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The Impact of the Belt and Road Initiative on Enterprise Labor Productivity

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ABSTRACT

The Belt and Road Initiative has brought new opportunities for high-quality development to enterprises over its decade-long implementation. Using a difference-in-differences approach, this study examines the impact of the Belt and Road Initiative on total factor productivity among enterprises listed on the Shanghai and Shenzhen A-share markets from 2007 to 2022. The findings reveal a significant improvement in total factor productivity for enterprises influenced by the initiative. Further analysis indicates that the initiative enhances corporate innovation and optimizes human capital structures, thereby boosting total factor productivity. Heterogeneity studies show this effect is more pronounced in non-state-owned enterprises, large-scale firms, and regions with higher exposure levels. The research provides theoretical support and recommendations for the strategic deployment of the Belt and Road Initiative.

KEYWORDS

The Belt and Road Initiative; Total factor productivity; Tchnological innovation; Human capital structure

1. INTRODUCTION

The "the Belt and Road" initiative has been implemented for ten years. In the past ten years, the "the Belt and Road" has gone from planning and layout to taking root, from Asia to the world, from maintaining a sound momentum of development to high-quality development, injecting new momentum into world economic growth and opening up new space for global development. In this context, in-depth discussion on the impact of the "the Belt and Road" on the development of enterprises along the line and its mechanism is of great practical significance to continuously promote the high-quality development of China's economy.

The growth rate of labor productivity in our country has always maintained a world leading level, but the per capita labor productivity is lower than the world average, which reflects the current development status of "big but not strong" with high total output and low per capita. Since entering a new stage of high-quality development, our country has focused on improving the quality of development as the main goal. In 2021, the State owned Assets Supervision and Administration Commission of the State Council listed the overall labor productivity as an important assessment indicator for enterprises, with the aim of releasing signals to guide the high-quality development of enterprises and effectively implementing the goals of industrial upgrading and high-quality development proposed at the 19th National Congress. The concept of total labor productivity reflects many similarities with sustainable development and high-quality development, which has significant guiding significance for the development of enterprises in the context of the current decrease in labor force and the increase in unit labor costs in China.

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Limited by the time range and degree of impact of the initiative, the existing research on the micro impact of the "the Belt and Road" initiative is not sufficient. However, there is little research on the comprehensive performance indicator of enterprise development, which is the overall labor productivity of all employees. China has changed from high-speed development in the past to high-quality development today. As the top strategy led by the country, does the "the Belt and Road" initiative play a constructive role in the development and transformation of enterprises? Specifically, how does the "the Belt and Road" initiative affect the overall labor productivity of enterprises? What is its functional pathway?

In view of this, this paper discusses the impact of the "the Belt and Road" initiative on the overall labor productivity of enterprises and its path of action. Taking the "the Belt and Road" initiative as a quasi natural experiment, using the data of all A-share listed companies from 2007 to 2022, this paper uses the statistics of whether listed companies are located in the "the Belt and Road" concept section of the Tonghua Shun iFind database as the standard of whether enterprises are affected by the "the Belt and Road" initiative, and uses the double difference method to explore the impact of the "the Belt and Road" initiative on the overall labor productivity of enterprises. The research results show that the "the Belt and Road" initiative significantly improves the overall labor productivity of enterprises, and its improvement level is rising year by year. The main impact mechanism is to promote the improvement of the overall labor productivity of enterprises by improving the technological innovation and human capital structure of enterprises. The heterogeneity analysis shows that the "the Belt and Road" initiative can better promote the improvement of the overall labor productivity of non-state-owned enterprises, large-scale enterprises and regions with high impact of the initiative.

The marginal contribution of this paper may have the following aspects: (1) The impact of the "the Belt and Road" initiative on the overall labor productivity of enterprises is studied, which provides evidence for the impact of national macro policies on the micro level, and broadens the impact mechanism of the "the Belt and Road" initiative. (2) From the perspective of enterprise ownership, enterprise scale and the degree of influence of the "the Belt and Road" initiative, this paper examines the heterogeneous effect of the "the Belt and Road" initiative on the overall labor productivity of enterprises, providing a reference for the top-level design and program planning of the initiative. (3) It has a certain reference significance for the government to implement and promote the "the Belt and Road" initiative and flexibly and effectively allocate government resources according to the actual situation in various regions.

2. LITERATURE REVIEW AND HYPOTHESIS FORMULATION

2.1. Literature Review

The "the Belt and Road" initiative has attracted wide attention from all walks of life since it was proposed. Scholars have conducted in-depth research on the economic impact of the "the Belt and Road" initiative from the macro and micro perspectives, including international production capacity cooperation [2], foreign investment [3-5], corporate financing constraints [6] and corporate innovation [7]. In terms of the international impact of the "the Belt and Road" initiative, Lv Yue et al. [3] found that its role in promoting foreign investment is more significant for countries along the initiative. In addition, the "the Belt and Road" initiative has also greatly promoted the construction of infrastructure along the route, which can increase capital formation and create employment [8], thereby increasing the economic aggregate and per capita income [9]. The construction of infrastructure, especially railways and other related facilities, has greatly promoted the increase of European export income and product categories to China, and improved market access and export opportunities [10]; The research of Wang et al. [11] also shows that the "the Belt and Road" initiative

is conducive to achieving green and sustainable development and has a great driving effect on countries and regions along the line.

In terms of the impact on enterprises, Xu Si and He Xiaoyi [6] found that the proposal of the "the Belt and Road" initiative can ease the pressure on enterprises' capital, and its realization path is to reduce operating costs by expanding financing sources; Lu Shengfeng et al. [12]'s research on micro enterprises shows that the initiative brings about an improvement in export levels and also has a significant impact on the innovation level of Chinese enterprises [13], and found that its promoting effect depends on outward direct investment. Promote high-quality development of enterprises represented by total factor productivity.

The improvement of labor productivity for all employees in enterprises is specifically reflected in the decrease of operating costs, the expansion of market demand, the increase of investment in scientific and technological research and development, and the improvement of product quality. Pan Ying et al. [15] selected panel data of companies listed on the New Third Board from 2006 to 2015 and found a significant negative correlation between the labor productivity of all employees and the tax burden rate of the company. Yang Zhonghai et al. [16] examined the positive impact of digital transformation on the overall labor productivity of enterprises, and proposed a method to promote the overall labor productivity of enterprises by improving innovation and worker quality, integrating the two to reduce costs.

Due to the time frame and degree of impact of the initiative, there are still many gaps in existing literature on the impact research at the micro enterprise level. First of all, in the measurement of enterprises affected by the "the Belt and Road" initiative, most use the analysis method of whether enterprises are located in the key provinces affected by the "the Belt and Road" initiative and the text of annual reports of listed companies to determine whether enterprises are affected by the "the Belt and Road" initiative. However, the relevance between the provinces and enterprises that are mainly affected by the "the Belt and Road" initiative and whether they are supported by the "the Belt and Road" initiative is not strong, and the text analysis method has strong subjectivity, which has certain defects. Secondly, the existing literature has studied the impact of the "the Belt and Road" initiative on the high-quality development of enterprises, but the indicators of high-quality development of enterprises mostly focus on total factor productivity, the research object is relatively single, and the research on the impact path is relatively insufficient. Finally, due to the timing and impact of the "the Belt and Road" initiative, existing research at the micro enterprise level focuses on financing constraints, technological innovation, etc., but has not yet involved the research on the overall labor productivity of enterprises.

2.2. Research Hypothesis

As a top-down national initiative, the the Belt and Road Initiative has received strong support from governments at all levels and relevant functional departments. Generally speaking, policies play a positive role in optimizing industrial structure, correcting market failures, and promoting economic upgrading and upgrading. Existing literature indicates that enterprises encouraged and supported by industrial policies can receive more government subsidies and bank loans [19]. After the implementation of the "the Belt and Road" initiative, commercial financial institutions such as domestic banks and stock exchanges have strengthened their credit support to relevant enterprises, including measures such as preferential financing costs, optimization of financing review processes, and reduction of bond financing threshold. The financing space of enterprises has been improved, and the financing channels have been further expanded. In addition, according to the "going global" tax guidance of the State Administration of Taxation, relevant enterprises participating in the "the Belt and Road" initiative will enjoy tax relief. Generally speaking, enterprises will alleviate tax pressure by reducing cash flow and retained earnings, and tax management policies will also create a certain tax burden for more standardized enterprises, thereby exacerbating their financial difficulties

[20]. According to the research of Han Baoshan et al. [21], tax exemptions will increase a company's cash flow, alleviate financing constraints, thereby increasing R&D and innovation expenditures, and promoting labor productivity growth. In addition, the "the Belt and Road" initiative can also send a signal of government support for relevant enterprises, enhance the confidence of internal and external stakeholders in enterprise development, and guide the appropriate tilt of social resources. Therefore, the "the Belt and Road" initiative can improve the internal and external environment of enterprises, enable enterprises to enjoy various preferential policies, and promote high-quality development of enterprises.

With the full implementation of the "the Belt and Road" initiative in countries and regions along the line, enterprises are facing new investment opportunities. According to the research of Mao Qilin et al. [22], there is a significant causal relationship between foreign direct investment and enterprise innovation, so enterprises can indirectly improve their technological innovation by taking advantage of the direct foreign investment opportunities brought to enterprises by the "the Belt and Road" initiative. Most of the countries along the "the Belt and Road" initiative are developing countries, and the outbound investment of domestic enterprises often belongs to the "gradient" model [23]. Enterprises can transfer low value capacity or domestic excess capacity to developing economies, reduce the cost of enterprises' products through economies of scale after expanding the market, and then ease the pressure on enterprises' internal R&D investment with the help of resource advantages. At the same time, enterprises expand their research and development investment in core technologies with sufficient funds, thereby enhancing their technological innovation level and ultimately achieving high-quality development. In addition, the expansion of outward investment will inevitably lead to competition between enterprises and other multinational companies in overseas markets. Intense competition often forces enterprises to further increase their R&D investment, ultimately promoting the improvement of enterprise innovation capabilities and overall labor productivity.

Human capital exhibits strong positive externalities in economic development and is one of the essential core elements driving enterprise growth. With the proposal of the "the Belt and Road" initiative, many development opportunities have been brought to enterprises. On the one hand, local talent introduction plans will be accompanied by the influx of high-quality talents, providing enterprises with a high-quality human resources market. On the other hand, as enterprises respond to the "the Belt and Road" initiative and actively carry out project investment, the demand for professional talents is also gradually expanding. For some high skilled production tasks, such as enterprises' intelligent transformation of production and manufacturing, their technological processes cannot be separated from the support of high-tech talents [25]. Therefore, the implementation of the "the Belt and Road" initiative will greatly optimize the human capital structure of enterprises, bring about technological upgrading and internal management innovation, and ultimately promote the upgrading of the industrial structure [26] and improve the labor productivity of enterprises. Based on the above analysis, hypothesis H1a is proposed.

H1a: Compared with enterprises not supported by the "the Belt and Road" initiative, the labor productivity of enterprises supported by the "the Belt and Road" initiative will significantly increase.

However, due to the information asymmetry between the government and enterprises [19], the mismatch between institutional and market operations, and the non strong effectiveness of the domestic market, the implementation of government policies sometimes goes against the original intention of the policy. Therefore, it is necessary to consider the possibility of policies having a negative impact on enterprises [12, 17, 19]. First of all, the investment in the "the Belt and Road" initiative mostly involves long-term investment in infrastructure construction such as transportation, health, energy and digital platform construction. It has the characteristics of long return cycle and great uncertainty of return, so the investment in related projects by enterprises will aggravate financial risks and operational risks. Secondly, because the cost of investing in the "the Belt and Road" project is huge, even if banks and stock exchanges provide financing facilities and the government provides tax relief, it is still difficult to make up for the huge capital gap of enterprises; In addition, some

enterprises find it difficult to manage large-scale investment projects due to rigid management models and fixed resource utilization methods. Finally, the blindness of corporate investment can also lead to the counterproductive effect of government policies. On the one hand, in order to obtain policy subsidies, even under enormous financial pressure, enterprises still expand their investments by borrowing, which creates a supportive effect of policies but leads to an increase in long-term debt and overinvestment, hindering the normal development of enterprises; On the other hand, there may be a "herd effect" in investment between enterprises. In order to gain the first mover advantage of policy support, enterprises often expand their investment scale to compete for the limited resources provided by the government. However, neglecting the actual situation leads to enterprises falling into the trap of blind investment, resulting in huge financial and debt pressure, and even bankruptcy liquidation. Based on the above analysis, hypothesis H1b is proposed.

H1b: Compared with enterprises not supported by the "the Belt and Road" initiative, the total labor productivity of enterprises supported by the "the Belt and Road" initiative will be significantly reduced.

3. RESEARCH DESIGN

3.1. Sample Selection and Data Sources

The financial data used in this article are all from CAMAR and Wind databases, with A-share listed companies in China from 2007 to 2022 as the research sample. The following treatments were applied to the sample: (1) excluding financial enterprises, ST, PT enterprises, and samples with missing values in key variables; (2) Perform 1% truncation on continuous variables.

3.2. Variable Definition and Description

3.2.1. Labor productivity of all employees in the enterprise

Total Labor Productivity (TLP), calculated using formula (1) with reference to the method proposed by Yang Zhonghai et al. [16], where Dep and Salary represent the annual depreciation and total employee compensation payable, respectively; OP is the amount obtained by adding the current year's operating profit, government subsidies, fair value change gains and losses, investment income, and research and development investment expenses; Tax is the total annual tax payable, and Staff is the average number of employees per company for the year.

$$TLP = (Dep + Salary + OP + NTP) / Staff \tag{1}$$

3.2.2. "The Belt and Road" Initiative

Build a dummy variable (BR) to measure whether enterprises are affected by the "the Belt and Road" initiative. The method adopted is to take enterprises located in the "the Belt and Road" concept section of the Flush iFind database as the processing group, and the rest as the control group; As for the determination of the time node of policy shock, since the the Belt and Road initiative was formally included in the government work report in 2014, 2014 was selected as the year of policy shock (Post), representing the dummy variable before and after the implementation of the the Belt and Road initiative.

3.2.3. Control variables

This article draws on Zhao Chenyu et al. [27] and Pan Maomao et al. [28] to control the age, ownership nature, asset liability ratio, profitability, equity concentration, total number of employees, company size, growth potential, proportion of fixed assets, and proportion of independent directors

at the enterprise level; At the urban level, population size, proportion of tertiary industry, government expenditure, and foreign investment are controlled.

3.3. Model Construction

This paper constructs the (2) type double difference model to examine the impact of the "the Belt and Road" initiative on the overall labor productivity of enterprises:

$$TLP_{ijt} = \alpha + \beta BR_i \times Post_t + \gamma Firm_{it} + City_{jt} + \mu_j + \tau_t + \varepsilon_{ijt} \quad (2)$$

Among them, subscripts, and respectively represent company, region, and year. The dependent variable represents the total labor productivity of the enterprise in year t. A dummy variable indicating whether the enterprise is affected by the "the Belt and Road" initiative. 0 indicates that it is not affected, and 1 indicates that it is affected; Represents the dummy variable before and after the implementation of the "the Belt and Road" initiative, which is set to 0 before 2014 and 1 after 2014; Representing control variables at the enterprise level and control variables at the city level. Represents the fixed effect of the city, represents the fixed effect of time, and is a random perturbation term.

4. EMPIRICAL RESULTS AND ANALYSIS

4.1. Descriptive Statistics

Table 1 presents the descriptive statistical results of the main variables in this article. The mean of total labor productivity (TLP) among enterprises is 27.702, and the median is 15.387, indicating significant differences in total labor productivity among enterprises. The average value of the the Belt and Road Initiative Index (BR) is 0.117, the standard deviation is 0.321, and the median value of BR is 0.000, far less than the average value of 0.117, indicating that more than half of the enterprises are almost not affected by the the Belt and Road Initiative, only a few enterprises are directly supported by the the Belt and Road Initiative, and the sample companies are greatly affected by the the Belt and Road Initiative. There is no significant difference in the statistical results of other variables compared to existing literature.

Table 1. Descriptive statistics of variables

Variable	(1) N	(2) Mean	(3) Medium	(4) SD	(5) Min	(6) Max
TLP	47127	27.707	15.387	52.573	-75.005	363.912
BR	47127	0.117	0.000	0.321	0.000	1.000
Post	47127	0.774	1.000	0.418	0.000	1.000
Size	47127	22.304	22.112	1.369	19.796	26.360
Lev	47127	0.440	0.437	0.205	0.056	0.896
ROA	47127	0.038	0.036	0.065	-0.217	0.228
Ppe	47127	0.215	0.181	0.163	0.002	0.696
Gr	47127	0.149	0.092	0.390	-0.589	2.343
Indep	47127	37.493	36.360	5.401	30.000	57.140
TOP1	47127	34.510	32.317	14.722	9.107	74.095
SOE	47127	0.430	0.000	0.495	0.000	1.000
Age	47127	2.958	2.996	0.363	1.792	3.555
lnNOE	47127	7.677	7.621	1.299	4.533	11.083

4.2. Parallel Trend Testing and Regression Analysis

4.2.1. Parallel trend test

An important prerequisite for the use of the double difference method is to meet the parallel trend test, that is, before and after the "the Belt and Road" initiative, the change trend of the overall labor productivity among enterprises should be parallel, and thus the (3) test model is constructed:

$$TLP_{it} = \partial + \sum_{-3}^{3} \beta_t Policy_{it} + \lambda Control_{it} + \mu_j + \tau_t + \varepsilon_{ijt} \quad (3)$$

Among them, $Policy_{it}$ is the policy dummy variable, and 2014 is selected as the year of policy occurrence. If enterprise i is affected by the "the Belt and Road" initiative in year t, the value is 1; The unaffected value is 0; $Control_{it}$ represents the controlled variable. The meanings of the remaining variables are the same as equation (2). The core coefficient represents the difference between the total labor productivity of the treatment group and the control group in the year t of the implementation of the "the Belt and Road" initiative. This article selected the first three periods and the last three periods before the implementation of the initiative, and used the first period before the implementation of the initiative as the benchmark period. The final results of the parallel trend test are shown in Figure 1. Before the "the Belt and Road" initiative, because the coefficient values estimated in each period are not significant, it can be seen that there is no significant difference in overall labor productivity among enterprises; There is a significant difference in the overall labor productivity between the post-treatment group and the control group, and the difference is showing a clear trend of widening. Therefore, the parallel trend assumption in this article is basically satisfied.

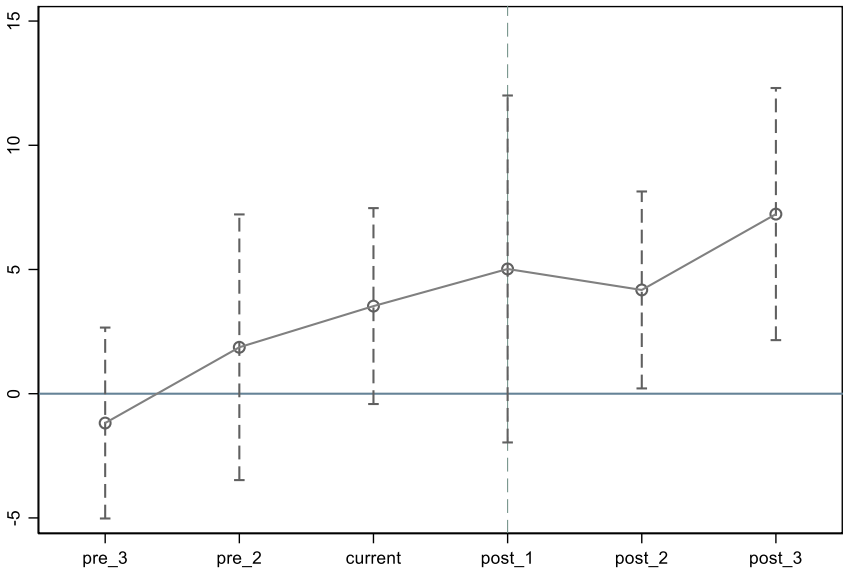

Figure 1. Parallel Trend Test

4.2.2. Regression analysis

Table 2 reports the regression results of the "the Belt and Road" initiative on the overall labor productivity of enterprises. Among them, column (1) added fixed effects of region and year, and column (2) added enterprise level control variables on this basis; The third column further includes city level control variables. It can be seen from the regression analysis that the coefficients of are significantly positive at the level of 1%, indicating that the "the Belt and Road" initiative can significantly improve the overall labor productivity of enterprises. According to the estimation results in column (2), after the implementation of the "the Belt and Road" initiative, the overall labor

productivity of enterprises affected by the "the Belt and Road" initiative will significantly increase by 5.598, equivalent to 20.20% of the average, with a relatively obvious effect.

Table 2. Regression analysis of the "the Belt and Road" initiative and the overall labor productivity of enterprises.

Variable	(1)	(2)	(3)
	TLP	TLP	TLP
BR×Post	5.333***	5.598***	3.571***
	(3.65)	(5.09)	(2.76)
Firm Controls	NO	YES	YES
City Controls	NO	NO	YES
Year FE	YES	YES	YES
City FE	YES	YES	YES
N	47,058	47,058	27,552
R^2	0.0965	0.496	0.466

4.3. Robustness Test

4.3.1. Propensity score matching method

This article uses propensity score matching (PSM) to address potential sample selection bias. Firstly, using the control variables in this article as covariates, a 1:1 non replacement nearest neighbor matching method is employed. Figure 2 shows the difference in variables before and after variable matching. After PSM, there was no significant difference between the two groups. The function density plots before and after matching in Figure 3 indicate a significant improvement in the fitting degree between the two groups. The PSM test in Table 3 shows that the matched coefficients are still significantly positive at the 1% level.

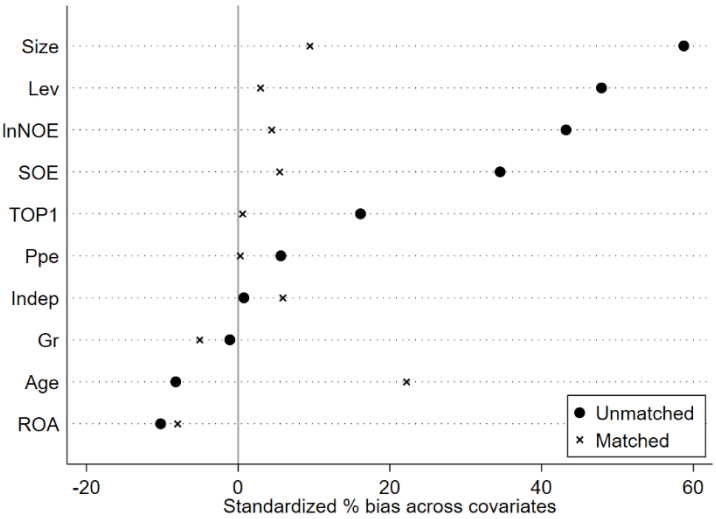

Figure 2. Balance of covariate matching

Table 3. PSM Inspection

Variable	TLP
BR×Post	5.597*** (5.09)
Size	30.398*** (-9.68)
Lev	2.723** (2.30)
ROA	293.526*** (72.29)
Ppe	28.397*** (18.34)
Gr	6.659*** (8.22)
Indep	-0.276 (-0.77)
TOP1	0.131*** (9.09)
SOE	0.699** (1.44)
Age	3.048*** (4.44)
lnNOE	-31.286*** (-65.10)
CONSTANT	-436.676*** (-67.70)
Firm Controls	YES
Year Controls	YES
Year FE	YES
City FE	YES
N	47,058
R^2	0.5011

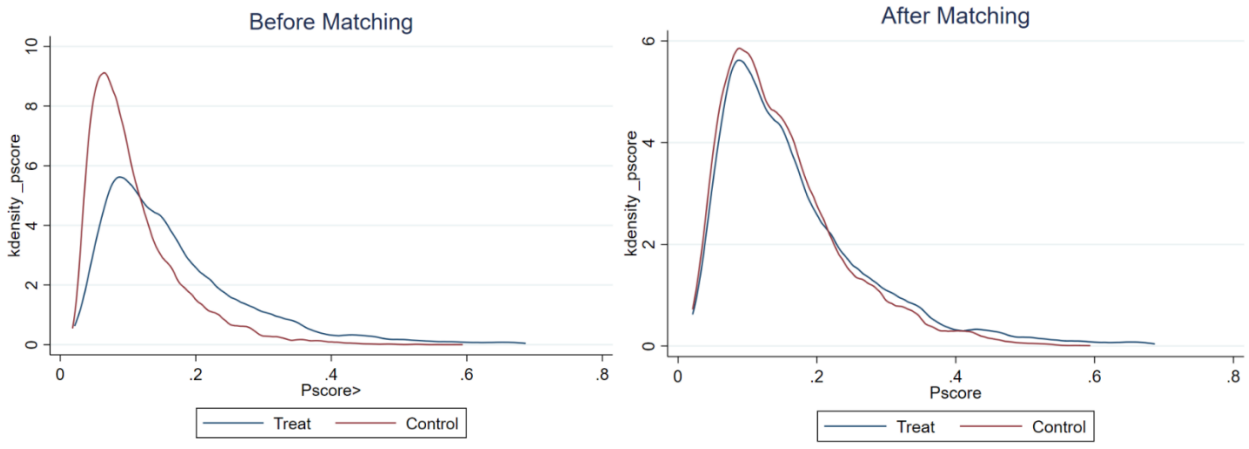

Figure 3. Density function before and after matching

4.3.2. Placebo test

This article uses a placebo test to exclude possible interference from other policies on the empirical results. Firstly, a BR × Post interaction term is constructed, and then the interaction term is randomly

sampled 1000 times and subjected to regression testing. The regression results show that the p-values corresponding to the beta rows estimated by sampling are all less than 1%; The p-value kernel density distribution of the interaction term is shown in Figure 4, which can be seen to be concentrated around the zero point and basically consistent with the normal distribution. Therefore, the placebo test can show that the improvement of the overall labor productivity of enterprises is mainly due to the impact of the "the Belt and Road" initiative, rather than other interference factors. The above conclusions show that the results of the benchmark regression are still robust.

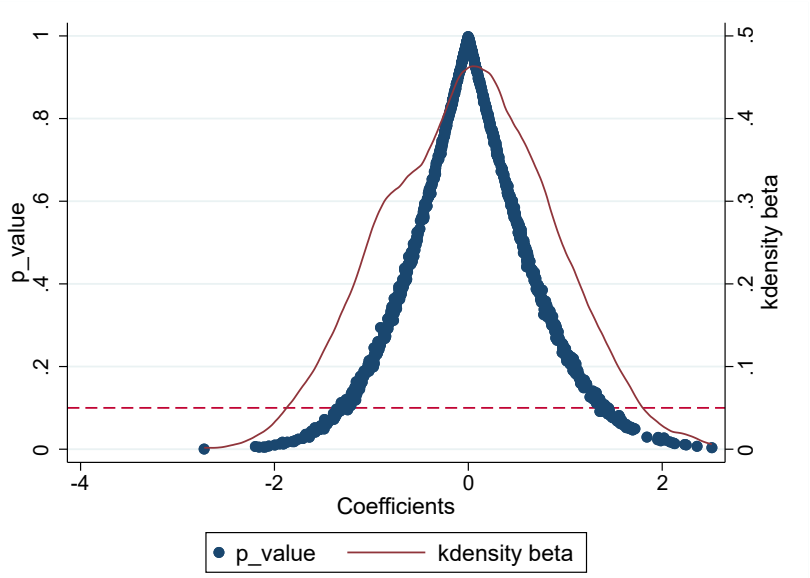

Figure 4. Placebo test

4.3.3. Adjust the calculation standard for labor productivity of all employees

Excluding R&D investment and recalculating TLP, the regression results are shown in columns (1) and (2) of Table 4. Columns (1) to (4) of Table 4 all include city fixed effects and year fixed effects, while columns (2) and (4) respectively include control variables. It can be observed that the regression coefficient of is still significantly positive. Secondly, fair value changes have manipulability. Excluding gains and losses from fair value changes, a re examination of labor productivity for all employees was conducted. The estimated results are shown in columns (3) and (4) of Table 4, and the regression coefficient remains significantly positive.

Table 4. Robustness test of the impact of the "the Belt and Road" initiative on the overall labor productivity of enterprises

Variable	(1)	(2)	(3)	(4)
	TLP1	TLP1	TLP2	TLP2
BR×Post	18.367**	17.737***	8.558**	8.770***
	(2.51)	(2.58)	(2.47)	(2.84)
Controls	NO	YES	NO	YES
City FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
N	47,058	47,058	47,058	47,058
R^2	0.0453	0.158	0.0155	0.131

4.3.4. Replace the labor productivity of all employees with total factor productivity

This article draws on the research of Zhao Chenyu et al. [27] and uses total factor productivity as a substitute variable for TLP. Total factor productivity reflects the essence of productivity as an

economic concept, including the unit average output level of various input factors in the production process, that is, the overall efficiency of input conversion into final output, which can be partially replaced by total labor productivity to a certain extent. The dependent variable TFP represents the total factor productivity of the enterprise. This article mainly refers to Levinsohn and Petrin's method [29] (referred to as LP method), as well as Lu Xiaodong and Lian Yujun's least squares method, fixed effects method, and OP method [30] for measurement. The test results are shown in Table 5. Columns (1) and (4) are replaced by explanatory variables with total factor productivity calculated by LP method (recorded as TFP_LP) and total factor productivity calculated by GMM method (recorded as TFP_GMM). It can be seen that the "the Belt and Road" initiative has a significant positive impact on TFP_LP and TFP_GMM at the level of 1%; The total factor productivity calculated using fixed effects method and least squares method is also significant at the 5% level, indicating that there is no substantial change in the empirical results after replacing the explained variable, and the robustness test is verified.

Table 5. Robustness Test Using TFP

Variable	(1)	(2)	(3)	(4)
	TFP_LP	TFP_FE	TFP_OLS	TFP_GMM
BR×Post	0.097***	0.045**	0.112**	0.058***
	(2.70)	(2.44)	(2.56)	(2.99)
Controls	NO	YES	NO	YES
City FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
N	44,861	44,861	44,861	44,861
R^2	0.173	0.848	0.176	0.557

5. FURTHER ANALYSIS

5.1. Mechanism Analysis

5.1.1. Enterprise technological innovation

When enterprises rely on the "the Belt and Road" initiative to expand investment at home and abroad, they are often accompanied by the improvement of their technological innovation level [23]; And because the "the Belt and Road" initiative can effectively ease the financing constraints of enterprises [21, 22], after expanding investment, we can use economies of scale to reduce the cost of enterprises' products, and use loose cash flow to increase technology research and development; In addition, fierce competition in the international market will also prompt companies to increase their R&D investment [24] in order to gain a competitive advantage. The level of technological innovation in enterprises is directly related to the labor productivity of all employees. Therefore, it is necessary to test the intermediary effect of technological innovation in the "the Belt and Road" initiative to promote the overall labor productivity of enterprises. In order to measure the level of technological innovation in enterprises, drawing on the research of Zhong Changbiao et al. [31], the logarithm of the number of patents obtained plus one is used to measure enterprise innovation.

To investigate the mediating effect of enterprise technological innovation, models (4) and (5) were constructed respectively:

$$M_{it} = \partial + \beta BR_i \times Post_t + \gamma Control_{it} + \mu_j + \tau_t + \varepsilon_{ijt} \quad (4)$$

$$TLP_{it} = \partial_1 + \beta_1 M_{it} + \gamma_1 Control_{it} + \mu_j + \tau_t + \varepsilon_{it} \quad (5)$$

Among them, M is the mediating variable, where is the enterprise's technological innovation. The regression coefficients of columns (1) and (2) in Table 6 are significantly positive at the level of 1%. Sobel test results show that the intermediary role of technological innovation accounts for 6.7%, and is significant at the level of 1%, which indicates that the "the Belt and Road" initiative can improve the overall labor productivity of enterprises by promoting technological innovation.

Table 6. Mediation Effect Test

Variable	Innovation		HCS		High talent	
	(1)	(2)	(3)	(4)	(5)	(6)
	Innovation	TLP	Edu	TLP	Pts	TLP
BR×Post	0.343***		0.532***		1.634***	
	(14.535)		(3.71)		(4.57)	
Innovation		4.000***				
Edu		(2.937)		0.504***		0.040***
Pts				(8.45)		(2.94)
Sobel test	0.389***		0.414***		0.114***	
	(5.55)		(6.472)		(3.286)	
Intermediary	0.067		0.093		0.027	
Controls	YES	YES	YES	YES	YES	YES
N	29955	29955	29955	29955	29955	29955
R^2	0.210	0.505	0.278	0.5146	0.220	0.512

5.1.2. Human capital structure

The technological upgrading, investment expansion and internal management structure innovation of enterprises are inseparable from professional talents, while the talent introduction plan of the "the Belt and Road" initiative will bring in high-quality talents. After absorbing high-quality external human resources, enterprises can optimize their human capital structure, form talent and knowledge spillover effects, and thus improve the overall labor productivity of enterprises. Therefore, optimizing the structure of human capital may be an important way for enterprises to enhance high-quality development represented by overall labor productivity. This article uses high skilled talents and employee quality to jointly measure the human capital structure of enterprises. High skilled talents are measured by the proportion of technical personnel, while employee quality is measured by the proportion of employees with a bachelor's degree or above, drawing on the research of Zhao Chenyu et al. [27]. Construct human capital structure indicators for mechanism testing. The model is constructed using equations (4) and (5), where M is the mediator variable, and here is the employee quality (Edu) and high skilled talent (Pts). It can be seen from the test results in Table 6 that the regression coefficients in columns (3) - (6) are significantly positive at the level of 1%, which indicates that the "the Belt and Road" initiative can optimize the human capital structure of enterprises, thus promoting the improvement of the overall labor productivity of enterprises.

5.2. Heterogeneity Analysis

5.2.1. Nature of Enterprise Ownership

The "the Belt and Road" initiative may have a differentiated impact on enterprises with different property rights. In this paper, the sample enterprises are divided into state-owned enterprises and non-state-owned enterprises and tested. The results are shown in (1) and (2) of Table 7. The results show that the "the Belt and Road" initiative has a significant positive impact on the promotion of non-state-owned overall labor productivity, but not on state-owned enterprises. This may be due to the faster adjustment speed of human resources in non-state-owned enterprises, which can respond more quickly and absorb a large number of technical talents in the face of policy shocks. Moreover, non-

state-owned enterprises are more sensitive to the market and have more flexible adjustments to their development strategies.

Table 7. Heterogeneity Analysis

	(1)	(2)	(3)	(4)	(5)	(6)
BR×Post	7.362*** (4.04)	2.823 (1.59)	9.202*** (3.90)	0.189 (0.13)	7.074*** (4.29)	4.167** (2.23)
Controls	YES	YES	YES	YES	YES	YES
City FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
N	26,827	20,231	23,552	23,568	22493	24605
R^2	0.479	0.532	0.346	0.322	0.470	0.504

5.2.2. Enterprise scale

The transformation of enterprises is greatly influenced by their size. This article follows the approach of Sun Xiaohua and Wang Yun [32], using asset size as a measure of enterprise size and the median annual assets of the industry as the dividing standard. Large enterprises are those that exceed the median, while small enterprises are those that fall below the median. The impact of enterprise size on the overall labor force improvement effect of enterprises is examined. The results are shown in column (3) and (4) of Table 7, which shows that the "the Belt and Road" initiative is more conducive to the improvement of the overall labor productivity of large-scale enterprises, and has a significant role in promoting it, but it is not significant for small enterprises. The possible reason for this is that small-scale enterprises are unable to bear the cost of responding to policy changes, while large-scale enterprises can rely on their own information and resource advantages to fully enjoy policy dividends, ultimately improving the overall labor productivity of the enterprise.

5.2.3. Impact of the "the Belt and Road" Initiative

This paper uses the key provinces (BRpr) affected by the "the Belt and Road" initiative since the impact of the "the Belt and Road" initiative, and combines whether the enterprises are located in the "the Belt and Road" initiative concept block of the iFind database in Flush, to construct the variable (BR_level) of the impact degree of the "the Belt and Road" initiative, as shown in Formula (6):

$$BR\_level_i = BR_i \times BRpr_i \tag{6}$$

Divide BR_1evel into larger and smaller impacts based on their size, and study the differential impact of each on the overall labor productivity of the enterprise; The test results are shown in columns (5) and (6) of Table 7. It can be seen that for enterprises with a greater degree of impact, it is significantly positive at the 1% level, while for enterprises with a smaller degree of impact, it is significantly positive at the 5% level, and the coefficient of the former is greater than that of the latter; Therefore, the overall labor productivity of enterprises greatly affected by the "the Belt and Road" initiative has increased more significantly, indicating that the "the Belt and Road" initiative has a gradual impact on the overall labor productivity of enterprises to varying degrees.

6. CONCLUSION AND INSIGHTS

This paper selects the adjusted A-share listed companies from 2007 to 2022 as the sample, takes 2014 as the year of policy shock, and takes whether the listed companies are listed in the iFind "the Belt and Road" concept section of the Flush database as the measurement standard of whether they are affected by the "One Generation One Road" initiative, and uses the double difference method to

explore the effect of policy shock. The results show that the "the Belt and Road" initiative has a significant positive impact on the overall labor productivity of enterprises. This conclusion is still valid after a series of robustness tests such as the parallel trend test, propensity score matching test, and placebo test. In the further analysis, through the research based on the existing literature, the role of the "the Belt and Road" initiative on the human capital structure of enterprise labor productivity and enterprise technological innovation has been expanded,

The research findings of this paper are as follows: (1) The "the Belt and Road" initiative can significantly improve the overall labor productivity of enterprises. The improvement effect is equivalent to 20.20% of the average labor productivity of all employees in the enterprise, and the positive impact brought by the initiative is significant. (2) The human capital structure and enterprise technological innovation represented by the quality level of employees and the proportion of skilled talents play an intermediary role in promoting the overall labor productivity of enterprises in the "the Belt and Road" initiative. Driven by the "the Belt and Road" initiative, enterprises absorb high-quality talents with the help of policy dividends, and optimize the internal human capital structure of enterprises to meet the needs of enterprises to invest in new projects and expand the scale of production and research and development; On the other hand, the impact of policies has also produced a talent attraction effect, and the gathering of talents generates a technology spillover effect, which correspondingly improves the technological innovation level of enterprises and has a positive effect on the overall labor productivity of enterprises. (3) The heterogeneity test shows that the "the Belt and Road" initiative promotes the overall labor productivity of enterprises more significantly in non-state-owned enterprises, large-scale enterprises and enterprises deeply affected.

Based on the above research conclusions, this paper proposes the following policy implications: (1) Continue to promote the "the Belt and Road" initiative. At present, the scope of the "the Belt and Road" initiative is mainly concentrated in some provinces, cities and regions along the "the Belt and Road" initiative, and the scope of impact is limited. In view of the positive impact of the "the Belt and Road" initiative on enterprises, the "point to surface" approach can be adopted to promote the policy of the initiative, such as project cooperation with foreign businessmen along the "the Belt and Road", and gradually promote the impact of the initiative to the whole country. (2) Continuously promote the talent introduction plan. The development of enterprises, especially those that rely on policies to carry out new projects or implement transformation and reform, cannot do without high-quality talents. The gathering of talents and knowledge forms a technology spillover effect, expanding employment while continuously promoting enterprise development, forming a virtuous cycle. (3) Strengthen guidance for enterprises and provide selective policy support. The promotion effect of the initiative on state-owned enterprises is not significant, indicating that state-owned enterprises adjust policies slowly, while non-state-owned enterprises adjust more quickly due to their more flexible personnel systems and other aspects; Compared to small-scale enterprises, initiatives have a more significant promoting effect on large-scale enterprises. Due to their own resource limitations, small enterprises find it difficult to bear the cost of carrying out new projects, and loan costs are also higher compared to large enterprises. In addition, small businesses have a weaker attraction for high-quality talents, so it is necessary to strengthen policy support for small-scale enterprises, such as providing loans and encouraging the establishment of enterprise resource sharing platforms.

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