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Digital Finance and Supply Chain Resilience of Chinese Manufacturing Enterprises: Evidence from A-Share Listed Companies

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Abstract

Against the backdrop of global industrial and supply chain restructuring and rising external uncertainty, enhancing the supply chain resilience of manufacturing firms through digital finance has become a key concern in both academia and policy. Guided by an information – resource - capability framework, this paper matches the city-level Peking University Digital Financial Inclusion Index of China with data on A-share listed manufacturing firms from 2011 to 2023, and constructs a composite index of firm-level supply chain resilience from four dimensions: supply-demand resistance, relationship stability, recovery capability, and operational robustness. The results show that digital finance significantly improves the supply chain resilience of manufacturing firms, and this finding remains robust after addressing endogeneity and conducting multiple robustness tests. Mechanism analysis indicates that digital finance enhances resilience by reducing information search costs, easing financing constraints, and strengthening innovation capability. The effect is more pronounced in ordinary prefecture-level cities, non-state-owned enterprises, and highly concentrated industries. This study provides empirical evidence and policy insights for promoting the integration of digital finance with the real economy and for strengthening the security and resilience of manufacturing supply chains.

JEL classification numbers: G21, L14.
Keywords: Digital Finance, Supply Chain Resilience, Manufacturing Enterprises, Information Search, Financing Constraints, Innovation capability.

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1. Introduction

Manufacturing is a cornerstone of the national economy, and the stability and resilience of its supply chains are critical for industrial modernization and national economic security. Amid major global transformations, global industrial and supply chains are being rapidly reconfigured. Geopolitical conflicts, public health crises, and fluctuations in energy and commodity prices have made the external environment facing China's manufacturing sector increasingly complex and uncertain (Shi and Lu, 2023). In this context, enhancing supply chain resilience has become a key pathway for balancing development and security and advancing high-quality growth (Xiao and Li, 2022). The Resolution of the Central Committee of the Communist Party of China on Further Deepening Reform Comprehensively to Advance Chinese Modernization explicitly calls for improving the systems for enhancing the resilience and security of industrial and supply chains, accelerating the development of self-supporting and risk-controllable industrial and supply chains, and establishing risk assessment, response, and backup mechanisms for key industries, indicating that supply chain resilience and security have been elevated to a national strategic priority. Meanwhile, with the rapid expansion of the digital economy and continued progress in financial supply-side structural reform, digital finance is emerging as an important tool for optimizing resource allocation, improving capital allocation efficiency, and strengthening risk management. Examining its impact on the supply chain resilience of Chinese manufacturing firms is therefore theoretically and practically important.

In practice, manufacturing firms occupy critical positions in global production networks and are embedded in long, interconnected supply chains. Once manufacturing operations are disrupted, downstream trade and service activities are also affected. At the same time, manufacturing is characterized by high capital intensity, asset-heavy operations, tight cash flows, and relatively weak bargaining power, making it particularly vulnerable to external shocks. Overall, the resilience of China's manufacturing supply chains remains constrained by several structural weaknesses, including external dependence in key links, inefficient factor allocation and coordination, an underdeveloped innovation system, and rising external shocks stemming from technological restrictions and trade frictions (Zhang and Ding, 2023). These challenges underscore the urgency of strengthening resilience through digital technologies. Enabled by technologies such as big data, cloud computing, artificial intelligence, and blockchain, digital finance can improve financial institutions' risk assessment capabilities and firms' information transparency, reshape capital allocation and transaction patterns (Su et al., 2025), and accelerate the precise allocation of financial resources to key segments of the supply chain.

Theoretically, digital finance can strengthen firms' supply chain resilience to unexpected shocks through multiple channels, such as improving information transparency, alleviating financing constraints, and promoting innovation investment (Wan et al., 2020; Tang et al., 2020), thereby enhancing their adaptive, adjustment, and recovery capacities. However, systematic firm-level evidence remains limited. Given manufacturing's dual role as both a key node in global value chains and a source of risk transmission, this study focuses on manufacturing firms. It examines how digital finance helps buffer upstream and downstream shocks and enhance supply chain resilience.

Existing studies have examined supply chain resilience and related outcomes, such as supply chain configuration, from the perspective of digital transformation (Wu and Yao, 2023), new quality productive forces (Hong and Wang, 2024), and intelligent logistics (Zhang et al., 2023), yet three gaps remain. First, most studies focus on regional or industrial resilience or rely on survey data, while multidimensional firm-level measurement for listed manufacturing firms remains limited. Second, supply chain resilience studies mainly emphasize operational, inventory, and coordination capabilities, whereas digital finance research focuses largely on economic performance and innovation outcomes (Zhang et al., 2020; Tang et al., 2020; Wan et al., 2020), leaving the intersection between digital finance and firm supply chain resilience under explored. Third, related studies tend to focus on single channels, and systematic evidence on the mechanisms by which digital finance affects the supply chain resilience of manufacturing firms remains lacking.

Compared with the existing literature, this paper makes three contributions. First, it brings the economic effects of digital finance into the firm-level governance context of supply chain resilience by focusing on listed manufacturing firms and assessing how digital finance affects supply chain stability and continuity under shocks. Second, using a panel of Chinese listed manufacturing firms over 2011-2023, it constructs a composite measure of firm-level supply chain resilience - capturing resistance, relationship stability, recovery capability, and operational robustness - examines the underlying mechanisms via information search, financing efficiency, and innovation, and documents heterogeneity across city administrative hierarchy, ownership structure, and industry competition. Third, combining the Peking University Digital Financial Inclusion Index with firm-level data from CSMAR and CNRDS, it estimates multi-period panel fixed-effects models and provides evidence relevant to strengthening digital-finance support and enhancing the resilience of manufacturing supply chains in the context of deeper digital – real economy integration.

2. Literature review

2.1 Literature on Supply Chain Resilience

The term resilience originated in ecology and engineering, referring to a system's capacity to resist, recover from, and re-adapt to shocks. As the concept gained traction in the early 2000s, Christopher and Peck (2004) defined it as '*the ability of a system to return to its original state or move to a new, more desirable state after being disturbed*'. Ponis and Koronis (2012) further argued that it is a systemic attribute shaped by agility, redundancy, collaboration, and knowledge of supply chain structure rather than a single performance indicator. Scholten and Schilder (2015) emphasize that supply chain resilience is a network wide outcome that depends on collaboration, while Hohenstein et al. (2015) classify its elements into proactive and reactive strategies for the ex-ante/ex-post disruption stage, and discuss measurement via performance metrics. Overall, early studies differ somewhat in emphasis but largely agree that supply chain resilience is a multidimensional systemic capability, providing the theoretical basis for composite measurement in empirical research.

Recent Chinese studies have continued this multidimensional perspective. Zhang and Gu (2024) emphasize the adaptive capacity of supply chain resilience and decompose it into resistance and recovery dimensions in empirical analysis. Jiang et al. (2025) synthesizing existing research, also argue that supply chain resilience is an integrated capability spanning the strategic, operational, and tactical levels, and should be examined along collaboration, redundancy, flexibility, and agility. In the manufacturing context, following Su et al. (2025), some studies measure supply chain resilience along five dimensions: resistance, recovery, operational capability, supply-demand matching capability, and renewal capability.

Synthesizing the literature, most quantitative research on supply chain resilience is concentrated on large firms in developed economies (Tukamuhabwa et al., 2015). Empirically, resilience is typically operationalized using performance-based metrics, which captured by operational capability, cost/output volatility, recovery time, and the stability of supply–demand relationships and network structure (Han et al., 2020; Guo and Luo, 2024), while renewal capabilities (e.g., innovation, R&D, and upgrading) are more often treated as antecedents or foundational capabilities (Tao et al., 2023; Zhang and Gu, 2024). Accordingly, this paper defines manufacturing firms' supply chain resilience as the capability to sustain or improve supply chain operations under shocks through stable supply-demand structures, robust operations, and strong recovery and adjustment capacity. It is measured along four dimensions - supply-demand resistance, relationship stability, recovery capability, and operational robustness - while innovation performance is examined as a key mechanism shaping resilience.

2.2 Literature on Digital Finance

In recent years, a growing body of research has viewed digital finance as an enabling infrastructure for economic and industrial resilience. At the household level, Zhang et al. (2020) show that digital financial inclusion increases household income - especially among rural low-income groups - and promotes entrepreneurship by expanding access to financial services, thereby improving households' capacity to cope with negative shocks. At the regional level, Guo et al. (2020) document strong regional convergence and pronounced spatial heterogeneity in China's digital financial inclusion, suggesting that digital finance can penetrate less-developed areas by expanding coverage breadth and usage depth, providing a new financial-supply basis for narrowing regional development gaps and strengthening overall economic resilience. At the industry level, Wei (2023) finds that digital finance enhances industrial-chain resilience partly via improving the allocation of innovation factors, while its marginal effect diminishes at higher quantiles of resilience. Overall, digital finance not only improves financial efficiency but also strengthens economic resilience by expanding the coverage and accessibility of financial services and providing a more resilient financial foundation for the economic system, thereby strengthening macro-level economic resilience.

However, existing studies mainly focus on aggregate or regional economic resilience, and many remain weakly grounded in an integrated theoretical framework, offering limited systematic and quantifiable evidence on how digital finance affects firm-level resilience (Tukamuhabwa et al., 2015), especially the supply chain resilience of manufacturing firms. Building on these macro-level findings, this paper analyzes the issue from the perspectives of information, resource, and capability foundations. It examines how digital finance reshapes the supply chain resilience of manufacturing firms by improving the information environment, easing financing constraints, and stimulating innovation activities.

3. Theoretical Analysis and Research Hypotheses

3.1 Analysis of the Impact of Digital Finance on the Supply Chain Resilience of Manufacturing Firms

Against the backdrop of global supply chain restructuring and frequent external shocks, manufacturing supply chains face growing systemic risks due to their cross-regional embeddedness and multi-node coordination. Supply chain resilience can thus be understood as a network-based capability to maintain critical functions, contain the propagation of risk, and enable recovery and adjustment in the face of shocks (Christopher and Peck, 2004; Hohenstein et al., 2015). In this context, digital finance, as a new form of infrastructure integrating finance and digital technology, not only expands financing supply but also reshapes information generation, credit assessment, and resource allocation through data, platform-based transactions, and intelligent risk control, thereby strengthening firms' supply chain resilience. Information asymmetry theory suggests that information gaps lead to adverse selection (Akerlof, 1970), moral hazard, and credit rationing (Stiglitz and Weiss, 1981). By improving information verifiability and risk pricing through online credit systems, transaction data traceability, and real-time risk control, digital finance brings more firms and transactions into a more inclusive and sustainable credit system. Moreover, financial development matters not only for capital accumulation, but also for improving the quality of financial functions by reducing information and transaction costs and shaping investment decisions and technological innovation (Levine, 1997). With advantages in coverage, responsiveness, and accessibility, digital finance can reduce structural exclusion in traditional finance and improve the efficiency of resource allocation.

Specifically, digital finance can strengthen the four dimensions of supply chain resilience identified in this paper. First, digital finance enhances supply chain visibility and reduces transaction frictions and search costs through digital payment and clearing systems and transaction data traceability (Su et al., 2025), it helps firms maintain key procurement and sales activities under shocks, thereby enhancing supply-demand resistance. Second, data-driven supply chain management reduces information processing and transmission costs among node enterprises, alleviates information asymmetry (Zhang and Gu, 2024), and reduces upstream/downstream concerns about opportunistic risks, thereby improve relationship stability. During shocks, digital finance boosts financial service accessibility and resource allocation efficiency while mitigating liquidity constraints caused by credit contraction. This provides timely funding support for business resumption, resource reallocation, and supply chain recovery, enhancing recovery capabilities. Fourth, under normal conditions, digital finance alleviates corporate financing constraints, reduces financing friction, and improves capital turnover conditions, thereby strengthening cash flow resilience and operational flexibility (Wan et al., 2020). This reduces the probability of cash flow strain and business chain paralysis, ultimately reinforcing operational capabilities.

Hypothesis 1: Digital finance can significantly enhance the supply chain resilience of Chinese manufacturing firms.

3.2 Mechanism Analysis of the Effect of Digital Finance on the Supply Chain Resilience of Manufacturing Firms

3.2.1 Information Foundation: Digital Finance, Transaction Costs, and Supply Chain Resilience

From the perspective of transaction cost theory, firms exist because they economize on market transaction costs (Coase, 1937). In supply chains, demand information can be easily distorted as it passes through multiple tiers, generating the bullwhip effect that amplifies uncertainty, raises coordination costs (Lee et al., 1997), and weakens overall resilience. Information asymmetry not only intensifies adverse selection and moral hazard but also increases the cost for upstream and downstream firms to assess potential partners, making supply chains more vulnerable to disruptions and coordination failures during disruptions.

A core function of digital finance is to mitigate information asymmetry by improving the information environment and the efficiency of information processing. Current research indicates that digital finance enhances corporate information disclosure timeliness and verifiability through big data risk control and online information collection, significantly alleviating information asymmetry and providing positive incentives for high-risk activities, such as green innovation (Kong et al., 2022; Han and Zhang, 2023). From a broader perspective, enhancing transparency and information sharing is crucial for supply chain visibility and flexibility, which helps strengthen pre-event risk perception and post-event coordination capabilities. When digital finance integrates into corporate operational systems through digital data links, it not only enhances information disclosure standards and reduces external information search costs, but also facilitates information flow among supply chain partners. This reduces collaborative uncertainties while strengthening supply chain resilience, response agility, and coordination efficiency.

Hypothesis 2: Digital finance can enhance the supply chain resilience of manufacturing firms by reducing market information search costs and improving information transparency and coordination efficiency.

3.2.2 Resource Foundation: Digital Finance, Financing Constraints, and Supply Chain Resilience

From the perspectives of the resource-based view and corporate financing theory, sufficient buffer resources are essential for firms to remain resilient in the face of uncertainty. Valuable, scarce, imperfectly inimitable, and non-substitutable resources underpin sustained competitive advantage (Barney, 1991), and in capital-intensive manufacturing, stable financing channels and adequate liquidity are themselves critical strategic resources. Financing constraints can make investment overly dependent on internal cash flow (Fazzari et al., 1988), leaving firms more vulnerable to shocks. Under information asymmetry, firms tend to rely on internal funds and, when external financing is required, prefer debt to equity (Myers and Majluf, 1984), which reinforces the constraining effect of financing frictions on long-term investment and shock-absorbing capacity.

Existing evidence suggests that digital supply chain finance alleviates firms' financing constraints and improves liquidity conditions (He and Liu, 2025), thereby strengthening financial resilience along the supply chain. Related evidence also indicates that digital finance significantly eases financing constraints for small and micro enterprises (Liang and Lin, 2020). Accordingly, by relaxing financing constraints and improving access to external funding, digital finance helps manufacturing firms maintain production continuity, fulfill supply commitments, and undertake timely structural adjustments during disruptions, thereby enhancing supply chain resilience.

Hypothesis 3: Digital finance can enhance the supply chain resilience of manufacturing firms by reducing financing costs, improving financing efficiency, and strengthening financial flexibility.

3.2.3 Capability Foundation: Digital Finance, Innovation Activities, and Supply Chain Resilience

In environments characterized by heightened uncertainty and rapid technological change, firms' innovation and dynamic reconfiguration capabilities are pivotal for shifting from passive recovery to proactive adaptation. Dynamic capability theory emphasizes that the capacity to integrate, build, and reconfigure internal and external competences in response to environmental change is a higher-order capability that underpins sustained competitive advantage (Teece et al., 1997). Consistent with this view, empirical evidence shows that more innovative firms tend to recover faster and maintain more stable performance during supply chain disruptions (Sabahi and Parast, 2020).

Digital finance can stimulate corporate innovation by easing financing constraints, improving the information environment, and facilitating more effective risk assessment and risk sharing. Prior studies document that digital finance promotes green innovation (Kong et al., 2022; Lyu et al., 2025), and also increases firms' R&D investment and overall technological innovation (Yu, 2024; Gu et al., 2025). Moreover, digital finance is found to encourage breakthrough innovation by relaxing financial frictions and expanding corporate social networks (Shi, 2024). Related evidence further suggests that these innovation-enhancing effects are more pronounced for non-state-owned firms and those in central and western regions, with the effects operating mainly through alleviating financing constraints and increasing R&D investment (Ling and Ling, 2025). Technological and process innovation can improve production flexibility and adaptability to supply and demand shocks. In contrast, product and business model innovation helps firms adjust their market positioning and supply structures, reducing dependence on a single customer, input, or region. Therefore, by supporting innovation activities, digital finance can strengthen firms' dynamic capabilities and structural adjustment capacity, thereby enhancing supply chain resilience.

Hypothesis 4: Digital finance can enhance the supply chain resilience of manufacturing firms by promoting innovation input and innovation output.

4. Research Design

4.1 Model

To investigate the impact effect of digital finance on the supply chain resilience of China's manufacturing enterprises, this paper constructs the following benchmark regression model:

$$ResSupply_{it}=\beta_0+\beta_1 Index_{it}+\beta_2 Controls_{it}+Year_t+Ind_j+\varepsilon_{it} \tag{1}$$

where i, t and j represent the firm, year, and industry, respectively. The key explanatory variable, $Index_{it}$, refers to the digital finance development index of the city where the firm is located. The dependent variable, $ResSupply_{it}$, captures the level of supply chain resilience of manufacturing firms. $Controls_{it}$ is a vector of control variables (defined in Table 3). $Year_t$ and Ind_j denote the year and industry fixed effects respectively, while ε_{it} representing the random error term. This paper adopts cluster standard errors at the firm level during the benchmark regression phase.

4.2 Variable Definition and Descriptive Statistics

4.2.1 Key Explanatory Variable

The key explanatory variable is the Digital Finance Development Index (*Index*). Following Tang et al. (2020) and Wei (2023), this paper uses the city-level Peking University Digital Financial Inclusion Index of China as a proxy for regional digital finance development. Based on transaction and account big data from Ant Group, the index is constructed from three dimensions: coverage breadth, usage depth, and degree of digitalization. It incorporates data from 31 provinces, 337 cities, and approximately 2,800 counties in mainland China (Guo et al., 2020). Detailed indicators are presented in Table 1.

Table 1: Indicator system for digital finance

Primary Indicator	First-Level Indicator	Second-Level Indicator
Digital Finance Development Level（*Index*）	Coverage Breadth（*Index_br*）	Account Coverage Rate
	Usage Depth（*Index_de*）	Payment Services
		Money Market Fund Services
		Credit Services
		Insurance Services
		Investment Services
		Credit Information Services
	Degree of Digitalization（*Index_le*）	Mobility
		Affordability
		Creditization
		Convenience

4.2.2 Dependent Variable

The dependent variable is the supply chain resilience of manufacturing firms (*ResSupply*). Drawing on methodologies from Zhang and Hu (2025), Wu and Yao (2023), and Tao et al. (2023), this paper constructs eight sub-indicators for supply chain resilience among China's A-share listed manufacturing enterprises from 2011 to 2023 across four dimensions: supply-demand resistance, relationship stability, recovery capability, and operational robustness. The total resilience index is derived by weighting these dimensions using the entropy weight method. The specific indicator composition and weightings are detailed in Table 2.

Supply-demand resistance. This study using the core-transaction concentration to measure supply-demand resistance, captured by (i) the share of purchases from a firm’s top five upstream suppliers in its total annual purchases (*PPOTV*) and (ii) the share of sales to a firm’s top five downstream customers in its total annual sales (*SPOTV*). Higher values of these ratios indicate a more stable scale of supply and demand, which facilitates the formulation of long-term production and sales plans.

Relationship stability. From the perspective of core partner turnover, relationship stability is proxied by (i) the number of new suppliers among the firm's top five suppliers in the current year divided by five (*new_supplier_ratio*) and (ii) the number of new customers among the firm's top five customers in the current year divided by five (*new_customer_ratio*). Lower values of these indicators suggest more stable upstream and downstream trading relationships, thereby reducing supply chain uncertainty arising from fluctuations in supply-demand relationships.
Recovery capability. Recovery capability refers to a supply chain's ability to rebound after indicators decline in response to shocks. Drawing on the deviation-based approach, the magnitude of deviations or fluctuations in supply chain indicators can be used to gauge the strength of recovery capability. Following Zhang and Hu (2025), this paper employs two proxies to characterize recovery capability: the residual-based measure (*Bias*) and supply-demand volatility (*fluctuation*). Specifically, the following benchmark regression for firm performance is first estimated:

$$Perform_{it}=\alpha_0+\alpha_1 Lnasset_{it}+\alpha_2 Asset\_liability_{it}+\alpha_3 Cash_{it}+\alpha_4 Tat_{it}+\alpha_5 Rgr_{it}+\mu_i+\lambda_t+\varepsilon_{it} \quad (2)$$

Here, firm performance (*Perform*) is measured by the growth rate of net profits, with control variables including asset size (*Lnasset*), leverage (*Asset_liability*), cash ratio (*Cash*), total asset turnover (*Tat*), and revenue growth rate (*Rgr*). The firm and year fixed effects are denoted by μ_i and λ_t respectively, and the residual ε_{it} indicates the deviation (*Bias*) between the firm's actual performance and the model's predicted performance. The larger the residual, the higher the performance is compared to the baseline regression forecast, indicating stronger adjustment capabilities under external shocks, as well as greater resilience.
The second indicator of recovery capability is supply-demand fluctuation (*fluctuation*), which is measured in this study by comparing the magnitude of production fluctuations relative to demand fluctuations. Output is calculated as "current period demand plus inventory changes", where inventory is measured by net ending inventory and demand is proxied by operating cost. Larger values indicate greater fluctuations in supply and demand between enterprises and suppliers or customers, whereas smaller values imply more stable supply-demand conditions and hence stronger supply chain recovery capability.
Operational robustness. Two proxies are used. The first is the trade credit reliance ratio (*TCRR*), defined as the natural logarithm of the ratio of the sum of notes receivable, accounts receivable, and prepaid expenses to operating revenue. This metric reflects a company's cash collection efficiency and financial stability. A lower value indicates that the business primarily relies on cash sales, maintains stronger cash flow, and thus demonstrates greater resilience against external shocks. The second indicator, inventory adjustment intensity (*LnS_D*), is measured as the natural logarithm of the absolute change in ending inventory between the current and prior periods. A higher value indicates greater inventory adjustment magnitude,

increased supply-demand mismatch between upstream and downstream supply chain partners, and poorer actual operational performance.

Table 2: Indicator system for supply chain resilience

Primary Indicator	First-Level Indicator	Second-Level Indicator
Supply Chain Resilience (*ResSupply)*	Supply-demand resistance	Share of transactions with core suppliers (*PPOTV*)
		Share of transactions with core customers (*SPOTV*)
	Relationship stability	Supplier replacement rate (*new_customer_ratio*)
		Customer replacement rate (*new_customer_ratio*)
	Recovery capability	Residual of firm performance (*Bias*)
		Supply–demand volatility (*fluctuation*)
	Operational capability	Inventory adjustment intensity (*LnS_D*)
		Reliance on trade credit (*TCRR*)

4.2.3 Control Variables

Following Su et al. (2025), this paper includes the following firm-level control variables in the baseline regression model to account for factors that may affect the resilience of manufacturing firms: firm age (*Age*), firm size (*Lnasset*), leverage (*Asset_liability*), board size (*Boardsize*), ownership concentration (*Equity*), and return on assets (*ROA*). The definitions and descriptive statistics of the firm-level controls are reported in Table 3.

Table 3: Definitions of control variables

Variable symbol	Hidden meaning	Variable Definition (Method of calculation)
Age	firm age	Natural logarithm of the difference between the sample year and the firm's establishment year
Lnasset	firm size	Natural logarithm of total assets
Asset_liability	leverage	Ratio of total liabilities to total assets
Boardsize	Board size	Natural logarithm of (number of directors at year-end + 1)
Equity	Ownership concentration	Natural logarithm of the shareholding ratio of the top five shareholders
ROA	Return on assets	Ratio of net profit to total assets

In the robustness checks, several city-level controls are additionally included: regional GDP per capita (*GDP_p*), degree of openness (*Open*), the share of the secondary industry in GDP (*Secind*), and the share of science-and-education spending in fiscal expenditure (*Spend_et*). Specifically, the degree of openness is measured as the ratio of total imports and exports to regional GDP, and the science and education expenditure share is measured as the proportion of local science and education spending in total fiscal expenditure.

4.3 Data Sources and Data Processing

The sample period spans 2011–2023. Data used to construct the supply chain resilience measures for A-share listed manufacturing firms, as well as firm-level control variables, are primarily obtained from the CSMAR database and the China Research Data Services (CNRDS) platform. The city-level Peking University Digital Financial Inclusion Index of China and its construction are taken from the Peking University Digital Finance Research Center's official release. The firm sample - A-share listed manufacturing firms classified according to the CSRC 2012 industry classification - is processed as follows: (i) firm-year observations in which firms are designated as ST or *ST, as well as PT firms, are excluded; and (ii) firms that are delisted or suspended from listing are removed. The final dataset contains 14,824 firm-year observations. To mitigate the influence of outliers on the regression estimates, selected continuous variables are winsorized at the 1st and 99th percentiles. Descriptive statistics are reported in Table 4.

For robustness analyses, several city-level variables are additionally incorporated. Raw city-level control data for 2011–2023 are collected from CSMAR. After merging these city-level controls with the digital financial inclusion index and the firm-level dataset, cities with extensive missing data are excluded, yielding an unbalanced panel of 249 cities over 13 years.

Table 4: Descriptive statistics of variables

VarName	Obs	Mean	SD	Min	Max	Median
ResSupply	14824	0.531	0.153	0.070	0.968	0.556
Index	14824	5.521	0.305	3.988	5.922	5.608
Asset_liability	14824	0.399	0.182	0.008	0.993	0.395
Age	14824	2.918	0.317	1.386	4.205	2.944
ROA	14824	0.040	0.068	-1.648	0.786	0.039
Boardsize	14824	2.224	0.169	0.000	2.944	2.303
Equity	14824	3.906	0.307	1.611	4.593	3.945
Lnasset	14824	22.247	1.170	17.641	27.638	22.086

5. Results and Discussion

5.1 Benchmark Regression Results

The benchmark regression results are presented in Table 5. Column (1) includes only the key explanatory variable; Column (2) incorporates a subset of firm-level control variables; Column (3) incorporates the full set of control variables; and

Column (4) presents the regression results after adding year and industry fixed effects to Column (3), with standard errors clustered at the firm level. Across all four specifications, the coefficients of the digital finance index are positive and statistically significant, indicating that after controlling for relevant factors, firms in regions with higher levels of digital finance exhibit significantly stronger supply chain resilience. These results lend support to *H1*.

Table 5: Results of benchmark regression

VARIABLES	(1)	(2)	(3)	(4)
Index	0.154***	0.148***	0.156***	0.052**
	(0.004)	(0.004)	(0.004)	(0.022)
Asset_liability		-0.081***	-0.021***	-0.024*
		(0.007)	(0.008)	(0.013)
Age		0.007*	0.015***	0.007
		(0.004)	(0.004)	(0.007)
ROA		-0.035*	0.021	0.056**
		(0.019)	(0.019)	(0.024)
Boardsize		-0.036***	-0.014*	-0.017
		(0.007)	(0.007)	(0.012)
Equity			0.017***	0.021***
			(0.004)	(0.006)
Lnasset			-0.018***	-0.024***
			(0.001)	(0.002)
Constant	-0.318***	-0.194***	0.006	0.711***
	(0.022)	(0.029)	(0.037)	(0.128)
Observations	14,824	14,824	14,824	14,824
Adjusted R-squared	0.094	0.104	0.118	0.192
Industry FE	NO	NO	NO	YES
Year FE	NO	NO	NO	YES

*** p<0.01, ** p<0.05, * p<0.1. In Column (4), standard errors are clustered at the firm level.

5.2 Robustness Tests

1) *Alternative regression equation.* To examine the robustness of the baseline results, this study further employs a model tailored for restricted dependent variables. Because the entropy-weighted supply chain resilience index (*ResSupply*) is bounded in [0,1] and may exhibit mass points at the lower and upper bounds, traditional OLS may suffer from coefficient attenuation and heteroskedasticity induced by censoring. Accordingly, a two-limit Tobit model is used to re-examine the benchmark regression. The estimation results in Column (1) of Table 6 maintain consistency with the benchmark estimates in both sign and significance levels, demonstrating that our conclusions are independent of specific functional form assumptions.

2) *Interacted fixed effects.* Following Moser and Voena's (2012) approach to controlling for the "time × industry" interactions, this study replaces the separate year and industry fixed effects in the baseline regression with interaction terms. This adjustment mitigates the issue of insufficient endogeneity control caused by excessive flexibility in the dual fixed model. As shown in Column (2) of Table 6, the development of digital finance continues to significantly enhance corporate supply chain resilience.
3) *Alternative clustering and additional controls.* To further reduce the influence of regional fixed characteristics on estimation results, several city-level control variables are added, including the secondary industry share of GDP (*Secind*), the degree of openness (*Open*), GDP per capita (*GDP_p*), and the share of science and education expenditure (*Spend_et*). Standard errors are then clustered at the city level. Column (3) of Table 6 shows that the coefficient on the key explanatory variable remains stable in both magnitude and significance, confirming the robustness of the estimates.
4) *Excluding potentially confounding samples.* First, to mitigate potential disturbances arising from China's 2015 stock market crash, the year 2015 is excluded and the regressions are re-estimated. Second, given that China's municipalities and sub-provincial cities exhibit significant differences in economic structure and policy environment compared to ordinary cities, they may feature different patterns of digital finance and transmission mechanisms. Therefore, this paper refers to Tang et al. (2020) and conducts regression tests again after excluding municipalities and sub-provincial cities. Columns (4) and (5) of Table 6 show that the core conclusion remains consistent with the baseline results: digital finance contributes to higher firm supply chain resilience.

Table 6: Robustness test results 1

VARIABLES	(1)	(2)	(3)	(4)	(5)
	Tobit	Year × Industry FE	Plus City Controls	Excluding 2015 Crash	Excluding Municipalities
Index	0.052**	0.056**	0.059*	0.045**	0.042*
	(0.022)	(0.022)	(0.030)	(0.022)	(0.024)
Constant	0.696***	0.691***	0.640***	0.791***	0.810***
	(0.110)	(0.131)	(0.182)	(0.128)	(0.141)
Firm-level controls	YES	YES	YES	YES	YES
City-level controls	NO	NO	YES	NO	NO
Year FE + Industry FE	YES	NO	YES	YES	YES
Year×Industry FE	NO	YES	NO	NO	NO
Observations	14,824	14,749	11,157	13,854	12,817
Adjusted R-squared		0.187	0.196	0.188	0.198

*** p<0.01, ** p<0.05, * p<0.1. Standard errors are clustered at the city level in Column (3) and at the firm level in all other columns.

5) *Variable Replacement and Re-testing.* First, the baseline explanatory variable is replaced with three sub-indicators of digital finance—coverage breadth (*Index_br*), usage depth (*Index_de*), and digitalization level (*Index_le*). Columns (1) and (2) of Table 7 report significantly positive coefficients, supporting the robustness of the results. In contrast, the coefficient on the more aggregate digitalization level (*Index_le*) in Column (3) is insignificant, likely because this measure has a broader scope and exhibits less within-group variation; consequently, its identifying variation is substantially diminished in the two-way fixed effects model. Second, to mitigate potential regression errors caused by measurement methods, this study employs principal component analysis to re-measure firms' supply chain resilience (*ResSupply_PCA*) as an alternative to the entropy method. As reported in Column (4) of Table 7, the coefficient on Index remains significantly positive, providing further support for the robustness of the main findings.

Table 7: Robustness test results 2

VARIABLES	(1)	(2)	(3)	(4)
	ResSupply	*ResSupply*	*ResSupply*	*ResSupply_PCA*
Index_br	0.037**			
	(0.016)			
Index_de		0.047***		
		(0.018)		
Index_le			-0.013	
			(0.020)	
Index				16.171***
				(2.779)
Constant	0.797***	0.742***	1.070***	-100.709***
	(0.102)	(0.109)	(0.123)	(16.870)
Observations	14,824	14,824	14,824	14,824
Adjusted R-squared	0.192	0.193	0.192	0.210
Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

*** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parentheses and are clustered at the firm level by default.

5.3 Endogeneity Tests

In the preliminary analysis, this study employed industry and year fixed effects with standard errors clustered at the firm level to mitigate potential endogeneity issues. However, the following endogeneity problems remain unresolved: First, while reverse causality may have been mitigated, it could still persist. Second, omitted variables correlated with digital finance development may also affect firms' supply chain resilience. Two approaches are adopted.

1) *Instrumental variable estimation (2SLS).* Following Xie et al. (2018) and Huang et al. (2019), this study uses prefecture-level Internet penetration (*Internet*) as an instrumental variable for digital finance. The internet penetration rate in prefecture-level cities is measured by the number of broadband Internet access users per 100 people. Column (1) of Table 8 demonstrates that *Internet* is significantly and positively associated with the *Index*; the first-stage Wald F-statistic far exceeds the Stock–Yogo 10% critical value, and the LM test remains significant at the 1% level, indicating no under-identification or weak-instrument concerns. In the second stage (Column (2)), the *Index* remains significantly positive, indicating that digital finance's positive impact on corporate supply chain resilience remains robust after controlling for potential endogeneity. Furthermore, since the number of instruments equals the number of endogenous regressors, no over-identification test is required.
2) *Exogenous-shock test.* To further alleviate potential omitted variable bias, this study employs the staggered designation of "National E-commerce Demonstration Cities" as an exogenous-shock variable. This policy primarily targets the comprehensive enhancement of urban digital infrastructure, payment systems, and logistics networks. Its original intent was not to directly address corporate supply chain resilience. Therefore, after controlling for Industry and year fixed effects, it can be regarded as an exogenous driver of digital financial development. Based on this, this study constructs a dummy variable for demonstration cities (*DID_Ecom*) and incorporates the interaction term (*Index*×*DID_Ecom*) into the benchmark regression model, following the methodology proposed by Wang et al. (2025). Column (3) of Table 8 demonstrates that the coefficient of the digital finance index remains significantly positive, suggesting that the policy designation does not drive the main effect and is robust across policy environments. The *DID_Ecom* coefficient is significantly positive, while the interaction term is significantly negative, indicating that the policy raises average resilience but attenuates the marginal effect of digital finance in demonstration cities with stronger initial digital foundations.

Table 8: Endogeneity test results

VARIABLES	(1) 2SLS first_stage *Index*	(2) 2SLS second_stage *ResSupply*	(3) Exogenous-shock *ResSupply*
Internet	0.004***		
	(0.000)		
Asset_liability	-0.028***	-0.031**	-0.026*
	(0.011)	(0.014)	(0.014)
Age	-0.008	0.011	0.006
	(0.006)	(0.008)	(0.007)
ROA	-0.014	0.046*	0.051**
	(0.016)	(0.026)	(0.025)
Boardsize	-0.024***	-0.010	-0.014
	(0.009)	(0.012)	(0.012)
Equity	0.027***	0.016**	0.020***
	(0.006)	(0.007)	(0.007)
Lnasset	0.005***	-0.024***	-0.023***
	(0.002)	(0.002)	(0.002)
Index		0.144***	0.059**
		(0.046)	(0.027)
DID_Ecom			0.129**
			(0.061)
Index_DID_Ecom			-0.024**
			(0.011)
Industry FE	YES	YES	YES
Year FE	YES	YES	YES
Kleibergen-Paap rk LM		329.652	
		[0.000]	
Kleibergen-Paap rk Wald F		348.903	
		{16.38}	
Observations	12,224	12,224	12,934
R-squared		0.042	0.194

*** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parentheses; p-values are reported in brackets; Stock – Yogo 10% weak-identification critical values are reported in braces. Standard errors are clustered at the firm level by default.

5.4 Mechanism Analysis

After confirming that digital finance can significantly enhance supply chain resilience in manufacturing firms, this section aims to further investigate its underlying mechanisms. Building upon prior theoretical analysis and adopting a logical framework of "information foundation - resource foundation - capability foundation", this paper selects three dimensions as mechanism variables: (i) market information search costs and efficiency, (ii) firms' financing costs and efficiency, and (iii) innovation inputs and outputs. Following Jiang (2022), the mechanism test is implemented using the following specification:

$$M_{it}=\theta_0+\theta_1 Index_{it}+\theta_2 Controls_{it}+Year_t+Ind_j+\varepsilon_{it} \quad (3)$$

Here, M_{it} denotes six mechanism variables across the three dimensions. Specifically, voluntary earnings forecast frequency (*FREO*) and information disclosure quality rating (*Grade*) characterize the information base; financial expense ratio (*finance*) and KZ index (*KZ*) measure the resource base; while R&D investment ratio (*RDR*) and invention patent output (*LnTot_patent*) reflect the capability base. The set of control variables, fixed effects, and the clustering of standard errors follow the baseline specification.

5.4.1 Market Information Search Costs and Efficiency

First, at the information-foundation level, this study employs the voluntary earnings forecast frequency (*FREO*), proposed by Sun et al. (2022) to measure market information search costs. *FREO* refers to the number of times companies voluntarily issue earnings forecasts in a given year when the firm is not subject to mandatory disclosure requirements triggered by poor performances. A higher *FREO* reflects stronger corporate disclosure willingness, resulting in lower external information search costs for suppliers and customers when assessing business operations. In addition, the Shenzhen Stock Exchange disclosure quality rating (Grade) is used to capture the quality/efficiency of information search. The rating is coded as 4 for "Excellent," 3 for "Good," 2 for "Qualified," and 1 for "Unqualified".

Higher ratings indicate superior corporate disclosure quality, thereby enhancing information transparency, strengthening collaborative trust, and mitigating efficiency losses caused by information asymmetry in supply chains.

The results in Columns (1) and (2) of Table 9 demonstrate that the *Index* coefficient is significantly positive at the 5% and 1% significance levels, respectively, indicating that digital finance substantially enhances corporate information disclosure incentives and transparency while reducing the time and costs required by supply chain market participants to identify corporate status. This effect is highly consistent with the expectations of traditional information asymmetry theory, indicating that digital financial instruments can enhance information transparency and credibility among supply chain nodes, reduce demand expectation deviations and cooperation uncertainties, thereby strengthening supply chain coordination capabilities and risk identification capabilities. Enhanced information transparency enables enterprises to identify potential supply chain disruption risks earlier and make timely adjustments, thereby cultivating the fundamental adaptability and responsiveness essential for supply chain resilience. Accordingly, *H2* is supported.

5.4.2 Financing Costs and Financing Efficiency

Secondly, at the resource-foundation level, financing costs are proxied by the financial expense ratio (*finance*), defined as financial expenses divided by operating revenue following Tang et al. (2020). The lower values indicate lower financing costs and greater financial stability. Additionally, financing efficiency is proxied by the Kaplan–Zingales index (Kaplan and Zingales, 1997). A smaller *KZ* value signifies reduced financing constraints and higher financing efficiency.

Columns (3) and (4) in Table 9 report a significantly negative *Index* coefficient, indicating that digital finance effectively alleviates financing constraints and resource bottlenecks within the traditional financial system. The empirical results align with financing constraint theory. Digital finance has restructured corporate credit evaluation systems through data-driven risk assessment, online credit provision, and supply chain financial instruments, enabling capital supply to better match firms' actual production needs, thereby enhancing cash flow stability and reducing financing uncertainty. The improved capital liquidity has enhanced firms' resilience against supply chain disruptions, preventing chain-wide crises caused by funding disruptions. This establishes the critical carrying capacity and resilience in supply chain resilience. Accordingly, *H3* is supported.

5.4.3 Innovation Inputs and Innovation Outputs

Thirdly, at the capability-foundation level, innovation input is proxied by R&D intensity (*RDR*), measured as the ratio of annual R&D investment to operating revenue, with higher values indicating stronger innovation drive. Innovation output is proxied by invention patent output (*LnTot_patent*). Because invention patents better capture high-quality innovation than utility model or design patents, *LnTot_patent* is defined as the logarithm of one plus the number of obtained invention patents during the reporting year, including both sole and joint grants. Higher values indicate stronger innovative performance.

Columns (5) and (6) of Table 9 show that the coefficients on *Index* are both significantly positive, indicating that both corporate R&D investment rates and invention patent outputs are substantially enhanced by digital finance development. This demonstrates how digital finance lowers financing barriers and reduces risk exposure for innovation activities, enabling enterprises to sustain technological R&D and capacity upgrades. This mechanism aligns with dynamic capability theory. When enterprises possess stronger technological innovation capabilities, their production systems can achieve more flexible, intelligent, and highly adaptive transformations. This reduces dependence on external shocks while enhancing internal adjustment capabilities, ultimately manifesting as stronger reorganization, restructuring, and structural upgrading capacities within the supply chain framework. Enhanced innovation capabilities enable enterprises to not only withstand short-term shocks but also establish a more stable supply chain ecosystem in long-term competition. Accordingly, *H4* is supported.

Table 9: Mechanism analysis results

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	FREO	*Grade*	*finance*	*KZ*	*RDR*	*LnTot_patent*
Index	0.490**	0.376***	-0.019***	-0.361*	4.160***	1.064***
	(0.194)	(0.089)	(0.005)	(0.191)	(0.687)	(0.226)
Constant	2.763**	-2.645***	0.148***	9.246***	-9.233**	-13.623***
	(1.179)	(0.545)	(0.028)	(1.191)	(4.187)	(1.441)
Industry FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Observations	14,773	12,151	14,249	14,622	14,256	11,326
Adjusted R-squared	0.296	0.173	0.254	0.582	0.234	0.199

*** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parentheses and are clustered at the firm level by default.

Taken together, evidence from the three dimensions suggests that digital finance enhances supply chain resilience through an integrated, multi-layered mechanism. Specifically, digital finance improves transparency by facilitating information access and disclosure, strengthens supply chain stability through enhanced financial support, and ultimately reinforces firms' adaptive and upgrading capacity by fostering technological innovation. The combined effect creates a logically coherent, progressively layered, and mutually reinforcing structural impact of digital finance in enhancing supply chain resilience, thereby serving as a key driver for manufacturing enterprises to establish resilient supply chain systems.

5.5 Heterogeneity Analysis

5.5.1 City Administrative Hierarchy

To further investigate the regional differences in the impact of digital finance on supply chain resilience, this paper divides the sample cities into two categories - "core cities" and "ordinary prefecture-level cities" - based on China's urban administrative hierarchy system. Core cities comprise municipalities directly under the central government, sub-provincial cities, and provincial capitals, which rank among the top nationwide in terms of digital infrastructure, financial resource supply, and industrial agglomeration levels. The ordinary prefecture-level cities generally exhibit relatively insufficient financial resources and economic development. This framework effectively captures the disparities across resource endowments in urban administrative hierarchies, thereby facilitating the identification of marginal effects of digital finance across different regions.

Columns (1) and (2) of Table 10 report the subgroup estimates. The coefficient on *Index* is positive but statistically insignificant in core cities, while it is positive and significant in ordinary prefecture-level cities. Traditional financial systems in ordinary prefecture-level cities is relatively underdeveloped, with more pronounced information asymmetry, limited financial service accessibility, and lower stability in supply chain partnerships. Consequently, digital finance yields larger marginal effects in facilitating financing, improving information transparency, and boosting transaction efficiency, thereby more effectively generating significant spillover effects on supply chain resilience. In contrast, core cities with superior resource endowments show limited improvement potential for digital finance, resulting in relatively weaker marginal effects. This conclusion demonstrates that digital finance exhibits distinct structural compensation characteristics, meaning it can more effectively enhance supply chain resilience for enterprises in regions with underdeveloped traditional finance.

5.5.2 Ownership Structure

The study divides the sample into state-owned enterprises (SOEs) and non-state-owned enterprises (non-SOEs). As shown in Columns (3) and (4) of Table 10, the coefficient on the digital finance index (*Index*) is significantly positive in both subsamples, is stronger for non-SOEs than for SOEs. This indicates that digital finance more effectively enhances supply chain resilience among private and other non-SOEs. This disparity carries distinct institutional implications: SOEs typically enjoy inherent advantages in credit access, government support, and supply chain stability, with relatively weaker financing constraints and stronger capabilities in securing critical materials, resulting in limited marginal improvement potential from digital finance. By contrast, non-SOEs tend to face tighter financing constraints, weaker bargaining power, and lower shock-absorption capacity. Digital finance can strengthen their capital turnover and risk management capabilities by mitigating information asymmetry and expanding financing channels, thereby generating stronger empowerment effects.

5.5.3 Industry Competition

To examine heterogeneity by market structure, industries are classified into high-concentration (less competitive) and low-concentration (more competitive) groups based on the Herfindahl–Hirschman Index (*HHI*). Columns (5)–(6) of Table 10 show that the index is significantly positive in high-HHI industries, indicating a more pronounced resilience-enhancing effect in more concentrated and structurally stable industries. In such settings, supply chain ties are relatively stable and traditional financial resources are often concentrated among leading firms, so digital finance is more likely to translate improvements in financing access and information transparency for smaller firms into resilience gains. In low-HHI industries, the coefficient remains positive but is statistically insignificant, suggesting that in highly competitive markets with greater substitutability and higher risk exposure, the benefits of digital finance may be partly offset by competitive pressures. Overall, the effect of digital finance on supply chain resilience is market-structure dependent, strengthening with industry concentration and attenuating in more competitive industries.

Table 10: Heterogeneity analysis results

VARIABLES	(1) Core cities	(2) Other cities	(3) SOEs	(4) Non-SOEs	(5) High HHI	(6) Low HHI
Index	0.071	0.085***	0.069*	0.051**	0.056*	0.045
	(0.049)	(0.032)	(0.040)	(0.025)	(0.031)	(0.029)
Constant	0.498*	0.643***	0.712***	0.685***	0.752***	0.677***
	(0.282)	(0.185)	(0.225)	(0.155)	(0.179)	(0.170)
Industry FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Observations	7,363	7,459	4,091	10,731	7,281	7,522
Adjusted R-squared	0.182	0.208	0.230	0.185	0.224	0.162

*** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parentheses and are clustered at the firm level by default.

6. Conclusions and Policy Implications

Digital finance is an important enabler of more resilient and secure industrial and supply chains. This study finds that, compared with traditional finance, digital finance can reduce the problem of financial resource misallocation in the economic system, provide greater support to China's manufacturing sector - the core of its industrial system - and gradually evolve into structural institutional arrangements and technological infrastructure embedded within the manufacturing supply chain operatios. Through the mechanism of information foundation - resource foundation - capability foundation, digital finance can effectively reshape supply chain resilience within an imbalanced real-world landscape.

On one hand, digital finance has significantly enhanced manufacturing enterprises' supply-demand resistance, relationship stability, recovery capability, and operational robustness. This effect is particularly pronounced in ordinary prefecture-level cities, non-SOEs, and industries with high market concentration. It demonstrates structural compensation for regions with limited financial resources, weak credit foundations, and growth-stage enterprises with development potential, while fulfilling the dual role of "strengthening supply chains and addressing weaknesses" to improve the accessibility and equity of financial resources. On the other hand, from a mechanism perspective, digital finance enhances risk visibility through improved information transparency and quality, strengthens corporate resilience by alleviating financing constraints and optimizing resource allocation, and boosts evolutionary capabilities via continuous innovation and R&D upgrades. This transforms supply chain resilience management from post-event remediation to a comprehensive governance framework encompassing ex ante early warning, in-process buffering, and ex post reconfiguration. Thus, digital finance is not merely a technical tool for enhancing resource allocation efficiency, but also a pivotal institutional lever for shaping a new supply chain landscape for manufacturing enterprises that is secure and resilient.

Therefore, policy priorities should shift toward strategically integrating digital financial resources to enhance supply chain resilience. At the macro level, digital finance should be integrated into the core toolkit for industrial chain and supply chain security governance. More supportive policies should be introduced to facilitate the convergence of digital finance with manufacturing supply chains. By leveraging technologies such as big data, artificial intelligence, and blockchain, it is necessary to continuously improve supporting digital infrastructure to create an enabling environment for digital finance to enhance supply chain resilience in manufacturing enterprises. At the meso-level of industrial chains and participating enterprises, we should leverage digital finance as a bridge to reconstruct a tripartite synergy mechanism integrating information, resources, and capabilities. First, enhance comprehensive coordination mechanisms across supply chain enterprises by utilizing industry platforms and industrial internet. Encourage supply chain participants to employ digital technologies in building transparent information networks, improving visualization of real transactions and risk data, and breaking down information barriers. Second, financial institutions should develop innovative financial products and financing solutions tailored for manufacturing enterprises, with particular focus on supporting high-potential regions, innovative startups facing financing challenges, and regions experiencing funding difficulties. While promoting high-quality innovation across industries, digital finance should effectively address the needs of long-tail market segments. Finally, establish an efficient end-to-end financial regulatory framework to ensure timely monitoring information transmission and strengthen systemic financial risk prevention capabilities in the digital era.

Overall, the essence of digital finance lies not in superficial adjustments like "more or less," but in strategic direction, integration points, and alignment mechanisms with supply chain resilience objectives. Only through coordinated policy efforts that align national strategic guidance, industry collaboration, and corporate participation can digital finance evolve from a supplementary support tool to a long-term institutional framework. This framework will empower China's manufacturing sector to build highly resilient supply chains and ensure the security and stability of industrial ecosystems.

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