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The Impact of China: U.S Trade Frictions on Chinese Enterprise Innovation

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Abstract: The trade frictions between the United States and China has brought great uncertainty and risk to the global economic development environment. Using the panel data of Chinese listed firms from 2009 to 2023, the Difference in Difference (DID) panel model and mediation effect model are employed to study the impact of the US-China trade frictions on firms' innovation. The empirical results show that the US-China trade friction has a negative impact on R&D innovation of Chinese firms. Further research finds that US-China trade friction has a stronger negative effect on R&D innovation of non-state-owned firms and the central and western regions. Finally, this paper finds that US-China trade friction will reduce corporate technology innovation by exacerbating corporate financing constraints.

Keywords: US-China Trade Frictions; Corporate Innovation; R&D Investment; Financing Constraints.

1. Introduction

On 18 August 2017, the US government launched a "301 investigation" into China under an executive order signed by the Trump administration, which became the trigger for the trade frictions between the U.S. and China. In 2019, China and the U.S. reached a "phase one" trade agreement to hold off on tariff increases. However, in 2021, with the Biden administration coming to power, the US government continued Trump's trade policy, including restrictions on the export of semiconductors and chips to China. Therefore, the wave of globalization is developing so rapidly, how to ensure that the independent innovation ability of Chinese enterprises is not affected by the general environment. How Chinese enterprises can break through the uncertainty and risk brought about by the trade frictions have aroused widespread concern among scholars.

Most of the academic research on US-China trade focuses on the macro and globalization level, analyzing the impact of regionalized trade and international trade. Some scholars have studied the impact of the US-China trade frictions on global trade (Badar et al., 2019), as well as the possible impact of the US-China trade frictions on the economy (Li, 2018). Some scholars have analyzed the trade dispute between the two countries in terms of the transformation of the relationship between China and the United States from this (Wang & Zeng, 2020). The few micro-level discussions have focused on the employ market and capital market, lack of exploration of the US-China trade frictions enterprises and inconsistent conclusions. This makes the uncertainty caused by the current round of trade frictions more confusing in terms of independent innovation of Chinese enterprises, how to overcome the uncertainty and riskiness of the environment becomes more relevant.

The contributions of this paper are as follows. Firstly, using panel data from Chinese listed firms spanning 2009-2023, this paper constructs a DID model and a mediation effect model for empirical analysis. The empirical results show that US-China trade friction has a negative impact on R&D innovation of Chinese firms. Second, this paper finds that US-China trade friction has a stronger negative effect on R&D innovation of non-state-owned firms in the eastern part of China, which enriches the literature on the impact of the US-China trade frictions on the regionalization of the trade frictions at the micro level. Finally, this paper discovers that US-China trade friction will reduce firms' technology innovation by exacerbating firms' financing constraints, which will enrich new perspectives of research on firms' financing and technology innovation.

The rest of the paper are organized as follows. the section 2 is the literature review and research hypotheses. The section 3 is the research design. The section 4 is the analysis of empirical results. The last section is the conclusions.

2. Literature Review and Research Hypotheses

In the current round of trade frictions, U.S. technology export controls on China, especially in high-tech areas such as semiconductors, artificial intelligence and 5G communications, have restricted Chinese companies' access to advanced technologies and equipment. Some restrictions have directly impacted the R&D capabilities and innovation progress of Chinese firms (Gu et al.,2024). Continued trade friction has created uncertainty in the policy and market environments. More firms are more cautious in their long-term R&D and ongoing trade frictions have created uncertainty in the policy and market environment. The trade frictions have forced firms to reevaluate and realign their global supply chains. Such adjustments may lead to short-term supply chain instability, affecting the continuity of production and R&D, and therefore the number of innovative products will decrease volume by volume (Mao and Görg,2020). As a result, this paper proposes the hypothesis:

H1: China-US trade friction has a negative impact on R&D innovation of Chinese enterprises.

In China, state-owned firms are often perceived to have a higher risk-taking capacity. Non-state-owned enterprises usually face higher business risks (Bown 2021). The trade friction between China and the US has increased market uncertainty, non-state-owned enterprises may be more cautious in R&D investments. State-owned enterprises tend to be able to obtain more direct or indirect support from the

government (Wang and Song, 2019), including financial subsidies and policy concessions, which help to mitigate the negative impact of trade frictions (Wang and Song, 2019; Zhang, 2021). Thirdly, SOEs usually have stronger market power and bargaining power due to their larger scale and high market share, which makes them better able to protect their R&D and innovation activities from external shocks in the face of U.S.-China trade frictions (Boylan et al., 2020). As a result, this paper proposes the hypothesis:

H2: US-China trade frictions have a stronger dampening effect on R&D innovation in non-state-owned firms.

Due to its geographical location and historical development, the eastern region has a higher degree of economic openness and outward orientation, and is more closely linked to international trade. Therefore, the external impact brought by the trade friction between China and the United States has a more direct and significant impact on enterprises in the eastern region (Wang et al., 2022). The eastern region is relatively concentrated in innovation resources, including talent, capital, technology and so on. US-China trade friction may affect the flow and allocation of these innovative resources, which inhibits the R&D and innovation capabilities of enterprises (Zhao et al., 2022). China-US trade friction may lead to more complex policy environment and market expectations for enterprises in the eastern region, increasing the uncertainty of business operations and thus affecting the willingness of enterprises to invest in long-term R&D and innovation (Liu et al. 2022). As a result, this paper proposes the hypothesis:

H3: China-US trade friction has a stronger inhibitory effect on R&D innovation of enterprises in the eastern region.

The issue of China-US trade friction constraining enterprises innovation is becoming more and more significant. First, export restrictions affecting enterprise revenues and cash flows, trade frictions may lead to export restrictions for Chinese enterprises, affecting their sales and revenues. As technology innovation often requires large upfront investments, a reduction in corporate revenues will directly affect their R&D budgets and innovation capacity (Zhou et al., 2021). Second, Trade frictions between the United States and China may lead to supply chain disruptions or cost increases, affecting the production and operational efficiency of enterprises. For technology innovation projects that rely on specific raw materials or components, supply chain instability may increase R&D costs and time, thereby inhibiting innovation activities (Chi et al., 2024). Third, Trade frictions may lead to changes in policy and market environments, which may force firms to reassess their innovation strategies and investment decisions. In some cases, firms may choose to postpone or cancel green technology innovation projects in response to short-term financial pressures arising from trade frictions (Zhang, 2021). As a result, this paper proposes the hypothesis:

H4: China trade frictions may dampen corporate technology innovation by exacerbating corporate financing constraints

3. Research Design

3.1. Data

In this paper, China's listed companies in Shanghai and Shenzhen were selected as the research sample from 2009-2023, and the data were obtained from CSMAR database and Wind database. And the data were processed to exclude ST* and ST company samples; exclude samples with missing key variables. In order to mitigate the impact of extreme values, a 1 per cent shrinkage (Winsorize) process was carried out to obtain the panel data of listed companies-year. The trade friction between China and the United States involves the retail industry, agricultural railway transport industry, food manufacturing industry, etc. (Li et al. 2020) Mentioned food manufacturing industry, transport industry, etc.

3.2. Variable Selection

3.2.1. Explained Variables

Enterprise patents (Lnpatents). Drawing on previous references, the article uses the number of patent applications of listed companies to measure corporate technology innovation, and the values are logarithmically processed.

Enterprise R&D investment (Lnrdsepnd). The article uses the amount of R&D investment of listed companies as an indicator of corporate innovation investment, and the values are logarithmically processed.

3.2.2. Mediating Variables

Financing constraints (SA) is an indicator used to measure the degree of corporate financing constraints, which refers to the difficulties or limitations faced by the company in obtaining external funds. The specific formula of financing constraint SA is as follows:

$$SA = -0.737 \times Size + 0.043 \times Size^2 - 0.04 \times Age$$

where Size is the natural logarithm of firm size.

Age is the length of time the firm has been in existence.

3.2.3. Explanatory Variables

Whether or not affected by the US-China trade friction (DID), affected by the US-China trade friction policy is 1, otherwise it is 0. Before affected is 1, otherwise it is 0.

Firm size (Lnsize) representing the size of the firm, the logarithmization of firm size is used to eliminate differences between firms of different sizes, making the analysis more comparable.

Gearing ratio (Lev) measures the ratio of a firm's total liabilities to its total assets. The gearing ratio reflects the debt level of the enterprise, when the gearing ratio is too high, the enterprise faces higher pressure to repay debts.

Shareholding Concentration (Topten) calculates the total proportion of shares held by the top ten shareholders of a company. The proportion of shares held by the top ten shareholders reflects the shareholding structure of a company, which has a certain impact on corporate governance and enterprise value.

Price-to-book ratio (PB) is a financial indicator that measures the relationship between the market value of a listed company and its book value. PB reflects the market price investors pay for each unit of book value.

Separation of powers (Separation): Separation of powers is the distribution of power between the owners and operators of a business. Separation of powers may reflect the soundness of a company's governance structure, which has an impact on business decisions and enterprise value.

Whether the Big4 accounting firms audit (Big4): the four largest professional services networks in the world, which are: PricewaterhouseCoopers (PwC), Deloitte, Ernst & Young (EY) and KPMG. The Big Four accounting firms have extensive influence and authority in the areas of audit, tax, consulting and financial advisory services.

A business operating year (lnage) is the number of years a business has been in continuous operation since its inception. It is an important indicator that reflects the experience,

resources and credibility that a business has accumulated in the market.

The specific variables are shown in Table 1:

Table 1. Description table of variables

type	variables	notation	Definitions/formulas
Explained variables	Corporate Patents	Lnpatents	Using the number of patent applications filed by listed companies to measure corporate technology innovation and logarithmic treatment of the values.
	Enterprise R&D investment	Lnrdsepnd	The amount of R&D investment by listed companies was used as an indicator of firms' investment in innovation, and logarithmic treatment of the values.
Explanatory variables	Whether it is affected by the trade friction between China and the United States	DID	policy*post interaction term, 1 if affected by U.S.-China trade friction policy, 0 otherwise. 1 before affected, 0 otherwise.
Intermediary variable	Financial constraint	SA	An indicator used to measure the extent of a firm's financing constraints, which are the difficulties or limitations faced by a firm in obtaining external financing.
Control variable	Firm size	Lnsize	Natural logarithm of total company assets
	debt-to-asset ratio	Lev	Gearing ratio = total liabilities/total assets
	Ownership concentration	Topten	Shares held by top ten shareholders/total share capital
	Market-to-book ratio	PB	Market price per share/book value per share
	Separation of ownership and control ratio	Separation	(Control - cash flow rights) / cash flow rights
	Big four accounting firms audit	Big4	whether it is audited by a Big Four accounting firm
	Financial year	lnage	firm age
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Explanatory variables	Whether it is affected by the trade friction between China and the United States	DID	policy*post interaction term, 1 if affected by U.S.-China trade friction policy, 0 otherwise. 1 before affected, 0 otherwise.
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Control variable	Firm size	Lnsize	Natural logarithm of total company assets
	debt-to-asset ratio	Lev	Gearing ratio = total liabilities/total assets
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	Market-to-book ratio	PB	Market price per share/book value per share
	Separation of ownership and control ratio	Separation	(Control - cash flow rights) / cash flow rights
	Big four accounting firms audit	Big4	whether it is audited by a Big Four accounting firm
	Financial year	lnage	firm age

3.3. Model

This paper adopts a Difference in Difference (DID) regression model, and selects the number of patents ($Lnpatents_{i,t}$) and enterprise innovation investment ($Lnrdsepnd_{i,t}$) as the explanatory variables, and selects whether it is affected by the US-China friction ($DID_{i,t}$) as the explanatory variables. The control variables include gearing ratio ($Lev_{i,t}$), company size ($Size_{i,t}$), equity concentration ($Topten_{i,t}$), market-to-book ratio ($PB_{i,t}$), two rights separation rate ($Separation_{i,t}$), whether the four major audits ($Big4_{i,t}$), and the company's operating year ($Age_{i,t}$) to construct the model as follows:

$$Lnpatents_{i,t}(Lnrdsepnd_{i,t}) = \alpha_i + \beta_1 DID_{i,t} + \beta_i Controls_{i,t} + Indu_i + Year_t + \varepsilon_{it} \quad (1)$$

where $Controls_{i,t}$ is the control variable, Industry and Year represent industry and year fixed effects, i represents enterprise, t represents year, and ε represents the residual term.

In order to analyze the mechanism of carbon trading pilot policy on enterprise green technology innovation, this paper uses the corporate financing constraint (SA) mediating variable to check whether the two play a mediating effect

between carbon trading pilot policy and enterprise technology innovation. The causal step method is used to test the mediating effect, in which the causal step method testing process is as follows:

$$Lnpatents_{i,t}\left(Lnrdsepnd_{i,t}\right) = \alpha_i + \beta_2 DID_{i,t} + \beta_i Controls_{i,t} + Indu_i + Year_t + \varepsilon_{it} \quad (2)$$

$$SA_{i,t} = \alpha_i + \beta_3 DID_{i,t} + \beta_i Controls_{i,t} + Indu_i + Year_t + \varepsilon_{it} \quad (3)$$

$$Lnpatents_{i,t}\left(Lnrdsepnd_{i,t}\right) = \alpha_i + \beta_4 DID_{i,t} + \omega FC_{i,t} + \beta_i Controls_{i,t} + Indu_i + Year_t + \varepsilon_{it} \quad (4)$$

The test is carried out according to the above steps to determine whether there is a mediation effect based on the significance of the regression coefficients. Specific judgment criteria are: (1) If the regression coefficient β_2 is significant, the next test is conducted, if it is not significant, it is considered that there is no mediation effect. (2) If β_3, ω are both significant, then the existence of mediation effect. (3) If the regression coefficient ω is not significant, it means that there is a full mediation effect (strong mediation effect); if the regression coefficient β_4 is significant and $|\beta_4|<|\beta_2|$, the mediation effect is said to be partial mediation effect (weak mediation effect).

4. Empirical Research

4.1. Descriptive Statistics

Table 2 demonstrates the descriptive statistics of each variable. The maximum, minimum, mean and standard deviation of the variables are statistically analyzed so as to avoid excessive data volatility and large extreme deviation causing bias to the regression results. The standard deviation of all variables is less than the extreme deviation, indicating that there are some differences in the variables between different enterprises.

Table 2. Descriptive Statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
Lnpatents	30356	0.461	1.288	0	5.521
Lnrdsepnd	30356	13.032	8.128	0	25.025
DID	30356	0.247	0.431	0	1
Lev	30356	0.459	0.202	0.067	0.915
Topten	30356	57.669	15.659	22.53	90.9
PB	30356	4.159	3.386	1.191	25.025
Seperation	30356	5.077	7.677	0	29.337
Big4	30356	0.066	0.248	0	1
Lnage	30356	2.946	0.339	1.792	3.555

4.2. Correlation Analysis

In this paper, the correlation test analysis was carried out between the selected variables two by two, and the results of the correlation analysis are shown in Table 3. According to the results can be seen, the correlation coefficient between the variables, most of the values are below 0.4, indicating that the degree of correlation between the variables selected in this paper is not high, and there is no serious multicollinearity.

Table 3. Correlation analysis Matrix of correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Lnpatents	1.000								
(2) Lnrdsepnd	0.206	1.000							
(3) DID	0.026	0.187	1.000						
(4) Lev	0.003	-0.109	-0.115	1.000					
(5) Topten	0.004	0.075	-0.022	-0.066	1.000				
(6) PB	-0.021	-0.092	-0.058	0.387	-0.143	1.000			
(7) Seperation	0.005	-0.009	-0.015	0.050	0.074	0.008	1.000		
(8) Big4	0.028	0.036	-0.023	0.087	0.193	-0.040	0.081	1.000	
(9) Lnage	-0.058	-0.037	0.252	0.106	-0.181	0.049	0.024	0.001	1.000

4.3. Benchmark Regression

Table 4 demonstrates the results of the benchmark regression, in which the explanatory variable in column (1) (2) is Lnpatent (Corporate Patent), and the other explanatory variable in column (3) (4) is Lnrdsepnd (Enterprise R&D investment).

From the regression results in column (2), it can be seen that the coefficient of US-China trade friction on Corporate Patent (Lnpatent) is -0.047, and it is significant at the 5% level, which indicates that US-China trade friction has a negative effect on Corporate Patent.

In addition, as can be seen from column (4) of Table 4, the coefficient of enterprise R&D investment (Lnrdsepnd) is -1.505 and is significant at the 1% level, indicating that US-China trade friction has a significant negative impact on enterprise R&D investment. And the coefficient of the gearing ratio (Lev) is 2.35 and significant at the 1% level,

indicating that the US-China trade friction has a negative effect on corporate R&D investment. Due to the cost pressures generated by trade frictions, especially for export-dependent firms, they may need to use their limited resources to cope with direct impacts such as tariff increases rather than investing in proprietary R&D. Moreover, the coefficient on whether it is a Big 4 accounting service (Big4) is 1.118 and significant at the 1% level, indicating that auditing firms through a Big 4 accounting firm is more conducive to firms' R&D investment. The audit service of the Big 4 accounting firms is equivalent to providing a "medical report" for the financial health of the enterprise, which not only allows investors and other stakeholders to have a clearer understanding of the financial status of the enterprise and reduces the risk of information asymmetry faced by them, but also through the professional insight of the Big 4, the enterprise can obtain valuable management recommendations and improvement programmes, thus facilitating its R&D investment.

Table 4. Baseline Regression

	(1)	(2)	(3)	(4)
	Lnpatents	Lnpatents	Lnrdsepnd	Lnrdsepnd
DID	-0.0573**	-0.0470*	-1.637***	-1.505***
	(-2.13)	(-1.75)	(-13.63)	(-12.77)
Lev		0.337***		2.35***
		(7.94)		(12.61)
Topten		0.000106		0.0275***
		(0.21)		(12.55)
PB		-0.0161***		-0.197***
		(-6.68)		(-18.52)
Seperation		-0.000326		0.00136
		(-0.34)		(0.33)
Big4		0.155***		1.118***
		(5.16)		(8.45)
Lnage		-0.0889***		-2.011***
		(-3.31)		(-17.02)
Constant	0.161**	0.313***	3.633***	7.313***
	(2.32)	(2.96)	(11.74)	(15.73)
Obs	30356	30356	30356	30356
R^2	0.0508	0.0546	0.5233	0.5413

Notes: t statistics in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4.4. Mediating Effect Model Regression Results

Table 5. The financing constraint mechanism test

	(1)	(2)	(3)
	Lnrdsepnd	SA	Lnrdsepnd
DID	-1.505***	0.00943***	-1.486***
	(-12.77)	(3.66)	(-12.61)
SA			-2.009***
			(-7.66)
Lev	2.350***	-0.0475***	2.255***
	(12.61)	(-11.65)	(12.08)
Topten	0.0275***	-0.000915***	0.0257***
	(12.55)	(-19.08)	(11.65)
PB	-0.197***	-0.00536***	-0.207***
	(-18.52)	(-23.05)	(-19.38)
Seperation	0.00136	0.000691***	0.00275
	(0.33)	(7.55)	(0.66)
Big4	1.118***	-0.126***	0.865***
	(8.45)	(-43.47)	(6.35)
Lnage	-2.011***	0.683***	-0.639***
	(-17.02)	(264.16)	(-2.98)
Constant	7.313***	1.941***	11.21***
	(15.73)	(190.88)	(16.27)
Obs	30356	30356	30356
R^2	0.5413	0.7961	0.5422

*Notes: t statistics in parentheses * p < 0.1, ** p < 0.05, *** p < 0.01*

This paper chooses the degree of financing constraints (SA) index as the mediating variable, the larger the absolute value of the SA index, the greater the financing constraints of the enterprise.

From the regression results in column (1) of Table 5, it can be seen that the coefficient of enterprise R&D investment (Lnrdsepnd) on enterprise value is -1.505, and it is significant at 1% significance level, which indicates that US-China frictions have a negative effect on the enhancement of enterprise value.

The results in column (2) of Table 5 show that the coefficient of financing constraints (SA) is 0.00943 and is significant at 1% level of significance, indicating that US-China frictions increase financing constraints of firms.

After adding both US-China trade friction (DID) and financing constraints (SA) in column (3), the coefficient of SA is 0.00943 and is significant at 1% significance level. the coefficient of DID increase from -1.505 to -1.486 and is still significant, which indicates that the financing constraints play a partly negative mediating role between US-China frictions on corporate innovation. It promotes corporate technology innovation by alleviating corporate financing constraints.

4.5. Heterogeneity Analysis

4.5.1. Heterogeneity Analyses based on Shareholding

Based on the analysis of the nature of equity, columns (1) and (2) of Table 8, the nature of the enterprise is divided into state-owned enterprises and non-state-owned enterprises for the sub-sample regression, the empirical results found that the coefficient of DID of state-owned enterprises is 0.0455, and is not significant; the DiD coefficient of non-state-owned enterprises is -0.0643, which is significant, indicating that the inhibitory effect of the U.S.-China trade is more obvious to the enterprises that are not state-owned enterprises.

The possible explanation for this is that state-owned enterprises may receive more support and protection from the government, including financial subsidies, tax incentives and other measures, which helps to mitigate the negative impact of the trade frictions. Non-state-owned enterprises may lack the same level of policy support. SOEs tend to be involved in key sectors and strategic industries such as infrastructure, energy and communications, which may not be direct targets of trade frictions. Non-SOEs may be more involved in consumer goods and general manufacturing, which are more vulnerable to the direct impact of tariff increases. In addition, large SOEs tend to be bigger and possess greater bargaining power and negotiating leverage, enabling them to secure more favorable terms in their dealings with US firms. Non-SOE may be smaller and have relatively weaker bargaining power, making them more vulnerable in trade disputes. As a result, the U.S.-China trade frictions have a more significant dampening effect on non-SOEs.

Table 6. Heterogeneity analyses based on shareholding

	(1) state-owned	(2) non-state-owned
	Lnpatents	Lnpatents
DID	0.0455	-0.0679*
	(1.07)	(-1.94)
Lev	0.310***	0.146***
	(4.49)	(2.64)
Topten	0.00174**	-0.00140**
	(2.12)	(-2.24)
PB	-0.0215***	-0.00947***
	(-5.41)	(-3.13)
Seperation	-0.00499***	0.00309**
	(-3.24)	(2.53)
Big4	0.129***	0.0834*
	(3.24)	(1.73)
Lnage	-0.250***	-0.103***
	(-5.12)	(-3.18)
Constant	0.535***	0.547***
	(3.03)	(4.05)
Obs	13415	16941
R^2	0.0864	0.0419

*Notes: t statistics in parentheses * p < 0.1, ** p < 0.05, *** p < 0.01*

4.5.2. Based on the Analysis of Reginal Development Level Heterogeneity

Based on the analysis of regional differences, columns (1) and (2) of Table 8, the regional differences are divided into the eastern region and the central and western regions for the sub-sample regression, and the empirical results find that the coefficient of DID the eastern region is -0.0636 and significant, and that the coefficient of DID the central and western regions is 0.00408 and non-significant.

Columns (3) and (4) of Table 8, which also divide the regional differences into eastern and midwestern regions for the sub-sample regression, empirically find that the coefficient DID for the eastern region is -1.566 and significant. The coefficient of DID for the midwestern region is -1.175 and significant. In comparison, the suppression effect is more significant for the eastern region.

The paper indicates that for Lnpatents, the inhibitory effect of US-China trade on enterprises in the eastern region is more significant compared to those in the central and western regions. However, for Lnrdsepnd, the inhibitory effect on firms in both the Midwest and the East is significant. This may be explained by the fact that the economy of the eastern region is more dependent on exports, and many enterprises are closely linked to the international market. The export reduction or market access restrictions caused by US-China trade frictions have a greater impact on foreign trade enterprises and the related industrial chain in this region. Additionally, the eastern region is more developed in high-tech industries, and the restrictions on technology exports and

disputes over intellectual property rights due to US-China trade frictions have a greater impact on high-tech enterprises in the eastern region. Therefore, the US-China trade frictions have a more obvious inhibitory effect on enterprises in the eastern region than in the central and western regions

Table 7. Regional development level heterogeneity

	(1) East	(2) midwest	(3) East	(4) midwest
	Lnpatents	Lnpatents	Lnrdsepnd	Lnrdsepnd
DID	-0.0636*	0.00408	-1.566***	-1.175***
	(-1.86)	(0.09)	(-11.31)	(-5.42)
Lev	0.406***	0.272***	2.716***	1.993***
	(7.23)	(4.21)	(11.99)	(6.12)
Topten	-0.00114*	0.00156**	0.0227***	0.0282***
	(-1.76)	(1.99)	(8.70)	(7.15)
PB	-0.0131***	-0.0186***	-0.197***	-0.180***
	(-3.88)	(-5.52)	(-14.47)	(-10.58)
Seperation	0.00154	-0.00255*	0.00441	0.00307
	(1.24)	(-1.72)	(0.88)	(0.41)
Big4	0.148***	0.0547	1.245***	-0.0280
	(4.14)	(0.93)	(8.61)	(-0.09)
Lnage	-0.0795**	-0.103**	-1.910***	-1.864***
	(-2.42)	(-2.15)	(-14.43)	(-7.76)
Constant	0.530***	0.162	6.859***	6.915***
	(3.46)	(1.02)	(11.08)	(8.65)
Obs	19590	10766	19590	10766
R^2	0.0577	0.0584	0.5753	0.4974

*Notes: t statistics in parentheses * p < 0.1, ** p < 0.05, *** p < 0.01*

5. Conclusion

This paper selects panel data of Chinese listed companies from 2009-2023 as a research sample, and uses the DID model and mediation effect model to explore the impact of trade frictions on corporate innovation and the way it affects it. The empirical results show that U.S.-China trade friction has a negative impact on R&D innovation of Chinese firms, and U.S.-China trade friction has a stronger inhibition of R&D innovation of non-state-owned firms. In terms of regionalization, US-China trade friction has a stronger inhibition of R&D innovation of firms in the eastern region. In addition, this paper finds that U.S.-China trade friction will exacerbate the financing constraints of firms by increasing the heterogeneous firms' technology innovation. Specifically, the coefficient of US-China trade frictions on enterprises' patent applications is -0.047, and the coefficient on enterprises' R&D investment is -1.505 and significant.

Based on the conclusions of this paper. several policy recommendations are proposed to enhance the independent innovation capacity of Chinese enterprises in response to the instability and risks in the global order caused by trade frictions.

Firstly, the government should introduce incentives for R&D and innovation, such as tax breaks, R&D subsidies, and innovation funds. These measures will help enterprises mitigate the negative impacts of trade frictions. Additionally, establishing national or regional innovation platforms and promoting collaboration between enterprises and scientific research institutions can further enhance R&D and technological innovation.

Secondly, when formulating policies to support enterprise R&D and innovation, it is crucial to improve the efficiency of R&D processes and the rate at which innovation results are commercialized. Policies should account for regional differences, providing more support to enterprises in the eastern region while also promoting balanced development in the central and western regions. Encouraging cooperation between enterprises across these regions can facilitate the sharing of technology and innovation resources, achieving complementarities and enhancing overall innovation capacity.

Finally, the financial market system should be improved by broadening enterprise financing channels. Banks and other financial institutions should be encouraged to offer more credit support to innovative enterprises. Developing a multi-level capital market, including equity and bond financing, will help lower financing costs and improve the financing capacity of enterprises.

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