

The Influence of “One Belt One Road” Initiative on Chinese Enterprises’ Heterogeneity and Innovation

Jin Yang¹, Zhaoshan Liu^{2*}, Jing Liu², Ping Chen^{3,4}, Yiming Ma⁴, Jia Liu⁵

¹ School of Management, Guangzhou College of Commerce, Guangzhou, Guangdong, China

² School of Economics and Management, Taishan University, Taian, Shandong, China

³ Accounting institute, Guangzhou Huashang College, Guangzhou, Guangdong, China

⁴ Graduate School, Nueva Ecija University of Science and Technology, Cabanatuan, Philippines

⁵ International college, Krirk University, Maha Nakhon, Thailand

*Corresponding Author.

Abstract:

The Belt and Road Initiative is a cooperative initiative proposed in 2013 to build the “New Silk Road Economic Belt” and the “21st Century Maritime Silk Road”. An effective and effective regional cooperation platform, and actively develop economic partnerships with countries along the route. The “Belt and Road” initiative, as a new engine for China to comprehensively promote opening-up, will inevitably bring about continuous dynamic changes in the internal and external environment of the company and its resource base. To some extent, this will break the balance between the organization and management model of the enterprise, the market environment, and the resources it grasps. This research is based on the “Belt and Road” initiative, which has a differentiated impact on the innovation behavior of enterprises with different characteristics. Provide a richer and in-depth understanding for the follow-up of the “Belt and Road” initiative and the smooth implementation of innovation by enterprises. In the research design, this paper selects the 2013-2020 China Shanghai and Shenzhen A-share listed companies as the research sample, adopts the double difference method, and hypothesizes that the “Belt and Road” initiative has an effect on the innovation of enterprises. According to the research needs, the samples were screened, the financial and insurance industry samples and the ST and *ST samples were excluded, and a total of 7228 samples of 1218 companies were obtained. Winsorize the continuous variables and use the clustering robust standard error estimation to control the potential Sequence autocorrelation and heteroscedasticity problems. In the measurement of corporate innovation, three indicators of corporate management efficacy (M1), operational efficacy (M2) and marketing efficacy (M3) are selected to measure corporate innovation (MOI) for quantification. The results of this research show that the “Belt and Road” initiative promotes the innovation of enterprises. The initiative supports the resource endowment of enterprises and the market environment in which they are located, and encourages enterprises to actively respond and follow up through innovation. A sub-sample regression analysis was conducted based on the degree of product market competition and the location characteristics of the company. The test results show that sufficient product market competition can enhance the role of the “Belt and Road” initiative in promoting corporate innovation. The conclusion of this paper is that the

“Belt and Road” initiative has an incentive effect on corporate innovation. The implementation of the “Belt and Road” initiative has significantly improved the innovation level of enterprises supported by the initiative. Companies with fierce competition in the product market will capture development opportunities through more active innovation. Under the impact of increased certainty and increased product market competition, more active innovation can be carried out. The research provides decision-making basis for Chinese enterprises to carry out innovation and promote the implementation and implementation of national innovation strategies, and is of great significance.

Keywords: "One Belt One Road" Initiative; Chinese Enterprises'; Market Competition; Innovation

I. INTRODUCTION

Innovation is the strategic support for the construction of a modern economic system, an important driving force for the transformation of China's economy from a stage of rapid growth to a stage of high-quality development, and a potential source for enterprises to cultivate sustainable competitive advantages. Innovation and its theoretical development have always been a hot spot in the academic world, but scholars' research focuses more on the field of technological innovation in The "dual core" theory of organizational innovation and technological innovation enjoys the same status as innovation but lacks sufficient attention ^[1-2].

With the continuous intensification of technology assimilation and market competition, the possibility of leading competitors solely by technological innovation is gradually declining. innovation; that eradicates deep-level operation problems of the organization and systematically improves organizational performance is becoming an important factor for organizations to build a sustainable competitive advantage important weapon ^[3]. The “Belt and Road” initiative, as a new engine for China to fully open up to the outside world, will inevitably bring about continuous dynamic changes in the internal and external environment of enterprises and significant changes in the resource base ^[4], which will break the corporate organization and management model and market to some extent. Balanced match between the environment and the grasped resources. Innovation is an effective reform of the original management concepts and practices of the enterprise according to the internal and external environment and specific problems faced by the organization ^[5], which helps to promote the re-adaptation of the enterprise to the complex external environment and the optimization and integration of resources , Improving the operating efficacy of enterprises ^[6] is an important source for enterprises to obtain sustainable competitiveness ^[7]. Whether the "Belt and Road" initiative will promote the improvement of the level of corporate innovation is the focus of this article.

Different from previous studies based on individual case or questionnaire statistical analysis to investigate the driving factors of corporate innovation ^[8-9], process mechanism ^[10-11], and impact effects ^[12-13], this paper uses large-sample estimation methods to test "one area" The causal relationship between the macro policy of the “One Road” initiative and the innovation of Chinese enterprises can not only enrich the theoretical research related to the macro driving factors of innovation, but also quantify the

economic effect of the national policy on the micro subjects. Based on this, this paper regards the “Belt and Road” initiative as a quasi-natural experiment.

This paper regards the “Belt and Road” initiative as a quasi-natural experiment, using the data of China’s A-share listed companies from 2013 to 2020, and constructing a double differential model to examine the “Belt and Road” initiative On the impact of corporate innovation, and based on the heterogeneity of enterprises, we will test the differential impact of the “Belt and Road” initiative on the innovation behavior of enterprises with different characteristics in order to provide more information for the follow-up promotion of the “Belt and Road” initiative and the smooth development of innovation by enterprises. Rich and in-depth understanding.

II. THEORIES AND RESEARCH HYPOTHESES

2.1 "One Belt One Road" Initiative and Chinese Enterprise Innovation

Resource-based theory points out that an enterprise is a combination of various resources, and resources are the basis of its strategic activities. As an important strategic activity that affects the long-term development of an enterprise, innovation is naturally closely related to the resource base of the enterprise^[14]. The "Belt and Road" initiative aims to rely on the existing platforms of China and related countries to carry out more extensive and in-depth strategic and resource cooperation investment^[15], and will further explore and optimize in the process of promotion. Participate in the construction of “Belt and Road” enterprises Resource base. First, the “Belt and Road” route runs through Asia, Europe and Africa. Most of the hinterland countries are in the middle and late stages of industrialization, and their economic development levels are not high, but they are highly complementary to China's economy and have huge market scale and development potential. This has opened up new markets for the foreign trade and direct investment of Chinese companies and tapped new growth points^[16]. Secondly, with the advancement of the "One Belt One Road" initiative, the government will take advantage of the situation and formulate supporting measures based on the characteristics of the enterprise, thereby forming a resource adjustment bias. It can be seen that the “Belt and Road” initiative has brought a broad platform for industrial transfer and favorable resource adjustment bias for Chinese enterprises, which will significantly change the resource base of enterprises. When the existing organization and management model of the enterprise cannot effectively integrate, utilize and transform these resources, it is urgent for the enterprise to develop new management concepts and methods, implement new management processes and practices, and improve the ability and efficacy of resource allocation. It can be seen that the change in the resource base provides a key internal driving force for promoting enterprises to carry out innovation.

There are many countries along the "Belt and Road" and their differences are significant, making enterprises face greater political, legal, and religious risks in the process of responding to the initiative^[17], and further aggravating business risks due to differences in cultural customs and conflicts in management methods . According to the theory of dynamic capabilities, environmental turbulence will bring many risks and challenges to business management. After companies have identified the resistance to outward

expansion caused by internal management deficiencies, they need to quickly form innovation solutions ^[18]. It can be seen that under the background of the expansion and deepening of the "Belt and Road", the environment of continuous change and high uncertainty will drive enterprises to carry out innovation to effectively resolve the frictions and conflicts that arise in the process of exchanges and cooperation between different cultural groups.

To sum up, the "Belt and Road" initiative has changed the resources that companies have and the market environment in which they are located, and puts forward higher requirements on corporate management concepts and practices, and encourages companies to respond to the challenges brought about by the "Belt and Road" initiative through innovation. Opportunities and Challenges. However, the government's industrial support policies often have a crowding-out effect, that is, supporting some enterprises and crowding out other enterprises^[19]. From the perspective of industrial economics, the "One Belt One Road" initiative has a high degree of similarity with previous industrial policies . Therefore, it can be reasonably expected that the "Belt and Road" initiative will have a more significant promotion effect on the innovation of the enterprises supported by the initiative. Based on this, this paper proposes the following hypotheses:

Hypothesis 1: After the "Belt and Road" initiative was put forward, compared with companies not supported by the initiative, the enterprises supported by the initiative have a higher level of innovation.

2.2 The impact of the "Belt and Road" initiative on innovation of heterogeneous enterprises

If Hypothesis 1 is established, the further question is whether the "Belt and Road" initiative will have the same degree of impact on all enterprises? The answer to this question will help to further open the "black box" between the "Belt and Road" initiative and enterprise innovation Therefore, This paper will further examine the differences in the impact of the "Belt and Road" initiative on the innovation of heterogeneous enterprises from the characteristics of the market and geographic location of enterprises.

2.2.1 Degree of market competition

Fierce market competition will eliminate inefficient companies, and companies with fierce product market competition are more motivated to cultivate core capabilities through innovation in order to gain long-term competitive advantages. On the one hand, market competition will intensify the liquidation threats, takeover risks and employment risks of enterprises, and reduce the information asymmetry between shareholders and management, thereby alleviating the agency conflict between the two parties ^[20], and prompting management to proceed. Independent innovation in order to improve the sustainable competitiveness of enterprises ^[21]; on the other hand, the innovation activities of enterprises have strong externalities. The more competitive the product market, the stronger the demonstration effect of industry benchmarking enterprises benefiting from innovation. The easier it is for other companies to follow or imitate innovation through acquisition learning, thus speeding up the pace of innovation. It can be seen that sufficient product market competition will prompt enterprises to actively carry out innovation, change the status quo of enterprise development, and establish core competitive advantages. With the introduction and

advancement of the “One Belt One Road” initiative, companies with fierce product market competition will be more keenly aware of the development opportunities it brings, and actively respond through innovation. In view of this, this paper proposes the following hypotheses:

Hypothesis 2: The “One Belt One Road” initiative will significantly improve the innovation level of companies with fierce competition in the product market.

2.2.2 Geographical characteristics

On March 28, 2015, the relevant departments of the Chinese government jointly issued the "Vision and Action for Promoting the Joint Construction of the Silk Road Economic Belt and the 21st Century Maritime Silk Road" Regional comparative advantages, implement a more proactive opening strategy, strengthen the interactive cooperation between the East, China and the West, comprehensively improve the level of open economy, and combine the functional advantages and development positioning of provinces and cities to delineate 18 key provinces and 26 important nodes along the "Belt and Road" The city forms a spatial distribution pattern of sea and land planning, east and west, and central radiation. This paper refers to the practice of Xu Si et al. (2019) ^[22] and divides the 26 node cities into two categories: one is the cooperation direction that all points to the domestic 7 Inward-looking node cities, including Changsha, Chengdu, Lanzhou, Nanchang, Xi'an, Xining, and Zhengzhou; the other is the 19 outward-looking node cities where partners focus on foreign countries, including Chongqing, Dalian, Fuzhou, Haikou, Hefei, Guangzhou, Ningbo, Qingdao, Quanzhou, Sanya, Shantou, Shanghai, Shenzhen, Tianjin, Wuhan, Xiamen, Yantai, Zhanjiang, and Zhoushan. Compared with inward node cities, export-oriented node cities are the vanguard and main force of the “Belt and Road” construction. Most of its investment directions are concentrated in the countries along the “Belt and Road”, enjoying more high-quality resources at home and abroad, but will also face the pressure of competition in both domestic and overseas markets at the same time. Changes in the resource base, increased environmental uncertainty, and product market competition Intensification of the degree will drive enterprises to carry out innovation ^[23]. Therefore, enterprises located in export-oriented node cities have more motivation and ability to carry out innovation in order to actively respond to the “Belt and Road” initiative. Based on this, this paper proposes the following hypotheses:

Hypothesis 3: The “Belt and Road” initiative will significantly improve the innovation level of enterprises located in export-oriented node cities.

III. RESEARCH DESIGN

3.1 Research methods

This paper adopts the double difference method to study the causal relationship between the “Belt and Road” initiative and the innovation of Chinese enterprises. The key to adopting this method is to determine the time when the “Belt and Road” initiative will have an impact on Chinese companies and the selection of companies affected by the initiative (processing group) and companies not affected by the initiative (control group).

Regarding the determination of the time when the “Belt and Road” initiative will have an impact on Chinese companies, This paper refers to the practices of Chen Shenglan and Liu Xiaoling (2018) ^[24], Wang Guijun and Lu Xiaoxiao (2019) ^[25], and selects 2015 as the impact time of the initiative. The specific reasons are as follows. In September and October 2013, when President Xi visited Kazakhstan and Indonesia, he successively proposed the “Belt and Road” initiative, but at that time it was more of a high-level government’s strategic vision and diplomatic concept. On March 28, 2015, the relevant departments of the Chinese government jointly issued the "Vision and Action". This is the first "Belt and Road" document released to the public. The direction, mission and route of the “Belt and Road” initiative marked the formal implementation of the “Belt and Road” initiative from the top-level design between countries. Therefore, This paper uses the release time of "Visions and Actions" in 2015 as the time when the "Belt and Road" initiative will have an impact on Chinese companies.

In the long run, the “Belt and Road” initiative will drive the development of all local companies in China, but the initiative will not have the same degree of impact on all companies in a short period of time. This provides conditions for the selection of the processing group and the control group for this study. Existing studies mostly judge whether a company is affected by the “Belt and Road” initiative based on its geographic location. Companies registered in key provinces along the “Belt and Road” initiative are regarded as the “processing group” and the rest as the “control group”. However, this classification method may have the following problems: On the one hand, although some companies are located in key provinces along the “Belt and Road” route, their business scope and development direction are not directly related to the “Belt and Road” initiative in the short term. On the other hand, some companies are not located in key provinces along the “Belt and Road”, but their business scope and development direction are closely related to the “Belt and Road” initiative. Based on the above reasons, This paper based on whether the company belongs to the "Belt and Road" concept section provided by Fung Huashun Software to identify whether the company is currently affected by the "Belt and Road" initiative, and will belong to Enterprises in the "Belt and Road" conceptual sector are regarded as the "processing group", and the rest are regarded as the "control group".

3.2 Sample selection and data sources

This paper takes Shanghai and Shenzhen A-share listed companies as the research object to examine the impact of the “Belt and Road” initiative on corporate innovation. In order to alleviate the interference of other matters and ensure that the sample data covers before and after the impact of the initiative, the sample year is limited to 2013 to 2020. The samples are further screened according to research needs, and samples from the financial and insurance industries are eliminated; ST and *ST samples are eliminated; and samples with missing key data are eliminated. In addition, this paper further cleans up the data in accordance with the principle that the sample companies should have observations before and after the implementation of the policy to ensure that the samples before and after the implementation of the policy are comparable. Finally, a total of 7,228 samples from 1,218 companies were obtained. In order to eliminate the influence of extreme values, Winsorize is performed on

continuous variables. At the same time, clustering robust standard error estimation is used to control potential serial autocorrelation and heteroscedasticity problems. The company-level financial data comes from the Guotaian and Fonghuashun databases, and cross-checked; the provincial economic development data comes from the National Bureau of Statistics of China database.

3.3 Measurement of enterprise innovation

In recent years, as the importance of innovation has become increasingly prominent, there have been relatively many studies on innovation in Chinese enterprises, mainly focusing on case studies and empirical studies based on questionnaire surveys. Scholars represented by Su Jingqin and Lin Haifen have carried out a large number of exploratory single-case or multi-case studies around the innovation process mechanism, decision-making mechanism, effectiveness enhancement mechanism and adaptation mechanism [26-27]. Although case analysis can directly reflect the process and effectiveness of corporate innovation in China's special pornography environment, due to the limited representativeness of typical samples, the research results have problems such as insufficient universality. Some scholars began to study the issue of business innovation from an empirical level. Existing empirical literature generally quantifies corporate innovation from two aspects. One is to select mature innovation measurement scales in authoritative literature at home and abroad, make appropriate revisions according to the research situation, and use questionnaire surveys to obtain measurement values of corporate innovation. And carry out statistical analysis to quantify business innovation [28-29]. The second is based on the idea of input-output, through the analysis of indicators that reflect the effectiveness of corporate innovation to quantify corporate innovation [30-31].

Under the premise of fully considering the nature of innovation and its impact on corporate performance, this paper selects corporate management efficacy (M1), operational efficacy (M2) and marketing efficacy (M3) The three indicators measure enterprise innovation (MOI), and the correlation coefficient matrix method is used to determine the weight of the three indicators, and finally the weighted average method is used to calculate the value of innovation. Among them, management efficacy (M1) is determined by the ratio of operating income to management expenses, operating efficacy (M2) is determined by the ratio of operating income to total assets, and marketing efficacy (M3) is determined by the ratio of operating income to sales expenses.

Using the sample company data, the calculation formula for innovation (MOI) obtained through the above steps is:

In the follow-up work, this paper uses the above-mentioned methods to quantify enterprise innovation and conduct empirical analysis.

3.4 Model setting and variable definition

This paper designs the following model based on the principle of the double difference method to

identify the causal effect between the “Belt and Road” initiative and the innovation of Chinese enterprises:

Among them, MOI represents the innovation level of the *i*-th company in year *t*. Treat is a virtual variable for enterprise grouping. This paper defines enterprises in the “Belt and Road” concept sector of Flush Software as an initiative support enterprise (processing group) with a value of 1, and the remaining enterprises (control group) with a value of 0. Time is a dummy variable of the time when the initiative affects. This paper uses the release time of the "Vision and Action" as the time of the initiative. Therefore, the value is 1 for 2015-2019 and 0 for 2012-2014. Treat × Time is an interactive item that affects time between enterprise groupings and initiatives. Its coefficient β_3 measures the changes in the level of innovation in supporting enterprise management after the implementation of the “Belt and Road” initiative, which is the focus of this article. As expected, the “Belt and Road” initiative can significantly improve the innovation level of Chinese enterprises, and β_3 should be significantly positive.

This paper controls the size, age, and growth ability of the enterprise at the enterprise level. Taking into account the possible interference of economic development differences between provinces on the research results, the GDP of the province (city, autonomous region) where the enterprise is located is further controlled. In order to alleviate the possible endogenous problems, the control variables other than the age of the enterprise were processed with a lag.

The specific definitions of variables are shown in Table I.

TABLE I: Definition and description of main variables

Variable attributes	Variable name	Variable symbol	Variable definitions
Explained variable	Innovation	MOI	$0.487 \times \text{standardized M1} + 0.466 \times \text{standardized M2} + 0.047 \times \text{standardized M3}$
Explanatory variables	Enterprise Grouping Dummy Variable	Treat	Companies in the “Belt and Road” concept board are taken as 1, and the rest are taken as 0
	Proposal to influence time dummy variables	Time	The “Belt and Road” initiative has an impact on Chinese companies. The current year and subsequent years (2015-2020) are taken as 1, and the previous year (2013-2015) is taken as 0.
Control variable	Enterprise size	Size	The natural logarithm of the company’s total assets at the end of the period
	Business age	Age	Natural logarithm of company establishment

			time
	Growth ability	Growth	(Operating income for the current period-Operating income for the same period last year) / Operating income for the same period last year
	GDP	GDP	The natural logarithm of the GDP of the province where the company is located

IV. RESEARCH RESULTS AND ANALYSIS

4.1 Descriptive statistics

Table 2 performs descriptive statistics on the main variables in the regression. It can be seen that the mean value of innovation MOI is 0, the median is -0.1906, and the standard deviation is 0.8258, indicating that the innovation level of most of the sample companies is below the average level, and the difference in I innovation level between different companies is relatively large. big. The average value of the variable Treat is 0.0571, which means that 5.71% of the enterprises in the sample are “Belt and Road” supporting enterprises. Among the control variables, the mean value of enterprise size is 21.8435, and the median is 21.7206; the mean value of enterprise age is 2.8381, and the median is 2.8332, indicating that the sample interval has good symmetry. The average value of Growth Ability is 16.65%, which indicates that the sample companies are operating well. In addition, the average value of the provincial variable regional GDP is 10.2356.

TABLE II: Descriptive statistics of main variables

Variable	Average value	Standard deviation	25 th	Median	75 th
MOI	0.0000	0.8259	-0.4236	-0.1906	0.1589
Treat	0.0571	0.2321	0.0000	0.0000	0.0000
Size	21.8435	1.0978	21.0758	21.7206	22.4524
Age	2.8381	0.2864	2.6391	2.8332	3.0445
Growth	0.1665	0.4365	-0.0341	0.0956	0.2433
GDP	10.2356	0.7030	9.8624	10.2175	10.8820

4.2 Parallel trend test

An important prerequisite for the use of the double difference method is that the explained variables of the processing group and the control group companies have the same changing trend before the implementation of the policy, that is, before the “Belt and Road” initiative is put forward, the innovation level of the supported and non-supported companies of the initiative The trend of change is basically the same. Therefore, before using the double-difference model for regression analysis, this paper examines

the change trend of the innovation level of the supported and non-supported companies from 2013 to 2020, and presents it by drawing a trend chart as shown in Figure 1. The figure shows that the changes in the innovation level of supported companies and non-supported companies from 2012 to 2014 are convergent; since 2015, the innovation level of companies supported by the initiative has shown a significant upward trend, indicating that such companies have improved their management. The level of innovation actively responds to the “One Belt, One Road” proposal instead of supporting the innovation level of enterprises. The change is not obvious, which proves that the parallel trend assumption of the double difference method is satisfied.

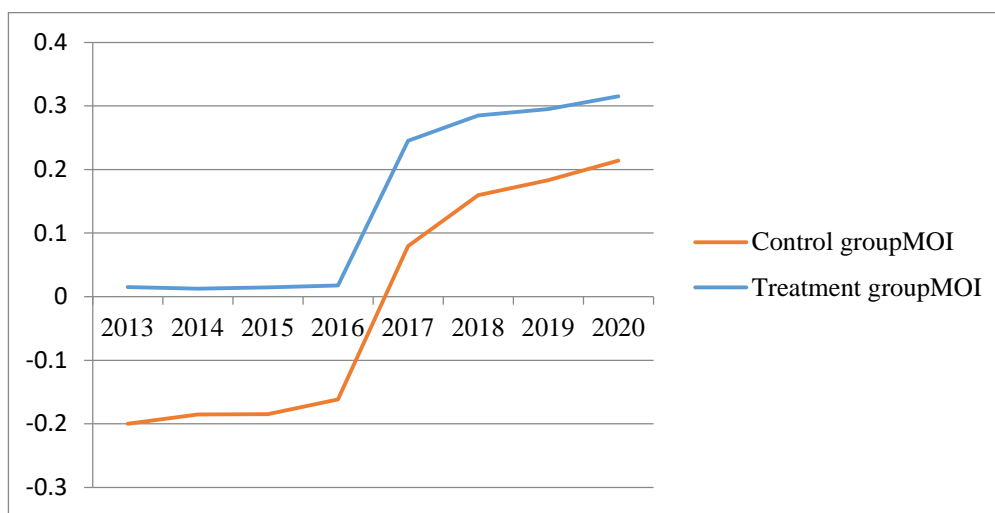


Figure 1: Parallel trends between supported companies and non-supported companies

4.3 Analysis of empirical results

4.3.1 How the "One Belt, One Road" initiative affects corporate innovation

Table 3 reports the regression results of corporate innovation to the degree of response to the “Belt and Road” initiative. Column (1) uses the mixed effects model (OLS) of the control industry and the year. In order to eliminate the influence of corporate characteristics on the regression results, column (2) uses the time fixed effects model (FE) to control the company and conduct an annual test. The estimated coefficient β_3 of the interaction term $Treat \times Time$ explains the degree to which the innovation of supporting enterprises responds to the “Belt and Road” initiative after the “Belt and Road” initiative was put forward. The results show that the estimated coefficient of $Treat \times Time$ is significantly positive at the 1% level in both models (the estimated coefficient of column (1) is 0.3289, $t=3.6147$; the estimated coefficient of column (2) is 0.3422, $t=3.8921$). This shows that the “Belt and Road” initiative has significantly improved the innovation level of the enterprises supported by the initiative, and Hypothesis 1 has been verified. In addition, this result is also economically significant. Take column (2) as an example. The implementation of the “Belt and Road” initiative has increased the innovation level of enterprises supported by the initiative by an average of 0.3422 units. The “Belt and Road” initiative changes the resource endowment and market environment of the enterprises supported by the initiative,

and encourages enterprises to actively respond and follow up through innovation.

Table 3:"One Belt One Road" Initiative and Enterprise innovation

Variable	Enterprise innovation (MOI)	
	(1)	(2)
Treat	0.2287*	-
	(1.7836)	-
Time	0.1103***	0.1172**
	(3.2465)	(2.5138)
Treat×Time	0.3289***	0.3422***
	(3.6147)	(3.8921)
Size	-0.0153	-0.0143
	(-0.8918)	(-0.4865)
Age	0.0117	-0.0905
	(0.2355)	(-1.1816)
Growth	0.1686***	0.1683***
	(6.5736)	(6.7011)
GDP	-0.0010	0.0026
	(-0.0465)	(0.0774)
Industry and annual	control	-
Company and year	-	control
N	7228	7228
Adj_R ²	0.1298	0.0289

Note: *, **, and *** indicate significant at the 10%, 5%, and 1% levels, respectively, and the values in parentheses are the heteroscedasticity robust t-values.

4.3.2 The Impact of the "One Belt One Road" Initiative on Chinese Enterprise Innovation: A Heterogeneity Test

The above empirical analysis shows that the "Belt and Road" initiative has an incentive effect on the innovation of supported enterprises. It should be noted that the "Belt and Road" initiative has different impacts on all enterprises. This paper will take market characteristics and geographic characteristics as the starting point, and examine the differences in the impact of the "Belt and Road" initiative on the innovation of heterogeneous enterprises through the method of sub-sample regression.

(1) Degree of product market competition

In this paper, according to the mean value of the "Herfindahl Index" (HHI), the sample is divided into two groups: high market competition and low market competition. The regression results are shown in Table 4. In Table 4, columns (1) to (2) are the estimated results of the "Belt and Road" initiative affecting the innovation of high-market competition enterprises. It can be seen that the estimated

coefficient of Treat×Time is significantly positive at the level of 1% (The estimated coefficient of column (1) is 0.5486, t=6.3439; the estimated coefficient of column (2) is 0.5238, t=5.5981); columns (3) to (4) in the regression of samples of low market competition enterprises, Treat× The estimated coefficients of Time are not significant (the estimated coefficient of column (3) is -0.1116, t=-0.4656; the estimated coefficient of column (4) is 0.1684, t=0.6802). This shows that the positive response to the “Belt and Road” initiative mainly comes from companies with fierce competition in the product market. Existing documents [32-33] have confirmed that product market competition has a significant role in promoting enterprise innovation. Therefore, companies with fierce competition in the product market will capture the development opportunities brought about by the “Belt and Road” initiative through more active innovation, which is consistent with Hypothesis 2 of this article.

TABLE IV: Heterogeneity test: the degree of product market competition

Variable	Enterprise Innovation (MOI)			
	Higher than the level of market competition		Below the level of market competition	
	(1)	(2)	(3)	(4)
Treat	0.0066	-	0.6521**	-
	(0.1147)	-	(2.0509)	-
Time	0.0821**	0.1069*	0.1630**	-0.0446
	(2.3752)	(1.7012)	(2.4779)	(-0.4849)
Treat×Time	0.5486***	0.5238***	-0.1116	0.1684
	(6.3439)	(5.5981)	(-0.4656)	(0.6802)
Controls	control	control	control	control
Industry and annual	control	-	control	-
Company and year	-	control	-	control
N	4979	4979	2249	2249
Adj_R ²	0.1973	0.0371	0.0879	0.0326

(2) Geographical characteristics

According to the city positioning, this paper divides the sample into two groups, which are located in outward-looking node cities and those located in inward-looking node cities. The regression results are shown in Table 5. Columns (1) to (2) are the estimated results of the “Belt and Road” initiative affecting the innovation of enterprises located in export-oriented cities. It can be seen that the estimated coefficient of Treat×Time is significantly positive at the level of 1% (column (1)) The estimated coefficient is 0.6352, t=3.9285; column (2), the estimated coefficient is 0.3948, t=3.9296); columns (3) to (4) in the regression of the sample of enterprises located in inward node cities, the estimate of Treat×Time The coefficients are not significant (column (3) estimated coefficient is -0.0762, t=-0.4014; column (4) estimated coefficient is 0.0620, t=0.3161). This shows that the positive response to the “Belt and Road” initiative mainly comes from companies located in export-oriented node cities, and Hypothesis 3 has been verified. It can be seen that, driven by geospatial elements, companies located in

export-oriented node cities have carried out more active innovations under the impact of changes in the resource base, increased environmental uncertainty, and increased product market competition.

TABLE V: Heterogeneity test: geographic location characteristics

Variable	Enterprise Innovation (MOI)			
	Export-oriented node city		Inward node city	
	(1)	(2)	(3)	(4)
Treat	-0.1077 [*]	-	0.3899 ^{**}	-
	(-1.7413)	-	(2.1845)	-
Time	0.1420 ^{**}	0.1409	0.1768 ^{**}	0.1472
	(1.9935)	(1.3547)	(2.2613)	(0.4541)
Treat×Time	0.6352 ^{***}	0.3948 ^{***}	-0.0762	0.0620
	(3.9285)	(3.9296)	(-0.4014)	(0.3161)
Controls	control	control	control	control
Industry and annual	control	-	control	-
Company and year	-	control	-	control
N	2138	2138	535	535
Adj_R ²	0.2214	0.0446	0.2248	0.1289

4.4 Robustness test

In order to enhance the reliability of the aforementioned empirical analysis, this paper uses the following two methods to conduct a robustness test:

4.4.1 Placebo test

In order to further prove the rationality of the use of the double-difference model, eliminate the interference of inherent differences between the treatment group and the control group, and the influence of other difficult-to-control factors on the research conclusions, this paper uses the method of constructing a virtual initiative year to conduct a placebo-controlled test. The proposed year is assumed to be 2013 and 2016 respectively. The results are shown in Table 6 columns (1) to (3). Column (1) set the sample interval to 2012-2014 (when it is 2012, Time is 0; when it is 2013-2014, Time is 1), columns (2) to (3) The setting method of is similar to this, and uses the same variables as the previous article to test the causal relationship between the "Belt and Road" initiative and business innovation The results show that the estimated coefficient of Treat×Time is only significantly positive in column (3), indicating that, except for 2015, if other years are used as the implementation years of the "Belt and Road", the conclusion consistent with the previous article cannot be obtained. It can be seen that the inherent differences between the supported companies and non-supported companies have little effect on the conclusions of this article.

4.4.2 Propensity score matching test

In order to further eliminate the influence of individual characteristics in the sample on the research results, the method of combining the propensity score matching method and the double difference method (PSM+DID) is used to re-regress the model. Specifically, a sample of the most similar control group is matched for each treatment group sample. The matching variables mainly include enterprise size (Size), enterprise age (Age), and growth ability (Growth). To avoid excessive sample loss, the matching process allows sampling to be reset. Substituting the matched control group samples into the model and re-testing, it is found that the significance of the variable estimation coefficients is roughly the same as the previous article, which further eliminates the interference of the individual differences of the samples on the results. The specific results are shown in Table 6 column (4).

The results of the above robustness test show that the results of this paper have a certain degree of rigor.

TABLE VI: Robustness test

Variable	Enterprise innovation (MOI)			
	Placebo test			PSM+DID
	2013-2016	2017-2020	2014-2017	
	Time=2014, 2015	Time=2018, 2019	Time=2015, 2016	
(1)	(2)	(3)	(4)	
Time	-0.0233 (-0.6961)	-0.0027 (-0.0908)	0.0925*** (3.5400)	0.0075 (0.0644)
Treat×Time	0.0942 (0.6377)	-0.0041 (-0.0256)	0.2455* (1.8516)	0.3580*** (2.7156)
Controls	control	control	control	control
Company and year	control	control	control	control
N	3578	3650	3653	799
Adj_R ²	0.0296	0.0191	0.0247	0.0853

V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion

This paper regards the “Belt and Road” initiative as a quasi-natural experiment, and selects 2015 as the impact time of the “Belt and Road” initiative. Companies belonging to the “Belt and Road” conceptual sector are regarded as the “processing group” and the rest as the “control group”. Combining with the laws of economic psychology's psychological response to the economic system and using the data of Shanghai and Shenzhen A-share listed companies from 2013 to 2020, the causal relationship between the “Belt and Road” initiative and the innovation of Chinese enterprises is investigated by

constructing a double differential model. The research found that the implementation of the “Belt and Road” initiative has significantly improved the innovation level of the enterprises supported by the initiative. Furthermore, a sub-sample regression based on the degree of product market competition and the characteristics of the geographic location of the company, the test results show that sufficient product market competition can enhance the role of the "Belt and Road" initiative in promoting enterprise innovation; company innovation is important to the "Belt and Road" initiative. The positive response to the initiative mainly comes from companies in export-oriented node cities.

5.2 Policy recommendations

The research results of this paper confirm that the “Belt and Road” initiative has an incentive effect on enterprise innovation. In order to better guide enterprises to pay attention to management, strengthen innovation, and promote the implementation and implementation of national innovation strategies, the following suggestions are put forward:

Firstly, enterprises are not only the recipients of national macro policies, but also the main body of the market economy. Governments and enterprises at all levels should give full play to their joint efforts, make use of the psychological response of economic psychology to the economic system, and take corresponding measures to trigger enterprises to carry out effective innovations and improve the quality and efficacy of economic development. In addition, the impact of the “Belt and Road” initiative on companies has broken through geographic restrictions. Companies located in non-key provinces should also have a long-term vision and a certain degree of risk tolerance, actively participate in the construction of the “Belt and Road”, and improve the overall enterprise through innovation. Strength and lasting competitiveness.

Secondly, the sub-sample regression based on the degree of product market competition shows that benign market competition is an important factor in promoting enterprise innovation. Therefore, the government should take a variety of measures to improve the market mechanism, create a fair, orderly, and sufficient market competition environment, gradually increase the degree of market competition, and use competition to drive business innovation. When facing fierce market competition, enterprises should take the initiative to carry out innovation to respond.

Finally, a sub-sample regression based on the geographic location of the company shows that companies located in export-oriented node cities have a higher level of innovation. Therefore, the government should combine location differences and resource endowments to optimize the positioning and layout of urban functions. Enterprises should consider the coordination of their own characteristics and urban function positioning, adhere to the "going out" strategy, and realize a virtuous circle of foreign investment and innovation.

ACKNOWLEDGEMENTS

This research was supported by Ministry of Education Humanities and Social Sciences Research Foundation of China (No. 20YJA630044).

REFERENCES

- [1] Han Chen, Gao Shanxing(2017).How can innovation and institutional support help companies profit from original innovation. *Science and Technology Management Research*, (21): 9-14.
- [2] Yu Chuanpeng, Lin Chunpei, Zhang Zhengang (2020), Ye Baosheng. Specialized knowledge search, innovation and corporate performance: the moderating effect of cognitive evaluation . *Management World*, (1): 146-166+240.
- [3] Lin Haifen, Su Jingqin (2014). A review of the research perspectives and methods of Chinese enterprise innovation theory . *Research and Development Management*, (2): 110-119.
- [4] Liu Jin, Pan Mengting, Yao Zhenjiu (2021). Research on Corporate Strategic Differences and Investment Efficacy under the "One Belt One Road" Initiative——Based on Empirical Evidence from Shanghai and Shenzhen A-Share Listed Companies . *Friends of Accounting*, (4): 18- twenty four.
- [5] Su Jingqin, Lin Haifen (2010). Review and prospects of innovation research perspectives . *Journal of Management*, (9): 1343-1349.
- [6] Lin Haifen, Su Jingqin (2014). Research on the longitudinal transmission mechanism of strategic innovation--Based on the perspective of meaning construction and meaning giving . *Journal of Management*, (10): 1491-1498.
- [7] HAMEL, G (2006). The Why, What and How of Innovation. *Harvard Business Review*, 84(2):72-84.
- [8] MOL M J, BIRKINSHAW J (2009). The Sources of innovation: When Firms Introduce New Management Practices. *Journal of Business Research*,22(12):1269-1280.
- [9] Niu Zhanwen, Jing Shuwei, Yang Fudong (2015). Analysis of the driving factors of innovation in manufacturing enterprises based on lean management-case studies of four enterprises . *Science and Management of Science and Technology*, (7): 116-126.
- [10] BIRKINSHAW J, HAMEL G, MOL M J(2008). Innovation. *Academy of Management Review*, 33(4):825-845.
- [11] Yu Chuanpeng, Zhang Zhengang, Lin Chunpei (2019). Research on the Process Mechanism of Enterprise Innovation Based on Technology Acceptance Model. *Scientific Research Management*, (8): 206-214.
- [12] MANGIER-WATANABE, R., BENTON (2017). Innovation and Firm Performance: the Mediating Effects of Tacit and Explicit Knowledge. *Knowledge Management Research & Practice*, 15(3):325-335.
- [13] Zhang Zhengang, Yao Cong, Yu Chuanpeng (2018). The "double-edged sword" effect of the implementation of innovation on the growth of SMEs. *Research in Science of Science*, (7): 1325-1333.
- [14] Han Chen, Gao Shanxing (2017). Research on the relationship between strategic flexibility, strategic innovation and innovation. *Management Science*,(2): 16-26.

- [15] Xu Na, Yu Xiaotao (2021). Research on the Improvement Path of Chinese Enterprises' Innovation Performance under the "One Belt One Road"——Based on the Analysis of New Investment. *Friends of Accounting*, (4): 12-17.
- [16] Chen Jiping, Xu Mengmeng (2021). The spillover effect of the “Belt and Road” initiative on the innovation of Chinese enterprises: an empirical test based on quasi-natural experiments. *Business Economics Research*, (2): 94-98.
- [17] Shen He, Yu Chuanpeng, Zhang Zhengang (2018). Research on the introduction mechanism of innovation in technology-based small and micro enterprises——Based on the perspective of acquired learning. *Research in Science of Science*, (5): 884-892.
- [18] Gong Lianbing, Wang Xiaoqing (2018). The risk of party rotation in Southeast Asian countries along the “Belt and Road” route and China’s response. *Contemporary World and Socialism*,(5): 150-157.
- [19] Zhang Yulan, Cui Riming, Guo Guangzhen (2020). Industrial Policy, Trade Policy and Industrial Upgrade——Based on the Perspective of Global Value Chain. *International Trade Issues*,(7): 111-128.
- [20] Wang Wei, Liang Shi, He Hongling, Wang Chunli (2021). State-owned enterprise mixed reform and dual innovation-based on the perspective of equity diversity. *East China Economic Management*,(9): 11-20.
- [21] Wang Jingyu, Fu Jianing, Zhang Hongliang (2019). Product market competition and enterprise innovation: a quasi-natural experiment *Modern Finance and Economics (Journal of Tianjin University of Finance and Economics)*,(12): 52-66.
- [22] Xu Si, He Xiaoyi, Zhong Kai (2019) The "One Belt, One Road" Initiative and China's corporate financing constraints. *China Industrial Economy*,(7): 155-173.
- [23] Qin Zhen, Xie Luhua, Guo Juanjuan (2021). Government Innovation Preference, Entrepreneurship and Provincial Innovation Efficacy——An Empirical Explanation Based on Threshold Effect. *East China Economic Management*,(12): 63-71.
- [24] Chen Shenglan, Liu Xiaoling (2018). How does company investment respond to the "One Belt One Road" initiative? ——Empirical research based on quasi-natural experiments. *Financial Research*,(4): 20-33.
- [25] Wang Guijun, Lu Xiaoxiao (2019). Can the "Belt and Road Initiative" promote innovation in Chinese companies?. *Financial Research*,(1): 19-34.
- [26] Lin Haifen, Su Jingqin (2014). Research on the Mechanism of Innovation from the Perspective of Path Dependence: Taking Zhejiang Mobile Channel Model Innovation as an Example . *Technoeconomics*,(1): 7-13.
- [27] Su Jingqin, Li Zhaomin, Lu Yibo (2011). Analysis of the key influencing factors of the process of innovation: A theoretical perspective. *Journal of Management*, (8): 1174-1181.
- [28] Yu Chuanpeng, Shang Yu, Zhang Zhengang (2019). The impact of innovation implementation on innovation performance from the perspective of the integration of structural power and knowledge-based theories. *Technoeconomics*,(1): 48-55.
- [29] Han Chen, Gao Gaoxing (2018). The mechanism and context adjustment of government support to enhance the innovation of state-owned enterprises. *Management Journal*,(3): 23-31.

- [30] Wang Tienan, Tu Yunmi (2012). The impact of technological innovation ability on enterprise performance under the adjustment of innovation ability. *Science and Technology Management Research*, (10): 25-32.
- [31] Jiang Shiyong, Li Suicheng, Li Bo (2015). Research on the Impact of Entrepreneur Relationship Network on Innovation Capability——Based on the Empirical Study of High-tech Industries. *Science and Technology Management Research*, (23): 126-130.
- [32] Wang Suikun, Li Jing (2021). Product market competition, government subsidies and dual innovation investment: based on the perspective of high-tech enterprises on the Growth Enterprise Market. *Friends of Accounting*, (14) 54-59.
- [33] Yu Desheng, Li Xing (2021). Corporate financialization, product market competition and corporate innovation. *Financial Development Research*,(3): 20-25.