Is supply chain finance really beneficial for borrowers and lenders?

First author

Qian Wang, Associate Professor, School of Finance, Shandong University of Finance and Economics: Jinan, Shandong, CN

Organization identifiers: RINGGOLD:47855

E-mail: peggy120925@163.com

Second author (the corresponding author)

Zhi-Wei Gao, Master of Economics, School of Finance,Shandong University of Finance and Economics: Jinan, Shandong, CN

Organization identifiers:

RINGGOLD:47855

Tel:+86-187-6368-9030

E-mail: m18763689030@163.com

Address: Shandong University of Finance and Economics, No. 40 Shungeng Road, Shizhong District, Jinan City, Shandong Province, China

Third author:

Zi-Chen Zhao, master of Economics (School of Finance)

Shandong University of Finance and Economics: Jinan, Shandong, CN

Organization identifiers: RINGGOLD: 47855

E-mail: 2643954055@qq.com

Forth author:

Yuan-Guo Wei, master of Economics (School of Finance)

Shandong University of Finance and Economics: Jinan, Shandong, CN

Organization identifiers: RINGGOLD: 47855

E-mail: weiyuanguo2000@163.com

Is supply chain finance really beneficial for borrowers and lenders?

Abstract

Unlike the efficient redistribution theory, which holds that firms with high credit levels, high liquidity and high market position are lenders among firms, we find that they may also be borrowers. We empirically tested the different effects of value enhancement, coordination and stability when borrowers and lenders implement supply chain financial solutions. The results show that lenders (firms with low market position) providing supply chain finance (SCF) reduce financial performance, decrease enterprise risk, and improve operational efficiency. In addition, borrowers (firms with high market position) who provide SCF increase enterprise risk, but do not affect financial performance and operational efficiency. Results from different ownership analyses suggest that, compared with non-state owned enterprises, state-owned enterprises providing SCF, either as borrowers or lenders, can improve performance and reduce risk, but do not affect operational efficiency.

Is supply chain finance really beneficial for borrowers and lenders?

Abstract

Unlike the efficient redistribution theory, which holds that firms with high credit levels, high liquidity and high market position are lenders among firms, we find that they may also be borrowers. We empirically tested the different effects of value enhancement, coordination and stability when borrowers and lenders implement supply chain financial solutions. The results show that lenders (firms with low market position) providing supply chain finance (SCF) reduce financial performance, decrease enterprise risk, and improve operational efficiency. In addition, borrowers (firms with high market position) who provide SCF increase enterprise risk, but do not affect financial performance and operational efficiency. Results from different ownership analyses suggest that, compared with non-state owned enterprises, state-owned enterprises providing SCF, either as borrowers or lenders, can improve performance and reduce risk, but do not affect operational efficiency.

Keywords: Supply chain finance; Financial performance; Corporate risk; Operational efficiency; Market position

1. Introduction

Compared with traditional financing methods, supply chain finance (SCF) plays an increasingly important role in the context of industry-finance integration. Nowadays, supply chain financial solutions consist of various forms, including factoring, commercial credit, reverse factoring, etc. (Pei et al., 2022). Globally, the emergence of Block-chain, Digital Twins, Internet of Things, 5G, Edge, and Fog computing, which has laid a foundation for the rapid development of SCF, greatly improve the liberalization and transparency of transactions and reduce the degree of information asymmetry (MacCarthy and Ivanov, 2022). SCF is a financing mode in which each participant in the supply chain plans and directs the flow of capital, thus improving the liquidity of capital, and takes into account inventory optimization to create more value (Hofmann, 2005).

The advantages brought by the implementation of SCF mainly depend on three roles played by supply chain management, that is, value-enhancing role, stabilizing role and ordinating role (Gelsomino et al, 2016). First, value-enhancing role of SCF can enhance the value of lenders and borrowers. On the one hand, providing loans to other enterprises can obtain interest income for lenders. On the other hand, SCF increases access to financing , and can obtain loans at a lower cost or reduce working capital, thereby improving the financial performance of borrowers (Astvansh and Jindal, 2021). Second, stabilizing role refers to the reduction of enterprise risk. The implementation of SCF strengthens the connection among enterprises and increases

the conversion cost of enterprises, thus reducing the bankruptcy risk and uncertainty of the whole chain (Pei et al, 2022). Third, ordinating role is embodied in the inventory optimization. By implementing SCF, enterprises can promote the operation of logistics, capital flow and information flow, so as to optimize inventory and improve operational efficiency (Lee and Rhee, 2011).

The role of cooperation and competition in SCF has attracted scholars' attention, and the research focus of SCF is the combination of game theory and SCF (Xu et al., 2018). Theories on supply chain relationships usually focus on two aspects, competition and cooperation. The former attaches importance to the interests of the company while the latter pays attention to the value creation of the whole chain (Pathak et al. 2014; Kim and Henderson, 2015; Cho et al., 2019). Nowadays, the competition among enterprises has evolved into the competition among supply chains (Eshraqi and Eshraqi, 2019; Chen and Pan, 2019). Competition among individual enterprises is not conducive to the long-term development and survival, and the company's market position will become more stable only after the convenient and perfect development of the entire supply chain. Therefore, enterprises should not only focus on their own interests, but also on the development of upstream and downstream. Appropriate competition among firms can improve performance, but excessive competition can backfire and increase risk across the chain (Cho et al., 2019). Cooperation between enterprises is propitious to establishing a fair and long-term relationship. Consequently, through research, we wonder whether cooperation or competition is more conducive to the development of enterprises.

Based on competition and cooperation, two different oriented SCF have been formed. One is finance-oriented SCF, and the other is supply chain-oriented SCF (Gelsomino et al, 2016). The former focuses mainly on accounts receivable and accounts payable, which is a short-term financing scheme, usually provided by financial institutions (Liu et al, 2020). The latter attaches importance to cooperation, which aims at improving the capital turnover efficiency of the whole chain and industrial competitiveness, which does not necessarily require the participation of financial institutions (Gelsomino et al, 2016). However, with the development of SCF, the independent development of enterprises is not conducive to sustainable development. Therefore, it has become increasingly important to focus on the supply chain as a whole, and the academia is more and more inclined to supply chain orientation. Supply chain oriented researches aim to improve the value of the whole chain, which improves the value of all enterprises. However, there is uneven distribution of benefits among different enterprises. It is worth emphasizing that the uneven distribution of interests due to different market positions of enterprises has stimulated our interest in research. We hope to know whether there is a win-win situation for enterprises with different market positions in our research.

In the field of SCF, scholars mainly focus on cash flow direction (Brahm et al., 2020; Astvansh & Jindal, 2021). However, must the focal enterprises be lenders? Some scholars hold that the more dominant focal enterprises provide supply chain financing for their upstream and downstream, which can solve the financing difficulties of enterprises in the chain (Wetzel and Hofmann, 2019). However, there are different

voices in academia. Some scholars find that SMEs with financing constraints provide SCF to focal companies, and even tolerate focal enterprises' delayed payment (Murfin and Njoroge, 2015). This is contrary to the theory of efficient redistribution, that is, capital usually flows from creditworthy firms to finance-constrained SMEs (Cosci et al., 2020). In particular, China's SCF has developed rapidly in recent years, but there is a problem of large enterprises exploiting small and medium-sized enterprises (SMEs). To address this issue, a Guideline[1] was issued in China under the leadership of the People's Bank of China[2]. The Guideline points out that it is necessary to standardize the payment discipline of large enterprises, so as to prevent them from taking advantage of their market position to delay payment to SMEs and harm the interests of SMEs. In view of the above reasons,We chose to use Chinese data for our study. Based on the differences in the direction of cash flow, we attempt to explore the characteristics of focal enterprises with higher market position. In the supply chain, enterprises' financing decisions are closely related to market position. Enterprises with more bargaining power in the supply chain tend to have a higher market position, and the direction of cash flow in the supply chain often depends on the willingness of enterprises with a higher market position (Cho et al, 2019). Hence, we try to explain the differentiated impact of SCF on corporate performance in terms of corporate market position .

1 Guidelines on standardizing the development of supply chain finance and supporting the stable circulation, optimization and upgrading of the supply chain industrial chain issued in 2020 by the eight departments of the People's Bank of China, Ministry of Industry and Information Technology of the People's Republic of China, Ministry of Justice of the People's Republic of China, Ministry of Commerce of the People's Republic of China, State-owned Assets Supervision and Administration Commission of the State Council, State Administration for Market Regulation, China Banking and Insurance Regulatory Commission, and State Administration of Foreign Exchange.

2 The People's Bank of China is China's central bank.

Compared with the existing literature, we attempt to make possible improvements from the following aspects. First of all, we extend the role of SCF from the perspective of market position. SCF has different effects on enterprises with different market positions and we uses the direction of cash flow to distinguish market position. Secondly, several studies show that corporate market position has a significant impact on financing (Cosci et al, 2020). In contrast, we consider the differences in corporate characteristics between borrowers and lenders, and distinguish the market position between them. Moreover, we find that the market position of borrowers is higher than that of lenders. Finally, our research enriches the theoretical content of SCF, and we find that cooperation is more conducive to the development of enterprises than competition.

The following of the paper arranged as follows. Section 2 reviews the relevant theories of cooperation and competition in SCF, and puts forward research hypotheses. Section 3 presents methodology. Section 4 discusses the empirical results. We present the robustness tests and additional exploration in Section 5 and Section 6, respectively. Section 7 concludes this paper and puts forward some suggestions.

2 **Literature review and hypotheses development**

2.1 Cooperation and Competition on SCF

According to the Inter-organizational relationship theory, providing funds to upstream and downstream enterprises is a kind of relationship investment (Palmatier et al, 2006). The investment of enterprises in customer relationships can increase the

conversion cost of customers, which is conducive to the enterprise value improvement (Frennea et al., 2019). As the most popular financing tool, trade credit is a relationship investment between customers and suppliers. Relevant scholars propose that enterprises that provide and accept trade credit establish mutual commitment and trust, so the relationship among them is closer (Frennea et al., 2019). According to relationship marketing theory, the more benefits the supplier promises, the more obligations the enterprise has to repay (Johnson et al., 2001). The establishment of trust can guarantee the product quality and reduce the risk of default, which in turn helps to fulfill the contract and improve operation efficiency (Astvansh and Jindal, 2021).

Inter-organizational relationship theory focuses more on the company itself in order to achieve the enhancement of corporate value, while stakeholder theory pursues the interests of the whole chain. According to the stakeholder theory, the whole chain is a network of multiple participants. Each stakeholder does not exist independently, so they are closely connected to each other and thus they lay emphasis on the overall interests (Moretto et al., 2019). That is in line with the view that supply chains are closely linked and pursue integration (Keebler, 2002). Supply chain oriented researches connect various stakeholders (i.e. supply chain participants) to carry out trade on the basis of trust and commitment, so as to reduce the financing costs of enterprises and optimize the working capital structure.

There are both cooperative and competitive relationships among enterprises. If

competition dominates the whole chain, enterprises focus more on their own interests and act in ways that are detrimental to the overall interests. The behavior of SMEs providing trade credit to focal enterprises with higher market positions increases the operational risk of the whole chain and thus harms the overall interests, which can be explained by the market power theory and the warranty theory (Klapper et al, 2012). According to the market power theory, higher status enterprises have more negotiating advantages in the transaction process, and small suppliers have to make concessions in order to obtain orders from higher status enterprises (klapper et al., 2012). This is similar to the bargaining mechanism, in which more powerful focal enterprises force SMEs to compromise and make concessions (Cho et al, 2019). The resource dependence theory can explain why focal enterprises are more competitive, mainly because focal enterprises control more scarce resources, so they are more irreplaceable (Cho et al, 2019). According to the warranty theory, SMEs allow focal enterprises to pay after selling goods, so that focal enterprises have time to check the quality of goods (klapper et al., 2012).

There are differences in the willingness to compete and cooperate among enterprises with different market positions. Enterprises are not only lenders, but also borrowers. In other words, an enterprise obtains trade credit from its upstream suppliers, that is, it can delay payment to its suppliers. At the same time, it also needs to provide trade credit to its downstream customers, that is, allow its customers to delay payment to it (Astvansh and Jindal, 2021). In addition, due to the differences in market status among enterprises and their willingness to carry out supply chain financial services,

the net trade credit provision is inconsistent among different enterprises, which is mainly manifested by the difference in direction of cash flow. The higher the market position of an enterprise, the more advantageous it will be in negotiation in the chain, and therefore it will be more able to occupy upstream and downstream funds (Cho et al, 2019). The lower the market position of an enterprise, the higher the concentration of its supply chain, and therefore less advantageous in negotiation, and the higher the conversion cost it faces (Liu et al., 2022). Therefore, it is more necessary to maintain the upstream-downstream relationship, and hence the enterprise has to choose cooperation. Enterprises with positive net trade credit have a weak market position and provide more capital for upstream and downstream, which indirectly indicates that the willingness to cooperate is greater than the willingness to compete in the chain of lenders. On the contrary, the enterprises with negative net trade credit have a stronger market position and choose to occupy upstream and downstream funds, indirectly indicating that they are more concerned about their own interests and their willingness to compete is greater than their willingness to cooperate.

2.2 Hypotheses development

2.2.1 Value-enhancing role

Based on the theory of SCF and the traditional corporate financing theory, enterprises providing SCF for upstream and downstream bring both benefits and costs (Pei et al., 2022). The value enhancement is mainly reflected in the strengthening of the relationship among enterprises, and the value loss is mainly manifested as the increase

of opportunity cost. Therefore, the net impact of SCF is determined by both.

The value-enhancing role is mainly realized through market response, information sharing and innovation. According to the theory of inter-organization relationship, an enterprise providing trade credit for its upstream and downstream can strengthen the relationship with them, further increase the sales volume, and thus improve the performance (Palmatier et al., 2006). As the relationship among enterprises becomes closer, the responsiveness of the market will also be enhanced. For an enterprise market responsiveness is the ability to quickly respond to changes in market demand, and to update products in time according to the needs of buyers (Holweg, 2005). Providing SCF for upstream and downstream can enhance the willingness of cooperation among enterprises, build trust and commitment, and strengthen the vertical relationship, so as to share information more timely and elevate the overall performance (Cao & Zhang, 2010) . The firm's ability to innovate also increases with relationship enhancement, as suppliers invest more in R&D to maintain the relationship and thus adapt to changes in market demand (Faria et al., 2010).

However, SCF causes an increase in opportunity cost, which in turn leads to the value loss. If enterprises do not provide SCF for upstream and downstream and do not allow credit sales, they can quickly receive the payment for goods, and then obtain more available cash. In this way, If companies invest this funds, they will make greater profits. Since deferred payment can address moral hazard issues and coordinate the supply chain (Devalkar & Krishnan , 2019), firms choose deferred payment as a

solution to SCF. In general, enterprises delaying payment can obtain SCF from upstream suppliers. This enables enterprises to obtain more benefits, reduces financing costs, and improves product quality. However, for lenders, enterprises need to accept the delayed payment from their downstream customers, which not only increases the financing costs, but also raises the opportunity costs. Especially, due to the limited liquidity, enterprises have to face the dilemma of providing SCF to customers through borrowing. This leads to enterprises being forced to bear higher financing costs, thereby reducing profits and enterprise value. Therefore, the value enhancement brought by enterprises providing SCF depends on both benefits and costs. As a result, we hypothesize that:

H 1: Enterprises providing SCF affect financial performance.

There are differences in the effects of SCF provided by enterprises with different market positions. Enterprises with higher market position have more negotiation advantages, and are more inclined to force upstream and downstream SMEs to provide SCF (Liu et al., 2022). Therefore, this behavior takes up more upstream and downstream funds. It is in line with the traditional financing theory, that is, using upstream and downstream funds to improve their own working capital management and to reduce their financing costs and opportunity costs, thus increasing profits. For enterprises with weak market position, their willingness to cooperate is greater than their willingness to compete, so more capital flows to upstream and downstream SMEs. As a result, the level of cash is reduced, and the revenue generated from using

the fund for other investments is lost. This has resulted in a certain opportunity costs and reduced the management level of the enterprise's working capital. Accordingly, Our Hypothesis is formulated as follows.

H2: For enterprises with different market positions, the impact of SCF on the financial performance is different.

2.2.2 Stabilizing role

Information asymmetry is the significant reason of supply chain risk (Shen et al., 2017). SCF provided by enterprises to upstream and downstream can make the relationship among enterprises closer, thus reducing the level of information asymmetry and uncertainty (Lam and Zhan, 2021). In addition, according to the signaling theory, enterprises providing SCF can convey two important signals to the market, that is, the probability of damage behavior in the whole chain is low, and the economic consequences caused by such damage behavior are highly controllable (Lam et al., 2019). Besides, SCF can also reduce and avoid the moral hazard between suppliers and buyers (Sung & Ho,2020). Hence, we propose:

H3: Enterprises providing SCF reduce enterprise risks.

Enterprises with low market position tend to provide SCF, which can effectively solve the dilemma of upstream and downstream financing difficulties. At the same time, SCF provided by focal enterprises can form halo effect, that is, upstream and downstream SMEs, as the partners of focal enterprises, can use the reputation of focal

enterprises to improve credit rating (Cho et al., 2019). This reduces the financing constraints of upstream and downstream SMEs, thus abating the bankruptcy risk of the entire chain. Ultimately, it is helpful to reduce the enterprise risk. However, enterprises with a relatively high market position may use their position advantages to occupy funds from upstream and downstream. Although this behavior improves the focal enterprise's working capital management (Hofmann and Kotzab,2011), it causes losses to upstream and downstream. it makes the upstream and downstream capital turnover more difficult and makes them more prone to bankruptcy, which will increase the bankruptcy risk of the entire chain, and thus improve the level of enterprise risk. Our Hypothesis is therefore formulated as follows.

H4: Compared with the enterprises with low market position, enterprises with high position providing SCF play a weaker role in reducing the risks of the enterprises.

2.2.3 Ordinating role

The research of supply chain-oriented SCF highlights the turnover of inventories. Providing SCF to customers transfer more inventory to the buyers faster, thus reducing its own inventory (Zhang et al., 2019). Credit sales reduces the risk of the whole chain interruption caused by insufficient working capital (Zhang et al., 2019). There are moral hazard, opportunism and other market behaviors that hinder communication among enterprises (Goeij et al., 2021). SCF can effectively solve the above problems by strengthening cooperation and sharing information and funds. Therefore, stakeholders in the supply chain often regard supply chain management as

a tool to improve inventory turnover efficiency (Daripa and Nilsen, 2011), which can effectively connect the whole supply chain. According to the inter-organizational relationship theory, providing SCF establishes a closer relationship among enterprises, which can effectively improve operational efficiency (Astvansh and Jindal, 2022).

H5: Enterprises providing SCF improve enterprise operation efficiency.

From an operational point of view, the more inventory, the more cash is occupied, and the more costs (Storage cost, etc) are incurred. Excessive exploitation of upstream and downstream by focal enterprises leads to more easily broken supply chains. Enterprises with low status provide more funds for upstream and downstream, and sometimes even sacrifice their own interests, so the connection among enterprises is closer, thereby improving the efficiency of the entire supply chain. Since focal enterprises provide funds for upstream, suppliers can have more sufficient funds for the procurement of raw materials, which can improve production efficiency, thereby improving the efficiency of the entire supply chain (Hofmann and Kotzab, 2011). Our Hypothesis is therefore formulated as follows.

H6: Compared with high-status enterprises, low-status enterprises providing SCF can improve operational efficiency.

3 Date and model specification

3.1 Data collection

We mainly take A-share listed companies in Shanghai Stock Exchange and Shenzhen Stock Exchange from 2007 to 2020 as samples, excluding ST and ST* companies. At the same time, according to the industry classification of China Securities Regulatory Commission (CSRC) in 2012, we exclude financial enterprises. The data comes from the China Stock Market and Accounting Research (CSMAR) listed company database. At the same time, the samples were processed, excluding the samples with fixed asset ratio greater than 1 or less than 0, and also excluding the samples with asset-liability ratio greater than 1 or less than 0. Our final sample includes 27871 annual observations. So as to alleviate the effects of some extreme observations on the empirical results, the top (bottom) 1% of each continuous variable are winsorized.

3.2 Variable

3.2.1 Dependent Variable

The implementation of SCF has three functions, namely, value-enhancing role, stabilising role and ordinating role, so we choose three dependent variables. We choose Tobin's Q as an proxy variable of financial performance, which mirrors the long-term profitability of an enterprise. There is a positive correlation between Tobin's Q and profitability. Tobin's Q is a better indicator of a company's long-term financial position than the most common measures of short-term profitability (ROA and ROE). We select the Z-Score model as the proxy variable of enterprise risk, which can well reflect an enterprise's financial difficulty. 1.81 and 2.67 are the two key critical points. Generally, a Z value greater than 2.67 indicates a good financial

position. A greater Z value indicates a lower probability of bankruptcy. Z less than 1.81 reflects that the company is very likely to go bankrupt. We proxy for the operating efficiency using inventory turnover, which is calculated as operating cost to inventory. Inventory turnover is positively correlated with operating efficiency

3.2.2 Independent Variable

The existing research of SCF is not rich enough, there is still a lot of room to research. Therefore, there is a lack of an appropriate measure of SCF. Among them, the most commonly used measurement is Cash Conversion Cycle (CCC) (Zhang et al,2019; Wetzel and Hofmann,2019). CCC is calculated as days sales outstanding plus days inventory held minus days payables outstanding. However, this indicator has limitations. First of all, inventory cannot reflect the management efficiency of funds, and cannot reflect the provision of funds for upstream and downstream. Second, Inventory turnover is a key measure of our operational efficiency. Due to the causal relationship between the days inventory held and the inventory turnover, it can lead to endogeneity problems. Third, the inventory interferes with our regression results, because it is different among various kinds of industries, such as manufacturing and retail. Finally, the financial support for the upstream is usually reflected in advance collections, so this indicator cannot reflect the supply chain financial situation provided for the upstream. CCC considers SCF from time perspective. Similar indicators include days sales outstanding minus days payables outstanding. In addition, some scholars also select proxy variables of SCF from volume perspective,

such as receiveables (Rec), prepayments (Pre), receivables plus prepayments and accounts receivable/operation revenue(Pei et al., 2022).

We draw on the two measurement methods of CCC and days sales outstanding minus days payables outstanding, and make a improvement on this basis. Specifically, we use a measure of SCF as follows:

days sales outstanding plus days inventory held minus days payables outstanding.

SCF = Days sales outstanding + Prepayment conversion cycle - Days payables outstanding - Receivable in advance conversion cycle (1)

where Days sales outstanding denotes SCF provided for downstream, Prepayment conversion cycle reflects SCF provided for upstream, Days payables outstanding expresses SCF obtained from upstream, and receivables in advance conversion cycle means SCF obtained from downstream.

This indicator takes into account not only SCF provided by focal enterprises for downstream, but also SCF provided for upstream. It reflects the capital turnover more comprehensively, and connects the capital cooperation of the whole supply chain, fitting in with the goal of supply chain oriented research.

3.2.3 Control Variable

We control for other variables that prior research has used predominantly to explain

SCF (Zhang et al,2019; Pei et al., 2022). Table 1 summarizes these variables and their

measures.

Table 1
Measurements of variables

Variable	Definition	Measurements
Q	Tobin's Q	The ratio of the market value of a firm to the replacement of its assets. (Zhang et al.,2019)
Z	Z-Score	$Z = 1.2 * \frac{\text{working capital}}{\text{total assets}} + 1.4 * \frac{\text{retained earning}}{\text{total assets}} + 3.3 * \frac{\text{EBIT}}{\text{total assets}} + 0.6 * \frac{\text{market value of equity}}{\text{book value of total liabilities}} + 0.999\frac{\text{sales}}{\text{total asse}}$ (Altman,1968; Zhang et al..,2019 ; Pei et al., 2022)
Inv.To.	Inventory turnover	A ratio calculated as cost of goods sold over total inventories. (Zhang et al.,2019)
SCF	Supply Chain Finance	SCF= Days sales outstanding + Prepayment conversion cycle - Days payables outstanding - Receivable in advance conversion cycle
SIZE	size	The logarithm of the total assets of the firm.(Zhang et al.,2019 ; Pei et al., 2022)
Lev	Leverage	The ratio of the total amount of debt relative to total assets.(Zhang et al.,2019; Pei et al., 2022)
SGR	Sales Growth Rate	The firm's total sales growth.(Zhang et al., 2019; Pei et al., 2022)
CA	Capital Assets	Fixed assets divided by total assets.(Chakuu et al., 2019)
EC	Executive Compensation	The sum of the top three salaries of the management takes logarithm.(Li , 2018; Freund et al., 2018)
ID	Independent Director	The ratio of independent directors to the total number of directors.(Xia et al., 2019)
SI	Sales Income	The logarithm of the sales revenue of the firm.(Ali, 2021)
State	State-owned or not	The dummy variable State equals 1 for state-owned enterprise and 0 otherwise.(Pei et al., 2022)

3.3 Estimation method

In order to explore the impact of SCF on financial performance, corporate risk and operational efficiency, we run the following regression specification:

$$Y_{i,t} = \beta_0 + \beta_1 SCF_{i,t} + \beta_2 \sum control_{i,t} + \gamma_t + \mu_i + \varepsilon_{i,t} \qquad (2)$$

Where Y includes Q, Z, and Inv.To., which proxy for corporate financial

performance, corporate risk, and operational efficiency, respectively. The SCF proxy considers the situations of focal enterprises accepting and providing SCF. Where control represents the relevant control variable. In the formula, i represents the firm, t represents the time. In the regression, μ_i denotes a fixed firm, γ_t presents a fixed time.

3.4 Determine the market position of enterprises

We use the between-group difference test to compare the characteristics of lenders and borrowers to distinguish the market positions of the two types of firms. Here, we use the difference between the sum of accounts receivable and prepayments minus accounts payable and accounts received in advance as the standard to distinguish lenders from borrowers. The firm is a lender if the difference is greater than 0, and borrower otherwise. A lender acts as a provider of funds, while a borrower indicates that it is more of a business that acts as a recipient of funds.

3.4.1 Difference test between lenders and borrowers

In order to distinguish the different market positions of the two types of enterprises, we consider Net trade credit, Short debt, Long debt, Liquid assets, Cash flow, Inventory, Size, Operation revenue, Operation profit, R&D investment, R&D Staff Ratio, Customer concentration, Supplier concentration, Release date and state. The SA index is negative and the larger the absolute value is, the more serious the financing constraint is (Hadlock and Pierce, 2010). A higher Lerner index indicates a stronger monopoly power in the market. Net trade credit is the sum of accounts receivable and prepayments minus the sum of accounts payable and accounts received

in advance. Net trade credit, Liquid assets, Cash flow and Inventory are all measured by their proportion in the total assets of the enterprise. Size, Operation revenue, Operation profit and R&D investment are all logarithmicized.

Table 2

Difference between borrowers and lender

Variable	Borrowers		Lenders		Mean Difference
	N	Mean	N	Mean	
Net trade credit	10991	-0.0860	13452	0.0800	-0.166***
Short debt	11153	0.108	13745	0.112	-0.004***
long debt	10279	0.0810	11478	0.0440	0.037***
Liquid assets	11922	0.520	14886	0.590	-0.070***
Cash flow	11901	0.0560	14878	0.0430	0.013***
Inventory	11922	0.188	14886	0.128	0.059***
Size	12439	22.59	15432	21.81	0.779***
Operation revenue	12439	21.95	15432	21.12	0.828***
Operation profit	10561	19.39	13530	18.65	0.745***
R&D investment	7311	17.82	12774	17.71	0.102***
R&D Staff Ratio	4354	11.84	8293	19.27	-7.427***
SA Index	11922	-3.754	14886	-3.738	-0.017***
Industry Lerner Index	11922	0.124	14886	0.108	0.017***
Customer concentration	10979	27.75	14629	32.39	-4.635***
Supplier concentration	8363	33.42	12070	34.76	-1.338***
Release Date	11922	2002	14886	2006	-4.599***
state	12277	0.597	15154	0.302	0.295***

***, **and * indicate significance differences at the 1%, 5%, and 10% levels respectively.

In Table 2, we can see that the size of borrowers is significantly higher than that of lenders through comparison of mean difference. The long debt of lenders only

accounted for 4.4% of total assets, while the long debt of borrowers accounted for 8.1% of total assets, so long debt of lenders were significantly lower than those of borrowers. The short-term debt of a company is negatively related to its credit, while the long-term borrowing is the opposite (Cosci et al., 2020). Therefore, the credit level of borrowers is higher than that of lenders. At the same time, the cash flow of borrowers is also significantly more than that of lenders, and thus borrowers are more capable of coping with liquidity risks. Borrowers is significantly higher than that of lenders in terms of operation revenue or operation profit, so the profitability of borrowers is stronger. Industry Lerner index is positively correlated with market monopoly power. Since the Lerner index of borrowers is higher than that of lenders, it indicates that the industry monopoly power of borrowers is stronger. Concentration is positively related to switching costs. Therefore, the higher concentration, the easier it is to be in a weak position in the transaction. On the contrary, the core competitiveness of its customers or suppliers will be stronger. The supplier concentration and customer concentration of lenders are significantly higher than those of borrowers, so the core competitiveness of borrowers is stronger than that of lenders. In terms of the nature of property rights, state-owned enterprises (SOEs) accounted for 59.7% of borrowers, while SOEs accounted for 30.2% of lenders. Judging from the release date, the release date of borrowers is 4.6 years earlier than that of lenders, and the scale of borrowers is significantly larger than that of lenders. In general, from the above data, we conclude that borrowers seem to have a stronger market position, occupying more upstream and downstream funds, while lenders have

a weak market position in the chain, with more capital flowing upstream and downstream. The financing constraint of the borrower is higher than that of the borrower, which also explains why the borrower is more inclined to occupy the upstream and downstream capital. Holding upstream and downstream funds is cheaper than other financing methods.

3.4.1 Enterprise characteristics of borrowers

Through the mean difference test between groups, we find that the market position of lenders is relatively low, while the market position of borrowers is higher. Next, we use probit and logit models to examine what characteristics the borrowers should have.

Table 3

Regression analysis: Probability of being a borrower, 2007-2020.

Variable	(1) Probit Borrowers	(2) Logit Borrowers
Short debt	-3.915***	-2.318***
	(-10.10)	(-10.15)
Long debt	-1.397**	-0.774**
	(-2.40)	(-2.30)
Liquid assets	-4.231***	-2.413***
	(-15.40)	(-15.40)
Cash flow	4.271***	2.491***
	(6.83)	(6.83)
Inventory	6.442***	3.727***
	(16.25)	(16.47)
Size	0.289***	0.178***
	(3.54)	(3.72)
Operation revenue	0.624***	0.358***
	(8.55)	(8.45)
Operation profit	-0.241***	-0.141***
	(-6.71)	(-6.62)

R&D investment	-0.178***	-0.106***
	(-5.68)	(-5.83)
R&D Staff Ratio	-0.006*	-0.003
	(-1.78)	(-1.57)
SA index	-0.207	-0.137
	(-1.40)	(-1.60)
Industry Lerner Index	0.463	0.237
	(0.79)	(0.69)
Customer concentration	0.000	0.000
	(0.17)	(0.09)
Supplier concentration	-0.004*	-0.002*
	(-1.89)	(-1.74)
Release Date	0.002	0.001
	(0.38)	(0.32)
state	0.540***	0.320***
	(7.15)	(7.11)
Constant	-16.926	-9.581
	(-1.32)	(-1.28)
N	5,928	5,928

***, **and * indicate significance differences at the 1%, 5%, and 10% levels respectively.

In view of the effective redistribution theory, funds should flow from enterprises with higher reputation level and higher market position to SMEs with relatively weak reputation level and low market position. That is, a focal enterprise with a higher reputation and a higher market position is more likely to become a lender. However, judging from the results of the test of the mean difference between the two groups, the direction of Cash flow of lenders is in line with the effective redistribution theory. However, borrowers are contrary to this. Funds flow from SMEs with low market positions to focal enterprises with larger market positions. In Table 3, we group the sample by net trade credit, and our observation is 5928. In addition, according to the pecking order theory, companies are more inclined to internal financing than debt financing. Therefore, the cash flow generated within the enterprise is higher than the

commercial credit financing in the financing ranking, which leads to the more cash flow the enterprise has, the lower its willingness to take supply chain financing.This means that a higher level of cash flow is associated with a lower probability of becoming a borrower. In table 3, the probability of becoming a borrower increases with the increase of cash flow. Therefore, companies choose supply chain financing not for financing needs, but for transaction guarantee needs, using market forces to force a low market position companies provide financing for them. In general, the probability of becoming a borrower increases with cash flow level, inventory, size, and operation revenue, and decreases with short debt, long debt, liquid assets, and R&D investment.

4. **Results**

4.1 Descriptive statistics

Table 4

Descriptive statistics

Variable	N	Mean	SD	Min	Median	Max
Q	27871	2.25	1.452	0.907	1.778	9.309
Z	27870	8.34	8.915	0.929	5.644	58.233
Inv.To.	27870	10.108	27.587	0.15	3.906	231.906
SCF	25266	-.044	.334	-1.474	-.013	0.92
SIZE	27871	22.154	1.298	19.803	21.968	26.168
Lev	27871	0.444	.206	.056	0.442	0.889
SGR	27841	0.405	1.117	-.66	0.133	8.009
CA	27871	0.229	.168	.003	0.196	.719
EC	27819	14.359	.751	12.457	14.352	16.407
ID	27783	37.295	5.517	9.09	33.33	80
SI	27871	21.492	1.496	12.801	21.335	28.718
State	27431	0.434	0.496	0	0	1

Table 4 is the descriptive statistics of the main variables. The mean of SCF is negative, indicating that most companies accept upstream and downstream trade credit. And the standard deviation of SCF is relatively large, indicating that there are large differences in the level of SCF provided by different enterprises, which indirectly illustrates the necessity of distinguishing two types of enterprises by status. The mean of Q is 2.25, the median is 1.778, and the mean is greater than the median. This shows that the financial performance of more than half of the enterprises does not reach the mean, indicating that the financial performance of enterprises needs to be improved. The mean of Z is 8.34, while the median is 5.644. That shows that more than half of the enterprises does not reached the mean of Z, so the enterprise risk needs to be reduced. The mean of Inv.To. is 10.108, which is greater than the median of 3.906, indicating that the operating efficiency of most enterprises is lower than the average level. Therefore, it is necessary for them to improve their operating efficiency. At the same time, the minimum of Inv.To. is 0.15 and the maximum is 231.906, reflecting that there is a big difference in the operational efficiency of enterprises.

4.2 Value-enhancing role

Table 5

The impact of SCF on financial performance under different market positions

Variable	(1)	(2)	(3)
	Full sample	Lenders	Borrowers
	Q	Q	Q
SCF	-0.025	-0.289**	-0.082
	(-0.462)	(-2.463)	(-1.252)

SIZE	-0.874***	-0.940***	-0.779***
	(-19.404)	(-13.701)	(-13.886)
Lev	0.569***	0.635***	0.399**
	(4.894)	(4.177)	(2.291)
SGR	0.001	0.012	-0.011
	(0.085)	(0.853)	(-1.373)
CA	-0.433***	-0.241	-0.831***
	(-2.847)	(-1.223)	(-3.505)
EC	0.215***	0.204***	0.185***
	(7.104)	(4.625)	(4.443)
ID	0.003	0.003	0.003
	(1.187)	(0.690)	(1.207)
SI	0.156***	0.196***	0.132**
	(4.166)	(3.364)	(2.474)
State	-0.024	0.079	-0.098
	(-0.346)	(0.687)	(-1.254)
Constant	14.712***	15.223***	13.897***
	(18.304)	(12.845)	(13.359)
N	24744	13562	11182
R-squared	0.280	0.326	0.239
Firm	Yes	Yes	Yes
Year	Yes	Yes	Yes

The t statistics are in parentheses. ***, **and * indicate significance at the 1%, 5%, and 10% levels respectively.

Table 5 displays the regression of SCF on financial performance (Q). In column (1) of Table 5, we show an insignificant correlations between SCF and corporate financial performance. As a result, hypothesis 1 has not been verified. In order to verify whether this value-enhancing effect exists among enterprises of different status, we separate the full sample into two subgroups based on the net trade credit. The results are shown in columns (2) and (3). In column (2), we show economically large and statistically significant correlations between SCF and financial performance (Q) for lenders (firms with low market status). Meanwhile, the coefficient is negative, indicating that the SCF provided by enterprises in a weak position adversely affect

their financial performance. However, the coefficient is statistically insignificant for borrowers (companies with high market status) in column (3). This shows that borrowers providing SCF do not affect financial performance. To sum up, borrowers providing SCF do not affect financial performance, while lenders providing SCF damages corporate performance, so hypothesis 2 is verified. The reasons for this phenomenon are as follows: (i) the development of SCF in China is still in the primary stage, (ii) the system construction of SCF is not perfect, (iii) there are still a lot of oppressive behaviors, which leads to the "double defeat" of high-status enterprises and low-status enterprises.

4.3 Stabilizing role

Table 6

The impact of SCF on enterprise risk under different market positions

Variable	(1) Full sample Z	(2) Lenders Z	(3) Borrowers Z
SCF	-0.008	0.989**	-0.557***
	(-0.049)	(2.355)	(-2.872)
SIZE	-3.730***	-4.670***	-3.008***
	(-30.918)	(-22.016)	(-21.017)
Lev	-17.956***	-22.219***	-13.695***
	(-53.127)	(-39.794)	(-33.924)
SGR	-0.044	-0.112*	-0.006
	(-1.259)	(-1.671)	(-0.165)
CA	-1.602***	1.258	-4.343***
	(-3.681)	(1.639)	(-8.895)
EC	0.519***	0.698***	0.249**
	(5.141)	(4.076)	(2.234)
ID	0.021**	0.022	0.009
	(2.252)	(1.392)	(0.891)
SI	1.546***	1.935***	1.498***
	(15.819)	(10.803)	(13.055)

State	0.102	0.539	-0.264
	(0.424)	(1.296)	(-0.999)
Constant	56.156***	65.217***	45.103***
	(29.003)	(19.540)	(19.363)
N	24743	13562	11181
R-squared	0.257	0.276	0.244
Firm	Yes	Yes	Yes
Year	Yes	Yes	Yes

The t statistics are in parentheses. ***, **and * denote significance at the 1%, 5%, and 10% levels respectively.

We further explore the stabilizing effect of implementing SCF. The results are reported in Table 6. In column (1), we find a insignificant effect on enterprise risk (Z). The regression results after grouping by market position are shown in columns (2) and (3). In column (2), we find that the regression coefficient of lenders (firms with low market status) is 0.989. Since the Z-value is negatively related to the risk taken by the firm, we find that lenders providing SCF can reduce the risk. This is mainly because more funds of focal enterprises flow upstream and downstream, which can solve the problem of financing difficulties in upstream and downstream, improve the stability of the supply chain, and then reduce corporate risks. In column (3), the coefficient is negative and statistically significant at the 1% level. This shows that when borrowers (firms with high market status) hold too much capital from upstream and downstream, even if borrowers provide SCF, it increases the risk of the enterprise. This is mainly due to the lack of liquidity of SMEs in the upstream and downstream, which increases the risk of bankruptcy and increases the instability of the chain, thereby increasing the risk level of enterprises. Therefore, hypothesis 4 is verified. Enterprises with lower market position pay more attention to cooperation with upstream and downstream. Due to the halo effect, providing SCF reduces the lender's enterprise risk. On the other hand, borrowers cooperate with relatively high-risk SMEs, providing SCF increases the risk.

4.4 Ordinating role

Table 7

The impact of SCF on operational efficiency under different market positions

Variable	(1) Full sample Inv.To.	(2) Lenders Inv.To.	(3) Borrowers Inv.To.
SCF	0.997**	2.196**	0.500
	(2.059)	(2.321)	(0.668)
SIZE	-1.751***	-2.597***	-1.724***
	(-5.073)	(-5.434)	(-3.120)
Lev	-6.896***	-3.367***	-8.483***
	(-7.130)	(-2.676)	(-5.444)
SGR	-0.117	-0.165	-0.193
	(-1.170)	(-1.088)	(-1.477)
CA	2.930**	-0.015	0.601
	(2.353)	(-0.009)	(0.319)
EC	0.643**	0.753*	0.163
	(2.226)	(1.952)	(0.378)
ID	0.035	0.095***	-0.036
	(1.303)	(2.693)	(-0.921)
SI	3.659***	4.350***	3.001***
	(13.079)	(10.778)	(6.776)
State	0.134	-0.820	0.427
	(0.196)	(-0.875)	(0.419)
Constant	-38.381***	-38.451***	-14.592
	(-6.927)	(-5.113)	(-1.623)
N	24744	13562	11182
R-squared	0.018	0.018	0.015
Firm	Yes	Yes	Yes
Year	Yes	Yes	Yes

The t statistics are in parentheses. ***, **and * indicate significance at the 1%, 5%, and 10% levels respectively.

Table 7 displays the regression results of SCF on operational efficiency (Inv.To.). Column (1) reveal that SCF has a significant positive effect to operational efficiency. This shows that the provision of SCF by enterprises can improve the operational

efficiency, so H5 is empirically verified. In column (2) and column (3), we regress companies in groups based on market position. For lenders with low market position, the regression coefficient between SCF on operational efficiency is 2.196, which is significant at the level of 5%, indicating that providing SCF can improve the operational efficiency. However, for borrowers with higher market position, providing SCF dose not have effect on operational efficiency. Therefore, compared with borrowers, lenders providing SCF can improve the operation efficiency.

5 Robustness tests

5.1 Robust test Use alternative grouping criteria

Table 8

The impact of SCF on enterprises under the new grouping standard

Variable	(1) Lenders Q	(2) Borrowers Q	(3) Lenders Z	(4) Borrowers Z	(5) Lenders Inv.To.	(6) Borrowers Inv.To.
SCF	-0.200*	-0.119**	0.876**	-0.576***	2.524***	0.088
	(-1.737)	(-2.098)	(2.194)	(-3.287)	(2.821)	(0.131)
SIZE	-0.949***	-0.780***	-4.580***	-3.102***	-1.875***	-3.850***
	(-14.090)	(-14.373)	(-20.959)	(-22.889)	(-3.829)	(-7.398)
Lev	0.683***	0.328*	-22.108***	-13.805***	-4.889***	-5.240***
	(4.213)	(1.905)	(-38.674)	(-35.594)	(-3.816)	(-3.518)
SGR	0.003	-0.011	-0.142**	-0.021	-0.048	-0.207*
	(0.231)	(-1.389)	(-2.020)	(-0.651)	(-0.306)	(-1.662)
CA	-0.109	-0.726***	1.868**	-3.724***	2.665	-4.185**
	(-0.512)	(-3.320)	(2.338)	(-8.057)	(1.488)	(-2.358)
EC	0.193***	0.158***	0.509***	0.248**	0.974**	-0.004
	(4.149)	(4.142)	(2.896)	(2.304)	(2.472)	(-0.009)
ID	0.002	0.004	0.028*	0.010	0.049	0.010
	(0.584)	(1.483)	(1.762)	(0.978)	(1.412)	(0.277)
SI	0.224***	0.144***	1.812***	1.654***	3.848***	3.453***
	(3.838)	(2.985)	(9.733)	(15.557)	(9.225)	(8.456)
State	0.109	-0.116	0.519	-0.324	0.217	0.473
	(0.935)	(-1.454)	(1.252)	(-1.208)	(0.233)	(0.458)

Constant	14.843***	14.060***	67.764***	43.781***	-46.225***	22.324**
	(12.762)	(13.161)	(19.912)	(19.069)	(-6.060)	(2.532)
N	13566	11178	13566	11177	13566	11178
R-squared	0.331	0.235	0.274	0.247	0.017	0.017
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes

The t statistics are in parentheses. ***, **and * indicate significance at the 1%, 5%, and 10% levels respectively.

We changed the grouping criteria. Referring to Cosci (2020), the difference between accounts receivable minus accounts payable is used as the criterion for distinguishing between lenders and borrowers. The firm is a lender if the difference is positive, and a borrower otherwise. After changing the grouping criteria, the results are still robust, as shown in Table 8. Other results remain unchanged, except that borrowers providing SCF reduce Q.

5.2 Endogenous analysis

Table 11

Two-stage least squares regression with the annual average value of SCF as the instrumental variable

Variable	(1) Q	(2) Z	(3) Inv.To.
SCF	-0.118***	-0.058	1.199**
	(-3.50)	(-0.32)	(2.30)
Control	Yes	Yes	Yes
Constant	14.732***	56.339***	-39.331***
	(41.07)	(29.12)	(-7.12)
N	25,113	25,112	25,113

The t statistics are in parentheses. ***, **and * indicate significance at the 1%, 5%, and 10% levels respectively.

Considering that enterprises with lower risk are more inclined to carry out SCF, reverse causality may exist. We adopt the two-stage least squares (2SLS) regression

to address endogeneity. The instrument variable is the annual average value of SCF in the industry of the enterprise. Table 11 displays the 2SLS regression results of SCF on Q, Z and Inv.To. under full sample. Control variables are omitted from the table. However, in table 11, providing SCF reduces the financial performance. Other conclusions remain unchanged.

Table 12

Two-stage least squares regression with the annual average value of SCF as the instrumental variable under different market positions

Variable	(1) Lenders Q	(2) Borrowers Q	(3) Lenders Z	(4) Borrowers Z	(5) Lenders Inv.To.	(6) Borrowers Inv.To.
SCF	-0.423***	-0.129***	0.477	-0.472**	2.546**	0.623
	(-5.70)	(-2.61)	(1.08)	(-2.15)	(2.56)	(0.74)
Control	Yes	Yes	Yes	Yes	Yes	Yes
Constant	15.417***	13.840***	66.198***	45.542***	-44.125***	-13.417
	(27.33)	(26.66)	(19.76)	(19.79)	(-5.83)	(-1.52)
N	13,787	11,326	13,787	11,325	13,787	11,326

The t statistics are in parentheses. ***, **and * indicate significance at the 1%, 5%, and 10% levels respectively.

Table 12 displays 2SLS regression results of SCF on Q, Z and Inv.To. under under different market positions. Columns (1), (3) and (5) are lenders (firms with low market position). Columns (2), (4) and (6) are borrowers (firms with high market position). Control variables are also omitted from the table. Except that columns (2) and (3) are inconsistent with the original results, other results remain unchanged.

5.3 Unconditional quantile regression

Table 13

The impact of SCF on enterprises using unconditional quantile regression

Variable	(1) Q	(2) Z	(3) Inv.To.
SCF	-0.023	-0.613***	0.549***
	(-0.57)	(-3.91)	(4.08)
SIZE	-0.296***	-2.696***	-1.409***
	(-10.80)	(-22.50)	(-13.28)
Lev	0.001	-11.486***	-1.160***
	(0.01)	(-34.29)	(-3.91)
SGR	0.022***	0.011	0.006
	(3.08)	(0.38)	(0.29)
CA	0.122	-1.575***	1.835***
	(1.13)	(-3.69)	(4.32)
EC	0.171***	0.684***	0.074
	(7.94)	(7.86)	(0.94)
ID	0.002	0.029***	0.006
	(1.00)	(3.56)	(0.86)
SI	0.031	1.774***	1.739***
	(1.34)	(15.10)	(17.04)
State	-0.059	0.104	-0.180
	(-1.11)	(0.52)	(-0.81)
Constant	5.106***	21.728***	-3.340**
	(14.09)	(14.81)	(-2.32)
N	24,744	24,743	24,744
R-squared	0.0234	0.1951	0.0673

The t statistics are in parentheses. ***, **and * indicate significance at the 1%, 5%, and 10% levels respectively.

We used unconditional quantile regression to regress the model on di-quantile. This method can avoid the influence of outliers and make the results more robust. Table 13 displays the unconditional quantile regression results of SCF on Q, Z and Inv.To. under full sample. Except the result in column (2) is different, other results are basically consistent with the original results.

Table 14

The impact of SCF on enterprises using unconditional quantile regression under different market positions

Variable	(1) Lenders	(2) Borrowers	(3) Lenders	(4) Borrowers	(5) Lenders	(6) Borrowers

	Q	Q	Z	Z	Inv.To.	Inv.To.
SCF	-0.238***	-0.074	-0.054	-0.726***	0.465**	0.782***
	(-2.64)	(-1.60)	(-0.14)	(-3.65)	(2.14)	(3.61)
SIZE	-0.173***	-0.349***	-2.561***	-2.715***	-1.340***	-1.462***
	(-3.67)	(-10.86)	(-13.07)	(-16.10)	(-9.71)	(-7.03)
Lev	0.126	-0.101	-13.656***	-9.332***	-0.704**	-1.790***
	(0.99)	(-0.98)	(-25.27)	(-21.00)	(-2.18)	(-2.92)
SGR	0.046***	0.001	0.091	-0.037	0.062*	-0.013
	(3.12)	(0.20)	(1.60)	(-1.19)	(1.66)	(-0.44)
CA	0.358*	0.000	0.030	-1.679***	0.494	3.219***
	(1.91)	(0.00)	(0.04)	(-2.89)	(0.88)	(3.96)
EC	0.206***	0.111***	0.770***	0.451***	-0.051	0.155
	(5.65)	(4.17)	(5.49)	(4.29)	(-0.56)	(1.08)
ID	0.005	0.001	0.027**	0.022**	0.005	0.012
	(1.52)	(0.65)	(2.04)	(2.35)	(0.58)	(0.94)
SI	-0.026	0.045*	1.681***	1.867***	1.667***	1.773***
	(-0.63)	(1.67)	(8.46)	(12.12)	(12.23)	(9.74)
State	-0.039	0.029	0.067	-0.019	-0.328	-0.130
	(-0.40)	(0.45)	(0.20)	(-0.07)	(-1.25)	(-0.34)
Constant	3.025***	6.825***	20.038***	22.719***	-1.474	-4.056
	(5.13)	(15.45)	(8.74)	(11.38)	(-0.87)	(-1.35)
N	13,562	11,182	13,562	11,181	13,562	11,182
R-squared	0.012	0.048	0.170	0.210	0.061	0.062

The t statistics are in parentheses. ***, **and * indicate significance at the 1%, 5%, and 10% levels respectively.

Table 14 displays the unconditional quantile regression results of SCF on Q, Z and Inv.To. under different market positions. Columns (1), (3) and (5) are lenders (firms with low market position). Columns (2), (4) and (6) are borrowers (firms with high market position). Except that columns (2) and (6) are different from the original conclusion, other results are consistent with the original conclusion.

6. Additional exploration

With the continuous development of supply chain, China has put forward higher requirements for the supply chain. In recent years, the government has disciplined

many targeted policy documents[3] designed to prevent high market position enterprises from oppressing SMEs and promote the development of SCF. SOEs tend to focus on political goals and comply with political advice (Li and Zhang, 2010). SOEs are more likely to benefit from SCF due to their wider financing channels and preferential policies. Therefore, we also divided them into SOEs and non-SOEs to study the impact of heterogeneity.

In order to analyze the heterogeneous influence of ownership, we adopt the dummy variable of State, which is 1 if enterprise is a SOE, and 0 otherwise. SCF*State reflects the incremental impact of providing SCF activities on firm performance when the firm is a SOE.

$$Y_{i,t} = \beta_0 + \beta_1 SCF_{i,t} + \beta_2 State + \beta_3 SCF * State + \beta_4 \sum control_{i,t} + \gamma_t + \mu_i + \varepsilon_{i,t} \quad (2)$$

Table 15

SCF, ownership and corporate performance

Variable	(1) Q	(2) Z	(3) Inv.To.
SCF	-0.165***	-0.448**	1.468**
	(-4.003)	(-2.032)	(2.325)
State	-0.007	0.157	0.073
	(-0.146)	(0.655)	(0.106)
State*SCF	0.307***	0.966***	-1.033
	(5.299)	(3.109)	(-1.161)
SIZE	-0.869***	-3.712***	-1.747***
	(-38.573)	(-30.724)	(-5.052)
Lev	0.560***	-17.988***	-6.885***
	(8.885)	(-53.192)	(-7.113)
SGR	0.001	-0.044	-0.118
	(0.115)	(-1.247)	(-1.175)
CA	-0.436***	-1.596***	2.936**
	(-5.369)	(-3.667)	(2.356)
EC	0.210***	0.501***	0.651**

3 The Regulation on Payment Guarantee for Small and Medium-sized Enterprises was issued by The State Council No. 728 in 2020. The Implementation Plan for Strengthening Credit Information Sharing Applications to Promote Financing for Micro, Small and Medium-sized Enterprises was issued by The State Council No. 52 in 2021.

	(11.136)	(4.957)	(2.250)
ID	0.003	0.021**	0.034
	(1.628)	(2.238)	(1.296)
SI	0.149***	1.525***	3.674***
	(8.168)	(15.570)	(13.104)
Constant	14.805***	56.469***	-38.875***
	(40.935)	(29.098)	(-6.998)
N	24732	24731	24732
R-squared	0.280	0.257	0.018
Firm	Yes	Yes	Yes
Year	Yes	Yes	Yes

The t statistics are in parentheses. ***, **and * indicate significance at the 1%, 5%, and 10% levels respectively.

Table 15 presents the moderating effect of ownership, interaction terms are State*SCF. The full sample is used for regression. In column (1) the interaction coefficient (state*SCF) is 0.307, and are significant at the 1% level. This shows that when SOEs provide SCF, they have a significant positive impact on corporate financial performance. However, in column (1) , the coefficient of SCF is -0.165, indicating that non-SOEs reduce corporate financial performance when they provide SCF. Therefore, compared with non-SOEs, SOEs obtain improved performance in providing SCF. At the same time, SCF provided by SOEs can reduce the risk, but SCF provided by non-SOEs can increase the risk. SCF provided by SOEs does not affect operational efficiency, but SCF provided by non-SOEs improves operational efficiency.

Table 16

SCF, ownership and corporate performance under different market positions

Variable	(1) Lenders Q	(2) Borrowers Q	(3) Lenders Z	(4) Borrowers Z	(5) Lenders Inv.To.	(6) Borrowers Inv.To.
SCF	-0.406***	-0.195***	0.241	-1.020***	2.223**	1.501
	(-5.008)	(-3.359)	(0.505)	(-3.969)	(2.062)	(1.512)
State	-0.004	-0.026	0.005	0.030	-0.797	-0.204
	(-0.056)	(-0.411)	(0.012)	(0.106)	(-0.790)	(-0.186)

State*SCF	0.430***	0.227***	2.752***	0.930***	-0.123	-1.980
	(2.982)	(3.006)	(3.242)	(2.776)	(-0.064)	(-1.530)
SIZE	-0.939***	-0.775***	-4.671***	-2.996***	-2.586***	-1.696***
	(-26.045)	(-23.966)	(-21.991)	(-20.891)	(-5.400)	(-3.063)
Lev	0.625***	0.400***	-22.286***	-13.690***	-3.357***	-8.550***
	(6.590)	(4.395)	(-39.888)	(-33.900)	(-2.665)	(-5.482)
SGR	0.013	-0.011	-0.108	-0.004	-0.165	-0.196
	(1.130)	(-1.419)	(-1.615)	(-0.118)	(-1.089)	(-1.501)
CA	-0.230*	-0.835***	1.344*	-4.343***	-0.037	0.626
	(-1.761)	(-7.583)	(1.749)	(-8.892)	(-0.021)	(0.332)
EC	0.202***	0.181***	0.685***	0.234**	0.750*	0.171
	(6.938)	(7.195)	(3.999)	(2.094)	(1.942)	(0.396)
ID	0.002	0.003	0.021	0.008	0.095***	-0.035
	(0.927)	(1.478)	(1.343)	(0.845)	(2.690)	(-0.915)
SI	0.197***	0.128***	1.947***	1.479***	4.346***	3.023***
	(6.483)	(4.941)	(10.865)	(12.885)	(10.756)	(6.817)
Constant	15.229***	13.917***	65.357***	45.263***	-38.555***	-15.389*
	(26.886)	(26.460)	(19.577)	(19.399)	(-5.123)	(-1.708)
N	13556	11176	13556	11175	13556	11176
R-squared	0.326	0.239	0.277	0.244	0.018	0.015
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes

The t statistics are in parentheses. ***, **and * indicate significance at the 1%, 5%, and 10% levels respectively.

Table 16 presents the moderating effect of ownership under different market positions, interaction terms are State*SCF. The column (1) (2) (3) and 4 in Table 5 shows that whether it is lenders or borrowers, SCF provided by SOEs can improve performance and reduce risks. However, the provision of SCF by SOEs among lenders and borrowers does not affect operational efficiency. Column (1) (3) and (5) reveal that non-SOEs among lenders providing SCF reduces performance and improves efficiency, but does not affect risks. Column (2) (4) and (6) show that non-SOEs among borrowers providing SCF can reduce performance and increase risks, but it does not affect operational efficiency. This is mainly due to SOEs enjoying more preferential policies. SOEs have lower financing costs and relatively more abundant

cash flow. Therefore, SOEs can obtain extra income by investing their funds in SCF, and reduce the occurrence of the whole chain breaking problem caused by upstream and downstream bankruptcy.

7. Conclusions

Value-enhancing role, stabilizing role and ordinating role are the common demands of enterprises to develop SCF. However, for enterprises with different market positions, the development of SCF has a differentiated impact, which is also the main reason why the China emphasizes standardizing the development of SCF. We take the listed companies on the Shanghai and Shenzhen Stock Exchanges from 2007 to 2020 as samples, and divide the enterprises into borrowers (enterprises with high-position) and lenders (enterprises with low-position) based on the different direction of capital flow. In addition, we also study the differential impact and mechanism of SCF on financial performance, corporate risk and operational efficiency of companies with different market positions. Therefore, the conclusions are as follows. First, we find that the market position of borrowers is higher than that of lenders, and the willingness of the former to cooperate with upstream and downstream is lower than that of the latter. Second, for the entire chain, enterprises providing SCF can achieve coordination, but the value-enhancing and stabilizing effects are not obvious. Third, the implementation of SCF negatively affects the financial performance of lenders, but does not affect the performance of borrowers. Fourth, lenders to carry out SCF reduce their risks, but borrowers providing SCF increase risks. Fifth, the adoption of

SCF by lenders improves operational efficiency, but the implementation of SCF by borrowers does not affect operational efficiency. Sixth, SOEs have more advantages than non-SOEs in providing SCF, and this is also true for borrowers and lenders. In general, lenders pay more attention to upstream and downstream cooperation in the trade process. Even if SCF leads to a decrease in corporate financial performance, it reduces corporate risks and improves operational efficiency. However, borrowers use their positional advantages to squeeze the upstream and downstream. Even if SCF does not bring negative performance, it increases risk and does not improve operational efficiency. Therefore, the cooperation pattern is more conducive to the development of enterprises and supply chains, and enterprises should achieve "win-win" by strengthening cooperation with upstream and downstream.

Although we provide some theoretical contributions, there are still some limitations. Firstly, in the future, we can use commercial banks and other financial institutions as an entry point to study how companies obtain SCF from banks or financial institutions. Secondly, other schemes of SCF are no considered. Therefore, SCF business activities, such as inventory pledge financing factoring, reverse factoring and receivables financing, can be considered together for research in the future.

Reference

Ali, A. . (2021). Firm size and supply chain finance in Indian pharmaceutical industry: relational firm analysis of size determinants and cash conversion cycle. Accounting, 7(1), 197-206.

Altman, E. I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. The journal of finance, 23(4), 589-609.

Astvansh, V., & Jindal, N. (2022). Differential effects of received trade credit and provided trade credit on firm value. Production and Operations Management, 31(2), 781-798.

Brahm, A., Hadj-Alouane, A., & Sboui, S. (2020). Dynamic and reactive optimization of physical and financial flows in the supply chain. International Journal of Industrial Engineering Computations, 11(1), 83-106.

Cao, M., & Zhang, Q. (2011). Supply chain collaboration: Impact on collaborative advantage and firm performance. Journal of operations management, 29(3), 163-180.

Chakuu, S., Masi, D., & Godsell, J. (2019). Exploring the relationship between mechanisms, actors and instruments in supply chain finance: A systematic literature review. International Journal of Production Economics, 216, 35-53.

Lee, C. H., & Rhee, B. D. (2011). Trade credit for supply chain coordination. European journal of operational research, 214(1), 136-146.

Chen Q & Pan X. (2019). An Empirical Study on the Influencing Factors of Interconnected Costs between Organizations. International Journal of Industrial and Business Management, 3(10).

Cho, W., Ke, J. Y. F., & Han, C. (2019). An empirical examination of the use of bargaining power and its impacts on supply chain financial performance. Journal of Purchasing and Supply Management, 25(4), 100550.

Cosci, S., Guida, R., & Meliciani, V. (2020). Does trade credit really help relieving financial constraints?. European Financial Management, 26(1), 198-215.

Daripa, A., & Nilsen, J. (2011). Ensuring sales: A theory of inter-firm credit. American Economic Journal: Microeconomics, 3(1), 245-79.

Faria, D., Lima, & Santos. (2010). Cooperation in innovation activities: The importance of partners. Research policy, 39(8), 1082-1092.

Devalkar, S. K., & Krishnan, H. (2019). The impact of working capital financing costs on the efficiency of trade credit. Production and Operations Management, 28(4), 878-889.

Eshraqi, S., & Eshraqi, S. (2019). The concept supply chain technological capability in case of new product development process. International Journal of Automotive Technology and Management, 19(1-2), 125-143.

Frennea, C., Han, K., & Mittal, V. (2019). Value appropriation and firm shareholder value: Role of advertising and receivables management. Journal of Marketing Research, 56(2), 291-309.

Freund, S. , Latif, S. , & Phan, H. V. . (2018). Executive compensation and corporate financing policies: evidence from ceo inside debt. Journal of Corporate Finance, 50, 484-504.

Gelsomino, L. M., Mangiaracina, R., Perego, A., & Tumino, A. (2016). Supply chain finance: a literature review. International Journal of Physical Distribution & Logistics Management, 4,348-366..

Goeij, C. D., Gelsomino, L. M., Caniato, F., Moretto, A. M., & Steeman, M. (2021). Understanding SME suppliers' response to supply chain finance: a transaction cost economics perspective. International Journal of Physical Distribution & Logistics Management, 51(8), pp. 813-836.

Hadlock, C. J., & Pierce, J. R. (2010). New evidence on measuring financial constraints: Moving beyond the KZ index. The review of financial studies, 23(5), 1909-1940.

Hofmann, E. (2005). Supply chain finance: some conceptual insights. Beiträge Zu Beschaffung Und Logistik, 16, 203-214.

Hofmann, E., & Kotzab, H. (2010). A supply chain-oriented approach of working capital management. Journal of business Logistics, 31(2), 305-330.

Johnson, J. L., & Sohi, R. S. (2001). The influence of firm predispositions on interfirm relationship formation in business markets. International Journal of Research in Marketing, 18(4), 299-318.

Kim, Y. H., & Henderson, D. (2015). Financial benefits and risks of dependency in triadic supply chain relationships. Journal of Operations Management, 36, 115-129.

Klapper, L., Laeven, L., & Rajan, R. (2012). Trade credit contracts. The Review of Financial Studies, 25(3), 838-867.

Lam, H. K., & Zhan, Y. (2021). The impacts of supply chain finance initiatives on firm risk: evidence from service providers listed in the US. International Journal of Operations & Production Management, 41(4), 383-409.

Li, Q. . (2018). Research on the correlation between executive compensation and business performance in electric power listed companies. Science Publishing Group(6), pp. 141-149.

Li, W., & Zhang, R. (2010). Corporate social responsibility, ownership structure, and political interference: Evidence from China. Journal of business ethics, 96(4), 631-645.

Liu, B., Ju, T., & Chan, H. K. (2022). The diverse impact of heterogeneous customer characteristics on supply chain finance: Empirical evidence from Chinese factoring. International Journal of Production Economics, 243, 108321.

Liu, B., Wang, Y., & Shou, Y. (2020). Trade credit in emerging economies: an interorganizational power perspective. Industrial Management & Data Systems, 120(4), pp. 768-783..

MacCarthy, B. L., & Ivanov, D. (2022). The Digital Supply Chain—emergence, concepts, definitions, and technologies. In The Digital Supply Chain (pp. 3-24). Elsevier.

Moretto, A., Grassi, L., Caniato, F., Giorgino, M., & Ronchi, S. (2019). Supply chain finance: From traditional to supply chain credit rating. Journal of Purchasing and Supply Management, 25(2), 197-217.

Murfin, J., & Njoroge, K. (2015). The implicit costs of trade credit borrowing by large firms. The Review of Financial Studies, 28(1), 112-145.

Palmatier, R. W., Gopalakrishna, S., & Houston, M. B. (2006). Returns on business-to-business relationship marketing investments: Strategies for leveraging profits. Marketing science, 25(5), 477-493.

Pathak, S. D., Wu, Z., & Johnston, D. (2014). Toward a structural view of co-opetition in supply networks. Journal of Operations Management, 32(5), 254-267.

Pei Q., Chan H. K., Zhang T., et al ,. (2022). Benefits of the implementation of Supply Chain Finance,Annals of Operations Research,1-33.

Shen B , Choi T M , Minner S. (2019). A review on supply chain contracting with information considerations: information updating and information asymmetry. International Journal of Production Research,15-16,4898-4936.

Sung, H. C., & Ho, S. J. (2020). Supply chain finance and impacts of consumers' sustainability awareness. The North American Journal of Economics and Finance, 54, 100962.

Wetzel, P., & Hofmann, E. (2019). Supply chain finance, financial constraints and corporate performance: An explorative network analysis and future research agenda. International Journal of Production Economics, 216, 364-383.

Xia, C., Zhang, X., Cao, C., & Xu, N.. (2019). Independent director connectedness in china: an examination

of the trade credit financing hypothesis. International review of economics & finance, 63(Sep.), 209-225.

Xu, X., Chen, X., Jia, F., Brown, S., Gong, Y., & Xu, Y. (2018). Supply chain finance: A systematic literature review and bibliometric analysis. International Journal of Production Economics, 204, 160-173.

Zhang, T., Zhang, C. Y., & Pei, Q. (2019). Misconception of providing supply chain finance: Its stabilising role. International Journal of Production Economics, 213, 175-184.