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Xiaotian Xu
Wenzhou University
Master student
https://orcid.org/0009-0000-0393-9978
975963536@qq.com

Does Establishment of Overseas Economics and Trade Cooperation Zones Influence China's Regional Export Effects? – Evidence from the Provincial Panel Data

Abstract

China's Overseas Economic and Trade Cooperation Zones (COCZs) are an important measure to comply with the high-quality and sustainable development of the economy and promote the construction of the Belt and Road Initiative national cooperation. This paper analyzes the impact mechanism of COCZs on the high-quality development of China's foreign trade through the establishment of COCZs as a quasi-natural experiment. It also evaluates the impacts of COCZs on export trade based on the data of 23 provinces in China and 54 countries around the world in the period of 2002-2021. Moreover, this paper utilizes a three-dimensional panel model to assess the impact of COCZs on export trade. The findings of this study shows that: First, the establishment of COCZs has generally significantly promoted the high-quality development of regional exports. And it effectively improved regional export levels through feedbacks of intermediate products, improved logistics systems, and inflows of foreign direct investment. Second, there are significant differences in export trade promotion impacting on different provinces establishing COCZs in various countries. Meanwhile, the finding shows significant differences in the export effects of different types of COCZs on China's regional exports. Third, the regional export promotion effects of COCZs have a time lag. Thus it is necessary to plan sustainable development strategies from a long-term perspective and pay attention to the practice of environmental protection and sustainable development while accelerating exports.

Keywords: *overseas economic and trade cooperation zone, regional export effects, host country, export, empirical research*

Xiaotian Xu
Wenzhou Universiteti
magistrant
https://orcid.org/0009-0000-0393-9978
975963536@qq.com

Xarici iqtisadiyyat və ticarət əməkdaşlıq zonalarının yaradılması Çinin regional ixrac effektlərinə təsir edirmi? – Əyalət paneli məlumatlarından sübut

Xülasə

Çinin Xarici İqtisadi və Ticarət Əməkdaşlıq Zonaları (COCZs) iqtisadiyyatın yüksək keyfiyyətli və davamlı inkişafına riayət etmək və "Bir Kəmər və Yol Təşəbbüsü" milli əməkdaşlığının qurulmasını təşviq etmək üçün mühüm tədbirdir. Bu məqalədə KÖZ-lərin kvazi-təbii təcrübə kimi yaradılması vasitəsilə Çinin xarici ticarətinin yüksək keyfiyyətli inkişafına COCZ-lərin təsir mexanizmi təhlil edilir. O, həmçinin 2002-2021-ci illər ərzində Çinin 23 əyalətinin və dünyanın 54 ölkəsinin məlumatları əsasında COCZ-lərin ixrac ticarətinə təsirlərini qiymətləndirir. Bundan əlavə, bu sənəd COCZ-lərin ixrac ticarətinə təsirini qiymətləndirmək üçün üçölçülü panel modelindən istifadə edir. Bu tədqiqatın nəticələri göstərir ki: Birincisi, COCZ-lərin yaradılması regional ixracın yüksək keyfiyyətli inkişafına ümumilikdə əhəmiyyətli dərəcədə kömək etmişdir. Və o, aralıq

məhsulların rəyləri, təkmilləşdirilmiş logistika sistemləri və birbaşa xarici investisiya axını vasitəsilə regional ixrac səviyyələrini effektiv şəkildə yaxşılaşdırdı. İkincisi, müxtəlif ölkələrdə COCZ quran müxtəlif əyalətlərə təsir edən ixrac ticarətinin təşviqində əhəmiyyətli fərqlər var. Eyni zamanda, tapıntı müxtəlif növ COCZ-lərin Çinin regional ixracına ixrac təsirlərində əhəmiyyətli fərqləri göstərir. Üçüncüsü, COCZ-lərin regional ixracın təşviqi təsirləri zaman gecikməsinə malikdir. Beləliklə, davamlı inkişaf strategiyalarını uzunmüddətli perspektivdən planlaşdırmaq və ixracı sürətləndirərkən ətraf mühitin mühafizəsi və davamlı inkişaf təcrübəsinə diqqət yetirmək lazımdır.

Açar sözlər: *xarici iqtisadi və ticarət əməkdaşlıq zonası, regional ixrac effektləri, ev sahibi ölkə, ixrac, empirik tədqiqat*

Introduction

Since China's reform and opening up in 1978, China has continuously accelerated the pace of opening up. The development of China's foreign direct investment and export trade has achieved remarkable results, which increased the process of China's economic globalization level. Chinese enterprises have complied with the trend of international trade and factor flows to establish industrial parks overseas spontaneously. However, many Chinese enterprises are unfamiliar with the host country's economy and policy environment and lack experience in overseas investment, which brings high risks in investing overseas. It led some Chinese enterprises to slow down their internationalization process. Therefore, the Ministry of Commerce in China proposed the establishment of overseas economic and trade cooperation zones to help Chinese enterprises go abroad in groups to reduce the risk of overseas investment pay attention to sustainable development strategies, and ensure that investment projects meet local environmental protection and social responsibility standards in 2005 by drawing on the development model of Special Economic Zones. In January 2022, China's six departments, including the National Development and Reform Commission, the Ministry of Commerce, and the General Administration of Customs, jointly released the guiding opinions on the high-quality implementation of the Regional Comprehensive Economic Partnership Agreement (RCEP) proposing to "build COCZs with high quality and improve the coordinated development level of cooperation zones and domestic parks; strengthen the protection of overseas investment and safeguard the legitimate rights and interests of enterprises". "Chinese companies had invested $57.13 billion in COCZs, created 421,000 jobs for local communities, and lifted nearly 40 million people out of poverty, which effectively improved the quality of the local ecological environment and community well-being through sustainable business models by the end of 2022 in the Belt and Road Initiative cooperation countries". It means that COCZs have not only driven many Chinese enterprises to go abroad in groups and enter the global market but also become an important door for China's opening up and mutual benefit among China and other countries (Bräutigam & Tang, 2014).

China needs to maintain the sustained growth of foreign trade to promote high-quality economic development in the current global economic context. COCZs bring export trade positive effects to the regions where the enterprises implementing the establishment of COCZs through continuous expansion and deepening. Is there any difference in the export effect from different areas and types of cooperation zones? What channels or mechanisms realize these differences? In order to solve these questions, this paper first intends to construct a three-dimensional panel and use the fixed-effects model method to verify the promotion effect of COCZs on regional export trade. Then, this study will conduct a series of robustness tests to ensure the reliability of the results. It would further analyze the mechanism through which the effect occurs. This research summarizes the policies to promote the construction of COCZs to ensure that these policies can not only promote trade, but also implement the principle of environmental protection and social responsibility to provide suggestions for the construction and promotion of COCZs (Cheng & Fan, 2021).

Compared with the existing studies, the possible marginal contributions of this paper are as follows: First, in terms of research perspective, unlike most current perspectives focusing on bilateral or host-country trade, this paper based on the domestic regional perspective to verify the promotion of downstream effects brought by the establishment of COCZs. Second, in terms of data measurement, this paper based on the crawler-organized data of 115 COCZs (the number of

cooperation zones set up by China's implementing enterprises in a particular country), 23 provinces in China (the provinces where China implement enterprises), and related data of 54 countries around the world (GDP, per capita national income, the proportion of import and export volume of goods and services in GDP, and the ratio of domestic credit of the private sector in GDP), and assess the impact of the COCZs on regional export trade. Third, in terms of the content of the study, the indirect link between the cooperation zone and the host country's import trade is established by analyzing the three mechanisms of feedback from intermediate products, improvement of the logistics system, and inflow of outward foreign direct investment by the indirect trade link among COCZs and host countries. This paper further discusses the heterogeneous impact of the cooperation zone (Dannenberg, Yejoo, & Schiller, 2013).

2. Literature Review

The construction of COCZs has achieved remarkable results in recent years. This innovative mode of cooperation has attracted wide attention worldwide, so the research on COCZs has become increasingly rich.

Most scholars believed that COCZs showed strong agglomerations and radiation effects, a kind of internationalized development mode characterized by mutual benefits for bilateral countries. Much relevant literature explored the positive economic and trade effects through establishing COCZs for China, host countries, and even bilateral countries based on a macro perspective COCZs. Li et al. quantitatively found that COCZs had a substitution effect on China's export trade through the method of propensity score matching. Brautigam et al. suggested that cooperation zones may promote upgrading of the host country' industrial structure through investment promotion, industrial synergy, innovation, and technology transfer. Yan et al. indicated that establishing the zone significantly expands the scale of the host country's import and export trade. Dannenberg et al. suggested that the establishment of cooperation zones would boost globalization and drive the economic development of African countries. Xian et al. analyzed bilateral economic and trade effects through the DID method, which showed that overseas cooperation zones promoted both two-way investment and bilateral trade. Some scholars held a negative view of the effects of COCZs. Manfredi believed that the construction of cooperation zones may cause China to transfer surplus industries, and the collective outward relocation of high-energy-consuming and high-polluting enterprises would lead to pollute the local environment and lack of labor force protection, which may not be conducive to sustainable development of the host country. Some scholars notice that the cooperation zone also had a positive effect on cross-border supply chain extension, and cross-border supply chain extension showed an inclusive growth effect from the more microscopic supply chain (Gao, 2021).

Some scholars explored the economic and trade effects of COCZs from the Belt and Road Initiative perspective. Shen et al. believed that the establishment of COCZs in countries along the routes was significant for China further to promote the construction of the Belt and Road Initiative and COCZs were important platforms for deepening bilateral economic and trade cooperation, mutual benefit, and win-win results. Many scholars argued that COCZs have promoted direct investment and economic development in countries along the routes of different empirical models. Zhang et al. analyzed that establishing the zone significantly promoted the economic development of countries of the Belt and Road Initiative through progressive DID and the economic development of the host country through attracting foreign capital inflow by the mediating effect model (Hong & Zhang, 2011).

Some other studies focused on how to better utilize the driving effect of COCZs, and the existing literature generally believed that the key to maximizing the economic impact of the zones on the host country was the host government's supervision and implementation to continuously improve the bilateral exchange and cooperation mechanism between China and the host countries. Wang et al. and other scholars took the Zambian-China Economic and Trade Cooperation Zone as an example to analyze the challenges faced by COCZs in order to find that the stability of the host country's preferential policies on cooperation zones needed to be improved. Some scholars have also proposed

that problems such as financial risks, financing, and talent faced by overseas economic and trade cooperation should be solved (Nie & Liu, 2015).

Most existing literature studies the economic and trade effects of the establishment of COCZs at the country level (China or the host country), involving foreign trade, investment, local economic promotion, and so on. Due to limitations in the availability of micro-data, most of the literature focused only on the country level, and few studies have examined the regional export effect of the establishment of COCZs from the provincial level. This paper examines the export effect, internal mechanisms and differences in the establishment of COCZs at the provincial level to provide decision-making suggestions for China in promoting the construction of COCZs (Jia & Sa, 2015).

3. Research Hypothesis

3.1. Promotion Effect on Export Trade

COCZs are essentially foreign direct investment, COCZs which are backed by the Belt and Road cooperation to strengthen the joint development of China and the countries of the Belt and Road Initiative. First of all, Chinese government negotiates with the host government to establish COCZs to reduce the high transaction costs caused by the negative externalities of the system for enterprises. It also maximizes the excellent operating conditions for Chinese enterprises' overseas investment and smoothly clears the obstacles for the foreign direct investment of domestic enterprises, further greatly overcoming the high transaction costs and threats of competition caused by the heterogeneity of the system. Moreover, it promotes enterprises to develop and utilize the international market more actively, to drive the common development of China and host countries. Through the platform of the cooperation zone, enterprises of the home country could avoid trade barriers such as institutional heterogeneity, which directly effects on increasing the volume of bilateral trade. Moreover, enterprises in COCZs bring mature production technology from their own countries, specially manufacturing enterprises, which need to be supplemented with matching machinery and equipment, intermediate goods and raw materials, and so on to ensure smooth production. Therefore, establishing COCZs would increase the volume of regional export trade from the host country to the home country (Sun, 2023).

The establishment of COCZs can transplant the primary industries and market expansion links to the host countries to promote the professional production of related sectors and open up space for domestic efforts in order to focus on the development of high-value-added and high-technology industries, thus improving the capacity for innovation. Innovation can optimize trade processes and reduce repetitive and inefficient trade links while enhancing the quality of export products, integrating into the middle and high end of the global value chain, and contributing to improving the competitiveness of foreign trade development. It can also stimulate the export of domestic intermediate products by establishing cooperation zones and put them into production, which not only expands the market share but also promotes the inflow of foreign capital. Furthermore, the establishment of cooperation zones provides strong financial support for the development of emerging industries and ultimately improves the trade competitiveness of domestic export products in the international market.

Based on this, this paper puts forward the hypothesis that establishing COCZs can promote regional export trade development.

3.2. Differences in Export Effects among Different Regions in China

Significant differences exsit among Chinese diverse regions in terms of historical development, resource distribution, and industrial structure. These differences determine each region's initial conditions and development potential in the face of COCZs. For example, western regions have advantages in natural resources, while eastern regions are more inclined toward technology and brand development than China's western regions. There are also differences in the degree of policy support and openness of the central and local governments to different regions. In China, for instance, the western region may benefit from the national policy favoring the development region of the west, while the northeastern region may benefit from the policy of transforming old industrial bases. These policy differences further affect the ability and opportunity of regions to utilize COCZs. In addition, the export structure of China varies from one region to another, and some regions may be more

dependent on a particular industry or product. Establishing COCZs may bring specific opportunities for these regions to optimize their export structure and further enhance their competitiveness. For example, the manufacturing industry in the central region may benefit. In a word, the establishment of COCZs may promote the export competitiveness of enterprises in various regions of China. However, the export effect might differ significantly across Chinese regions.

Based on this, this paper proposes the hypothesis that the establishment of COCZs significant affects the export effect on each region of China.

3.3 Differences in the Regional Export Effects of Different Types of COCZs

The types of COCZs are distinct based on the leading industries, which show different effects on regional exports. Other types of COCZs are described as follows. Agricultural cooperation zones are mainly concerned with the integration and optimization of the farming industry chain, which promotes the modernization and industrialization of agriculture and improves the quality and added value of agricultural products. Since agriculture is a traditionally advantageous industry for China, agricultural cooperation zones should significantly promote Chinese regional exports. Logistics cooperation zones mainly focus on developmenting of the logistics industry, which provides convenient logistics services for enterprises and reduces logistics costs. Logistics cooperation zones can facilitate trade between enterprises and thus improve export efficiency, although their contribution to Chinese regional exports may be indirect. Comprehensive cooperation zones usually contain multiple industrial sectors, which lack specialized division of labor and industrial focus and are not conducive to forming industrial clusters and export competitiveness. Therefore, its effect on Chinese regional exports is relatively low. Light cooperation zones mainly focus on developing of light industries, such as textiles, garments, toys, and so on. These industries are usually labor-intensive and are traditional advantageous industries in Chinese regions. Therefore, light cooperation zones might have a significant effect on promoting the export of Chinese regions. Heavy cooperation zones focus on developing of heavy industries, such as machinery, iron and steel, and chemicals. These industries are usually capital-intensive and require large amounts of capital and technical support. Although heavy cooperation zones also contribute to Chinese regional exports, their effect is relatively low. High-tech cooperation zones, mainly focus on developing high-tech industries, such as electronic information, biomedicine, and new energy. Since high-tech industries are characterized by high technology and high added value, high-tech cooperation zones are essential in promoting the upgrading of regional export structures and the high-quality development of China. However, manifesting their effects may require a more extended period of technology accumulation and market expansion (Li, Xian, & Li, 2022).

Based on this, this paper proposes the hypothesis that there are significantly different in regional export effects of different types of COCZs.

4. Model Design

4.1. Model Construction

The purpose of this paper is to study the impact of COCZs on regional export trade, so we set up the following model:

$$LnYijt=\beta0 +\beta1Xijt + Xjt +\beta i +\beta j +\beta t+Ɛ\ ijt \quad (1)$$

Where *i* denotes cities, *j* represents exporting countries, and t denotes year. *Yijt* is the explanatory variable, which indicates the export volume of province *i* to country *j* in year *t*. *Xijt* is the core explanatory variable, which represents the number of COCZs set up by province *i* in country *j* in year *t* and before. In addition, per capita national income (*LnGNI*), trade openness level (*open*), population of each country (*Lnpop*), gross national product (*LnGDP*), net inflow of foreign direct investment as a percentage of GDP (*FDI*), and the country's degree of financial development (*Finance*) are selected as control variables X*it*. *βi* is to control for the province fixed effect, *βt* is to control for the time fixed effect, *βj* is to control for country fixed effects, *Ɛijt* is a random disturbance term, *β0* is a constant term, and *β1* is the estimated coefficient of the explanatory variable *Xijt*.

In this empirical study, we focus on the regression result of $\beta 1$. If $\beta 1 > 0$, it means that the greater the number of COCZs, the more it can promote export trade development compared with the control group; on the contrary, it will not promote export trade.

4.2. Description of Variables and Descriptive Statistics

4.2.1. Core Explanatory Variables

The core explanatory variable of this paper is the number of COCZs set up by a Chinese province in a particular country. Since the establishment of COCZs is mainly concentrated in 2006-2019, to better evaluate the net effect of COCZs, we chose the data period from 2002 to 2021 to better observe the changes in export trade after the establishment of COCZs.

4.2.2. Explained Variables

The paper explains a variable: the export volume of a Chinese province to a country in a certain year, measured in US dollars. We selected the data from the EPS database. We use the natural logarithm to solve the problem of data heteroskedasticity.

4.2.3. Control Variables

This paper refers to Zhuang et al., Zhao et al., Zhou et al., and other scholars to control the interference of other factors. We selected the following variables as control variables:

Level of economic development (*LnGDP*): The level of economic development of a country or region is an essential determinant of export trade. In this paper, we choose Gross Domestic Product (GDP) to measure economic development. And it is taken as the natural logarithm.

Per capita national income (*LnGNI*): The higher a country or region's per capita national income is, the higher the disposable income and the higher the demand is, which leads to an increase in imports. The natural logarithm of LnGNI is taken.

Level of trade openness (*open*): A country with a higher level of trade openness has more frequent import and export trade to a certain extent, and the amount of import and export will be more important. The proportion of the import and export trade volume of goods and services in GDP measures the level of trade openness in this paper (Timmer et al., 2014).

Population of countries (*Inpop*): Countries with larger populations indicate, to some extent, that the demand is greater and the possibility of needing imports is greater if the market is larger.

Table 1 List of variable definitions

Variable name	Variable indicators	Data sources
Explanatory variable	Export amount	EPS Data Platform
Core explanatory variables	Number of COCZs	Council for the Promotion of International Trade (CCPIT), Ministry of Commerce (MOFCOM), provincial commerce departments, Chinese Overseas Cooperation zones Information Dataset 1992-2018, etc.
Control variable	Level of economic development	World Bank database
	National income per capita	World Bank database
	Level of trade openness	World Bank database
	Overseas foreign direct investment (OFDI)	World Bank database

	Level of financial development	World Bank database

Foreign Direct Investment (*FDI*): The level of a country's economic development is affected by foreign direct investment, measured by net inflows of FDI as a percentage of GDP in this paper.

The level of financial development (*Finance*): The level of financial development can affect the regional export technology structure through factor endowment to promote capital accumulation. Also, technological progress improves the value-added of export products in two ways. It further affects a country's export trade. This paper selects the private sector's domestic credit as a proportion of GDP to measure.

In summary, Table 1 shows the meanings of the variables and data sources, and Table 2 presents descriptive statistics for the main variables are presented in Table 2. The standard deviation is comparatively low, with a total sample size of 2300. The data is more concentrated, establishing a strongly balanced panel.

Table 2 Descriptive statistics

Variables	Number of samples	Average	Median	Standard deviation	Minimum	Maximum
Number of establishments	2300	0.697	0	1.663	0	26
lnyGNI	2293	7.881	7.654	1.440	4.700	11.17
lnpop	2300	17.46	17.55	1.595	12.76	21.07
Open	2299	73.89	60.31	43.35	0	210.4
lnyGDP	2269	25.54	25.83	1.937	20.59	30.65
FDI	2299	3.919	2.692	5.310	40.09	106.6
Finance	2300	36.53	25.38	39.01	0	216.3

4.3. Sample Selection

To assess the impact of the establishment of COCZs on regional export trade, this paper chose the period from 2002 to 2021 as the research interval and selected 25 provinces and cities and 53 countries as research samples. We proposed the data in a preliminary manner. First, we filled in the missing data, deleted the countries with many missing values, and finally formed the strongly balanced panel data from 2002 to 2021. Among them, the geographic areas of countries and regions that had built COCZs included Asia, Africa, Europe, and the Americas. The 25 provinces and cities include Heilongjiang, Jilin, and Liaoning in Northeast China; Beijing, Fujian, Guangdong, Hainan, Hebei, Jiangsu, Shandong, Shanghai, Tianjin, and Zhejiang in the East China; and Guangxi Zhuang Autonomous Region, Inner Mongolia Autonomous Region, Guangxi Zhuang Autonomous Region, Ningxia Hui Autonomous Region, Xinjiang Autonomous Region, and Xinjiang Autonomous Region in the west, Ningxia Hui Autonomous Region, Xinjiang Autonomous Region, Sichuan Province, and Yunnan Province locate in the western region. Anhui Province, Henan Province, Hubei Province, Hunan Province, Jiangxi Province, and Shanxi Province are in the central area (Jing & Li, 2016).

Table 3 Sample countries (regions) for empirical research

Continent	Country	Number of cooperation zones
Asia	Myanmar Malaysia Pakistan India Sri Lanka Vietnam Cambodia Laos Thailand Indonesia Kyrgyzstan Tajikistan Brunei Uzbekistan Saudi Arabia Kazakhstan UAE Timor-Leste Korea Oman Georgia	57
Europe	France Belarus Russian Federation Serbia Germany Ukraine Italy Finland Belgium Romania Hungary Czech Republic	20
Africa	Ethiopia Nigeria Tanzania Mozambique Zambia Egypt South Africa Mauritania Uganda Sierra Leone Algeria Djibouti Kenya Sudan Mauritius Zimbabwe	32
North America	Mexico United States	3
South America	Brazil Venezuela	2
Oceania	Fiji	1

Source of data: Organized according to the websites of CCPIT, the Ministry of Commerce, and provincial commerce departments, etc.

5. Empirical Test

5.1. Benchmark Regression Analysis

Table 4 presents the results of the benchmark regression. Specifically, column 1 shows the estimation results considering control variables. The estimated coefficient of the number of explanatory variables established in this column is 0.125, representing that if the number of COCZs established by China in foreign countries increases by 1, China's foreign export trade volume would increase by 12.5 %. It also passes the significance test at the 1 % level. Meanwhile, Column 2 is the result when control variables are not taken into account, and the estimated coefficient of the number of explanatory variables in this column is 0.127, which represents that the number of COCZs set up by China in foreign countries increases by 1, China's foreign export trade volume would increase by 12.7 %. It also passes the significance test at the level of 1 %. The coefficient of column 1 is slightly smaller than that of column 2, which indicates that there are factors affecting foreign export trade in the control variables. Consistent with the theoretical consideration of exporting countries and provinces as well as time fixed-effects and control variables, it is possible to estimate accurately the net effect of the establishment of COCZs on regional export trade (Jia, Yan, & Guo, 2010).

Table 4 Basic regression results with the number of COCZs established as the explanatory variable

	(1) lny	Std. err.	(2) lny	Std. err.
Number of establishments	0.125***	(0.014)	0.127***	(0.015)
lnyGNI	0.353***	(0.129)		
lnpop	0.956***	(0.302)		
Open	-0.001	(0.001)		
lnyGDP	0.415*	(0.225)		
FDI	0.014***	(0.004)		
Finance	0.004***	(0.001)		

_cons	-12.320**	(5.011)	18.459***	(0.021)
N	2225.00		2259.00	
r2	0.904		0.899	
r2_a	0.899		0.894	

* $p < 0.1$,** $p < 0.05$,*** $p < 0.01$

5.2. Robustness Tests

The results of the benchmark regression indicate that the establishment of COCZs can significantly promote the development of China's regional foreign exports. However, to exclude the interference of other confounding factors from the basic conclusions, the robustness test is still needed. In this paper, the alternative dependent variable robustness test is selected for analysis to ensure the robustness of the results. To more intuitively obtain the impact of the establishment of COCZs on regional export development, we replace the explanatory variables in the benchmark regression with the dummy variable of whether or not to establish economic and trade cooperation zones in a three-dimensional panel fixed-effects regression. Results of column 1 take into account a series of control variables, while results of column 2 are the empirical result obtained without taking into account any of the control variables. column 1 and 2 of Table 4 shows that the estimated coefficient of 0.184 for the control variables taken into account and the estimated coefficient of 0.184 for the explanatory variables not taken into account are significantly positive at the 1% significance level, which indicates that the establishment of COCZs has a significant impact on the development of regional exports (Li, Long, & Zhang, 2016).

Table 5 Basic regression results with whether or not to set up COCZs as explanatory variables

	(1) lny	**Std. err.**	**(2) lny**	**Std. err.**
Whether to establish	0.184***	(0.062)	0.222***	(0.062)
lnyGNI	0.388***	(0.130)		
lnpop	0.877***	(0.307)		
Open	-0.001	(0.001)		
lnyGDP	0.365	(0.228)		
FDI	0.014***	(0.004)		
Finance	0.004***	(0.001)		
_cons	-10.008**	(5.081)	18.442***	(0.035)
N	2225.00		2259.00	
r2	0.901		0.896	
r2_a	0.896		0.891	

* $p < 0.1$,** $p < 0.05$,*** $p < 0.01$

To ensure empirical robustness, this paper deletes the 26 COCZs established by Heilongjiang Province with Russia and carries out the empirical regression again due to the extreme value situation of the samples. Table 5 shows the results of the three-dimensional panel model with extreme sample values of Heilongjiang Province on establishing of COCZs in Russia. Column 1 shows the estimated results when considering control variables, and the estimated coefficient of the number of explanatory variables set up in this column is 0.107, which represents that if the number of Chinese regions establishing COCZs in foreign countries increases by 1, China's foreign export trade volume would significantly increase by 10.7 % ($p<0.01$). Column 2 does not take into account the results of the control variables; the estimated coefficient of the number of explanatory variables in the column is 0.159, which represents that if the number of foreign economic and trade cooperation zones set up in foreign countries in China increases by 1, the volume of China's foreign export trade would

significantly increase by 15.9 % (p<0.01). It can be seen that the estimated coefficients of considering the control variables after dealing with the sample extremes and the estimated coefficients without considering the control variables are lower than those without removing the sample extremes, which is also in line with the related theory. Therefore, this paper concluded that the empirical regression can still prove that the establishment of COCZs significantly influence enhancing export development after removing the sample extremes.

Table 6 Regression results after treatment of sample extremes

	(1) lny	**Std. err.**	**(2) lny**	**Std. err.**
Number of establishments	0.107***	(0.034)	0.159***	(0.035)
lnyGNI	0.411***	(0.120)		
lnpop	0.762***	(0.282)		
Open	-0.000	(0.001)		
lnyGDP	0.246	(0.210)		
FDI	0.014***	(0.004)		
Finance	0.004***	(0.001)		
area	0.173	(0.266)		
_cons	-4.996	(4.718)	18.427***	(0.027)
N	2205.00		2239.00	
r2	0.916		0.911	
r2_a	0.912		0.907	

$^{*}\ p < 0.1,^{**}\ p < 0.05,^{***}\ p < 0.01$

5.3. Endogeneity Test

Since this paper uses three-dimensional panel data, the three-dimensional panel data are processed into two-dimensional in the lag analysis. The original provinces and countries are processed into regions and countries. Table 6 shows the lagged regression results. The first, second, and third row represent the results of lagged one, lagged two, and lagged three periods, respectively. The results show that the establishment of COCZs positively impacts on China's export trade, and the coefficient is 0.119 in the first-order lag, 0.113 in the second-order lag, and 0.112 in the third-order lag (p<0.01). It shows that the establishment of COCZs has a lagging effect on the promotion of China's regional export trade, which also explains the robustness of the benchmark regression to a certain extent in this paper (Xu & Li, 2020).

Table 7 Basical regression results for lags one, two and three

	(1) lny	**(2) lny**	**(3) lny**
L. Establishment	0.119***		
	(0.015)		
L2. Number of establishments		0.113***	
		(0.016)	
L3. Number of establishments			0.112***
			(0.017)

lnyGNI	0.277**	0.252*	0.249*
	(0.136)	(0.142)	(0.150)
lnpop	0.794**	0.606*	0.487
	(0.330)	(0.357)	(0.397)
Open	-0.001	-0.000	-0.000
	(0.001)	(0.001)	(0.001)
lnyGDP	0.608**	0.732***	0.781***
	(0.244)	(0.262)	(0.283)
FDI	0.014***	0.013***	0.014***
	(0.004)	(0.004)	(0.004)
Finance	0.005***	0.005***	0.005***
	(0.001)	(0.001)	(0.001)
_cons	-13.256**	-12.912**	-12.008*
	(5.312)	(5.729)	(6.250)
N	2122.000	2016.000	1907.000
r2	0.904	0.905	0.905
r2_a	0.899	0.900	0.900

$^{*}\ p < 0.1,^{**}\ p < 0.05,^{***}\ p < 0.01$

6. Further Analysis

6.1. Analysis of Regional Heterogeneity

Referring to the criteria of the National Bureau of Statistics Statistical Information Management Center for the division of China's economic regions, this paper divides the provinces that set up COCZs into the eastern, western, central, and northeastern areas according to their different locations. Meanwhile, taking into account the extreme values of the samples, this paper excludes 26 COCZs set up by Heilongjiang Province in Russia and then groups them into regressions to examine the impact of the establishment of COCZs on exports in different regions of China. The division of the eastern, central and western economic zones mainly relies on geographic location and the level of economic development. So, the heterogeneity test for the eastern, western, central and northeastern regions is also a heterogeneity test for the level of economic development to a certain extent. Columns 1 to 4 in Table 5 represent the northeast, eastern, central, and western regions (Liu & Li, 2013).

Table 8 Analysis of regional heterogeneity

	(1) lny	**(2) lny**	**(3) lny**	**(4) lny**
Number of establishments	0.065***	0.374***	0.952***	1.157***
	(0.022)	(0.052)	(0.097)	(0.170)
nyGNI	1.216***	0.821***	1.211***	0.829*
	(0.404)	(0.135)	(0.154)	(0.454)
lnpop	1.230***	1.067***	1.637***	1.645***
	(0.472)	(0.152)	(0.176)	(0.505)
Open	-0.041***	0.011***	0.010***	0.009*
	(0.010)	(0.001)	(0.001)	(0.005)
lnyGDP	0.020	-0.063	-0.482***	-1.050**
	(0.460)	(0.149)	(0.165)	(0.511)
FDI	0.171***	-0.025***	0.009	0.090*

	(0.050)	(0.008)	(0.009)	(0.051)
Finance	-0.011	0.005***	-0.003*	-0.013**
	(0.009)	(0.001)	(0.002)	(0.006)
_cons	12.613***	-5.392***	-9.430***	7.798***
	(2.335)	(0.650)	(0.855)	(2.581)
N	167.000	1249.000	509.000	300.000
r2	0.709	0.682	0.741	0.262
r2_a	0.696	0.680	0.737	0.244

$^{*}\ p < 0.1,^{**}\ p < 0.05,^{***}\ p < 0.01$

Table 5 presents that the sub-samples of northeastern, eastern, central, and western regions have passed the significance test at the 1% level, and the coefficients are positive, which indicates that the COCZs established in foreign countries by these four regions have significantly boosted China's export trade. The coefficients of the northeastern, eastern, central, and western regions are 0.065, 0.374, 0.952, and 1.157, respectively. The coefficient of the region of the west is the largest, which indicates that the establishment of COCZs in the region of west has the most significant promotion effect on export trade. The Western region is located in the center of China's inland, which has more convenient land transportation and logistics advantages compared with the eastern coastal region and the Western region. At the same time, the Western region is also abundant in resources and labor resources that help promote the development of foreign trade. The coefficient of the northeastern region is the smallest, which indicates that the establishment of COCZs in the northeastern has the most miniature promotion effect on export trade due to the relatively homogeneous industrial structure of the northeast. It is mainly dominated by heavy industry and agriculture, while the proportion of light industry and high-tech industry is relatively low. In contrast, the industrial structure of the southern coastal region is more diversified and has more market competitiveness and export potential than others. Therefore, the promotion effect of establishing COCZs in the northeastern region of China on China's export trade is smaller than that of the non-establishment of COCZs.

6.2. Heterogeneity Analysis of the Types of Zones

This paper chooses a sample of 115 cooperation zones, including 25 agricultural cooperation zones, five logistics cooperation zones, 41 comprehensive cooperation zones, 20 light cooperation zones, 15 heavy cooperation zones, and nine high-tech cooperation zones. Also, this paper excludes the 26 COCZs established in Russia by Heilongjiang Province, considering the extreme values of the sample. It then examines the heterogeneity of the effect of different types of cooperation zones on regional exports. Columns 1, 2, 3, 4, 5, and 6 of Table 9 report the impact of agricultural cooperation zones, logistics cooperation zones, comprehensive cooperation zones, light cooperation zones, heavy cooperation zones, and high-tech cooperation zones on China's regional export effects, respectively. All regressions control the province-fixed effects, time-fixed effects, and country-fixed effects (Yan, XIe, & Zhang, 2021).

Table 9 Heterogeneity analysis of cooperation zones types

	(1) lny	**(2) lny**	**(3) lny**	**(4) lny**	**(5) lny**	**(6) lny**
N of E[1]	0.723***	0.590***	0.069**	0.295***	0.503***	0.406
	(0.114)	(0.170)	(0.028)	(0.086)	(0.110)	(0.247)
lnyGNI	0.813***	1.804***	1.051***	1.524***	1.857***	-0.266
	(0.234)	(0.400)	(0.241)	(0.285)	(0.336)	(0.339)

lnpop	0.647**	1.621***	1.787***	2.971***	2.312***	0.952***
	(0.256)	(0.504)	(0.278)	(0.323)	(0.351)	(0.363)
Open	-0.004	0.016***	0.010***	0.021***	0.005	0.020***
	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)
lnyGDP	0.129	-1.016**	-0.580**	-1.473***	1.799***	0.495
	(0.254)	(0.448)	(0.279)	(0.318)	(0.344)	(0.323)
FDI	-0.023	0.054	0.011	0.041	-0.006	-0.006
	(0.017)	(0.042)	(0.022)	(0.026)	(0.009)	(0.023)
Finance	-0.003	-0.005	-0.001	0.007***	-0.001	0.023***
	(0.003)	(0.004)	(0.003)	(0.002)	(0.005)	(0.003)
_cons	-2.757**	0.265	-7.040***	10.215***	9.204***	-11.133***
	(1.264)	(2.197)	(1.317)	(1.943)	(1.949)	(2.130)
N	485.000	94.000	792.000	399.000	299.000	156.000
r2	0.611	0.752	0.442	0.571	0.463	0.863
r2_a	0.605	0.732	0.437	0.564	0.450	0.857

* $p < 0.1$,** $p < 0.05$,*** $p < 0.01$

[1] N of E is the abbreviation of establishment number

It can be seen in Table 10 that the sub-samples of agricultural cooperation zones, logistics cooperation zones, light cooperation zones, and heavy cooperation zones have passed the significance test at the 1 % level, and the coefficient is positive. Also, the comprehensive cooperation zones have passed the significance test at the 5 % level and the coefficient is positive, while high-tech cooperation zones still need to pass the significance test at the 5 % level. Agricultural cooperation zones have the most significant impact on China's regional export effect. The reason is that most countries where China has set up COCZs are economically backward regions, and even the agricultural economies of many countries are also very backward of the agriculture is China's traditionally advantageous industry, and China has rich agricultural resources and production experience. Establishing overseas agricultural cooperation zones can provide Chinese agricultural enterprises with broad markets and resources, reducing production costs, and improving export competitiveness. Comprehensive cooperation zones have the most negligible impact on China's regional export effect because they may face various challenges and risks, such as domestic and foreign policies, regulations, culture, etc., which increase enterprises' operating costs and management difficulties. At the same time, comprehensive cooperation zones have higher requirements for infrastructure and public service systems, while the host country does not have the corresponding development conditions to meet enterprises' production and export needs. The main reason that the high-tech cooperation zones' effect on China's exports is not significant might be that the production and export of high-tech products require highly specialized industrial environments and conditions, which may not be available or perfect in some overseas regions (Yan, XIe, & Zhang, 2021).

6.3. Mechanism Analysis

The establishment of COCZs significantly influences China's exports. In conjunction with a series of policies and measures implemented by COCZs, the mechanism of their impact on export trade is as follows:

First, COCZs should establish an intermediate product feedback mechanism. In the early stages of investing in COCZs, there may be some challenges. For example, many enterprises face problems such as high prices of local products, shortage of products that meet the requirements, lower quality of products, and insufficient quantities because the infrastructure of some host countries has not yet been fully constructed, and their industrial systems are relatively weak. These make their host countries unable to provide the raw materials required for the construction of infrastructure, as well as machinery and equipment and intermediate products needed for the production of the cooperation zone. At the same time, Chinese enterprises often spontaneously import machinery, equipment, and

raw materials from China due to China's preferential policies for equipment, raw materials, and spare parts invested in the zones, such as export tax refunds (exemptions) according to the unified tax rebate rate stipulated by the government and other regulations.

Secondly, administration level shoud improve the logistics system in COCZs. With the financial support of the host countries and the Chinese central government, the construction and upgrading of ports, roads, railways, and airports in host countries have significantly improved the efficiency of cargo transportation, which facilitated the local production activities of Chinese enterprises and helped reduce logistics costs, making Chinese export products more price-competitive. The perfect transportation infrastructure of the host country can simplify the import process, reduce transit links, and improve the speed of delivery. Also, government would reduce the transportation costs of raw materials, intermediate goods, and finished products. The perfect transportation infrastructure in the COCZs would provide the host country with a smoother import channel, which would help to expand the export share of Chinese goods to the host country (Zhang, Song, & Hou, 2023).

Thirdly, The COCZs should encourage the inflow of foreign direct investment. Establishing COCZs can promote the economic development of neighboring regions and enhance the overall level of foreign trade in the host country. This external economic effect is conducive to the growth of the host country's economy and provides a broader market space for Chinese enterprises. As the host country's economy grows, its demand for Chinese products would also increase accordingly, especially the demand for Chinese export products such as machinery and equipment and high-tech products in industrialization. Moreover, the construction of overseas cooperation zones would also produce significant foreign capital flow effects and attract foreign-funded enterprises stationed in the zones, which directly generates a large number of employment opportunities and raises the income level of local residents in order to increase the market demand for China's export commodities and services (Zhang, Wang, & Pan, 2019).

Conclusion

COCZs are an essential measure to adapt to the era of economic globalization and promote China's foreign exports. This paper regards the establishment of COCZs as a quasi-natural experiment. Firstly, the impact mechanism of this pilot project on foreign exports is theoretically analyzed. Then, based on testing the effectiveness of the pilot in promoting the development of foreign trade exports, the impact of the establishment of COCZs on foreign export development is examined by using the three-dimensional panel model based on the panel data of 2002-2021. Next, we carry out the robustness test and heterogeneity test.

Through the above research, this paper draws the following main conclusions: First, the establishment of COCZs has significantly increased regional foreign exports. Second, there are significant differences in the promotion effect of COCZs in different provinces and cities. The establishment of COCZs has the weakest promotion effect on foreign trade in the northeastern region and the most essential promotion effect on foreign trade in the western region. Different types of COCZs also have significant differences in the export effect of China's provinces. Third, this study did a lag one, two, and three basic regressions, and the results are significant at the 1% level, which shows that the promotion effect of the establishment of COCZs on regional export trade is lagging. Therefore, the government should plan sustainable development strategies from a longer-term perspective and pay attention to environmental protection and sustainable development while boosting exports (Zhou & Kang, 2021).

7.2. Policy Implications

Based on this, this paper puts forward the following policy implications:

First, China should summarize and promote the development experience and continuously accelerate the expansion of cooperation zones. The results of this paper show that the establishment of COCZs can significantly promote foreign export trade. Therefore, it is necessary to accelerate the expansion of COCZs by summarizing and encouraging experience. Furthermore, the Chinese government should fully consider the actual situation and needs of various regions when formulating

relevant policies and formulate corresponding policies and measures according to the characteristics of different areas. More importantly, China should implement a macro-planning in terms of spatial distribution and industry distribution.

Second, China should optimize the structure of cooperation zone types and formulate strong supportive solid policies for developing cooperation zones. Government should adopt different strategies and measures for various types of COCZs. On one hand, necessary supports should continue to be increased for the types of zones with apparent promotion effects. On the other hand, reasons should be found, and measures should be taken to improve the types of zones with weaker effects.

Third, COCZs should improve the environment and further enhance the service capacity around the cooperation zone. To improve its business environment and attract more enterprises to enter the cooperation zone, the cooperation zone should strengthen the construction of “soft” and “hard” supporting facilities and enhance the level of supporting services. While maintaining the construction of power supply, transportation, and other “hardware” to meet the production needs of enterprises in the cooperation zone, the construction of the internet, information, and other “software” should be increased to provide professional services for enterprises in the zone.

Fourth, COCZs should actively assume social responsibility and accelerate the integration of the cooperation zone into the local community. Enterprises should consider the interests of the government and host country’s people and strive to achieve a “win-win” situation when growing up. Enterprises in the cooperation zone should carry out green production and green innovation to achieve sustainable development. At the same time, it should actively fulfill its social responsibility by employing local residents of the host country to operate production and business activities, bringing more jobs and tax revenues locally. Therefore, it would enhance the integration and reputation of the local cooperative zone.

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