



The Belt and Road Initiative and Corporate Supply Chain Finance: Mediating and Moderating Effects Based on a Difference-in-Differences Approach

Jing Yuan¹ and Siming Zuo^{1,*}

School of Economics, Beijing Technology and Business University, No. 33 Fucheng Road,
Haidian District, Beijing, 100048, P.R. China

*13520193680@163.com

Abstract. The Belt and Road Initiative (BRI) reshapes global supply chains, yet its effect on corporate supply chain finance (SCF) performance remains unclear. Using a difference-in-differences approach, this study finds that BRI participation indirectly improves SCF performance by reducing supply chain concentration, with digital transformation positively moderating this indirect effect. Results pass parallel trend tests and are robust. Heterogeneity analysis shows stronger effects for state-owned enterprises and firms in highly competitive markets. This study contributes to SCF literature by integrating BRI, supply chain concentration, and digital transformation into a unified framework, clarifying their interaction mechanism and offering new analytical insights for future research.

Keywords: Belt and Road Initiative, supply chain finance, supply chain concentration, Difference-in-Differences model

1 Introduction

BRI reshapes global supply chains via reconfiguring trade routes^[1]. Based on a difference-in-differences quasi-natural experiment design, this paper verifies the BRI's causal impact on corporate supply chain finance (SCF). Drawing on prior work showing that SCF enhances performance by easing financing constraints^[2], we propose that BRI facilitates institutionalized SCF adoption via improved asset turnover and supply chain stability, with firms' financing constraints moderating this effect. This study provides new micro-level insights into the BRI and practical guidance for working capital management along the Belt and Road.

2 Theoretical Literature

2.1 BRI Policy Shock and Corporate Supply Chain Financing Capacity

Existing studies confirm BRI improves external credit environment: firms located in BRI-supported regions face lower financing constraints due to cheaper debt^[3]. Yet

little is known about how the BRI changes firms' working capital management within supply chains. This gap motivates our study.

2.2 The Mediating Role of Supply Chain Concentration

Supply chain concentration, meaning overreliance on trade credit. Close ties can foster trust and ease credit access^[4], yet a dominant supplier may weaken buyer bargaining power, reducing payment flexibility. Higher supplier concentration generally reduces trade credit, especially for constrained firms or in competitive markets. These mixed findings suggest supply chain concentration is a plausible channel through which the BRI may shape supply chain finance.

2.3 Digital Transformation: A Conditional Moderator

Digital transformation's moderating role in supply chain finance depends on firm conditions. One study shows digitalization boosts supply chain finance, yet financing constraints weaken this effect^[5]. This conditional nature fits well with our research design. It suggests that the BRI's impact on supply chain finance via digitalization may vary across firms with different financial constraints.

3 Research Design

3.1 Sample Screening and Original Data Sources

We adopt 2009 – 2023 A-share listed firms as samples. A total of 755 BRI-associated companies screened via Tonghuashun concept stock list constitute the treatment group. Empirical data are derived from CSMAR, listed annual financial statements and disclosure reports.

3.2 Empirical Strategy

Using the Belt and Road Initiative (BRI) launch as a quasi-natural experiment, we estimate a difference-in-differences (DID) model as follows:

$$SCF_{it} = \alpha_0 + \alpha_1 Treat_i \times Post_t + \beta X_{it} + \mu_i + \lambda_t + \epsilon_{it}$$

In this specification, SCF_{it} is the supply chain finance indicator for firm i in year t . $Treat_i$ is a dummy variable equal to one for firms closely linked to the BRI and zero otherwise. $Post_t$ equals one for years from 2014 onward, marking the post-BRI announcement period. X_{it} represents a vector of firm-level control variables. μ_i and λ_t denote firm and year fixed effects, respectively. The error term ϵ_{it} is clustered at the firm level to account for within-firm correlation. α_1 measures causal effect on SCF; its significant positive value means the policy boosts supply chain finance.

3.3 Variable Description

Table 1. Variable Definition

Variable Type	Variable Symbol	Measurement Indicator
Dependent Variable	<i>SCF</i>	(Short-term borrowings + notes payable) / year-end total assets ^[6] .
Mediator Variable	<i>SCC</i>	The average of the sum of purchase proportions from the top 5 suppliers and sales proportions to the top 5 customers ^[7] .
Moderating Variable	<i>DT</i>	Keyword frequency is measured from A-share annual reports using Python crawling and Java PDFbox text extraction. A two-layer dictionary (core technology application and technical practice application) is built from academic and policy sources. After removing negations and irrelevant terms, keyword counts are log-transformed to correct right-skewness ^[8] .
Control Variables	<i>Inv</i>	Ratio of inventory to total assets
	<i>Liquid</i>	Current ratio (current assets / current liabilities)
	<i>FL</i>	Ratio of total debt to total assets (or total liabilities / total assets)
	<i>Mshare</i>	Percentage of shares held by management (executives)
	<i>FirmAge</i>	Natural logarithm of (current year minus establishment year plus one)

Table 1: Variable definitions. SCF = (ST loans + notes payable)/total assets. SCC = mean of top5 supplier purchase and customer sales ratios. DT = log of tech keyword count from annual reports.

4 Empirical Result

4.1 Benchmark Regression

Table 2 reports a DID coefficient of 0.0118 ($p < 0.05$) on $Treat \times Post$, showing that BRI firms perform better in supply chain finance than others. This result holds after adding controls. A possible reason is that the BRI boosts trade and investment along the routes, raising capital needs and coordination across supply chains. Among the controls, inventory turnover and firm age have positive effects, while liquidity and management ownership have negative effects. Faster inventory turnover speeds up cash collection and builds credit records. Older firms enjoy stronger reputation and better financing channels. High liquidity lowers the need for external funds, and more management ownership makes managers cautious, both reducing the use of supply chain finance.

Table 2. Baseline Estimates

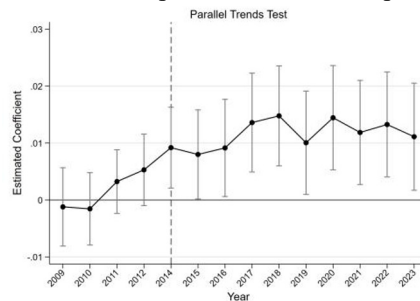
	(1)	(2)
$Treat_i \times Post_t$	0.0116** (0.0054)	0.0118** (0.0052)
Inv		0.0859*** (0.0167)
$Liquid$		-0.0046*** (0.0008)
FL		0.0000** (0.0000)
$Mshare$		-0.0223* (0.0122)
$FirmAge$		0.0655*** (0.0116)
_cons	0.1535*** (0.0026)	-0.0108 (0.0298)
Observations	35562	35361
Adj. R ²	0.0118	0.0545
Fixed Year	Yes	Yes
Fixed Firm	Yes	Yes

Note: Standard errors are robust and displayed within brackets; *, **, and *** denote significance at 10%, 5%, 1% thresholds.

4.2 Robustness Test

Parallel Trends Test.

Fig. 1 reports the coefficients before 2014 are small and near zero, ranging from -0.02 to 0.06, with no clear trend. After 2014, they turn positive and stay between 0.08 and 0.14. This confirms that the parallel trends assumption holds.

**Fig. 1.** Parallel Trends

Placebo Test.

Fig. 2 reports the random assignment of treatment status and policy year to firms, repeating the process 500 times. The placebo coefficients cluster around zero and lack

statistical significance. Our true estimate falls outside this distribution, confirming that the main result is not driven by chance or omitted factors.

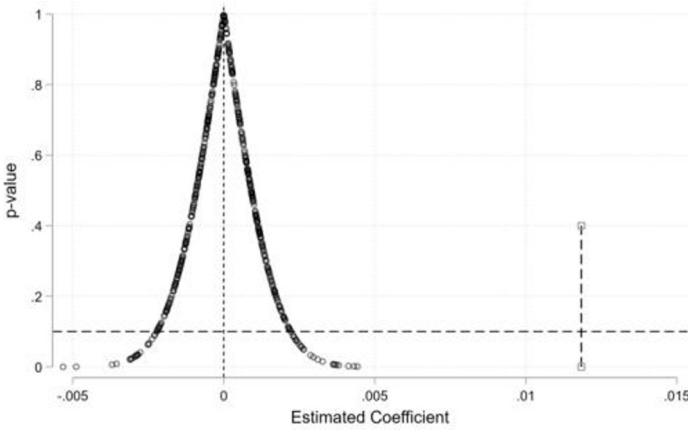


Fig. 2. Falsification Test

4.3 Heterogeneity Tests: Property Rights and Industrial Competition

Table 3 reports policy effects tend to be more pronounced among state-owned enterprises, large firms, and industries with less competitive pressure^[9]. The positive effect of the Belt and Road Initiative on supply chain finance performance is significant only for state-owned enterprises, thanks to their stronger ties with policy banks along the routes. Similarly, this effect is significant only for firms in highly competitive markets. In such markets, companies face greater pressure to improve efficiency and cash flow, which drives them to adopt and benefit from supply chain finance.

Table 3. Heterogeneity Results

	(1)	(2)	(3)	(4)
	SOE	No_SOE	High Competition	Low Competition
$Treat_t \times Post_t$	0.0201** (0.0097)	0.0074 (0.0061)	0.0148* (0.0082)	0.0080 (0.0062)
Control variables	Yes	Yes	Yes	Yes
_cons	0.0522 (0.0466)	-0.0239 (0.0392)	0.0346 (0.0470)	-0.0576 (0.0412)
Observations	14889	20470	17712	17649
Adj. R ²	0.0630	0.0581	0.0565	0.0521

Note: Standard errors are robust and displayed within brackets; *, **, and *** denote significance at 10%, 5%, 1% thresholds.

4.4 Mechanism Analysis

Column (1) of Table 4 shows that the Belt and Road Initiative significantly reduces supply chain concentration (coefficient = -2.3126, $p < 0.01$), which creates more room for supply chain finance activities. Column (2) finds that digital transformation dampens this positive effect (interaction term = -0.0002, $p < 0.10$), even though digital transformation alone improves supply chain finance performance. One explanation is that highly digitized firms already manage working capital efficiently through internal systems, reducing their need for external supply chain finance.

Table 4. Mechanism Analysis

	(1)	(2)
Treati×Postt	-2.3126*** (0.6908)	0.0142** (0.0056)
DT		0.0001*** (0.0000)
Treati×Postt×DT		-0.0002* (0.0001)
Control variables	Yes	Yes
_cons	31.1419*** (4.2693)	0.1531*** (0.0026)
Observations	33295	35560
Adj. R ²	0.0711	0.0074

Note: Standard errors are robust and displayed within brackets; *, **, and *** denote significance at 10%, 5%, 1% thresholds.

5 Conclusions and Policy Recommendations

This study finds that the Belt and Road Initiative improves corporate supply chain finance performance by reducing supply chain concentration, with digital transformation positively moderating this indirect effect. Results are robust after parallel trend tests, with stronger effects for state-owned enterprises and firms in highly competitive markets. Policymakers should complement the BRI with policies that help firms optimize supply chain concentration, promote digital platforms (e.g., blockchain invoices) especially for non-SOEs, while managers in competitive markets should adjust supplier-customer structures after joining BRI projects. Firms with weak digital foundations need only incremental upgrades. In short, the BRI triggers structural change, supply chain concentration transmits it, and digital transformation amplifies it without replacing traditional finance.

Acknowledgments

This work was supported by National Natural Science Foundation of China (Grant Numbers: 72003010) and 2026 College Student Innovation and Entrepreneurship Training Program Project.

Conflict Statement

No potential financial conflicts or personal ties among authors exist to bias the research findings here.

References

1. Thürer, M., Tomasevic, I., Stevenson, M., Blome, C., Melnyk, S., Chan, H., & Huang, G. (2020). A systematic review of China's belt and road initiative: Implications for global supply chain management. *INTERNATIONAL JOURNAL OF PRODUCTION RESEARCH*, 58(8), 2436–2453. (WOS:000466062400001). <https://doi.org/10.1080/00207543.2019.1605225>.
2. Jia, L., & Ren, Y. (2026). Supply chain finance, financing constraints, and corporate new quality productivity. *FINANCE RESEARCH LETTERS*, 88. (WOS:001637185100001). <https://doi.org/10.1016/j.frl.2025.109140>.
3. Xu, S., He, X. Y., & Zhong, K. (2019). The Belt and Road Initiative and corporate financing constraints in China. **China Industrial Economics**, (7), 155–173. <https://doi.org/10.19602/j.chinaeconomist.2019.11.07>.
4. Burkart, M., & Ellingsen, T. (2004). In-kind finance: A theory of trade credit. *AMERICAN ECONOMIC REVIEW*, 94(3), 569–590. (WOS:000222559400009). <https://doi.org/10.1257/0002828041464579>.
5. Wang, W., Zhen, Z., Li, M., & Li, S. (2025). The Effects of Market Power Discrepancy on Trade Credit Scales: A Paradoxical Perspective of Digitalization. *JOURNAL OF BUSINESS LOGISTICS*, 46(4). (WOS:001587292200001). <https://doi.org/10.1111/jbl.70039>.
6. Chen, M., Tang, X., Liu, H., & Gu, J. (2023). The impact of supply chain concentration on integration and business performance. *International Journal of Production Economics*, 257, 108781. <https://doi.org/10.1016/j.ijpe.2023.108781>.
7. Yang, J., Liu, J., Yao, Z., & Ma, C. (2024). Measuring digitalization capabilities using machine learning. *Research in International Business and Finance*, 70, 102380. <https://doi.org/10.1016/j.ribaf.2024.102380>.
8. Xu, J., Wang, F., & Zhang, X. (2020). Supply chain finance and corporate innovation: Evidence from China's Belt and Road Initiative. *International Journal of Finance & Economics*, 26(3), 4320–4337. <https://doi.org/10.1016/j.frl.2022.103052>.
9. Yan, Z., Jia, Y., & Zhang, B. (2024). Environmental protection taxes and green productivity: Evidence from listed companies in China. *ECONOMIC SYSTEMS*, 48(4). (WOS:001370594400001). <https://doi.org/10.1016/j.ecosys.2024.101213>.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

