Proceedings of the 3rd International Conference on Management Research and Economic Development
DOI: 10.54254/2754-1169/181/2025.22797

The Impact of Green Trade Barriers in RCEP Member Countries on Agricultural Product Exports from the Yangtze River Delta

Jiarui Ning

International Business School, Shenyang Normal University, Shenyang, China
njr0313@163.com

Abstract: This paper examines green trade barriers in RCEP countries using an extended gravity model to analyze their impact and mechanisms on Yangtze River Delta agricultural exports, with policy recommendations. Findings show that despite strengthening barriers, exports to some countries saw countercyclical growth: SPS notifications, a key barrier indicator, positively correlate with exports, especially at higher volumes. Mechanism analysis reveals barriers enhance competitiveness via increased organic certifications, improving product quality. Combining SPS/TBT indicators confirms robust results, offering theoretical and practical guidance for addressing barriers, upgrading agriculture, and promoting sustainable regional development.

Keywords: Green trade barriers, agricultural product exports, RCEP, Yangtze River Delta regional development

1. Introduction

Against the backdrop of deepening regional economic integration, RCEP's implementation has been a pivotal international trade event. As member countries increasingly adopt green trade barriers amid global green development, agricultural trade faces uncertainties. The Yangtze River Delta, a key economic driver in China, plays a significant role in the country's agricultural exports. This study analyzes how RCEP members' green trade barriers affect its agricultural exports and their mechanisms, aiding export enterprises and promoting regional green development. Innovations include: (1) Theoretically and empirically exploring how green barriers can expand export scale, offering new insights beyond traditional negative impacts. (2) Using an extended gravity model with quantile regression and combining SPS/TBT notification data to construct robust indicators, enhancing analytical depth. (3) Revealing a quality-driven reverse promotion mechanism of green barriers, filling a research gap as prior studies focused on cost increases and standard stringency rather than quality improvements.

The remainder of this paper is organized as follows: Section 2 introduces the theoretical hypotheses; Section 3 discusses the development trends; Section 4 presents the empirical design and data sources; Section 5 provides the regression analysis; Section 6 conducts the mechanism test; and Section 7 presents the conclusions and policy implications.

DOI: 10.54254/2754-1169/181/2025.22797

2. Theoretical hypotheses

In recent years, green trade barriers' impact on China's agricultural exports has drawn academic attention. Wang Yinqi, using the GTAP model from a carbon tariff perspective, found carbon tariffs reduced China's agricultural output, trade volume, and adjusted export markets [1]. Wang Weiyuan, focusing on RCEP members with a trade gravity model, showed increased SPS notifications significantly cut export volumes, especially for lower-trade countries [2]. Sun Yanan noted green barriers negatively affect exports but promote agricultural sustainability and industrial upgrading [3]. Li Cheng summarized their multidimensional impacts, including higher costs and reduced competitiveness, alongside potential for technological upgrades [4]. However, existing studies mainly focus on negative effects, lacking exploration of positive impacts in specific regions like the Yangtze River Delta and RCEP. How green barriers create new export opportunities for the Delta remains under-researched. Given the Delta's role in China's agricultural exports and RCEP's regional significance, this paper proposes **Hypothesis 1:** RCEP members' green trade barriers positively promote Yangtze River Delta agricultural exports

Literature shows green barriers impact China's agricultural trade via higher costs, stricter standards, and information gaps. Yan Yingzhao highlighted NAFTA members setting barriers like technical standards, detention systems, and certification requirements, raising market thresholds and export challenges [5]. Zhou Lisheng and Cai Zhengui found Japan's "Positive List System" increased pesticide residue limits, forcing Chinese exporters to invest in testing and certification, boosting costs and reducing competitiveness [6]. Li Cheng noted information asymmetry leaves developing countries at a disadvantage, weakening export competitiveness and consumer confidence [4]. Yet existing research rarely analyzes green barriers' reverse promotion mechanisms. Based on this, the paper proposes **Hypothesis 2:** RCEP members' green barriers encourage Yangtze River Delta agricultural producers to increase tech/management investment, boost organic certifications, and improve quality, positively impacting exports.

3. Green trade barriers and the development trend of agricultural product exports

3.1. The development trend of green trade barriers

Table 1: Total number of SPS notifications issued by RCEP member countries

Year	Japan	South Korea	Australia	Thailand	Vietnam	Philippines	Indonesia	Malaysia	Singapore	New Zealand	Total
2015	53	20	23	9	5	64	7	1	3	17	202
2016	57	29	21	13	7	35	7	0	1	20	190
2017	50	23	35	5	5	60	9	2	3	13	205
2018	57	23	19	17	11	29	0	1	1	21	179
2019	128	11	27	24	2	19	3	0	3	11	228
2020	148	9	26	70	0	31	3	3	4	21	315
2021	99	9	22	104	6	27	1	4	3	25	300
2022	294	6	11	112	2	20	0	1	7	20	473
2023	135	9	17	97	2	17	1	2	3	55	338

Data Sources: WTO Technical Barriers to Trade Notification and Early Warning System

Table 1 shows RCEP members' SPS notifications (2015–2023), reflecting evolving green trade barrier regulations. Total notifications fluctuated: decreasing from 202 in 2015 to 179 in 2018, surging to 473 in 2022, then dropping to 338 in 2023, indicating adaptive regulatory adjustments.

DOI: 10.54254/2754-1169/181/2025.22797

Country-specific trends: Japan's notifications spiked to 294 in 2022 (2019–2022), signaling stricter import rules and compliance pressures for Yangtze Delta exports; South Korea maintained stable annual notifications (6–29) with undiminished rigor; Australia increased from 23 in 2015 to 26 in 2020, prioritizing safety; Thailand/Vietnam showed varied changes. While rising SPS notifications suggest intensified green barriers challenging Delta exports, they may also drive regional agricultural upgrades: improved technology/quality could create new export opportunities, aligning with the study's hypothesis. Thus, notification fluctuations represent both stricter barriers and potential impetus for export transformation.

3.2. The development trend of agricultural product exports

Table 2: China's agricultural exports and Yangtze Delta Agri-exports to RCEP countries (USD 100mn)

Year	Total Export Value of China's Agricultural Products	Export Value to Japan	Export Value to South Korea	Export Value to Australia	Export Value to Thailand	Export Value to Vietnam	Export Value to the Philippines	Export Value to Indonesia	Export Value to Malaysia	Export Value to Singapore	Export Value to New Zealand
2015	706.8	19.67	7.98	2.07	4.6	2.57	2.25	3.77	2.21	1.80	0.31
2016	729.86	19.55	7.94	1.94	4.76	3.53	2.32	5.21	2.02	1.47	0.30
2017	755.32	19.52	7.04	2.29	4.02	5.69	2.76	4.94	2.25	1.13	0.31
2018	804.48	20.73	8.07	2.35	4.58	6.92	2.11	3.57	2.17	1.24	0.37
2019	790.98	19.39	7.17	2.21	4.65	5.75	1.92	3.76	2.39	1.67	0.39
2020	765.31	16.83	7.19	2.03	4.31	3.93	1.90	3.47	3.18	2.26	0.35
2021	850.05	17.97	7.49	2.36	4.28	4.14	2.16	3.79	3.71	4.20	0.41
2022	996.06	18.21	7.87	2.91	4.94	5.59	2.67	4.55	4.13	5.94	0.52
2023	1001.45	17.26	8.02	2.79	5.52	6.37	2.99	5.67	4.12	6.00	0.67

Data Sources: General Administration of Customs of China - Customs Statistics Data Query Platform; Ministry of Agriculture and Rural Affairs of the People's Republic of China.

Table 2 depicts China's total agricultural exports and the Yangtze Delta's exports to select RCEP members (2015–2023). China's total exports rose from $70.68B to $100.145B, growing overall and reflecting stronger competitiveness. The Delta's exports to RCEP countries varied: Japan saw fluctuating declines, notably dropping 2018–2020 amid stricter barriers; South Korea showed stable growth, indicating adaptability; Australia had fluctuating growth influenced by barriers and market dynamics; Thailand, the Philippines, and others trended upward with rising demand. While green barriers pose challenges, export values correlate with Table 1's SPS notifications: though increasing difficulties, they may drive the Delta to upgrade via tech/quality improvements, creating new opportunities that align with the hypothesis and could positively impact export scale.

Table 3: Agricultural export data of the Yangtze River Delta region

Year	Shanghai (USD 100 million)	Jiangsu Province (USD 100 million)	Zhejiang Province (USD 100 million)	Anhui Province (USD 100 million)	Total Export Value (USD 100 million)
2018	16.44	38.96	55.44	15.34	126.18
2019	12.85	33.30	50.68	16.72	113.55
2020	17.07	35.03	49.52	13.18	114.80
2021	22.53	40.44	53.53	15.84	132.34

DOI: 10.54254/2754-1169/181/2025.22797

Table 3: (continued)

2022	27.82	45.26	59.00	17.81	149.89
2023	30.12	42.35	59.88	16.39	148.74

Data Source: Ministry of Agriculture and Rural Affairs of the People's Republic of China.

Table 3 shows the Yangtze Delta's agricultural exports (2018–2023) by region: total exports fell from $12.618B in 2018 to $11.355B in 2019, rose to a peak of $14.989B in 2022, then dipped to $14.874B in 2023. Shanghai's exports grew steadily, reflecting strong competitiveness and adaptability to green barriers; Jiangsu and Zhejiang saw fluctuations, likely due to industrial adjustments and external changes; Anhui's exports remained stable, indicating resilience. These differences stem from varied agricultural structures, competitiveness, and capacities to handle RCEP barriers across regions.

4. Empirical design and data sources

4.1. Empirical design

Based on existing literature, the following benchmark regression model is constructed:

$$\ln F_{ij} = R_i + \alpha \ln G_i + \beta \ln G_j - \theta \ln D_{ij} + \mu_{ij} \quad (1)$$

In this equation, F_{ij} represents the trade flow between country i and country j, G_i and G_j refer to the economic sizes (such as GDP), respectively, and D_{ij} indicates the geographical distance. M, α, β, and θ are coefficients. According to the model, trade flow is directly proportional to the economic size of both countries and inversely proportional to the distance between them.

Based on Wang Weiyuan [2], this study extends the traditional gravity model by adding control variables:

$$\ln EX_{ijt} = \beta_0 + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln DIS_{ij} + \beta_4 \ln SPS_{jt} + \mu_{ijt} \quad (2)$$

Where EX_{ijt} is the Yangtze Delta's (i) agricultural exports to RCEP member (j) in year t. GDP_{it} denotes the per capita GDP of the Yangtze River Delta region in period t, while GDP_{jt} refers to the GDP of RCEP member countries in the same period. DIS_{ij} indicates the straight-line geographical distance from Shanghai (as a representative of the Yangtze River Delta) to the geographical center of the RCEP member countries. SPS_{jt} represents the number of SPS notifications issued by RCEP member countries in period t.

4.2. Data sources

The export value of agricultural products from the Yangtze River Delta to RCEP members is from China's Customs Statistics Data Query Platform. Yangtze River Delta per capita GDP data comes from the China Statistical Yearbook; RCEP members' per capita GDP is from the IMF. Distances from the Delta (centered on Shanghai) to RCEP capitals are calculated via Distance Calculator. RCEP members' SPS notifications count is from the WTO Technical Barriers to Trade system.

DOI: 10.54254/2754-1169/181/2025.22797

5. Regression analysis

5.1. Baseline regression

Table 4: Baseline regression

VARIABLES	(1) lnex	(2) lnex	(3) lnex	(4) lnex
lngdp_i	-0.0199	0.8355	1.1594	0.9352*
	(0.2407)	(0.7592)	(0.7532)	(0.5446)
lngdp_j	1.6515***	0.0639	0.0039	0.0326
	(0.3745)	(0.1211)	(0.1202)	(0.0869)
lnsps	0.0780***	-0.1012	0.0573	0.1461***
	(0.0265)	(0.0771)	(0.0765)	(0.0553)
lndis		-1.1980***	-0.6980***	-0.9377***
		(0.2043)	(0.2027)	(0.1465)
Observations	90	90	90	90
R-squared	0.4254	0.3032	0.2719	0.3339

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

To analyze how RCEP members' green trade barriers affect Yangtze Delta agricultural exports, this study uses a panel fixed-effects model and quantile regression (25%, 50%, 75%). Column (1) includes lnsps (green barriers) and controls (lngdp_i, lngdp_j, lndis). Results show lngdp_j (RCEP per capita GDP) has a significant positive effect (coefficient=1.651, p<0.001), while lnsps (coefficient=0.0780, p<0.01) also significantly promotes exports. Other variables are insignificant.

Quantile regressions in Columns (2) (25%) and (3) (50%) show lnsps coefficients (-0.101, 0.0573) are not significant, indicating green barriers do not drive exports at low/medium scales. Column (4) (75% quantile) reveals a significant positive lnsps coefficient (0.146, p<0.01), meaning stronger barriers boost exports when scale is high. This supports the hypothesis: green barriers encourage Delta agricultural upgrades, raising technical standards and quality to create new opportunities, thus positively impacting export scale.

5.2. Robustness test

Table 5: Robustness test

VARIABLES	(1) lnex	(2) lnex	(3) lnex	(4) lnex
lngdp_i	-0.0161	1.1230	1.1609	0.7003
	(0.2449)	(0.7933)	(0.7616)	(0.5316)
lngdp_j	1.6064***	0.0084	0.0260	0.0807
	(0.3784)	(0.1248)	(0.1198)	(0.0837)
lnts	0.0798**	-0.1368	0.0603	0.1434**
	(0.0315)	(0.0939)	(0.0901)	(0.0629)
lndis		-1.1974***	-0.6729***	-1.0242***
		(0.2125)	(0.2040)	(0.1424)
Observations	90	90	90	90
R-squared	0.4098	0.2995	0.2718	0.3464

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

DOI: 10.54254/2754-1169/181/2025.22797

The study creates a new indicator, TS, combining annual SPS and TBT notifications to the WTO, to examine green trade barrier impacts and validate robustness. Table 6 shows fixed effects regression: lnts has a 0.0798 coefficient, significantly positive at 5%. At the 75% quantile, lnts' coefficient is 0.1434, also significant at 5%. These results align with prior SPS-based findings, both showing RCEP green barriers significantly promote Yangtze Delta agricultural exports. They confirm conclusion robustness and support hypothesis 2.

6. Mechanism testing

Table 6: Mechanism analysis

	(1)	(2)
VARIABLES	organic_num	organic_num
sps_j	0.8044**	
	(0.3382)	
ts_j		0.8208**
		(0.3362)
Observations	90	90
R-squared	0.0668	0.0702

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6 shows regression coefficients of 0.8044 and 0.8208, both significantly positive at the 5% level, indicating RCEP members' green trade barriers boost organic agricultural certifications in the Yangtze Delta. More certifications reflect improved product quality, driving export growth—evidence that green barriers positively impact exports via a quality-enhancing mechanism.

7. Conclusions and recommendations

This study innovatively explores the positive impact of green trade barriers of RCEP member countries on agricultural exports of the Yangtze River Delta from both theoretical and empirical perspectives, enhances the depth and reliability of the study by constructing an extended trade gravity model, quantile regression, and new indexes, and reveals the reverse facilitation mechanism from the perspective of quality enhancement to make up for the shortcomings of the literature. Nevertheless, this study has certain limitations: the data covers only some RCEP countries, and the selection of model variables is insufficient. Using SPS notification counts as a measure of green trade barriers is not comprehensive enough. Future research should expand the data scope, introduce more variables to optimize the model, develop composite indicators such as a green barrier intensity index, and conduct specialized analyses on individual agricultural products to improve research accuracy.

References

[1] *Wang, Y. (2022). The impact of the EU carbon tariff policy on China's agricultural product trade (Master's thesis). Academy of International Trade and Economic Cooperation, Ministry of Commerce.*

[2] *Wang, W. (2022). A study on the impact of green trade barriers from RCEP member countries on China's agricultural product exports (Master's thesis). Academy of International Trade and Economic Cooperation, Ministry of Commerce.*

[3] *Sun, Y. (2022). The impact and countermeasures of green trade barriers on China's agricultural product trade: A review of A study on China's agricultural product export trade from the perspective of green trade barriers. Ecological Economy, 38(06), 230-231.*

[4] *Li, C. (2024). An analysis of the impact of green trade barriers on agricultural product export trade. China Business Review, 02, 80-83.*

DOI: 10.54254/2754-1169/181/2025.22797

[5] *Yan, Y. (2022). The impact of green trade barriers in the North American Free Trade Area on China's agricultural product exports (Master's thesis). Capital University of Economics and Business.*

[6] *Zhou, L., & Cai, Z. (2008). The impact and countermeasures of green trade barriers on China's agricultural product exports: A case study of Japan's positive list system. Market Modernization, (31), 24-25.*