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The Impact of Cross-Border E-Commerce Comprehensive Pilot Zones on Exports from Inland Cities: Evidence from a Difference-in-Differences Analysis of the Sixth Batch of Pilot Zones

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Abstract. Cross-border e-commerce comprehensive pilot zones (CBEC-CPZs) represent an important policy instrument for fostering an open economy and cultivating new drivers of foreign trade growth in China. Taking the establishment of the sixth batch of CBEC-CPZs as a quasi-natural experiment, this paper adopts a difference-in-differences (DID) method to investigate the policy effect on city-level exports. Based on panel data of 29 inland cities spanning 2015-2024, the estimation shows that the policy coefficient is positive yet statistically insignificant. Event-study results confirm the parallel pre-policy trend assumption, and both placebo tests and robustness checks support the baseline findings. Within the relatively short post-policy observation window, this study finds insufficient empirical evidence for a significant export-promoting effect. Delayed policy implementation and heterogeneous firm responses may account for this result, although these potential mechanisms are not formally tested in the current analysis. This paper therefore offers empirical insights into the short-run initial outcomes of CBEC-CPZs in China's inland areas.

Keywords: cross-border e-commerce comprehensive pilot zones, inland cities, city-level exports, difference-in-differences

1. Introduction

With the increasing integration of the digital economy and international trade, cross-border e-commerce has emerged as an important form of international business by connecting domestic and overseas supply and demand through digital platforms. By reducing intermediaries, mitigating information asymmetry, and lowering trade costs, cross-border e-commerce has become an important driver of China's foreign trade transformation and deeper participation in economic globalization. Data from a Ministry of Commerce report indicates that China's cross-border e-commerce import and export volume stood at RMB 2.84 trillion in 2025. The figure marked a 4.8% year-on-year increase and accounted for 6.2% of China's overall trade in goods [1]. To regulate and promote the development of cross-border e-commerce, China has continuously expanded its cross-

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border e-commerce comprehensive pilot zone (CBEC-CPZ) program since the establishment of the first pilot zone in Hangzhou in 2015 [2]. The expansion covered several inland cities, providing them with opportunities to overcome traditional geographical constraints through digital trade and expand exports. Against this background, this study examines whether the establishment of the sixth batch of CBEC-CPZs promoted export growth in inland cities.

Existing research on CBEC-CPZs falls into two main strands. At the city level, previous studies have examined their effects on regional economic development, industrial structure, and imports and exports [3-5]. However, most focus on nationwide city samples or earlier batches of pilot zones, leaving inland cities in later batches relatively underexplored. At a more disaggregated level, studies have investigated the effects of institutional innovations within CBEC-CPZs on cross-border e-commerce exports, firm innovation, and markups of small and medium-sized listed firms [6-8]. Such evidence, however, does not directly capture the effects on total city-level exports. Accordingly, this study focuses on inland cities included in the sixth batch of CBEC-CPZs and evaluates changes in city-level exports during the initial stage of policy implementation. The study contributes to the literature by providing evidence on a relatively underexplored group of inland pilot cities and assessing the policy through total city-level exports. Given the relatively short period since policy implementation and the availability of data, the analysis focuses on initial export effects and does not draw conclusions about long-term policy effects.

2. Theoretical mechanisms and research hypotheses

CBEC-CPZs are regional policies designed to promote foreign trade through institutional innovation. Traditional export activities involve multiple procedures, including customs clearance, taxation, payment, and regulatory compliance, which impose substantial information and institutional transaction costs on firms. By integrating information and services across relevant government departments, improving integrated online service platforms, and streamlining trade procedures, CBEC-CPZs can reduce these barriers. Previous research shows that cross-border e-commerce can lower trade costs by reducing information costs and improving trade facilitation [9]. Lower transaction costs reduce barriers to firms' entry into international markets, thereby facilitating the expansion of city-level exports. In addition, cross-border e-commerce platforms can transcend the temporal and spatial restrictions of conventional trade, facilitating more efficient alignment between domestic businesses and foreign markets [10]. The public services and institutional support provided by CBEC-CPZs can further strengthen firms' access to international markets through these platforms. Existing evidence also indicates that institutional innovation within CBEC-CPZs significantly promotes cross-border e-commerce exports [6]. For inland cities, exports have long been constrained by relatively high logistics costs and limited access to international markets. Conceptually, CBEC-CPZs can improve the cross-border transaction environment and strengthen links between inland firms and international markets, thereby offsetting geographical disadvantages. A study of five early pilot zones found stronger trade-promoting effects in inland locations than in coastal locations [3]. However, pilot-zone development, the provision of supporting infrastructure, and firms' responses require time, suggesting that policy effects may emerge with a lag. For this reason, the research puts forward the following hypotheses:

H1: The establishment of CBEC-CPZs promotes the growth of city-level exports in inland cities.

H1a: During the initial stage of policy implementation, the export-promoting effect of CBEC-CPZs on inland cities may not yet be fully evident.

H1b: As policy implementation progresses, the export-promoting effect of CBEC-CPZs on inland cities may gradually emerge.

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3. Model specification and data sources

3.1. Model specification and variable definitions

To identify the effect of CBEC-CPZs on city-level exports in inland cities, the following DID model is specified:

$$\ln Export_{it} = \alpha_0 + \alpha_1 DID_{it} + \beta X_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

where lnExportit is the natural logarithm of total exports of city i in year t. The key explanatory variable is DIDit = Treati × Postt, which equals 1 if city i belongs to the sixth batch of CBEC-CPZs and the observation falls within the post-policy period of 2022–2024, and 0 otherwise. α1 measures how export trends diverge between the treated and control groups once the policy is rolled out. City fixed effects (μi) account for permanent city-level attributes, while year fixed effects (λt) represent shared macroeconomic disturbances across different years. The vector β contains the coefficients on the control variables. In addition, α0 denotes the intercept, and εit is the error term.

The vector Xit contains three control variables: the natural logarithm of gross domestic product (GDP; lnGDPit), the secondary sector's share of GDP (Industryit), and the natural logarithm of year-end resident population (lnPopulationit). These variables capture differences in economic development, industrial structure, and city size and labor endowment, respectively(Table 1).

Table 1. Variable definitions and descriptive statistics

Variable	Definition	Obs.	Mean	Std. Dev.	Min.	Max.
$\ln Export_{it}$	Natural logarithm of total city exports	290	12.686	1.182	9.822	15.444
DID_{it}	Treatment group × post-policy period	290	0.093	0.291	0.000	1.000
$\ln GDP_{it}$	Natural logarithm of gross domestic product	290	7.339	0.520	6.052	8.758
$Industry_{it}$	Secondary sector's share of GDP (%)	290	45.161	9.178	23.470	73.000
$\ln Population_{it}$	Natural logarithm of year-end resident population	290	5.636	0.552	4.018	6.484

3.2. Sample selection and data sources

Information on CBEC-CPZs is mainly obtained from official approval documents issued by the State Council and the Ministry of Commerce of China, with the policy year determined by the release date of the corresponding approval document [2]. Given the focus on inland cities, cities located in coastal provinces are excluded from the sixth batch approved in 2022. Honghe Hani et al. are also excluded because of insufficient continuous data. The final treatment group therefore consists of nine cities.

To improve sample comparability, 20 cities that had not been approved as CBEC-CPZs during the sample period are selected from the same provinces as the treatment cities. These cities are

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selected on the basis of economic development, population size, and industrial structure. The final sample is a balanced panel of 29 cities covering 2015–2024. A number of pilot areas are dropped from the sample because relevant data cannot be acquired. As a result, the research findings may not be readily generalisable. Other data sources mainly include the CSMAR database, alongside statistical yearbooks and statistical bulletins released by the sampled cities [11, 12]. Data from different sources are harmonized to ensure consistent measurement, and missing values and outliers are checked and addressed before estimation.

4. Empirical results and analysis

4.1. Baseline regression results

Table 2 shows results from the baseline regression. Control variables are added progressively, and city and year fixed effects are adopted in all specifications. Standard errors are clustered at the city level.

In Column (1), which includes only the key explanatory variable, the estimated coefficient of DID is 0.037, which is statistically insignificant. Once GDP and the secondary sector's share of GDP are controlled for in Column (2), the coefficient drops slightly to 0.028. Column (3) further controls for year-end resident population, yielding a coefficient of 0.031, which remains statistically insignificant. The DID coefficient remains positive and changes only slightly across specifications, indicating that the core estimate is relatively stable. Overall, the baseline results do not provide sufficient statistical evidence that the establishment of CBEC-CPZs significantly increased city-level exports in inland cities during the observed post-policy period. This may reflect the relatively short period since policy implementation, as well as the comparatively weak cross-border e-commerce infrastructure, logistics systems, and foreign trade services in some inland cities. Moreover, differences in the implementation progress of supporting measures across pilot cities may delay the translation of policy interventions into export growth.

Table 2. Baseline regression results

Variable	(1)	(2)	(3)
DID	0.037	0.028	0.031
	(0.170)	(0.170)	(0.181)
lnGDP		0.346	0.352
		(0.305)	(0.312)
Industry		−0.002	−0.002
		(0.008)	(0.008)
lnPopulation			−0.072
			(1.042)
City fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	290	290	290

Note: City-level cluster-robust standard errors are reported in parentheses.

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4.2. Parallel trends test

The validity of the DID approach requires the treatment and control groups to exhibit comparable trends before policy implementation. An event-study specification is therefore employed by including relative-time indicators for the years surrounding the establishment of the CBEC-CPZs, with 2021, the year immediately preceding implementation, serving as the reference period. The coefficients estimated for the pre-policy period show no statistical significance, and zero lies within all their 95% confidence intervals. A joint significance test of the pre-policy coefficients yields $F(6, 28) = 0.76$ and $p = 0.609$, so the null hypothesis of jointly zero pre-policy effects cannot be rejected(Figure 1). Consistent with the parallel trends assumption, these results do not imply equal pre-policy trends merely because the null hypothesis cannot be rejected. The post-policy coefficients are also statistically insignificant, consistent with the baseline results. Thus, within the current sample and observation period, no statistically significant export-promoting effect of CBEC-CPZs on inland cities is detected.

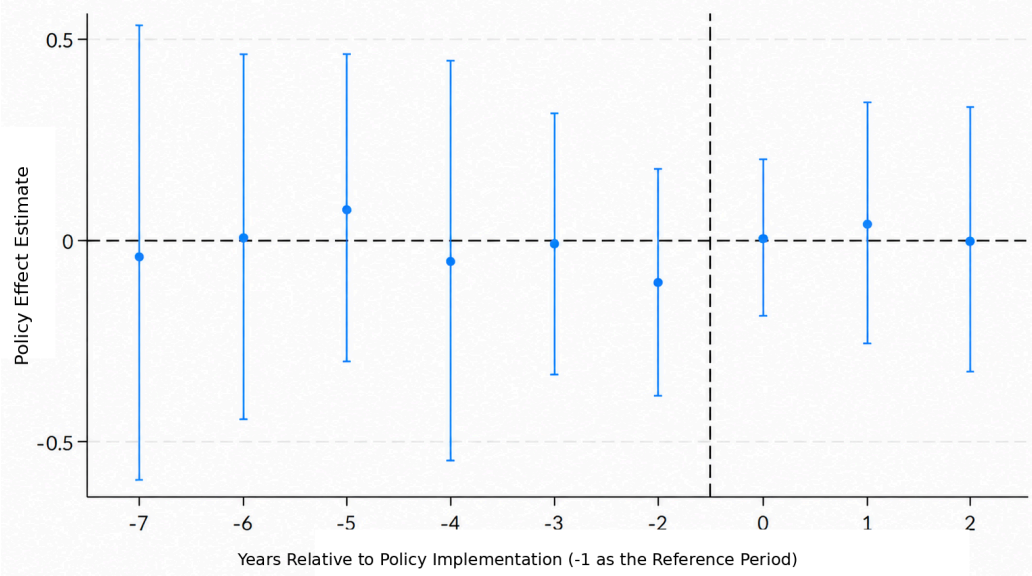


Figure 1. Parallel trends test

4.3. Placebo test

A placebo test is conducted by assigning a fictitious policy implementation year of 2020 and re-estimating the model using only the actual pre-policy sample from 2015 to 2021. As shown in Table 3, the estimated coefficient of the placebo DID variable is −0.105, which is statistically insignificant. Thus, the test detects no statistically significant placebo effect before actual policy implementation. This result corroborates the baseline analysis, although a placebo test alone cannot validate the research design.

Table 3. Placebo test

Variable	(1)
Placebo DID	−0.105
	(0.146)

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Table 3. (continued)

lnGDP	0.559
	(0.342)
Industry	0.000
	(0.007)
lnPopulation	0.886
	(0.722)
Control variables	Yes
City fixed effects	Yes
Year fixed effects	Yes
City-level clustered standard errors	Yes
Observations	203

Note: City-level cluster-robust standard errors are reported in parentheses.

4.4. Robustness check

Robustness is assessed by shortening the sample period from 2015–2024 to 2018–2024 while maintaining the same control variables, city and year fixed effects, and city-level clustered standard errors. The estimated DID coefficient increases from 0.031 in the baseline specification to 0.102 but remains statistically insignificant(Table 4). In both sign and significance, the estimate agrees with the baseline results. The larger positive coefficient in the shorter sample window is consistent with the proposed interpretation that policy effects may emerge gradually, but offers, at most, limited indirect support. Both specifications retain the same post-policy period of 2022–2024, and the coefficient remains statistically insignificant; this comparison therefore does not establish that the policy effect increases over time. Overall, shortening the sample period does not alter the main conclusion.

Table 4. Robustness check

Variable	(1)
DID	0.102
	(0.133)
lnGDP	0.767
	(0.750)
Industry	−0.005
	(0.012)
lnPopulation	−1.397
	(0.976)
Control variables	Yes

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Table 4. (continued)

City fixed effects	Yes
Year fixed effects	Yes
City-level clustered standard errors	Yes
Observations	203

Note: City-level cluster-robust standard errors are reported in parentheses.

5. Conclusion

The estimated policy coefficient is positive across specifications but statistically insignificant, providing insufficient statistical support for H1 within the current observation period. This finding is compatible with H1a, which allows for an effect that is not yet fully evident during the initial stage of implementation. The increase in the DID coefficient from 0.031 to 0.102 in the shorter sample window offers, at most, limited indirect support for the interpretation underlying H1b. However, neither the insignificant estimates nor the sample-window comparison establishes a delayed policy effect, and H1b remains unconfirmed. The parallel trends test, placebo test, and robustness check are consistent with the main finding. Several factors may explain the lack of a statistically significant short-term effect. The sixth batch of CBEC-CPZs had been in operation for a relatively short period by the end of the sample, while platform development, interdepartmental coordination, firm participation, and business expansion require time. Moreover, relatively weak cross-border logistics and foreign trade infrastructure in some inland cities may prevent institutional advantages from being rapidly translated into export growth. Future research could reassess these effects using longer observation periods and broader city samples. These findings and the implementation constraints discussed above suggest three policy priorities. First, delays in policy implementation should be reduced. Second, shared cross-border logistics hubs should be further developed by leveraging existing development zones, bonded areas and railway freight terminals, rather than pursuing excessively large new industrial parks or overseas warehouses. Third, local enterprises' capacity to leverage policy support should be strengthened. Authorities may identify export-ready enterprises within locally competitive industries and maintain individual service files for each firm.

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