



Belt and Road Initiative and Corporate Investment Efficiency: Evidence from China's Listed Companies

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Abstract. This research investigates the influence of China's Belt and Road Initiative (BRI) on corporate investment efficiency by utilizing data from A-share listed companies spanning the period from 2010 to 2020. By applying the Richardson model and the difference-in-differences approach, it is discovered that the BRI significantly curtails inefficient investment, thus enhancing investment efficiency. The impact is more prominent for manufacturing enterprises and companies situated in key BRI regions, indicating industry and geographical heterogeneity. These findings imply that the BRI improves both the quantity and quality of corporate investment.

Keywords: Belt and Road Initiative, Corporate investment efficiency, Panel Regression, DID, DDD

1 Introduction

The Belt and Road Initiative (BRI), as the top-level design for China's opening-up and cooperation in the new era, has become an important practical platform for promoting the building of a community with a shared future for mankind since it was proposed by General Secretary Xi Jinping in 2013. The initiative aims to promote policy communication, infrastructure connectivity, trade facilitation, financial integration, and people-to-people bonds among countries along the routes, and to build an open, inclusive, balanced, and mutually beneficial regional economic cooperation framework. The Fifth Plenary Session of the 19th CPC Central Committee further proposed "promoting high-quality development of the Belt and Road," marking that the initiative has entered a new stage of deepening practical cooperation and enhancing comprehensive benefits. At the macro level, the Belt and Road construction has had a profound impact on promoting global economic growth, optimizing the layout of regional industrial chains, and improving infrastructure in countries along the routes.

The efficiency of corporate capital allocation is a crucial micro-level foundation for the health and growth of the macroeconomy. Ideal investment decisions should allocate scarce capital to projects with positive net present value, achieving value maximization. However, in the real economy, due to factors such as agency problems, information asymmetry, and financing constraints, enterprises often exhibit investment inefficien-

cies, specifically manifested as underinvestment and overinvestment [1,2]. Extensive research indicates that in emerging market countries, these two distortions coexist and are particularly severe, directly hindering the enhancement of corporate core competitiveness and the realization of long-term value[3-6]. Therefore, exploring effective pathways to improve corporate investment efficiency is of critical significance for promoting the high-quality development of China's economy [7].

Existing research has systematically explored the impact of the Belt and Road Initiative on corporate behavior and performance from multiple perspectives, providing a solid theoretical foundation and analytical framework for this paper. A large body of literature confirms that the initiative has significantly promoted enterprises' outward direct investment by offering broader market access, policy-based financial support, and overseas investment risk protection, guiding investments toward higher quality and more strategic directions aligned with national priorities. Meanwhile, in terms of innovation-driven development and industrial upgrading, studies indicate that the Belt and Road construction has stimulated technological innovation and product upgrades by deepening international production capacity cooperation and embedding in global innovation networks, thereby propelling manufacturing industries toward higher value chains [3,8,9]. This process has also effectively improved capacity utilization rates in certain industries and optimized domestic resource allocation [3].

In the context of micro-level corporate decision-making, scholars have found that the implementation of the Belt and Road Initiative helps alleviate financing constraints faced by enterprises, particularly participating ones, thanks to the support of accompanying financial policies and the improvement of their international reputation and transparency [4,6]. More importantly, the research emphasizes that the policy enhances information efficiency in capital markets by strengthening information disclosure and attracting attention from analysts and the media, thereby providing more effective decision-making basis for corporate managers and investors and creating external conditions conducive to optimizing capital allocation [4,5,10]. Some studies further extend their perspective to corporate strategy and sustainable development, exploring how the initiative affects corporate strategic differentiation and ESG (environmental, social, and governance) performance [5,10]. These abundant literature collectively demonstrate that the Belt and Road Initiative not only reshapes the external operating environment of enterprises but also profoundly influences their internal resource allocation logic and long-term development paths, laying an important foundation for this study to examine its specific mechanisms and heterogeneous impacts on corporate investment efficiency.

Despite the fruitful results, existing literature mostly focuses on the impact of Belt and Road Initiative on the "quantity" of corporate investment, such as investment scale, direction, or specific performance like innovation and production capacity, while relatively neglecting its direct impact on the "quality" of investment, namely investment efficiency. Investment efficiency measures the deviation of corporate investment decisions from the optimal level, comprehensively reflecting the ultimate effect of the interaction between corporate internal governance and the external environment. Whether the market opportunities and resource support brought by policies truly guide

enterprises to make more precise and effective investment decisions remains a question that has not yet received a systematic empirical answer.

In light of the above background and gaps in the literature, the central research question of this paper is: "Is it possible for the Belt and Road Initiative to influence the investment efficiency of participating firms, and if so, how does it exert such influence?"

2 Research Hypothesis

The Belt and Road Initiative, as an important strategy for China to promote high-level opening-up and regional economic cooperation, not only provides enterprises with broader international markets and resource channels, but also may influence the efficiency of their investment decisions through various mechanisms. On one hand, the initiative helps alleviate financing constraints for enterprises, especially participating ones, by providing policy-based financial support, overseas investment insurance, and tax incentives, thereby ensuring funding for expanding investment opportunities. On the other hand, the infrastructure connectivity and trade facilitation driven by the Belt and Road construction can reduce information asymmetry and transaction costs in cross-border operations, enhancing the predictability and stability of returns for investment projects. Additionally, participating in the Belt and Road cooperation helps enterprises improve their international reputation and enhance the transparency of information disclosure, thereby attracting more attention from capital markets, improving the external governance environment, and guiding corporate investment behavior toward rationality. Based on the above analysis, this paper proposes the following hypothesis

H1: The Belt and Road Initiative significantly improves corporate investment efficiency.

Enterprises in different industries exhibit significant differences in asset structure, investment cycle, technology intensity, and the degree of integration with international markets, which may lead to heterogeneous industry effects of the Belt and Road policy on their investment efficiency. Manufacturing enterprises typically have higher fixed asset investments, longer investment payback periods, and stronger demand for supply chain coordination, making their investment projects more aligned with the capacity cooperation, infrastructure construction, and industrial chain integration promoted by the Belt and Road Initiative. In contrast, non-manufacturing investments rely more on human resources, brands, and channels, and their participation in the Belt and Road may involve more indirect and diversified approaches and benefit mechanisms. Therefore, the policy's promoting effect on the investment efficiency of manufacturing enterprises may be more direct and significant. Based on the above analysis, this paper proposes the following hypothesis:

H2: The Belt and Road Initiative has yielded more substantial enhancements for manufacturing enterprises than for non-manufacturing enterprises.

The geographical location of an enterprise directly affects its convenience in obtaining policy support, market information, and resource allocation. According to the

"Vision and Actions on Jointly Building the Silk Road Economic Belt and the 21st-Century Maritime Silk Road," key provinces and hub cities such as Xinjiang, Fujian, and Shanghai have been given clearer strategic positioning and policy incentives. Enterprises located in these regions often benefit earlier and more fully from the implementation of Belt and Road-related projects, financial support, and external cooperation platforms, thereby gaining stronger information advantages and resource guarantees in investment decisions. Additionally, geographical proximity helps enterprises form industrial cluster effects, reduce coordination costs, and improve the matching degree and success rate of investment projects. Therefore, geographical location may significantly enhance the improvement effect of Belt and Road policies on enterprise investment efficiency. Based on the above analysis, this paper proposes the following hypothesis:

H3: The geographical location of an enterprise can significantly enhance the improvement effect of Belt and Road Initiative on investment efficiency.

3 Experimental Design

3.1 Empirical Model

$$Invest_{i,t} = \beta_0 + \beta_1 Treat_Post_{i,t} + \gamma \times ControlVariables_{i,t} + \varepsilon_{i,t} \tag{1}$$

Where: *i* represents the firm, and *t* represents the year. The dependent variable *Invest_{i,t}* denotes the investment efficiency of firm *i* in year *t*. The core explanatory variable *Treat_Post_{i,t}* is the interaction term between the treatment group dummy variable and the post-policy time dummy variable. *ControlVariables_{i,t}* is a set of lagged one-period firm-level control variables. The coefficient β_1 measures the net effect of the Belt and Road initiative, which is expected to be significantly negative, indicating that the policy reduces inefficient investment levels and thereby improves investment efficiency.

3.2 Dependent Variable: Investment Efficiency

This study employs Richardson's (2006) residual measurement model. An expected investment model is constructed to assess corporate investment efficiency *Invest_{i,t}* based on the disparity between projected and actual investments. A positive residual implies over - investment, whereas a negative residual indicates under - investment. The absolute value $|\varepsilon_t|$ reflects the firm's investment efficiency.

$$INV_{i,t} = \alpha_0 + \alpha_1 * Growth_{i,t-1} + \alpha_2 * LEV_{i,t-1} + \alpha_3 * CF_{i,t-1} + \alpha_4 * ROA_{i,t-1} + \alpha_5 * Size_{i,t-1} + \alpha_6 * BM_{i,t-1} + \alpha_7 * FA_{i,t-1} + \alpha_8 * IVN_{i,t-1} + \alpha_9 * REV_{i,t-1} + \alpha_{10} * AGE_{i,t-1} + \sum Industry + \varepsilon_{i,t} \tag{2}$$

Where the investment *INV_t* calculation formula is as follows:

$INV_{i,t} = (\text{Cash paid for construction of fixed assets, intangible assets, and other long-term assets} - \text{Cash recovered from disposal of fixed assets, intangible assets, and other long-term assets}) / \text{Total assets at the beginning of the year}$

The overall calculation process consists of three step:

a. Calculate the actual investment $INV_{i,t}$

$INV_{i,t} = (\text{Cash paid for construction of fixed assets, intangible assets, and other long-term assets} - \text{Cash recovered from disposal of fixed assets, intangible assets, and other long-term assets}) / \text{Beginning total assets}$

b. Control the impact of extreme values

A panel regression is conducted using financial variables from the previous year (t-1 period) to estimate the current investment level $INV_{i,t}$. All continuous variables are censored at the 1% level to control for the impact of outliers.

c. Calculating the proxy variable for investment efficiency $\varepsilon_{i,t}$

The residuals from the regression are used to measure inefficient investment. Residuals greater than 0 indicate over-investment, while those less than 0 indicate under-investment. This study primarily employs the absolute value of residuals, denoted as $|\varepsilon_{i,t}|$, as a reverse indicator of investment efficiency. A larger value signifies a greater deviation from the optimal investment level, indicating lower efficiency. This absolute value variable is referred to as AbsInvEfficiency in subsequent regressions. Additionally, the original residuals are grouped for testing to distinguish the heterogeneous effects of policies on over-investment and under-investment.

3.3 Explanation of Variables: The Timing and Targets of the Belt and Road Initiative

3.3.1 The Targets of the Belt and Road Initiative (Treat).

A dummy variable for BRI enterprises. In the BRI concept section of Tonghuashun, listed companies are considered BRI participating enterprises, with a value of 1, while others are non-participating enterprises, with a value of 0. time is a time dummy variable, with 1 for the year 2014 and later.

3.3.2 The Timing of the Belt and Road Initiative (Post).

Considering that the BRI was proposed in 2013 and entered the substantive implementation phase in 2014, this paper defines the years from 2014 onward as the post-implementation period, with Post valued as 1, and before 2014 as 0.

3.3.3 The Interaction Item(Treat_Post).

The core estimate of this study is the coefficient β_1 of the Treat_Post interaction term, which quantifies the average difference in investment efficiency between treatment group firms and control group firms before and after policy implementation.

3.4 Main Variable Settings and Explanations

Table 1 shows the abbreviations of all the research variables and their corresponding detailed explanations.

Table 1. The list of main variables

Type of variable	Variable symbol	Definition
Dependent variable		(Cash paid for construction of fixed assets, intangible assets, and other long-term assets
	<i>INV</i>	- Cash recovered from the disposal of fixed assets, intangible assets, and other long-term assets)/
		Total assets at the beginning of the year
Independent variable	<i>Invest</i>	If the residual is greater than 0, it indicates that the enterprise has over-invested. If the difference is less than 0, it indicates that the enterprise's investment is insufficient
	<i>Treat_Post</i>	The listed companies of Treat in the "Belt and Road" concept board are "Belt and Road" supported enterprises, with a value of 1, and the rest are set to 0. Post is a time dummy variable, with 1 for the year 2014 and subsequent years.
	<i>MI</i>	Enter 1 if the enterprise is in manufacturing, otherwise enter 0.
	<i>Bel-troad_area</i>	Enterprises in key Belt and Road regions are assigned a value of 1, while others are assigned a value of 0.
	<i>A</i>	The log of total assets
	<i>LEV</i>	Total liabilities to total assets ratio
	<i>CF</i>	Ratio of operating cash flow to total assets at the beginning of the year
	<i>MANAGER</i>	The shareholding ratio of the management
	<i>FA</i>	Ratio of fixed assets to total assets at the beginning of the year
	Controlled variable	<i>ROA</i>
<i>BM</i>		Book value of assets / market value of assets
<i>GROWTH</i>		Year-on-year growth rate of operating revenue
<i>Ind_dir</i>		Proportion of independent directors to the total number of directors
<i>Top_10</i>		The shareholding ratio of the top 10 shareholders
	<i>AGE</i>	Corresponding date-company listing date

4 Experimental Procedures

4.1 Data Acquisition and Sample Selection

The data for this study were sourced from the East Money Choice Financial Data Terminal, with A-share listed companies in Shanghai and Shenzhen from 2010 to 2020 selected as the initial sample. To meet research requirements and ensure data quality, the sample underwent the following processing:

First, listed companies in the financial industry were excluded due to significant differences in business models and accounting standards compared to other industries; second, companies that had been labeled as ST or *ST during the study period were removed to exclude abnormal financial conditions and delisting-risk special samples from interfering with the research conclusions.

The final sample was classified by industry according to the "Guidelines for the Classification of Listed Companies by Industry" (2012 revision) published by the China Securities Regulatory Commission, ensuring the authority and consistency of industry classification. After the above screening, a non-balanced panel dataset suitable for analyzing the policy effects of the BRI was ultimately constructed.

4.2 Descriptive Statistics

Figure 1 displays the model residual distribution after tail-trimming from the 1st to the 99th percentile, used to analyze corporate investment efficiency.

The deviation pattern. As illustrated, the residual distribution exhibits an approximately symmetrical shape centered at zero, closely resembling a normal distribution curve. This indicates that most firms' actual investment levels fluctuate closely around their expected values. Specifically, residuals are densely clustered within the $[-0.05, 0.05]$ range, demonstrating a pronounced concentration trend. Meanwhile, the distribution shows gradual tail attenuation without abnormal thick tails, suggesting a low proportion of extreme inefficient investments in the sample. These distribution characteristics preliminarily indicate that firms' investment behaviors in the sample generally do not exhibit systematic significant deviations, providing a relatively clean empirical foundation for subsequent identification of policy effects.

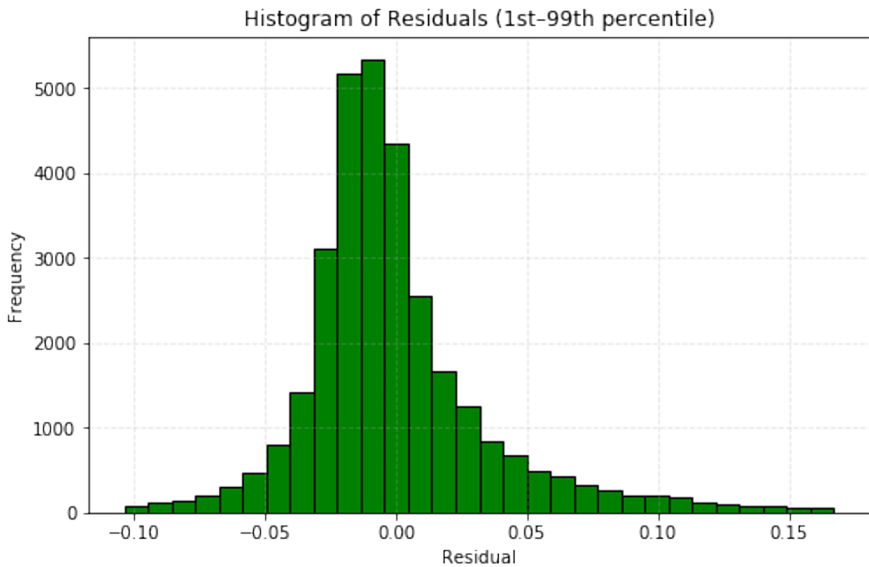


Fig. 1. This histogram of residual distribution

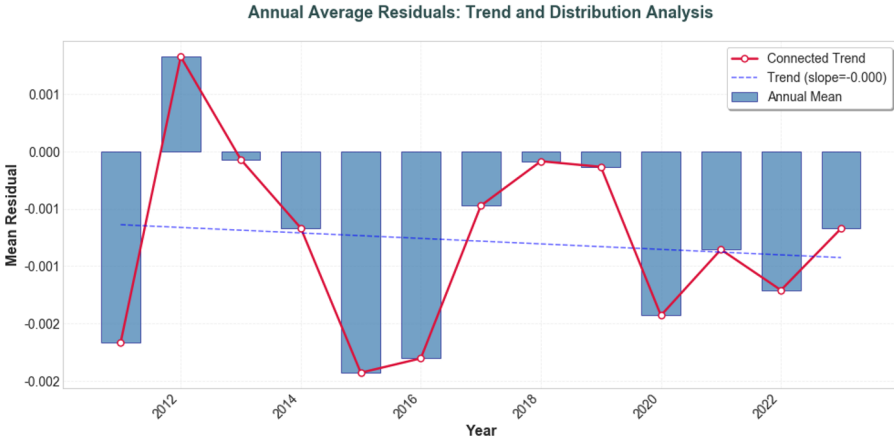


Fig. 2. Average Average Residuals: Trend and Distribution Analysis

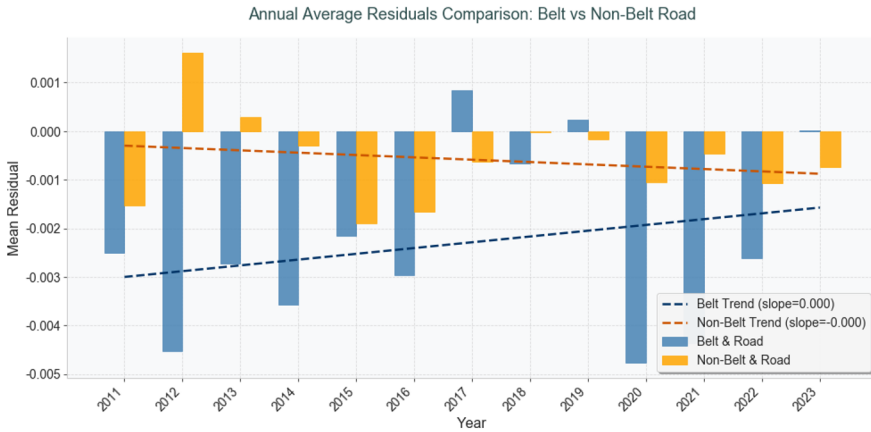


Fig. 3. Average Average Residuals Comparison: Belt vs Non-Belt Road

As shown in Figure 2, the investment efficiency of all sample enterprises remained stable overall from 2011 to 2024, with the long-term trend line slope approaching zero, showing no significant systematic rise or decline. Before 2014, the investment efficiency fluctuated slightly; after 2014, influenced by the promotion of the BRI, the efficiency values experienced phased fluctuations, with a slight increase around 2017. In 2020, due to the impact of the COVID-19 pandemic, the investment efficiency significantly declined, and then gradually recovered from 2021 to 2024, indicating that corporate investment behavior became more rational after adapting to external shocks.

As shown in the Figure 3, during the entire period covered by the sample (2011-2024), the average investment efficiency of non- BRI enterprises was generally better than that of BRI enterprises before and after the policy implementation (2014), indicating that the latter may face higher investment uncertainties or resource allocation challenges in participating in transnational initiatives.

Before 2014, the investment efficiency curves of the two types of enterprises were parallel and close, with little difference, and the overall situation remained stable. After 2014: The investment efficiency of BRI enterprises showed a significant improvement, indicating that the policy had a positive impact on the investment behavior of related enterprises. This trend peaked in 2017, even leading to investment redundancy, with its efficiency value briefly surpassing that of non-BRI enterprises. This may be related to the concentrated launch of projects and large-scale capital investment in the early stages of the policy.

In 2020, severely impacted by the COVID-19 pandemic as a "black swan" event, the investment efficiency of both types of enterprises declined significantly, with BRI enterprises experiencing a more dramatic drop due to obstacles in cross-border projects. Since 2021, both curves have gradually recovered, indicating that investment activities are gradually rebounding as they adapt to the new environment. However, non-BRI enterprises recovered faster, consolidating their efficiency advantage once again.

4.3 Correlation Testing and Analysis

According to the correlation coefficient matrix (Table 2), the correlation coefficient is less than 0.8, so there is no collinearity problem between the variables.

Table 2. The correlation test results

	A_log	LEV	ROA	CF	FA_log	Growth	REV	AGE	Ind_dir	Top_10	PD	Treat_Post
A_log	1.000											
LEV	0.435	1.000										
ROA	-0.024	-0.273	1.000									
CF	0.113	0.041	0.007	1.000								
FA_log	0.389	0.178	0.031	0.141	1.000							
Growth	-0.004	0.021	0.093	-0.004	-0.016	1.000						
REV_log	0.682	0.426	0.077	0.074	0.400	0.021	1.000					
AGE	0.193	0.134	-0.088	0.011	-0.052	-0.011	0.131	1.000				
Ind_dir	0.021	0.000	-0.028	-0.010	-0.008	0.014	0.005	-0.030	1.000			
Top_10	0.126	-0.057	0.167	0.048	0.109	0.012	0.094	-0.164	0.011	1.000		
PD	-0.073	0.044	-0.027	-0.005	-0.046	0.006	-0.086	0.019	0.012	-0.024	1.000	
Treat_Post	0.196	0.124	-0.042	0.015	0.076	-0.013	0.129	0.022	0.025	0.027	-0.017	1.000

4.4 Panel Regression Results

To test whether the policy significantly improves corporate investment efficiency, this paper establishes a research model to analyze the correlation. Multiple regression analysis was performed on the variables. The table presents the regression results of Model (1). The regression results in Table 3 indicate that:

The coefficient of the core explanatory variable *Time_Treat* is -0.0011, and it is significant at the 5% confidence level (t-value is -2.1867). Since the explained variable is the deviation of investment efficiency, the larger its value, the lower the investment efficiency. Therefore, this significantly negative coefficient indicates that after the implementation of the policy, the level of investment inefficiency among participating enterprises has significantly decreased. This suggests that Hypothesis **H1** is verified, namely that the policy has significantly improved the investment efficiency of participating enterprises.

Table 3. The regression results

	(1)	(2)	(3)
<i>Constant</i>	0.0897*** (27.326)	0.0888*** (26.990)	0.0612*** (7.8866)
<i>Treat_Post</i>	-0.0011** (-2.1867)	0.0012 (1.4169)	-
<i>MI</i>		-0.0016* (-1.8141)	
<i>Treat_Post_MI</i>		-0.0038*** (-3.6563)	
<i>Belroad_area</i>			0.0087*** (4.2539)
<i>Treat_Post_Belroad_area</i>			-0.0052** (-2.3529)
<i>A_log</i>	-0.0024*** (-14.083)	-0.0024*** (-13.996)	-0.0024*** (-13.996)
<i>LEV</i>	1.099e-05 (1.2839)	1.086e-05 (1.2689)	1.086e-05 (1.2689)
<i>ROA</i>	0.0002*** (9.6480)	0.0002*** (9.6726)	0.0002*** (9.6726)
<i>CF</i>	-5.278e-08 (-0.6379)	-5.194e-08 (-0.6279)	-5.194e-08 (-0.6279)
<i>FA_log</i>	0.0011*** (12.420)	0.0011*** (12.413)	0.0011*** (12.413)
<i>Growth</i>	4.101e-06*** (3.3381)	4.108e-06*** (3.3446)	4.108e-06*** (3.3446)
<i>REV_log</i>	-0.0010*** (-7.1331)	-0.0010*** (-7.1427)	-0.0010*** (-7.1427)
<i>AGE</i>	-0.0002*** (-9.1656)	-0.0002*** (-9.1146)	-0.0002*** (-9.1146)

	(1)	(2)	(3)
<i>Indp_dir</i>	0.0038 (1.5339)	0.0038 (1.5280)	0.0038 (1.5280)
<i>Top_10</i>	5.676e-05*** (5.7073)	5.563e-05*** (5.5920)	5.563e-05*** (5.5920)
<i>pb</i>	1.242e-05 (1.3727)	1.221e-05 (1.3505)	1.221e-05 (1.3505)
<i>Year</i>	Controlled	Controlled	Controlled
<i>Industry</i>	Controlled	Controlled	Controlled
<i>Observations</i>	30395	30395	30395
<i>Adj R-squared</i>	0.0642	0.0646	0.0787

Note: The values in parentheses are t-values, where *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.1$.

4.4.1 The Bias Towards Manufacturing Enterprises.

To test whether the impact of the Belt and Road Initiative on corporate investment efficiency exhibits industry heterogeneity, this paper introduces a "manufacturing" dummy variable (*MI*) and its interaction term with policy (*Treat_Post_MI*) based on the benchmark model. The regression results show that the coefficient of the interaction term *Treat_Post_MI* is -0.0038, which is highly significant at the 1% level ($t = -3.6563$), indicating that participation in the Initiative significantly reduces the level of investment inefficiency in manufacturing enterprises. In contrast, the policy effect term *Treat_Post* for non-manufacturing industries has a coefficient of 0.0012 and fails to pass the significance test ($t = 1.4169$). These results suggest that the BRI has distinct industry heterogeneity in its promotion of investment efficiency, with its positive effects primarily concentrated in manufacturing enterprises, while the impact on non-manufacturing enterprises is not significant. This confirms H2, namely that the BRI has different effects on improving investment efficiency in manufacturing and non-manufacturing industries.

4.4.2 The Bias Towards the Key Areas of the Belt and Road Initiative Policy.

Based on the official document "Vision and Actions on Jointly Building the Silk Road Economic Belt and the 21st-Century Maritime Silk Road" and academic research practices, we have systematically organized the key provinces and hub cities of "Belt and Road" as shown in Table 4.

To further examine the impact of geographical convenience and policy support density in the Belt and Road Initiative on corporate investment efficiency, this paper constructs regional dummy variables based on whether the company's registered location is in key provinces or hub cities officially planned, and conducts heterogeneity tests. The regression results show that the coefficient of the interaction term *Treat_Post_Beltroad_Area* is -0.0052, which is significant at the 5% level ($t = -2.3529$), indicating that companies located in key regions experience a more substantial reduction in investment inefficiency after policy implementation. Meanwhile, the coefficient of the regional variable *Beltroad_area* is significantly positive (0.0087, $t = 4.2539$), reflecting that companies in key regions had relatively low investment efficiency

before the policy. These results collectively demonstrate that the Belt and Road Initiative exerts a more pronounced "corrective" and enhancing effect on companies in key regions, reflecting the policy's regional coordination and balanced development effects. Therefore, H3 is validated, confirming that a company's geographical location can significantly enhance the Belt and Road Initiative's improvement effect on investment efficiency.

Table 4. The key areas of the Belt and Road Initiative policy

Region	Include provinces	Strategic positioning focus
Northwest	Xinjiang, Shaanxi, Gansu, Ningxia, Qinghai, Inner Mongolia (6)	The Core of the Silk Road Economic Belt: A Gateway and Hub to Central and Western Asia
Northeast	Heilongjiang, Jilin, Liaoning (3)	An important window to the north
Southwest	Guangxi, Yunnan, Xizang (3)	Radiation center for South and Southeast Asia; organic connection between sea and land
Foreland	Shanghai, Fujian, Guangdong, Zhejiang, Hainan (5)	The Core Area of the 21st Century Maritime Silk Road:Port Construction and International Hub
Inland	Chongqing (1)	An important support for the development and opening up of the western region

5 Conclusion

5.1 Research Summary

This study focuses on the core issue of the impact of the Belt and Road initiative on corporate investment efficiency. Based on the Richardson model, it constructs an investment efficiency measurement index and uses data from China A-share listed companies from 2010 to 2020 to conduct a systematic empirical test using the difference-in-differences method. The main findings are as follows:

H1: The overall policy effect is significant: The benchmark regression results show that the Belt and Road initiative (*Treat_Post*) has a significant positive impact on the investment efficiency of participating enterprises. The policy effectively reduces the level of inefficient investment by enterprises (absolute value of residuals), indicating that the initiative not only expands the "quantity" of enterprise investment but also optimizes the "quality" of investment, bringing enterprise investment behavior closer to the expected optimal level.

H2: Significant industry heterogeneity: There are notable differences in policy effects across industries. The improvement in investment efficiency for manufacturing enterprises is particularly significant and strong, while the impact on non-manufacturing enterprises is statistically unclear. This is mainly due to the higher coupling degree between the asset structure and investment cycle of manufacturing and the market guarantees, supply chain support, and financing resources provided by the Belt and Road Initiative.

H3: Enhanced geographical participation effect: The geographical convenience and policy support density of enterprises participating in the Belt and Road initiative are crucial. Enterprises registered in key provinces or hub cities show significantly greater improvements in investment efficiency. Notably, policies have played a stronger "corrective" role for enterprises in these key regions, which might otherwise have "efficiency disadvantages," reflecting the initiative's effect on regional balanced development.

5.2 Policy Recommendations

Based on the above conclusions, this paper puts forward the following policy recommendations:

1. Implement differentiated and targeted industry support strategies

For the manufacturing sector, efforts should continue to deepen infrastructure connectivity, international production capacity cooperation, and special financial credit support along the "Belt and Road" to stabilize long-term investment expectations. At the same time, manufacturing enterprises should be encouraged to move up the industrial chain and enhance investment returns through technological innovation. For non-manufacturing sectors, it is necessary to accelerate the establishment of flexible cooperation platforms, including information consulting service networks, intellectual property protection collaboration mechanisms, and financing guarantee systems adapted to the light-asset model, to stimulate their investment vitality in new business models.

2. Optimize the spatial distribution of policy resources and enhance regional coordination

While consolidating the pivotal role of key regions such as Xinjiang, Fujian, and Shanghai, an effective mechanism should be established to diffuse policy dividends to non-key regions. For instance, by building cross-regional industrial chain cooperation platforms and organizing counterpart negotiation meetings, inland enterprises can be assisted in tapping into the opportunities of the Belt and Road Initiative. For enterprises in key regions with relatively weak investment efficiency foundations, more targeted investment decision-making guidance and risk management support can be provided to help them transform policy advantages into tangible operational improvements.

3. Implications for corporate managers

Enterprises, especially manufacturing enterprises, should proactively incorporate the Belt and Road Initiative into their long-term strategic planning, actively seeking to optimize their global asset layout through participation in overseas park construction, engineering contracting, and technical cooperation. Non-manufacturing enterprises need to explore flexible and diverse participation models, such as leveraging digital platforms to provide cross-border services or forming complementary service alliances with manufacturing enterprises going global, thereby indirectly integrating into the Belt and Road cooperation network.

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