



Article

Financing the Chain in China: Industry–Finance Collaboration and the Resilience of Corporate Supply Networks

Guanfen Hua ¹, Jinliang Wang ¹, Xuesheng Chen ¹ and Zhenying Zuo ^{2,*}

¹ Business School, Shandong University, Weihai 264209, China; guanfen_hua@mail.sdu.edu.cn (G.H.); wangjl_11@163.com (J.W.); cxs1999@126.com (X.C.)

² Shandong Academy of Social Sciences, Jinan 250002, China

* Correspondence: sdskyzuozy@shandong.cn

Abstract

Recent disruptions have made supply chain resilience a central concern for firms and policy-makers, yet the financial-policy foundations of resilience remain insufficiently understood. This study examines whether policy-driven industry–finance cooperation strengthens corporate supply chain resilience and through which financial channels this effect operates. Using the China Industry–Finance Cooperation (IFC) Pilot Policy as an exogenous policy shock, we analyze Chinese A-share listed manufacturing firms from 2014 to 2023. The SDID estimates show that the IFC Pilot Policy increases firms' supply chain resilience by 0.061 standard deviations, and this result remains stable across multiple robustness checks. Mechanism tests indicate that the policy improves resilience by reducing debt financing costs, promoting supply chain finance, and enhancing real investment efficiency. Further heterogeneity analysis shows that the effect is stronger among technology-intensive firms and firms located in less favorable business environments. Theoretically, this study links industry–finance cooperation to supply chain resilience through a “funding cost–chain cash flow–capital use” framework. Practically, it shows that better coordination between financial services and industrial needs can help firms strengthen their capacity to withstand supply chain risks.

Keywords: industry–finance cooperation pilot policy; supply chain resilience; supply chain finance; debt financing costs; investment efficiency; supply chain risk management

1. Introduction

During the last decade, global production systems have faced successive shocks arising from public health crises, geopolitical conflicts, and climate-related extreme events. Consequently, supply-network disruption has ceased to be regarded as an occasional tail risk but has become a persistent managerial challenge for firms. Many governments have therefore begun to treat supply chain resilience as a key objective of industrial policy, aiming to reconcile economic efficiency with supply security. Existing research links firms' resilience in supply chains to operational capability, risk-control practices, organizational adaptability, digital transformation, and the configuration of production networks (Brusset & Teller, 2017; Dubey et al., 2021; Elliott et al., 2022; Hosseini et al., 2019; Wieland & Durach, 2021). Nevertheless, such resilience depends not only on firms' internal operating capabilities. It also depends on whether firms can obtain stable and low-cost financial resources that match their real production needs. Existing research has not fully examined whether finance–industry coordination policies can strengthen firms' ability to withstand



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shocks in production networks. Using China's IFC Policy as an external policy event, our analysis provides the first systematic empirical test of this mechanism.

China's Industry–Finance Cooperation (IFC) Pilot Policy provides an ideal institutional setting for this study. Chinese manufacturing firms have long faced structural constraints, including high external financing costs, insufficient collateral, and short debt maturities, which have limited their sustained investment in resilient supply chains. To alleviate the mismatch between financial resource provision and industrial development needs, the Chinese government officially launched the IFC Pilot Policy in 2016. The policy uses cities as the main implementation units. The first batch of pilot cities entered the implementation stage in 2017, and the second batch was rolled out in 2021. The detailed distribution is shown in Figure 1. In terms of policy content, the IFC Pilot Policy may affect corporate supply chain resilience through three channels. First, through information-sharing platforms, the policy transforms dispersed information on firms' production and operations, project development, credit conditions, and industrial-chain positions into financing signals that financial institutions can identify. This reduces banks' information search costs and post-loan monitoring costs, alleviates informational disparities separating lenders from firms, and narrows the credit spread attached to firms' external borrowing. As a result, financial institutions can provide stable credit support for firms' supply-chain-resilience projects at lower debt financing costs. Second, relying on lists of key firms, key projects, and financing needs, the policy guides financial resources toward areas consistent with industrial upgrading and real-economy development. This makes credit funds more likely to flow into real production activities and supply chain capability building, rather than inefficient expansion unrelated to firms' core businesses. Finally, the IFC Pilot Policy places particular emphasis on the development of supply chain finance. It requires pilot areas to build stable industrial-chain ecosystems, improve industry–finance cooperation platforms and industrial internet-based financial services, and strengthen intelligent matching between industry and finance. Under this institutional arrangement, accounts receivable, accounts payable, orders, commercial bills, and stable trading relationships can be transformed into financeable credit assets. Upstream suppliers can therefore obtain early payment based on authentic transaction documents, even when core firms delay payments after external shocks. This helps ease liquidity pressure and reduce the risk that local financial shocks spread through the supply chain. This institutional design closely follows the logic of supply chain finance theoretical framework, which suggests that real transaction relationships and credit information embedded in supply chains can help alleviate collateral shortages and information asymmetry (Cull et al., 2009; Gelsomino et al., 2016). However, existing research into supply chain financing mainly examines individual financial instruments or specific financing models. Less research examines how systematic matching of financial institutions with real-sector firms, driven by policy coordination, affects corporate supply chain resilience. The IFC Pilot Policy therefore provides a quasi-natural experimental setting for examining this issue. It allows this study to further investigate how financial resources are ultimately transformed into firms' ability to withstand supply chain risks through lower financing costs, more stable funding circulation throughout supply networks, and improved capital allocation efficiency.

To investigate this issue, we compile longitudinal data on Chinese A-share-listed manufacturing firms covering 2014–2023 and use the phased implementation of the IFC Pilot Policy across cities for identification. Following classic studies on resilience, we measure supply chain resilience using a three-part framework comprising resistance to disruptions, post-shock recovery, and adaptive growth capability (Hosseini et al., 2019; Wieland & Durach, 2021). We then apply an SDID model to evaluate the impact of the policy. Our baseline results indicate that the policy increases firms' supply chain resilience

by 0.061 standard deviations. The estimated effect is stable under numerous supplementary checks. In addition, this study identifies three core transmission channels: debt financing costs, supply chain finance, and real investment efficiency. The resulting evidence suggests that the resilience-enhancing effect of industry–finance cooperation does not arise merely from an expansion of credit supply. Rather, the policy improves firms’ systematic capacity to withstand supply chain risks by alleviating financing frictions, smoothing the circulation of funds between upstream and downstream firms, and guiding capital toward real production activities. The heterogeneity results further show that stronger policy impacts are observed for technology-intensive enterprises and firms located in regions with weaker business environments. This study not only provides empirical evidence and policy implications for China to improve the IFC Pilot mechanism and strengthen firms’ supply chain risk resistance, but also provides useful lessons for other economies that aim to use institutional financial tools to promote coordination between finance and industry and enhance the security of industrial and supply chains.

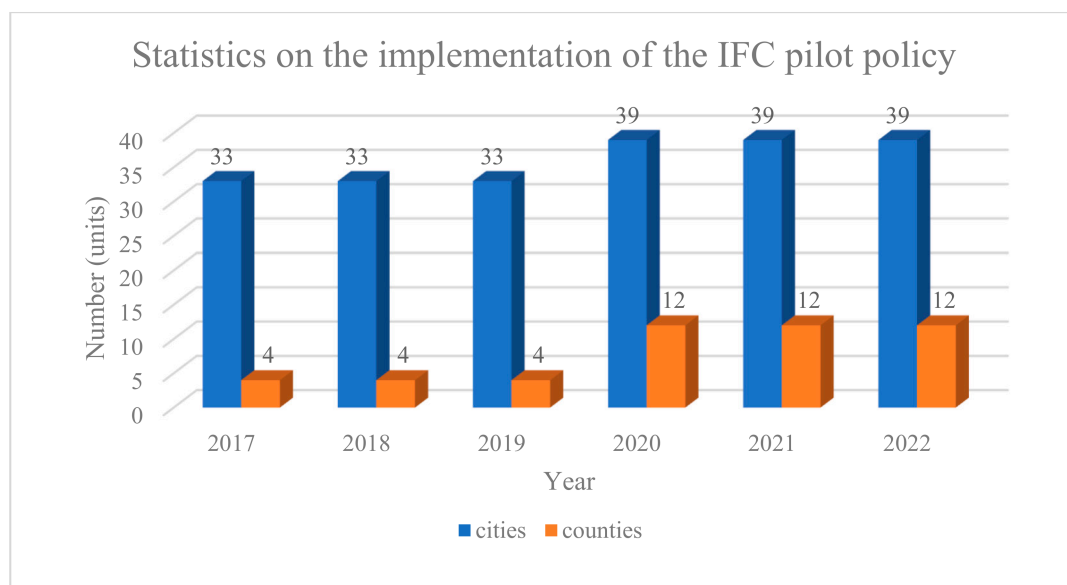


Figure 1. Annual stock of IFC pilot cities and counties.

The present analysis offers two main contributions. Its first contribution is to broaden research concerning the microeconomic consequences arising from the IFC Pilot Policy by providing direct empirical evidence on whether the policy enhances firms’ capacity to withstand supply-chain disruptions. Existing scholarship has mainly focused on how the IFC Pilot Policy affects corporate innovation, total factor productivity, corporate financialization, green transformation, credit allocation efficiency, and maturity mismatch between investment and financing (X. Chen et al., 2025; X. Chen & Xiao, 2026; Cui et al., 2026; M. Jiang et al., 2026; Qiu et al., 2024; Wu et al., 2026; Zhang et al., 2025). These studies provide important evidence for understanding how industry–finance cooperation supports the real economy, but they do not directly answer whether such coordination can strengthen firms’ operational stability within supply chain systems. Meanwhile, the literature on supply chain resilience mainly explains how firms respond to external shocks from the perspectives of organizational flexibility, data analytics capability, supply network structure, ripple effects, risk management capability, as well as transaction-based financing arrangements within supply networks (Dubey et al., 2021; Elliott et al., 2022; Hosseini et al., 2019; Wieland & Durach, 2021). However, national-level industry–finance coordination policies have rarely been incorporated into this analytical framework. Different from existing studies,

this paper exploits the staggered rollout of the IFC Pilot program as an externally imposed institutional intervention to examine whether institutional matching between financial services and industrial needs can improve firms' supply chain resilience. In doing so, the focus moves beyond the conventional question of whether finance improves firm performance and further asks whether finance can strengthen the stability of production networks under shocks. This provides firm-level evidence for research on resilient supply networks from the perspective of industry–finance policy.

Second, this study develops a “funding cost–chain cash flow–capital use” framework to explain the internal mechanisms through which industry–finance cooperation affects corporate supply chain resilience, and further identifies the firm-level and regional boundary conditions of this effect. Existing studies on industry–finance cooperation usually explain its policy effects through the alleviation of financing constraints, improvements in financing allocation efficiency, reductions in maturity mismatch, lower agency costs, and enhanced innovation capacity (X. Chen et al., 2025; M. Jiang et al., 2026; Wu et al., 2026; Zhang et al., 2025). Studies examining financing and resilience within supply networks further indicate that liquidity continuity, organizational adaptability, and supply network structure are important conditions for firms to absorb supply chain shocks (Elliott et al., 2022; Hosseini et al., 2019; Wieland & Durach, 2021). Nevertheless, existing research has not fully revealed how resources mobilized through coordination between finance and industry ultimately enhance firms' ability to withstand supply chain risks. Different from these studies, this paper does not simply equate industry–finance cooperation with the easing of financing constraints. Instead, it explains how financial resources are converted into supply chain resilience through three connected links: funding costs, funding circulation along supply networks, and more efficient capital use. Meanwhile, this study further identifies the boundaries of policy effectiveness associated with industry technology intensity, and regional business environment. Therefore, this study not only explains how industry–finance cooperation affects supply chain resilience, but also shows under which firm-level and regional conditions the policy is more likely to be transformed into firms' capacity to withstand supply chain risks.

2. Literature Review and Research Hypotheses

2.1. Literature Review

Industry–finance cooperation serves as a key policy mechanism that channels funding into the real economy. Existing studies have evaluated the IFC pilot policy from several perspectives. From a resource-deployment and productive-efficiency perspective, studies show that industry–finance cooperation improves firms' total factor productivity and financing allocation efficiency, suggesting that a better match between financial resources and industrial demand can enhance production efficiency and capital use efficiency (M. Jiang et al., 2026; Wu et al., 2026; Zhu et al., 2025). Regarding innovation and technological upgrading, related studies find that industry–finance cooperation promotes corporate innovation, mainly by easing financing constraints, strengthening information sharing, and improving the allocation of innovation resources (X. Chen & Xiao, 2026; H. Jiang et al., 2026; Y. Xu et al., 2026). From the perspective of financial structure and risk governance, existing research has explored the implications of closer coordination between finance and industry for corporate financialization, investment–financing maturity mismatch, and employment expansion. These studies suggest that the policy can curb the diversion of capital away from the real economy, improve debt maturity structures, and support firms' real operating activities by alleviating liquidity constraints (X. Chen et al., 2025; Zhang et al., 2025). Regarding green transformation and environmental governance, studies also show that industrial–financial integration helps to improve environmentally adjusted multifactor

productivity, reduce city-level carbon intensity and corporate pollution emissions, and generate green spillover effects through supplier–customer linkages (Cui et al., 2026; Qiu et al., 2024; Yin et al., 2026). Taken together, these findings indicate that industry–finance cooperation can optimize the allocation of financial resources and enable finance to better serve the real economy.

Nevertheless, prior research has rarely investigated whether industry–finance cooperation can enhance firms' supply chain resilience. This issue essentially concerns how the financial system mitigates financing frictions faced by firms embedded in production networks and helps them maintain operational continuity under external shocks. In recent years, research linking financial intermediation with the resilience of supply networks has developed along three main lines. The first focuses on trade credit and financial flows along the supply chain. Existing studies show that supply chain relationships are embedded in financial arrangements, and that financing constraints weaken firms' ability to maintain customer relationships through trade credit, thereby increasing the risk of supply chain disruption (Ersahin et al., 2024; Gofman & Wu, 2022). Second line examines supply chain finance and resilience. Studies find that supply chain finance strengthens firms' capacity to withstand disruptions by lowering operating expenses and alleviating financing constraints (Sun & Xiong, 2025; Zheng et al., 2025), thereby embedding financial intermediation functions into real transaction settings (Gelsomino et al., 2016). The third line concerns the role of banks in supply chain adjustment. Research suggests that banks not only provide funding, but also offer information and risk-identification support that helps firms restructure their supply chains (Rahaman et al., 2020). These studies point to a close connection linking financial system and supply chain resilience, but two limitations remain. First, most studies focus on specific financial instruments, while paying less attention to policy-driven systematic coordination between financial institutions and real-sector firms. Second, insufficient attention has been given to how financial intermediation enhances supply chain resilience by reducing financing costs, stabilizing financial flows along the supply chain, and directing capital toward more productive uses. The IFC Pilot Policy provides a suitable setting for addressing these gaps. It is not a single financial instrument; rather, it systematically improves the match between financial services and real industrial demand through information platforms, lists of key firms, bank–firm matching, and industrial-chain financial services.

2.2. Theoretical Analysis and Research Hypotheses

Under the financial intermediation theory, an important function of financial institutions is to reduce information and monitoring costs between capital suppliers and demanders through information collection, borrower screening, and post-loan monitoring, thereby improving the efficiency of financial resource allocation (Diamond, 1984; Levine, 2005). This theoretical perspective helps explain how the IFC Pilot Policy affects firms' resilience across supply networks. Building such resilience does not rely merely on firms' short-term operational adjustments. Rather, it requires sustained resource investment in supplier diversification, safety stock reserves, logistics system upgrading, digital supply chain platforms, risk early-warning mechanisms, and production flexibility. Existing studies show that multi-sourcing, inventory buffers, reserved capacity, and flexible supply contracts are important strategies for enhancing supply chain resilience, while digital transformation and real-time decision-making systems also improve supply chain visibility, agility, and shock-response capacity (Dey, 2023; Guo et al., 2025; Li et al., 2025). However, these resilience-building activities often involve high upfront costs, long payback periods, substantial uncertainty, and limited collateral value, making them vulnerable to external financing constraints. Financial studies on innovation and long-term capability building also

show that such investments often face financing gaps due to information asymmetry and capital market frictions, and that firms' cash flow and access to external finance significantly affect their ability to sustain investment (Brown et al., 2009; Hall & Lerner, 2010).

The IFC pilot policy strengthens information exchange and resource linkages between the financial sector and real-sector firms by establishing industry–finance information-matching platforms, issuing lists of key firms and key projects, and creating targeted bank–firm matching mechanisms. This improves financial institutions' ability to identify firms' actual operating conditions, financing needs, and positions in industrial chains. It can therefore alleviate insufficient funding supply caused by information asymmetry and financing frictions and ultimately direct financial resources more precisely toward resilience-building activities such as supplier coordination, inventory buffers, logistics upgrading, digital supply chain construction, and risk early warning. Meanwhile, financial service innovation and the optimization of industrial-chain financial ecosystems promoted by the policy also provide more favorable external conditions for firms to coordinate upstream and downstream resources and stabilize transaction relationships. Thus, by improving the information-identification and resource-allocation functions of financial intermediaries, the IFC Pilot Policy can strengthen firms' capacity to absorb disturbances across supply networks and rapidly restore normal operations. Accordingly, we formulate the following baseline hypothesis:

H1. *The IFC Pilot Policy improves firms' supply chain resilience.*

Having established this aggregate impact, this study further identifies the underlying transmission channels. We argue that the IFC Pilot Policy operates through at least three channels: reducing debt financing costs, developing supply chain finance, and improving real investment efficiency.

First, industry–finance cooperation can enhance supply chain resilience by reducing firms' debt financing costs. Information asymmetry is widespread in credit markets. When financial institutions cannot accurately identify firms' operating quality, project risks, repayment capacity, and positions in industrial chains, lenders often demand larger financing spreads or tighten borrowing eligibility criteria (Akerlof, 1978; Myers & Majluf, 1984). Higher borrowing expenses discourage firms from committing resources to long-horizon investment projects. This barrier is especially important for efforts to build resilient supply networks, since initiatives including backup supplier development, safety stock reserves, logistics system upgrading, and digital supply chain platform construction usually have long payback periods and limited collateral value. Existing studies also show that financing constraints inhibit firms' long-term investment and innovation-oriented initiatives (Brown et al., 2009; Hall & Lerner, 2010). Therefore, when debt financing costs are high, firms may postpone resilience-building projects, reduce redundant resources, and compress liquidity buffers, thereby weakening both ex ante risk resistance and ex post recovery efficiency.

The IFC Pilot Policy alleviates these constraints by transforming dispersed industrial and firm-level information into credit signals that financial institutions can identify. Specifically, information-sharing platforms, financing demand lists, key project databases, and targeted bank–firm matching can reduce banks' information search costs and post-loan monitoring costs, compress the risk premium on external financing, and lower firms' debt financing costs. As financing costs decline, the financial feasibility of various resilience-related projects improves significantly, enabling firms to maintain necessary liquidity reserves and continue investing in supply chain capabilities. With sufficient liquidity and lower investment thresholds, firms facing external shocks are less likely to transfer financial pressure by delaying payments, reducing orders, or sharply cutting inventories. This

ultimately enhances their capacity to withstand disruptions and rapidly resume supply chain operations. Accordingly, we formulate the second hypothesis:

H2. *The IFC Pilot Policy improves firms' supply chain resilience by reducing debt financing costs.*

Second, industry–finance cooperation can strengthen firms' capacity to withstand supply-network disruptions by expanding transaction-based financing within industrial chains. A major challenge in industrial-chain operations is that liquidity pressure can spread across firms. When core firms delay payments, downstream repayment uncertainty increases, or upstream suppliers face cash flow stress, financial pressure may diffuse through procurement, production, and sales links. Research on production networks shows that shocks can be transmitted across firms through supplier–customer relationships and generate amplification effects (Elliott et al., 2022). Existing studies further indicate that trade credit acts as a stabilizer in supply chains: when firms suffer operating shocks, they expand trade credit to maintain customer relationships and avert disruptions across supply networks (Ersahin et al., 2024). Therefore, the smooth circulation of funds within industrial chains is a core condition for maintaining supply chain resilience.

The IFC Pilot Policy promotes financial services that fit industrial-chain scenarios to address this problem. Supply chain finance theory argues that real transaction relationships embed credit information. Accounts receivable, accounts payable, purchase orders, commercial bills, warehouse receipts, and long-term stable trading relationships can all serve as financing bases for firms in industrial chains (Gelsomino et al., 2016; Gofman & Wu, 2022). The policy encourages financial institutions to incorporate transaction information and core-firm credit into credit decisions, thereby transforming real trade relationships into pledgeable credit assets. Even when downstream firms delay payments, upstream suppliers can still obtain financing based on complete transaction documents, which helps stabilize settlement links across the industrial chain. Once financial flows along the industrial chain become more stable, local liquidity pressure is less likely to spread through the supply chain, ultimately improving firms' ability to maintain normal industrial-chain operations under external shocks. Accordingly, we formulate the third hypothesis:

H3. *The IFC Pilot Policy improves firms' supply chain resilience by developing supply chain finance.*

Third, industry–finance cooperation can strengthen firms' capacity to withstand supply-network shocks by improving real investment efficiency. Even when firms obtain more financial resources, these resources do not automatically translate into supply chain resilience. The core issue lies in capital misallocation. Studies on investment efficiency show that financing constraints and agency conflicts may cause firms to deviate from optimal investment levels: underinvestment leads firms to miss valuable real-sector projects, while overinvestment directs resources toward inefficient scale expansion (Biddle et al., 2009; Richardson, 2006). Both types of inefficient investment are detrimental to resilience building. Underinvestment constrains firms' ability to develop alternative suppliers, optimize inventories, and upgrade logistics and digital supply chain platforms, while overinvestment unrelated to the core business crowds out funds needed for risk control and supply chain adjustment. Therefore, whether financial support can enhance resilience depends not only on whether firms obtain funds, but also on whether those funds are allocated to real production and long-term risk-resistance capability building.

The IFC Pilot Policy closely links financial support with real industrial needs and improves the efficiency of firms' fund use. Relying on lists of key firms, key project databases, financing demand lists, and industry–finance matching mechanisms, the policy guides credit resources toward firms and projects that are consistent with industrial upgrading and

the real economy. On the one hand, it alleviates financing constraints for high-quality real-sector projects and reduces underinvestment. On the other hand, it aligns credit allocation more closely with firms' actual production and operations, thereby restraining inefficient expansion. As capital allocation efficiency improves, firms can devote a greater share of their resources to measures that reinforce operational robustness, including supplier development, inventory optimization, logistics upgrading, digital system construction, and production flexibility enhancement. This comprehensively strengthens firms' ability to resist, absorb, and recover from disruptions across supply networks. Accordingly, we formulate Hypothesis 4:

H4. *The IFC Pilot Policy improves firms' supply chain resilience by improving real investment efficiency.*

The policy effect of industry–finance cooperation may differ significantly across firms and regions, mainly because firms vary in their endowments for absorbing financial resources and transforming them into supply chain risk-resistance capabilities.

Technology-intensive firms face another type of constraint. Their production and supply chain systems are highly dependent on specialized intermediate inputs and core components, and they require continuous technological upgrading. Such firms have longer investment cycles, higher uncertainty, and stronger demand for stable external finance. Existing studies show that R&D and innovation activities are characterized by high uncertainty, long horizons, and severe information asymmetry, making them highly dependent on external financial support (Brown et al., 2009; Hall & Lerner, 2010; Hsu et al., 2014). If financial support is insufficient, technology-intensive firms may postpone resilience-related investments such as alternative supplier development, core technology reserves, and digital supply chain management systems. The IFC Pilot Policy eases financing frictions and stabilizes funding supply, helping these firms continue resilience-building investment and better cope with disruptions in key components and core technologies. Therefore, the policy effect is expected to be more pronounced among technology-intensive firms.

The regional business environment may further moderate the marginal effect of the policy. Firms operating in less favorable commercial environments typically encounter greater information frictions, higher transaction costs, and less developed market-based financial services. Existing studies show that legal institutions, financial development, and the business environment directly affect firms' access to external finance and growth opportunities (Beck et al., 2005; La Porta et al., 1997; Reyes et al., 2021). These institutional shortcomings make it difficult for firms to obtain financial support that matches their production needs. Industry–finance cooperation can partly compensate for these institutional deficiencies by improving information matching, strengthening targeted credit support, and coordinating financial resources. This alleviates the marginal financing constraints faced by firms in regions with weaker business environments and releases greater gains in the resilience of their supply networks. Accordingly, we formulate the following heterogeneity propositions:

H5a. *The positive effect of the IFC Pilot Policy on supply chain resilience is stronger among technology-intensive firms.*

H5b. *The positive effect of the IFC Pilot Policy on supply chain resilience is stronger in regions with less favorable business environments.*

3. Data and Identification Strategy

3.1. Data

Our empirical investigation draws on longitudinal data for A-share manufacturing firms in China over the period 2014–2023. China announced two batches of national IFC pilot cities in December 2016 and December 2020. Since each batch of pilot policies usually lasts for three years, we examine observations spanning 2014–2023. This period covers the pre-policy years, the implementation period of the first batch, and the observation window after the second batch was launched. Financial data and registered-location information of listed firms are mainly obtained from the CSMAR database. Regional macro-level data are collected from the China Statistical Yearbook. In terms of sample processing, this study sequentially excludes firms that were ever designated as ST or *ST during the sample period, firms in the real estate and financial industries, observations with substantial gaps in the principal variables, firms whose registered city or county changed during the sample period, and firms observed only after the policy shock. To limit the influence of extreme observations, we winsorize every continuous variable at the 1st and 99th percentiles. In addition, among the 37 cities selected in the first batch, 18 continued to be included in the second batch, while the remaining 19 cities were not retained for various reasons. Following the practice of existing policy evaluation studies, this study further excludes observations from these cities after they exited the pilot program. This helps avoid potential interference with the estimation results. After the first pilot cycle ended, these cities no longer clearly correspond to an active national IFC pilot status. Treating them as continuously treated may overstate policy persistence, while reclassifying them as untreated may ignore possible legacy effects from the first pilot cycle. Therefore, this treatment helps maintain a cleaner definition of the policy variable. We further retain these observations in a robustness check. The final sample contains 16,549 firm-year observations.

Our outcome variable is firms' supply chain resilience. It reflects a firm's capacity to maintain supply-chain stability, withstand disruptions, and restore or adapt its operations following external shocks. Following the resilience measurement framework that emphasizes resistance, adaptation, recovery, and transformation capabilities (Hosseini et al., 2019; Wieland & Durach, 2021), we build a composite firm-level index. The index combines indicators related to three aspects of resilience: resistance to supply chain disruptions, post-shock recovery, and capability creation. We apply an entropy-based weighting procedure to aggregate these indicators. This method is appropriate because the indicators have different units and capture distinct dimensions of firms' capacity to withstand and recover from supply-network disruptions. Compared with equal weighting, the entropy method reduces the arbitrariness of assigning the same weight to all indicators. Compared with PCA and factor analysis, it does not require the indicators to load on a single latent factor and better preserves the theoretical structure of the three resilience dimensions. Therefore, we use entropy weights to construct the composite index after adjusting the direction and standardizing each indicator. The final index is further standardized using the Z-score method, with larger values indicating stronger supply chain resilience. Table 1 reports the specific indicators, definitions, directions, and supporting literature.

Table 1. Dimensions for Measuring Corporate Supply Chain Resilience.

Dimension	Specific Indicator	Definition	Direction	Link to Supply Chain Resilience	Supporting Literature
Supply chain resistance capability	Operating risk	Ratio of total net receivables and prepayments to operating revenue	negative	Higher funds tied up in transactions weaken cash turnover and reduce the ability to withstand disruptions.	(Deloof, 2003; Theodore Farris & Hutchison, 2002)
	Financial risk	Debt ratio	negative	Higher leverage reduces financial slack and weakens the firm's capacity to absorb supply chain shocks.	(Ambulkar et al., 2015; Opler et al., 1999)
	Supplier diversification	Sum of squared purchase ratios of top five suppliers	negative	Greater dependence on a few suppliers increases exposure to supplier-side disruptions.	(Bode et al., 2011; Choi & Krause, 2006)
Supply chain recovery capability	Bullwhip effect	Ratio of output variance to demand variance	negative	Stronger production-demand amplification indicates weaker stability and slower post-shock recovery.	(Lee et al., 1997; Shan et al., 2014)
	Inventory turnover capability	Ratio of cost of goods sold to average inventory	positive	Higher inventory turnover reflects better inventory circulation and stronger operational recovery capacity.	(Brandon-Jones et al., 2014; Hendricks & Singhal, 2005)
	Cash reserve level	Ratio of net operating cash flow to total profit	positive	Stronger operating cash flow supports procurement, payment, and production recovery after shocks.	(Bates et al., 2009; Opler et al., 1999)
	Management efficiency	Ratio of administrative expenses to operating revenue	negative	Lower management cost indicates stronger internal coordination and resource adjustment efficiency.	(Dubey et al., 2021; Teece et al., 1997)
	Profitability	Ratio of net profit to average shareholders' equity	positive	Higher profitability provides internal financial support for supply chain recovery and adjustment.	(Ambulkar et al., 2015; Brandon-Jones et al., 2014)
Supply chain creation capability	R&D ratio	Ratio of R&D expenditure to operating revenue	positive	Higher R&D investment supports technological upgrading, digitalization, and adaptive supply chain capabilities.	(Dubey et al., 2021; Hall & Lerner, 2010)
	Per capita profit	Ratio of total profit to total employees	positive	Higher labor productivity reflects stronger resource utilization and capability reconfiguration.	(Brandon-Jones et al., 2014; Teece et al., 1997)
	Educational level	Proportion of employees with bachelor's degree	positive	Higher human capital quality improves information processing, learning, and adaptive response capacity.	(Dubey et al., 2021; Pyatt, 1966)

To examine the transmission channels of the IFC Pilot Policy, we construct three mechanism variables. First, debt financing cost (Cost) is measured as the ratio of interest expense to the mean outstanding balance of short- and long-term borrowings. It reflects firms' cost of obtaining debt capital. A lower value indicates cheaper financing and a lower financial burden for long-term investment in supply chain resilience. Second, following Xue and Qu (2026), supply chain finance (SCF) is measured as the sum of short-term loans, notes payable, and accounts payable, scaled by total assets. This indicator is a balance-sheet-based composite proxy that captures the scale of short-term financing and trade credit related to firms' supply chain activities. Specifically, short-term loans reflect external working-capital financing used to support procurement, production, and payment settlement; notes payable capture bill-based settlement and financing arrangements; and accounts payable represent trade credit provided by upstream suppliers. Taken together, these three items reflect the extent to which firms obtain short-term financial support from supply-chain transaction settings. A higher value of SCF indicates stronger access to supply-chain liquidity and transaction-credit support. Third, investment efficiency is measured following Biddle et al. (2009) and Richardson (2006). We first estimate an expected investment model¹ and obtain the residuals from this model. The residual captures the deviation of a firm's actual investment from its expected investment level. A positive residual indicates that actual investment exceeds the expected level and is therefore interpreted as overinvestment, while a negative residual indicates that actual investment is below the expected level and is interpreted as underinvestment. Inefficient investment (Efficiency¹) is defined as the absolute value of the residual, with a larger value indicating lower investment efficiency. Overinvestment (Efficiency²) is constructed only from observations with residuals greater than zero and measures the extent to which firms' actual investment exceeds the reasonably expected level. Underinvestment (Efficiency³) is constructed only from observations with residuals below zero, the absolute value of the negative residual is used to measure the investment shortfall relative to the reasonably expected level. These indicators help test whether the policy guides financial resources more efficiently toward real production and supply chain capability building.

We also control for regional economic and financial conditions that may influence firms' supply chain resilience. Regional GDP is defined as the logarithm of per capita GDP, while financial development (Fd) is measured by the ratio of local financial institutions' deposit and loan balances to regional GDP. Because pilot-city selection may be related to local economic and financial conditions before the policy, we construct predetermined city-level controls. Specifically, we use the pre-2017 city averages of per capita GDP and financial development and interact them with year fixed effects in the regressions. This design accounts for time-varying differences associated with cities' initial economic and financial conditions.

Table 2 summarizes the distributions of the principal variables for the pooled sample and for the treated and untreated subsamples. Panel A shows that the average Resilience score is 0.273 among treated firms, higher than the corresponding value of −0.041 among untreated firms. This raw comparison indicates that firms located in pilot cities exhibit a higher level of supply chain resilience over the sample period. It should be noted, however, that this mean difference cannot be directly viewed as evidence of the policy's causal impact, because firms in the treatment and control groups may differ systematically in terms of regional economic foundations, financial environments, and firm-level characteristics. Therefore, the regressions that follow isolate the policy's incremental impact by absorbing firm and year fixed effects and accounting for more stringent regional- and industry-level influences. Panel B summarizes the mechanism variables. The treated subsample has an average debt financing cost (Cost) of 0.048, lower than 0.058 for the control subsample. In

terms of chain-level capital flows, the average SCF value is 0.250 for treated firms, higher than 0.214 for control firms. Regarding capital allocation efficiency, firms in the treatment group have lower mean values of inefficient investment (Efficiency¹), overinvestment (Efficiency²), and underinvestment (Efficiency³) than those in the control group. These differences indicate that firms located in pilot cities display relatively more favorable sample characteristics in terms of financing costs, the use of transaction-based funding within supply networks and the effectiveness of investment deployment, which is broadly consistent with the three proposed mechanisms of “capital price–chain-level capital flow–capital use.” Panel C reports the city-level characteristics measured before policy implementation. The mean value of pre-treatment regional economic development (GDP) is 11.758 for cities in the treatment group, higher than 11.448 for cities in the control group. Similarly, the mean value of pre-treatment financial development (FD) is 4.441 for the treatment group, compared with 3.873 for the control group. This indicates that cities selected for the industry–finance cooperation pilot already had stronger economic foundations and more developed financial conditions before the policy was implemented, suggesting that pilot selection was not completely random. To mitigate the influence of pre-treatment differences across cities and their associated trends, subsequent regressions account for year-specific variation in regional economic and financial development, together with province- and industry-specific annual effects.

Table 2. Descriptive statistics.

Variable	Obs	Mean	SD	Obs	Mean	SD	Obs	Mean	SD
Full Sample				Treatment Group			Control Group		
Panel A: Key dependent Variable									
Resilience	16,549	0.021	0.946	3272	0.273	0.799	13,277	−0.041	0.969
Panel B: Mediator Variables									
Cost	14,362	0.056	0.062	3009	0.048	0.031	11,353	0.058	0.068
SCF	15,610	0.220	0.138	2929	0.250	0.130	12,681	0.214	0.138
Efficiency ¹	14,877	0.049	0.052	3037	0.039	0.028	11,840	0.052	0.056
Efficiency ²	4844	0.068	0.076	905	0.046	0.041	3939	0.073	0.081
Efficiency ³	9254	0.039	0.025	1958	0.035	0.019	7296	0.040	0.026
Panel C: Pre-Treatment Variables									
GDP	16,549	11.509	0.476	3272	11.758	0.426	13,277	11.448	0.468
FD	16,549	3.986	1.624	3272	4.441	1.527	13,277	3.873	1.627

Notes: Efficiency¹ denotes overall investment inefficiency, measured as the absolute value of the residuals from the expected investment model. Efficiency² denotes overinvestment, measured as the absolute value of positive residuals, whereas Efficiency³ denotes underinvestment, measured as the absolute value of negative residuals.

3.2. Identification Strategy

We estimate whether the IFC pilot program strengthens supply chain resilience using an SDID framework. The policy rollout across cities provides quasi-experimental variation, as specified in Model (1):

$$Resilience_{i,t} = \alpha_0 + \beta_1 IFC_{i,t} + \mu_i + \delta_t + \varepsilon_{i,t} \quad (1)$$

In Equation (1), $Resilience_{i,t}$ denotes the supply chain resilience of firm i in year t . $IFC_{i,t}$ is the policy variable for the IFC Pilot Policy. Specifically, we identify whether and when a firm is affected by the pilot policy based on the firm’s registered location. $IFC_{i,t}$ equals one if the firm’s registered location is in an IFC pilot city and the year is within the post-treatment period of that city. Otherwise, it equals zero. Specifically, the two batches of the pilot policy were announced in December 2016 and December 2020, respectively. Considering that policy implementation may take time to translate into firms’ operational

behavior, we define 2017 as the first effective treatment year for firms located in the first-batch pilot cities and 2021 as the first effective treatment year for firms located in the second-batch pilot cities. The coefficient β_1 measures the average policy impact on firms' supply chain resilience. Firm fixed effects μ_i absorb time-invariant firm characteristics, while year fixed effects δ_t account for common annual shocks, including macroeconomic fluctuations and nationwide policy changes. $\varepsilon_{i,t}$ is the random error term. To account for serial correlation and heteroskedasticity within the same firm over time, this study clusters standard errors at the firm level.

The DID design relies on the assumption that treated and untreated firms would have followed comparable trends in the absence of the policy. In this setting, firms in pilot and non-pilot cities should display similar pre-policy movements in supply chain resilience. We assess this condition using an event-study specification following Jacobson et al. (1993):

$$Y_{i,t} = \alpha_0 + \sum_{\substack{k=-3 \\ k \neq 0}}^6 \phi_k D_{i,t}^k + \mu_i + \delta_t + \varepsilon_{i,t} \quad (2)$$

In Equation (2), the time indicator k denotes the year relative to the 2017 policy launch, spanning from -3 to 6 (given the 2014–2023 sample period). The treatment dummy $D_{i,t}^k$ equals 1 for a treatment group firm i in k year, otherwise equals 0. We omit the first policy year (2017) as the reference category to prevent multicollinearity. Accordingly, ϕ_k captures the difference in supply chain resilience between treated and control firms in event year (k), relative to the omitted reference year. The coefficients ϕ_k for ($k < 0$) measure the pre-treatment differences in supply chain resilience between treated and control firms relative to the initial exposure year, and are used to assess whether the two groups exhibited systematic differential trends before the policy became effective. If the estimated pre-treatment coefficients are statistically indistinguishable from zero, the parallel trend assumption is considered plausible.

4. Empirical Results

4.1. Benchmark Results

Table 3 reports the baseline regression results. Column (1) controls for unobserved firm characteristics and common annual shocks. The coefficient indicates that, after the policy took effect, firms in pilot cities improved their supply chain resilience by 0.061 standard deviations compared with firms in non-pilot cities. This result accords with the evidence reported by Y. Chen et al. (2024). Using stock return stability to capture firms' long-term-oriented resilience, Y. Chen et al. (2024) find that the IFC Pilot Policy increases long-term-oriented resilience by approximately 0.055 standard deviations (0.0021/0.038), thereby providing further support for our findings from the broader perspective of firm resilience. The following columns gradually introduce stricter fixed effects and trend controls. Column (2) controls for pre-policy regional economic development and financial development. This accounts for potential time trends associated with cities' pre-policy economic and financial conditions. Column (3) further absorbs province-by-year and industry-by-year effects. Column (4) combines these high-dimensional fixed effects with trends based on cities' pre-policy characteristics. Column (5) additionally includes firm-level covariates. Stable coefficients across different model settings confirm the baseline results are robust. As documented, the IFC Pilot Policy significantly promotes corporate supply chain resilience. In other words, by strengthening information matching between financial institutions and industrial firms, the policy improves the alignment between financial resources and real production needs. This enables firms to maintain necessary liquidity buffers and invest more in supply chain adjustment. This provides favorable support for H1.

Table 3. The policy effect of IFC Pilot Policy on listed firms' supply chain resilience.

	Resilience				
	(1)	(2)	(3)	(4)	(5)
IFC	0.061 *** (0.022)	0.042 * (0.025)	0.048 * (0.025)	0.050 * (0.028)	0.051 * (0.028)
Firm FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Year FE × GDP ^{before 2017}		✓		✓	✓
Year FE × FD ^{before 2017}		✓		✓	✓
Province-Year FE			✓	✓	✓
Industry-Year FE			✓	✓	✓
Firm-level controls					✓
Observations	16,549	12,890	16,546	12,883	12,883
R ²	0.822	0.790	0.838	0.810	0.811

Notes: Values in parentheses are standard errors adjusted for clustering at the firm level. The symbols *** and * correspond to *p*-values below 0.01 and 0.10, respectively. "✓" indicates "Yes". Firm-level controls include firm size, board size, proportion of independent directors, Tobin's Q, and institutional ownership.

4.2. Robustness Analysis

4.2.1. Substitution of Other Dependent Variables

To assess whether the baseline result holds under an alternative outcome definition, we use supply chain risk (Risk) as the dependent variable. Following [Shan et al. \(2014\)](#), Risk is defined as the relative volatility of production to demand. Specifically, it equals the standard deviation of quarterly production divided by the standard deviation of quarterly demand. Quarterly production is proxied by cost of goods sold plus net inventory changes, while quarterly demand is proxied by main business revenue plus other business revenue. A larger value means that demand fluctuations are more strongly transmitted to production, indicating greater supply chain risk.

Table 4 reports the estimates obtained after substituting the dependent variable. The estimates show that the IFC policy lowers the amplification of production volatility relative to demand volatility by 3.4–5.7%. [Bray and Mendelson \(2012\)](#) report that the mean and median bullwhip effects account for 15.8% and 6.7% of total demand variability, respectively. In light of this evidence, the IFC Pilot Policy substantially mitigates the excess variability of production compared with demand fluctuations. Overall, whether supply chain stability is captured through resilience capabilities or through production–demand volatility exposure, the IFC Pilot Policy produces a consistent improvement. This also alleviates concerns related to outcome measurement and further supports the baseline finding.

Table 4. Robustness: Substitution of other dependent variables.

	Risk			
	(1)	(2)	(3)	(4)
IFC	−0.056 *** (0.020)	−0.057 ** (0.025)	−0.034 * (0.019)	−0.038 *** (0.012)
Firm FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Year FE × GDP ^{before 2017}		✓		✓
Year FE × FD ^{before 2017}		✓		✓
Province-Year FE			✓	✓
Industry-Year FE			✓	✓
Observations	14,035	11,003	14,031	10,994
R ²	0.226	0.266	0.265	0.418

Notes: The symbols ***, **, and * correspond to *p*-values below 0.01, 0.05, and 0.10, respectively. "✓" indicates "Yes".

4.2.2. Imputation-Based Estimator Method

To further examine whether the baseline results depend on the functional form of the conventional two-way fixed effects model, this study applies the imputation estimator of [Borusyak et al. \(2024\)](#). Instead of directly comparing treated and control firms over the full sample, this method first uses untreated observations to estimate the potential level of supply chain resilience that treated firms would have achieved in the absence of the IFC Pilot Policy. It then compares the actual outcomes of treated firms with their counterfactual outcomes. This approach provides a more direct way to capture changes in firms' supply chain resilience after policy implementation relative to the untreated state.

Figure 2 reports the dynamic effects estimated using the imputation-based estimator. The pre-policy coefficients are close to zero and show no clear trend, while the post-policy estimates become positive and stay at relatively high levels in most years. Table 5 provides the corresponding regression estimates. Across specifications, the coefficients on IFC are consistently positive. These findings indicate that, after using an estimation method that constructs counterfactual outcomes based on untreated observations, the positive effect of the IFC Pilot Policy on firms' supply chain resilience remains robust. This further strengthens the credibility of the baseline conclusion.

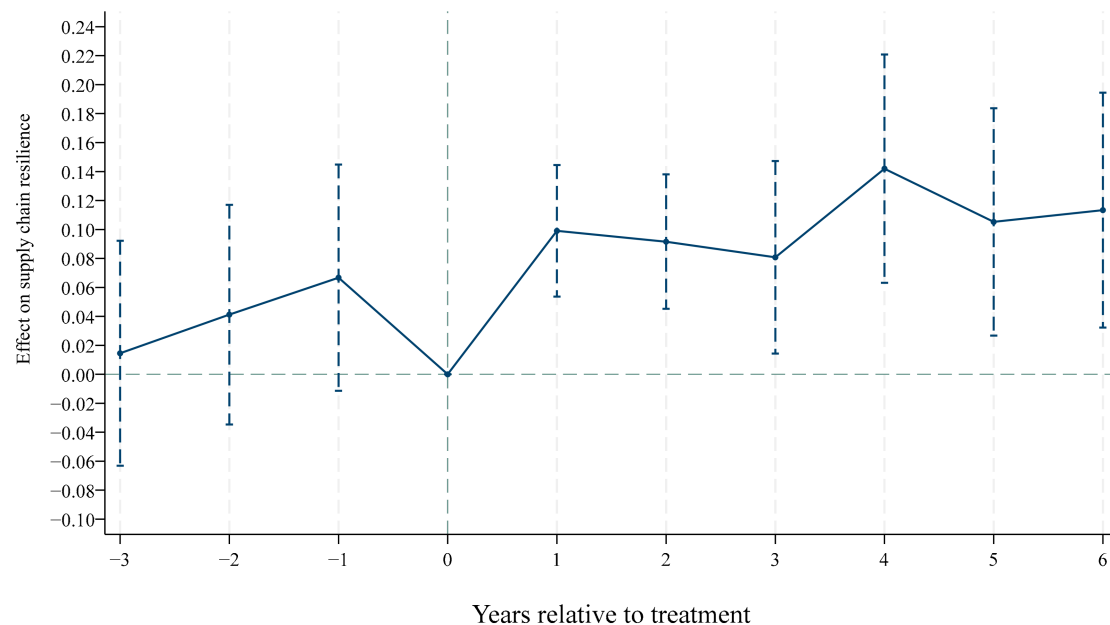


Figure 2. Imputation-based estimates of IFC policy effects on supply chain resilience.

Table 5. Robustness: Imputation-based estimator method.

	Resilience			
	(1)	(2)	(3)	(4)
IFC	0.081 *** (0.023)	0.081 *** (0.023)	0.053 ** (0.029)	0.053 ** (0.029)
Firm FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Year FE × GDP ^{before 2017}		✓		✓
Year FE × FD ^{before 2017}		✓		✓
Province-Year FE			✓	✓
Industry-Year FE			✓	✓
Observations	16,263	16,263	16,121	16,121

Notes: The symbols *** and ** correspond to p -values below 0.01 and 0.05, respectively. "✓" indicates "Yes".

4.2.3. Parallel Trend Check

We conduct a dynamic effect analysis to assess the validity of the staggered DID design. This test examines whether treated and control firms followed similar pre-policy trends in supply chain resilience. We take the implementation year as the reference period and create relative-time indicators covering three years before and six years after the policy. These indicators are then estimated within the baseline specification.

Figure 3 plots the event-study estimates. In the pre-treatment years, the coefficients are close to zero and their confidence intervals cover zero, indicating no obvious divergence in supply chain resilience between treated and untreated firms before the policy took effect. This supports the parallel trends assumption. After treatment begins, the estimates become positive and remain relatively stable in subsequent years. These results are consistent with the baseline estimates and reduce concerns that the findings are driven by differential pre-treatment trends.

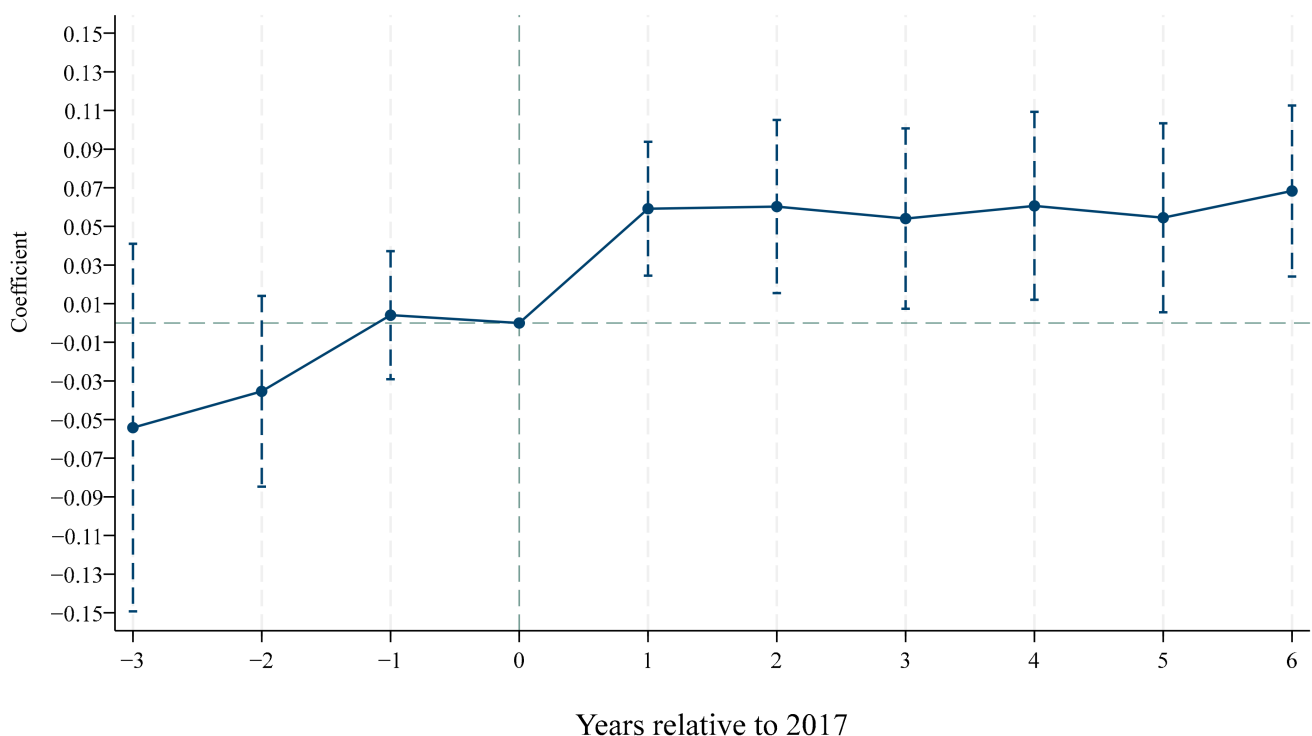


Figure 3. Dynamic effects of the IFC policy on supply chain resilience.

4.2.4. Placebo Test

We perform a placebo test to examine whether the baseline finding is driven by random shocks or unobserved factors. Holding the sample structure fixed, we randomly assign pseudo-treated groups and pseudo policy timings, and then re-estimate the baseline model many times. The purpose is to test whether artificial policy variables can generate effects similar to those of the actual IFC Pilot Policy.

As shown in Figure 4, the placebo coefficients are centered around zero, with most p -values above standard significance thresholds. Artificial policy assignments yield no consistent significant impacts. This eliminates concerns over random grouping, sample noise and omitted variables, which further validates our baseline findings.

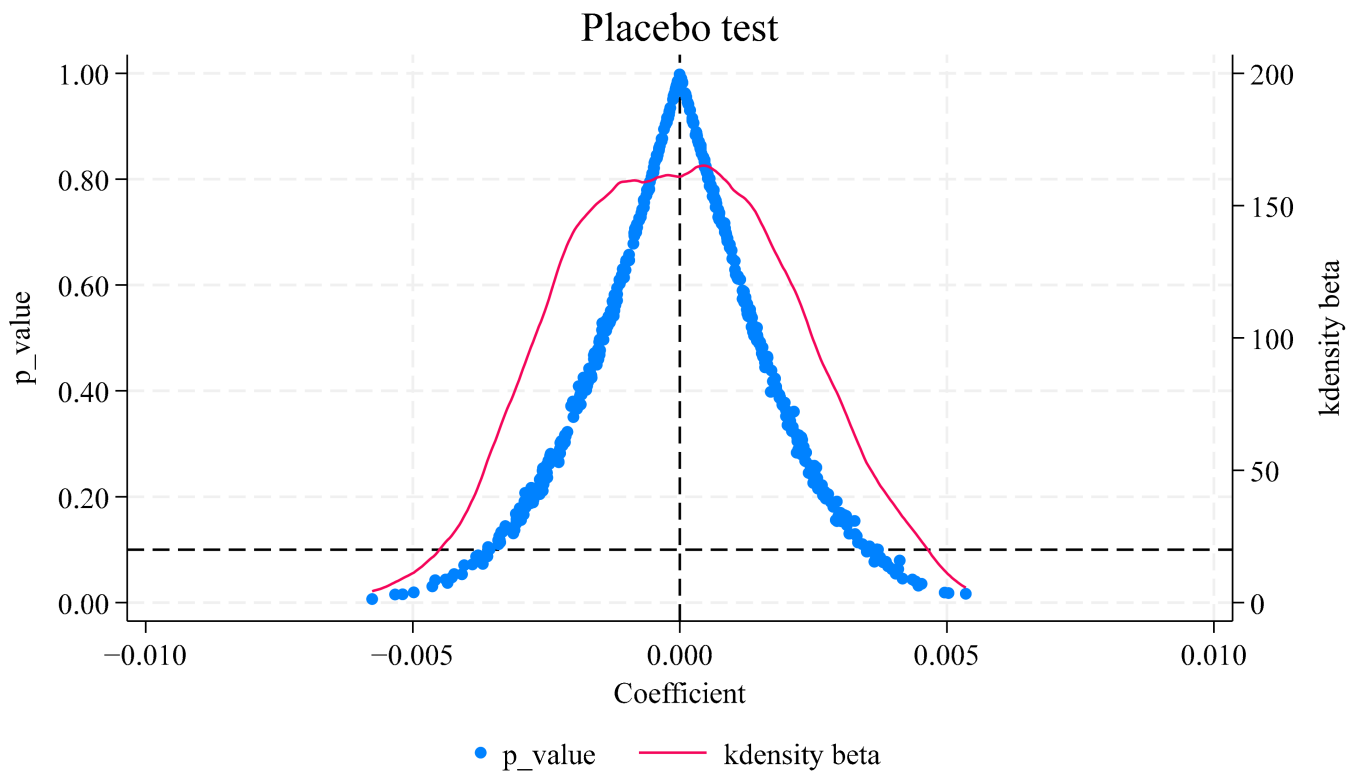


Figure 4. Placebo test of the IFC Pilot Policy.

4.2.5. Including Exit-City Observations

The baseline sample excludes the post-exit observations of 19 cities that were included in the first pilot batch but not retained in the second batch. To address potential sample-selection concerns, we restore these firm-year observations and recode the IFC variable according to the cities' actual pilot status. Table 6 reports the results. The coefficients on IFC remain positive and statistically significant across all specifications. Therefore, the main finding is not driven by the exclusion of observations from cities that exited the pilot program.

Table 6. Robustness: Including exit-city observations.

	Resilience			
	(1)	(2)	(3)	(4)
IFC	0.109 *** (0.022)	0.106 *** (0.024)	0.041 * (0.025)	0.054 * (0.029)
Firm FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Year FE × GDP ^{before 2017}		✓		✓
Year FE × FD ^{before 2017}		✓		✓
Province-Year FE			✓	✓
Industry-Year FE			✓	✓
Observations	17,337	13,300	17,334	13,294
R ²	0.810	0.778	0.828	0.800

Notes: The symbols *** and * correspond to *p*-values below 0.01 and 0.10, respectively. "✓" indicates "Yes".

4.2.6. Controlling for Concurrent Policies

To address the potential confounding effect of concurrent policies, we further control for the Supply Chain Innovation and Application Pilot Policy. This policy may independently improve firms' supply chain management, information sharing, and coordination with upstream and downstream partners and may therefore affect supply chain resilience

during the sample period. We construct a policy indicator based on the officially designated pilot enterprises and pilot cities. The indicator equals one for pilot enterprises or firms located in pilot cities from 2018 onward and zero otherwise. This variable is then included as an additional control in the baseline specification.

Table 7 reports the results. After controlling for the Supply Chain Innovation and Application Pilot Policy, the coefficient on IFC remains positive. This indicates that the resilience-enhancing effect of the IFC Pilot Policy is not driven by the overlapping influence of the concurrent supply chain pilot policy and further supports the robustness of the baseline finding.

Table 7. Robustness: Controlling for the Supply Chain Innovation and Application Pilot Policy.

	Resilience			
	(1)	(2)	(3)	(4)
IFC	0.054 ** (0.022)	0.043 * (0.025)	0.044 * (0.025)	0.051 * (0.028)
Firm FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Year FE $\times$ GDP ^{before 2017}		✓		✓
Year FE $\times$ FD ^{before 2017}		✓		✓
Province-Year FE			✓	✓
Industry-Year FE			✓	✓
Supply Chain Pilot Policy	✓	✓	✓	✓
Observations	16,549	12,890	16,546	12,883
R ²	0.822	0.790	0.828	0.810

Notes: The symbols ** and * correspond to *p*-values below 0.05, and 0.10, respectively. “✓” indicates “Yes”.

4.3. Mechanism Analysis

Section 2.2 identifies three channels through which the IFC Pilot Policy may enhance supply chain resilience: debt financing costs, supply chain finance, and real investment efficiency. This section empirically examines these mechanisms.

4.3.1. Capital Price Channel

Debt financing cost is the first transmission channel. Table 8 examines how the Policy affects firms’ debt financing costs. Column (1) demonstrates that the policy lowers debt financing costs by 0.5 percentage points, supporting the role of financing cost as a key transmission channel. The decline in debt financing costs further provides a financial foundation for firms to build supply chain resilience. Investments in supplier diversification, inventory buffers, logistics adjustment, digital supply chain systems, and risk early warning mechanisms usually have long cycles, uncertain returns, and partly irreversible features. Higher external financing costs raise the threshold for firms to undertake these resilience-related investments. Financing costs also matter for liquidity transmission within supply chains. When borrowing is expensive, firms facing external shocks may conserve cash by delaying payments, reducing procurement, or cutting inventories, which can intensify risk transmission between upstream and downstream firms. Gelsomino et al. (2016) emphasize the importance of cash-flow management for supply chains and value networks, while Elliott et al. (2022) also show that local shocks may spread and amplify through production networks. Therefore, by reducing debt financing costs, the IFC Pilot Policy can ease firms’ liquidity pressure and strengthen their ability to maintain supply chain relationships and invest in resilience. The results therefore support H2 and indicate that lower debt financing costs constitute an important channel through which the IFC Pilot Policy enhances supply chain resilience.

Table 8. Capital price channel: debt financing cost.

	Cost			
	(1)	(2)	(3)	(4)
IFC	−0.005 ** (0.002)	−0.007 *** (0.002)	−0.004 * (0.002)	−0.006 ** (0.002)
Firm FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Year FE × GDP ^{before 2017}		✓		✓
Year FE × FD ^{before 2017}		✓		✓
Province-Year FE			✓	✓
Industry-Year FE			✓	✓
Observations	14,362	11,732	14,357	11,724
R ²	0.451	0.395	0.479	0.432

Notes: The symbols ***, **, and * correspond to *p*-values below 0.01, 0.05, and 0.10, respectively. “✓” indicates “Yes”.

4.3.2. Chain Cash Flow Channel

Financial flows along the supply chain constitute the second key link through which industry–finance cooperation is translated into firms’ supply chain resilience. Resilience is shaped not only by a firm’s own financing capacity, but also by whether funds circulate smoothly across upstream and downstream transactions. Table 9 reports the mechanism evidence for the supply-chain financing channel (SCF). The first specification displays that policy significantly increases the level of supply chain finance by 1.5 percentage points, indicating that supply chain finance is an important transmission channel through which industry–finance cooperation takes effect. The expansion of supply chain finance further helps improve firms’ supply chain resilience. First, supply chain finance can ease the pressure of funds tied up in procurement, production, and sales. It can also reduce liquidity risks arising from longer payment periods or uncertain customer repayments among upstream and downstream firms (Gelsomino et al., 2016; Wetzel & Hofmann, 2019). Second, supply chain finance can direct funds more precisely to weaker connections in the chain. This reduces the likelihood that firms respond to cash flow pressure by delaying payments, cutting orders, or reducing inventories (Caniato et al., 2016; Wuttke et al., 2019). Production network theory indicates that local liquidity shocks may spread through upstream and downstream transaction relationships and generate amplification effects within supply chain networks (Elliott et al., 2022). Therefore, by expanding supply chain finance, the IFC Pilot Policy can stabilize financial flows and transaction relationships along the supply chain. It can also weaken the transmission of local shocks within supply chain networks, thereby strengthening firms’ supply chain resilience. These findings support H3.

Table 9. Chain cash flow channel: supply chain finance.

	SCF			
	(1)	(2)	(3)	(4)
IFC	0.015 *** (0.004)	0.014 *** (0.004)	0.007 * (0.004)	0.009 * (0.005)
Firm FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Year FE × GDP ^{before 2017}		✓		✓
Year FE × FD ^{before 2017}		✓		✓
Province-Year FE			✓	✓
Industry-Year FE			✓	✓
Observations	15,610	12,210	15,607	12,203
R ²	0.798	0.781	0.815	0.802

Notes: The symbols *** and * correspond to *p*-values below 0.01 and 0.10, respectively. “✓” indicates “Yes”.

4.3.3. Capital Use Channel

The use of funds is the third key link through which industry–finance cooperation is translated into firms’ supply chain resilience. Once financing costs decline and liquidity circulation becomes more stable, the resilience effect depends on whether firms’ direct financial resources toward real production and long-term capability building. Table 10 reports the mechanism results of corporate investment efficiency. Panel A uses inefficient investment (Efficiency¹) as the dependent variable. Panels B and C examine overinvestment (Efficiency²) and underinvestment (Efficiency³), respectively. The estimates indicate that the Policy lowers inefficient investment, overinvestment, and underinvestment. This indicates that industry–finance cooperation improves corporate investment efficiency and enhances the quality of financial resource allocation. More specifically, improved investment efficiency strengthens the conversion of financial support into supply chain resilience through two channels. On the one hand, alleviating underinvestment enables firms to undertake the long-term investments needed for resilience. Prior research suggests that such resilience depends on sustained investment in resource redundancy, organizational flexibility, information processing capacity, and supply chain reconfiguration capability. These investments help firms maintain operational continuity and recover more quickly when shocks occur (Ambulkar et al., 2015; Brandon-Jones et al., 2014; Dubey et al., 2021). On the other hand, reducing overinvestment lowers the occupation of funds by inefficient projects. This allows firms to retain more resources for core operations and risk management. Prior research into investment efficiency argues that overinvestment leads to resource misallocation and weakens the efficiency of fund use. Underinvestment caused by financing constraints, in contrast, restricts firms’ investment in positive-NPV projects (Biddle et al., 2009; Richardson, 2006). Therefore, by improving the use of funds and the quality of resource allocation, the IFC Pilot Policy enables financial support to flow more effectively into supply chain capability building. This constitutes the third transmission channel through which the policy enhances firms’ supply chain resilience and supports H4.

Table 10. Capital use channel: investment efficiency.

	Panel A: Efficiency ¹			
	(1)	(2)	(3)	(4)
IFC	−0.010 *** (0.002)	−0.007 *** (0.002)	−0.006 *** (0.002)	−0.004 * (0.002)
Firm FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Year FE × GDP ^{before 2017}		✓		✓
Year FE × FD ^{before 2017}		✓		✓
Province-Year FE			✓	✓
Industry-Year FE			✓	✓
Observations	14,877	12,116	14,875	12,111
R ²	0.320	0.252	0.361	0.302
	Panel B: Efficiency ²			
	(1)	(2)	(3)	(4)
IFC	−0.022 *** (0.005)	−0.017 *** (0.006)	−0.022 *** (0.006)	−0.012 * (0.007)
Firm FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Year FE × GDP ^{before 2017}		✓		✓
Year FE × FD ^{before 2017}		✓		✓
Province-Year FE			✓	✓
Industry-Year FE			✓	✓
Observations	4844	3508	4819	3472
R ²	0.427	0.386	0.517	0.498

Table 10. Cont.

	Panel C: Efficiency ³			
	(1)	(2)	(3)	(4)
IFC	−0.004 *** (0.001)	−0.004 *** (0.001)	−0.002 * (0.001)	−0.003 ** (0.001)
Firm FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Year FE × GDP ^{before 2017}		✓		✓
Year FE × FD ^{before 2017}		✓		✓
Province-Year FE			✓	✓
Industry-Year FE			✓	✓
Observations	9254	8179	9251	8176
R ²	0.403	0.386	0.472	0.461

Notes: The symbols ***, **, and * correspond to *p*-values below 0.01, 0.05, and 0.10, respectively. “✓” indicates “Yes”. Efficiency¹ denotes overall investment inefficiency, measured as the absolute value of the residuals from the expected investment model. Efficiency² denotes overinvestment, measured as the absolute value of positive residuals, whereas Efficiency³ denotes underinvestment, measured as the absolute value of negative residuals.

4.4. Heterogeneity Analysis

4.4.1. Firm-Level Heterogeneity

We first examine whether the effect of the IFC Pilot Policy varies across industries with different factor intensities. Firms are classified into technology-intensive, capital-intensive, and labor-intensive industries, and the regressions are estimated separately for each group. Following X. L. Xu et al. (2020), the classification is based on two indicators: fixed-asset intensity, measured as net fixed assets divided by average total assets, and R&D-to-labor-compensation intensity, measured as R&D expenditure divided by employee compensation payable. We calculate the two indicators at the detailed-industry level and standardize them before conducting hierarchical cluster analysis using Ward’s linkage method and squared Euclidean distance. The cluster with the highest fixed-asset intensity is classified as capital-intensive, whereas the cluster with the highest R&D-to-labor-compensation intensity is classified as technology-intensive. The remaining cluster is classified as labor-intensive².

Table 11 reports the heterogeneity results by industry type. Columns (1) and (2) focus on technology-intensive industries, Columns (3) and (4) on capital-intensive industries, and Columns (5) and (6) on labor-intensive industries. The estimates show that the policy significantly improves supply chain resilience among firms in technology-intensive industries. This finding is consistent with the production and financing characteristics of technology-intensive firms. These firms usually have higher R&D intensity, longer investment cycles, and greater dependence on key components. Their supply chain systems are often more complex and rely more heavily on specialized suppliers, technological coordination, and continuous financial support. Existing studies show that innovation and R&D involve high uncertainty, long horizons, and information asymmetry. They therefore depend more on stable external finance and high-quality financial development (Brown et al., 2009; Hall & Lerner, 2010; Hsu et al., 2014). For these firms, supply chain resilience depends not only on short-term liquidity. It also depends on whether firms can continuously invest in alternative supplier development, key technology reserves, digital supply chain management, and production flexibility. By easing financing frictions, smoothing liquidity circulation within supply chains, and improving capital allocation efficiency, the policy can be more effectively converted by technology-intensive firms into stronger adjustment and risk-response capabilities.

Table 11. Industry heterogeneity.

	Technology-Intensive		Resilience Capital-Intensive		Labor-Intensive	
	(1)	(2)	(3)	(4)	(5)	(6)
IFC	0.076 *** (0.026)	0.082 ** (0.035)	0.011 (0.058)	−0.066 (0.075)	−0.006 (0.053)	0.022 (0.073)
Firm FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Year FE × GDP ^{before 2017}		✓		✓		✓
Year FE × FD ^{before 2017}		✓		✓		✓
Province-Year FE		✓		✓		✓
Industry-Year FE		✓		✓		✓
Observations	10,206	7824	2976	2403	3300	2539
R ²	0.828	0.814	0.806	0.816	0.820	0.825
Cross-group coefficient-difference tests						
			Coefficient difference	F-statistic	p-value	
Technology-intensive vs. Capital-intensive			0.161 ***	8.89	0.0029	
Technology-intensive vs. Labor-intensive			0.193 ***	15.89	0.0001	
Capital-intensive vs. Labor-intensive			0.032	0.23	0.6283	
Joint equality test across the three groups			–	10.72	0.0000	

Notes: The symbols *** and ** correspond to *p*-values below 0.01 and 0.05, respectively. “✓” indicates “Yes”.

4.4.2. Regional Heterogeneity

We further examine whether local institutional conditions shape the effect of the IFC Pilot Policy. The regional business environment is measured using the marketization index from the China Provincial Marketization Index Report (2021)³. A larger index value reflects a higher level of marketization and better local business conditions. We split the sample at the annual median of this index into regions with stronger and weaker business environments, and then estimate the regressions separately.

Table 12 reports the heterogeneity test results by business environment. The first two columns are estimated using firms located in low-marketization regions, whereas the last two columns use firms in high-marketization regions. The coefficient is larger and statistically clearer in the former group. This pattern indicates that the policy brings greater resilience gains to firms operating in less developed business environments. This finding is consistent with the institutional function of the IFC Pilot Policy. Existing studies show that legal institutions, the information environment, and financial market efficiency affect firms’ ability to obtain outside capital and allocate it efficiently (Beck et al., 2005; La Porta et al., 1997; Rajan & Zingales, 1998). In regions with weaker business environments, firms usually face higher information frictions, higher transaction costs, and more severe financial resource mismatch. Financial institutions also find it more difficult to identify firms’ true operating conditions, project quality, and positions in industrial chains. As a result, firms are less able to obtain financial support that matches their production needs through market-based financial systems. The IFC Pilot Policy can partly address these constraints by building industry–finance information platforms, establishing lists of key firms and projects, promoting bank–firm matching, and developing industrial chain financial services. These arrangements can provide institutional credit support and improve information matching, thereby compensating for the lack of local market-based financial services. Therefore, in these regions, the policy is more likely to improve firms’ supply chain resilience by reducing financing frictions, stabilizing financial flows along the supply chain, and improving resource allocation efficiency. By contrast, regions with stronger business environments usually have more mature market mechanisms, more developed financial

service systems, and higher information transparency. Firms in these regions already have stronger access to financial resources and supply chain support services, leaving less room for marginal improvement from the IFC Pilot Policy. Overall, the regional heterogeneity results suggest that the IFC Pilot Policy has an institutional compensation function.

Table 12. Business environment heterogeneity.

	Resilience			
	Disadvantaged Business Environment		Advantaged Business Environment	
	(1)	(2)	(3)	(4)
IFC	0.075 ** (0.033)	0.085 ** (0.043)	0.046 (0.030)	0.007 (0.041)
Firm FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Year FE $\times$ GDP ^{before 2017}		✓		✓
Year FE $\times$ FD ^{before 2017}		✓		✓
Province-Year FE		✓		✓
Industry-Year FE		✓		✓
Observations	8281	6764	8213	6055
R ²	0.819	0.830	0.832	0.803
Cross-group coefficient-difference test				
		Difference	F-statistic	p-value
Advantaged – Disadvantaged business environment		−0.087 **	4.01	0.0455

Notes: The symbols ** correspond to *p*-values below 0.05. “✓” indicates “Yes”.

5. Conclusions and Policy Implications

5.1. Conclusions

This paper evaluates whether industry–finance cooperation strengthens firms’ supply chain resilience by exploiting the staggered rollout of China’s IFC Pilot Policy. Drawing on longitudinal observations for A-share manufacturing firms in China spanning 2014–2023, we estimate an SDID model. The baseline estimates indicate that the policy significantly enhances supply chain resilience. After the policy takes effect, treated firms achieve a 0.061-standard-deviation improvement relative to firms outside the pilot areas. The estimated effect persists under numerous supplementary checks.

The mechanism analysis shows that industry–finance cooperation does not work by simply expanding the supply of finance. Instead, it translates financial support into firms’ supply chain resilience through three connected links: lowering funding costs, improving liquidity circulation across supply chain participants, and guiding funds toward more efficient uses. First, the IFC Pilot Policy reduces the cost for financial institutions to identify firms’ operating quality, project risks, and positions in industrial chains. It does so through industry–finance information platforms, lists of key firms, and targeted bank–firm matching. This lowers firms’ debt financing costs and eases the financial pressure of long-term resilience-related investment. Second, the IFC Pilot Policy promotes the development of supply chain finance. It transforms real transaction relationships and the credit of core firms into financeable credit bases. This helps stabilize upstream and downstream financial flows and transaction relationships and weakens the diffusion of local liquidity shocks within supply chain networks. Finally, the IFC Pilot Policy improves corporate investment efficiency through industrial lists, key project databases, and targeted matching of financial resources. It reduces underinvestment and inefficient expansion, allowing financial resources to flow more effectively into supply chain capability building.

The heterogeneity results indicate that the resilience gains from the IFC Pilot Policy vary across firms and regions. These gains depend on firms' ability to absorb resources, the technological characteristics of industries, and the regional institutional environment. At the firm level, the policy effect is mainly concentrated among firms in technology-intensive industries, suggesting that firms with greater resource integration capabilities and greater demand for resilience-related investment are better able to transform financial support into supply chain stability. At the regional level, the policy generates larger gains in areas with weaker business environments. In these regions, industry–finance cooperation can partly provide institutional credit support and improve information matching. It can also compensate for the lack of market-based financial services and generate stronger marginal effects in regions with greater institutional frictions.

Several limitations warrant consideration. First, the empirical setting centers on a city-level pilot policy in China, where the financial system is predominantly bank-based and local governments are deeply involved in coordinating industrial and financial resources. Accordingly, the findings cannot be directly generalized to economies that differ substantially in their financial structures, regulatory systems, and government–business relationships. Second, the supply chain resilience measure is constructed from publicly available firm-level data and cannot directly capture specific supply chain disruption events, supplier substitution, delivery delays, or the transmission of risk across the entire supply chain. Subsequent work may build on these findings along several avenues. First, cross-country comparisons and comparative policy studies could examine how the resilience-enhancing effects of industry–finance coordination vary across financial systems and institutional environments. Second, transaction-level data, credit contracts, supplier–customer relationships, payment records, and specific shock events could be used to identify more precisely how financial support affects firms' operating decisions before, during, and after supply-network disruptions.

5.2. Policy Implications

Drawing on the principal results and supplementary analyses, we propose the following policy recommendations.

First, firms and financial institutions should improve the conversion of financial support into supply chain resilience rather than treating easier financing as an opportunity for general scale expansion. Firms should allocate lower-cost and more stable funds to supplier diversification, appropriate inventory buffers, logistics flexibility, digital monitoring systems, alternative supplier development, and contingency planning. Core firms should also use their network positions to improve payment discipline, share verifiable transaction information, and facilitate financing access for upstream and downstream partners. Financial institutions, in turn, should move beyond credit assessment based solely on collateral and individual financial statements. Orders, accounts receivable, commercial bills, inventory records, and stable trading relationships should be incorporated into credit evaluation so that financial resources can better support the continuity of real supply chain transactions.

Second, the implementation and evaluation of industry–finance cooperation should focus on the quality, circulation, and use of financial resources rather than only on the total amount of credit provided. The mechanism results show that lower debt financing costs, broader access to transaction-based funding within supply networks, and more efficient investment are the main channels associated with higher resilience. Accordingly, industry–finance information platforms should integrate firms' financing needs with verifiable information on production, orders, receivables, project implementation, and supply chain positions. Pilot performance should also be evaluated using indicators such as financing costs, the availability of transaction-based financing, payment continuity across supply

chains, and the proportion of funds entering real production- and resilience-related projects. At the same time, post-lending monitoring should be strengthened to prevent policy-supported funds from being diverted into inefficient expansion, financial arbitrage, or activities unrelated to firms' core operations.

Third, industry–finance cooperation should adopt a differentiated implementation approach that reflects variation in industry characteristics and regional institutional conditions. The stronger effects identified in specific subsamples indicate that the same financial instrument may not generate equal resilience gains in all settings. Policy implementation should therefore match financing products, maturity structures, information requirements, and risk-sharing arrangements with firms' actual production and supply chain needs. In particular, greater attention should be paid to firms that have difficulty converting policy support into resilience because of weak information disclosure, limited collateral, insufficient bargaining power, or underdeveloped local financial services. Public guarantees, transaction-data-based credit assessment, risk-sharing mechanisms, and coordination through core firms may help broaden access to policy resources. Such differentiation should improve the precision of industry–finance cooperation without replacing commercial risk assessment or relying on indiscriminate administrative credit allocation.

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Abbreviations

The following abbreviations are used in this manuscript:

IFC	Industry–Finance Cooperation
SDID	Staggered Difference-in-Differences

Notes

- ¹ $Inv_t = \alpha_0 + \alpha_1 Growth_{t-1} + \varepsilon$. Inv_t : The actual new investment expenditure of the company in year (t) = total investment – maintenance investment = cash paid for the purchase and construction of fixed assets, intangible assets, and other long-term assets + net cash paid for the acquisition of subsidiaries and other business units – net cash recovered from the disposal of fixed assets, intangible assets, and other long-term assets – net cash received from the disposal of subsidiaries and other business units – (depreciation of fixed assets + amortization of intangible assets + amortization of long-term deferred expenses)/total assets at the beginning of the year. $Growth_{t-1}$: The company's growth opportunities in year ($t - 1$), measured by Tobin's Q.
- ² Detailed industry codes are based on the 2012 CSRC Industry Classification Guidelines. In the manufacturing sample, the technology-intensive group includes C27, C29, C33, C35, C36, C37, C38, C39, C40, and C41; the capital-intensive group includes

C22, C25, C26, C28, C30, and C31; and the labor-intensive group includes C13, C14, C15, C17, C18, C19, C20, C21, C23, C24, C32, and C34.

³ <https://cmi.ssap.com.cn/newsDetail?id=32>, accessed on 9 November 2021.

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