Proceedings of Business and Economic Studies

Research Article

The Influence of Fiscal Subsidy on the Innovation Behavior of Manufacturing Enterprises Under the Background of "The Belt and Road"

Yanan Li[1], Tao Xie[2,3*]

[1]Panyapiwat Institute of Management, Bangkok 10700, Thailand

[2]Liaoning Technical University, Hu Ludao 125000, China

[3]Liaoning University, Shenyang 110000, China

Abstract: Based on the "The Belt and Road" initiative, this article selects the panel data of A-share manufacturing listed companies in 2014 and 2016, and uses the difference in difference (DID) model to test the effect of fiscal subsidy policies on the innovative behavior of Chinese manufacturing companies since the "The Belt and Road" initiative was proposed. Influence, and the mediating effect of innovation cooperation between financial subsidies and innovation behavior. The empirical results show that the fiscal subsidy policy has affected the innovation behavior of manufacturing enterprises, but the results of this effect are different due to different stages of innovation behavior. In addition, in the process of enterprises carrying out innovative behaviors, innovation cooperation can promote the effective use of financial subsidies by enterprises, thereby enhancing their innovative behaviors. Finally, based on the conclusions, corresponding suggestions are put forward at the three levels of enterprise, policy and system.

Keywords: The belt and road; Intermediary effect; Financial subsidies; Innovation cooperation

Publication date: February, 2021
Publication online: 28 February, 2021
[*]***Corresponding author:*** Tao Xie, pdr_xie@163.com

1 Introduction

With the continuous development of China's "The Belt and Road" initiative, China's economic market has formed a new development pattern centered on "Bringing in" and "Going out". Then Chinese manufacturing companies are facing a broader international market. Based on this background, Chinese manufacturing companies should continuously improve their own innovation level and the efficiency of corporate R&D activities, so as to form their own corporate competitiveness in the countries along the "The Belt and Road". In order to promote the smooth development of R&D and innovation activities of manufacturing enterprises, the Ministry of Finance and other departments of China have successively introduced various subsidy policies to help the high-quality economic development of manufacturing enterprises, promote the innovation and development of manufacturing enterprises, and improve quality and efficiency.

The research contribution of this article is that, in order for Chinese manufacturing companies to "go global" better, clarifying the government's financial subsidy measures to enhance the effectiveness of China's manufacturing companies' innovative behavior, which has practical significance for companies and the government; at the same time, This article takes the innovation cooperation between enterprises as an intermediary variable into the process of the influence of financial subsidy policies on enterprise innovation behavior, and provides a basis for decision-making on how to promote enterprise innovation behavior more effectively.

2 Literature Review

2.1 Financial Subsidies and Innovative Behavior

Since the announcement of "The Belt and Road" initiative, how manufacturing companies conduct their own R&D activities in the international market and how to use government financial subsidies to promote innovation have become research hotspots. First, from the existing research, the article can find that the fiscal subsidy policy implemented by the government can promote the implementation of enterprise innovation behavior. For example, the policy support provided by the government will affect enterprise innovation, especially in newly industrialized China and developing countries, financial subsidies have a greater impact on the innovation behavior of enterprises(Dieter Ernst and Linsu Kim 2001); then the market In developing countries where the mechanism is not yet fully established, financial subsidies can help companies improve their innovation performance (Soltanzadeh, J et al 2019). The financial subsidies can increase the confidence of business operators when making innovation investments and encourage companies to increase their investment in innovation (Guo, D. et al 2016). Second, the fiscal subsidy policies implemented by the government will have an impact on the innovation behavior of enterprises, mainly for the following reasons: First, from the perspective of enterprise innovation resources, the government subsidies will affect the enterprise's internal The innovative behavior of the company produces agglomeration effects, allowing companies to obtain more resources that can be used for corporate innovation (Sergio, G. and Lazzarini 2013); secondly, from the perspective of innovation funds, the financial subsidies provided by the government will reduce the tax burden of enterprises, which is beneficial to Alleviate the lack of funds when enterprises are innovating, and alleviate the innovation risks they may face(Bronzini, R. and Piselli, P. 2014); the financial subsidy policy has a function of compensating for the innovation behavior of enterprises(A, C. H. Y. et al 2012). After enterprises have received financial support, they will have more ability and time to carry out innovative research and development according to technological changes in the face of complex and changeable technological changes (Chiappini, R. et al 2020); due to the long cycle and high uncertainty of R&D activities, some companies reduce their investment in innovation, and certain financial subsidies will reduce the prejudice of corporate managers or related stakeholders on innovative behaviors and promote corporate innovative behaviors (Bellucci, A. , Pennacchio, L. and Zazzaro, A.2019). The government provides preferential policies to enterprises so that enterprises will not slow down R&D expenditure due to funding problems, and weaken the risk expectations of enterprises in R&D projects (Montmartin, B. and Herrera, M.2015). Finally, from the perspective of innovation performance, companies that received fiscal subsidies performed better in innovation performance in subsequent innovation (Rosa, H. J. M. 2011)..

2.2 The Mediating Effect of Innovation Cooperation

After calculating the competitiveness index of the manufacturing industry in the "The Belt and Road" region, Mendi et al(2020)pointed out that China should expand cooperation with manufacturing enterprises to promote the development of China's manufacturing industry. Companies supported by government policies will improve their innovative behavior by changing and initiating innovative cooperation. The method of innovative cooperation is mainly to strengthen the innovation cooperation between the company and external companies. First, from the perspective of the internal function of the enterprise, the use of innovative cooperation by enterprises will integrate more human and knowledge resources, produce complementary effects, expand the scope of R&D, and improve R&D performance (Dyer, J. H. and Singh, H.1998). The company's R&D department will make up for its lack of innovation resources through cooperation with the outside of the company (Rubera, G. and Kirca, A. H. 2012). Second, from the perspective of the external environment of enterprises, the help of financial subsidy policies for enterprises can promote innovation cooperation between enterprises and different partners, expand innovation cooperation, and achieve better innovation performance (Ana Luísa Silva. 2020). government policies playing a bridging role in providing cooperation and mutual assistance between enterprises (Dan Prud'homme.2016). In summary, the following conclusions can be drawn. First, most scholars

believe that the fiscal subsidy policy implemented by the government will actively promote the innovative behavior of enterprises in all aspects. Second, China and the countries along the “The Belt and Road” can rely on strengthening the innovation cooperation of manufacturing enterprises in the international environment to enhance the sustainable development and revitalization of China's manufacturing industry. This kind of innovative cooperation can improve the R&D environment within the enterprise, thereby speeding up R&D output and inspiring innovation inspiration.

3 Theoretical Analysis and Hypothesis

3.1 The Impact of Financial Subsidies on Innovation

Due to the monopoly of the external market and incomplete information, only relying on the price mechanism to allocate social resources will not be able to achieve efficiency-Pareto Optimality. In order to maximize the efficiency of resource allocation, it is necessary to resort to government intervention, which has actually made it clear that government behavior will affect the function of enterprise development. In the process from the initiation of innovative behavior to the transformation of innovative results, enterprises need to face many pressures in terms of manpower and technology. The government's implementation of financial subsidy policies will enable enterprises to have more capital to hire innovative talents and research and develop technologies, thereby alleviating management for the uncertainty of innovative projects, the help to enterprises from the basis of innovative behavior(Wu, R. et al. 2020). The more subsidies that enterprises receive, the greater the government's supervision, and the more standardized use of financial subsidies by enterprises, which ultimately promotes the development of enterprise R&D activities(Simona and Mateu. 2017). Since the government's incentive policies are mainly based on financial subsidies provided to enterprises, and the amount of financial subsidies is easy to obtain and quantify in the company's financial statements, the financial subsidies are selected as the measure of financial subsidy policies. Based on the above analysis, hypothesis 1:

Hypothesis 1: The financial subsidies granted by the Chinese government will positively promote the innovative behavior of Chinese manufacturing enterprises.

3.2 The Mediating Effect of Innovation Cooperation

Core technology resources are the key to whether Chinese manufacturing companies can smoothly "go global" under the "The Belt and Road" environment. Since enterprises in different environments have different endowments and different areas of advantage, cooperation between enterprises can improve the efficiency of enterprise research and development. Therefore, Chinese manufacturing companies can rely on the sound and stable cooperation between China and the “The Belt and Road” region to strengthen cooperation in R&D, technology, and personnel levels among manufacturing companies, and encourage Chinese manufacturing companies to actively explore new product technologies. Generally speaking, the way for enterprises to carry out innovation cooperation is mainly cooperation in resources and technology with other manufacturing enterprises. Therefore, the cooperation cost value of the enterprise and the external enterprise is used to measure the innovation cooperation of the enterprise. In summary, propose hypothesis 2 and hypothesis 3:

Hypothesis 2: The innovation cooperation adopted by Chinese enterprises will positively promote the development of enterprise innovation behavior.

Hypothesis 3: Innovation cooperation has an intermediary effect in the relationship between financial subsidies and the innovative behavior of Chinese companies, which will amplify the role of financial subsidies in promoting innovation behavior.

4 Sample Selection and Model setting

4.1 Sample Selection

Since the “The Belt and Road” initiative was first proposed in 2015, this article selects 2015 as the target year for the study. Since the article cannot determine whether the fiscal subsidy policy implemented by the government can directly affect the innovative behavior of listed companies in 2015 after the implementation of the “The Belt and Road” initiative, the article excludes the 2015 data. At the same time, as the implementation time of the fiscal subsidy policy increases, the innovative behavior of enterprises will be more susceptible to other factors. In order to reduce the interference of this kind of

influence on research, the article only selects one year before and after the implementation of the "The Belt and Road" (2014 and 2016) as the research interval.

The article uses China's A-share listed companies in 2014 and 2016 as the research object, and at the same time uses the classification of companies in the Cathay Pacific database as the standard to classify manufacturing companies and non-manufacturing companies. The specific data of the article comes from the CSMAR(China Stock Market Accounting Research) database, and excludes the financial industry and ST companies, a total of 253 companies. In order to eliminate the influence of outliers on this study, the article carried out 1% tailing treatment on all continuous variables, and finally obtained 4554 observations. The data in the early stage of the article uses Excel2013 software and Stata15.0 for summary and processing, and the post-empirical analysis uses Stata15.0 for data analysis.

4.2 Model Setting and Variable Definition

Since the innovation behavior of enterprises is generally divided into two stages of R&D investment and innovation output, in the article, R&D intensity is used to measure the level of R&D investment of the enterprise, and innovation performance is used to measure the level of innovation output of the enterprise. The article uses two dependent variables, RD and INNO, to represent the two indicators of the firm's R&D intensity and innovation performance, where RD is determined by the value of R&D investment divided by the firm's operating income, and INNO uses the logarithm of the number of patents applied for by the firm within a year plus 1 To represent. Both data are current values. Year and Manufacture are two dummy variables. Year=1 means that after 2015, the representative company has enjoyed the financial subsidy policy; Year=0 means that the representative company did not enjoy the financial subsidy policy before 2015. Manufacture=1 is the experimental group, which means that the enterprise type is a manufacturing enterprise; Manufacture=0 is the control group, which means that the enterprise is not a manufacturing enterprise. Among them, if β3 and γ3 are significantly positive, H1 is verified. The article uses INCO to represent the innovation cooperation of enterprises, and the measurement method adopts the logarithm of the cash value paid and related to operating activities.

The control variables are defined as follows: (1) Cash holding level (CF): The article is determined by dividing the company's current operating cash flow from operating activities by the value of total assets at the beginning of the period. This variable can reflect the company's ability to obtain resources through its own operating activities. Affect the level of research and development, this ability can have an impact on the innovation behavior of enterprises, so this variable is selected as the control variable. (2) Debt availability (LEV): The article is determined by dividing the company's total liabilities at the end of the period by the total assets at the end of the period. Different corporate debts have different financial risks, and financial risks will affect the company's designated innovation decisions, thereby affecting corporate innovation behavior, so this variable is selected as a control variable. (3) Enterprise size (SIZE): The article is determined by the logarithm of the company's total assets at the end of the period. Because the degree of difference in company size will have an impact on the level of innovation, R&D investment, etc., and these effects will restrict the innovation behavior of enterprises to a certain extent, this variable is selected as the control variable. (4) Company profitability (ROA): The article is determined by dividing the company's total profit for the year by the total assets at the end of the period. Through this variable, we can see the company's ability to use assets to obtain income. This ability affects the formulation of corporate innovation decisions and thus affects corporate innovation behavior. Therefore, this variable is selected as a control variable. The specific names and calculation formulas of variables are shown in Table 3.

Because it is difficult to exclude the influence of irrelevant factors by simply using a sample of manufacturing enterprises to compare the policy implementation year before and after, the research conclusions are biased. The article constructs a double differential regression model to better explain the financial subsidy policy for the innovation of Chinese manufacturing enterprises The influence of behavior.

Model 1: $RD_{it} = \alpha+\beta_1 Year_{it}+\beta_2 Manufacture_{it}+\beta_3 Year_{it}*Manufacture_{it}+\sum ind+\sum yr+\beta_4 X_{it}+\delta_{it}$

Model2: $INNO_{it}=\tau+\gamma_1 Year_{it}+\gamma_2 Manufacture_{it}+\gamma_3 Year_{it}*Manufacture_{it}+\sum ind+\sum yr+\gamma_4 X_{it}+\zeta_{it}$

Table 1. The significance of the main parameters of Model 1

	The year before 2015	The year after 2015	Difference
Test group	$\alpha+\beta_2$	$\alpha+\beta_1+\beta_2+\beta_3$	$\Delta y_1=\beta_1+\beta_3$
Control group	α	$\alpha+\beta_1$	$\Delta y_0=\beta_1$
DID			$\Delta\Delta y=\beta_3$

Table 2. The significance of the main parameters of Model 2

	The year before 2015	The year after 2015	Difference
Test group	$\tau+\gamma_2$	$\tau+\gamma_1+\gamma_2+\gamma_3$	$\Delta y_1=\gamma_1+\gamma_3$
Control group	τ	$\tau+\gamma_1$	$\Delta y_0=\gamma_1$
DID			$\Delta\Delta y=\gamma_3$

All models in the article, the subscript i represents the enterprise, and t represents the year. The article uses ∑ind to measure industry fixed effects, and ∑yr to measure time fixed effects.δandζare random interference terms. X represents the control variable of the model:

Table 3. Measurement of variables

Variable	Code	Measuring Method
RD	R&D intensity	R&D investment/Operating income
INNO	Innovation performance	ln (Number of patents in one year +1)
SUB	Financial subsidy	ln (Financial subsidy)
CF	Cash flow	Cash flow from operating activities/total assets
LEV	Debt availability	Total liabilities/total assets
SIZE	Firm size	ln (total assets)
ROA	Return on total assets	Total profit/total assets
INCO	Innovation cooperation	ln (Cash value paid related to operating activities)

5 Empirical Results and Analysis

5.1 Descriptive Statistics

In order to more directly understand the difference between the variables of manufacturing enterprises and non-manufacturing enterprises, the article carried out descriptive statistics on the two types of enterprises.

As shown in Table 4, in the experimental group, 50% of the enterprises have R&D intensity less than 3.73, while the maximum value is as high as 27.58. This shows that some manufacturing enterprises' capital investment in innovation is much greater than the industry average, and the gap in R&D intensity among enterprises Larger. For innovation performance, the average value is 5.14, and the minimum and maximum values are 1.39 and 8.72, respectively, which also shows that companies have differences in the ability to transform R&D results. Moreover, the financial subsidies that enterprises enjoy are also different. It can be seen from the financial subsidy (SUB) that the minimum value is 0, indicating that some companies do not enjoy the financial subsidy policy. From the variable article of innovation cooperation, it can be seen that the minimum value is 16.38, the maximum value is 22.11, and the standard deviation is 19.88. This shows that the sample companies in the experimental group have different attitudes towards innovation cooperation, and therefore the data are quite different. For the control variables, the article can see that the gap between enterprises is not big.

By comparing Table 4 and Table 5, it can be seen that there are differences between the experimental group and the control group. From the perspective of corporate innovation behavior, in terms of R&D intensity, the data of the control group is slightly higher than that of the experimental group; and in terms of innovation performance, the data of the experimental group is higher than the control group. However, how much of this difference is caused by the implementation of the fiscal subsidy policy, and whether the innovative behavior of manufacturing companies has increased since 2015 requires further analysis to demonstrate.

Table 4. Descriptive Statistics of Manufacturing Enterprise

Variable	Min	Median	Max	Mean	SD
Year	0	1	1	0.54	0.49
Manufacture	0	0	1	0.15	0.36
YM	0	0	1	0.07	0.26
RD	0.07	3.73	27.58	4.32	3.11
INNO	1.39	5.18	8.72	5.14	1.29
SUB	10.45	16.38	20.52	17.50	18.52
INCO	16.38	18.60	22.11	19.38	19.88
CF	-0.22	0.05	0.35	0.06	0.07
LEV	0.03	0.37	0.80	0.38	0.19
SIZE	19.20	21.19	26.05	21.86	1.04
ROA	-0.37	0.04	0.32	0.05	0.06

YM represents the interaction item of YEAR and MANUFACTURE

Table 5. Descriptive statistics of non-manufacturing enterprises

Variable	Min	Median	Max	Mean	SD
Year	0	0	1	0.54	0.65
Manufacture	0	1	1	0.23	0.47
YM	0	0	1	0.12	0.45
RD	0.14	4.27	30.91	5.93	4.91
INNO	0.69	4.71	10.07	4.80	1.56
SUB	0.00	16.12	20.82	17.75	18.76
INCO	16.21	18.76	24.57	20.82	22.25
CF	-0.39	0.05	4.54	0.08	0.37
LEV	0.06	0.35	5.46	0.42	0.46
SIZE	19.86	21.73	27.36	22.01	1.47
ROA	-0.27	0.05	0.21	0.05	0.05

YM represents the interaction item of YEAR and MANUFACTURE

5.2 Correlation Analysis

In order to more directly observe the relationship between each variable and the two major innovation behaviors of the enterprise, the article uses R&D intensity (RD) and innovation performance (INNO) as dependent variables to analyze the correlation. The results are shown in Table 6 and Table 7.

By comparing the correlation analysis results reported in Table 6 and Table 7, the following conclusions can be drawn: First, the R&D intensity (RD) and the interaction terms of YEAR and MANUFACTURE are significantly negatively correlated at the level of 5%, while innovation performance (There is a significant positive correlation between INNO) and the interaction terms of YEAR and MANUFACTURE at the 1% level. This shows that the implementation of the fiscal subsidy policy has different effects on the innovation behavior of enterprises. Second, the research and development intensity (RD) and the fiscal subsidy policy (SUB) have a negative correlation at 1%, while the fiscal subsidy at 1% is a positive promotion of the innovation performance of the enterprise. This shows that the financial subsidy policy (SUB) has different effects on the innovation behavior of enterprises.

Table 6. Correlation coefficient table

	Dependent variable: RD						
	RD	**YM**	**SUB**	**CF**	**LEV**	**SIZE**	**ROA**
RD	1						
YM	-0.061**	1					
SUB	-0.058***	0.019**	1				
CF	0.073	-0.041**	-0.016**	1			
LEV	-0.190***	-0.037	0.204***	-0.013	1		
SIZE	-0.229***	0.077*	0.649***	-0.029	0.449*	1	
ROA	0.352**	-0.091**	-0.057	0.367***	-0.254***	-0.086*	1

Note: *P< 0.05, **P< 0.01

Table 7. Correlation coefficient table

	Dependent variable: INNO						
	INNO	**YM**	**SUB**	**CF**	**LEV**	**SIZE**	**ROA**
INNO	1						
YM	0.341***	1					
SUB	0.403***	0.211*	1				
CF	-0.115***	-0.041	-0.016	1			
LEV	0.206**	-0.037	0.204***	-0.013	1		
SIZE	0.457***	0.077*	0.649***	-0.029	0.449***	1	
ROA	0.084*	-0.091**	-0.057	0.167***	-0.254***	-0.086*	1

Note: *P< 0.05, **P< 0.01

Among the control variables, the return on total assets (ROA) is positively correlated with corporate innovation behavior, indicating that the improvement of corporate profitability will promote corporate R&D behavior, thereby driving the growth of R&D intensity and the improvement of innovation performance. Cash holdings (CF), debt availability (LEV), and company size (SIZE) are inversely correlated with companies' R&D intensity and innovation performance, respectively. This is related to the nature of corporate R&D activities and the difficulty in transforming R&D results. The degree of ease is closely related.

5.3 Regression Analysis of DID

Table 8. DID regression results

variable	Model 1	Model 2
YM	-0.381*	0.463*
	(-1.13)	(1.06)
CF	0.594*	0.793***
	(1.11)	(4.95)
LEV	-0.112	-0.604***
	(-0.23)	(-4.20)
SIZE	-0.953***	0.616***
	(-3.02)	(6.59)
ROA	6.749***	0.521
	(2.44)	(0.64)
Cons_	25.602***	-8.283***
	(3.80)	(-4.14)
Industry	Control	Control
Year	Control	Control
F	4.19	26.76
P	0.01	0.02
R^2	0.06	0.22

Note: *P< 0.05, **P< 0.01

Table 8 reports the regression results of the DID model. The p values of F test in Model 1 and Model 2 are 0.01 and 0.02, respectively, indicating that the two models are overall statistically significant. In Model 1 and Model 2, the interaction coefficients of YEAR and MANUFACTURE are -0.381 and 0.463, respectively, and both are significant at the 10% level. This is consistent with the above correlation analysis and univariate test conclusions, indicating the fiscal subsidy policy. The implementation of the company did not promote the R&D intensity of the company, but had a significant incentive effect on the innovation performance of the company. In Model 1 and Model 2, the coefficients of corporate cash holdings (CF) and return on total assets (ROA) are positive, and are significant at the levels of 10% and 1%, respectively, indicating that companies with sufficient funds have invested in R&D The degree will be higher. For debt acquisition (LEV), the coefficient of this variable is negative in both models, and in Model 2, the p-value is significantly negatively correlated at the level of 1%, which shows that the company's capital leverage will hinder the company The development of innovative behavior.

Table 9 reports the univariate double difference test results of R&D intensity (RD) and innovation performance (INNO) after the implementation of the initiative, illustrating the difference in innovation behavior between the control group and the experimental group. As shown in Table 9, whether it is the control group or the experimental group, after the implementation of the initiative, the innovation behavior of enterprises has increased. For R&D intensity (RD), the control group increased by 0.427, while the experimental group increased by 0.348. The univariate test result is -0.079, which is significant at the 1% level, indicating that the implementation of the fiscal subsidy policy has not significantly helped the R&D intensity of enterprises. From the perspective of innovation performance (INNO), the control group only increased by 0.324, while the experimental group increased by as much as 0.609. The horizontal fixed effect among comprehensive enterprises found that after the implementation of the initiative, the innovation performance of enterprises increased by 0.285, and was at the level of 10% Significantly. From an economic point of view, the innovation performance of the experimental group companies increased by 46.8% compared with the control group companies, indicating that the implementation of the fiscal subsidy policy has significantly promoted the improvement of manufacturing companies' innovation performance.

Table 9. DID test analysis

	Control group		Test group		Differences		DID
	Before	After	Before	After	Control group	Test group	
RD	5.704	6.131	4.143	4.491	0.427	0.348	-0.079***
t							3.21
INNO	4.979	5.303	4.495	5.104	0.324	0.609	0.285*
t							1.08

Note: $^{*}P< 0.05$, $^{**}P< 0.01$

5.4 Mediating Effect Test

In order to verify the hypothesis 2 proposed in the previous article, the article uses the sequential test method to test the mediating effect of business risk. The process is as follows:

First of all, since the innovation cooperation of enterprises is based on innovation cooperation, the influence of innovation cooperation on the internal R&D intensity of the enterprise is lower than that of innovation performance. Therefore, the article chooses the enterprise's innovation performance as the dependent variable of the model for analysis. X is the control variable in the model.

Model 3: $INNO=\eta_0+\eta_1 SUB+\eta_2 X+\rho$

As shown in Table 10 Model 3 regression test results, the model η1 is 2.05*10-11 and is significant at the 1% level, so the second step test is performed. Second, take innovation cooperation as the dependent variable and fiscal subsidies as the independent variable to construct Model 4. On the basis of Model 4, the article adds innovation cooperation as an intermediary variable to construct a model 5 of the intermediary effect of innovation behavior, financial subsidies and innovation cooperation. X is the control variable in the model.

Model 4: $INCO=\nu_0+\nu_1 SUB+\nu_2 X+o$

Model 5: $INNO=\tau_0+\tau_1 SUB+\tau_2 INCO+\tau_3 X+\psi$

According to the regression results in Table 10, ν1 is 5.163 and is significant at the 1% level; τ2 is 2.00*10-13 and is significant at the 10% level. Therefore, it can be initially proved that innovation cooperation has a partial mediating effect between innovation performance and financial subsidies.

Finally, check the significance of τ1 in Model 5. From Table 10, it can be seen that τ1 is significant at the 1% level. This proves that innovation cooperation has a mediating effect between innovation performance and financial subsidies, which proves the accuracy of Hypothesis 2.

Table 10. Mediation effect test regression results

variable	Model 3	Model 4	Model 5
INCO			$2.00*10^{-13*}$
			(0.86)
SUB	$2.05*10^{-11***}$	5.163^{***}	$1.95*10^{-11***}$
	(3.40)	(4.46)	(3.17)
CF	-0.801^{***}	$3.48*10^{-9}$	-0.802^{***}
	(-3.18)	(0.07)	(-3.18)
LEV	-0.331^{*}	$7.12*10^{-9}$	-0.329^{*}
	(-1.59)	(-0.18)	(-1.58)
SIZE	0.448^{***}	$6.22*10^{-10***}$	0.435^{***}
	(6.88)	(4.97)	(6.53)
ROA	3.092^{***}	$1.99*10^{-11*}$	3.053^{***}
	(3.21)	(1.08)	(3.16)
R^2	0.25	0.22	0.26
P	0.01	0.02	0.01
F	35.7	27.97	29.86

Note: $^{*}P< 0.05$, $^{**}P< 0.01$

5.5 Robustness Test

In order to prevent the systematic error of the financial subsidy policy on the trend of corporate innovation behavior from affecting the analysis results and reduce the error of the DID model, the article further uses the PSM-DID method to conduct a robustness test to ensure the accuracy of the paper results Sex. Due to limited space, the article uses the nearest neighbor matching method for one-to-one matching. The following is the matching result.

As shown in Table 11, among the 506 observations, two of the experimental group (Treated) are not in the common value range (Off support); in the control group (Untreated), a total of 12 are not in the common value range (Off support), the remaining 492 are in the common value range (On support).

Table 11. Match result of PSM-DID

psmatch2: Treatment assignment	psmatch2: Common support		
	Off suppo	On suppo	Total
Untreated	12	241	253
Treated	2	251	253
Total	14	492	506

Then the article conducts a balance hypothesis test to see if the matching result meets the balance hypothesis. The article conducts a balance test on variables from two perspectives: t-test and standard deviation (Standard Bias) for the difference in mean between groups after matching. As shown in Table 12, the standard deviations after matching are all within 20%, and mean differences between groups are not significant at the 10% level. Therefore, the article can consider that the balance assumption is satisfied.

After matching by PSM method, the article tested Model 1 and Model 2, and the conclusions reached were basically consistent with the previous article, which further proved the accuracy of the previous hypothesis.

Table 12. Test Result

Variable	Test group	Control group	*t*	*P*	Standard Bias(%)
CF	0.053	0.054	-0.12	0.91	-0.4
LEV	0.38	0.36	0.89	0.38	5.0
SIZE	22.06	21.92	1.47	0.14	12.3
ROA	0.04	0.04	1.40	0.16	14.1

6 Discussion and Conclusion

6.1 Discussion

In the context of the "The Belt and Road" initiative, this article selects panel data from China's A-share manufacturing listed companies in 2014 and 2016 based on China's fiscal subsidy policy, and uses a double differential model to test the impact of the implementation of fiscal subsidy policies on corporate innovation behavior influences. The results show that the implementation of the fiscal subsidy policy does have an impact on the innovation behavior of Chinese manufacturing companies, but the degree of this impact has different impacts on different stages of corporate innovation; innovation cooperation acts as an intermediary in the relationship between fiscal subsidies and R&D intensity Factors that have strengthened the impact of financial subsidies on R&D intensity. The data analysis results of the article verify the hypothesis 1, hypothesis 2, and hypothesis 3 mentioned above and are consistent with the research conclusions of other scholars. Based on the existing references, the conclusions of the article can provide a reference for how Chinese manufacturing companies can use the financial subsidies provided by the government to better improve their innovation behavior. Furthermore, manufacturing companies can choose as much as possible Innovative cooperation with other companies, complementary advantages, so as to better enhance their own innovation level.

Based on the DID model, the article finds that among Chinese manufacturing enterprises, financial subsidies have an impact on the innovation behavior of enterprises, and innovation cooperation acts as an intermediary factor in the relationship between financial subsidies and R&D intensity, which strengthens the effect of financial subsidies on R&D intensity. influences. Specifically: First of all, there is a negative correlation between the implementation of the fiscal subsidy policy and the intensity of R&D. The reasons are as follows. First, because corporate R&D activities are characterized by long investment periods and slow returns, even if China releases favorable policies for innovation, corporate managers may still make R&D arrangements in accordance with existing initiatives. Second, since the observation years selected in the article are 2014 and 2016, the fiscal subsidy policy will not be able to quickly affect enterprises in 2016. Therefore, it cannot be seen that the implementation of fiscal subsidy policies will promote the R&D intensity of enterprises.

Secondly, the implementation of fiscal subsidy policies is positively related to innovation performance. The reason is as follows: Only when companies' R&D investment is quickly converted into intellectual property can they make up for the assets spent in the R&D process. After the implementation of the fiscal subsidy policy, China's innovation support for manufacturing companies will help companies accelerate the transformation of R&D results to a certain extent. Therefore, the article can see that after the implementation of the initiative, the development level of innovation performance of manufacturing companies will be higher than Non-manufacturing companies.

Finally, the article finds that while the fiscal subsidy policy promotes corporate innovation behavior, innovation cooperation plays an intermediary role in this influencing process.

6.2 Limitations and Future Research

Based on the investigation of the relationship between fiscal subsidy policies and the innovation behavior of manufacturing enterprises and the mediating effect of innovation cooperation in the relationship between the two, future research should be conducted in other industries, and the research on whether the Chinese conclusions are equally applicable to other industries. In addition, the investment tendency and marketization degree of business managers greatly influence innovation behavior, which is not tested in this study. Future research should consider these two aspects and test related mechanisms.

6.3 Conclusions

The article uses methods such as DID model and intermediary effect test. After empirical analysis of Chinese A-share listed manufacturing companies in 2014 and 2016, it is found that among Chinese manufacturing companies, government-provided financial subsidies have an impact on the innovation of companies. While innovation cooperation has played a mediating effect in the relationship between financial subsidies and R&D intensity, it has strengthened the impact of financial subsidies on R&D intensity.

The following enlightenment is obtained from the research conclusions: First, from the corporate level, in order to achieve the sustainable development of corporate R&D and innovation behaviors, Chinese companies should make full use of the open platform provided by the "Belt and Road Initiative" to actively respond to "going out" and The "introduction" initiative is to strengthen technology and knowledge cooperation with foreign companies, actively introduce other innovative resources, and seek a broader international market for the development of corporate R&D activities. At the same time, while manufacturing companies use financial subsidies to ensure the source of funds for independent research and development, they should also strive to guide the participation of external capital. With the continuous transformation and upgrading of manufacturing products, companies should also develop and manufacture products that meet demand from the product design level in accordance with market changes and consumer needs. At the same time, we should pay more attention to the transformation of research and development results, accelerate the marketization of products, promote the improvement of independent innovation, and improve the competitiveness of enterprises.

Second, from the perspective of fiscal subsidy policy, the government should adjust the method and amount of fiscal subsidy according to the different regions of the company and the size of the company under the premise of providing policy support. At the same time, it is necessary to monitor the use of subsidies throughout the entire process after subsidies enter the enterprise, improve the efficiency of the use of fiscal subsidies, and build a systematic evaluation mechanism for the use of fiscal subsidies to prevent enterprises from abusing fiscal subsidies. In addition, in addition to financial subsidies, the government should also provide more sources of funds for manufacturing companies to ensure that companies will not stop R&D due to lack of funds during the process of innovative R&D. The government's policy support should also be gradually diversified, and enterprises with excellent innovation performance can be rewarded, so as to increase the innovation income of enterprises in a disguised form.

Third, from the perspective of the innovative cooperation system, facing the continuous deepening of the "The Belt and Road", China should not only improve the manufacturing cooperation system, but also strengthen the construction of technology research and development, product transactions, investment and construction between China and the countries along the route. The cooperation information platform in other fields should not only introduce fiscal subsidy policies internally, but also externally encourage policies in the process of cooperation with countries along the "The Belt and Road", so as to create more convenient conditions for China's cooperation with manufacturing enterprises in countries along the route. .

References

[1] A, C. H. Y. , B, C. H. H. , & C, C. T. H. . (2012). Tax incentives and R&D activity: firm-level evidence from Taiwan. Research Policy, 41(9), 1578-1588.

[2] Ana Luísa Silva. (2020). Innovation in development cooperation: emerging trajectories and implications for inclusive sustainable development in the 21st century. Innovation and Development(53), 1-21.

[3] Bellucci, A., Pennacchio, L. , & Zazzaro, A.. (2019). R&D subsidies and firms' debt financing. CSEF Working Papers.

[4] Bronzini, R., & Piselli, P. . (2014). The impact of R&D subsidies on firminnovation. SSRN Electronic Journal, 45.

[5] Chiappini, R. , Demaria, S. , Montmartin, B. , & Pommet, S. . (2020). Can direct innovation subsidies relax SMEs' credit constraints? GREDEG Working Papers.

[6] Dieter Ernst, & Linsu Kim. (2001). Global production networks, knowledgediffusion, and local capability formation. Research Policy, 31(8), 1417-1429.

[7] Dyer, J. H. , & Singh, H. . (1998). The relational view: cooperative strategy and sources of interorganizational competitive advantage. Academy of Management Review, 23(4), 660-679.

[8] Dan Prud'homme. (2016). Dynamics of china's provincial-level specialization in strategic emerging industries. Research Policy.

[9] Guo, D. , Guo, Y. , & Jiang, K. . (2016). Government-subsidized R&D and firm innovation: evidence from china. Research Policy, 45(6), 1129-1144.

[10] Montmartin, B. , & Herrera, M. . (2015). Internal and external effects of R&D subsidies and fiscal incentives: empirical evidence using spatial dynamic panel models. Research Policy, 44(5), 1065-1079.

[11] Mendi, P. , Monercolonques, R. , & Phillips, F. . (2020). Cooperation for innovation and technology licensing: empirical evidence from Spain. Technological Forecasting and Social Change, 154.

[12] Rosa, H. J. M. . (2011). Evaluating the impact of R&D tax credits on innovation: a microeconometric study on Canadian firms. Research Policy.

[13] Rubera, G. , & Kirca, A. H. . (2012). Firm innovativeness and its performance outcomes: a meta-analytic review and theoretical integration. Journal of Marketing, 76(3), 130-147.

[14] Soltanzadeh, J. , Elyasi, M. , Ghaderifar, E. , Soufi, H. R. , & Khoshsirat, M.(2019). Evaluation of the effect of R&D subsidies on Iranian firms' innovative behavior: reconceptualizing behavioral additionality. Journal of ence and Technology Policy Management, 11(1), 17-48.

[15] Sergio, G., & Lazzarini. (2013). Strategizing by the government: can industrial policy create firm-level competitive advantage?. Strategic Management Journal.

[16] Simona, & Mateu. (2017). Subsidies, financial constraints and firm innovative activities in emerging economies. Small Business Economics.

[17] Wu, R. , Liu, Z. , Ma, C. , & Chen, X. . (2020). Effect of government R&D subsidies on firms' innovation in China. Asian Journal of Technology Innovation, 28(1), 42-59.