

Climate Risk Shock and the "Accelerator" Effect of Credit Financing Contraction

Moses Afopezi

University of Bamenda, Cameroon

Received: February 11, 2026

Accepted: March 15, 2026

Published: March 31, 2026

doi: 10.5296/ijaftr.v16i1.23860

URL: <https://doi.org/10.5296/ijaftr.v16i1.23860>

Abstract

Based on data from China's Annual Survey of Industrial Firms (2004–2013), this paper constructs a unique climate risk index to examine the impact of climate risk shocks on corporate credit financing. The results show that exogenous climate risk shocks trigger a "financial accelerator" effect, significantly suppressing corporate credit financing, especially for firms highly dependent on bank credit. Mechanism analysis reveals that climate risk primarily suppresses credit financing by reducing industrial output and sales revenue, and accelerating collateral depreciation. Heterogeneity analysis shows ownership and industry heterogeneity, while financial deepening helps mitigate the negative impact. Decision-makers should pay attention to the "financial accelerator" effect of climate risk, promote enterprises' climate resilience, optimize financial structures, and create a more favorable financing environment.

Keywords: Climate risk, Credit availability, Bank credit, Industrial firms

1. Introduction

In recent years, climate governance has become an important topic of international cooperation. However, due to the inherent "public goods" nature and "collective action" difficulties of this issue, coupled with the lack of effective coordination mechanisms, global climate governance still faces enormous challenges. In fact, climate risk has already caused severe damage to global sustainable development (Dafermos et al., 2018). According to the Global Climate Risk Index released by Germanwatch, from 2000 to 2019, more than 11,000 extreme climate events occurred globally, causing over 475,000 deaths and economic losses exceeding 2.56 trillion USD. Correspondingly, how to quantitatively assess the impact of climate risk on the financial system has been regarded as one of the most urgent economic policy challenges (Zhang S. et al., 2022).

The importance of climate risk in credit risk management and financial stability is increasingly prominent, attracting high attention from various parties. In May 2022, the European Central

Bank released the "Climate-Related Risk and Financial Stability Report." In October 2022, the US Financial Stability Oversight Council (FSOC) released the "Climate-Related Financial Risk Report," emphasizing that climate change is a threat to financial stability. The People's Bank of China also explicitly proposed in the "China Financial Stability Report (2022)" to incorporate climate change-related risks into the macroprudential policy framework and encourage financial institutions to assess and manage them. Concurrently, various commercial institutions are incorporating climate risk into their credit risk management frameworks. For example, Moody's Analytics announced in March 2022 that it would introduce climate risk into its credit lifecycle management platform to quantitatively assess the impact of climate risk on customer credit quality.

Many studies have focused on how climate risk potentially affects the stability of macroeconomy and financial systems (Chen G. et al., 2022; Cortés and Strahan, 2017; Dietz et al., 2016). For example, from the asset pricing perspective, a growing body of research incorporates climate risk factors and explores their impact mechanisms on micro-enterprises, which has been quite insightful (Zhang S. et al., 2022; Kahn et al., 2021; Sautner et al., 2023). However, overall, academic research on climate risk still lags behind practical progress. On the one hand, current research mostly takes a macro perspective, with relatively insufficient research on how micro-level climate risk affects corporate investment and financing behavior. On the other hand, existing literature on the mechanisms of climate shock impacts often inclines to qualitative analysis, with divergent views and a lack of sufficient empirical evidence. Although Chinese banks and other financial institutions are highly concerned about climate issues such as carbon peak and carbon neutrality, the specific pathways through which climate risk affects the economy remain unclear, and progress at the technical operational level still needs strengthening. From the enterprise perspective, the impact of climate shocks on the financing availability of industrial firms still lacks a complete analytical framework and empirical support.

To this end, following the method of Sautner et al. (2023) (Sautner et al., 2023), this paper constructs a unique climate risk indicator and explores the transmission mechanisms and differential effects of climate risk on corporate credit financing from the classic perspective of credit availability theory. The research shows that climate risk reduces corporate financing availability by lowering industrial output and sales revenue and accelerating fixed asset depreciation, triggering the "financial accelerator" mechanism. Decision-making departments should pay full attention to the "financial accelerator" effect of climate risk on enterprise operations, help enterprises enhance their climate risk response capabilities, optimize financial structures, and create a favorable financing environment for enterprises.

2. Theoretical Review and Research Hypotheses

2.1 Climate Risk and Corporate Credit Financing Availability

The precise pricing of climate risk has significant practical implications in the financial field and is a current focus of academic attention. Climate risk, which is highly valued by numerous institutional investors, is gradually becoming a key variable affecting corporate financing (Krueger et al., 2020). Many studies have confirmed that stock returns can absorb climate risk

pricing factors (Hong et al., 2019; Huynh et al., 2022; Bansal et al., 2016). However, due to insufficient disclosure of climate-related information, markets find it difficult to fully assess climate risk, and the pricing of climate risk is generally low globally. This pricing bias further exacerbates the problem of market failure (Kahn et al., 2021). In contrast, the banking sector, as an institution vulnerable to climate risk shocks, plays a pivotal "bellwether" role in addressing climate change practices. As extreme climate events become more frequent, climate risk information will receive increasing attention and be more incorporated into bank loan pricing considerations.

Banks' attention to climate risk sends positive signals to corporate clients, helping to shape good corporate image and reputation and improve loan portfolio quality (Bernstein et al., 2019). Additionally, some studies quantify the impact of climate risk on credit financing and the associated complex economic effects from the bank perspective. For instance, climate risk shocks lead to firms located in high-risk areas facing higher loan interest rates (Kahn et al., 2021). When a country has high climate vulnerability or weak climate resilience, its sovereign debt costs may rise substantially (Painter, 2020). Cities and counties vulnerable to climate change need to pay higher underwriting fees and financing costs when issuing municipal bonds (Custódio et al., 2022).

It can be seen that climate risk shocks have multiple negative effects on corporate financing behavior. In China's context, bank credit is the primary financing method for enterprises, and changes in financing conditions directly affect the sustainability of enterprise operations. Mechanistically, extreme weather damages loan collateral values, forcing financial institutions to reassess debt risk. Meanwhile, stricter climate policies and energy efficiency standards may increase the credit risk faced by banks. On the one hand, as economic losses from climate risk events continue to increase, banks are more motivated to incorporate climate risk into their credit evaluation processes, thereby raising the threshold for corporate access to credit. On the other hand, the continuous progress of financial technology provides banks with richer information acquisition channels, making their quantitative assessment and monitoring of climate risk more sensitive. When facing climate shocks, banks often proactively take action by reducing credit shares in regions with larger climate risk exposures to achieve rebalancing of credit asset allocation. Based on the above analysis, the following hypothesis is proposed:

H1: Climate risk shocks will suppress corporate credit financing availability.

2.2 Research on the Mechanisms of Climate Risk Affecting Corporate Credit Financing

Some literature deeply explores the mechanisms of climate shocks on enterprise management behavior. First, increased climate risk raises the uncertainty faced by enterprises, suppressing the improvement of total factor productivity and leading to declining potential output (Liu B. et al., 2022; Dell et al., 2012). Climate risk may prompt firms located in harsh climate regions to adopt more conservative financial strategies, such as increasing cash reserves, issuing long-term debt, and reducing cash dividends, to resist potential climate threats (Huang et al., 2022). This indicates that climate risk may suppress the expansion behavior of enterprises, leading them to adopt more conservative business strategies. Cross-country data studies have also reached similar conclusions (Javadi and Masum, 2021). Climate risk shocks make firms

more inclined to maintain lower leverage and reduce business expansion activities (Ginglinger and Moreau, 2023). Research also finds that in countries with larger climate risk exposures, corporate managers have incentives to engage in earnings management, attempting to conceal risks by adjusting earnings (Pankratz et al., 2023).

Second, extreme climate risk events may damage enterprise fixed assets such as factory buildings and equipment, reducing potential labor output, thereby affecting enterprise production efficiency (Brown et al., 2021). For example, abnormal seasonal temperature fluctuations adversely affect industrial output and revenue (Addoum et al., 2023; Dell et al., 2012). Additionally, extreme weather may lead to increased corporate sales costs and various expenses, raising management costs and reducing operating revenue (Zhang and Liu, 2022). Finally, climate risk may also damage corporate capital structure, reduce profitability and liquidity, and increase the probability of loan default (Cortés and Strahan, 2017).

Thus, changes in climate risk directly affect enterprise operational decisions and production efficiency. First, when dealing with climate risk shocks, enterprises tend to adopt more stable business strategies, leading to increased potential operating costs, weakened innovation momentum, ultimately manifesting as declining output efficiency and value. Second, climate shocks not only negatively affect corporate financing behavior and production operations but also weaken market demand and reduce the consumption capacity of market entities. Meanwhile, extreme weather also damages corporate sales channels and operating environments, raising sales management costs and leading to declining product sales revenue. When corporate industrial output and sales capacity are weakened, this is perceived as a signal of deteriorating business conditions, leading banks to reduce credit lines, thereby affecting corporate credit financing capacity. Finally, climate risk shocks will accelerate the depreciation of corporate fixed assets, causing fluctuation in collateral values. When facing the above situations, banks will reduce their credit supply to enterprises, triggering the "financial accelerator" mechanism. Based on this, the following research hypotheses are proposed:

H2: Climate risk suppresses corporate credit financing by reducing industrial output.

H3: Climate risk suppresses corporate credit financing by reducing sales revenue.

H4: Climate risk suppresses corporate credit financing by accelerating fixed asset depreciation (collateral valuation channel).

3. Indicator Construction and Research Design

3.1 Data Sources

Meteorological data used in the empirical research come from the National Meteorological Science Data Center. Enterprise data come from China's Annual Survey of Industrial Firms (ASIF), whose sample subject comprises small and medium industrial enterprises with strong representativeness (Li G. et al., 2016). Since the core indicator of bank credit calculation involves accounts payable, which was only formally provided from 2004, the research sample period is 2004–2013. Following existing research, considering the poor data quality of 2010 and the limited enterprise samples from Tibet, these were excluded from the sample. Other

macroeconomic data come from the China Statistical Yearbook. To improve data accuracy, following existing research (Nie H. et al., 2012), the industrial enterprise data undergo normal processing: samples with less than 3 consecutive years and missing core indicators are excluded, and all continuous variables are winsorized at the 1% level.

3.2 Indicator Construction

Existing literature has not reached a consensus on how to construct a climate risk index. The renowned environmental think tank Germanwatch uses climate event fatalities and GDP losses to construct the Global Climate Risk Index (Dafermos et al., 2018). However, these indicators emphasize economic losses from climate events and may not truly reflect the intensity of climate risk itself. Following existing research (Kahn et al., 2021; Sautner et al., 2023), this paper constructs a climate risk index for Chinese provinces from a meteorological perspective. Specifically, climate risk is divided into five sub-indicators: high-temperature, low-temperature, flood, typhoon, and drought risks—all common climate risks in China with strong representativeness. On this basis, the entropy method is used to assign weights to each indicator and calculate the composite index. The sub-indicators are as follows:

(1) High-Temperature Risk. Based on daily maximum temperature (T_{max}), daily minimum temperature (T_{min}), and high-temperature duration at each weather station, the high-temperature index is calculated. First, daily maximum and minimum temperatures are divided into four levels:

T_{max} level: 1 if $T_{max} \geq 38^{\circ}\text{C}$; 2 if $35^{\circ}\text{C} \leq T_{max} < 38^{\circ}\text{C}$; 3 if $32^{\circ}\text{C} \leq T_{max} < 35^{\circ}\text{C}$; 4 if $T_{max} < 32^{\circ}\text{C}$. T_{min} level: 1 if $T_{min} \geq 26^{\circ}\text{C}$; 2 if $24^{\circ}\text{C} \leq T_{min} < 26^{\circ}\text{C}$; 3 if $20^{\circ}\text{C} \leq T_{min} < 24^{\circ}\text{C}$; 4 if $T_{min} < 20^{\circ}\text{C}$. The monthly high-temperature index (HTI) at each station is: $\text{HTI} = (1/n_days) \Sigma(\text{days with } T_{max} \geq 35^{\circ}\text{C or } T_{min} \geq 25^{\circ}\text{C}) / \text{total days}$. The station-level HTI is averaged by province and year to obtain the provincial annual high-temperature index.

(2) Low-Temperature Risk. Freezing disaster reflects sharp temperature drops over a sustained period. The 5-day average temperature change ($\Delta T5$) is compared with its standard deviation (σT). Abnormal cooling (CF) is classified into four levels: Level 1 if $\Delta T5/\sigma T \leq -2$; Level 2 if $-2 < \Delta T5/\sigma T \leq -1.5$; Level 3 if $-1.5 < \Delta T5/\sigma T \leq -1$; Level 4 if $\Delta T5/\sigma T > -1$. The monthly low-temperature index (LTI) is: $\text{LTI} = \Sigma(\text{CF} \times (T5 - \mu T5) / \sigma T) / 6$, where $T5$ is the 5-day average and $\mu T5$ is the 20-year average for that period. Station-level LTI is averaged by province and year.

(3) Flood Risk. Based on daily precipitation and rainfall duration, rainfall events are classified into four levels: Level 1 if precipitation (P) $\geq 250\text{mm}$ and duration (D) ≥ 3 days; Level 2 if $100 \leq P < 250\text{mm}$ and $2 \leq D < 3$ days; Level 3 if $50 \leq P < 100\text{mm}$ and $D \geq 2$ days; Level 4 if $P < 50\text{mm}$. The monthly flood index (FI) at each station is: $\text{FI} = (1/n_days) \Sigma(\text{flood level})$. Station-level FI is averaged by province and year.

(4) Typhoon Risk. Given that typhoons are generally accompanied by flooding, the typhoon index is constructed from daily precipitation and maximum wind speed at each station. Wind speed (WS) is divided into five levels: 1 if $WS < 10.8\text{m/s}$; 2 if $10.8 \leq WS < 13.9\text{m/s}$; 3 if $13.9 \leq WS < 17.2\text{m/s}$; 4 if $17.2 \leq WS < 20.8\text{m/s}$; 5 if $WS \geq 20.8\text{m/s}$. When the wind level (W) is not

zero, precipitation (P) is divided into five levels: 1 if $P < 10\text{mm}$; 2 if $10 \leq P < 100\text{mm}$; 3 if $100 \leq P < 150\text{mm}$; 4 if $150 \leq P < 200\text{mm}$; 5 if $P \geq 200\text{mm}$. The daily typhoon index (TI) = $0.7 \times W + 0.3 \times P$. Station-level TI is averaged by province and year.

(5) Drought Risk. The self-calibrating Palmer Drought Severity Index (scPDSI) is used to measure regional drought. Following the national standard "Classification of Meteorological Drought," drought grades are classified into five categories: 1 if $\text{scPDSI} > -1$ (normal); 2 if $-2 < \text{scPDSI} \leq -1$ (mild); 3 if $-3 < \text{scPDSI} \leq -2$ (moderate); 4 if $-4 < \text{scPDSI} \leq -3$ (severe); 5 if $\text{scPDSI} \leq -4$ (extreme). The annual drought index for each city is the drought grade. City-level data are averaged by province.

Finally, the entropy method synthesizes the five sub-indicators into a comprehensive climate risk index (CR) for each province-year.

3.3 Variable Selection and Model Specification

(1) Dependent Variable. Since the industrial enterprise data do not directly disclose corporate borrowing data, following existing research (Li G. et al., 2016), total liabilities minus accounts payable is used as a proxy for bank credit, divided by total assets to reflect corporate credit financing (Loan). (2) Explanatory Variable. The climate risk index (CR) constructed from meteorological data is the core explanatory variable. Control variables include: firm size (Size), natural log of total assets; return on assets (ROA), ratio of total profit to total assets; firm age (Age), natural log of years since establishment plus 1; tangible asset ratio (Tang), ratio of fixed assets to total assets. Provincial macroeconomic variables include: per capita GDP (PGDP), natural log; regional industrial level (Indus), ratio of industrial output value to GDP; financial institution density (FinDens), number of financial institution outlets per 10,000 people. (3) Model. The econometric model is: $\text{Loan}_{it} = \beta_0 + \beta_1 \text{CR}_{jt} + \sum \gamma \text{Controls} + \text{FE} + \varepsilon$, with industry, year, and province fixed effects.

Table 1. Climate Risk and Corporate Credit Financing

Variable	Loan(1)	Loan(2)	Loan(3)	Loan(4)	Loan(5)
CR	-0.011***	-0.009***	-0.008***	-0.008***	-0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Size		0.001***	0.001***	0.001***	0.001***
		(0.000)	(0.000)	(0.000)	(0.000)
ROA		-0.035***	-0.035***	-0.035***	-0.035***
		(0.003)	(0.003)	(0.003)	(0.003)

Tang	-0.018***	-0.018***	-0.018***	-0.018***
	(0.003)	(0.003)	(0.003)	(0.003)
Controls/FE	Yes	Yes	Yes	Yes

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Robust SE clustered at firm level in parentheses. Table 1 shows that climate risk significantly restrains corporate credit financing, supporting H1.

The "financial accelerator" characteristics of the financial system make it a key channel for transmitting and amplifying external shocks, thereby disturbing the operations of real enterprises (Bernanke et al., 1999). If the banking system responds to climate shocks, it tends to significantly reduce credit supply, and enterprises highly dependent on credit financing are the first to be affected. Below, sample enterprises are divided into high, medium, and low groups based on annual bank credit ratios. Meanwhile, considering the substitution effect between bank credit and corporate commercial credit (Petersen and Rajan, 1997), enterprises facing climate risk may use inter-enterprise commercial credit financing to hedge against the adverse effects of credit contraction. Further group tests are conducted based on corporate commercial credit financing levels.

Table 2. Climate Risk and Credit Financing by Credit Dependence and Commercial Credit Level

Variable	Low Credit	Med Credit	High Credit	Low CommCr	Med CommCr	High CommCr
CR	-0.001	-0.005***	-0.015***	-0.008***	-0.003***	-0.001**
	(0.001)	(0.001)	(0.004)	(0.004)	(0.002)	(0.002)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
FE	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.121	0.171	0.211	0.133	0.143	0.186

Table 2 shows that climate risk has the most significant inhibitory effect on high-credit-dependence firms. In contrast, low-credit-dependence firms are not significantly affected. Combining commercial credit levels, enterprises accustomed to using commercial

credit are the least affected by climate shocks. These results indicate that enterprises with low credit dependence or high commercial credit can better isolate the negative effects of climate shocks. From another perspective, climate risk significantly affects the external financing environment of enterprises. When facing purely exogenous shocks like climate risk, the banking sector also exhibits a certain "financial accelerator" effect, tightening credit supply standards. Commercial credit can serve as a "stabilizer" for enterprise financing.

3.4 Robustness and Endogeneity Tests

(1) Replacement of Climate Risk Measure. Given that meteorological disasters have spatially uneven characteristics, provincial-level climate risk indices may smooth the actual risks faced by individual firms. Therefore, the explanatory variable is replaced with a city-level climate risk index. Column (1) of Table 3 shows that the city-level CR remains significantly negative at the 1% level, confirming robustness. (2) Replacement of Dependent Variable. First, "interest expense / bank borrowing" (IntCost) reflects credit costs. Second, "total liabilities / total industrial output" (FinSupport) reflects financing support. Finally, the SA index (SA) reflects external financing constraints (Shao and Zhang, 2024). Columns (2)–(4) show climate risk increases interest costs, reduces financial support, and exacerbates financing constraints. (3) Fixed Effect Model. To mitigate omitted variable issues, the sample is divided into eastern, central, western, and northeastern regions, with industry-year and region-year interaction terms added to control for policy and economic factors. Columns (5)–(6) confirm robustness. (4) Reconstructed Climate Risk Index. Following Germanwatch's method, four economic loss indicators (affected population, casualties, economic losses, loss ratio) are selected to reconstruct the index (CR_re). Column (6) confirms robustness. (5) Endogeneity. Using provincial latitude as an instrumental variable (Pan Y. et al., 2017), first-stage results show latitude negatively affects climate risk (consistent with climate disaster distribution), with F-values > 10 and passing under-identification tests. Second-stage results show CR remains significantly negative.

Table 3. Robustness Checks

Variable	City CR(1)	IntCost(2)	FinSupport(3)	SA(4)	FE(5)	Re-CR(6)
CR_city	-0.005*** (0.001)					
CR		0.002** (0.001)	-0.015*** (0.004)	0.024*** (0.001)	-0.006*** (0.002)	-0.009*** (0.002)
Controls/FE	Yes	Yes	Yes	Yes	Yes	Yes
N	1,548,356	2,225,055	2,153,198	2,244,786	2,244,786	2,244,786
R ²	0.255	0.084	0.253	0.854	0.315	0.105

4. Mechanism Analysis

4.1 Industrial Output Channel

The occurrence of extreme meteorological events increases the uncertainty of production and operation, causing enterprises to reduce production or shut down, leading to declining industrial output. The total industrial output value reflects the production and operation capacity of enterprises and is an important factor considered by banks when issuing credit. The variable "total industrial output / total assets" (Output) is selected to measure enterprise industrial output. Columns (1)–(2) of Table 4 show that industrial output positively affects corporate credit, while climate risk negatively affects industrial output. The Sobel test shows the mediation effect is significant at the 1% level, confirming that climate risk suppresses credit financing by reducing industrial output (H2 supported).

4.2 Product Sales Channel

Extreme weather events not only cause declining industrial output but may also hinder corporate sales activities. Sales revenue reflects product competitiveness and is a key performance indicator for bank credit evaluation. The variable "industrial sales output / total assets" (Sales) characterizes product sales. Columns (3)–(4) of Table 4 show that climate risk significantly negatively affects sales revenue, while sales revenue positively affects credit financing. The Sobel test confirms the mediation effect at the 1% level, supporting H3.

4.3 Collateral Depreciation Channel

Extreme climate events not only affect enterprise production and operation but also cause damage to production equipment and value loss. As the primary collateral for bank credit, the value fluctuation of fixed assets directly affects credit lines. The variable "fixed asset depreciation / fixed asset scale" (Depr) reflects the "accelerator" effect of climate risk impacting collateral valuation through the accelerated depreciation channel. Columns (5)–(6) of Table 4 show that climate risk significantly negatively affects fixed asset depreciation, while depreciation negatively affects credit financing. The Sobel test confirms the mediation effect at the 1% level. This demonstrates that climate risk suppresses corporate credit financing through the classic "collateral channel" of the "financial accelerator" theory (H4 supported).

Table 4. Mechanism Tests – Climate Risk and Bank Credit

Variable	Output(1)	Loan(2)	Sales(3)	Loan(4)	Depr(5)	Loan(6)
CR	-0.034***	-0.014***	-0.033***	-0.005***	-0.004***	-0.006***
	(0.012)	(0.012)	(0.015)	(0.002)	(0.002)	(0.003)
Output		0.003***				

(0.000)	
Sales	0.003***
(0.000)	
Depreciation	-0.002**
(0.001)	
Controls/FE	Yes Yes Yes Yes Yes Yes

Sobel test: all mediation effects significant at 1% level.

5. Heterogeneity Analysis

5.1 Industry Heterogeneity

Industries have different sensitivities to climate risk, making industry-grouped testing necessary. Intuitively, industries highly dependent on specific natural conditions and environments are susceptible to climate risk, and traditional energy industries and manufacturing are also easily affected. Figure 1 shows that climate risk significantly affects the credit financing of 21 out of 41 secondary industries. For example, climate risk has significant negative effects on the credit financing of the oil and gas extraction industry, instrument and office machinery manufacturing, and printing and recording media reproduction. In contrast, it does not adversely affect the credit financing of infrastructure industries such as electricity and heat production and supply, and gas production and supply.

5.2 Ownership Heterogeneity

Based on ownership type, sample enterprises are divided into four categories: state-controlled, collective-controlled, privately-controlled, and foreign-controlled. Columns (1)–(4) of Table 5 show that climate risk has significantly negative effects on credit financing for all types, most prominently for private and foreign-controlled enterprises. Inter-group coefficient difference tests confirm that the differences between private/foreign enterprises and state-owned enterprises are statistically significant. This means climate risk has a stronger impact on the credit financing of private and foreign-controlled enterprises, while its impact on state-controlled enterprises is relatively weaker.

5.3 Financial Development

Regional financial development should provide more means and methods for enterprises to hedge against and smooth external shocks. The financial marketization index (Yu and Pan, 2008) is used to represent regional financial development (FinDev). The interaction of CR×FinDev is added to the model. Columns (5)–(6) of Table 5 show that the CR×FinDev

coefficient is significantly positive. Group regressions show climate risk has a greater impact on enterprises in regions with lower financial development. This indicates that regions with higher financial development are more effective in dealing with and responding to the negative impacts of climate risk, thus weakening its adverse effects on corporate credit financing.

Table 5. Ownership Heterogeneity and Financial Development

Variable	State(1)	Collective(2)	Private(3)	Foreign(4)	High Fin(5)	Low Fin(6)
CR	-0.013**	-0.034*	-0.026***	-0.034***	-0.021**	-0.015***
	(0.032)	(0.017)	(0.067)	(0.076)	(0.010)	(0.001)
FinDev					0.012***	
					(0.000)	
CR×FinDev					0.002***	
					(0.002)	
Controls/FE	Yes	Yes	Yes	Yes	Yes	Yes

6. Conclusions and Policy Recommendations

In recent years, global climate change has intensified, with frequent extreme climate events in local areas, profoundly impacting enterprise production operations and credit financing activities. Using national meteorological data, this paper constructs a regional climate risk index and examines the mechanisms of climate risk shocks on corporate credit financing. The findings are as follows: First, climate risk significantly suppresses corporate credit financing overall, particularly for enterprises with high credit dependence, exhibiting a typical "financial accelerator" effect. Second, climate risk affects corporate credit financing not only by reducing industrial output and product sales revenue but also by accelerating fixed asset depreciation through the collateral valuation channel, further amplifying its negative impact. Third, in terms of enterprise group heterogeneity, the credit financing suppression effect of climate risk is more pronounced for private and foreign-controlled enterprises, with typical industry differences. Notably, regional financial development helps mitigate the negative effects of climate risk on corporate credit financing.

Based on the above conclusions, the following policy recommendations are proposed: First, decision-making departments should attach great importance to the negative impacts of climate

risk on enterprise operations and the "financial accelerator" effect, actively improve the government's climate risk governance structure and financing guarantee functions. Under the financial system dominated by indirect financing, climate risk will have broad and profound impacts on most enterprises through credit channels. Decision-makers should fully recognize the mechanism of climate risk's impact on enterprise production and operation, improve mechanisms and policy designs for addressing climate risk, and ensure that climate-sensitive industries and enterprises can access financial resources fairly and effectively.

Second, enterprises should be promoted to enhance their climate risk response capacity and gradually establish a complete climate risk management system. Specifically, enterprises can stabilize production and operations and weaken the impact effects of climate risk through multiple measures such as incentivizing information disclosure, implementing sustainable development strategies, enhancing technological innovation to improve adaptive capacity, and using financial insurance instruments to transfer risks.

Third, accelerating financial deepening is a beneficial institutional arrangement for actively addressing climate change and promoting green development, and can effectively mitigate the adverse impacts of climate risk on corporate credit financing. Financial institutions should strengthen quantitative assessment of climate risk, improve the precision of climate risk pricing, improve climate risk management strategies, and accelerate financial product innovation to enhance the diversity and inclusiveness of financial markets, providing enterprises with a more stable and guaranteed diversified financing environment.

References

- Addoum, J., Ng, D., & Ortiz-Bobea, A. (2023). Temperature shocks and establishment sales. *Review of Financial Studies*, 36(7), 2781-2822.
- Bansal, R., Ochoa, M., & Kiku, D. (2016). Climate change and growth risk. *NBER WP 23009*. <https://doi.org/10.3386/w23009>
- Bernanke, B., Gertler, M., & Gilchrist, S. (1999). The financial accelerator in a quantitative business cycle framework. *Handbook of Macroeconomics*, 1, 1341-1393. [https://doi.org/10.1016/S1574-0048\(99\)10034-X](https://doi.org/10.1016/S1574-0048(99)10034-X)
- Bernstein, A., Gustafson, M., & Lewis, R. (2019). Disaster on the horizon: The price effect of sea level rise. *Journal of Financial Economics*, 134(2), 253-272. <https://doi.org/10.1016/j.jfineco.2019.03.013>
- Brown, J., Gustafson, M., & Ivanov, I. (2021). Weathering cash flow shocks. *Journal of Finance*, 76(4), 1831-1874. <https://doi.org/10.1111/jofi.13024>
- Cai, X., Lu, Y., & Wu, M. (2022). Does environmental regulation drive away FDI?. *Journal of Development Economics*, 157, 102875.

- Chen, G. J., Guo, J. Y., & Zhao, X. Q. (2022). Progress in climate finance research. *Economic Dynamics*, (7), 131-148.
- Cortés, K., & Strahan, P. (2017). Tracing out capital flows: How financially integrated banks respond to natural disasters. *Journal of Financial Economics*, 125(1), 182-199. <https://doi.org/10.1016/j.jfineco.2017.04.011>
- Custódio, C., Ferreira, M., & Garcia-Appendini, E. (2022). *The economic impact of climate change on firms*. Working Paper. <https://doi.org/10.2139/ssrn.4205144>
- Dafermos, Y., Nikolaidi, M., & Galanis, G. (2018). Climate change, financial stability and monetary policy. *Ecological Economics*, 152, 219-234. <https://doi.org/10.1016/j.ecolecon.2018.05.011>
- Dell, M., Jones, B., & Olken, B. (2012). Temperature shocks and economic growth. *American Economic Journal: Macroeconomics*, 4(3), 66-95. <https://doi.org/10.1257/mac.4.3.66>
- Dietz, S., Bowen, A., & Dixon, C. (2016). Climate value at risk of global financial assets. *Nature Climate Change*, 6(7), 676-679. <https://doi.org/10.1038/nclimate2972>
- Ginglinger, E., & Moreau, Q. (2023). Climate risk and capital structure. *Management Science*, 69(6), 3267-3293. <https://doi.org/10.1287/mnsc.2023.4952>
- Hong, H., Li, F., & Xu, J. (2019). Climate risks and market efficiency. *Journal of Econometrics*, 208(1), 265-281. <https://doi.org/10.1016/j.jeconom.2018.09.015>
- Huang, B., Li, Z., & Zhang, T. (2022). Climate risk and corporate cash holdings. *Journal of Corporate Finance*, 76, 102256. <https://doi.org/10.1016/j.jcorpfin.2022.102256>
- Huynh, T., Nguyen, D., & Truong, C. (2022). Climate risk and the cross-section of stock returns. *Journal of Financial Economics*, 144(1), 227-254.
- Javadi, S., & Masum, A. (2021). The impact of climate change on the cost of bank loans. *Journal of Corporate Finance*, 69, 102012. <https://doi.org/10.1016/j.jcorpfin.2021.102019>
- Kahn, M., Mohaddes, K., & Ng, R. (2021). Long-term macroeconomic effects of climate change. *Energy Economics*, 104, 105624. <https://doi.org/10.1016/j.eneco.2021.105624>
- Krueger, P., Sautner, Z., & Starks, L. (2020). The importance of climate risks for institutional investors. *Review of Financial Studies*, 33(3), 1067-1111. <https://doi.org/10.1093/rfs/hhz137>
- Li, G. Z., Xiong, D. H., & Liu, L. (2016). How does small bank development affect SME financing?. *Financial Research*, (6), 50-68.
- Liu, B., Li, Y. Q., & Jiang, Y. J. (2022). Climate change shocks and manufacturing TFP. *Journal of Hunan University*, 36(6), 57-65.
- Nie, H. H., Jiang, T., & Yang, R. D. (2012). Current status and potential problems of China's industrial enterprise database. *World Economy*, (5), 142-158.

- Painter, M. (2020). An inconvenient cost: The effects of climate change on municipal bonds. *Journal of Financial Economics*, 135(2), 468-482. <https://doi.org/10.1016/j.jfineco.2019.06.006>
- Pan, Y., Weng, R. Y., & Liu, S. Y. (2017). Benevolent intentions: New evidence from corporate charitable donations during typhoons. *China Industrial Economics*, (6), 123-142.
- Pankratz, N., Bauer, R., & Derwall, J. (2023). Climate change, firm performance, and investor surprises. *Management Science*, 69(8), 4411-4438. <https://doi.org/10.1287/mnsc.2023.4685>
- PBC Research Group. (2022). Climate-related financial risk: Analysis based on central bank functions. *PBC Working Paper*.
- Petersen, M., & Rajan, R. (1997). Trade credit: Theories and evidence. *Review of Financial Studies*, 10(3), 661-691. <https://doi.org/10.1093/rfs/10.3.661>
- Sautner, Z., Van Lent, L., & Vilkov, G. (2023). Firm-level climate risk exposure and pricing. *Journal of Finance*, 78(3), 1449-1498. <https://doi.org/10.1111/jofi.13219>
- Shao, J. Y., & Zhang, P. (2024). Impact of loan interest rate deregulation on corporate innovation investment. *Finance and Economics Theory and Practice*, 45(2), 32-40.
- Yu, M. G., & Pan, H. B. (2008). Political connections, institutional environment and private enterprise bank loans. *Management World*, (6), 5-18.
- Zhang, P., & Liu, Q. (2022). Climate risk and corporate cost management. *Journal of Accounting Research*, (5), 112-128.
- Zhang, S., Lu, L. P., & Zhang, X. M. (2022). Assessment, pricing and policy responses to climate risk in financial systems. *Financial Review*, 14(3), 76-104.

Copyright Disclaimer

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>)