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The Impact of Supply Chain Digitalization on the Resilience of New Retail Enterprises: Mechanisms and Evidence

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Abstract: ***This study utilizes panel data from Shanghai and Shenzhen A-share new retail listed companies in China (2013–2023) to investigate the direct effects and mechanisms of supply chain digitalization on new retail enterprises. Results show that supply chain digitalization significantly enhances enterprise resilience, with robust effects. Mediation analysis reveals that it indirectly improves resilience through better product market performance. Additionally, enterprise ownership characteristics moderate the impact, with non-state-owned enterprises exhibiting a higher response to supply chain digitalization.***

Keywords: New retail enterprises, Enterprise resilience, Supply chain digitalization, Product market performance.

1. Introduction

With the rapid development of a new generation of digital technology and profound changes in the consumption structure, China's retail industry is accelerating its evolution from traditional retail to a new retail model that deeply integrates online and offline. New retail enterprises, driven by data at their core, upgrade and transform the production, circulation, and sales processes of goods, thereby reshaping the industry structure. However, against the backdrop of high uncertainty in the external environment, intensifying market competition, and rapidly changing consumer preferences, new retail enterprises face sudden shocks and systemic risks. How to maintain stable operations and continuous development in a dynamic environment has become a challenge that new retail enterprises must address. Therefore, enhancing the resilience of new retail enterprises has become the key to ensuring their high-quality development. Enterprise resilience refers to the ability of a company to maintain its critical functions, quickly adapt to changes, and achieve recovery and transformation when facing external shocks and uncertainties. New retail enterprises exhibit certain vulnerabilities when dealing with emergencies such as supply chain disruptions, demand fluctuations, and pandemics, reflecting evident shortcomings in current resilience-building efforts. This practical challenge has prompted both academia and practitioners to focus on digital transformation, particularly the potential role of supply chain digitalization in building resilience.

Supply chain digitalization involves the integration of information technology across the entire supply chain process, enabling data-driven operations, system integration, and intelligent collaboration in procurement, production, logistics, and sales. Theoretically, the role of supply chain digitalization in enhancing the resilience of new retail enterprises manifests at multiple levels, such as improving risk identification capabilities, demand forecasting abilities, and enhancing internal organizational coordination, thereby strengthening the resilience of new retail enterprises. Although the theoretical mechanisms of supply chain digitalization have gradually gained attention, there are still some gaps in the current research. On the one hand, existing literature primarily focuses on traditional retail sectors, with insufficient micro-empirical studies on new retail enterprises; on the other hand, there is a lack of exploration into the mediating mechanisms between supply chain digitalization and the resilience of new retail enterprises.

In summary, this paper selects listed new retail companies from China's Shanghai and Shenzhen A-share markets between 2013 and 2023 as research subjects, constructing an analytical framework for examining the direct impact and transmission mechanisms of supply chain digitalization on the resilience of new retail enterprises from both theoretical and empirical perspectives. Compared to existing studies, the innovations of this paper are mainly reflected in two aspects: first, focusing on micro-level data of new retail enterprises to empirically study the relationship between supply chain digitalization and enterprise resilience; second, introducing product market performance as a mediating variable to reveal the impact mechanism of digitalization on the resilience of new retail enterprises. This study provides theoretical support and data backing for promoting the digital transformation of supply chains in new retail enterprises, optimizing resource allocation, and achieving highly resilient development.

2. Research Hypotheses

2.1 Digitalization of the Supply Chain and the Resilience of New Retail Enterprises

The digitalization of the supply chain is a core pathway for new retail enterprises to build organizational resilience. By embedding information technology into every link of the supply chain, it systematically enhances the ability of new retail enterprises to respond to and recover from uncertain environments in terms of risk identification, demand forecasting, and promoting internal coordination. Specifically: First, in terms of risk identification capabilities. New retail enterprises use real-time data collection and intelligent analysis systems to identify potential supply chain disruptions, market fluctuations, or external shocks, improving the sensitivity of early warning mechanisms and the forward-looking nature of risk response. Second, in terms of

demand forecasting. New retail enterprises mine data on consumer behavior, sales trends, and the market environment, dynamically capture changes in demand, optimize production and sales decisions, and enhance the efficiency of supply-demand matching. Third, regarding internal synergy within the enterprise. Digital means of supply chain management reduce information barriers within new retail enterprises, achieving data sharing and process linkage across procurement, warehousing, logistics, and terminal sales, enhancing the flexibility of corporate resource allocation and the stability of business operations (Huang Hongbin et al., 2024). In summary, supply chain digitalization enhances the risk identification and demand forecasting capabilities of new retail enterprises and improves internal coordination, serving as an important strategic support for new retail enterprises to achieve resilient growth in complex and volatile environments. Based on this, we propose Hypothesis 1:

Hypothesis 1: Supply chain digitalization can significantly enhance the resilience of new retail enterprises.

3.2 The Mediating Effect of Product Market Performance

In the new retail business model, supply chain digitalization effectively drives the continuous improvement of product market performance by empowering demand forecasting and inventory optimization. New retail enterprises use digital tools to integrate historical sales volume, consumer behavior, and market changes, building dynamic forecasting models to predict market demand and structure. On this basis, they optimize product mix and inventory strategies, dynamically adjust product portfolios and replenishment rhythms, and enhance the agility of the supply system's response to the market. This data-driven supply-demand matching mechanism not only effectively alleviates the risks of overstock and stockouts but also improves product turnover efficiency and user satisfaction, enhancing the stability and sustainability of product sales. Ultimately, the competitiveness of new retail enterprises' products is enhanced, and their market performance continues to improve.

The continuous improvement in product market performance indicates that new retail enterprises have stable income and cash flow returns, providing financial support for them to cope with external environment fluctuations. Steady sales growth also helps enhance new retail enterprises' control over upstream and downstream resources, thereby increasing the confidence and synergy of supply chain partners, and strengthening enterprises' risk resistance and resource scheduling capabilities during crises. Meanwhile, excellent product market performance also boosts the brand awareness and customer loyalty of new retail enterprises, ensuring strong market recovery and organizational adaptability even when facing sudden shocks. Therefore, the improvement in product market performance significantly enhances the resilience of new retail enterprises. Based on this, this paper proposes Hypothesis 2:

Hypothesis 2: Supply chain digitalization indirectly enhances enterprise resilience by improving the product market performance of new retail enterprises.

3. Empirical Analysis

3.1 Research Design

1) Model construction. To test Hypothesis 1, this paper constructs a model as shown in Equation (1):

$$\text{Cres}_{it} = \alpha_0 + \alpha_1 SD_{it} + \alpha_2 X_{it} + u_i + v_t + \varepsilon_{it} \quad (1)$$

Where Cres_{it} and SD_{it} represent the enterprise resilience and the degree of supply chain digitalization of new retail enterprise i in year t; X_{it} represents the set of control variables; u_i and v_t represent individual fixed effects and time fixed effects respectively; α_1 represents the estimated coefficient of the core explanatory variable; ε_{it} represents the random error term.

To test Hypothesis 2, this paper refers to the method used by Zhang Yanyan and Wang Minfan (2025) to verify the mediating effect of product market performance:

$$SG_{it} = \delta_0 + \delta_1 SD_{it} + \delta_2 X_{it} + u_i + v_t + \varepsilon_{it} \quad (2)$$

Where SG_{it} represents the product market performance of new retail enterprises, and δ_1 represents the impact effect of supply chain digitalization on product market performance. If significant, then Equation (3) is tested:

$$\text{Cres}_{it} = \beta_0 + \beta_1 SD_{it} + \beta_2 SG_{it} + \beta_3 X_{it} + u_i + v_t + \varepsilon_{it} \quad (3)$$

Where β_2 represents the impact effect of product market performance on the resilience of new retail enterprises; if Equation (2) passes the test, and β_2 is found to be significant, then the mediating effect test of product market performance is established.

2) Variable selection. The dependent variable in this paper is enterprise resilience. Enterprise resilience reflects the ability of enterprises to quickly respond and maintain the continuous operation of key businesses when facing external emergencies. This paper references Xu Ying's (2024) study, measuring enterprise resilience from two aspects: financial volatility and long-term performance growth. Financial volatility is measured by the standard deviation of monthly stock returns within a year, while long-term performance growth is represented by the cumulative sales revenue growth over three years. Finally, the entropy method is used to calculate the enterprise resilience index. This indicator is a positive one, denoted as Cres.

The independent variable of this article is supply chain digitalization. Supply chain digitalization emphasizes the deep integration of digital technology and supply chain management. Currently, there is a relative lack of methods to measure supply chain digitalization at the enterprise level. Some scholars use the pilot work on supply chain innovation and application promoted by multiple departments, including China's Ministry of Commerce in 2018, as an exogenous shock to enterprise supply chain digitalization. However, this method uses a 0-1 dummy variable that hardly characterizes the varying degrees of supply chain digitalization among different enterprises, affecting the accuracy of research results. This article references the methods used by Jia Junwei et al. (2024) and Liu Ying et al. (2024), conducting a textual analysis of the management discussion and analysis section of

corporate annual reports, setting keywords for enterprise supply chain digitalization from five aspects: enterprise planning digitalization, procurement digitalization, production digitalization, sales digitalization, and logistics digitalization. The specific keyword settings can be found in the paper by Jia Junwei et al. (2024). Ultimately, the ratio of keyword occurrences to segment length is calculated and multiplied by 100. The larger this value, the higher the degree of enterprise supply chain digitalization, denoted as SD. To verify the robustness of the method used in this article, it refers to the research by Zhang Jingwei and Zhang Guannan (2025), constructing an evaluation index system for supply chain digitalization in the region where the enterprise is located from three aspects—supply chain digitalization infrastructure, industrial development, and development environment—from a macro perspective, using the entropy method to calculate the final score, and matching data based on the region where the enterprise is located and micro-level enterprise data.

The mediating variable is product market performance. Product market performance measures the overall operation and performance of a company's products in the market. It covers various aspects such as user feedback and sales performance of the products. Regarding its measurement method, existing literature has pointed out that changes in a company's sales relative to the industry can comprehensively reflect product market performance information. Therefore, based on data availability, this article references the methods used by Zhu Hongbing et al. (2024) and Tang Taijie et al. (2024), measuring product market performance with excess sales growth rate, defined as the difference between the company's revenue growth rate and the average revenue growth rate of the industry within an operating year, denoted as SG. This indicator is a positive one; the higher the value, the better the market performance.

Based on existing research, to avoid the impact of omitted variables on model estimation, this article includes control variables: firm size, years of operation, firm growth, ownership structure, and board of supervisors size. Among them, firm size is measured by the natural logarithm of total assets, denoted as Size; years of operation are measured by the natural logarithm of the number of years since the firm was established, denoted as Age; firm growth is measured by Tobin's Q value, denoted as Tobinq; ownership structure is measured by the proportion of shares held by the largest shareholder, denoted as Top; and board of supervisors size is measured by the natural logarithm of the number of members on the board of supervisors plus one, denoted as Supervisor.

Table 1: Descriptive Statistics of Variables

Variable	Sample Size	Mean	Standard Deviation	Minimum	Maximum
Cres	556	0.605	0.271	0.164	0.930
SD	556	0.174	0.202	0.000	1.367
SG	556	-0.011	0.511	-0.545	3.752
Size	556	22.567	0.979	20.664	24.149
Age	556	2.806	0.539	1.609	3.401
Tobinq	556	1.602	0.629	0.951	3.065
Top	556	0.333	0.122	0.144	0.603
Supervisor	556	1.274	0.262	1.099	1.946

Table 2: Baseline Regression Results

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
SD	0.0503***	0.0485***	0.0472***	0.0448***	0.0443***	0.0430***
	(0.0163)	(0.0164)	(0.0163)	(0.0155)	(0.0154)	(0.0154)
Size		0.0076	0.0063	-0.0146**	-0.0134**	-0.0146**
		(0.0060)	(0.0060)	(0.0065)	(0.0065)	(0.0065)
Age			0.0579***	0.0513**	0.0619***	0.0604***
			(0.0215)	(0.0205)	(0.0209)	(0.0209)
Tobinq				-0.0408***	-0.0395***	-0.0395***
				(0.0059)	(0.0059)	(0.0059)
Top					0.0761**	0.0769**
					(0.0324)	(0.0324)
Supervisor						0.0382*
						(0.0213)
Constant	0.5963***	0.4258***	0.2911**	0.8480***	0.7633***	0.7460***
	(0.0033)	(0.1356)	(0.1437)	(0.1594)	(0.1626)	(0.1625)
Individual	YES	YES	YES	YES	YES	YES
Time	YES	YES	YES	YES	YES	YES
N	556	556	556	556	556	556

Note: The values in parentheses are standard errors; * represents p<0.1, ** represents p<0.05, *** represents p<0.01, the same below.

3) Sample Selection. The current understanding of the new retail's essence remains inconsistent. Existing research emphasizes that new retail combines digital technology and intelligent concepts with traditional retail enterprises to drive the digital transformation of retail businesses. Therefore, referencing Yao Bingge and Jia Chunxiang (2024), this paper defines retail enterprises with online channels as new retail enterprises. Data from A-share retail industry listed companies in China from 2013-2023 were selected, excluding ST-labeled firms, insolvent enterprises, and observations existing for less than a year. Relevant data sources are the GTA database and the China Statistical Yearbook. Descriptive statistical analysis of each variable is shown in Table 1.

3.2 Analysis of the Direct Impact of Supply Chain Digitalization on New Retail Enterprise Resilience

This section explores the direct impact of supply chain digitalization on new retail enterprise resilience, divided into two parts: verification of Hypothesis 1 and robustness checks.

1) Baseline Model Estimation. Table 2 reports the effect coefficients of supply chain digitalization on new retail enterprise resilience after progressively adding control variables. Gradually incorporating control variables allows observation of the stability of the influence coefficient of supply chain digitalization. The data shows that as control variables are added, the influence coefficient of supply chain digitalization gradually stabilizes. When all selected control

variables are included, the influence coefficient of supply chain digitalization is 0.0430, passing the significance test at least at the 1% level (see Model 6 in Table 2). This indicates that improvements in supply chain digitalization can significantly enhance the resilience of new retail enterprises, confirming Hypothesis 1.

Theoretical analysis shows that supply chain digitalization enhances new retail enterprises' risk identification and demand forecasting capabilities and strengthens coordination among internal units. By accurately identifying risks, predicting consumer demands, and analyzing market structures, new retail enterprises can avoid risks, adjust product inventories, and improve adaptability to the market environment. Meanwhile, supply chain digitalization reduces communication barriers within enterprises by sharing procurement, inventory, and sales information, making internal operations more coordinated and smooth, significantly improving resistance and recovery capabilities against external shocks.

2) Robustness Test. To verify the robustness of the benchmark regression results, this paper conducts robustness tests using various methods. First, this paper comprehensively measures the digitalization level of regional supply chains from a macro perspective and matches samples based on the regions where new retail enterprises are located; the test results are shown in Model 1 of Table 3. Second, to address potential endogeneity issues in the model, this paper uses the Heckman two-step method to identify the model and examines whether there is sample selection bias. The first step estimates the probability deviation Imr through the selection equation, and Model 2 of Table 3 reports the regression results of the second step after adding Imr. Third, this paper uses the Bootstrap method for random sampling with replacement and re-examines the significance of the impact coefficient of supply chain digitalization using non-parametric methods; the results are shown in Model 3 of Table 3. Fourth, to avoid dynamic effects, this paper incorporates the first-order lag term of the explained variable and observes changes in the impact coefficient of supply chain digitalization; the results are shown in Model 4 of Table 3.

Table 3: Robustness Test Results

	Model 1	Model 2	Model 3	Model 4
	Replace Independent Variables	Heckman	Random Sampling	Dynamic Effect
SD	0.0519***	0.0473***	0.0430**	0.0390**
	(0.0179)	(0.0155)	(0.0208)	(0.0184)
Size	-0.0136**	-0.0757**	-0.0146**	-0.0223***
	(0.0065)	(0.0310)	(0.0065)	(0.0084)
Age	0.0598***	-0.1851	0.0604**	0.1150***
	(0.0209)	(0.1238)	(0.0290)	(0.0281)
Tobinq	-0.0401***	0.0813	-0.0395***	-0.0452***
	(0.0059)	(0.0603)	(0.0081)	(0.0067)
Top	0.0703**	-0.8346*	0.0769*	0.0910**
	(0.0324)	(0.4540)	(0.0394)	(0.0400)
Supervisor	0.0395*	0.3476**	0.0382**	0.0391
	(0.0212)	(0.1552)	(0.0173)	(0.0242)
Imr		0.6716**		
		(0.3337)		
L.Cres				-0.2071***
				(0.0503)
Constant	0.7117***	1.1488***	0.7460***	0.9149***
	(0.1622)	(0.2575)	(0.1603)	(0.2092)
Individual	YES	YES	YES	YES
Time	YES	YES	YES	YES
N	556	556	556	471

In summary, Models 1-4 in Table 3 all indicate that the impact coefficient of supply chain digitalization on the resilience of new retail enterprises remains significantly positive, demonstrating that the benchmark regression results have strong robustness.

3.3 Mediating Effect Analysis of Product Market Performance

The benchmark regression shows that the digitalization of the supply chain can significantly enhance the resilience of new retail enterprises, and this section discusses the mechanism of action. Table 4 reports the mediating effect results of product market performance. Model 1 shows that the impact coefficient of supply chain digitalization on the product market performance of new retail enterprises is 0.5589, which passes the significance test at least at the 1% level, indicating that supply chain digitalization can significantly improve the product market performance of new retail enterprises; Model 2 shows that after simultaneously incorporating supply chain digitalization and product market performance variables, the impact coefficient of product market performance on the resilience of new retail enterprises is 0.0105, which passes the significance test at least at the 1% level, indicating that the improvement of product market performance of new retail enterprises can significantly enhance corporate resilience. Therefore, the product market performance of new retail enterprises has a mediating effect in the process where supply chain digitalization influences the resilience of new retail enterprises, verifying the establishment of Hypothesis 2.

Table 4: Mediating Effect Test Results of Product Market Performance

	Model 1	Model 2
	SG	Cres
SD	0.5589***	0.0371**
	(0.1938)	(0.0154)
SG		0.0105***
		(0.0037)
Size	0.1681**	-0.0163**
	(0.0817)	(0.0065)
Age	-0.2702	0.0633***
	(0.2625)	(0.0207)
Tobinq	-0.0856	-0.0386***
	(0.0745)	(0.0059)
Top	0.7144*	0.0694**
	(0.4068)	(0.0322)
Supervisor	-0.1099	0.0393*
	(0.2674)	(0.0211)
cons	-3.1049	0.7786***
	(2.0435)	(0.1617)
Individual	YES	YES
Time	YES	YES
N	556	556

Theoretical analysis shows that after the degree of supply chain digitization in new retail enterprises is improved, the enterprises can use digital technology to analyze historical sales data of products, consumer demand structure, and changes in the market environment. By using dynamic forecasting models, they can identify consumer preferences in the market, thereby adjusting product inventory and production strategies in a timely manner to avoid overstock or stock shortages. At the same time, this improves the alignment between production and consumer preferences,

continuously enhancing product market performance. After the improvement in product market performance, new retail enterprises enjoy more stable cash flow and greater supply chain influence, with enhanced financial support capabilities and brand effectiveness. Facing uncertain external market conditions, the resilience of new retail enterprises gradually strengthens.

3.4 Heterogeneity Analysis Based on Enterprise Ownership

Furthermore, due to differences in ownership and management mechanisms between state-owned and non-state-owned enterprises, the impact of supply chain digitization on the resilience of new retail enterprises may vary. Therefore, this paper divides the sample enterprises into non-state-owned enterprise sample groups and state-owned enterprise sample groups, conducting grouped regressions through sample segmentation. The test results are shown in Table 5. The data indicates that in the non-state-owned enterprise sample group, the impact coefficient of supply chain digitization on the resilience of new retail enterprises is 0.0408, passing the significance test at least at the 1% level; in state-owned enterprises, this impact coefficient is 0.0397 but is not statistically significant. Thus, in the non-state-owned enterprise sample group, the marginal impact effect of supply chain digitization on the resilience of new retail enterprises is higher.

Table 5: Heterogeneity Test Results Based on Ownership Characteristics

	Model 1	Model 2
	Non-state-owned enterprises	State-owned enterprises
SD	0.0408**	0.0397
	(0.0183)	(0.0298)
Size	-0.0181**	0.0011
	(0.0075)	(0.0158)
Age	0.0878***	-0.0053
	(0.0280)	(0.0359)
Tobinq	-0.0452***	-0.0290***
	(0.0082)	(0.0090)
Top	0.0480	0.1582**
	(0.0419)	(0.0667)
Supervisor	0.0462	0.0362
	(0.0303)	(0.0327)
cons	0.7776***	0.5367
	(0.2033)	(0.3541)
Individual	YES	YES
Time	YES	YES
N	301	251

4. Implications

First, strengthen the degree of supply chain digitization in new retail enterprises. Intelligent systems should be integrated and applied in procurement, warehousing, distribution, and sales processes, encouraging new retail enterprises to build end-to-end visible and controllable digital supply chain systems. At the same time, promote the establishment of a supply chain data platform to achieve data sharing and intelligent collaboration between upstream and downstream partners, enhancing the overall flexibility and responsiveness of the supply chain.

Second, enhance product market performance. Policies should focus on promoting the establishment of data-driven product market response mechanisms for new retail enterprises, supporting companies in optimizing demand forecasting and product structure adjustment through digital tools to improve the sensitivity and adaptability of supply to market changes. Enterprises should also be encouraged to achieve precise marketing and user interaction on digital platforms, strengthen brand awareness and customer loyalty, driving sales growth and market share increase.

Third, implement differentiated support policies. Financial support mechanisms should be improved, providing low-cost financing tools and special technical renovation subsidies. Strengthen policy pilots and demonstration leadership by selecting representative non-state-owned enterprises to promote digital supply chain construction, forming replicable and scalable transformation paths to enhance the resilience and development quality of the overall industrial system.

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