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Original Paper

The Impact of Cross-Border E-Commerce Comprehensive Pilot Zone Policy on Firms' Physical Overseas Expansion Behavior

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Abstract

This study examines whether the Cross-Border E-Commerce Comprehensive Pilot Zone policy changes firms' internationalization choices. Using panel data for Chinese A-share listed companies from 2010 to 2022, it treats the staggered establishment of pilot zones as a quasi-natural experiment and applies a multi-period difference-in-differences model with firm and year fixed effects. The results show that the policy significantly reduces the probability that firms establish or maintain overseas subsidiaries, indicating an inhibitory effect on physical overseas expansion. This conclusion remains valid after the parallel trends test and robustness checks based on alternative estimation, city-level clustered standard errors, exclusion of the post-2020 sample, and lagged controls. Further analysis shows that the policy significantly increases the likelihood of light-asset internationalization, measured as the presence of overseas operating revenue without overseas subsidiaries. The findings suggest that cross-border e-commerce does not weaken firms' participation in international markets; instead, it provides an alternative, platform-based and lower-cost path. The study offers evidence for improving pilot-zone policies and guiding firms to select appropriate overseas expansion modes.

Keywords

cross-border e-commerce comprehensive pilot zone, physical overseas expansion, firm internationalization, difference-in-differences model, resource allocation

1. Introduction

With the deep integration of the digital economy and international trade, cross-border e-commerce has become an important force driving the transformation and upgrading of China's foreign trade. As a typical form of Internet-based foreign trade, cross-border e-commerce relies on digital platforms, online payments and cross-border logistics systems. It reshapes information search, transaction matching and fulfillment in traditional trade. Zhang and Pan (2021) show that cross-border e-commerce

can reduce trade costs by changing transaction modes, simplifying transaction links and optimizing trade processes. Since 2015, China has established Cross-Border E-Commerce Comprehensive Pilot Zones to create a more convenient external environment for firms entering international markets through institutional innovation and customs facilitation.

Firms can participate in international markets through multiple channels. Establishing overseas subsidiaries is a typical form of physical overseas expansion. This mode helps firms approach host-country markets, acquire local channels and customer resources, and build localized operating capacity. However, it also requires high fixed investment, management costs and compliance costs. By contrast, cross-border e-commerce platforms can break geographical constraints, reduce intermediate links and lower the threshold for market entry. Ma and Guo (2022) find that comprehensive pilot zones reduce export barriers through institutional arrangements such as tax exemption without invoices, simplified declaration, list-based clearance and aggregate statistics, thereby promoting cross-border e-commerce exports. These changes imply that when firms can use platform-based channels to conduct international business, the necessity of heavy-asset overseas subsidiary establishment may change.

Existing studies have examined the policy effects of cross-border e-commerce comprehensive pilot zones from several perspectives. Shi and Yu (2023) show that cross-border e-commerce reform improves firm innovation through higher profits, technology spillovers and the integration of manufacturing and services. Wang et al. (2024) further find that cross-border e-commerce improves supply chain resilience through firm competitiveness, innovation capability and digital infrastructure. These studies suggest that comprehensive pilot zones not only affect regional trade scale, but also reshape firm operations and resource allocation.

However, the existing literature pays more attention to export growth, innovation and supply chain resilience, while providing limited direct evidence on whether comprehensive pilot zones change firms' choices of internationalization paths. In particular, it remains unclear whether the policy affects firms' decisions to engage in physical overseas expansion by establishing overseas subsidiaries. To fill this gap, this study uses Chinese A-share listed companies from 2010 to 2022, treats the comprehensive pilot zone policy as a quasi-natural experiment, and applies a multi-period difference-in-differences model. The findings provide empirical evidence for evaluating the implementation effect of cross-border e-commerce policies and for guiding firms to optimize internationalization strategies.

2. Research Hypotheses

2.1 Effect of the Policy on Physical Overseas Expansion

Physical overseas expansion generally refers to the establishment of overseas subsidiaries and the development of foreign operating networks. For A-share listed companies, such expansion is not merely a market-entry decision. It is also a strategic choice based on existing resources, overseas operating experience and the continuity of subsequent investment. Wang et al. (2023) show that

outward foreign direct investment has features of experiential learning and continuity, and that previous overseas investment experience affects subsequent outward investment decisions. Therefore, listed firms' physical overseas expansion is characterized by path dependence and accumulated resources.

After the implementation of the comprehensive pilot zone policy, the external conditions for firms to participate in international markets change. On one hand, pilot zones reduce institutional and transaction costs by optimizing customs clearance, logistics, payment, taxation and information services. On the other hand, cross-border e-commerce platforms help firms connect with overseas markets through online sales, platform operations and digital marketing. When platform-based and digital cross-border operations can partly replace market entry and channel expansion functions, firms may have less need to establish overseas subsidiaries as a heavy-asset mode of expansion.

Therefore, the policy may not simply encourage firms to expand their overseas physical presence. Instead, it may change the mode through which firms participate in international markets. For some firms, if cross-border e-commerce channels can satisfy overseas sales and market development needs, they may reduce or postpone the establishment of overseas subsidiaries. Based on the above analysis, this study proposes the following hypothesis:

H1: The Cross-Border E-Commerce Comprehensive Pilot Zone policy has an inhibitory effect on firms' physical overseas expansion behavior.

2.2 Mechanism through Light-asset Internationalization

The effect of the comprehensive pilot zone policy on physical overseas expansion does not mean that firms' internationalization capability declines. Rather, it reflects an adjustment in internationalization paths. Peng et al. (2023) argue that firms do not follow a fixed internationalization route; instead, they choose differentiated paths according to their resources, market demand and development stage. Under traditional modes, firms often rely on overseas subsidiaries to realize localization, market development, channel construction and customer maintenance. Under the development of cross-border e-commerce, firms can participate in international markets through platform operations, online sales, digital marketing and overseas-warehouse supply chain coordination.

From the perspective of resource allocation, comprehensive pilot zones improve supporting systems for cross-border transactions, logistics distribution, payment settlement and customs facilitation. These improvements lower the threshold for firms to conduct international operations through light-asset modes. For listed firms, some resources that would otherwise be invested in overseas entity establishment, foreign management and localized operation may be redirected toward cross-border e-commerce channels, online brand promotion and export business expansion. In this sense, firms can enter international markets without establishing overseas subsidiaries, which may substitute for traditional physical overseas expansion.

Thus, the policy provides a more flexible and lower-cost alternative route by changing the direction of firm resource allocation. This alternative route may further affect firms' decisions on overseas

subsidiaries. Based on this mechanism, this study proposes the following hypothesis:

H2: The Cross-Border E-Commerce Comprehensive Pilot Zone policy affects firms' physical overseas expansion mainly by optimizing resource allocation and providing a light-asset internationalization alternative.

3. Research Design

3.1 Variable Selection

Dependent variable. Physical overseas expansion behavior (FDI) is measured by whether a firm has overseas subsidiaries in a given year. If the firm has at least one overseas subsidiary in that year, FDI equals 1; otherwise, it equals 0.

Core explanatory variable. The Cross-Border E-Commerce Comprehensive Pilot Zone policy variable (did) equals 1 if the city where a listed firm is registered had been approved as a comprehensive pilot zone in or before the current year; otherwise, it equals 0. Since the seventh batch of pilot zones was established at the end of 2022 and its policy effect was unlikely to be fully reflected in that year, it is not included in the treatment group.

Control variables. Firm size (income) is measured by the natural logarithm of operating revenue. Profitability (ROA) is measured by return on assets. Financial leverage (lev) is measured by the asset-liability ratio.

Supplementary variable. Light-asset internationalization behavior (Light) equals 1 if a firm has no overseas subsidiaries in a given year but has overseas operating revenue; otherwise, it equals 0. This variable captures the situation in which firms participate in international markets through non-entity-based modes.

3.2 Data Sources

This study uses Chinese A-share listed companies from 2010 to 2022 as the research sample. Information on overseas subsidiaries, overseas operating revenue and financial indicators is mainly obtained from the CSMAR database and annual reports of listed companies. To ensure sample validity, observations with missing key variables and abnormal values are excluded. Policy data on comprehensive pilot zones are compiled from official batches and city lists released by the State Council and relevant departments, and then matched with the registered cities of listed companies. The final dataset is a firm-year panel.

3.3 Model Specification

To test the impact of the comprehensive pilot zone policy on firms' physical overseas expansion, this study regards the establishment of pilot zones as a quasi-natural experiment and constructs a multi-period difference-in-differences model as follows:

$$FDI_{it}=\alpha_0+\alpha_1 did_{it}+\alpha_2 X_{it}+\mu_i+\lambda_t+\varepsilon_{it} \quad (1)$$

In equation (1), denotes the physical overseas expansion behavior of firm (i) in year (t). is the policy

variable for the Cross-border E-commerce Comprehensive Pilot Zone. represents a set of control variables. and $\lambda_t$denote firm fixed effects and year fixed effects, respectively. is the random disturbance term.

4. Empirical Analysis

4.1 Benchmark Regression

Table 1 reports the benchmark regression results for the effect of the comprehensive pilot zone policy on physical overseas expansion. Column (1) controls only for firm fixed effects and year fixed effects, while Column (2) further adds control variables. The coefficients of Multi-period DID are significantly negative in both columns, indicating that the establishment of pilot zones significantly reduces the probability that firms have overseas subsidiaries. This result supports H1. For the control variables, firm size is significantly positive, showing that larger firms are more likely to expand physically overseas. ROA is significantly negative, suggesting that more profitable firms may prefer lower-cost internationalization modes. Financial leverage is positive, indicating that firms engaged in physical overseas expansion may have greater financing needs.

Table 1. Benchmark Regression Results

Variable	(1) FDI	(2) FDI
Multi-period DID	-0.0385***	-0.0468***
	(0.0142)	(0.0149)
Income		0.0708***
		(0.0053)
ROA		-0.1673***
		(0.0339)
Lev		0.0304*
		(0.0171)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	43,255	43,255
R^2	0.7234	0.7234

Note. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively; robust standard errors are reported in parentheses.

4.2 Parallel Trends Test

To examine the applicability of the multi-period difference-in-differences model, this study takes the year in which a firm's registered city was approved as a comprehensive pilot zone as the policy shock year. It then constructs relative-year dummy variables before and after policy implementation, using the

year immediately before implementation as the benchmark period. As shown in Figure 1, the estimated coefficients before the policy do not exhibit significant differences, suggesting that there was no obvious pre-policy trend difference between the treatment and control groups. After policy implementation, the estimated coefficients generally turn negative, indicating that the policy has a persistent inhibitory effect on physical overseas expansion.

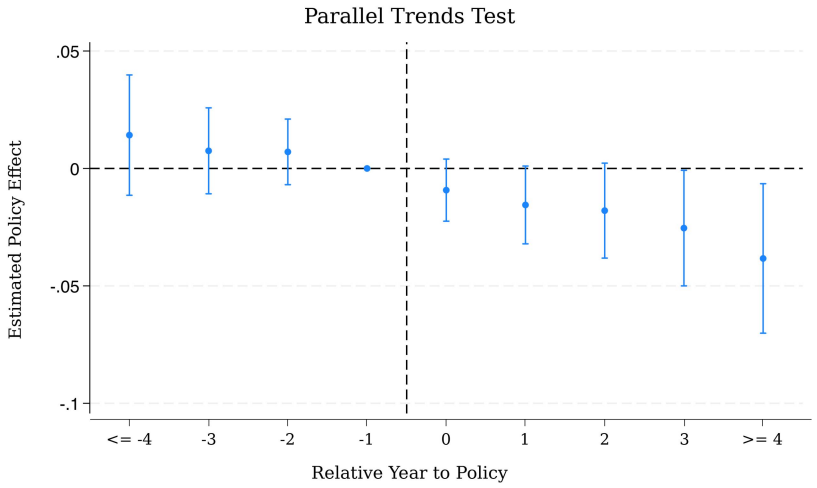

Figure 1. Parallel Trends Test

4.3 Robustness Tests

To test the reliability of the benchmark results, this study conducts several robustness checks. The results are reported in Table 2. Column (1) presents the benchmark regression. Column (2) re-estimates the model using a fixed-effects specification. Column (3) clusters standard errors at the city level. Column (4) excludes observations from 2020 and later to reduce the influence of the COVID-19 shock. Column (5) uses lagged control variables. Across all specifications, the coefficients of Multi-period DID remain significantly negative. These results show that the inhibitory effect of the comprehensive pilot zone policy on physical overseas expansion is robust under different empirical settings.

Table 2. Robustness Test Results

Variable	(1)	(2)	(3)	(4)	(5)
Multi-period DID	-0.0468***	-0.0468***	-0.0468***	-0.0407***	-0.0456***
	(0.0149)	(0.0139)	(0.0136)	(0.0147)	(0.0149)
Control variables	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	43,255	43,255	43,255	29,131	38,074
R^2	0.7234	0.1862	0.7234	0.7134	0.7409

Note. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively; robust standard errors are reported in parentheses.

4.4 Further Analysis: Light-asset Internationalization Path

To further examine whether the comprehensive pilot zone policy provides a light-asset internationalization path for firms, this study constructs the following supplementary model:

$$Light_{it}=\beta_0+\beta_1 did_{it}+\beta_2 X_{it}+\mu_i+\lambda_t+\varepsilon_{it} \quad (2)$$

In equation (2), denotes light-asset internationalization behavior. The other variables have the same meanings as in equation (1). Based on annual data for Chinese A-share listed companies from 2010 to 2022, equals 1 if a firm has no overseas subsidiaries but has overseas operating revenue in a given year; otherwise, it equals 0. This variable reflects the situation in which a firm conducts international operations through export sales, cross-border e-commerce platforms and related channels without establishing overseas subsidiaries. Zhang and Wang (2025) show that open institutional arrangements such as free trade zones can affect firm internationalization through digital transformation and resource allocation efficiency, suggesting that changes in the institutional environment influence firms' choices of cross-border operating modes. Information on overseas operating revenue and overseas subsidiaries is collected from financial statements and subsidiary data, and then matched with registered cities and policy batches of comprehensive pilot zones.

Table 3. Test of the Light-asset Internationalization Path

Variable	Light
Multi-period DID	0.0578***
	(0.0116)
Income	-0.0153***
	(0.0037)
ROA	0.0429
	(0.0279)
Lev	-0.0374***
	(0.0139)
Firm fixed effects	Yes
Year fixed effects	Yes
Observations	43,255
R^2	0.5482

Note. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively; robust standard errors are reported in parentheses.

Table 3 shows that the coefficient of Multi-period DID is 0.0578 and is significant at the 1% level. This result indicates that the establishment of comprehensive pilot zones significantly increases the probability of light-asset internationalization. Combined with the significant negative effect on physical overseas expansion in the benchmark regression, the results suggest that the policy may form a substitute for traditional overseas subsidiary establishment by promoting online, platform-based and export-oriented internationalization. Therefore, H2 is supported.

5. Conclusion

5.1 Main Conclusions

Using panel data for Chinese A-share listed companies from 2010 to 2022, this study treats the establishment of Cross-Border E-Commerce Comprehensive Pilot Zones as a quasi-natural experiment and applies a multi-period difference-in-differences model to examine the impact of the policy on firms' physical overseas expansion. The results lead to three main conclusions.

First, the comprehensive pilot zone policy significantly inhibits firms' physical overseas expansion. The benchmark regression shows that the policy coefficient is significantly negative, indicating that pilot-zone establishment lowers the probability that firms have overseas subsidiaries. This finding suggests that the policy provides an internationalization path different from overseas subsidiary establishment by improving supporting systems for cross-border transactions, logistics, payment and customs clearance.

Second, the parallel trends test and robustness tests support the benchmark conclusion. Dynamic effects show no significant pre-policy trend difference between the treatment and control groups, which satisfies the identification premise of the multi-period difference-in-differences model. After changing the estimation setting, adjusting the clustering level, excluding the pandemic period and using lagged control variables, the policy coefficient remains significantly negative. This confirms the robustness of the conclusion.

Third, the policy may affect physical overseas expansion by providing a light-asset internationalization path. Further analysis shows that pilot-zone establishment significantly increases the likelihood of light-asset internationalization. Combining this result with the benchmark regression, the policy does not simply weaken firms' international operations. Rather, it may guide firms to shift from overseas subsidiary establishment toward online, platform-based and export-oriented internationalization.

5.2 Contributions and Comparison with Existing Studies

The theoretical contribution of this study is that it extends the research on cross-border e-commerce comprehensive pilot zones from trade performance, innovation and supply chain resilience to firm internationalization path choice. Existing research mainly emphasizes the enabling role of cross-border e-commerce in export growth and operational upgrading. This study further shows that the policy can change the relative attractiveness of different overseas expansion modes. In this sense, the study

develops the understanding of how digital trade policies reshape firm-level resource allocation and strategic decisions.

The practical value of this study lies in its evidence on the relationship between digital trade policy and firms' overseas strategies. The findings indicate that a decline in overseas subsidiary establishment after policy implementation should not be interpreted mechanically as a decline in internationalization. Instead, it may reflect a shift toward lower-cost and more flexible internationalization channels. This distinction is important for policymakers, managers and evaluators of firm internationalization performance.

5.3 Policy Implications

First, China should continue improving the institutional system of comprehensive pilot zones and enhance services for light-asset internationalization. Supporting policies in customs clearance, settlement, tax rebate, logistics and data services should be optimized to reduce institutional and information costs. Special attention should be paid to small and medium-sized enterprises and firms entering international markets for the first time, helping them use cross-border e-commerce platforms, overseas warehouses and digital marketing to improve international operating efficiency.

Second, cross-border e-commerce and physical overseas expansion should be promoted in a coordinated manner. While comprehensive pilot zones encourage online and platform-based internationalization, policymakers should also consider firms' long-term overseas layout needs. Firms with advantages in brands, technology and supply chains should be guided to select appropriate combinations of export sales, overseas warehouse construction and overseas subsidiary establishment according to market conditions. In this way, light-asset internationalization and physical overseas expansion can complement each other.

Third, policy precision should be improved to strengthen firms' ability to manage internationalization risks. Financial support, compliance consulting, intellectual property protection and overseas market information services should be provided according to differences in firm size, industry attributes and internationalization stage. For firms relying on online channels, guidance on cross-border data flows, platform rules, international settlement and trade compliance should be strengthened to reduce uncertainty in light-asset internationalization.

5.4 Limitations and Future Research

This study still has several limitations. First, physical overseas expansion is measured by whether a firm has overseas subsidiaries, which captures the extensive margin but cannot fully describe the investment scale, functional role or performance of overseas entities. Second, light-asset internationalization is identified by overseas revenue without overseas subsidiaries, but the available data cannot directly distinguish all specific channels such as platform sales, overseas warehouses and cross-border service outsourcing. Third, due to data limitations, the study does not further examine heterogeneity across industries, ownership types and destination markets in sufficient detail. Future

research can use more detailed firm-level operating data and platform transaction data to identify the mechanisms more accurately, and can examine how digital trade policies affect the quality and sustainability of firms' internationalization.

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