

An Assessment of the Policy Effects of Cross-border E-commerce Pilot Zones: A Perspective Based on Enterprises' New-quality Productive Capacity

Yan Tang¹, Yongjian Zong¹, and Wei Xing²

¹School of Economics and Management, Nanjing University of Science and Technology, Nanjing, China

²School of Public Affairs, Nanjing University of Science and Technology, Nanjing, China

Abstract

This paper assesses the policy effects of cross-border e-commerce pilot zones from the perspective of enterprises' new-quality productive capacity, using a multi-period DID method. The study finds that the establishment of these pilot zones significantly positively impacts enterprises' new-quality productive capacity, and this finding passes multiple robustness tests, including parallel trend tests and placebo tests. Heterogeneous analysis shows that enterprises in the eastern and central regions, non-state-controlled enterprises, smaller enterprises, and high-tech industry enterprises are more significantly affected by the policy. The mechanism test reveals that the policy promotes the development of new-quality productive capacity by boosting enterprises' digital transformation and alleviating financing constraints. This research empirical provides evidence for optimizing cross-border e-commerce pilot zone policies and offers references for the development of related regions and enterprises.

Keywords

Cross-border E-commerce Pilot Zones; New-quality Productive Capacity of Enterprises; Multi-period DID; Digital Transformation; Financing Constraints.

1. Introduction

In today's era of thriving globalization and digital economy, cross-border e-commerce, as an emerging trading model, has become a key force in driving the transformation of the global trade landscape. Since 2015, with forward-looking strategic vision, China has been setting up pilot zones for cross-border e-commerce (hereinafter referred to as "cross-border e-commerce pilot zones") one after another. This marks the beginning of exploring innovative regulatory models and business form cultivation, creating a favorable growth environment for cross-border e-commerce enterprises.

At the same time, the concept of new-quality productive capacity has gradually become a research hotspot in the economic field. It breaks through the limitations of traditional productive forces, with scientific and technological innovation as the core driving force. It integrates frontier technological elements such as digital and green technologies and can significantly enhance enterprises' production efficiency, market competitiveness, and sustainable development ability. For enterprises participating in global competition, new-quality productive capacity has become a key factor affecting their survival and development. The implementation of the cross-border e-commerce pilot zone policy may have a profound impact on enterprises' operation and innovation, thereby influencing the development of new-quality productive capacity. However, existing research mainly focuses on the policy's impact on trade scale and high-quality urban development. The question of how it deeply affects enterprises' new-quality productive capacity has not been fully explored.

Given this, this paper focuses on the relationship between the cross-border e-commerce pilot zone policy and enterprises' new-quality productive capacity, trying to reveal the deep-seated mechanisms behind the policy. In the empirical part, combining data of A-share listed enterprises from 2011 to 2022, this paper constructs a multi-period difference-in-differences model for analysis. The study finds that the establishment of pilot zones significantly promotes enterprises' new-quality productive capacity, providing preliminary evidence of the policy's effectiveness.

Further heterogeneous analysis shows that eastern region enterprises, with their economic foundation and innovation environment advantages, can more effectively utilize policy benefits to enhance new-quality productive capacity. Central region enterprises, through industrial transfer and structural optimization, show positive development. Although western region enterprises have a relatively weak improvement effect, a certain catch-up trend is presented. Non-state-controlled enterprises, with their flexible management system and market sensitivity, have achieved significant growth in new-quality productive capacity under policy support. High-tech industry enterprises, with their R&D strength, have maintained strong competitiveness with the policy's help. Mechanism analysis shows that the cross-border e-commerce pilot zone policy actively promotes the improvement of new-quality productive capacity by boosting enterprises' digital transformation and alleviating financing constraints.

This paper aims to provide theoretical support and data reference for relevant policy optimization and offer insights for enterprises' strategic decisions in a global context. Future research can expand the data scope, incorporate more enterprise characteristics and market factors, and explore the policy's long-term effects and potential impact mechanisms. This will comprehensively and systematically promote the continuous optimization of cross-border e-commerce pilot zone policies and the overall improvement of enterprises' new-quality productive capacity.

2. Theoretical Analysis and Research Hypotheses

The improvement of enterprises' new-quality productive capacity is a result of multiple factors working together. As the basic units of economic activities, enterprises need external policy support and are influenced by their internal management and operational mechanisms in developing new-quality productive capacity. The cross-border e-commerce pilot zone policy, a significant institutional innovation, aims to create a favorable external environment for enterprises through trade facilitation, tax incentives, and financial services support, thereby boosting enterprise innovation and new-quality productive capacity. However, the enhancement of new-quality productive capacity is also constrained by enterprises' innovation capacity, market conditions, and policy implementation effectiveness. By optimizing trade processes, reducing transaction costs, and offering policy support, the pilot zone policy may positively impact new-quality productive capacity. Thus, this paper proposes the following hypothesis:

H1: The establishment of cross-border e-commerce pilot zones effectively promotes the development of local enterprises' new-quality productive capacity.

Under the support of the cross-border e-commerce pilot zone policy, enterprises can access digital infrastructure and policy support to accelerate digital transformation. Li et al. (2025)^[10] found that cross-border e-commerce pilot zones significantly drive enterprise digital transformation, particularly in underlying technology and digital technology applications. The establishment of pilot zones drives digital transformation by expanding market opportunities, optimizing the digital environment, and promoting fund management. Nie and Wang (2025)^[3] and Wei (2025)^[2] also show that digital transformation significantly improves breakthrough innovation and new-quality productive capacity. This indirectly suggests that the pilot zone

policy may enhance new-quality productive capacity through digital transformation. Therefore, this paper proposes the following hypothesis:

H2: The establishment of cross-border e-commerce pilot zones improves local enterprises' digital levels, thereby promoting new-quality productive capacity development.

Easing corporate financing constraints is crucial for new-quality productive capacity development. Financing constraints are a major barrier to innovation for many enterprises. The pilot zone policy can alleviate this by guiding financial institutions to offer diverse services and establishing industrial development funds. Xu (2023)^[11] and Zhang (2025)^[1] found that cross-border e-commerce pilot zones ease financing constraints and promote new-quality productive capacity. Hence, this paper proposes the following hypothesis:

H3: The establishment of cross-border e-commerce pilot zones effectively eases corporate financing constraints, thereby promoting new-quality productive capacity development.

3. Research Design

3.1. Variable Explanation

The explained variable in this paper is the new-quality productive capacity of enterprises. Given the inconsistent standards for measuring new-quality productive capacity in existing literature, this study refers to the approach by Song et al. (2024)^[4]. Based on the two-element theory of productive capacity, the entropy method is used to measure the new-quality productive capacity of enterprises (Npro), and the results are shown in Table 1.

Table 1. New-Quality Productive Capacity Indicators of Enterprises

Factor	Sub-Factor	Indicator	Weight
Labor Force	Living Labor	R&D Staff Salary Ratio	28
		R&D Staff Ratio	4
		Highly Educated Staff Ratio	3
	Materialized Labor (Labor Object)	Fixed Assets Ratio	2
		Manufacturing Expenses Ratio	1
Means of Production	Hard Technology	R&D Depreciation and Amortization Ratio	27
		R&D Rental Expenses Ratio	2
		R&D Direct Investment Ratio	28
		Intangible Assets Ratio	3
	Soft Technology	Total Asset Turnover	1
		Equity Multiplier Reciprocal	1
New-Quality Productive Capacity			100

To study the policy shock, this paper sets up a policy dummy variable (Treat) and a time dummy variable (Time). The core explanatory variable is their interaction term, named did. Treat indicates whether an enterprise is in a cross-border e-commerce pilot zone city, and Time indicates whether the time is after the policy implementation.

Considering other factors may potentially affect enterprises' new-quality productive capacity, this paper controls for several variables: enterprise size (Size), asset-liability ratio (Lev), top ten shareholders' holding ratio (Top), enterprise age (Age), dual role of chairman and CEO (Dual), and audit opinion (AO). Size is the natural log of year-end total assets. Lev is the ratio of year-end total liabilities to year-end total assets. Age is the difference between the observation year and the initial public offering year, log - transformed. Dual is 1 if the chairman and CEO are

the same person, and 0 otherwise. AO is 1 for an unqualified audit opinion on the financial report, and 0 otherwise.

3.2. Data Description

This study focuses on the first five batches of 105 pilot cities in the cross-border e-commerce pilot zones. It selects data of A-share listed enterprises from 2011 to 2022 and processes it as follows: (i) removing samples of ST and *ST enterprises that are poorly managed; (ii) discarding samples with missing indicators and supplementing a few missing values through interpolation; (iii) eliminating samples from the financial and real estate industries; (iv) performing Winsor2 tail reduction processing. The final sample size is 21,488. Samples of cities adjusted administratively or with severe data missing, such as Chongzuo, Manzhouli, and Suifenhe, are excluded. Data on the establishment years of cross-border e-commerce pilot zones come from MOFCOM documents. Other data are from the CSMAR database. Descriptive statistics of the main variables are shown in Table 2.

Table 2. Descriptive Statistics

Variable	Sample Size	Mean	Standard Deviation	Minimum	Median	Maximum
Npro	21488	4.9341	2.491	0.04	4.67	43.17
did	21488	0.3718	0.483	0.00	0.00	1.00
Lev	21488	0.4734	0.348	-1.59	0.47	31.47
Size	21488	22.5282	1.557	4.67	22.36	62.52
Age	21488	2.5810	0.599	0.00	2.71	3.50
Dual	21488	0.2055	0.404	0.00	0.00	1.00
Top	21488	55.0270	15.572	1.31	54.81	99.19
AO	21488	0.9598	0.196	0.00	1.00	1.00

3.3. Econometric Model

This paper uses a multi-period DID method to evaluate the net effect of the cross-border e-commerce pilot zone policy on enterprises' new-quality productive capacity. By controlling for differences in policy timing and implementation scope, it aims to eliminate time - trend and other confounding factors. The specific model is as follows:

$$Npro_{it} = \beta_0 + \beta_1 Treat_i \times Time_t + \sum \rho X_{it} + \alpha_i + \delta_t + \varepsilon_{it} \quad (1)$$

Where $Npro_{it}$ represents firm i 's new-quality productive capacity in year t ; $Treat_i$ is a dummy variable indicating whether firm i is located in a pilot city for cross-border e-commerce imports; $Time_t$ is a dummy variable indicating whether year t is after the policy implementation in the pilot areas; X_{it} is a matrix of control variables for firm i 's economic characteristics. The model also includes firm fixed effects (α_i) and time fixed effects (δ_t).

4. Empirical Analysis

4.1. Baseline Regression

4.1.1. Multi-period DID Model Regression

Based on the aforementioned model, the regression results are presented in columns (1) and (2) of Table 3. In the basic model that includes only the core explanatory variables, the policy effect coefficient is significantly positive at the 1% significance level. After introducing control variables, the estimation results remain robust. The research findings suggest that the establishment of cross-border e-commerce pilot zones has a positive and promoting effect on

the development of enterprises' new-quality productive capacity, which supports the theoretical hypothesis proposed earlier.

4.1.2. PSM-DID Model Regression

To control for potential selection bias, this study employs the doubly robust PSM-DID method for estimation. Initially, comparable samples are constructed using two algorithms: nearest-neighbor matching and kernel matching. The balance test indicates that after matching, the standardized biases of all covariates are below 10% (Rosenbaum and Rubin, 1985)^[9], satisfying the balance requirement. The regression results in columns (3) and (4) of Table 3 demonstrate that the estimated treatment effects remain significantly positive at the 1% level and are consistent with the benchmark DID results. This further confirms the positive impact of the cross-border e-commerce pilot zone policy on enterprises' new-quality productive capacity, thereby enhancing the reliability of the research conclusions.

Table 3. Baseline Regression Results

Variable	Npro			
	(1)	(2)	(3)	(4)
	did	did	psm-neighbor	psm-kernel
did	0.234***	0.203***	0.290***	0.202***
	(0.037)	(0.036)	(0.075)	(0.036)
Lev		0.210***	0.365***	0.197***
		(0.036)	(0.110)	(0.036)
Size		0.172***	0.099***	0.176***
		(0.015)	(0.027)	(0.017)
Age		1.088***	1.100***	1.095***
		(0.064)	(0.134)	(0.064)
Dual		-0.063*	-0.049	-0.056
		(0.035)	(0.068)	(0.035)
Top		-0.003*	0.003	-0.003*
		(0.001)	(0.003)	(0.001)
AO		-0.155***	-0.263**	-0.179***
		(0.059)	(0.108)	(0.059)
Constant	4.847***	-1.622***	-0.593	-1.853***
	(0.017)	(0.368)	(0.637)	(0.376)
Control Variables	No	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes
Individual Fixed Effects	Yes	Yes	Yes	Yes
Sample Size	21,488	21,488	6,994	21,479
R ²	0.697	0.707	0.153	0.188

Note: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. The values in parentheses are standard errors.

4.2. Robustness Tests

4.2.1. Parallel Trend Test

The parallel trend assumption is key for the validity of the DID model. It requires that the treatment and control groups have comparable trends before the policy intervention. To verify this, following Beck et al. (2010)^[12], we construct a dynamic effects model using an event study approach.

$$Npro_{it} = \beta_0 + \sum \theta_{\tau} pre_{\tau} + \theta_{\omega} current + \sum \theta_{\pi} post_{\pi} + \rho X_{it} + \alpha_i + \delta_t + \varepsilon_{it} \quad (2)$$

In the dynamic effects model, the dummy variable pre_{τ} equals 1 if a city is τ years before being listed as a pilot zone. The dummy variable $current$ equals 1 in the year of listing, and $post_{\pi}$ equals 1 if π years have passed since listing. For the parallel trend assumption to hold, coefficients θ_{τ} should be insignificant before the pilot zone year, while θ_{π} should be significantly positive after. Other variables are defined as in the benchmark model.

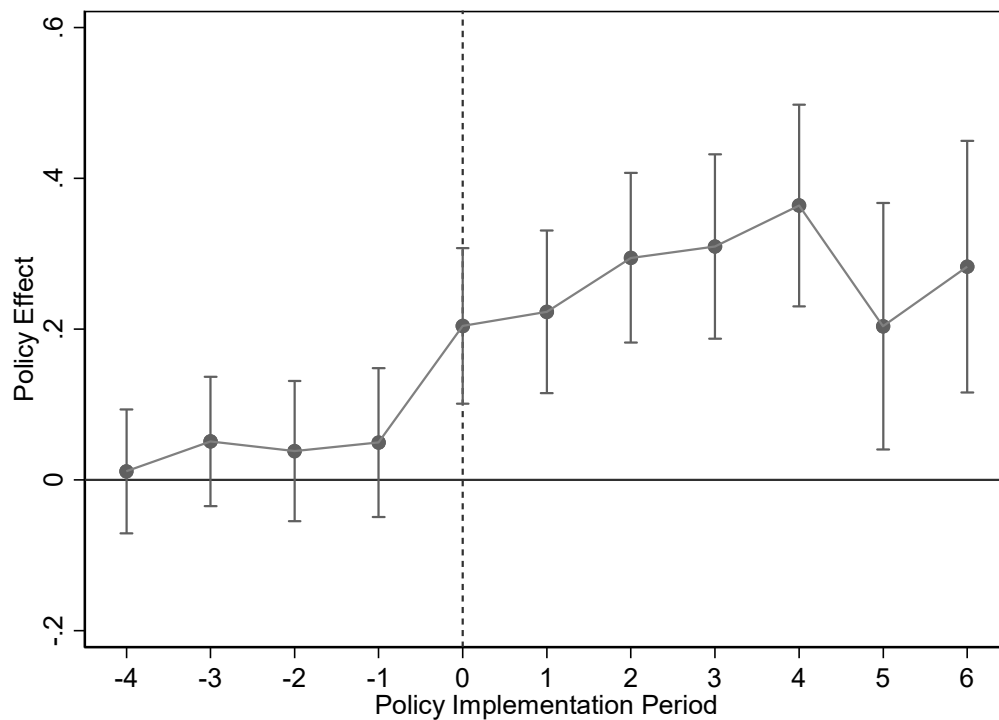


Fig. 1 Parallel Trends Test Results

The policy period of this study spans five years prior to and six years following the implementation. A 90% confidence interval is used to examine the trend of changes before and after the implementation of the pilot zone policy. As shown in Fig. 1, the regression coefficients are not statistically significant before the policy implementation, indicating no significant difference in the trend of change over time between the treatment and control groups before the policy was put into effect. This complies with the parallel trend assumption. However, in the year of policy implementation and subsequent years, all regression results are significantly positive. This suggests that after the pilot zone policy was enacted, the new-quality productive capacity of the treatment group showed a significant upward trend relative to the control group, consistent with the results of the benchmark regression. Therefore, it can be concluded that the sample has passed the parallel trend test required for the multi-period DID estimation.

4.2.2. Placebo Test

Apart from the impact of the pilot zone policy, the new-quality productive capacity of enterprises may also be influenced by other policies or random factors unrelated to the pilot zone policy, potentially leading to bias in the research conclusions. Therefore, this paper conducts a placebo test on the sample. First, treatment and control groups are randomly assigned, and the policy implementation time is randomly set to generate a “pseudo policy effect variable,” which produces an erroneous estimated coefficient α_r (where r is the first

letter of the English word ‘random’). Subsequently, 500 random samples are repeatedly drawn, and the baseline regression model is used for retesting. The distribution of the results is observed. According to the randomness, if $\alpha_r=0$, it indicates that the estimated coefficient does not affect the outcome. Even if there are unobservable variables or policies, the baseline results can still be ensured to be valid.

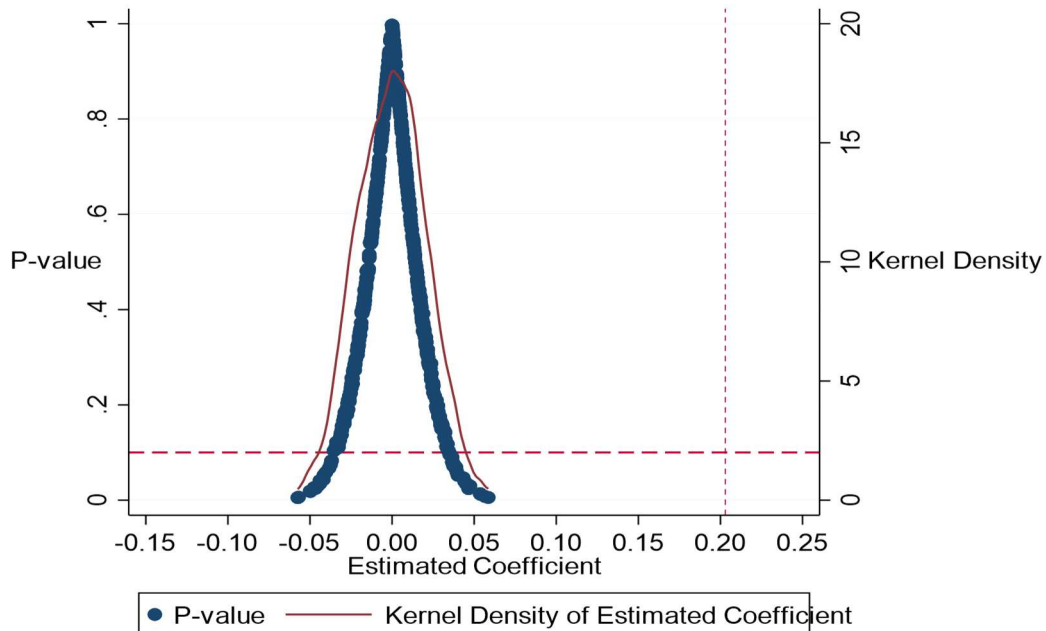


Fig. 2 Results of the Placebo

Fig. 2 shows the probability density distribution of the estimated coefficients of 500 “pseudo policy effect variables.” From the figure, it can be seen that the mean of the estimated coefficients is close to 0 and concentrated in the interval of -0.07 and 0.07, following a normal distribution, and is significantly different from the true policy effect variable estimated coefficient of 0.203 obtained from the baseline regression. The above analysis indirectly verifies the robustness of the regression results, indicating that the impact of other factors or random factors unrelated to the pilot zone policy on the new-quality productive capacity of enterprises is almost negligible, and the promoting effect of the cross-border e-commerce pilot zone on the new-quality productive capacity of enterprises is genuinely existent.

4.2.3. Counterfactual Test

It is also necessary to test the impact of temporal changes on the policy shock effect of the pilot zones. Signals of the gradual improvement of the policy system before the establishment of the pilot zones, regional planning and publicity work, and some random factors may have certain impacts on the new-quality productive capacity of enterprises, making it difficult to identify the direct effect of the policy. Therefore, this paper conducts a counterfactual test by changing the implementation time of the pilot zones. Assuming that the implementation time of each pilot zone is advanced by 2 to 5 years as a whole, if the core explanatory variable is always significantly positive at the same level, it indicates that the new-quality productive capacity of enterprises is likely to be influenced by the superimposed effects of other policies or interference from random factors. On the contrary, if the estimated coefficient is no longer significant, it indicates that the baseline regression estimation results are credible. The specific test results are shown in Table 4, where columns (1) to (4) represent advancing the policy

implementation time by 2 to 5 years, respectively. The estimated coefficients are no longer significant, thus verifying the robustness of the baseline regression results.

4.2.4. Excluding Interference from Other Pilot Policies

During the sample period of this paper, the government also introduced some other policies, such as the pilot policy of the Free Trade Zone (FTZ) starting in 2013. These policies may cause bias in the results of this paper. Therefore, focusing on the FTZ policy, this paper sets its interaction variable as DID_FTZ and adds it to the baseline model for regression. The regression results are shown in column (5) of Table 4. The estimated coefficient of the core explanatory variable remains significantly positive, indicating that the cross-border e-commerce pilot zone policy has a significant promoting effect on the new-quality productive capacity of enterprises, and the regression results remain robust.

4.2.5. Model Substitution Test

To further verify the robustness of the results, this paper replaces the multi-period DID model with a single-period DID model. The single-period DID requires selecting a unified policy shock time point. Considering that the effects of the pilot zone policy may have some lag, this paper takes the moderate year of 2018 as the shock time point. The listed enterprises in the 35 pilot cities approved between 2015 and 2018 are taken as the treatment group, and the listed companies in other cities as the control group. The double difference model is regressed again, and the test results are shown in columns (6) and (7) of Table 4. Column (6) includes only the core explanatory variables, and column (7) adds control variables on this basis. The results of both groups are basically consistent with the results obtained from the benchmark regression above, further indicating the robustness of the benchmark regression results.

Table 4. Robustness Test Results

Variables	Counterfactual Test				Excluding Other Pilot Policy Interference	Model Substitution Test	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Two Years Ahead	Three Years Ahead	Four Years Ahead	Five Years Ahead	Free Trade Pilot Zone Policy	Single Time Point DID	Single Time Point DID
did	0.0880 (1.5581)	0.0752 (1.2377)	0.0400 (0.5995)	0.0481 (0.6501)	0.1882*** (4.9560)		
DID_FTZ					0.0509 (1.3778)		
did_2018						0.2368*** (5.8426)	0.2286*** (5.7256)
Constant	-1.8221* (-1.6641)	-1.8292* (-1.6664)	-1.8331* (-1.6653)	-1.8487* (-1.6759)	-1.6212*** (-4.4093)	4.8744*** (344.5216)	-1.6028*** (-4.3598)
Control Variables	Yes	Yes	Yes	Yes	Yes	No	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample Size	21,488	21,488	21,488	21,488	21,488	21,488	21,488
R ²	0.188	0.188	0.188	0.188	0.707	0.697	0.707

Note: ***, **, and * respectively represent significance at the 1%, 5%, and 10% levels, with the values in parentheses being the standard errors.

4.3. Heterogeneity Analysis

4.3.1. Regional Heterogeneity

Due to the imbalance in regional development, the pilot zone policy will also have different impacts on enterprises in different regions. Therefore, this paper divides the samples into three major categories according to the region where the enterprises are located: eastern, central, and western, to explore the impact of geographical differences on the policy shock effect of the pilot zone. The regression results are shown in columns (1) to (3) of Table 5.

Columns (1) and (2) are both significant at the 1% significance level, while column (3) is significant at the 5% significance level. Based on this, it can be seen that for the eastern and central regions, the impact of the cross-border e-commerce pilot zone policy on the new-quality productive capacity of enterprises is extremely significant. For the western region, the pilot zone policy also has a significant impact on the new-quality productive capacity of enterprises, but compared to the eastern and central regions, its significance level is slightly lower. The possible reason is that the eastern region usually has a higher level of economic development, and the pilot zone policy is more likely to integrate with the local industry, forming a synergistic effect. The central region may benefit from the policy by taking over the industrial transfer from the eastern region and optimizing the industrial structure. In contrast, the western region, due to its relatively weak economic foundation, may require more time and resources to adapt to and digest the policy effects.

4.3.2. Corporate Equity Heterogeneity

Corporate equity heterogeneity significantly influences the formation and development of new-quality productive capacity. Different equity systems, structures, and ownership can lead to varying strategies in technological innovation, talent management, resource allocation, and other areas, thereby affecting the development of new-quality productive capacity. This paper divides the samples into state-controlled and non-state-controlled enterprises to explore the impact of the pilot zone policy on the new-quality productive capacity of enterprises under different equity systems. The regression results are shown in columns (4) and (5) of Table 5.

The pilot zone policy has a significantly positive effect on non-state-controlled enterprises, while the impact on state-controlled enterprises is not significant. This may be due to the fact that non-state-controlled enterprises are more flexible in decision-making mechanisms, market operations, and innovation vitality compared to state-controlled enterprises. Policies related to cross-border e-commerce pilot zones often involve tax incentives, funding support, and simplified logistics, which can be quickly absorbed and transformed into actual competitive advantages by non-state-controlled enterprises. In contrast, state-controlled enterprises may respond more slowly and have lower conversion efficiency due to longer decision-making processes and more conservative innovation mechanisms, leading to an insignificant impact of the policy on their new-quality productive capacity. Additionally, state-controlled enterprises may rely more on traditional business models and resources, and their adaptability to emerging markets and technologies may be relatively weaker, which could also be one of the reasons for the insignificant policy impact. Therefore, formulating more targeted cross-border e-commerce support policies for enterprises with different equity structures will help further enhance their new-quality productive capacity.

4.3.3. Corporate Size Heterogeneity

When facing the pilot zone policy, enterprises of different sizes may also show differences in the development of new-quality productive capacity. Larger enterprises, with their financial strength and technological reserves, may be slightly slower in adapting to policy changes, but they are more likely to obtain financing and tax incentives, which lay the foundation for the improvement of their new-quality productive capacity. On the contrary, smaller enterprises, despite facing challenges such as funding shortages and technological bottlenecks, can quickly

adapt to market changes due to their flexibility. By participating in cross-border e-commerce platforms, they can achieve digital transformation, expand sales channels, and reduce operational costs, thus showing greater growth potential in terms of new-quality productive capacity. This paper divides the samples into larger and smaller sizes based on the median of the sample and performs regressions, with the results shown in columns (6) and (7) of Table 5. The regression coefficient in column (6) is significant at the 1% significance level, and in column (7) it is significant at the 10% significance level, indicating that the pilot zone policy has a significant promotional effect on both larger and smaller enterprises. The policy’s promotional effect is more pronounced for smaller enterprises, thus verifying the correctness of the previous analysis. Therefore, the government should formulate differentiated policy measures according to the characteristics of enterprises of different sizes to fully leverage the positive impact of the pilot zone policy on the new-quality productive capacity of enterprises of various sizes.

Table 5. Heterogeneity Analysis Results

Variables	Region			Ownership		Size		Industry	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Eastern Region	Central Region	Western Region	State-owned	Non-state-owned	Smaller Size	Larger Size	High-tech Industry	Non-high-tech Industry
did	0.2182***	0.2034***	0.1954**	0.0292	0.3664***	0.2618***	0.0710*	0.3748***	0.0632
	(5.4783)	(2.6452)	(1.9647)	(0.6317)	(7.4350)	(4.5146)	(1.7381)	(7.8833)	(1.4327)
Constant	-2.2570***	-1.9524	-1.0494	-1.5970**	-1.8284	-0.7464	1.5341*	-0.0130	-0.9207
	(-3.4100)	(-0.9149)	(-0.9702)	(-2.2750)	(-1.5113)	(-0.4404)	(1.7468)	(-0.0096)	(-1.2860)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample Size	14,105	3,974	3,388	10,904	10,480	10,674	10,689	9,991	11,437
R ²	0.716	0.701	0.698	0.749	0.680	0.662	0.829	0.718	0.757

4.3.4. Industry Heterogeneity

The core of new-quality productive capacity in enterprises is technological innovation. Therefore, this paper divides the overall sample into two parts according to whether they belong to the high-tech industry. The specific classification criteria refer to the method of Guo et al. (2019)^[6], defining companies with industry classification codes C26-C28, C34-C40, I63-I65, and M73-M74 as high-tech industry companies. The regression results are shown in columns (8) and (9) of Table 5.

Column (8) is significantly positive at the 1% significance level, while the regression coefficient in column (9) is not significant. This indicates that the pilot zone policy has a significant and positive impact on the new-quality productive capacity of the high-tech industry, while the impact in non-high-tech industries is relatively weaker. This may be due to differences in industry characteristics and the adaptability of enterprises to policies. The high-tech industry, with its high technological intensity, strong innovation capabilities, and rapid technology transformation abilities, can more easily capture and utilize market and technological opportunities brought by policies, quickly adjust strategies, and expand into international markets. In contrast, non-high-tech industries may be limited by technical barriers, insufficient innovation capabilities, and market positioning, making it difficult to fully adapt to and utilize policy advantages, leading to delayed or less apparent policy effects. Therefore, in the construction of pilot zones, full consideration should be given to industry characteristics and differences in enterprise adaptability to policies, and measures such as strengthening industry

classification guidance should be taken to promote balanced development across various industries.

4.4. Mechanism Test

4.4.1. Digital Transformation Effect

This paper refers to the method of Zhen Hongxian (2023)^[8] and statistically analyzes the frequency of 139 digital-related terms under categories such as technology classification and organizational empowerment to derive the level of digital transformation. The results shown in columns (1) and (2) of Table 6 indicate that the policy effect of the pilot zone can significantly enhance the level of digital transformation of enterprises. Previous studies have also confirmed that digital transformation of enterprises can promote the development of new-quality productive capacity (Zhao Guoqing, 2024)^[7]. Based on this, Hypothesis 2 is verified. The possible reasons are: First, the establishment of cross-border e-commerce pilot zones provides strong support for the extensive application of intelligent manufacturing and digital intelligent technologies. The implementation of these technologies significantly reduces human errors and resource consumption in production processes, greatly improving production efficiency and market response speed, thereby promoting the significant enhancement of new-quality productive capacity. Second, the establishment of pilot zones accelerates the profound transformation of traditional industries towards digitalization and intelligence, not only promoting a significant increase in industrial added value but also effectively enhancing the international competitiveness of enterprises.

4.4.2. Financing Constraint Alleviation Effect

Table 6. Mechanism Test Results

Variables	Digital Transformation Effect		Financing Constraint Alleviation Effect	
	(1)	(2)	(3)	(4)
	Dig	Npro	FC	Npro
did	6.9910***	0.1619***	-0.0203***	0.1920***
	(10.9356)	(4.7748)	(-5.7689)	(5.6770)
Dig		0.0059***		
		(14.9984)		
FC				-0.4195***
				(-3.7481)
Constant	-128.7924***	-0.8569	3.2030***	-0.2525
	(-9.1101)	(-1.5838)	(17.8212)	(-0.4084)
Control Variables	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes
Individual Fixed Effects	Yes	Yes	Yes	Yes
Sample Size	21,488	21,488	21,464	21,464
R ²	0.776	0.711	0.792	0.707

To verify that the pilot zone policy can promote the development of new-quality productive capacity by alleviating corporate financing constraints, this paper uses the FC index to measure the phenomenon of corporate financing constraints. The regression results after including the model are shown in columns (3) and (4) of Table 6. Column (3) indicates that the pilot zone policy has a significant negative impact on corporate financing constraints, enhancing the competitiveness of enterprises. Existing research (Zheng Zhiyuan and Shao Yanhong, 2024)^[5] and relevant theoretical foundations also show that reducing corporate financing constraints can promote the development of new-quality productive capacity, thus Hypothesis 3 is verified. This can be explained by the following points: First, diversification of financing channels, the

pilot zone policy may provide enterprises with diversified financing channels by relaxing access conditions and encouraging innovation, reducing dependence on a single financing channel. Second, reduction of financing costs, policies may reduce corporate financing costs through measures such as fiscal subsidies and tax incentives. Third, improvement of financing efficiency, the pilot zone policy may improve financing efficiency by optimizing the investment environment and improving service efficiency.

5. Summary

This paper conducts empirical research to explore the impact of cross-border e-commerce pilot zone policies on enterprises' new-quality productive capacity. The results indicate that the establishment of cross-border e-commerce pilot zones significantly promotes the new-quality productive capacity of enterprises. This conclusion remains valid after undergoing various robustness tests, including parallel trend tests and placebo tests. Further heterogeneity analysis reveals that enterprises in the eastern and central regions, non-state-controlled enterprises, smaller enterprises, and those in the high-tech industry are more significantly affected by the policy. This may be closely related to factors such as the economic foundation, innovation capacity, and policy response speed of these regions and enterprises.

Mechanism tests reveal that the policy primarily promotes the development of new-quality productive capacity by facilitating enterprise digital transformation and alleviating financing constraints. Policy support provides enterprises with digital infrastructure and policy guarantees, accelerating the digital transformation process and thereby enhancing production efficiency and market competitiveness. At the same time, the policy effectively alleviates financing issues for enterprises by guiding financial institutions to offer a variety of financial services and establishing industrial development funds, providing financial support for innovation and development.

Based on the above conclusions, this paper proposes the following policy recommendations. First, the implementation of cross-border e-commerce pilot zone policies should be continued and further optimized in terms of policy design and execution mechanisms. Policymakers should strengthen the monitoring and evaluation of policy implementation effects to ensure that policies can accurately support enterprises in enhancing new-quality productive capacity. Second, it is recommended to increase policy support for the eastern and central regions while also focusing on the development of the western regions, promoting coordinated regional development through targeted policy support. In addition, the policy environment should be further optimized to provide differentiated policy support for various types of enterprises, such as non-state-controlled enterprises and those in the high-tech industry, to stimulate their innovation vitality and market competitiveness. More flexible tax incentives can be introduced for non-state-controlled enterprises to encourage increased R&D investment and technological innovation. At the same time, digital infrastructure construction should be strengthened, and digital technology training and consulting services should be provided to promote the process of enterprise digital transformation. Finally, the financial market system should be improved, and financial products and service models should be innovated to broaden financing channels and reduce financing costs for enterprises, providing ample financial support for the development of new-quality productive capacity.

This study provides empirical evidence for the optimization of cross-border e-commerce pilot zone policies and offers references for the development of related regions and enterprises. However, due to the limitations of the research scope and data, the conclusions still need further verification and improvement in a broader context. Future research can expand the data range and combine more enterprise characteristics and market factors to deeply explore the long-term effects and potential impact mechanisms of the policy, providing more

comprehensive and systematic theoretical and empirical evidence for the continuous optimization of cross-border e-commerce pilot zone policies and the overall improvement of enterprises' new-quality productive capacity.

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