition of Competitiveness and Complementarity

Trade competitiveness describes the relative ability of a country's products to obtain market share under international competition. It reflects not only natural resource endowments and production costs but also technology, infrastructure, quality, branding, and policy. Trade complementarity refers to the extent to which one economy's export specialization matches another economy's import demand. Competitiveness and complementarity can coexist: two economies may compete in some product groups while maintaining strong two-way or inter-industry exchange in others.

Zhangyue and Yutao (2024) [17] provide the basis for the bilateral interpretation used in this study. If both economies have an RCA above one in the same product, direct competition is comparatively strong; if one economy has an RCA above one and the other below one, their specializations are complementary. The larger the divergence between the two RCA values, the stronger the implied division of specialization, although the RCA evidence must be read together with the TC, TCI, and IIT indices.

3.2. Theoretical Foundations

3.2.1. Theory of Comparative Advantage

Comparative advantage explains why economies gain from specialization even when one economy is more productive in absolute terms across many goods. In agriculture, differences in land, climate, labor, capital, technology, and opportunity cost shape the product groups in which each economy specializes. Tariff reduction strengthens the price signal generated by these differences and can therefore deepen existing patterns of specialization.

Comparative advantage may be natural, arising from climate and resource endowments, or acquired through technology, infrastructure, skills, and institutions. Specialization based on these advantages can improve resource allocation, expand production, and support the trade balance; at the same time, acquired advantages allow countries to move from raw commodities toward higher-value products rather than treating the initial pattern as fixed.

3.2.2. Intra-Industry Trade Theory

Intra-industry trade theory explains simultaneous imports and exports within the same broad industry. Product differentiation, economies of scale, quality variation, seasonal supply, and consumer preference can all sustain two-way agricultural trade. The IIT index used below measures how balanced bilateral imports and exports are within a product group; it complements rather than replaces measures of net trade advantage.

For agriculture, this mechanism is especially relevant to differentiated varieties and processed products. Larger markets permit longer production runs and scale economies, while quality upgrading and product differentiation enable two-way trade even within the same HS group. A rise in IIT can therefore indicate a broader product range and deeper industrial integration rather than the disappearance of comparative advantage.

3.2.3. Theory of National Competitive Advantage

The national competitive-advantage framework emphasizes four interacting conditions: factor endowments, domestic demand, related and supporting industries, and firm strategy and rivalry. Applied to agriculture, this framework highlights the joint importance of resources, cold-chain logistics, processing capacity, food standards, consumer sophistication, and government policy. It therefore offers a broader explanation of competitiveness than production cost alone.

Government action and supporting industries influence all four conditions. Modern production bases, research and extension services, cold-chain networks, inspection and certification institutions, and competitive processing enterprises can convert factor endowments into reliable export capacity and help integrate farms into regional supply chains.

4. Changes in the Scale and Structure of China-Korea Agricultural Trade

4.1. Changes in Trade Scale

4.1.1. Before WTO Accession

Li Junjiang and Dengmin (2004) [18] document that bilateral commerce was limited before diplomatic normalization. Total China-Korea trade was about USD 4.4 billion in 1991 and rose to USD 31.5 billion by 2001. Agricultural trade increased from roughly USD 1.0 billion in 1991 to USD 1.5 billion in 2000 and USD 1.6 billion in 2001. China's agricultural imports from Korea expanded from only USD 3 million to USD 84 million over the decade, while Chinese exports to Korea rose more slowly from approximately USD 0.98 billion to USD 1.01 billion. The Asian financial crisis temporarily reduced exports in 1998-1999, but trade subsequently recovered.

4.1.2. After WTO Accession

Zhangyi et al. (2016) [19] report that bilateral agricultural trade expanded rapidly after China joined the WTO in 2001 and continued to generate a substantial surplus for China. Total agricultural trade rose from USD 1.82 billion in 2001 to USD 5.63 billion in 2014, an average annual increase of about 8.4%. In 2002, China exported USD 2.049 billion in agricultural goods to Korea but imported only USD 0.127 billion. By 2014, exports had reached USD 4.869 billion and imports USD 0.763 billion. Temporary declines in exports occurred in 2004, 2009, and 2012, but they did not alter the long-run trend. As shown in Fig. 1, total trade, exports and imports all exhibited overall upward trends across this period.

The persistent asymmetry also reveals Korea's dependence on Chinese supplies in several land- and labor-intensive categories. China's broad primary-product base and Korea's narrower processed-food strength expanded together after WTO accession, so the increase in total trade reflected both unequal trade volumes and a durable product-category division of labor.

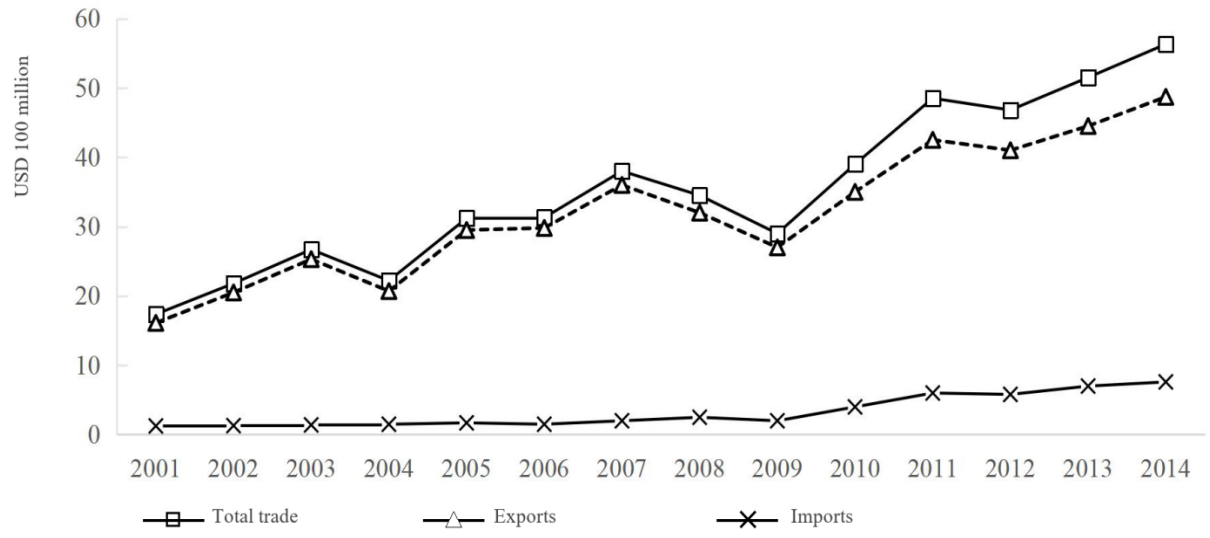


Fig 1. China-Korea agricultural trade after WTO accession, 2001-2014.

4.1.3. After the Entry into Force of the China-Korea FTA

During 2015-2023, bilateral agricultural trade displayed uneven but substantial growth. Total trade increased from USD 5.115 billion to USD 7.687 billion, a cumulative rise of 50.3%. Growth was negative in 2019 (-2.34%) and 2020 (-1.37%), reached 12.56% in 2022, and moderated to 2.66% in 2023. Over the full period, China's exports increased by 42.88%, imports by 87.51%, and the bilateral surplus by 31.76%. The faster growth of imports did not reverse the surplus because exports began from a much larger base. As illustrated in Fig. 2, trade performance fluctuated across individual years following the China-Korea FTA implementation.

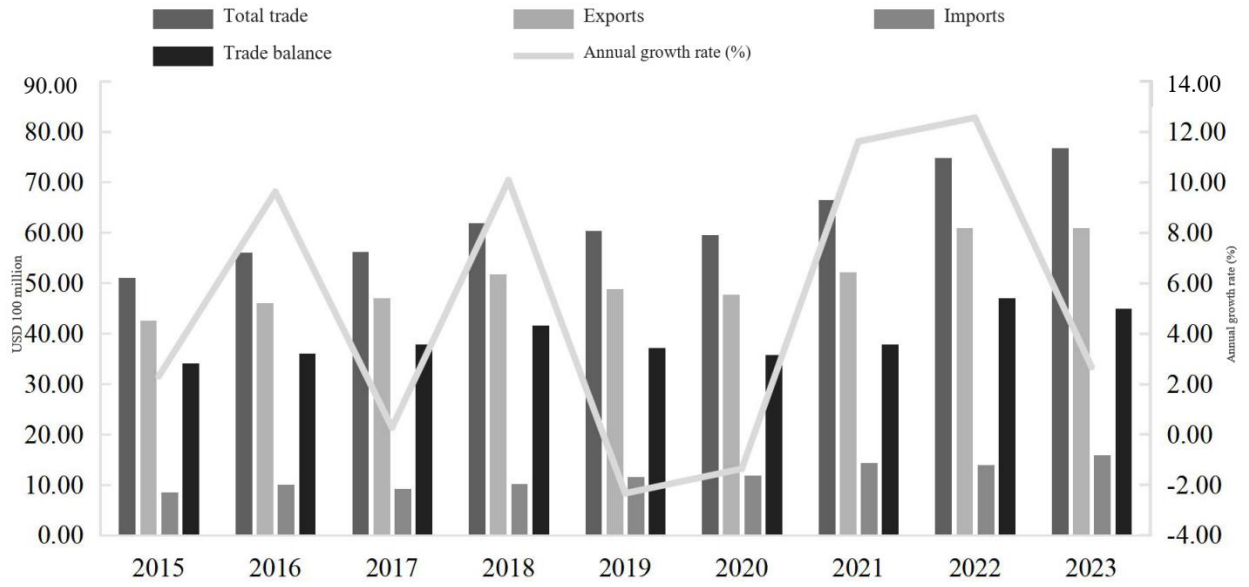


Fig 2. China-Korea agricultural trade after the China-Korea FTA, 2015-2023.

4.2. Trade Structure

4.2.1. Classification of Agricultural Products

Following the classification used by the China Chamber of Commerce of Import and Export of Foodstuffs, Native Produce and Animal By-Products, HS chapters 01-24 are consolidated into nine product groups. This aggregation balances product detail with the need for consistent bilateral comparison and is used throughout the index, gravity-model, and GTAP analyses. Detailed grouping rules can be found in Table 1.

Table 1. Classification of Agricultural Products by HS Chapter.

Product group	HS chapters	Chapter coverage
Aquatic products and preparations	03, 16	03 fish, crustaceans, molluscs and other aquatic invertebrates; 16 preparations of meat, fish, crustaceans, molluscs and other aquatic invertebrates
Vegetables and preparations	07	07 edible vegetables and certain roots and tubers
Cereals, starches, and preparations	10, 11, 19	10 cereals; 11 milling products, malt, starches, inulin and wheat gluten; 19 preparations of cereals, flour, starch or milk, and pastry products
Oilseeds and animal/vegetable oils	12, 15	12 oil seeds and fruits, miscellaneous grains and seeds, industrial or medicinal plants, straw and fodder; 15 animal or vegetable fats and oils, prepared edible fats and waxes
Fruit, nuts, and preparations	08, 20	08 edible fruit and nuts and peel of citrus fruit or melons; 20 preparations of vegetables, fruit, nuts or other plant parts
Beverages and alcoholic drinks	22	22 beverages, spirits and vinegar
Live animals, meat, and preparations	01, 02	01 live animals; 02 meat and edible offal
Other agricultural products	05, 06, 09, 13, 14, 23, 24	05 other animal products; 06 live plants and floricultural products; 09 coffee, tea, maté and spices; 13 lac, gums, resins and vegetable extracts; 14 vegetable plaiting materials; 23 food-industry residues and prepared animal fodder; 24 tobacco and substitutes
Other food products	04, 17, 18, 21	04 dairy produce, eggs and honey; 17 sugars and confectionery; 18 cocoa and preparations; 21 miscellaneous edible preparations

Source: General Administration of Customs of China; classification based on HS Chapters 01-24.

4.2.2. Structure of China's Agricultural Exports to Korea

China's export structure changed only gradually over 2015-2023. Aquatic products and preparations accounted for 34.2% of exports, followed by fruit and nuts (15.11%) and vegetables (11.86%). Other agricultural products increased sharply after 2021, driven particularly by HS chapters 9, 14, 23, and 24. Tobacco exports accelerated after 2022, consistent with lower Korean tariffs and stronger import demand. Beverages, meat, and oils remained comparatively small categories. Presented in Fig. 3 are the time-series trajectories for each export product category.

At the chapter level, tobacco (HS 24) showed the most exceptional change: its export value in 2022 was approximately 70 times its 2021 level and rose to a further 1.5 times its 2022 level in 2023. The surge coincided with changes in Korea's domestic tobacco prices and reductions in the applicable tariffs under RCEP. Despite its magnitude, this category-specific episode does not represent a broad transformation of China's export basket.

The concentration in aquatic products, fruit, and vegetables reflects geographic proximity, production conditions, and consumer preferences. It also indicates that China's bilateral export advantage remains anchored in primary and lightly processed goods. The post-2021 growth of other agricultural products broadens this pattern but does not yet constitute a structural transformation.

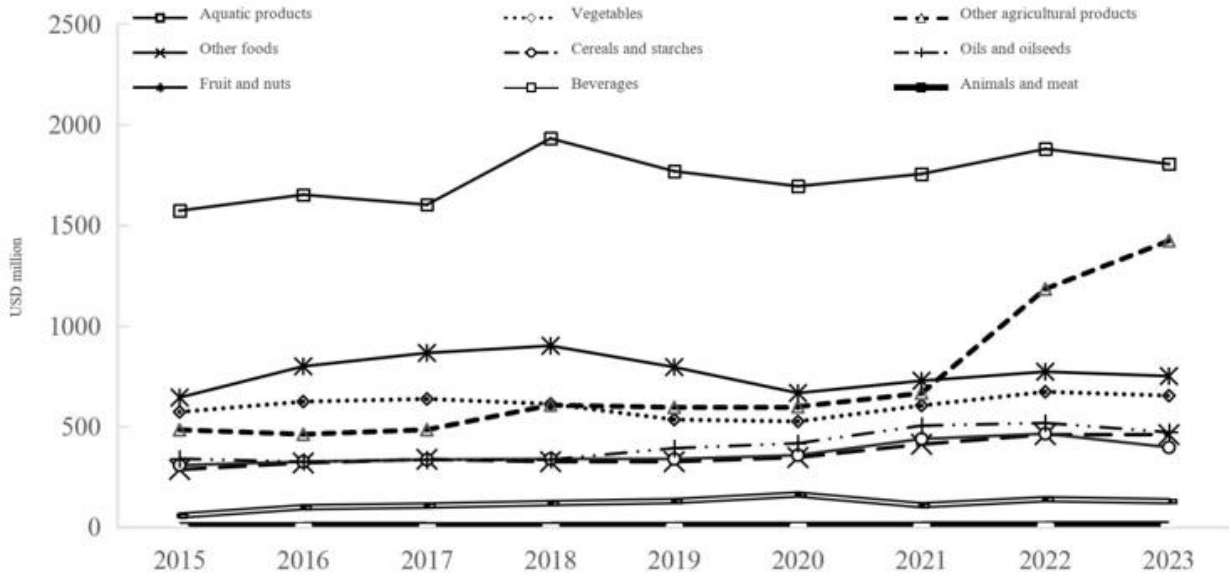


Fig 3. Structure of China's agricultural exports to Korea, 2015-2023.

4.2.3. Structure of China's Agricultural Imports from Korea

Korea's export structure to China was similarly stable but more processing-intensive. Cereals, starches, and preparations represented 22.63% of China's imports from Korea, followed by beverages (14.92%) and aquatic products (14.56%). Imports of cereals and starch preparations and other foods increased especially rapidly after 2019, led by HS chapters 19 and 21. These categories reflect Korea's specialization in processed foods rather than land-intensive primary products. Fig. 4 illustrates how import values evolved across different agricultural product groups.

Between 2019 and 2023, the expansion of the cereals-and-starches group was driven mainly by HS 19 preparations, whose imports increased by about 1.5 times, while HS 21 miscellaneous edible preparations raised the other-foods group by about 2.7 times. These chapter-level movements show that Korea's export strength is concentrated not in broad agricultural aggregates but in specific processed-food segments.

The two structures therefore match in economically meaningful ways: China exports resource- and labor-intensive products, while Korea supplies selected processed foods, beverages, and preparations. This division of specialization creates a durable basis for complementary trade even when individual product groups remain competitive.

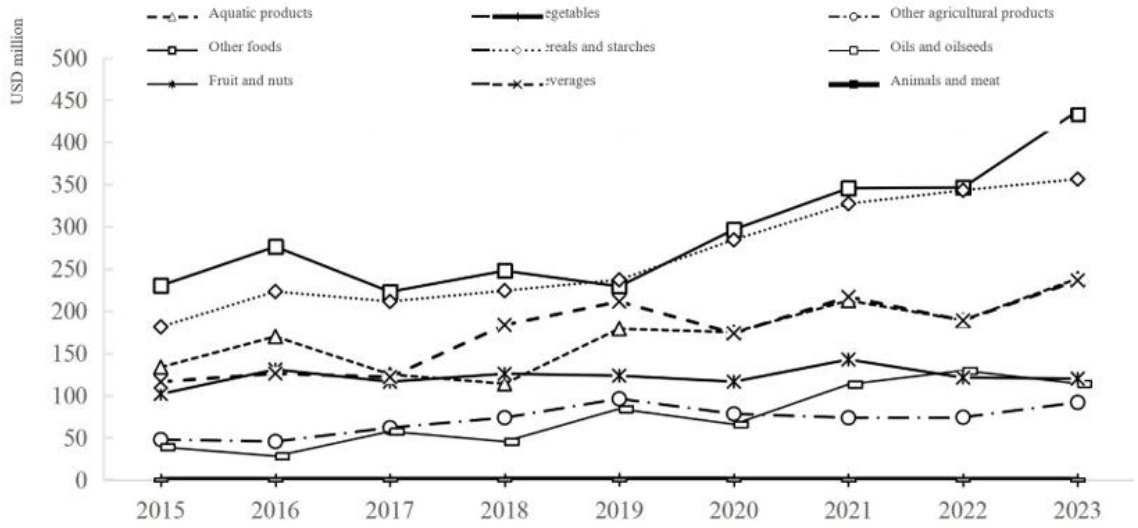


Fig 4. Structure of China's agricultural imports from Korea, 2015-2023.

5. Competitiveness and Complementarity of China-Korea Agricultural Trade

5.1. Competitiveness Analysis

5.1.1. Revealed Comparative Advantage Index

Following the competitiveness analysis of Wan Qing and Lv Xiaoying (2022) [20], the revealed comparative advantage (RCA) index compares the share of product k in country i's agricultural exports to partner j with the corresponding product share in the RCEP market. This regional-bilateral specification aligns the benchmark market with the empirical scope of the study. Values above one indicate revealed comparative advantage, whereas values below one indicate disadvantage.

$$RCA^{R}_{ijk} = (X_{ijk} / X_{ij}) / (X^{R}_{k} / X^{R}). \quad (1)$$

Here, X_{ijk} is country i's exports of product k to partner j, X_{ij} is its total agricultural exports to j, X^{R}_{k} is RCEP-region exports of product k, and X^{R} is total RCEP agricultural exports. Table 2 summarizes the interpretive thresholds applied in this study.

Table 2. Interpretation of the Revealed Comparative Advantage Index.

RCA range	Interpretation
$0 < RCA < 0.80$	No revealed comparative advantage
$0.80 \leq RCA < 1.25$	Moderate comparative position
$1.25 \leq RCA < 2.50$	Strong revealed comparative advantage
$RCA \geq 2.50$	Very strong revealed comparative advantage

China maintained revealed comparative advantage in aquatic products, vegetables, fruit and nuts, and other agricultural products. Aquatic products increased from 1.87 in 2015 to 2.32 in 2023, while other agricultural products rose from 1.04 to 1.97. The RCA of fruit and nuts declined from 1.36 to 0.82, indicating an erosion of advantage. Cereals and starches, oils and oilseeds, beverages, animals and meat, and other foods remained below one in 2023. The full set of computed RCA outcomes for China is summarized in Table 3.

The underlying HS results sharpen this aggregate picture. China's HS 03 aquatic products and HS 23 food-industry residues retained strong and generally rising advantages; HS 24 tobacco moved from disadvantage to a very strong advantage after 2022; and HS 07 vegetables and HS 13 vegetable extracts remained strong. By contrast, HS 01, 02, 04, 08, 09, 10, 15, and 22 were weak in the chapter-level comparison. These details explain why movements within a broad product group can differ from its aggregate RCA.

Table 3. RCA of China's Agricultural Exports to Korea.

Product group	HS chapters	20152017201920212023
Aquatic products	03+16	1.87 1.74 1.85 2.00 2.32
Vegetables	07	2.03 2.05 2.03 2.31 1.57
Cereals and starches	10+11+19	0.67 0.66 0.70 0.80 0.57
Oils and oilseeds	12+15	0.49 0.42 0.59 0.49 0.54
Fruit and nuts	08+20	1.36 1.52 1.18 1.07 0.82
Beverages	22	0.36 0.56 0.64 0.58 0.55
Animals and meat	01+02	0.01 0.01 0.01 0.02 0.01
Other agricultural products	05+06+09+13+14+23+24	1.04 1.04 1.19 1.31 1.97
Other foods	04+17+18+21	0.52 0.54 0.44 0.54 0.50

Source: Author's calculations based on UN Comtrade data.

Korea's strongest advantages were concentrated in beverages, cereals and starches, and other foods. Beverage RCA remained above three in every year of the sample and reached 3.87 in 2023. Cereals and starches recorded 1.97 in 2023, whereas vegetables and animals and meat remained near zero. Aquatic products moved from disadvantage to a modest advantage, increasing from 0.80 to 1.17. Key RCA statistics for Korean agricultural exports can be consulted in Table 4.

At chapter level, Korea recorded very strong advantages in HS 17 sugar and confectionery, HS 19 cereal and flour preparations, HS 21 miscellaneous edible preparations, and HS 22 beverages. HS 03 strengthened modestly, whereas HS 01, 02, 07, and 10 remained near zero. The resulting pattern is a processed-food advantage that remains substantial but shows some overall weakening, alongside a deepening disadvantage in several primary-product chapters.

Table 4. RCA of Korea's Agricultural Exports to China.

Product group	HS chapters	20152017201920212023
Aquatic products	03+16	0.80 0.70 0.79 0.88 1.17
Vegetables	07	0.00 0.00 0.01 0.00 0.00
Cereals and starches	10+11+19	2.00 2.13 2.05 2.19 1.97
Oils and oilseeds	12+15	0.29 0.37 0.53 0.40 0.50
Fruit and nuts	08+20	1.07 1.05 0.77 0.77 0.50
Beverages	22	3.71 3.31 4.42 4.21 3.87
Animals and meat	01+02	0.00 0.00 0.00 0.00 0.00
Other agricultural products	05+06+09+13+14+23+24	0.52 0.68 0.81 0.53 0.49
Other foods	04+17+18+21	2.09 1.83 1.31 1.65 1.83

Source: Author's calculations based on UN Comtrade data.

5.1.2. Trade Competitiveness Index

Following Wangning (2022) [21], the trade competitiveness (TC) index measures normalized net exports. It ranges from -1 to 1. Positive values indicate that exports exceed imports and therefore signal a bilateral net-export advantage; negative values indicate a net-import disadvantage.

$$TC_{ik} = (X_{ik} - M_{ik}) / (X_{ik} + M_{ik}) \quad (2)$$

The benchmark intervals used for TC index interpretation are laid out in Table 5.

Table 5. Interpretation of the Trade Competitiveness Index.

TC range	Disadvantage	TC range	Advantage
$-0.30 \leq TC < 0$	Weak	$0 \leq TC < 0.30$	Weak
$-0.60 \leq TC < -0.30$	Strong	$0.30 \leq TC < 0.60$	Strong
$-1 \leq TC < -0.60$	Very strong	$0.60 \leq TC \leq 1$	Very strong

China held strong or very strong bilateral advantages in vegetables, aquatic products, oils and oilseeds, fruit and nuts, animals and meat, and other agricultural products. The aquatic-products index declined from 0.84 in 2015 to 0.77 in 2023 but remained strongly positive. Cereals and starches and

other foods moved closer to balance, while beverages remained negative. The results confirm that China's advantage covers more categories, whereas Korea's advantages are concentrated in selected processed products. Calculated TC values across product categories are provided in Table 6.

The chapter-level TC evidence also records structural turning points. HS 02 meat and HS 24 tobacco moved from disadvantage to strong net-export advantage after 2021 and 2022, respectively, while the advantages of HS 12 oilseeds and HS 18 cocoa products weakened. Korea's corresponding net-export advantages were concentrated mainly in HS 17, HS 19, and HS 22.

Table 6. China-Korea Agricultural Trade Competitiveness Index.

Product group	HS chapters	2015	2017	2019	2021	2023
Aquatic products	03+16	0.84	0.86	0.82	0.78	0.77
Vegetables	07	1.00	1.00	1.00	1.00	1.00
Cereals and starches	10+11+19	0.26	0.23	0.18	0.14	0.05
Oils and oilseeds	12+15	0.79	0.71	0.65	0.63	0.61
Fruit and nuts	08+20	0.73	0.76	0.73	0.67	0.72
Beverages	22	-0.35	-0.07	-0.24	-0.33	-0.30
Animals and meat	01+02	1.00	0.88	0.85	1.00	1.00
Other agricultural products	05+06+09+13+14+23+24	0.82	0.77	0.72	0.80	0.88
Other foods	04+17+18+21	0.11	0.20	0.17	0.09	0.02

Source: Author's calculations based on UN Comtrade data.
Positive values denote China's net-export advantage.

5.2. Complementarity Analysis

5.2.1. Trade Complementarity Index

Bie Shijie and Qi Chunjie (2019) [22] use the trade complementarity index (TCI) to evaluate whether the export specialization of country i matches the import specialization of country j in product k. A value above one indicates a strong match between supply and demand; the value below one indicates weak complementarity.

$$TCI_{ijk} = RCA^{export}_{ik} \times RCA^{import}_{jk} \quad (3)$$

Complementarity was strongest in aquatic products, cereals and starches, beverages, and selected other foods. Aquatic products rose from 1.49 in 2015 to 2.72 in 2023. Beverage TCI exceeded two after 2019, while cereals and starches remained above one. Fruit and nuts declined from 1.46 to 0.41, and vegetables remained near zero. Other agricultural products approached one by 2023, indicating a progressively closer match. Time-variant TCI index outcomes for all nine groups are laid out in table7.

Within the broad groups, HS 16 prepared aquatic and meat products and HS 24 tobacco rose above one after 2022, indicating stronger complementarity. By contrast, HS 06 live plants, HS 13 vegetable extracts, and HS 20 fruit and vegetable preparations fell below one after 2017 or 2022. The timing is consistent with stronger complementarity in selected chapters following tariff reductions, but the improvement was not uniform across products.

Table 7. Trade Complementarity Index by Product Group.

Product group	HS chapters	2015	2017	2019	2021	2023
Aquatic products	03+16	1.49	1.22	1.46	1.76	2.72
Vegetables	07	0.01	0.01	0.01	0.01	0.00
Cereals and starches	10+11+19	1.35	1.41	1.43	1.76	1.13
Oils and oilseeds	12+15	0.14	0.16	0.31	0.20	0.27
Fruit and nuts	08+20	1.46	1.59	0.92	0.82	0.41
Beverages	22	1.33	1.87	2.83	2.42	2.12
Animals and meat	01+02	0.01	0.00	0.01	0.01	0.00
Other agricultural products	05+06+09+13+14+23+24	0.54	0.70	0.96	0.69	0.96
Other foods	04+17+18+21	1.09	0.99	0.58	0.89	0.92

Source: Author's calculations based on UN Comtrade data.

5.2.2. Intra-Industry Trade Index

Kang Xiaoru and Zhao Junhua (2024) [23] apply the Grubel-Lloyd intra-industry trade (IIT) index to measure the balance of exports and imports within a product group. It ranges from zero to one. Values near one indicate balanced two-way trade, whereas values near zero indicate inter-industry specialization and, in this bilateral setting, stronger one-way complementarity.

$$IIT_{ijk} = 1 - |X_{ijk} - M_{ijk}| / (X_{ijk} + M_{ijk}) \quad (4)$$

IIT was low for aquatic products, vegetables, oils and oilseeds, fruit and nuts, animals and meat, and other agricultural products. Cereals and starches and other foods recorded much higher values, reaching 0.95 and 0.98 in 2023, respectively. HS 02 meat and HS 24 tobacco shifted from values near one before 2021 to values near zero thereafter, indicating rapid movement toward one-way specialization. The mean IIT increased from approximately 0.35 in 2015 to 0.41 in 2023, suggesting modest growth in balanced two-way trade and a corresponding weakening of aggregate complementarity. The post-2021 declines in IIT for HS 02 and HS 24 nevertheless indicate renewed complementarity in those specific chapters. A full overview of intra-industry trade metrics can be viewed in Table 8.

Table 8. Intra-Industry Trade Index by Product Group.

Product group	HS chapters	20152017201920212023
Aquatic products	03+16	0.16 0.14 0.18 0.22 0.23
Vegetables	07	0.00 0.00 0.00 0.00 0.00
Cereals and starches	10+11+19	0.74 0.77 0.82 0.86 0.95
Oils and oilseeds	12+15	0.21 0.29 0.36 0.37 0.39
Fruit and nuts	08+20	0.27 0.24 0.27 0.33 0.28
Beverages	22	0.65 0.93 0.76 0.67 0.70
Animals and meat	01+02	0.00 0.12 0.15 0.00 0.00
Other agricultural products	05+06+09+13+14+23+24	0.18 0.23 0.28 0.20 0.12
Other foods	04+17+18+21	0.89 0.80 0.83 0.91 0.98

Source: Author's calculations based on data from the General Administration of Customs of China.

6. Empirical Analysis of RCEP Tariff-Concession Effects on China's Agricultural Exports

The structural indices describe bilateral specialization but do not identify the correlates of export performance. This section therefore estimates an extended gravity model using China's agricultural exports to 11 RCEP partners during 2015-2023. Because RCEP had been in force for only two years by the end of the sample, the model is used primarily to estimate observed trade relationships and export potential rather than to claim a fully realized causal RCEP effect.

6.1. The Gravity Model

Wangjing (2021) [24] explains that the gravity model predicts higher trade with greater economic size and lower trade with higher trade costs. In applied work, GDP captures production and demand capacity, while distance, tariffs, and regulatory barriers proxy trade resistance. The framework has been extended to include income, logistics, land, and institutional variables, making it well suited to agricultural trade, where perishability and border procedures materially affect delivered cost.

Yuan Ruiling and Tian Zhihong (2014) [25] present the classical multiplicative gravity form used below, which originated from the empirical analogy that bilateral trade is positively related to the economic mass of two economies and negatively related to geographic separation. Subsequent applications introduced economic-integration dummies, tariff variables, and other policy-related trade costs to distinguish geographic resistance from institutional market access.

$$X_{ij} = \alpha_0 Y_i^{\alpha 1} Y_j^{\alpha 2} / D_{ij}^{\alpha 3} \quad (5)$$

6.2. Model Specification

6.2.1. Variable Selection

The dependent variable is China's agricultural exports to partner j. The principal explanatory variable is the partner's weighted agricultural tariff. Control variables include the product of bilateral GDP, the absolute difference in per-capita GDP, the partner's Logistics Performance Index, the share of agricultural land, and capital-to-capital distance. Tariffs and distance are expected to reduce exports; the remaining controls are expected to have positive coefficients.

Economic size measures combined supply and market capacity. The per-capita-GDP gap allows demand differences to generate complementary trade. Logistics performance is especially important for fresh and perishable products, while agricultural land captures resource endowment and the composition of domestic supply. Distance proxies transport costs but is time-invariant and is consequently absorbed by partner fixed effects in the preferred panel specification.

6.2.2. Model Specification

$$\ln X_{ijt} = \beta_0 + \beta_1 \ln T_{jt} + \beta_2 \ln(G_{it}G_{jt}) + \beta_3 \ln|PG_{it} - PG_{jt}| + \beta_4 \ln L_{jt} + \beta_5 \ln AL_{jt} + \beta_6 \ln D_{ij} + \varepsilon_{ijt} \quad (6)$$

X denotes exports, T the tariff rate, G GDP, PG per-capita GDP, L logistics performance, AL agricultural land, and D bilateral distance. Log transformation reduces scale differences and permits coefficient interpretation as elasticities. Partner fixed effects control for time-invariant bilateral heterogeneity; the distance term is therefore omitted from the fixed-effects estimates reported in Table 12.

6.2.3. Sample Selection and Data Sources

The balanced core sample covers Korea, Japan, Australia, New Zealand, Singapore, Myanmar, Thailand, Malaysia, Indonesia, the Philippines, and Cambodia. Viet Nam, Laos, and Brunei are excluded because key variables are incomplete for several years. The resulting panel contains 99 country-year observations for most variables and 88 observations when agricultural land is included. Singapore's zero agricultural tariff is replaced with 0.01 before logarithmic transformation and missing biennial logistics observations are interpolated using adjacent survey years. Definitions, expected signs and sources for each regression variable are compiled within Table 9.

Table 9. Variable Definitions and Data Sources.

Variable	Definition	Expected sign	Source
X_{ij}	China's agricultural exports to partner j	−	UN Comtrade
T_j	Partner j's agricultural tariff	+	WTO
G_iG_j	Product of China's and partner j's GDP	+	World Bank
$\|PG_i - PG_j\|$	Absolute bilateral per-capita-GDP gap	+	World Bank
L_j	Partner j's logistics performance index	+	World Bank
AL_j	Partner j's share of agricultural land	+	World Bank
D_{ij}	Capital-to-capital distance	−	CEPII

6.3. Empirical Results and Analysis

6.3.1. Descriptive Statistics

The descriptive statistics show substantial heterogeneity across RCEP partners. Agricultural exports range from USD 38.6 million to USD 10.6 billion. The agricultural tariff ranges from 0.01% to 57%, reflecting the coexistence of free-trade hubs and highly protected agricultural markets. GDP, income, logistics performance, and land endowments also vary widely, supporting the use of panel methods with partner fixed effects. Key descriptive metrics for the panel dataset are given in Table 10.

Table 10. Descriptive Statistics.

Variable	N	Mean	Std. dev.	Minimum	Maximum
Agricultural exports (USD)	99	2.734×10^{9}	2.849×10^{9}	38,600,643	1.060×10^{10}
Agricultural tariff (%)	99	12.819	14.993	0.01	57
GDP product	99	13,277.717	17,153.204	268.32	76,112.20
Per-capita-GDP gap	99	22,122.308	19,466.243	1,334.49	80,980.87
Logistics performance index	99	3.429	0.516	2.354	4.380
Agricultural land (%)	88	28.437	14.093	0.919	48.341
Capital distance (km)	99	4,792.212	3,163	955	10,755

Source: Author's calculations using Stata 15.

6.3.2. Multicollinearity Analysis

As shown in Table 11, all variance-inflation factors are below five. The maximum is 3.919 for logistics performance, the minimum is 1.477 for the per-capita-GDP gap, and the mean is 2.309. These values do not indicate severe multicollinearity among the regressors. The corresponding tolerances are also sufficiently large to support the subsequent fixed-effects estimation.

Table 11. Multicollinearity Diagnostics.

Variable	VIF	1/VIF
ln logistics	3.919	0.255
ln GDP product	2.875	0.348
ln agricultural land	1.744	0.573
ln distance	1.531	0.653
ln per-capita-GDP gap	1.477	0.677
Mean VIF	2.309	—

Source: Author's calculations using Stata 15.

6.3.3. Empirical Results

F and Hausman tests reject the pooled and random-effects alternatives at the 1% level, supporting partner fixed effects. Table 12 introduces the tariff variable first and then adds controls sequentially. Distance is excluded because it does not vary over time within a bilateral pair. Standard errors are shown in parentheses, and significance is reported at the 1%, 5%, and 10% levels. Step-wise regression estimation outputs are presented in Table 12.

Table 12. Fixed-Effects Regression Results.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
ln tariff	−0.350***	−0.170**	−0.176**	−0.124*	−0.168**	−0.168**
	(0.086)	(0.077)	(0.071)	(0.067)	(0.079)	(0.079)
ln GDP product		0.397***	0.352***	0.209***	0.199***	0.199***
		(0.063)	(0.059)	(0.064)	(0.061)	(0.061)
ln per-capita-GDP gap			0.166***	0.179***	0.166***	0.166***
			(0.043)	(0.039)	(0.045)	(0.045)
ln logistics				3.088***	2.793***	2.793***
				(0.751)	(0.777)	(0.777)
ln agricultural land					2.831***	2.831***
					(0.947)	(0.947)
Constant	21.628***	17.876***	16.709***	13.968***	5.992**	5.992**
	(0.144)	(0.604)	(0.635)	(0.885)	(2.930)	(2.930)
Observations	99	99	99	99	88	88
R-squared	0.161	0.428	0.515	0.596	0.611	0.611
Partner countries	11	11	11	11	11	11

Notes: Partner fixed effects. Standard errors in parentheses.
**** p < 0.01; ** p < 0.05; * p < 0.10. Source: Author's calculations using Stata 15.*

The tariff coefficient is negative in every specification and equals -0.168 in the preferred model, consistent with the expected inhibitory effect of import duties. Bilateral GDP, the per-capita-GDP gap, logistics performance, and agricultural land are positive and statistically significant. The positive income-gap coefficient is consistent with complementary rather than similarity-driven agricultural demand in this sample. Model fit increases from 0.161 to 0.611 as controls are added.

The tariff estimate becomes less statistically precise as controls are added, suggesting that part of the simple tariff relationship reflects market conditions and unobserved non-tariff barriers. In preliminary OLS, distance carried the expected negative sign but was not statistically significant; in the preferred fixed-effects model, it is absorbed because it is invariant within each partner pair. The negative sign in Eq. (7) is consistent with both the regression results in Table 12 and the expected effect of tariffs on exports.

$$\ln X_{ijt} = 5.992 - 0.168 \ln T_{jt} + 0.199 \ln (G_{it}G_{jt}) + 0.166 \ln|PG_{it} - PG_{jt}| + 2.793 \ln L_{jt} + 2.831 \ln AL_{jt} \quad (7)$$

6.3.4. Robustness Test

Following the panel-gravity approach of Jiang Guanhong and Jiang Dianchun (2012) [26], the robustness test replaces the regressors with one-period lags to reduce concern that current economic size and trade are jointly determined. Columns (1)-(5) first confirm persistence in the explanatory variables, while column (6) re-estimates exports using the lagged covariates. The signs and statistical significance remain broadly consistent with the baseline results, including a negative lagged-tariff coefficient and positive coefficients for GDP, income differences, logistics, and agricultural land. Lag-based robustness regression outputs are displayed in Table 13.

Table 13. Lagged-Variable Robustness Tests.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	ln tariff	ln GDP product	ln PCGDP gap	ln logistics	ln agri. land	ln exports
L1.ln tariff	0.850***					−0.149*
	(0.110)					(0.093)
L1.ln GDP product		0.505***				0.272***
		(0.100)				(0.072)
L1.ln PCGDP gap			0.285**			0.143***
			(0.133)			(0.053)
L1.ln logistics				0.753***		1.926**
				(0.088)		(0.913)
L1.ln agricultural land					0.709***	2.932**
					(0.080)	(1.112)
Constant	0.194	4.381***	6.767***	0.308***	0.888***	6.357*
	(0.187)	(0.869)	(1.251)	(0.107)	(0.242)	(3.441)
Observations	88	88	88	88	77	88
R-squared	0.441	0.250	0.057	0.489	0.550	0.525
Partner countries	11	11	11	11	11	11

*Notes: L1 denotes a one-period lag. Standard errors in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.*

6.3.5. Export-Potential Assessment

Following Zhanghong et al. (2009) [27], export potential is assessed by comparing fitted and observed logarithmic exports. Values below one is classified as 'insufficient trade' and indicates scope for further export growth. Because the indicator is a fitted-to-observed log ratio rather than a direct measure of unrealized exports, its magnitude should be interpreted cautiously. It declined from 0.9336 in 2015 to 0.9194 in 2022, with a brief recovery in 2021. Year-wise export-potential index computations can be seen in Table 14.

The downward movement may reflect Korean quotas and technical barriers, diversion toward ASEAN suppliers, and pandemic-related disruptions. China's relatively rapid production recovery in 2020 temporarily supported bilateral supply. The results suggest room for further trade expansion,

but the index should be interpreted cautiously because it is based on logarithmic fitted and observed values and because non-tariff measures are not modeled directly.

Table 14. Export-Potential Index for China's Agricultural Exports to Korea, 2015-2022.

Year	Observed ln exports	Fitted ln exports	Index
2015	22.17	20.70	0.9336
2016	22.25	20.66	0.9287
2017	22.27	20.69	0.9290
2018	22.36	20.70	0.9255
2019	22.30	20.58	0.9225
2020	22.28	20.51	0.9203
2021	22.37	20.65	0.9230
2022	22.53	20.72	0.9194

Source: Author's calculations. Note: The index is the ratio of fitted to observed logarithmic exports.

7. Trade Effects of RCEP Tariff Concessions: A GTAP-Based Analysis

7.1. Research Design

7.1.1. Model Specification

GTAP is a multi-region, multi-sector computable general-equilibrium model grounded in neoclassical production and demand theory. Producers minimize cost, households allocate expenditure, and markets clear through price adjustment. The model treats tariff reductions as exogenous shocks and traces their effects across production, trade, factor markets, income, and welfare. Its simplifying assumptions make it suitable for isolating policy effects, although the results should be understood as scenario-based comparative outcomes rather than forecasts.

The maintained structure assumes perfect competition and constant returns to scale. Firms minimize cost, private and public agents maximize utility subject to their constraints, and commodity and factor markets clear. These assumptions ensure an internally consistent equilibrium but exclude strategic pricing, increasing returns, and involuntary unemployment unless introduced through a modified closure.

The agricultural sectors in GTAP 10.0 are aggregated into the same nine groups used in the descriptive analysis, together with a residual “other industries” sector, for ten sectors in total. Regions are aggregated into China, Korea, and the rest of the world. Because GTAP is organized by customs territory, the China region in this simulation excludes Hong Kong, Macao, and Taiwan.

Following the dynamic-recursive procedure of Zhao Qingsong and Li Yanfeng (2024) [28], the recursive closure exogenizes the GDP path and endogenizes the corresponding model adjustment variable, while population remains an exogenous driver. World Bank GDP and population shocks update the 2014 benchmark recursively to 2021, after which the RCEP tariff shock is applied. This sequence separates baseline economic growth from the policy experiment.

Walmsley (2002) [29] describes the linked producer, border, and importer prices through which tariffs enter a CGE model. In this study, the price transmission mechanism is represented by the following three relationships, with the freight factor connecting free-on-board and cost-insurance-freight valuations.

$$P^{fob} = P^{ex}(1 + T^{ex}) \tag{8}$$

$$P^{cif} = P^{fob}(1 + F) \tag{9}$$

$$P^{im} = P^{cif}(1 + T^{im}) \tag{10}$$

P^{fob} is the price at the producer-country border, P^{cif} is the importer-border price including freight and insurance, P^{ex} and P^{im} are the producer- and importer-country domestic prices, T^{ex} is the export

tax, T^{im} is the import tariff or subsidy, and F is the freight factor. A tariff shock therefore changes the domestic import price and propagates through demand, production, factor returns, and trade.

7.1.2. Data Selection

Drawing on the dynamic-recursive applications of Liao Dongsheng et al. (2024) and Feng Xiaoling and Jiang Shanshan (2020) [30, 31], the simulation combines GTAP 10.0 and RunGTAP with World Bank GDP and population data and the bilateral RCEP tariff schedules. GTAP 10.0 covers 141 regions and 65 sectors; aggregation is required to align these sectors with the nine agricultural product groups. The database and closure follow established applications to RCEP and Northeast Asian trade.

China committed to immediate elimination for 38.6% of tariff lines imported from Korea, compared with 50.4% in Korea's schedule for China. After transition periods, both schedules reach 86% final zero-tariff coverage. Approximately 1% of products receive partial reductions and about 13% remain excluded. These differences in timing and initial protection help explain the asymmetry of the simulated sectoral effects. The bilateral tariff-cut commitments under RCEP are summarized within Table 15.

Table 15. Bilateral Tariff-Reduction Commitments under RCEP.

Tariff-reduction category	China's concessions to Korea (%)	Korea's concessions to China (%)
Immediate elimination	38.60	50.40
Elimination after a transition period	47.40	35.60
Final zero-tariff coverage	86.00	86.00
Partial tariff reduction	1.00	1.10
Excluded products	13.00	12.90

Source: Bilateral RCEP tariff schedules; compiled by the author.

7.1.3. Scenario Design

The policy scenario applies the final bilateral tariff rates as shocks to the benchmark equilibrium. The model then computes percentage changes in agricultural output, changes in trade balances, GDP, equivalent-variation welfare, and the terms of trade. No separate productivity, non-tariff-barrier, or investment-liberalization shock is imposed, so the reported results isolate the tariff channel within the model's maintained assumptions.

7.2. Simulation Results

7.2.1. Output Effects

Percentage shifts of agricultural output across sectors are reported in Table 16. Full implementation increases China's aggregate agricultural output by 0.31% and reduces Korea's by 0.97%. The largest adjustment occurs in oils and oilseeds: output rises by 2.18% in China and falls by 40.55% in Korea. China also records gains in vegetables, cereals and starches, fruit and nuts, other agricultural products, and other foods, while beverages and animals and meat each decline by 0.04%. Korea records gains in beverages, animals and meat, vegetables, cereals and starches, and other agricultural products, but losses in aquatic products, oils and oilseeds, fruit and nuts, and other foods.

Liuxuan et al. (2021) [32] interpret the aggregate divergence as a result of the initial production structure and the relative intensity of tariff reduction. China expands in several land- and labor-intensive categories, whereas Korea contracts sharply in products where import competition rises against a small domestic base. These are model-based reallocation effects and do not incorporate possible productivity adaptation or new non-tariff measures.

These sectoral shifts have distinct policy implications. In China, output expansion may increase demand for agricultural factors, raise farm income, and support modernization. In Korea, contractions in several primary sectors may release scarce land and labor for more technology-intensive activities, although affected producers may require transition support.

Table 16. Changes in Agricultural Output under the Target Tariff Shock (%).

Product group	China	Korea
Aquatic products	0.13	−0.47
Vegetables	0.17	0.09
Cereals and starches	0.15	0.05
Oils and oilseeds	2.18	−40.55
Fruit and nuts	0.30	−4.60
Beverages	−0.04	1.34
Animals and meat	−0.04	1.15
Other agricultural products	0.38	2.06
Other foods	0.46	−0.20
Total agriculture	0.31	−0.97

Source: Author's simulation using GTAP 10.0.

7.2.2. Trade-Balance Effects

Monetary changes for each product-group trade balance can be obtained from Table 17. The zero-tariff scenario expands China's agricultural trade surplus by USD 5.922 billion and Korea's agricultural deficit by USD 1.932 billion. China's largest increases occur in other foods, oils and oilseeds, and fruit and nuts. Its balance deteriorates in animals and meat, beverages, and vegetables. Korea records the corresponding pattern, with particularly large deteriorations in other foods and oils and oilseeds and improvements in beverages, animals and meat, and other agricultural products.

Tariff elimination therefore enlarges bilateral trade without overturning the observed specialization pattern. The detailed results are consistent with the index analysis: product groups in which one economy already has a strong advantage experience the largest trade-balance adjustment. Liberalization reinforces complementarity, but it also increases adjustment pressure on import-competing sectors.

Table 17. Changes in Agricultural Trade Balances under the Target Tariff Shock (USD million).

Product group	China	Korea
Aquatic products	80.75	−74.55
Vegetables	−1.43	0.01
Cereals and starches	40.63	−35.46
Oils and oilseeds	2,091.27	−582.38
Fruit and nuts	811.74	−252.39
Beverages	−42.20	77.71
Animals and meat	−104.38	24.82
Other agricultural products	246.35	43.74
Other foods	2,799.26	−1,133.90
Total agriculture	5,921.99	−1,932.40

Source: Author's simulation using GTAP 10.0.

7.2.3. Macroeconomic Effects

Zhang Jifeng (2021) [33] reports positive macroeconomic effects for both economies. Korea's GDP rises by 1.12%, compared with 0.07% for China. Welfare increases by USD 7.473 billion in Korea and USD 2.952 billion in China. Korea's terms of trade improve by 1.11%, whereas China's improve by 0.01%. The larger Korean percentage effects partly reflect its smaller economic base and stronger initial protection in several agricultural categories. Aggregate macro-simulation outputs are summarized in Table 18.

Shi Jingfang and Zhao Xueting (2022) [34] emphasize that tariff concessions can generate gains even when sectoral effects are uneven. China receives the larger increase in the agricultural trade balance, while Korea obtains the larger proportional GDP, welfare, and terms-of-trade effects. This distinction is important: a bilateral sectoral deficit does not imply an economy-wide welfare loss, because consumers and other industries also respond to lower prices and reallocated resources.

Qi Shuli and Bai Wenbiao (2022) [35] argue that successful RCEP implementation can consolidate overlapping regional agreements and create conditions for deeper China-Japan-Korea cooperation, including progress toward a trilateral free-trade arrangement. Such institutional deepening would require policy coordination beyond the tariff effects captured by the GTAP simulation.

Table 18. Principal Macroeconomic Effects under the Target Tariff Shock.

Economy	GDP (%)	Welfare (USD billion)	Terms of trade (%)
China	0.07	2.952	0.01
Korea	1.12	7.473	1.11

Source: Author's simulation using GTAP 10.0. Welfare values are in USD billion.

8. Research Conclusions and Policy Recommendations

8.1. Research Conclusions

First, China-Korea agricultural trade expanded substantially during 2015-2023 but followed an uneven annual path. China maintained a large and rising surplus, while both exports and imports increased. The trade structure was comparatively stable: China specialized in aquatic products, fruit and nuts, vegetables, and other primary products, whereas Korea specialized in cereals and starch preparations, beverages, and other processed foods.

Second, the RCA, TC, TCI, and IIT indices show that bilateral agricultural trade is more complementary than directly competitive. China's advantage covers a wider range of primary products, while Korea's advantage is concentrated in processed categories. Complementarity strengthened in aquatic products and beverages but weakened in fruit and nuts. The modest increase in average IIT indicates some growth in balanced two-way trade without displacing inter-industry specialization.

The detailed HS evidence is consistent with this conclusion but adds important qualification: tobacco, prepared aquatic products, meat, and selected processed foods experienced structural turning points after 2021-2022, while several plant and fruit preparations lost complementarity. Aggregate group averages therefore conceal meaningful chapter-level adjustments.

Third, the gravity model associates lower tariffs with higher Chinese agricultural exports to RCEP partners. Economic scale, per-capita-income differences, logistics performance, and agricultural land are positively associated with exports, and the lagged-variable test yields the same principal signs. The GTAP scenario further indicates that final tariff elimination expands China's agricultural output and surplus, deepens Korea's agricultural deficit, and produces positive GDP and welfare effects in both economies. These findings are conditional on the model specification and should not be interpreted as point forecasts.

8.2. Policy Recommendations

China and Korea should first reduce avoidable regulatory frictions in areas of strong complementarity. Mutual recognition, transparent sanitary and phytosanitary procedures, interoperable traceability systems, and regular technical consultation would allow tariff preferences to translate more effectively into trade. Cooperation should prioritize aquatic products, processed foods, and other categories in which bilateral demand is strong, but standards frequently differ.

They should also expand trade in differentiated varieties and processed products so that a larger regional market can support scale economies and two-way specialization. RCEP committees can be used to strengthen multilateral and bilateral agricultural cooperation, coordinate rules across existing agreements, and advance practical conditions for deeper China-Japan-Korea economic integration, including a possible trilateral FTA.

China should consolidate its advantage in primary products while raising the value added of agricultural exports. Investment in cold-chain infrastructure, processing, grading, certification, digital traceability, and brand development can improve quality consistency and reduce the perception that

competitiveness depends mainly on low prices. Diversification is also important because concentration in a few primary categories increases exposure to demand shocks and border measures.

The upgrading agenda should increase the share of processed and technology-intensive agricultural goods. Modern standardized production bases, dedicated inspection and testing bodies, and certification systems aligned with international practice can improve consistency at the point of production. Full-chain traceability—from inputs and cultivation through processing, logistics, and final sale — should make safety and origin information verifiable across borders.

Finally, adjustment should accompany liberalization. Korea may need transition support in import-competing sectors, while China should monitor environmental, food-safety, and rural-employment effects as output expands. RCEP and bilateral committees should exchange information, resolve disputes early, and coordinate standards. These steps would sustain the gains from specialization while limiting distributional costs.

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