

Supply Chain Concentration, Market Position and Corporate Trade Credit

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Abstract. Corporate trade credit serves as a vital financing channel in supply chain transactions, operating on trust between firms and partners. This study analyzes 2010-2021 Shanghai/Shenzhen A-share manufacturing firms to examine how supply chain concentration affects corporate trade credit, using market position as a moderating variable. Results show: (1) Significant negative correlation between supply chain concentration and trade credit; (2) Market position mitigates this relationship. Robustness tests confirm these findings, enriching trade credit literature and providing managerial insights for supply chain relationships.

Keywords: Supply chain concentration, Trade credit, Market position.

1. Introduction

Recent years have witnessed growing structural debt imbalances among Chinese enterprises. State-owned enterprises (SOEs) benefit from preferential bank credit access, whereas non-SOEs face credit constraints due to weaker risk resilience [1]. This has intensified reliance on trade credit—a vital financing tool offering lower costs and reduced information asymmetry compared to formal channels like bank loans. Globally, trade credit constitutes about 25% of corporate debt, but exceeds 34% for Chinese enterprises [3], with 2022 industrial receivables reaching ¥21.65 trillion (13.86% of total assets).

Trade credit negotiations fundamentally reflect supply chain dynamics, where competitive or collaborative relationships determine credit terms. These terms critically impact corporate liquidity and supply chain stability. Market position further influences credit outcomes, serving both as competitive leverage and relationship modulator [4]. This study thus investigates how supply chain concentration shapes trade credit financing, while examining market position's moderating effect. The analysis aims to provide strategic insights for optimizing trade credit practices within China's evolving financial environment.

2. Organization of the Text

This study holistically examines how supply chain relationships affect trade credit, along with market position's moderating role. The paper comprises: (1) Introduction outlining research background and significance; (2) Content overview summarizing methodology and structure; (3) Literature review synthesizing studies on trade credit determinants, supply chain concentration effects, and market position impacts; (4) Hypothesis formulation defining key concepts and proposing testable hypotheses, plus data sources and modeling; (5) Empirical analysis validating hypotheses with robustness checks; (6) Conclusion presenting evidence-based recommendations while acknowledging limitations.

3. Literature References

3.1. Research on Factors Influencing Trade Credit Financing

Trade credit serves as a vital short-term financing channel characterized by cost efficiency and reduced information asymmetry. Its theoretical foundation derives from two motives: the financing

motive (exemplified by substitute financing theory positioning it as a bank credit alternative [5]) and the operational motive (encompassing competitive hypothesis and buyer market theory framing it as strategic market instrument [4]). Thus, trade credit functions both as a cooperative/competitive tool and financing vehicle.

Existing research examines influencing factors through dual dimensions:

Externally, economic policy uncertainty constrains credit supply [6], subsidy adjustments alter supply chain credit terms [7], while monetary policy conditions determine applicable theoretical frameworks [8]. Supply chain dynamics reveal that customer procurement share elevates credit [10], whereas product substitutability diminishes suppliers' willingness [9,13-15]. Industry competition intensity also correlates with increased credit provision [11].

Internally, corporate governance factors demonstrate financial fraud reduces credit [17], while internal control quality enhances it [19]. Firm attributes show strategic divergence impedes credit access [18], with ownership structure and regional financial development moderating effects [20]. Information disclosure quality further positively influences credit scales [21].

Collectively, these studies confirm trade credit's dual nature as both financing substitute and competitive instrument, shaped by market conditions and corporate characteristics.

3.2. Research on the Impact of Supply Chain Concentration on Trade Credit Financing

Corporate supply chain relationships have evolved from fragmented arrangements to stable, concentrated partnerships. Scholars examining supply chain concentration and trade credit adopt dual perspectives: dyadic and triadic.

In dyadic studies, customer concentration shows multifaceted effects: Chen finds higher concentration compels firms to provide more trade credit, especially for non-SOEs amid industry competition [11]; Jiang et al. observe lenient credit terms with concentrated clients [12]; whereas Wu et al. note reduced credit encroachment [22]. For supplier concentration, Di et al. demonstrate negative correlation, stronger in SOEs or weak-market-position firms [23]; Ma et al. confirm reduced credit scales and shortened financing periods [24]; while Fisman and Dass et al. reveal dual effects: excessive concentration weakens bargaining power yet closer collaboration may incentivize trade credit investments [4,13,9].

Triadic research explores supplier-client-firm interactions: Li and Liu find triadic cooperation enhances credit access despite dyadic reduction [25]; conversely, Li notes upstream/downstream squeezing reduces credit in triadic contexts [26]; Nagarajan and Bassok reveal bidirectional pressures (suppliers demanding faster payables/clients extending receivables) decreasing overall credit availability [27].

Collectively, these findings underscore how competitive dynamics, relational governance, and strategic collaboration shape trade credit across relationship configurations.

3.3. Research on the Impact of Market Position on Trade Credit Financing

Market position significantly affects trade credit by reflecting firms' competitiveness and bargaining power. According to the competitive hypothesis theory [4,29], dominant firms threaten supplier switching to gain more trade credit, while weaker firms voluntarily offer credit to maintain key relationships. This framework is widely validated: studies show market position determines credit terms favoring stronger players [15,30], concentrates financing in high-position firms while constraining weaker firms [32], and correlates positively with trade credit scale—especially in competitive industries [33,34].

Furthermore, market position moderates other credit dynamics: it mitigates financialization's negative credit impact [35], reduces supply chain concentration's squeezing effect [26], and complements internal controls in credit acquisition [36,37].

3.4. Literature Summary

Literature confirms trade credit correlates with external factors (procurement share, supply chain concentration, policies, competition) and internal factors (fraud, strategic divergence, internal controls, disclosure, ownership). For supply chain concentration: Dyadic perspectives generally show negative concentration-credit correlations. Triadic analyses yield mixed results: competition-dominated relationships reduce credit whereas collaboration enhances it through mutual trust, while market position theory confirms stronger firms gain more credit [29,33], scant research examines how market position—as an industry competitiveness proxy—moderates the holistic supply chain concentration-credit relationship.

This study thus investigates chain concentration's impact on trade credit with market position's moderating role, extending insights into chain governance and credit accessibility.

4. Research Hypotheses

4.1. Conceptual Definitions

(1) Supply Chain Concentration

Reflecting transactional reliance on key partners, supply chain concentration comprises supplier and customer dimensions. High concentration signifies dependency on few partners, yielding efficiency gains through stable collaboration while increasing vulnerability to disruptions and weakening bargaining power [17]. Low concentration spreads risk but indicates fragmented partnerships with higher transaction costs.

(2) Market Position

Representing industry competitiveness and bargaining power, market position is commonly measured by market share or Herfindahl-Hirschman Index [32]. Firms leverage strong positions to demand favorable terms (e.g., threatening supplier switches), countering bargaining disadvantages from supply chain dependency [41].

(3) Trade Credit

Arising from deferred payments or prepaid sales, trade credit manifests as receivables (supply) or payables (demand). Measured as proportions of assets/liabilities [17,24,32], its low-cost financing function substitutes bank credit, facilitated by inter-firm trust and information symmetry.

4.2. Research Hypotheses

4.2.1 Supply Chain Concentration and Trade Credit Financing

Supply chain concentration's impact on trade credit arises from cooperative or competitive dynamics within the chain. Cooperatively, heightened concentration strengthens collaboration, reduces operating expenses, accelerates capital turnover, and enhances financial performance [28,46], facilitating greater trade credit from partners. Conversely, competitively, powerful entities may exploit weaker counterparts' working capital, increasing liquidity risks through squeezing effects [26].

Resource dependency theory indicates that fewer suppliers/clients signify greater dependency and concentration. While closer relationships foster information sharing and resource complementarity, asymmetric dependency—particularly overreliance on few partners—undermines decision autonomy. When suppliers restrict credit or clients demand extended terms, high-switching-cost firms reluctantly comply, reducing their own trade credit access.

Bargaining power theory posits that concentration reflects negotiating leverage. Concentrated transactions increase susceptibility to dominant partners' pressure. Asymmetric dependency weakens bargaining power, preventing firms from resisting credit encroachment by clients or financing cuts by suppliers, forcing concessions.

Thus, this study contends competition dominates supply chain relationships. Strengthened ties deepen upstream/downstream dependency, erode bargaining power, and intensify competitive pressures, ultimately diminishing corporate trade credit.

Based on the above, the following hypothesis is proposed:

H1: Supply chain concentration negatively affects a firm's trade credit.

4.2.2 Moderating Effect of Market Position

Market position moderates the supply chain concentration-trade credit relationship through multiple mechanisms. Resource dependence theory suggests concentrated supply chains create asymmetric interdependence that weakens bargaining power. However, strong market position mitigates excessive reliance on specific partners by leveraging industry power and resources, making even concentrated partners replaceable. Since competition causes mutual damage while cooperation enables complementary resource utilization, dominant partners value relationships with market-leading firms more, counteracting positional disadvantages.

Per signal theory, information asymmetry regarding operational status exists between firms and partners. Market position signaling enables suppliers/customers to better assess bargaining power and payment capacity. Partners perceive strong market positions as indicating superior product/service quality and creditworthiness [33], increasing their willingness to provide trade credit support.

Bargaining power theory indicates concentrated partners gain negotiation advantage, potentially causing insufficient trade credit or excessive resource occupation [26]. Strong market position reduces dependence on dominant partners, establishes equitable negotiation footing, and prevents working capital appropriation. Thus, market position strengthens firms' bargaining influence in credit arrangements, mitigating trade credit reduction from concentration.

Based on this analysis, the second hypothesis is proposed:

H2: Market position can weaken the negative effect of supply chain concentration on trade credit.

4.3. Sample Selection

This study focuses on A-share manufacturing listed companies on the Shanghai and Shenzhen main boards from 2010 to 2021. To avoid distortions caused by exceptional circumstances, we excluded firms labeled as Special Treatment (ST) during the sample period and observations with missing variables using Excel. Additionally, all continuous variables were winsorized at the 1% and 99% levels using Stata to further mitigate the influence of outliers, resulting in a final dataset of 9,475 unbalanced panel observations. All data used in this study were sourced from the CSMAR database.

4.4. Variable Definitions

4.4.1 Trade Credit

Currently, the measurement of net trade credit (NTC) varies: some studies use the sum of accounts payable, advances from customers, and notes payable as a percentage of total assets, while others adopt net trade credit financing. Following the approach of Zhang et al. to measure trade credit financing, this paper accounts for both a firm's supply of trade credit to downstream partners and its demand from upstream partners [32]. The calculation formula is defined as:

Net Trade Credit (NTC) = [(Accounts Payable + Advances from Customers + Notes Payable) – (Accounts Receivable + Prepayments + Notes Receivable)] / Total Assets.

4.4.2 Supply Chain Concentration

This study measures supply chain concentration (SCII) by adopting the approach of Patatoks and Fang et al., which calculates the average of the sum of a firm's purchase ratio from its top five suppliers and sales ratio to its top five customers. This metric comprehensively reflects the overall concentration of a firm's upstream and downstream supply chain relationships [42, 44].

4.4.3 Market Position

For market position (MP), following the methodology of Liu and Wang, this paper uses a firm's market share to represent its market position. Market share is defined as the ratio of the firm's annual operating revenue to the total operating revenue of its industry. A higher market share indicates a stronger market position and greater market influence [45]. The formula is:

Market Position (MP) = Firm's Annual Operating Revenue / Total Operating Revenue of the Industry.

4.4.4 Control Variables

Drawing on prior studies by Li and Xiu et al., this paper incorporates nine control variables that may influence trade credit financing, including firm characteristics such as firm size, ownership type, return on assets (ROA), and operating cash flow, to account for operational and financial conditions [17, 26]. Additionally, year and industry fixed effects are included as dummy variables to control for temporal and sector-specific variations. The detailed measurement methods for all control variables are presented in Table 4.1.

Table 4.1 Variable Definitions

Variable Name	Symbol	Definition/Measurement
Trade Credit Financing	NTC	(Accounts Payable + Notes Payable + Advances from Customers – Accounts Receivable – Notes Receivable – Prepayments) / Total Assets
Supply Chain Concentration	SCII	(Purchases from Top 5 Suppliers / Total Purchases + Sales to Top 5 Customers / Total Sales) / 2
Market Position	MP	Firm's Annual Operating Revenue / Total Industry Revenue
Firm Size	SIZE	Natural logarithm of total assets
Ownership Type	STATE	Dummy variable: 1 for state-owned enterprises (SOEs), 2 for non-SOEs
Return on Assets	ROA	Net Profit / Total Assets
Bank Borrowings	BANK	(Short-term Loans + Long-term Loans + Current Portion of Non-current Liabilities) / Total Assets
Inventory Turnover	TURN	Annual Operating Cost / Average Inventory Balance
Revenue Growth Rate	GROW	(Current Year's Operating Revenue – Previous Year's Operating Revenue) / Previous Year's Operating Revenue
Operating Cash Flow	CFO	Net Cash Flow from Operating Activities / Total Assets
Financial Distress	ZSCORE	Measured using Altman's Z-score: $Z < 1.8$ (Bankruptcy Zone), $1.8 \leq Z < 2.99$ (Gray Zone), $Z \geq 2.99$ (Safe Zone)
Fixed Asset Ratio	FIXED	Net Fixed Assets / Total Assets
Year Fixed Effects	Year	Annual dummy variables
Industry Fixed Effects	Industry	Industry dummy variables

4.5. Model Construction

To test hypotheses H1 and H2, this study constructs the following two regression models:

$$NTC_{i,t} = \alpha_0 + \alpha_1 SCII_{i,t} + \alpha_2 Controls_{i,t} + \sum Industry_{i,t} + \sum Year_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$NTC_{i,t} = \gamma_0 + \gamma_1 SCII_{i,t} + \gamma_2 MP_{i,t} + \gamma_3 SCII_{i,t} \times MP_{i,t} + \gamma_4 Controls_{i,t} + \sum Industry_{i,t} + \sum Year_{i,t} + \zeta_{i,t} \quad (2)$$

Model (1) primarily verifies H1 by examining the impact of supply chain concentration on trade credit financing. Model (2) introduces an interaction term between supply chain concentration ($SCII_{i,t}$) and market position ($MP_{i,t}$) based on Model (1) to test H2, thereby evaluating the moderating role of market position in the relationship between supply chain concentration and trade credit. Both regression models incorporate a series of control variables ($Controls_{i,t}$) and include industry and year dummy variables to account for fixed effects.

5. Empirical Results

5.1. Descriptive Statistics

As shown in Table 5.1, the median value of trade credit financing (NTC) is -0.026, and the mean is -0.029. The negative values arise because the measurement of trade credit financing accounts not only for credit obtained from suppliers or customers (e.g., accounts payable, which increases trade credit) but also for credit extended to customers or suppliers (e.g., accounts receivable, which reduces trade credit). The negative median and mean indicate that over half of the firms provide more trade credit than they receive. The standard deviation of NTC is 0.113, with maximum and minimum values of 0.278 and -0.326, respectively, reflecting significant variation in trade credit financing across sample firms, likely due to substantial differences across industries.

For supply chain concentration (SCII), the standard deviation is 14.85, with a mean of 32.24% and a median of 29.92%, suggesting considerable heterogeneity in supply chain concentration among firms. Most firms have diversified supplier and customer bases, resulting in relatively dispersed supply chain transactions.

Regarding market position (MP), despite the large gap between the maximum (0.286) and minimum (0.001) values, the small standard deviation (0.042) indicates limited overall variation in market position across the sample. However, a few firms may exhibit exceptionally high market shares due to factors such as industry monopolies or niche markets.

Regarding financial health, the average Z-score (ZSCORE) is 6.12, well above the safe zone threshold of 2.99, while the 25th percentile value (2.856) slightly falls below 2.99. This implies that most firms in the sample exhibit sound financial conditions, though approximately 25% face varying degrees of financial distress. For ownership type (STATE), state-owned enterprises (SOEs) account for 28.1% of the sample. Overall, while significant differences exist across firms in certain variables, all metrics remain within reasonable ranges.

5.2. Correlation Analysis

To examine the correlations and rationality of the variables in this study, we conducted correlation tests and multicollinearity diagnostics, with results presented in Table 5.2. The table reveals that trade credit financing (NTC) exhibits significant correlations with supply chain concentration (SCII) and market position (MP) at the 1% level, as well as with all control variables at the 1% or 5% significance levels. For multicollinearity, all variance inflation factors (VIFs) are below 5, confirming the absence of severe multicollinearity and preliminarily validating the robustness of the models.

Specifically, the correlation coefficient between NTC and SCII is -1.23 (significant at 1%), supporting Hypothesis H1 by indicating a significant negative relationship. In contrast, the correlation coefficient between NTC and MP is 0.144 (significant at 1%), reflecting a positive association. Among control variables, NTC shows significantly positive correlations with firm size (SIZE) and financial health (ZSCORE), suggesting that larger firms and those with stronger financial conditions generally secure more trade credit financing in commercial transactions.

Table 5.1 Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	1st Quartile	Median	3rd Quartile	Max
NTC	9475	-0.029	0.113	-0.326	-0.097	-0.026	0.04	0.278
SCII	9475	32.242	14.85	7.38	20.94	29.92	41.23	76.69
MP	9475	0.018	0.042	0.001	0.003	0.005	0.014	0.286
SIZE	9475	22.121	1.119	19.998	21.328	22.009	22.74	25.516
STATE	9475	0.281	0.449	0	0	0	1	1
BANK	9475	0.128	0.122	0	0.015	0.1	0.21	0.486
ROA	9475	0.041	0.06	-0.223	0.014	0.039	0.072	0.2
TURN	9475	4.999	4.2	0.394	2.372	3.879	6.202	25.9
GROW	9475	0.152	0.314	-0.473	-0.012	0.106	0.254	1.825
CFO	9475	0.053	0.065	-0.135	0.014	0.05	0.091	0.235
ZSCORE	9475	6.12	5.894	0.748	2.856	4.34	6.927	38.443
FIXED	9475	0.234	0.134	0.018	0.132	0.211	0.313	0.622

Table 5.2 Correlation Coefficient Matrix

	NTC	SCII	MP2	SIZE	STAT E	BAN K	ROA	TUR N	GRO W	CFO	ZSCO RE	FIX ED
NTC	1											
SCII	- 0.123 ***	1										
MP	0.144 ***	- 0.183 ***	1									
SIZE	0.276 ***	- 0.237 ***	0.391 ***	1								
STAT E	0.161 ***	- 0.033 ***	0.107 ***	0.294 ***	1							
BAN K	0.021 **	0.005 00	0.134 ***	0.303 ***	0.133 ***	1						
ROA	- 0.065 ***	- 0.095 ***	0.042 ***	0.030 ***	0.076 ***	- 0.376 ***	1					
TURN	0.050 ***	0.124 ***	0.080 ***	0.106 ***	0.087 ***	0.066 ***	0.061 ***	1				
GRO W	- 0.023 **	0.042 ***	0.023 **	0.071 ***	- 0.047 ***	0.003 00	0.266 ***	0.082 ***	1			
CFO	0.212 ***	- 0.122 ***	0.077 ***	0.095 ***	- 0.018 *	- 0.224 ***	0.451 ***	0.110* **	0.012 0	1		
ZSCO RE	0.204 ***	0.104 ***	- 0.112* **	- 0.350 ***	- 0.121 ***	- 0.461 ***	0.307 ***	- 0.057 ***	- 0.016 0	0.161 ***	1	
FIXE D	0.213 ***	- 0.020 **	0.010 0	0.093 ***	0.155 ***	0.297 ***	- 0.138 ***	0.200 ***	- 0.060 ***	0.152 ***	- 0.147* **	1

5.3. Regression Analysis

5.3.1 Supply Concentration and Corporate Trade Credit Financing

The empirical results of this study are presented in Table 5.3. Column (1) shows a significantly negative correlation between supply chain concentration (SCII) and trade credit financing (NTC) at the 5% level, with a coefficient of -0.001, supporting H1. This indicates that competitive dynamics dominate the supply chain, where firms compete for working capital. Increased supply chain concentration reduces trade credit financing for two reasons. First, higher dependence on a limited number of suppliers or customers amplifies their influence over decision-making, leading to potential appropriation of trade credit in competitive supply chain relationships. Second, heightened concentration weakens the firm's bargaining power, forcing concessions during negotiations with upstream and downstream partners. This dual pressure limits the firm's ability to secure trade credit from suppliers while compelling it to extend more credit to customers, thereby reducing net trade credit financing.

Column (2) of Table 5.3 reveals a significantly positive correlation between market position (MP) and NTC at the 5% level (coefficient = 0.072). This underscores that trade credit serves not only as a financing channel but also as a strategic tool for market competition. Firms with weaker market positions may prioritize timely payments to suppliers or proactive credit extensions to customers to maintain cooperative relationships or avoid pressure from dominant partners. In contrast, firms with stronger market positions leverage their resources and reputation to secure more trade credit from weaker suppliers or customers without needing to rely on credit extensions to secure transactions or market share. Consequently, high-market-position firms can maintain larger trade credit balances while preserving bargaining power.

5.3.2 Moderating Effect of Market Position

To investigate the moderating effect of market position, this study centralizes the independent variable supply chain concentration (SCII) and the moderating variable market position (MP), then generates an interaction term $SCII \times MP$ by multiplying the centered variables. This interaction term is incorporated into the regression model to test whether market position mitigates the negative impact of supply chain concentration on trade credit financing. As shown in Column (3) of Table 5.3, the interaction term $SCII \times MP$ exhibits a significant positive coefficient of 0.03 ($p < 0.05$), confirming H2 that market position weakens the adverse effect of supply chain concentration on trade credit financing.

To further analyze this moderating role, the sample is divided into two groups based on the industry median of market position, and Model (1) is re-estimated separately for each subgroup.

Table 5.4 demonstrates that in the low-market-position group, SCII significantly negatively correlates with NTC at the 1% level (coefficient = -0.001). In contrast, the coefficient remains -0.001 in the high-market-position group but becomes statistically insignificant. This divergence suggests that supply chain concentration significantly reduces trade credit financing only for firms with weaker market positions. For high-market-position firms, their elevated market share and bargaining power incentivize suppliers and customers to prioritize cooperative relationships, thereby shielding them from credit reductions despite concentrated supply chains. These results robustly validate H2, highlighting market position's role in neutralizing the negative impact of supply chain concentration.

Table 5.3 Supply Chain Concentration, Market Position, and Corporate Trade Credit Financing

	(1)	(2)	(3)
	NTC	NTC	NTC
SCII	-0.001**		-0.000**
	(-2.56)		(-2.14)
MP		0.072**	0.108***
		(1.98)	(2.62)
SCII*MP			0.003**
			(2.16)
SIZE	0.020***	0.019***	0.018***
	(17.00)	(14.85)	(13.90)
STATE	0.016***	0.016***	0.016***
	(6.74)	(6.70)	(6.64)
BANK	-0.175***	-0.177***	-0.176***
	(-16.13)	(-16.37)	(-16.20)
ROA	-0.311***	-0.308***	-0.312***
	(-14.32)	(-14.22)	(-14.36)
TURN	-0.001***	-0.001***	-0.001***
	(-3.35)	(-3.91)	(-3.52)
GROW	0.010***	0.010***	0.010***
	(2.97)	(2.77)	(2.90)
CFO	0.365***	0.367***	0.364***
	(19.69)	(19.78)	(19.61)
ZSCORE	-0.003***	-0.003***	-0.003***
	(-15.06)	(-15.46)	(-15.12)
FIXED	0.118***	0.120***	0.119***
	(13.10)	(13.25)	(13.17)
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
_cons	-0.302***	-0.313***	-0.276***
	(-6.84)	(-7.15)	(-6.11)
N	9,475	9,475	9,475
F	47.77	47.72	46.63
R ²	0.271	0.270	0.271
R ² _a	0.265	0.265	0.265

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5.4 Subsample Regression Results

	(1)	(2)
	Low-MP group	High-MP group
	NTC	NTC
SCII	-0.001***	-0.001
	(-2.64)	(-1.28)
SIZE	0.014***	0.021***
	(5.67)	(12.13)
STATE	0.015***	0.015***
	(3.88)	(4.61)
BANK	-0.154***	-0.194***
	(-9.47)	(-12.97)
ROA	-0.259***	-0.318***
	(-9.04)	(-9.35)
TURN	-0.001**	-0.001***
	(-2.07)	(-4.07)
GROW	0.008*	0.010**
	(1.70)	(2.08)
CFO	0.352***	0.376***
	(13.49)	(14.36)
ZSCORE	-0.003***	-0.005***
	(-11.37)	(-10.23)
FIXED	0.131***	0.106***
	(10.19)	(8.20)
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
_cons	-0.254***	-0.319***
	(-3.52)	(-5.96)
N	4,521	4,954
F	24.60	28.64
R ²	0.242	0.300
R ² _a	0.232	0.289

5.4. Robustness Tests

To ensure the reliability of our findings, this study conducts a series of robustness and endogeneity tests, including replacing the dependent variable, replacing the independent variable, lagging supply chain concentration by one period, and employing the two-stage least squares (2SLS) method.

5.4.1 Replacing the Dependent Variable—Trade Credit

First, this study replaces the dependent variable and re-runs the regressions for robustness testing. We use NTC_1 as an alternative measure for NTC, where NTC_1 is calculated as (accounts payable - accounts receivable) divided by total operating revenue [49]. The detailed results are presented in Table 5.5. Column (1) shows the regression results of supply chain concentration (SCII) on trade credit financing (NTC_1), revealing a significantly positive correlation at the 5% level. Column (2) presents the regression results of market position (MP) on trade credit financing (NTC_1), with a correlation coefficient of 0.114 that is significant at the 5% level. Column (3) displays the moderating effect results, where the interaction term (SCII×MP) shows a significant relationship with trade credit financing (NTC_1) at the 1% level. Columns (4) and (5) report the results of subsample regressions based on the industry median of market position. Comparing these two groups reveals that for firms with low market positions, the correlation coefficient between supply chain concentration and trade

credit financing is -0.001, significant at the 1% level, while for firms with high market positions, the relationship between supply chain concentration and trade credit financing is not significant. Therefore, after replacing the dependent variable, the conclusions remain consistent with the previous findings, which continues to validate our research hypotheses and demonstrates the robustness of the empirical results.

5.4.2 Replacing the Independent Variable—Supply Chain Concentration

Next, this study replaces the independent variable (SCII) with a new measure (SCII_1) and conducts additional regression analyses. The alternative measure SCII_1 follows the approach of Jiang et al. [12], calculated as the average of the Herfindahl indices for the top five suppliers' purchase ratios and the top five customers' sales ratios. As shown in Table 5.6, column (1) presents the regression results of supply chain concentration (SCII_1) on trade credit financing (NTC), showing a significant negative correlation coefficient of -0.001 at the 1% level. Column (2) displays the moderating effect results, where the interaction term (SCII_1×MP) demonstrates a significant positive correlation coefficient of 0.009 with trade credit financing (NTC) at the 1% level, indicating that market position continues to mitigate the negative impact of supply chain concentration. These results remain consistent with our previous findings, further validating the robustness of our conclusions.

5.4.3 Lagging Supply Chain Concentration by One Period

A firm's supply chain concentration reflects its degree of dependence on upstream and downstream partners in the supply chain. Due to information asymmetry, suppliers or customers cannot accurately assess the firm's actual dependence level or bargaining power during commercial negotiations. Instead, they rely on the firm's prior-period supply chain concentration to evaluate its bargaining position when making trade credit financing decisions. Following prior research [47], this study employs one-period-lagged supply chain concentration (L.SCII) as an alternative measure to test the robustness of its findings regarding trade credit financing (NTC). The results, presented in Table 5.8, confirm that both Hypothesis H1 and H2 remain valid: higher supply chain concentration continues to reduce trade credit financing, while market position still mitigates this negative effect. These findings demonstrate the consistency of our main conclusions.

Table 5.5 Regression Results after Replacing the Dependent Variable

	(1)	(2)	(3)	(4)	(5)
	NTC_1	NTC_1	NTC_1	NTC_1	NTC_1
SCII	-0.000**		-0.000	-0.001***	0.000
	(-2.05)		(-1.54)	(-3.35)	(0.70)
MP		0.114**	0.219***		
		(2.05)	(3.30)		
SCII*MP			0.010***		
			(3.11)		
SIZE	0.019***	0.018***	0.017***	-0.008*	0.022***
	(10.89)	(9.22)	(8.37)	(-1.81)	(10.07)
STATE	0.039***	0.039***	0.039***	0.042***	0.031***
	(10.33)	(10.30)	(10.27)	(6.23)	(7.58)
BANK	-0.199***	-0.201***	-0.200***	-0.188***	-0.198***
	(-11.89)	(-12.08)	(-11.99)	(-6.51)	(-10.50)
ROA	-0.124***	-0.121***	-0.125***	-0.145***	-0.125***
	(-3.70)	(-3.62)	(-3.73)	(-2.85)	(-2.91)
TURN	0.004***	0.003***	0.003***	0.004***	0.002***
	(8.61)	(8.15)	(8.46)	(5.54)	(3.46)
GROW	0.027***	0.026***	0.026***	0.040***	0.013**
	(4.97)	(4.81)	(4.83)	(4.51)	(2.20)
CFO	0.408***	0.409***	0.405***	0.458***	0.333***
	(14.28)	(14.34)	(14.20)	(9.89)	(10.09)
ZSCORE	-0.004***	-0.004***	-0.004***	-0.004***	-0.003***
	(-10.68)	(-11.02)	(-10.71)	(-8.16)	(-4.84)
FIXED	0.257***	0.259***	0.258***	0.286***	0.233***
	(18.48)	(18.61)	(18.55)	(12.50)	(14.31)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
_cons	-0.444***	-0.454***	-0.396***	0.255**	-0.510***
	(-6.53)	(-6.74)	(-5.72)	(1.98)	(-7.55)
N	9,475	9,475	9,475	4,521	4,954
F	48.52	48.52	47.46	26.18	33.88
R ²	0.274	0.274	0.275	0.254	0.336
R ² _a	0.268	0.268	0.269	0.244	0.326

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5.6 Regression Results after Replacing the Independent Variable

	(1)	(2)
	NTC	NTC
SCII_1	-0.001***	-0.001***
	(-3.37)	(-3.17)
MP		0.088**
		(2.38)
SCII_1*MP		0.009***
		(2.93)
SIZE	0.020***	0.019***
	(17.81)	(14.50)
STATE	0.017***	0.016***
	(6.80)	(6.68)
BANK	-0.175***	-0.176***
	(-16.15)	(-16.26)
ROA	-0.312***	-0.314***
	(-14.37)	(-14.48)
TURN	-0.001***	-0.001***
	(-3.13)	(-3.15)
GROW	0.010***	0.010***
	(2.94)	(2.93)
CFO	0.367***	0.366***
	(19.81)	(19.75)
ZSCORE	-0.003***	-0.003***
	(-14.97)	(-14.99)
FIXED	0.117***	0.118***
	(12.98)	(13.05)
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
_cons	-0.312***	-0.293***
	(-7.17)	(-6.68)
N	9,475	9,475
F	47.86	46.79
R ²	0.271	0.272
R ² _a	0.265	0.266

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

5.4.4 Endogeneity Test—Two-Stage Least Squares(2SLS)

The regression models in this study may suffer from endogeneity issues due to unobserved or uncontrolled omitted variables. To address this concern, we adopt the approach from prior studies by using the industry-year average of the sum of customer and supplier concentration as an instrumental variable for supply chain concentration (SCII) and perform a two-stage least squares (2SLS) test [31, 50]. Detailed results in Table 5.7 show that Column (2) reveals a significant negative correlation coefficient of -0.001 between the instrumental variable (IVSCII) and trade credit financing (NTC) at the 1% level, supporting Hypothesis H1. Column (4) presents the moderating effect results, where the interaction term coefficient of 0.007 further supports Hypothesis H2, demonstrating the robustness of the study's conclusions.

Table 5.7 2SLS Regression Results

	(1)	(2)	(3)	(4)
	First stage	Second stage	First stage	Second stage
	SCII	NTC	SCII*MP	NTC
IVSCII	1.020***	-0.001***	0.005***	-0.001***
	(41.679)	(-5.208)	(3.011)	(-4.600)
IVSCII*MP			0.079***	0.007
			(15.533)	(0.882)
MP			-14.521***	0.185**
			(-45.793)	(1.989)
SIZE	-3.488***	0.020***	0.021**	0.018***
	(-25.249)	(15.790)	(2.318)	(13.934)
STATE	0.717**	0.018***	0.053***	0.018***
	(2.290)	(7.344)	(2.705)	(7.096)
BANK	8.136***	-0.170***	0.081	-0.174***
	(5.963)	(-15.652)	(0.946)	(-15.857)
ROA	-17.310***	-0.347***	0.550***	-0.350***
	(-6.149)	(-15.355)	(3.129)	(-15.161)
TURN	0.437***	-0.000	-0.006***	-0.000
	(13.327)	(-0.415)	(-3.116)	(-0.496)
GROW	2.863***	0.009***	-0.012	0.009***
	(6.404)	(2.630)	(-0.441)	(2.636)
CFO	-10.620***	0.385***	0.086	0.382***
	(-4.411)	(20.018)	(0.572)	(19.815)
ZSCORE	0.247***	-0.003***	-0.006***	-0.003***
	(9.185)	(-13.639)	(-3.525)	(-12.977)
FIXED	-4.387***	0.132***	-0.022	0.134***
	(-3.979)	(15.129)	(-0.319)	(15.331)
_cons	73.428***	-0.435***	-0.458**	-0.406***
	(23.678)	(-14.274)	(-2.261)	(-12.853)
R ²	0.247	0.190	0.258	0.190

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5.8 Multiple Regression with Lagged Supply Chain Concentration by One Period

	(1)	(2)
	NTC	NTC
MP		0.106**
		(2.23)
L.SCII	-0.000**	-0.000
	(-1.98)	(-1.63)
L.SCII *MP		0.005**
		(2.15)
SIZE	0.020***	0.019***
	(15.56)	(12.70)
STATE	0.014***	0.014***
	(5.31)	(5.29)
BANK	-0.167***	-0.168***
	(-13.86)	(-13.91)
ROA	-0.312***	-0.312***
	(-13.15)	(-13.14)
TURN	-0.001**	-0.001**
	(-2.49)	(-2.56)
GROW	0.012***	0.011***
	(3.09)	(2.89)
CFO	0.369***	0.368***
	(17.74)	(17.69)
ZSCORE	-0.003***	-0.003***
	(-12.76)	(-12.76)
FIXED	0.130***	0.130***
	(13.03)	(13.06)
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
_cons	-0.344***	-0.318***
	(-7.22)	(-6.55)
N	7,701	7,701
F	40.96	39.93
R ²	0.273	0.274
R ² _a	0.266	0.267

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

6. Summary

This study primarily examines the impact of supply chain concentration on trade credit financing and the moderating effect of market position on this relationship. In further analyses, subsample regressions are conducted based on firm heterogeneity, size, profitability, and other characteristics to explore how supply chain concentration and market position affect trade credit financing under different conditions. Additionally, the roles of upstream (suppliers) and downstream (customers) relationships in trade credit financing are investigated. The findings are as follows:

- (1) Increased supply chain concentration reduces a firm's trade credit financing;
- (2) Market position weakens the negative impact of supply chain concentration on trade credit financing;

(3) Subsample analyses by ownership type reveal that the negative effect of supply chain concentration and the positive effect of market position on trade credit financing are significant only for non-state-owned enterprises (non-SOEs). For large firms or those with weak profitability, the negative impact of supply chain concentration and the moderating role of market position are more pronounced;

(4) Both supplier and customer concentrations negatively correlate with trade credit financing, but supplier concentration exerts a stronger adverse effect. Market position mitigates the negative impact of supplier concentration but exacerbates that of customer concentration.

The empirical results indicate that excessively high supply chain concentration impedes a firm's ability to obtain trade credit financing. Overreliance on dominant suppliers or customers without robust relationship management may lead to operational and financial challenges, undermining long-term growth. Firms should improve supply chain relationships and enhance their market position to strengthen trade credit bargaining power.

Based on these findings, practical recommendations are proposed:

(1) Firms should strengthen supply chain relationship management. The dual nature of close ties with key suppliers/customers requires balancing cooperation and dependency risks. Firms should: develop tailored supply chain strategies aligned with corporate goals; conduct due diligence on partners' creditworthiness; establish contractual safeguards (e.g., risk-sharing clauses) to deter opportunistic behaviors; diversify supplier/customer bases to reduce dependency; and maintain proactive communication to build trust.

(2) Firms must enhance market competitiveness. Low-market-position firms should leverage emerging technologies and strategically use trade credit to gain market share while monitoring counterparties' financial health. High-market-position firms should utilize their bargaining power to secure favorable trade credit terms without exploiting partners and support financially distressed partners to sustain long-term collaboration.

(3) Optimize trade credit utilization. While trade credit serves as a vital financing tool, its substitutive role remains underdeveloped for SMEs due to institutional gaps. Policymakers should strengthen legal frameworks for trade credit enforcement, establish regional credit guarantee institutions, and penalize contractual breaches. SMEs should allocate trade credit-derived funds to value-enhancing activities (e.g., innovation, market expansion) rather than mere operational sustenance.

Limitations and future research directions:

(1) Measurement limitations: The current metric for supply chain concentration (average of top five supplier/customer ratios) oversimplifies complex upstream/downstream dynamics. Future studies could adopt multidimensional indicators.

(2) Sample scope constraints: Findings are limited to A-share manufacturing listed firms. Extending research to non-manufacturing sectors and SMEs is warranted.

(3) Temporal heterogeneity: The 2010–2021 sample period overlooks policy shifts. Time-segmented analyses incorporating regulatory changes would enhance relevance. (4) Omitted variables: While controlling for firm-specific and macroeconomic factors, unobserved variables (e.g., managerial incentives, supply chain digitization) may influence results. Future work should expand the control variable set.

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