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The Digital Transformation of Supply Chain Resilience: Micro-level Mechanisms and Governance Pathways for Specialised, Refined, Unique and Innovative Enterprises

Li Sixian[1], Zhang Guihua[1], Tian Yuan[2]

[1]Business College of Beijing Union University, Beijing, 100025

[2]College of Applied Science and Technology, Beijing Union University, Beijing, 100012

sixian_liiii@163.com (Corresponding author), zhangguihua0709@163.com, Yuan.tian@ buu.edu.cn

ABSTRACT

In recent years, global environmental uncertainties have led to a continuous rise in supply chain fragility and an escalating risk of disruption. Specialised, Refined, Unique and Innovative (SRUI) enterprises, which specialise in niche sectors, are key players at critical nodes within the supply chain. Based on a theoretical framework regarding how digital technologies enhance the supply chain resilience of SRUI enterprises, this paper employs a two-way fixed-effects model to reveal the pathways through which digital technologies bolster the supply chain resilience of these enterprises. The research indicates that the application of digital technologies has a significant positive impact on the supply chain resilience of Specialised, Refined, Unique and Innovative enterprises. This effect is transmitted through product competitiveness and the degree of specialisation, whilst the enterprise's market competitive position and the institutional environment act as moderators. Furthermore, this enhancing effect is more pronounced among mature enterprises, enterprises in the eastern regions, and both technology-intensive and labour-intensive enterprises. This research provides a theoretical basis for enterprises to strengthen the transmission mechanism through which digital technology empowers supply chain resilience, for the government to foster a differentiated competitive environment, and for the establishment of regional coordination mechanisms.

Keywords: digital technology, specialised, refined, distinctive and innovative enterprises, supply chain resilience, mechanism of action

1 Introduction

Against the dual backdrop of pressure to restructure global industrial and supply chains and the accelerating penetration of digital technologies, Specialised, Refined, Unique and Innovative (SRUI) enterprises—as key players in 'addressing weaknesses' and 'filling gaps'—face the critical challenge of enhancing supply chain resilience to safeguard industrial security and strengthen international competitiveness. The Resolution of the Third Plenary Session of the 20th CPC Central Committee proposed "improving systems to promote the deep integration of the real economy and the digital economy" and "establishing mechanisms to foster the growth and development of Specialised, Refined, Unique and Innovative SMEs". This has charted a course and provided guidance for advancing the digital transformation of SMEs. Digital transformation relies on the support of digital technologies, and the empowerment of digital technologies is the core driving force behind corporate digital transformation; the depth of this empowerment determines the level of transformation achieved.

According to data from the Ministry of Industry and Information Technology, by the end of 2024, China had fostered over 140,000 'specialised, refined, distinctive and innovative' enterprises. These enterprises focus on niche markets and play a strategic role in addressing weaknesses and strengthening strengths within industrial chains; the resilience of their supply chains directly influences the overall stability of China's industrial and supply chains. However, in recent years, intensified geopolitical conflicts, recurring global pandemics and frequent fluctuations in demand have exposed shortcomings in some 'Specialised, Refined, Unique and Innovative' enterprises regarding supply chain responsiveness, risk forecasting capabilities and the efficiency of ecosystem collaboration. Existing research indicates that digital technologies reshape supply chain systems through pathways such as reducing internal and external costs (Zhao & Huang, 2024), optimising supply-demand matching mechanisms (Niu & Xiao, 2025; Guo et al., 2025; Tao et al., 2023), resource reallocation(Deng et al., 2024; Wang et al., 2025), ecosystem collaboration(Liu, 2025), and high-quality innovation(Ji et al., 2025; Zhang & Li, 2024). However, current research largely focuses on the impact of digital technologies on the supply chain resilience of listed enterprises as a whole, whilst studies specifically targeting the distinct group of 'Specialised, Refined, Unique and Innovative' enterprises remain relatively scarce. Existing research findings show that, compared to ordinary enterprises, digital transformation has a more pronounced positive effect on the supply chain resilience of 'Specialised, Refined, Unique and Innovative' enterprises (Ma et al., 2025). However, few studies have explored the mechanisms through which digital technologies empower the supply chain resilience of these enterprises. Compared to ordinary enterprises, 'Specialised, Refined, Unique and Innovative' enterprises demonstrate superior innovation capabilities and stronger core competitive advantages. Traditional supply chain resilience theories emphasise economies of scale and resource redundancy; however, 'Specialised, Refined, Unique and Innovative' enterprises face the dual challenge of 'limited resources' and the need for 'innovative agility'. Consequently, the effectiveness and pathways through which digital technologies enhance the supply chain resilience of these enterprises possess unique characteristics.

Compared with existing research, the potential marginal contributions of this paper lie in the following: firstly, by focusing the research perspective on 'specialised, refined, distinctive and innovative' enterprises, it fills a research gap in this specific sub-field; secondly, by integrating the characteristics of 'specialised, refined, distinctive and innovative' enterprises, it conducts an in-depth study of the unique mechanisms through which digital technologies empower the enhancement of supply chain resilience. Third, it examines the moderating effects of firms' competitive position and the institutional environment on the process by which digital technologies enhance the supply chain resilience of "Specialised, Refined, Unique and Innovative" enterprises, whilst further conducting a heterogeneity analysis based on the firm's life cycle, factor intensity and geographical location. This paper employs a two-way fixed-effects model to investigate the impact of digital technology adoption by 'Specialised, Refined, Unique and Innovative' enterprises on their supply chain resilience, and to test the underlying mechanisms. The study complements existing literature in this field, offering both theoretical value and practical significance.

2 Literature Review and Research Hypotheses

2.1 The Application of Digital Technologies and Corporate Supply Chain Resilience

As global instability intensifies, organisations are increasingly confronted with instability and complexity arising from supply disruptions. A resilient and secure supply chain is therefore a key safeguard for managing supply chain risks, stabilising organisational development, and ensuring the smooth functioning of the economy (Pei, 2024). Corporate supply chain resilience refers to the core capability of an organisation to transition from 'disruption caused by shocks' to 'restoration of normal operations'—and even to utilise such shocks as opportunities for technological iteration and collaborative upgrades—by dynamically adjusting supply chain structures and precisely optimising business processes when faced with internal and external shocks and uncertainties, such as technology embargoes. The strength of this resilience is specifically manifested in two aspects: the supply chain's resistance and its resilience (Wang et al., 2025). Cheng (2020) posits that supply chain resilience encompasses two dimensions: 'sustainability' and 'risk controllability'. 'Sustainability' refers to the capacity to recover and maintain development, whilst 'risk controllability' is manifested in the supply chain's substitutability (Cheng & Zhang, 2020). Wang Shuyao et al. (2025) expanded the conceptual framework of supply chain resilience and security, deconstructing it into four dimensions: absorption capacity, recovery capacity, stabilisation capacity, and secure development capacity (Wang et al., 2025). From the perspective of capability enhancement, supply chain resilience must centre on the development of three key capabilities: preparedness for contingencies, rapid response following chain disruptions, and recovery and reconstruction capabilities (Ponomarov & Holcomb, 2009). The synergistic strengthening of these three capabilities constitutes the core pathway for enterprises to enhance supply chain resilience.

Against the backdrop of a complex and volatile global economic environment, the application of digital technologies offers new avenues and possibilities for enhancing supply chain resilience. Scholars have conducted extensive research into the effects and mechanisms through which digital technologies empower supply chain resilience, yielding a wealth of findings from diverse perspectives. In terms of overall effectiveness, the application of digital technologies plays a significant role in enhancing the resilience of corporate supply chains. Li Xiaomei et al. (2025) revealed the role of digital technologies in promoting supply chain stability from the dual dimensions of supply chain integration and supply chain risk, noting that the empowerment of supply chain resilience by digital technologies is not merely a simple superimposition of technology, but rather brings about fundamental transformation (Li & Liu, 2025a); Feng Wenhua (2025), based on the TOE framework, found that enterprises can improve supply chain visibility, responsiveness and flexibility, thereby enhancing supply chain resilience and competitiveness(Feng, 2025). Meanwhile, Yuan Yehu et al. (2025) constructed a multi-stage digital transformation model and found that the impact of a firm's digital transformation on supply chain resilience varies across different stages of digital transformation (Yuan & Wu, 2025).

The mechanisms through which digital technologies enhance supply chain resilience primarily encompass cost reduction, resource integration and allocation, and innovation and collaboration. With regard to cost reduction, digital innovations—such as digital operations, big data analysis and predictive analytics—can effectively mitigate the negative impact of uncertainty shocks on a company's internal and external production and operations (Zhao & Huang, 2024). In corporate supply chain management, transaction costs encompass both explicit and implicit expenditures across the entire process of collaboration with upstream and downstream partners; the level of these costs is directly linked to supply chain operational efficiency. Song Donglin et al. (2024), examining both internal and external aspects of corporate development, demonstrated that digital transformation enables enterprises to significantly reduce transaction costs and enhance the supply chain's capacity for risk prevention (Song et al., 2024). From the perspective of resource integration and allocation, digital technologies should be able to accurately capture changes in consumer market demand. As personalised demands increase, traditional standardised production struggles to meet these needs; however, the application of digital technologies brings about changes in production methods, enabling customised production to satisfy personalised demands. Han Minchun (2025) indicates that corporate digital transformation will effectively reduce the concentration of supply chain allocation, improve supply chain allocation efficiency, and thereby enhance supply chain resilience (Han et al., 2025). Furthermore, Ge Xinting et al. (2024) found that corporate digital transformation enhances supply chain resilience by strengthening both internal resource integration and external control (Ge et al., 2024) Regarding innovation and collaboration mechanisms, Wang Lisha et al. (2025), examining collaborative innovation among downstream enterprises, found that the digital transformation of downstream client enterprises enhances the resilience of industrial and supply chains by reinforcing stable cooperative relationships and improving the level of supply-demand coordination(Wang et al., 2025).

2.2 The Application of Digital Technologies and Supply Chain Resilience in 'Specialised, Refined, Distinctive and Innovative' Enterprises

Compared with ordinary enterprises, 'Specialised, Refined, Distinctive and Innovative' (SRDI) enterprises are characterised by 'specialisation', 'refinement', 'distinctiveness' and 'innovation'. Overall, these enterprises possess distinctive features and focus on specific application areas for their core technologies;

they are better equipped to enhance the autonomy and controllability of their products through digital technologies and to fulfil the foundational supporting functions of the supply chain. They play a role in 'stabilising, supplementing and strengthening' the supply chain, thereby making a more significant contribution to enhancing supply chain resilience (Ma et al., 2025). On the one hand, "Specialised, Refined, Distinctive and Innovative" enterprises build product barriers through "distinctiveness and innovation"; the stronger their product competitiveness, the more they can attract high-quality supply chain resources, thereby reducing the risk of supply chain disruption caused by product stagnation or slow iteration, and consequently enhancing supply chain resilience. On the other hand, 'Specialised, Refined, Unique and Innovative' enterprises are often situated in 'bottleneck' segments of the industrial chain, acting as critical nodes in the supply chain. These enterprises direct the application of digital technologies specifically at the core issue of supply chain autonomy and controllability; their business focus enables the application of digital technologies to address 'single-point vulnerabilities' with greater precision. Furthermore, with 'specialisation, refinement, uniqueness and innovation' at their core, these enterprises have long cultivated a single vertical sector, establishing clear business scenarios and processes, and thereby forging closer supply chain relationships (Sun et al., 2025). Digital technologies can be precisely embedded within specific scenarios to uncover niche market demands and deepen specialised capabilities. The higher the degree of specialisation, the more "irreplaceable" the enterprise becomes within the supply chain; its supply chain network becomes more stable, and supply chain resilience is naturally enhanced. Based on this, this paper proposes hypotheses H1 and H2.

H1: The application of digital technologies can enhance the supply chain resilience of 'Specialised, Refined, Unique and Innovative' (SRUI) enterprises.

H2: Digital technologies enhance the supply chain resilience of SRUI enterprises by improving their product competitiveness and level of specialisation.

2.3 The moderating effects of market competitive position and the institutional environment

From the perspective of supply chain stability, when a firm enjoys a strong competitive position in the market, it demonstrates greater resilience in coping with market fluctuations and risk shocks, thereby being better able to mitigate the operational risks potentially arising from high supply chain concentration (Inter-Agency Standing Committee [IASC], 2022). The signalling effect of 'Specialised, Refined, Unique and Innovative' (SRUI) certification further helps to attract support from suppliers and capital markets; consequently, SRUI firms often enjoy a stronger competitive position in the market than their general counterparts. Furthermore, the irreplaceable nature of the technology possessed by 'Specialised, Refined, Unique and Innovative' enterprises in their specialised fields grants them differentiated bargaining power over upstream and downstream partners, which can significantly enhance risk resilience and strengthen the stability and reliability of segmented supply chains. Based on this, Hypothesis H3 is proposed in this paper.

H3: A firm's competitive position acts as a positive moderator in the process by which digital technologies enhance the supply chain resilience of 'specialised, refined, distinctive and innovative' enterprises.

As key beneficiaries of policy support, 'Specialised, Refined, Unique and Innovative' (SRUI) enterprises are far more reliant on the institutional environment than ordinary businesses. A lack of policy support directly constrains investment in digital technologies, preventing the realisation of the 'policy dividends' associated with such technologies and resulting in sluggish improvements in resilience. Furthermore, when institutional support is inadequate, the 'cost-risk' profile of digital technology adoption rises, hindering improvements in 'specialisation and product competitiveness' and thereby weakening supply chain resilience. Adequate institutional support can lower the barriers to adopting digital technologies, cover the costs of such investments, and amplify their enabling effects on specialisation and product competitiveness, thereby enhancing supply chain resilience. At the same time, clear market rules can make supply chain collaboration more efficient, improve response times, and boost overall supply chain efficiency. Based on the above analysis, this paper proposes Hypothesis H4.

H4: The institutional environment plays a 'U'-shaped moderating role in the process by which digital technologies empower the supply chain resilience of 'Specialised, Refined, Unique and Innovative' enterprises, initially weakening and subsequently strengthening it.

3 Model Design and Variable Descriptions

3.1 Model Design

To examine the impact of digital technology on supply chain stability, this paper constructs the following benchmark regression model for analysis:

$$SCR_{it} = \alpha_0 + \alpha_1 DTA_{it} + \sum_k \alpha_k Controls_{it} + \mu_j + \sigma_t + \epsilon_{it} (1)$$

In this context, SCR_{it} represents the supply chain resilience of firm i in year t; α_1 is the coefficient representing the impact of digital technology on supply chain resilience; DTA_{it} denotes the level of digital technology adoption by firm i in year t; $Controls_{it}$ comprises a set of control variables; and μ_j represents the individual fixed effect**.**

3.2 Variable descriptions

1. Dependent variable: Supply chain resilience (SCR)

The core concept of supply chain resilience encompasses both the ability to recover from internal and external shocks and the level of efficiency and structural stability in day-to-day operations. Therefore, in assessing the supply chain resilience of 'Specialised, Refined, Unique and Innovative' (SRUI) enterprises, this paper draws on the research methodology of Sun Shaoyan (2025) (Sun et al., 2025) to construct an index comprising both efficiency and stability factors for measurement; the specific construction method is shown in Table 1.

Inventory is a core "current asset" within the supply chain; a short inventory turnover period indicates that the capital and storage space tied up in inventory can "circulate" more rapidly and generate value. Consequently, this paper uses the logarithmic transformation of inventory turnover days to measure supply chain efficiency. For "Specialised, Refined, Unique and Innovative" enterprises, high supply chain concentration often manifests as deep reliance on a small number of technologically dominant suppliers. The higher the supply chain concentration, the greater the risk that enterprises face of supply disruptions and weak bargaining power due to single-source dependence, thereby reducing supply chain resilience. Consequently, this paper uses supply chain concentration to measure supply chain stability. Both indicators are given equal weighting and are normalised by taking their reciprocals; the specific calculation method is shown in Table 1, with higher values indicating greater resilience.

2. Explanatory variable: Digital Technology Applications (DTA)

Currently, most methods for measuring the application of digital technologies rely on text analysis. Drawing on the research by Li Xiaomei et al. (2025) (Li & Liu, 2025), this paper assesses the level of digital technology adoption by enterprises based on the frequency of appearance of digital technology-related keywords in annual reports. The keyword frequencies are transformed by taking the logarithm of their absolute values. The data is sourced from the Guotai-An Corporate Digital Transformation Database.

3. Control Variables

Drawing on relevant research, this study selects a series of factors relating to firm size, financial performance and corporate governance as control variables. These primarily include: firm size (Size), firm age (Age), debt-to-asset ratio (Lev), return on assets (ROA), financial leverage (FL), ownership concentration (Own), dual role (Dual), board size (Board) and firm growth (Growth). The specific definitions and measurements of these variables are shown in Table 1.

4. Mediating Variables

Product Competitiveness (PC): In 'Specialised, Refined, Unique and Innovative' (SRUI) enterprises, product competitiveness is specifically manifested in their market share advantage within their respective sub-sectors, as well as the resulting strong operating performance and market performance. Drawing on the research of Zhang Shushan (2024), this paper measures a firm's product competitiveness using its sales growth rate adjusted for the industry average (Zhang & Gu, 2024). A higher sales growth rate indicates stronger product competitiveness.

Level of Specialised Division of Labour (VSI): As mentioned earlier, 'Specialised, Refined, Unique and Innovative' enterprises are centred on 'specialisation and refinement'; digital technology can deepen their specialised capabilities by embedding itself in specific scenarios and uncovering demand. The higher the degree of specialisation, the greater the irreplaceability and stability of the enterprise's supply chain, and the greater its resilience. Consequently, this paper adopts the research methodology of Yuan Chun et al. (2021) (Yuan et al., 2021) to measure the degree of specialisation using a modified value-added approach, and, following the approach of Fan Ziying et al. (2017) (Fan & Peng, 2017), excludes outliers falling outside the [0, 1] interval.

5. Control Variables

Competitive Position (Pcm): This study employs the Lerner Index to measure a firm's competitive position (Li & Liu, 2025); the specific calculation method is shown in Table 1. The Lerner Index essentially quantifies the proportion of a firm's revenue remaining after deducting operating costs, thereby reflecting the firm's pricing power and market influence within its market segment. A higher value indicates that 'Specialised, Refined, Unique and Innovative' enterprises possess greater autonomy in setting product prices within their niche sectors and enjoy a more significant bargaining advantage over upstream and downstream partners, thereby reflecting a higher competitive position.

Institutional Environment (PE): The institutional environment essentially comprises the external regulatory framework that influences corporate decision-making and resource allocation. The marketisation index not only comprehensively reflects the overall quality of a region's institutional environment but also precisely correlates with micro-level corporate behaviour. Consequently, this paper employs the marketisation index as the metric for assessing external institutional conditions across regions. Data for the marketisation index is sourced from the《China Provincial Marketisation Index Report (2024)》compiled by the National Institute of Economic Research.

Table 1 : Methods for Constructing Key Variables

Variable types	Name	Variable	Variable Measure
Dependent variable	Supply chain resilience	SCR	- (PCS × 0.5 + PCPA × 0.5)
	Supply chain efficiency	PCPA	ln(360 / (Operating Costs / Closing Inventory))
	Supply chain stability	PCS	((Procurement proportion of top 5 suppliers + Sales proportion of top 5 customers)/2)
Independent variable	Application of digital technology	DTA	ln(Frequency of digital keywords + 1)
Mediating variable	Level of specialisation	VSI	Adapted from Yuan Chun et al. (2021)
	Product competitiveness and distribution channels	PC	Sales growth rate adjusted for industry average
Moderating variable	Competitive Position	Pcm	((Revenue – Cost of sales – Selling expenses – Administrative expenses)/Revenue)
	Institutional environment	PE	Marketisation index
	Company size	Size	ln(Total assets of the enterprise)
	Years in	Age	Years since company establishment – current year

	operation		
Control variable	Debt-to-equity ratio	Lev	Total liabilities at year-end / Total assets at year-end
	Profitability	ROA	Net profit / Average total assets
	Financial leverage	FL	(Net profit + Income tax expense + Finance costs) / (Net profit + Income tax expense)
	Concentration of shareholding	Own	Shareholding ratio of the company's largest shareholder
	Dual roles	Dual	1 if the Chairman and General Manager are the same person; 0 otherwise
	Board size	Board	Ln(Total number of board members)

3.3 Sample Selection and Data Sources

This study selects 'Specialised, Refined, Unique and Innovative' enterprises listed in China between 2013 and 2023 as the research sample, and processes the sample data as follows: firstly, enterprises with the stock codes PT, ST and *ST are excluded; secondly, samples with severe data missingness are excluded; thirdly, to account for differences in the original units of measurement between variables and reduce the impact of multicollinearity, variables with significant unit differences were standardised. A total of 3,851 observations were ultimately obtained. The sample data were sourced from the Guotai-An database, the Wind database and the annual reports of listed companies.

Table 2 presents the descriptive statistics for the main variables. As shown in Table 2, the minimum value for the level of digital technology application among enterprises is -1.983, the maximum is 2.153, and the mean is 0.00198. This indicates that there are significant differences in the level of digital technology application among the "Specialised, Refined, Unique and Innovative" enterprises in the sample, with the majority of enterprises operating at a relatively low level. Furthermore, to test for severe multicollinearity among the variables, this study conducted a Variance Inflation Factor (VIF) analysis. The results are shown in Table 3, where the overall VIF for the variables is 1.13, indicating that there is no systematic multicollinearity issue among the variables.

Table 2: Descriptive statistics

	（1）	（2）	（3）	（4）	（5）
Variable	N	mean	sd	min	max
SCR	3851	-4.114	0.506	-7.352	-1.159
DTA	3851	0.00198	0.996	-1.983	2.153
PC	3851	0.0411	0.785	-1.000	33.51
VSI	2812	0.492	0.178	0.000314	0.993
Size	3851	21.72	0.844	18.90	26.41
AGE	3851	19.46	5.649	0	64
LEV	3851	0.341	0.184	0.0111	1.957
ROA	3851	0.0290	0.0741	-0.894	1.285
FL	3851	1.375	12.64	-60.87	547.9
Own	3851	29.30	13.02	2.120	87.70

Dual	3851	0.380	0.485	0	1
Board	3851	7.931	1.412	4	13

Table 3: Collinearity diagnosis

Variable	VIF	1/VIF
LEV	1.370	0.728
Size	1.250	0.797
ROA	1.220	0.818
Own	1.090	0.917
DTA	1.080	0.929
Board	1.060	0.939
AGE	1.050	0.955
Dual	1.040	0.960
FL	1.010	0.991
Mean	VIF	1.130

4 Empirical Analysis

4.1 Baseline Regression

Firstly, this paper examines the impact of digital technology adoption by 'Specialised, Refined, Unique and Innovative' (SRUI) enterprises on supply chain resilience using the two-way fixed-effects model (1) established earlier. Column (1) of Table 4 presents the results of the baseline regression after including the core explanatory variables; Columns (2) to (9) present the estimation results obtained by progressively adding control variables to the estimates in Column (1). It can be observed that the coefficient of DTA is significantly positive at the 1% level and remains stable even after the progressive inclusion of control variables. This indicates that the application of digital technologies by 'Specialised, Refined, Unique and Innovative' enterprises can significantly enhance supply chain resilience, thereby validating H1 of this paper.

Table 4: Benchmark regression results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Variable	SCR	SCR	SCR	SCR	SCR	SCR	SCR	SCR	SCR
DTA	0.063***	0.060***	0.060***	0.061***	0.061***	0.061***	0.062***	0.063***	0.063***
	(4.18)	(3.97)	(3.97)	(3.99)	(4.03)	(4.03)	(4.09)	(4.15)	(4.15)

Size		0.029**	0.029**	0.031**	0.026*	0.026*	0.023	0.024	0.021
		(1.98)	(1.98)	(2.11)	(1.70)	(1.69)	(1.53)	(1.57)	(1.36)
AGE			-0.013***	-0.012***	-0.011***	-0.011***	-0.009***	-0.009***	-0.008***
			(-4.90)	(-4.56)	(-4.20)	(-4.18)	(-3.01)	(-3.07)	(-2.82)
LEV				-0.074	-0.042	-0.043	-0.035	-0.036	-0.034
				(-1.40)	(-0.75)	(-0.77)	(-0.64)	(-0.65)	(-0.60)
ROA					0.138*	0.139*	0.130*	0.131*	0.128
					(1.77)	(1.78)	(1.67)	(1.68)	(1.64)
FL						0.000	0.000	0.000	0.000
						(0.56)	(0.55)	(0.55)	(0.55)
Own							0.003***	0.003***	0.003***
							(3.02)	(3.00)	(2.99)
Dual								-0.022	-0.020
								(-1.35)	(-1.23)
Board									0.008
									(1.33)
Constant term	-4.001***	-4.614***	-4.448***	-4.482***	-4.393***	-4.389***	-4.485***	-4.485***	-4.500***
	(-232.93)	(-14.89)	(-15.12)	(-15.19)	(-14.69)	(-14.66)	(-14.93)	(-14.93)	(-14.97)
Individual effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	3851	3851	3851	3851	3851	3851	3851	3851	3851
R2	0.044	0.045	0.045	0.046	0.047	0.048	0.051	0.052	0.053

Note: ***, ** and * denote significance at the 1%, 5% and 10% levels respectively; the same applies throughout.

$$f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right) \quad (1)$$

4.2 Robustness Tests

1. One-period lag of the explanatory variables

As the application of digital technology constitutes a disruptive transformation, its effects may exhibit a time lag. Furthermore, to mitigate potential issues of reverse causality and endogeneity between variables, this paper further adjusts the measurement specifications of the core explanatory variables by incorporating DTA into a regression model with a one-period lag to conduct robustness tests. As can be seen from the empirical results reported in Column (1) of Table 5, the regression coefficient for DTA remains significantly positive at the 1% level, which further reinforces the reliability of the baseline regression results.

2. Clustered Standard Errors

As firms within the same region may be influenced by shared policies, resources or economic fluctuations, and firms within the same industry may face common shocks from technological change, market cycles or policies, this paper further clusters standard errors at the industry and regional levels. The test results are shown in Column (2) of Table 5; the coefficients of the explanatory variables remain significantly positive at the 1% level, and the conclusions of this study remain unchanged.

3. Replacement of the Dependent Variable

Drawing on existing research that employs supply chain concentration as a measure of supply chain resilience (Ma et al., 2025), this study uses the degree of change in supply chain concentration to gauge supply chain resilience. While supply chain concentration reflects the structure of a firm's supply chain, the core of supply chain resilience lies in dynamic responsiveness rather than static structural conditions. Consequently, this study further conducts a regression using the degree of change in supply chain concentration as a substitute indicator for the dependent variable. The results are shown in column (3) of Table 5, where the coefficients of the explanatory variables remain significantly positive, indicating that the research conclusions are robust.

4. Truncation Test

To effectively mitigate the interference of outliers in variable distributions on the results, this paper uniformly applies a two-sided truncation method using the 1st and 99th percentiles to the dependent and independent variables in the model, respectively, to eliminate the potential influence of outliers; subsequently, regression estimation is re-conducted based on the processed dataset. The empirical results of this round of regression are summarised in Column (4) of Table 5. As can be seen from the results, the core estimation conclusions following the trimming process are consistent with those of the baseline regression model.

5. Sub-sample Regression

2020 marked the onset of the COVID-19 pandemic, during which global supply chains faced sudden and extreme exogenous shocks. Consequently, corporate supply chains may have been distorted by passive adjustments rather than active strategic decisions. Therefore, to eliminate the interference of such 'shock-induced outliers' on the regression results, this paper excluded the 2020 data and re-ran the regression; the results are presented in column (5) of Table 5. The results are consistent with those of the baseline regression.

Table 5: Robustness tests

	（1）	（2）	（3）	（4）	（5）
Variable	SCR	SCR	SCR	SCR	SCR
DTA	0.062***	0.063***	0.692*	0.058***	0.061***
	（4.21）	（2.61）	（1.89）	（4.08）	（3.93）
Constant term	-4.201***	-4.678***	3.755	-4.444***	-4.439***
	（-13.13）	（-7.55）	（0.52）	（-15.72）	（-14.43）
Control variable	YES	YES	YES	YES	YES
Individual effects	YES	YES	YES	YES	YES
Year effect	YES	YES	YES	YES	YES
N	2323	2684	3836	3851	3609
R2	0.038	0.785	0.070	0.057	0.056

4.3 Mechanism Analysis

To examine whether the product competitiveness (PC) and specialisation level (VSI) of 'Specialised, Refined, Unique and Innovative' (SRUI) enterprises mediate the relationship between digital technology and supply chain resilience, this study builds upon Model (1) by introducing a mediating variable M—comprising PC and VSI—to construct Models (2) and (3) and test H2. The models are specified as follows:

$$M_{it} = \beta_0 + \beta_1 DTA_{it} + \sum_k \beta_k Controls_{it} + \mu_i + \sigma_t + \epsilon_{it} \tag{2}$$

$$SCR_{it} = \gamma_0 + \gamma_1 M_{it} + \gamma_2 DTA_{it} + \sum_k \gamma_k Controls_{it} + \mu_i + \sigma_t + \epsilon_{it} \tag{3}$$

In this context, the coefficient β_1 represents the direct effect of digital technology on the product competitiveness and specialisation of 'Specialised, Refined, Unique and Innovative' enterprises, whilst γ_2 is the coefficient representing the effect of digital technology after controlling for product competitiveness and enterprise specialisation.

To further examine the impact of digital technology on the supply chain resilience of 'specialised, refined, distinctive and innovative' enterprises under different competitive positions and institutional environments, this paper builds upon Model (1) by introducing the variables 'enterprise competitive position' (Pcm) and 'institutional environment' (PE) to construct moderation models (5) and (6), thereby testing H3 and H4.

$$SCR_{it} = \lambda_0 + \lambda_2 DTA_{it} + \lambda_3 DTA_{it} \times Pcm_{it} + \sum_k \lambda_k Controls_{it} + \mu_i + \sigma_t + \epsilon_{it} \tag{5}$$

$$SCR_{it} = \rho_0 + \rho_2 DTA_{it} + \rho_3 DTA_{it} \times PE_{it} + \rho_4 DTA_{it} \times PE_{it}^2 + \sum_k \rho_k Controls_{it} + \mu_i + \sigma_t + \epsilon_{it} \tag{6}$$

In Model (5), Pcmit represents a firm's competitive position, and the interaction term $DTA_{it} \times PE_{it}$ denotes the moderating effect of a firm's competitive position on the impact of digital technology on the supply chain resilience of 'Specialised, Refined, Unique and Innovative' (SRUI) enterprises; In Model (6), PE_{it} represents the institutional environment, and the interaction terms $DTA_{it} \times PE_{it}$ and $DTA_{it} \times PE_{it}^2$denote the non-linear moderating effects of the institutional environment on the impact of digital technology on the supply chain resilience of 'Specialised, Refined, Unique and Innovative' enterprises.

1. The mediating role of product competitiveness

This paper estimates Models (2) and (3) using different mediating variables to examine the transmission mechanisms through which the application of digital technologies influences the supply chain resilience of 'Specialised, Refined, Unique and Innovative' (SRUI) enterprises. Columns (1) and (2) of Table 6 report that the estimated coefficients for DTA are significantly positive at the 1% level, indicating that digital technologies can improve product quality and enhance market fit, thereby boosting the competitiveness of enterprises' products; simultaneously, the estimated coefficient for PC is also significantly positive, indicating that the application of digital technologies can attract higher-quality supply chain resources by creating more competitive products, thereby enhancing supply chain resilience. Consequently, the mechanism whereby digital technologies enhance supply chain resilience by improving the product competitiveness of 'Specialised, Refined, Unique and Innovative' enterprises has been empirically validated.

2. The mediating role of a firm's degree of specialisation

The results in Column (3) of Table 6 show that the application of digital technologies significantly enhances the degree of specialisation among 'Specialised, Refined, Unique and Innovative' (SRUI) enterprises. This indicates that digital technologies can assist SRUI enterprises in deepening their business focus within specific market segments, enabling them to use digital tools to optimise production processes in specific scenarios and integrate core technological resources, thereby further enhancing their ability to specialise deeply within a single vertical sector. The results in Column (4) further indicate that 'Specialised, Refined, Unique and Innovative' enterprises can ultimately achieve enhanced supply chain resilience by advancing their own level of specialisation. Specifically, as the level of specialisation gradually increases, 'Specialised, Refined, Unique and Innovative' enterprises can, on the one hand, more precisely define their core business scope, channelling key resources such as technology and capital towards core areas, thereby significantly optimising the efficiency of resource allocation; on the other hand, they can effectively reduce the diversion of risk-mitigation resources and energy to non-core businesses, avoiding the dilution of risk-resilience caused by an overly broad business portfolio, and consequently substantially strengthening the enterprise's ability to withstand external shocks. Therefore, H2 is validated.

Table 6: Results of the mediation analysis

	(1)	(2)	(3)	(4)
	PC	SCR	VSI	SCR
DTA	0.098***	0.061***	0.014*	0.031*
	(0.036)	(0.015)	(0.008)	(0.016)
PC		0.016*		
		(0.009)		
VSI				0.317***
				(0.045)
Constant	-4.115***	-4.435***	0.167	-4.519***

term				
	（0.713）	（0.302）	（0.167）	（0.321）
Control variable	YES	YES	YES	YES
Individual effects	YES	YES	YES	YES
Year effect	YES	YES	YES	YES
N	3851	3851	2812	2812
R2	0.154	0.054	0.067	0.102

3. The moderating effect of a firm's competitive position

Column (1) of Table 7 presents the results obtained by including only the explanatory variables and the interaction term between digital technology and firm competitive position, whilst Column (2) presents the results after incorporating the control variables. It can be observed that the coefficient of the interaction term between digital technology and firm competitive position is significantly positive. This indicates that firm competitive position plays a positive moderating role in the process by which 'Specialised, Refined, Unique and Innovative' (SRUI) firms utilise digital technology to enhance supply chain resilience, thereby confirming H3.

4. The moderating role of the institutional environment

Columns (3) and (4) present the results of the tests for the first-order interaction between the application of digital technologies and the institutional environment in 'Specialised, Refined, Unique and Innovative' (SRUI) enterprises, whilst columns (5) and (6) present the results of the tests for the second-order interaction between the application of digital technologies and the institutional environment in SRUI enterprises. It can be seen that the coefficient for the first-order interaction between digital technology and the institutional environment is significantly negative, whilst the coefficient for the second-order interaction is significantly positive. This indicates that the institutional environment exerts a 'U'-shaped moderating effect—first weakening and then enhancing—on the role of digital technology in promoting the supply chain resilience of 'Specialised, Refined, Unique and Innovative' enterprises, thereby validating H4.

Furthermore, based on the test results in columns (3) to (6) of Table 7, the bottleneck value for the institutional environment was calculated as 0.5714[1]; that is, when the institutional environment in which 'Specialised, Refined, Unique and Innovative' (SRUI) enterprises operate exceeds this threshold, the promotional effect of digital technology on the supply chain resilience of SRUI enterprises is enhanced. This indicates that when the institutional framework is inadequate, the 'cost-risk' of digital technologies' enabling role in enhancing the supply chain resilience of 'Specialised, Refined, Unique and Innovative' enterprises outweighs the benefits; simultaneously, ambiguous market rules lead to difficulties in the execution of supply chain contracts, which together negate the effects of digital technologies in optimising the supply chain. Once the institutional framework is improved—for example, through strengthened intellectual property protection, which encourages enterprises to invest in digital technologies and R&D for intelligent solutions, thereby enhancing product differentiation— clear market rules allow the efficiency of digital technology in optimising supply chains to be fully realised. With institutional safeguards in place, 'Specialised, Refined, Unique and Innovative' enterprises are better positioned to amplify the benefits of resilience enhancement through digital technology.

[1] Inflection Points:X=-（-0.016）/（2×0.014）=0.5714

Table 7: Results of the moderation effect test

	（1）	（2）	（3）	（4）	（5）	（6）
Variable	SCR	SCR	SCR	SCR	SCR	SCR
DTA	0.065***	0.065***	0.052***	0.055***	0.049***	0.050***
	（4.30）	（4.28）	（3.26）	（3.44）	（3.13）	（3.19）
DTA*Pcm	0.021***	0.019**				
	（3.03）	（2.56）				
DTA*PE			-0.022**	-0.016*		
			（-2.37）	（-1.66）		
DTA*PE2					0.016***	0.014***
					（3.31）	（2.97）
Constant term	-3.997***	-4.414***	-4.003***	-4.476***	-3.994***	-4.471***
	（-232.30）	（-14.61）	（-232.89）	（-14.88）	（-231.31）	（-14.89）
Control variable	NO	YES	NO	YES	NO	YES
Individual effects	YES	YES	YES	YES	YES	YES
Year effect	YES	YES	YES	YES	YES	YES
N	3851	3851	3851	3851	3851	3851
R2	0.047	0.052	0.046	0.054	0.048	0.056

4.4 Heterogeneity Analysis

The impact of digital technology adoption on supply chain resilience may vary across different types of ‘Specialised, Refined, Unique and Innovative’ (SRUI) enterprises. This paper therefore examines the impact of digital technology on supply chain resilience in SRUI enterprises from three perspectives: the enterprise life cycle, factor intensity, and the region in which the enterprise is located.

1. Heterogeneity in the Corporate Life Cycle

In terms of the classification of corporate life cycle stages, this paper draws on the research approach and methodology of Zhang Shushan et al. (2024) (Zhang & Gu, 2024), using firm age as the core classification dimension. The corporate life cycle is clearly defined as comprising three stages: the start-up stage (1–6 years), the growth stage (7–12 years) and the maturity stage (12 years or more). However, judging by the actual life cycle distribution of the sample firms in this study, the vast majority are concentrated in the start-up and maturity phases, whilst firms in the growth phase account for an extremely low proportion, making it difficult to form a valid sample for testing. Consequently, this paper ultimately conducts targeted tests only on enterprises in the start-up and maturity stages. Columns (1) and (2) in Table 9 show that, for 'Specialised, Refined, Unique and Innovative' (SRUI) enterprises in the maturity stage, digital technology plays a significant role in enhancing supply chain resilience, whereas for SRUI enterprises in non-mature stages, the role of digital technology in enhancing supply chain resilience is not significant. This may be because, for 'Specialised, Refined, Unique and Innovative' enterprises, mature firms have, through long-term development, accumulated more substantial reserves of capital, talent and technology, enabling them to allocate greater resources to ensure the successful implementation of digital technologies. Furthermore, mature 'Specialised, Refined, Unique and Innovative' enterprises possess more pronounced technological barriers, customer loyalty and bargaining power within their niche sectors; the application of digital technologies can reinforce these advantages, thereby directly enhancing supply chain resilience. In contrast, less mature 'Specialised, Refined, Unique and Innovative' enterprises, constrained by financial limitations and a shortage of talent, have seen the application of digital technology remain at a basic level, with its enabling effects yet to be fully realised.

2. Heterogeneity in Factor Intensity

Drawing on the production factor clustering analysis method proposed by Yi, Mei, et al. (2018) (Yin et al., 2018), this paper categorises the sample industries into three distinct groups: technology-intensive, capital-intensive and labour-intensive. The specific results of this industry classification are presented in Table 8.

Table 8: Classification of industries by factor intensity

Industry	Technology-intensive	Capital-intensive	Labour-intensive
Sub-sector code	N77 C36 M74 I65 C33 C35 C27 C29 C39 C38 C37 C41 C40	G56 D44 A04 B11 D45 B07 C22 C31 G55 C30 R86 C28 C26 C25	A01 A02 A03 A05 B06 B08 B09 C13 C14 C15 C17 C18 C19 C20 C21 C23 C24 C32 C34 D46 E48 E49 E50 F51 F52 G53 G54 G58 G59 I63 I64 K70 L72 M73 M75 N78 P82 R85 R87 S90
Sample size	2853	186	572

Columns (3) to (5) of Table 9 present the results of the regression analysis for the sample firms, categorised by factor intensity. Among these, the positive impact of digital technology on enhancing supply chain resilience is statistically significant at the 1% level for both technology-intensive and labour-intensive 'Specialised, Refined, Unique and Innovative' (SRUI) enterprises, whereas the impact is statistically significant and negative for capital-intensive SRUI enterprises. A possible reason for this is that technology-intensive SRUI enterprises rely on 'technological breakthroughs' as their core competitiveness, digital technology can directly empower these enterprises to conduct R&D and achieve production coordination, thereby enhancing supply chain resilience; whereas labour-intensive 'Specialised, Refined, Unique and Innovative' enterprises focus on 'manual craftsmanship and specialised processes', with their supply chain resilience dependent on the efficiency of human collaboration and skill proficiency. Digital technology can optimise workforce scheduling and improve order response times, thereby compensating for the shortcomings of a 'labour-intensive' model; Capital-intensive 'Specialised, Refined, Unique and Innovative' enterprises rely on fixed assets; the development and application of digital technologies require substantial investment, yet the capital base of such enterprises is relatively limited. Consequently, investment in digital technologies diverts resources away from supply chain resilience, thereby temporarily undermining it.

3. Regional Heterogeneity

In accordance with the 'Statistical System and Classification Standards (17)', this paper divides China into three economic regions—Eastern, Central and Western—to conduct tests of regional heterogeneity. The results are shown in columns (6) and (7) of Table 9. Digital technologies have a significant positive impact on supply chain resilience in both the Eastern and Central-Western regions, with the Eastern region exhibiting a higher coefficient and a more pronounced effect. This indicates that the role of digital technologies in enhancing supply chain resilience is universally applicable across regions; The Eastern region possesses more comprehensive digital infrastructure and technology services, enabling 'specialised, refined, distinctive and innovative' enterprises to access digital tools at low cost and rapidly translate digital technologies into enhanced supply chain resilience; in recent years, the Central and Western regions have rapidly addressed shortcomings through government-led digital infrastructure development, whilst 'specialised, refined, distinctive and innovative' enterprises have leveraged policy benefits to reduce transformation costs and achieve technological breakthroughs, thereby yielding significant effects.

Table 9: Results of the heterogeneity test

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variable	Established enterprises	Start-ups	Technology	Capital	Labour	Eastern regions	Central and Western regions
DTA	0.077**	0.028	0.087***	-0.110**	0.121***	0.065***	0.063**
	(0.030)	(0.025)	(0.018)	(0.052)	(0.044)	(0.018)	(0.028)
Constant term	-5.184***	-4.568***	-4.729***	-0.265	-3.997***	-5.172***	-2.390***
	(0.629)	(0.563)	(0.381)	(1.023)	(0.841)	(0.356)	(0.559)
Control variable	YES	YES	YES	YES	YES	YES	YES
Individual effects	YES	YES	YES	YES	YES	YES	YES
Year effect	YES	YES	YES	YES	YES	YES	YES
N	1038	1396	2583	186	572	3010	841
r2	0.092	0.131	0.095	0.318	0.141	0.057	0.086

5 Research Findings and Policy Implications

5.1 Research Findings

This paper employs a two-way fixed-effects model to examine the impact of digital technology adoption on the supply chain resilience of China's listed 'Specialised, Refined, Unique and Innovative' (SRUI) enterprises between 2013 and 2023. Building on this, we conduct an in-depth analysis of the underlying mechanisms by taking into account the characteristics of SRUI enterprises, whilst considering moderating factors from both internal and external perspectives. Furthermore, we conduct a heterogeneity analysis by incorporating the enterprise life cycle, factor intensity and the geographical location of the enterprises. The findings reveal the following: Firstly, the application of digital technologies by listed "Specialised, Refined, Unique and Innovative" enterprises in China enhances their supply chain resilience. Secondly, the application of digital technologies by these enterprises strengthens supply chain resilience by improving product competitiveness and the level of specialisation. Thirdly, a firm's competitive position exerts a positive moderating effect on the process by which digital technology empowers the supply chain resilience of "Specialised, Refined, Unique and Innovative" enterprises, whilst the institutional environment exerts a "U"-shaped moderating effect, initially inhibiting and subsequently promoting this process. Fourth, the positive impact of digital technology adoption on the supply chain resilience of 'Specialised, Refined, Unique and Innovative' enterprises is more pronounced among mature enterprises, as well as technology- and labour-intensive enterprises. Furthermore, the role of digital technology in enhancing supply chain resilience is universally applicable across regions; however, in capital-intensive 'Specialised, Refined, Unique and Innovative' enterprises, digital technology exerts a suppressing effect on supply chain resilience.

5.2 Policy Implications

First, targeted financial incentives should be implemented to mitigate digitalization costs for 'specialized, refined, distinctive, and innovative' (SRDI) enterprises. Government subsidies should address the digital divide by prioritizing R&D tools for technology-intensive firms and lightweight collaborative tools for labor-intensive ones, thereby facilitating platform integration and intelligent scheduling.

Second, policy designs must activate the dual mechanisms of product differentiation and specialization. Financial and institutional support should guide SRDI firms to leverage digital technologies for rapid market responsiveness, thereby consolidating competitive and technological barriers. Utilizing market-based incentives, such as preferential government procurement, can further motivate firms to deepen their core competencies.

Third, a tiered cultivation strategy based on market competitiveness should be adopted. For leading SRDI firms, regulatory constraints on supply chain innovation pilots should be relaxed to encourage advanced models like data asset-backed financing and digital collaboration leadership. Conversely, policies should channel digital resources and institutional endorsements toward lagging firms to stabilize their supply chain positioning.

Fourth, regional coordination must be strengthened to narrow the resilience divide. Capitalizing on existing digital infrastructure, eastern regions should spearhead digital industrial clusters and share ecosystem-based governance experiences. Concurrently, initiatives like the "East Data, West Computing" project should be leveraged to bridge the digital gap through collaborative platform development and policy transfers, enhancing the late-mover advantages of central and western regions.

References

Zhao Ling, Huang Hao. Uncertainty Shocks, Digital Technological Innovation and Supply Chain Resilience [J]. Journal of Zhongnan University of Economics and Law, 2024, (04): 148–160.

Niu Yuhao, Xiao Yao. Applications of Industrial Robots and Market Performance of Related Products: A Perspective Based on Supply Chain Resilience [J]. Contemporary Finance and Economics, 2025, (04): 140–152.

Guo Jiachen, Zhao Jingfeng, Liu Shan, et al. Does Digital and Intelligent Transformation Mitigate Supply Chain Risks in Manufacturing Enterprises? — A Perspective Based on Supply-Demand Relationships [J]. Economic Review, 2025, (01): 70–86.

Tao Feng, Wang Xinran, Xu Yang, et al. Digital Transformation, Resilience of Industrial and Supply Chains, and Firm Productivity [J]. Chinese Journal of Industrial Economics, 2023, (05): 118–136.

Deng Huihui, Liu Yujia, Wang Qiang. How Does the Development of Artificial Intelligence Enhance Supply Chain Resilience? — Empirical Evidence from Listed Companies [J]. Journal of Zhejiang University (Humanities and Social Sciences), 2024, 54(06): 5–23.

Wang Shuyao, Liu Da, Tang Jijun, et al. How Can Data Elements Enhance the Resilience and Security of Corporate Supply Chains in the Context of Digital-Physical Integration? [J]. Research and Development Management, 2025, 37(01): 1–13.

Liu Shuai. The Impact of Artificial Intelligence Technology on Supply Chain Resilience in Automotive Manufacturing Enterprises [J]. China Distribution Economy, 2025, 39(04): 42–56.

Ji Yuanyuan, Zhu Pingfang, Yang Lan. Digital Empowerment of the Development of New-Quality Productive Forces in Enterprises: High-Quality Innovation and Supply Chain Optimisation [J]. Academic Monthly, 2025, 57(03): 60–71.

Zhang Guofu, Li Ding. How Digital Transformation Affects Corporate Influence in Supply Chains [J]. Accounting Friend, 2024, (10): 90–100.

Ma Cuilian, Li Bing, Yang Shaoxian. Great Power Rivalry, Digital Transformation and Corporate Supply Chain Resilience: An Empirical Study Based on ‘Specialised, Refined, Distinctive and Innovative’ ‘Little Giant’ Enterprises [J]. Supply Chain Management, 2025, 6(06): 44–53.

Pei Yurong. A Review of Research on Supply Chain Resilience at Home and Abroad and Future Prospects [J]. Research on Business Economics, 2024, (13): 33–36.

Zhang Shushan, Gu Cheng. Supply Chain Digitalisation and Supply Chain Resilience [J]. Financial Research, 2024, 50(07): 21–34.

Cheng L,Zhang J. Is tourism development a Catalyst of economic recovery following natural disaster? an analysis of economic resilience and spatial variability [J]. Current issues in tourism,2020,23(20):2602-2623.

Wang Shuyao, Tang Jijun, Liu Da. How Supply Chain Digitalisation Enhances Supply Chain Resilience and Security [J]. Business Research, 2025, (02): 10–19.

PONOMAROV S Y, HOLCOMB M C. Understanding the concept of supply chain resilience[J]. The International Journal of Logistics Management, 2009, 20(1): 124-143.

Li Xiaomei, Liu Mengxue. Digital Technology, Supply Chain Resilience and Corporate Sustainable Performance: The Moderating Role of Absorptive Capacity [J]. East China Journal of Economics and Management, 2025, 39(04): 93–103.

Feng Wenhua. Pathways to Enhancing the Configuration of Supply Chain Resilience in Retail Enterprises under the TOE Framework: Based on Fuzzy Qualitative Comparative Analysis [J]. Research on Business Economics, 2025, (02): 137–141.

Yuan Yehu, Wu Duan. Corporate Digital Transformation and Supply Chain Resilience: A Perspective Based on Supply Chain Spillovers [J]. Theory and Practice of Systems Engineering, 2025, 45(07): 2309–2326.

Zhang, J., & Shang, Y. (2022). The influence and mechanism of digital economy on the development of the tourism service trade: Analysis of the mediating effect of carbon emissions under the background of COP26. Sustainability, 14(20), 13414.

Song, D. L., Liu, F. J., & Ding, W. L. (2024). Digital Transformation of Enterprises and Supply Chain Resilience: A Social Network Analysis Perspective [J]. Journal of Southeast University (Philosophy and Social Sciences Edition), 26(05): 47–60+149+2.

Han, M. C., Song, C. H., & Yuan, H. K. Digital Transformation, Supply Chain Resilience and Corporate Value-Added Rates [J]. Economic Dynamics, 2025, (01): 111-127.

Ge Xinting, Xie Jianguo, Yang Hongna. Digital Transformation and Corporate Supply Chain Resilience: Evidence from Chinese Listed Companies and Their Suppliers [J]. Journal of Zhongnan University of Economics and Law, 2024, (03): 136-150.

Wang Lisha, Pang Zhiqiang, Xing Qiang. Innovation Spillover Effects of Corporate Digital Transformation: A Perspective on Industrial and Supply Chain Resilience [J]. Soft Science, 2025, 39(01): 77–84.

Tu, W. J., Zhang, L. X., Sun, D. Y., & Mao, W. Q. (2023). Evaluating high-tech industries? technological innovation capability and spatial pattern evolution characteristics: Evidence from China. Journal of Innovation & Knowledge, 8(1), 100287.

Sun Shaoyan, Ma Yuezhu, Zhang Min. Can the ‘Specialised, Refined, Unique and Innovative’ Transformation of SMEs Enhance Supply Chain Resilience? [J]. Research on Economic Development, 2025, (02): 3–18.

Jiang, T., Hu, Y., Haleem, F., & Zeng, S. (2023). Do digital trade rules matter? Empirical evidence

from TAPED. Sustainability, 15(11), 9074.

Ivanov, D., & Dolgui, A. (2021). A digital supply chain twin for managing the disruption risks and

resilience in the era of Industry 4.0. Production Planning & Control, 32(9), 775–788.

Wei Hui, Zheng Wei. Corporate Competitive Position, Supply Chain Concentration and the Cost of Equity Capital [J]. Business Research, 2019 (2): 109–118.

Yuan Chun, Xiao Tusheng, Geng Chunxiao, et al. Digital Transformation and Corporate Division of Labour: Specialisation or Vertical Integration [J]. Chinese Industrial Economics, 2021, (09): 137–155.

Fan Z. Y., & Peng F. The Tax Reduction and Division of Labour Effects of the ‘Business Tax to VAT Reform’: A Perspective Based on Industrial Interconnection [J]. Economic Research Journal, 2017, 52(02): 82–95.

Li X. M., & Liu M. X. A Study on the Impact of Digital Technology on Supply Chain Stability [J]. Journal of Harbin University of Commerce (Social Sciences Edition), 2025, (02): 41–55.

Yin Meiqun, Sheng Lei, Li Wenbo. Executive Incentives, Innovation Investment and Firm Performance: An Empirical Study by Industry from an Endogeneity Perspective [J]. Nankai Management Review, 2018, 21(01): 109–117.