The Impact of Trade Policy Uncertainty on Corporate Supply Chain Resilience: Evidence from China

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Abstract. Amid rising trade protectionism and deglobalization, Chinese firms face increasing exposure to trade policy uncertainty (TPU). Understanding how TPU influences corporate supply chain resilience is therefore crucial for building a modern industrial system and promoting high-quality economic development. Using 2010-2023 panel data of Chinese A-share listed firms, this study constructs a firm-level TPU index via annual report textual analysis and measures SCR with an entropy-based multidimensional index. Employing firm- and year-fixed effects models, we find that higher TPU significantly weakens corporate supply chain resilience. Mechanism analysis suggests that this adverse effect mainly operates through reduced innovation activities and heightened financing constraints. Further heterogeneity analysis shows that the negative impact is more pronounced among firms located in eastern China firms, SOEs, high-technology industry firms, and firms with weaker financial conditions. These findings offer important policy implications for mitigating uncertainty shocks, strengthening supply chain resilience, and safeguarding supply chain security.

Keywords: Trade Policy Uncertainty, Supply Chain Resilience, Innovation, Financing Constraints.

1 Introduction

Supply chain resilience, defined as a firm's capacity to proactively mitigate potential disruptions, respond swiftly upon shock incidence, and restore operations to baseline or even enhanced functionality within an acceptable period of time], constitutes a cornerstone of robust supply chain governance. Against the backdrop of intensifying and evolving global risks, enhancing supply chain resilience has emerged as a strategic priority in China's national development agenda. Frequent external shocks, including geopolitical conflicts, public health crises, natural disasters, and macroeconomic policy uncertainty, have repeatedly triggered supply chain bottlenecks, ruptures, and dislocations across international markets. As the world's second-largest economy deeply integrated into global value chains, Chinese firms benefit substantially from openness yet remain acutely exposed to external volatility. This paper therefore investigates how trade policy uncertainty (TPU) affects corporate supply chain resilience (SCR).

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The Report of the 20th National Congress of the Communist Party of China explicitly emphasizes "enhancing the resilience and security of industrial and supply chains," underscoring its strategic centrality. Yet, amid the confluence of unilateralism and anti-globalization trends, trade policy uncertainty confronting Chinese firms has risen markedly, exacerbating underlying supply chain vulnerabilities. In this context, examining the impact of trade policy uncertainty on supply chain resilience, and elucidating its underlying mechanisms, is of critical theoretical and practical relevance for fostering a new development paradigm and sustaining long-term economic vitality under evolving global conditions.

The literature most closely related to this study can be broadly classified into two strands. The first strand focuses on the economic consequences of trade policy uncertainty, primarily examining its effects on firms' export behavior and innovation activities. While these studies provide valuable insights, they largely overlook the implications of trade policy uncertainty for supply chain outcomes. In terms of mechanisms, prior studies mainly emphasize firms' passive adaptation to external environments through channels such as financing constraints, market competition, and risk diversification, whereas the role of firms' internal capability building, particularly innovation, has received comparatively less attention.

The second strand of literature concerns the measurement and determinants of supply chain resilience. Existing studies commonly employ the entropy method to construct composite indices of supply chain resilience and investigate its drivers from two main dimensions: firms' internal capabilities and external uncertainty shocks. Research on uncertainty shocks has primarily focused on environmental uncertainty and geopolitical risk, while the impact of trade policy uncertainty on corporate supply chain resilience remains underexplored. Although a growing body of literature highlights the positive role of innovation in enhancing supply chain resilience, few studies explicitly incorporate innovation as a mediating mechanism linking trade policy uncertainty to supply chain resilience.

Against this background, this study uses a panel dataset of Chinese A-share listed firms from 2010 to 2023 to investigate the impact of trade policy uncertainty on corporate supply chain resilience at the firm level. Specifically, we construct a firm-level trade policy uncertainty index using textual analysis of corporate annual reports and develop a multidimensional measure of supply chain resilience based on the entropy method. This study addresses three key issues: the impact of TPU on Chinese firms' SCR, its transmission channels, and the mediating role of firm innovation.

Compared with existing studies, this paper makes two primary contributions. First, it extends the literature on the economic consequences of trade policy uncertainty by providing firm-level evidence on its impact on supply chain resilience in the Chinese context. Second, it introduces innovation into the analytical framework as a mediating variable linking trade policy uncertainty and supply chain resilience.

2 Literature Review and Theoretical Analysis

2.1 Literature Review

The first strand of literature centers on the economic consequences of trade policy uncertainty, with primary attention devoted to firms' import-export activities and innovation behavior. From a mechanism perspective, existing studies have documented the mediating roles of external factors such as financing constraints, transaction costs, and risk diversification (Mao, 2020; Yuan et al., 2021)[11][14]. However, analyses from the perspective of firms' internal capability building remain relatively limited. More broadly, the literature suggests that heightened trade policy uncertainty increases the real option value of waiting, prompting firms to hold more liquid assets, postpone or reduce investment, and even delay entry into or exit from foreign markets (Caldara et al., 2020;)[1]. These responses crowd out productive investment, suppress firm-level innovation (Yang & Xie, 2024)][13], and ultimately hinder improvements in total factor productivity and profitability (Handley & Limão, 2022)[5]. While the inhibiting effect of trade policy uncertainty on firm innovation has been extensively documented, further extensions of this line of research remain limited. Studies directly related to supply chains are scarce and are largely conducted at the macro level.

The second strand of literature focuses on the measurement of supply chain resilience and its determinants. To enhance supply chain resilience and security, identifying its key determinants has become a central topic in this literature. Prior research typically examines these determinants from two dimensions: firms' internal capabilities and external uncertainty shocks. Internal capabilities include responsiveness, financing capacity and liquidity, digitalization and technological sophistication, risk management ability, and supply chain quality (Jensen et al., 2025)[7]. External uncertainty shocks mainly encompass policy and institutional uncertainty as well as geopolitical risks (Fan et al., 2022; Dong et al., 2025)[2][3]. Although a growing body of literature has investigated the impact of uncertainty shocks on supply chain resilience, research explicitly focusing on trade policy uncertainty remains limited, particularly with regard to its underlying transmission mechanisms. Few studies take innovation as a mediator between uncertainty shocks and SCR (Tao et al., 2023)][12].

2.2 Theoretical Analysis

The Direct Effect of Trade Policy Uncertainty on Corporate Supply Chain Resilience. Corporate supply chain resilience (SCR) refers to a firm’s ability to prevent potential disruptions ex ante, respond rapidly when disruptions occur, and restore supply chain operations to their original, or even more optimal, state within an acceptable period[8]. This capability can be decomposed into resistance capacity and recovery capacity. Rising trade policy uncertainty (TPU) undermines the SCR of Chinese firms through both dimensions.

Based on resource-based theory, liquid assets and supply chain partnership networks are critical resources supporting SCR for Chinese firms. In terms of resistance capacity, rising TPU exacerbates information asymmetry among firms and increases the search,

transaction, and monitoring costs associated with supply chain partnerships[14]. These higher costs crowd out liquid assets that could otherwise serve as buffers against risk, thereby weakening the ability of supply chains to absorb potential shocks. In addition, higher cooperation costs reduce firms' willingness to engage in long-term collaboration, leading to deteriorating supply-demand matching and imbalance within supply chains. Consequently, firms tend to simplify supply chain structures and reduce the number of cooperative nodes, resulting in a shrinking supply chain network[12]. This trend toward de-diversification weakens risk-sharing capacity within supply chains and amplifies the negative impact of uncertainty. H1: An increase in TPU reduces Chinese firms' SCR

Transmission Channels of Trade Policy Uncertainty. *The Innovation Channel.* Rising TPU weakens the SCR of Chinese firms by suppressing firms' innovation activities. From the perspective of internal innovation, heightened TPU discourages firms from engaging in independent innovation investment and output. Innovation activities feature high costs, long cycles, and irreversibility[13]. TPU further amplifies the technological and market risks associated with innovation. When facing rising TPU, risk-averse managers tend to increase their perceived probability of innovation failure and thus reduce R&D investment or postpone innovation projects[15]. Existing studies show that higher TPU raises the option value of waiting, inducing firms to hold more liquid assets while reducing irreversible innovation investment. Insufficient internal innovation investment constrains technological progress and weakens the technological foundation supporting firms' resistance and recovery capacities.

With respect to external innovation, rising TPU also restricts firms' access to external innovation resources through channels such as collaborative R&D, technology licensing, and knowledge spillovers. As TPU increases, cooperation costs rise and trust among firms declines[14], leading to a contraction of supply chain networks and limiting knowledge spillovers[6]. In the Chinese context, heightened TPU is often accompanied by technology restrictions and export controls, giving rise to "bottleneck" constraints. Innovation plays a crucial role in enhancing SCR. It improves supply chain management and strengthens firms' ability to prevent disruptions, while stronger innovation capability enhances firms' response efficiency and recovery performance when disruptions occur. Firms with stronger innovation capabilities therefore tend to exhibit higher levels of SCR. H2: Trade policy uncertainty reduces the supply chain resilience of Chinese firms by suppressing firm innovation.

The Financing Constraint Channel. Trade policy uncertainty also weakens the SCR of Chinese firms by intensifying financing constraints. First, rising TPU directly undermines firms' internal cash flows. Heightened uncertainty is often accompanied by higher tariff barriers, declining overseas orders, and restricted access to foreign markets, which erode firms' profitability and operating cash flows. Export-oriented firms' shift to domestic markets intensifies competition and compresses internal capital accumulation. Tight internal cash flows reduce firms' investment in supply chain management and weaken their ability to prevent supply chain risks.Second, increased TPU deteriorates the external financing environment faced by firms. Policy-related uncertainty exacerbates information asymmetry, making it more difficult for financial institutions

to assess firms' creditworthiness and risk exposure. To mitigate risk, lenders tend to raise financing thresholds, increase borrowing costs, tighten collateral requirements, and adopt more conservative credit policies. Maintaining SCR requires sufficient liquidity and stable financial support across supply chain nodes. Under constrained internal cash flows and limited access to external financing, firms face greater liquidity risk, reduced flexibility in resource allocation, and weakened financial capacity to recover from supply chain disruptions, ultimately undermining SCR. H3: Trade policy uncertainty reduces the supply chain resilience of Chinese firms by intensifying financing constraints.

The theoretical framework is shown in Fig 1.

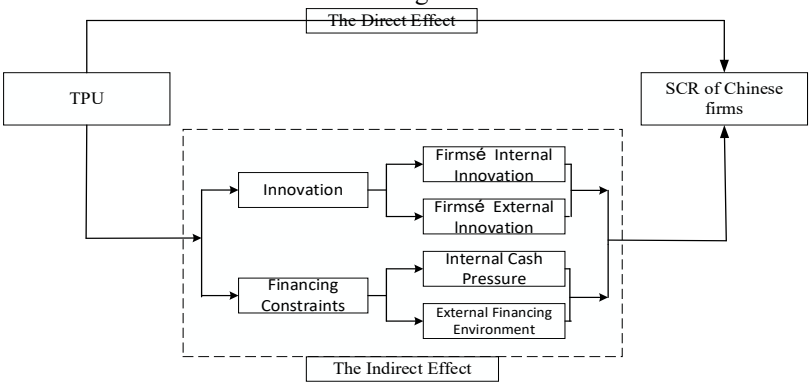

Fig. 1. Theoretical Framework

3 Data and Research Design

3.1 Sample Selection and Data Sources

This study employs an unbalanced panel dataset of Chinese A-share listed firms over the period 2010-2023 to examine the impact of trade policy uncertainty on the supply chain resilience of Chinese firms. We screen the sample by excluding financial firms, ST/*ST firms and observations with missing key values, and winsorize all continuous variables at the 1st and 99th percentiles. To mitigate the influence of extreme observations, all continuous variables are winsorized at the 1st and 99th percentiles. TPU is constructed via annual report textual analysis; other financial and governance data are from CSMAR.

3.2 Variable Definitions

Dependent Variable: Supply Chain Resilience of Chinese Firms (SCR). Financial strength includes Size, TobinQ, and ROA. Operating capability includes Apir, Arir, and Invtr. Operational flexibility includes Risk and RS. Supply chain collaboration includes Matching, Stable, and Scc. Human capital includes Degree, RDp, and RDs.

The entropy method is employed to determine the weights of individual indicators, and the composite SCR index is obtained through weighted aggregation. A higher value of SCR indicates stronger supply chain resilience.

Consistent with the existing literature, supply chain resilience is conceptualized as firms' capabilities to prevent, absorb, and recover from supply chain disruptions[8]. Following Guo and Luo (2024)[9], this study constructs a multidimensional indicator system to measure the supply chain resilience of Chinese firms by comprehensively considering firms' resistance capacity, recovery capacity, and their key determinants. Specifically, corporate supply chain resilience is measured from five dimensions: financial strength, operational flexibility, operating efficiency, supply chain collaboration, and human capital, comprising fourteen indicators. Financial strength includes Size, Tobin's Q, and return on assets (ROA). Operating capability includes Apir, Arir, and Invtr. Operational flexibility includes Risk and RS. Supply chain collaboration includes Matching, Stable, and Scc. Human capital includes Degree, RDp, and RDs. Table 1 shows the measurement factors and definition of Chinese firms' SCR.

Table 1. Measurement Factors and Definitions of Supply Chain Resilience of Chinese Firms

Dimension	Variable	Definition
Financial Strength	Size	The natural logarithm of the ending balance of total assets
	TobinQ	Tobin's Q
	ROA	Net profit divided by the ending balance of total assets
Operating Capability	Apir	Operating costs divided by the ending balance of accounts payable
	Arir	Operating revenue divided by the ending balance of accounts receivable
	Invtr	Operating revenue divided by the ending balance of inventories
Operational Flexibility	Risk	The three-period rolling standard deviation of industry-adjusted return on total assets
	RS	Administrative expenses divided by operating revenue
Supply Chain Collaboration	Matching	The natural logarithm of the absolute change in the net value of inventories between the current and the previous period
	Stable	The average overlap ratio of the top five suppliers and customers with those in the previous year
	Scc	The average sum of the procurement and sales shares of the top five suppliers and customers
Human and Physical Capital	Degree	The proportion of employees with a bachelor's degree or above to total employment
	RDp	The proportion of R&D personnel to total employment
	RDs	R&D expenditures divided by operating revenue

Core Explanatory Variable: Trade Policy Uncertainty Faced by Chinese Firms (TPU). Following Yang and Xie (2024)[13], Benguria et al. (2022)[4] and Caldara et

al. (2020)[1], this study constructs a firm-level TPU index for Chinese firms using textual analysis of Chinese listed firms' annual reports over the period 2010-2023. Specifically, we construct the TPU index by counting the normalized co-occurrence frequency of "uncertainty" and "trade policy" keywords in annual reports via Python. The resulting continuous variable captures the degree of trade policy uncertainty perceived by Chinese firms. A higher value of TPU indicates greater trade policy uncertainty faced by firms.

Control Variables(see Table 2). this study incorporates a set of firm-level control variables commonly used in studies based on Chinese listed firms. These control variables include Roa, Lev, Growth, Ato, Loss, Indep, Top1, Ins, Mshare, and Big4[9]. In addition, firm fixed effects are included to control for time-invariant heterogeneity across Chinese firms, while year fixed effects are incorporated to account for macroeconomic shocks and policy changes common to all firms in a given year.

Table 2. Variable and definition

Variable	Definition
Roa	Net Profit Margin / Average Total Assets
Lev	Total Liabilities / Total Assets
Growth	Current Year Operating Revenue Growth / Previous Year Operating Revenue
Ato	Operating Revenue / Average Total Assets
Loss	Dummy Variable: Net Profit is Negative (Assigned a Value of 1, Otherwise 0)
Indep	Number of Independent Directors / Total Number of Directors
Top1	Number of Shares Held by the Largest Shareholder / Total Number of Shares
Ins	Number of Shares Held by Institutional Investors / Total Number of Shares
Mshare	Number of Shares Held by Management / Total Number of Shares
Big4	Dummy Variable: Assigned a Value of 1 if the Auditor is One of the "Big Four" Accounting Firms, Otherwise 0

3.3 Model Specification

The baseline regression model is specified:

$$SCR_{it}=\alpha_1+\beta_1 TPU_{it}+A_1 X_{it}+\delta_{i1}+\theta_{t1}+\varepsilon_{it1} \quad (1)$$

where SCR_{it} = firm i's SCR in year t, TPU_{it} = firm i's TPU in year t, X_{it} = control variables, δ_i = firm fixed effects, θ_t = year fixed effects, ε_{it} = error term.

$$Med_{it}=\alpha_2+\beta_2 TPU+A_2 X_{it}+\delta_{i2}+\theta_{t2}+\varepsilon_{it2} \quad (2)$$

where Med_{it} = mediating variables (innovation/FC).

4 Empirical Analysis

4.1 Descriptive Statistics

Table 3 reports the descriptive statistics of the main variables. The sample consists of 11,425 firm-year observations of Chinese A-share listed firms over the period 2010-2023. SCR has a low mean and high dispersion, showing heterogeneous SCR across firms. In addition, SCR exhibits considerable dispersion, suggesting pronounced heterogeneity in Chinese firms' capabilities to prevent and withstand supply chain risks, which is consistent with real-world observations.

The core explanatory variable, TPU faced by Chinese firms displays significant time variation and cross-sectional heterogeneity, which provides a necessary empirical basis for subsequent heterogeneity analyses.

Table 3. Descriptive Statistics

variable	(1) Observations	(2) Mean	(3) Standard deviation	(4) Minimum	(5) Maximum
SCR	11,425	0.0169	0.0131	0.0010	0.4500
TPU	11,425	0.0129	0.0134	0.0007	0.1596
Roa	11,016	0.0422	0.0654	-0.3750	0.2552
Lev	11,016	0.4086	0.1958	0.0274	0.9268
Growth	11,012	0.1467	0.3519	-0.6544	3.8082
Ato	11,016	0.7207	0.4617	0.0537	2.9066
Loss	11,016	0.1407	0.3477	0.0000	1.0000
Indep	11,013	37.5914	5.3207	27.2700	60.0000
Top1	11,016	0.3420	0.1463	0.0752	0.7584
Ins	11,004	0.4403	0.2494	0.0010	0.9238
Mshare	10,733	15.0259	20.1332	0.0000	70.5964
Big4	11,016	0.0743	0.2622	0.0000	1.0000

Note: All continuous variables are winsorized at the 1% level. Same below.

4.2 Baseline Regression Results

Table 4 reports the baseline regression results for the impact of TPU on SCR of Chinese firms. TPU coefficients are significantly negative without control variables (Columns 1-2). After including the full set of control variables (Column 3), the results remain unchanged. Overall, TPU exerts a significantly negative impact on SCR, supporting H1.

Table 4. Baseline Regression Results

Variable	(1) SCR	(2) SCR	(3) SCR
TPU	-0.0424***	-0.0384**	-0.0372**
	(0.0119)	(0.0157)	(0.0170)
Roa			-0.0005
			(0.0044)
Lev			0.0001
			(0.0016)
Growth			-0.0008
			(0.0006)
Ato			0.0006
			(0.0009)
Loss			0.0003
			(0.0003)
Indep			-0.0000
			(0.0000)
Top1			0.0014
			(0.0035)
Ins			0.0023
			(0.0017)
Mshare			0.0001*
			(0.0000)
Big4			-0.0004
			(0.0006)
_cons	0.0174***	0.0174***	0.0151***
	(0.0002)	(0.0002)	(0.0014)
Sample size	11425	10754	10063
Year fixed effects	Yes	Yes	Yes
Firm fixed effects	No	Yes	Yes
R^2	0.2956	0.5944	0.5898
Adj.R^2	0.2948	0.4886	0.4787

Note: The values in parentheses are t-values. *, , and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The same applies to the following tables.

4.3 Robustness Checks

To ensure the robustness of the baseline results, this study conduct three robustness tests:1. Alternative SCR measure: Taking log(SCR) as dependent variable yields β=-1.0576*** (Table 5, Col. 1);2. Subsample (2018-2023):Post-U.S.-China trade war period strengthens the coefficient β=-0.0299*** (Table 5, Col. 2);3. Clustered SEs: Clustering at firm, industry, and year levels sustains significance(Table 5, Col. 3-5);

Table 5. Robustness Checks Results

Variable	Alternative Measure of SCR	Adjusting the Sample Period	Alternative Clustering of Standard Errors		
	(1)	(2)	(3)	(4)	(5)
	SCR	SCR	SCR	SCR	SCR
TPU	-1.0576***	-0.0299***	-	-0.0372*	-0.0379***
	(0.3387)	(0.0105)	0.0372***	(0.0195)	(0.0078)
			(0.0125)		
_cons	-4.2815***	0.0119***	0.0151***	0.0151***	0.0154***
	(0.0441)	(0.0017)	(0.0014)	(0.0009)	(0.0017)
Sample size	10063	6589	10063	10063	9733
R^2	0.8581	0.5699	0.5898	0.5898	0.5861
Adj.R^2	0.8197	0.4085	0.4787	0.4787	0.4745
Controls	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes

4.4 Endogeneity Concerns and Further Tests

We address endogeneity via Multidimensional Fixed Effects and Propensity Score Matching (PSM).

Multidimensional Fixed Effects. Adding industry, province, and triple interaction (year×industry×province) FEs yields β=-0.0231* to -0.0291** (Table 6), robust to omitted variables.

Table 6. Multidimensional Fixed Effects Results

Variable	(1) SCR	(2) SCR	(3) SCR
TPU	-0.0249*	-0.0291**	-0.0231*
	(0.0130)	(0.0127)	(0.0130)
_cons	0.0202***	0.0215***	0.0203***
	(0.0011)	(0.0010)	(0.0011)
Sample size	10299	10334	10299
R^2	0.3732	0.3222	0.3790
Adj.R^2	0.3599	0.3186	0.3639
Controls	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	No	Yes
Province fixed effects	No	Yes	Yes

Propensity Score Matching (PSM). After matching on covariates, TPU remains negatively significant β=-0.0362** to -0.0372** (Table 7), alleviating selection bias and reverse causality concerns. These findings indicate that the baseline conclusions regarding the adverse effect of trade policy uncertainty on the supply chain resilience of Chinese firms are robust.

Table 7. PSM Results

Variable	(1) SCR	(2) SCR	(3) SCR
TPU	-0.0362**	-0.0372**	-0.0372**
	(0.0171)	(0.0170)	(0.0170)
_cons	0.0148***	0.0151***	0.0151***
	(0.0014)	(0.0014)	(0.0014)
Sample size	9920	10063	10063
R^2	0.5876	0.5898	0.5898
Adj.R^2	0.4748	0.4787	0.4787
Controls	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes

4.5 Mechanism Analysis

Based on the theoretical framework presented earlier, this study posits that TPU weakens the SCR of Chinese firms through two primary channels: suppressing firm innovation and exacerbating financing constraints. To test these channels, this study adopts the causal mediation analysis framework proposed by Jiang (2022)[10] and uses the models (1) and (2) specified above for empirical verification. The regression results are reported in Table 8.

The Innovation Channel. We measure innovation by the number of granted patents and FC by the FC index. β=-1200.0511** (Table 8, Col. 2) indicates that TPU suppresses innovation, which in turn reduces SCR (supporting H2).

The Financing Constraint Channel. Column (4) of Table 8 reports the effect of trade policy uncertainty on financing constraints. The estimated coefficient of TPU is significantly positive, indicating that TPU exacerbates financing constraints, which further weakens SCR (supporting H3).

Table 8. Mechanism Analysis Results

Variable	(1) SCR	(2) innovation	(3) SCR	(4) FC
TPU	-0.0372**	-1200.0511**	-0.0372**	2.3630*
	(0.0170)	(588.7393)	(0.0170)	(1.2887)
_cons	0.0151***	174.5545*	0.0151***	5.4506***
	(0.0014)	(95.0779)	(0.0014)	(0.2088)
Sample size	10063	2448	10063	9725
R^2	0.5898	0.8149	0.5898	0.8175
Adj.R^2	0.4787	0.7381	0.4787	0.7683
Controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes

4.6 Heterogeneity Analysis

Regional Heterogeneity. Utilizing classifications by the National Bureau of Statistics of China, we divided the sample into three regions: Eastern, Central, and Western China. The regression results, presented in Table 9, identify that TPU' s negative impact is significant only for eastern China firms, due to their higher openness and export orientation.

Table 9. Regional Heterogeneity Regression Results

Variable	(1) SCR	(2) SCR	(3) SCR
TPU	-0.0381*	-0.0175	-0.0757
	(0.0214)	(0.0203)	(0.0515)
_cons	0.0152***	0.0212***	0.0177***
	(0.0013)	(0.0057)	(0.0063)
Sample size	7592	1194	931
R^2	0.5897	0.5189	0.6462
Adj.R^2	0.4802	0.3665	0.5313
Controls	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes

Ownership Heterogeneity. The systematic differences between state-owned enterprises (SOEs) and private firms concerning resource acquisition, risk preferences, and decision-making mechanisms suggest distinct impacts of TPU on supply chain resilience. Our analysis segregated the sample based on the nature of controlling shareholders and performed grouped regressions. The findings, as depicted in Table 10, reveal that TPU significantly reduces SOEs' SCR, maybe owing to their political connections, rigid governance and risk aversion.

Table 10. Ownership Heterogeneity Regression Results

Variable	(1)SCR	(2)SCR
TPU	-0.0307**	-0.0444
	(0.0134)	(0.0295)
_cons	0.0184***	0.0176***
	(0.0032)	(0.0015)
Sample size	2993	6694
R^2	0.5078	0.6473
Adj.R^2	0.3792	0.5450
Controls	Yes	Yes
Year fixed effects	Yes	Yes
Firm fixed effects	Yes	Yes

Industry Technology Intensity Heterogeneity. The analysis also considered the technological characteristics of firms by bifurcating them into high-tech and non-high-tech entities according to the industry classification guidelines provided by the China Securities Regulatory Commission. Results in Table 11 reveals the negative TPU effect is more pronounced for high-technology firms, due to their high dependence on imported technologies and concentrated supply chains.

Table 11. Industry Technology Intensity Heterogeneity Regression Results

Variable	(1) SCR	(2) SCR
TPU	-0.0466**	-0.0344*
	(0.0190)	(0.0193)
_cons	0.0132**	0.0155***
	(0.0055)	(0.0013)
Sample size	1885	8118
R^2	0.6938	0.5637
Adj.R^2	0.5915	0.4452
Controls	Yes	Yes
Year fixed effects	Yes	Yes
Firm fixed effects	Yes	Yes

Financial Condition Heterogeneity. Lastly, we evaluated how financial health impacts the resilience of firms under TPU conditions. Using the Z-score index to differentiate firms into those in strong and weak financial conditions, our analysis presented in Table 12 illustrates that the adverse effects of TPU are significantly more pronounced in financially weak enterprises, due to their insufficient liquidity and severe financing constraints.

Table 12. Financial Condition Heterogeneity Regression Results

Variable	(1) SCR	(2) SCR
TPU	-0.0574	-0.0316***
	(0.0625)	(0.0112)
_cons	0.0164***	0.0152***
	(0.0023)	(0.0018)
Sample size	2774	6838
R^2	0.5465	0.6433
Adj.R^2	0.3661	0.5361
Controls	Yes	Yes
Year fixed effects	Yes	Yes
Firm fixed effects	Yes	Yes

In summary, the heterogeneity analysis reveals that the negative repercussions of TPU on SCR are significantly amplified among firms located in economically advanced regions, state-owned enterprises, high-tech firms, and those with poorer financial health. This underscores the necessity for targeted strategies tailored to different firm profiles in addressing the challenges posed by trade policy uncertainty.

5 Conclusion and Policy Implications

This study examines the impact of trade policy uncertainty (TPU) on the supply chain resilience (SCR) of Chinese firms using data from all A-share listed companies in China from 2010 to 2023. The main conclusions are as follows:1. Trade policy uncertainty significantly weakens the supply chain resilience of Chinese firms.2. Mechanism analysis reveals that the adverse effect of TPU on SCR operates through innovation suppression and intensified financing constraints.3. Heterogeneity analysis indicates that the negative impact of TPU on SCR is more pronounced among firms located in eastern China, SOEs, high-technology industries, and firms with relatively weak financial conditions.

Based on these conclusions, the following policy recommendations are proposed: Policy Recommendations for the Chinese Government: Strengthen the role of innovation in supporting supply chain resilience. On the one hand, promote high-level foreign opening-up, attract international capital into China through tax incentives, and alleviate the financial pressure on domestic firms, thereby creating a favorable funding environment for the stable operation of Chinese firms' supply chains. On the other hand, strengthen innovation support via tax incentives and talent cultivation, and build industry-academia-research platforms to address technological bottlenecks. This would boost investment in R&D activities and the flow of talent to Chinese firms, encourage innovation, construct integrated industry-academia-research platforms, and address key technological bottlenecks, ultimately enhancing the risk prevention and resilience capabilities of Chinese firms' supply chains. Implement differentiated trade policies. Provide targeted support, such as offering credit support and relaxing market entry barriers,

for firms in eastern regions and high-tech industries, which are more significantly impacted by TPU.

Policy Recommendations for Chinese Firms: 1) Improve strategic decision-making and optimize innovation resource allocation with innovation risk reserve funds. Strengthen managerial training to mitigate short-termism and enhance the forward-looking nature of strategic decisions. Establish innovation risk reserve funds and failure-tolerance mechanisms to sustain R&D investment, thereby strengthening firms' independent innovation capabilities and mitigating the adverse effects of trade policy uncertainty on supply chain resilience; 2) Strengthen digital supply chain construction. Increase investment in supply chain management systems and leverage digital technologies and artificial intelligence to enhance operational transparency, improve risk prevention, and accelerate response and recovery from disruptions; 3) Promote collaborative innovation in supply chains. Enhance cooperation and information sharing among firms, encourage collaborative optimization across supply chains, and develop stable supply chain networks to reduce the risk of supply disruptions.

References

1. Caldara, D., Iacoviello, M., Molligo, P., Prestipino, A., Raffo, A.: The economic effects of trade policy uncertainty. Journal of Monetary Economics 109, 38-59 (2020)
2. Dong, F., Zhao, X., Mangla, S.K., Song, M., Talley, W.: Enhanced supply chain resilience under geopolitical risks: The role of artificial intelligence. Transportation Research Part E: Logistics and Transportation Review 202, 104300 (2025)
3. Fan, D., Zhou, Y., Yeung, A.C.L., Lo, C.K.Y., Tang, C.: Impact of the U.S.-China trade war on the operating performance of U.S. firms: The role of outsourcing and supply base complexity. Journal of Operations Management 68(8) (2022)
4. Benguria, F., Choi, J., Swenson, D.L., Xu, M.: Anxiety or pain? The impact of tariffs and uncertainty on Chinese firms in the trade war. Journal of International Economics 137, 103608 (2022)
5. Handley, K., Limao, N.: Trade policy uncertainty. Annual Review of Economics 14, 363-395 (2022)
6. Isaksson, O.H.D., Simeth, M., Seifert, R.W.: Knowledge spillovers in the supply chain: Evidence from the high tech sectors. Research Policy 45(3), 699-706 (2016)
7. Jensen, J., Cole, D., Roath, A.S., Richey, R.G., Thornton, L.: How firm level responsiveness influences supply chain network resilience. International Journal of Physical Distribution & Logistics Management 56(11), 47-69 (2025)
8. Negri, M., Cagno, E., Colicchia, C., Sarkis, J.: Integrating sustainability and resilience in the supply chain: A systematic literature review and a research agenda. Business Strategy and the Environment 30(7), 2858-2886 (2021)
9. Guo, C., Luo, J.B.: Major customers as suppliers and supply chain resilience: Empirical evidence from China. Contemporary Finance & Economics (3), 139-152 (2024)
10. Jiang, T.: Mediating effects and moderating effects in causal inference: An empirical study. China Industrial Economics (5), 100-120 (2022)
11. Mao, Q.L.: Does trade policy uncertainty affect Chinese firms' imports? Economic Research Journal 55(2), 148-164 (2020).
12. Tao, F., Wang, X.R., Xu, Y., Zhu, P.: Digital transformation, industrial and supply chain resilience, and firm productivity. China Industrial Economics (5), 118-136 (2023)

13. Yang, H.N., Xie, J.G.: Trade policy uncertainty and firms' breakthrough innovation: Evidence from textual analysis of Chinese listed companies. Journal of International Trade (9), 87-102 (2024)
14. Yuan, C., Xiao, T.S., Geng, C.X., Sheng, Y.: Digital transformation and division of labor in firms: Specialization or vertical integration? China Industrial Economics (9), 137-155 (2021)
15. Zhou, D.G., Yang, J.J., Lai, M.Y.: Trade policy uncertainty, tariff binding commitments, and export stability. The Journal of World Economy 42(1), 51-75 (2019)