

What kind of supply chain cooperation can help SME improve their supply chain financing performance? Considering the role of the application of information technology

Yong Geng*

gengyong@cufe.edu.cn*

Central University of Finance and Economics, Beijing China

Abstract. As the practice of supply chain management matures, the cooperation of enterprises in the supply chain gradually deepens, which creates conditions for enterprises to promote supply chain finance strategies. However, how the supply chain cooperative relationship affects supply chain financing performance of small and medium-sized enterprises (SME) are problems to be solved. This paper builds a model and proposes hypotheses on how the mechanism of supply chain cooperation influences the supply chain financing performance of SME. We perform verification analysis based on sample data and make recommendations to improve the supply chain financing performance. The results show that trust has a direct positive effect on the supply chain financing performance; information sharing has a mediate role between relationship commitment and the supply chain financing performance; and application of information technology positively moderates the relationship commitment and the supply chain financing performance.

Keywords: Supply chain cooperation; Information sharing; Supply chain financing

1 Introduction

SME are an important part of China's economy. However, low capital availability and high costs have always been constraints on their development. Government has continuously issued a series of policies to address this issue. However, due to limited operating scale, insufficient tangible assets, unstable financial status, and asymmetrical information with financial institutions, it is difficult for SME to obtain effective financing from commercial banks. In recent years, many core enterprises have begun to attach importance to coordinating with commercial banks and supply chain upstream and downstream enterprises to solve financing difficulties for SME through supply chain finance. Supply chain cooperation becomes the focus of investigations when commercial banks provide financing services and use them to control risks accordingly. Supply chain finance provides an innovative way to solve financing difficulties of SME, and provides capital guarantees for efficient operation of supply chain.

In this context, the active integration of SME into core enterprises' supply chain has become an effective way to improve supply chain financing performance. Whether led by commercial banks or others, establishing a close cooperative relationship between SME and core companies

can help all parties reduce moral hazard caused by information asymmetry and improve financing performance. On the basis of forming a stable cooperative relationship with SME, the core enterprises can dynamically grasp information of supply chain links such as the production, sales and inventory of SME through information sharing to better assess their credit level and reduce the risk compensation requirements and thus improve the financing performance of SME. At the same time, with the continuous development of information technology, the compatibility of information systems between enterprises has improved, and the degree of information sharing has been deepened, thereby further reducing information asymmetry.

Based on the theoretical logic of "cooperation-information-performance", this paper attempts to explore how supply chain cooperation influence SME' supply chain financing performance and test whether the application of information technology plays a moderating role in it. The contributions are as follows:(1) In terms of theory, it explores the impact of supply chain cooperation, information sharing, and information technology application on supply chain financing performance and provides a certain theoretical basis for improving the supply chain financing performance . (2) In terms of practice, through the establishment of stable cooperative relations with core enterprises and the improvement of information sharing, this paper provides two perspectives for SME to improve financing performance in management practices.

2 Theoretical Background

2.1 Supply Chain Cooperation

Supply chain cooperation is the relationship between two or more independent members within the supply chain, and the two parties will share profit, risks, and information to achieve specific goals or benefits. Granovetter (1973) proposed concept of relationship strength to characterize the closeness of supply chain cooperation. Intensity is a collection of time, emotion, intimacy (mutual trust) and reciprocal services. The longer cooperation time the greater the emotional coefficient, the higher the degree of trust, and the more benefits between network members can obtain through reciprocal services. the closer the relationship between them, the greater the network strength. ^[1]Trust, adaptability, information communication and mutual cooperation affect supply chain partnerships (Spekman (1984)).^[2] Mohr and Spekman (1994) believe that the basic characteristics of any successful partnership is commitment, cooperation, trust, communication quality, participation, etc. Trust is the most important factor in choosing a supply chain partnership.^[3] Naude and Buttle (2000) also believe that trust is an important dimension of relationship quality. ^[4]We believe that trust and relationship commitment are two important factors that affect supply chain cooperation.

2.2 Supply Chain Financing Performance

When SME embed themselves in a stable cooperative network, they can establish a relatively fixed connection with other enterprises in network and even establish a continuous and stable cooperative relationship. As a supplier of Huawei. In 2018, Huawei's revenue was 767 million yuan, up 40% year on year. The income in Huawei accounted for 31.55%.Carter et al. (2004) propose that cooperation networks can improve availability of financing for SME. ^[5]Song and Lu (2017) find that strong and weak connections in supply chain networks can effectively improve SME financing performance, especially weak connections. The strong

relationship of SME mainly comes from the personal social network of their founders. In weak relationships, they do not have to pay high costs and can obtain a wide range of external resources. [6]Traditional supply chain management is inadequate. Due to the flexibility and configurability of information technology, enterprises can use information technology to effectively allocate various internal resources and have better operational performance (Cámara et al., 2015).[7]

2.3 Information Asymmetry

George (1963) first proposed information market, arguing that information asymmetry arises when both parties in the activity hold different information and one party has information that the other party cannot obtain. Under information asymmetry, the following two problems related to corporate financing are often accompanied by: (1) Adverse selection. Information asymmetry often leads to financial institutions' adverse selection of loan companies. Commercial banks are more willing to lend to core companies, but such companies often have no liquidity gap. In contrast, SME are willing to pay higher interest rates than core companies to obtain financing, but due to their weak risk-resilience, they are prone to default risks. Banks actually prefer core corporate financing. (2) Moral hazard. Moral hazard of lenders means that banks are often unable to monitor the entire process of applying for corporate loans due to information asymmetry between banks and other financial institutions and lenders, and funders may engage in actions that harm the banks' interests.

3 Hypotheses

3.1 impact of supply chain cooperation on financing performance

Signal theory provides a feasible way for the missing party to solve adverse selection problems caused by information asymmetry.[8] Compared with traditional credit financing, supply chain finance places more emphasis on investigating enterprises from the perspective of structural relationships when choosing loan targets. Therefore, if SME send a specific signal to a bank to reveal its own production and operating conditions and good cash flow, the risks that the bank may face are relatively small, and it can distinguish itself from other unqualified financiers.

Building trust between SME and core companies is a key signal for identifying good funders in supply chain finance. Trust is a prerequisite for frequent and long-term business transactions between SME and core companies, as well as a guarantee of business authenticity and reliability. To avoid risks, financial institutions are more likely to provide financing services to SME that have real and reliable trading scenarios, thereby improving the availability of financing and reducing financing costs.

In traditional financing situations, the moral hazard of SME is one of the reasons for increased risk of financial institutions. Relationship commitment is the willingness of a party that has a trading relationship to maintain and consolidate relationships (Goodman and Dion, 2001). [9]If SME want to maintain long-term and stable cooperative relations with core enterprises, they will inevitably reduce breaches of contract caused by opportunistic motivation and reduce their own moral hazard, thereby further ensuring long-term business transactions. To avoid their own risks, financial institutions are more willing to provide financing services for SME with long-

term and stable transaction scenarios, thereby increasing the availability of supply chain financing and reducing financing costs. Therefore, we propose the following hypothesis:

H1: Supply chain cooperation has a positive impact on SME' financing performance.

H1a: Trust in supply chain cooperation has a positive impact on SME' financing performance.

H1b: Relationship commitment in a supply chain cooperation has a positive impact on the financing performance.

3.2 Mediating Role of Information Sharing

Relationship between SME and other companies in supply chain has an important impact on their resource acquisition. Grimes (1995) points out that when communication between members is not bound by a contract, successful information sharing largely depends on mutual trust. The relationship commitment expresses the willingness of both parties to maintain long-term cooperation or even form a strategic partnership, emphasizing that the two parties involved in the cooperation do not do things that harm the interests of the other and destroy the cooperative relationship due to short-sighted behavior. After forming long-term cooperation between enterprises, there is bound to be a certain degree of information sharing so that the cooperation between them can be completed more efficiently. Therefore, we propose the following hypothesis:

H2: Supply chain cooperation has a positive impact on information sharing.

H2a: Trust in supply chain cooperation has a positive impact on information sharing.

H2b: Relationship commitment in supply chain cooperation has a positive impact on information sharing.

The higher the level of trust and relationship commitment, the more helpful it is for SME to obtain accurate information about core companies' market demand and forecasts and real-time inventory status. Then they can make their own production arrangements. It helps SME improve their production flexibility and agility so that they can deliver orders on time and in volume, receive payment, and improve their solvency. In addition, through information sharing, financial institutions can understand the production status of upstream small and medium-sized suppliers in real time, grasp their capital flow status, and reduce the risk of information asymmetry. SME can improve the availability of financing and reduce financing costs by sharing information. Therefore, we propose the following hypothesis:

H3: Information sharing has a positive impact on the financing performance of SME.

3.3 Moderating Role of Technology Application

It is important for SME and core companies have a good relationship and a certain relationship commitment, and cooperate for a long time to obtain the supply chain financing. However, the lacks of transparency in business and good information technology to support information sharing between them prevents SME from obtaining funds. The application of information technology can enhance transparency of business among partners.^[11] Core enterprises can use information technology to obtain the cash flow status in real time and then effectively evaluate, supervise and control their financing efficiency and repayment capacity. The application of

information technology further improves availability of supply chain financing, enables them to obtain more flexible financing quotas and repayment cycles, and reduces supply chain financing costs. Therefore, we propose the following hypothesis:

H4: There is a positive adjustment role between information technology application supply chain cooperation and financing performance.

H4a: Application of information technology has a positive regulatory role between trust and financing performance.

H4b: Application of information technology has a positive regulating effect between relationship commitment and financing performance.

the theoretical model of this paper is shown in Figure 1:

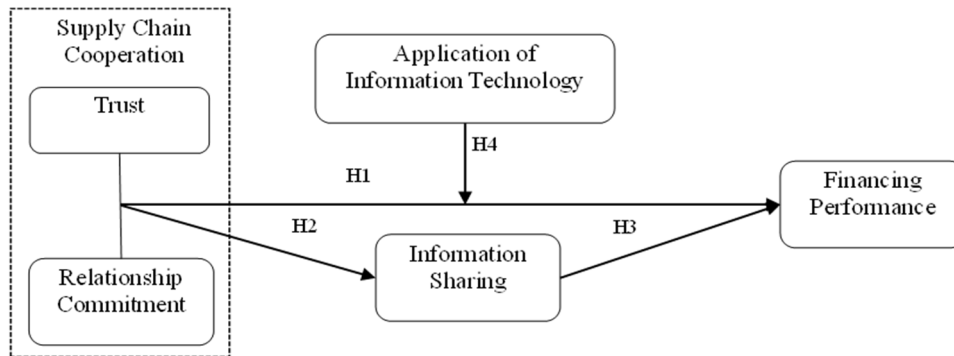


Fig. 1. Theoretical Framework

4 Research Methodology

4.1 Sampling and Data Collection

We sent questionnaires to SME managers through Credamo and screened the collected questionnaires. To ensure that all survey subjects are SME, we refer to the “Chinese Provisional Regulation on SME Standard” issued by the Ministry of Industry and Information Technology (2011). 155 questionnaires were recovered, 122 valid questionnaires were collected. The industries in which valid samples mainly include manufacturing, information transmission, wholesale and retail, in which supply chain finance has wide applications.

In addition, more than 90% of the participants in this questionnaire are middle-level managers and managers in higher positions. They know more about the situation of enterprises’ supply chain finance business. This ensures the credibility of the questionnaire responses.

4.2 Variable Measurement

(1) Independent variable: supply chain partnership. trust and relationship commitment are used to measure supply chain partnerships. Refer to the mature questionnaires of Li and Lin (2006) and Ye and Xue (2011).^[12] We set 3 items to measure trust. At the same time, referring to the mature questionnaires of Goodman and Dion (2001)^[9] and Ye and Xue (2011)^[12], 3 items are

set to measure relationship commitment.(2) Dependent variable: supply chain financing performance.Gomm (2010) analyzes financing performance in terms of financing volume, financing cost, and financing cycle. Referring to Gomm (2010) [13]and Song Hua (2017,2019)[6][14], we set 4 items to measure supply chain financing performance.(3) Mediating variables: information sharing. Integrating the questionnaires of Li et al. (2006) [15]and Gao et al. (2006)[16], we set 4 items to measure information sharing, which are combined with the practice of supply chain finance.(4) Moderating variables: use of information technology. The application of information technology enables core enterprises to obtain the required information from SME in real time and efficiently, meet the needs of business transactions, and improve cooperation performance. We refer to the mature questionnaire of Cámara et al. (2015) [7]and Subramani (2004)[17] and then use 4 items to measure the application of information technology.(5) Control variables. The characteristics of SME may also have an impact on financing performance. Therefore, we take the number of employees, annual sales, and total assets as control variables. The final measurement items of this paper are shown in Table 1.

Table 1. The Measurement Items and Sources of Literature

Constructs	Items	Literature Sources
Trust	We believe that core companies will keep their promises	Li&Lin(2006); Ye Fei&Xue Yunpu(2011)
	We believe that core companies will consider the impact on the company when making major decisions	
	We believe that core companies will place the company's interests in a crucial position	
Relationship Commitment	We hope to maintain cooperative relations with core enterprises	Goodman&Dion(2001); Ye Fei&Xue Yunpu(2011)
	We promise that we will not easily interrupt our cooperation with core companies in the future	
	We will proactively renew contracts with core companies in the future	
Information Sharing	We share order processing information with core companies	Li et al.(2006); Gao et al.(2006)
	We share material or product inventory information with core companies	
	We share production scheduling information with core companies	
	Core companies share market demand forecast information with us	
Financing Performance	The availability of funds with the help of core companies is high	Gomm(2010) Song Hua(2017)
	With the help of core companies,the cost of obtaining capitalis more reasonable	
	With the help of core companies, the amount of funds obtained is more flexible	
	With the help of core companies, the cycle of obtaining funds is more flexible	
Application of Information Technology	We are compatible with the information systems of core companies	Camara et al.(2015); Subramani et al.(2004)
	We can connect well with the core enterprise's information system	
	Core companies can obtain our historical transaction information through information technology	
	Core companies can obtain our capital flow status through information technology	

5 Analysis and Results

5.1 Reliability and Validity

We conduct Hamann single factor test to detect common method bias, shows that the variance degree of cumulative explanatory variance of five common factors reaches 74.767%, while the first factor is 16.712%, not exceeding 60%, which indicates that there is no CMB in this study.

Table 2. Reliability and Validity Test Results of the Scale

Variables	Items	CITC	Cronbach α after deleting the item	Standardized load	AVE	Cronbach α
Trust	T1	0.833	0.887	0.882	0.7916	0.920
	T2	0.839	0.882	0.885		
	T3	0.839	0.882	0.902		
Relationship Commitment	C1	0.851	0.944	0.881	0.8552	0.945
	C2	0.926	0.886	0.972		
	C3	0.876	0.925	0.919		
InformationSharing	IS1	0.554	0.709	0.646	0.4449	0.762
	IS2	0.611	0.677	0.708		
	IS3	0.585	0.693	0.64		
	IS4	0.495	0.740	0.672		
Financing Performance	FPI	0.554	0.733	0.708	0.4663	0.775
	FP2	0.508	0.757	0.588		
	FP3	0.631	0.693	0.751		
	FP4	0.622	0.697	0.674		
Application of Information Technology	IT2	0.608	0.682	0.664	0.6308	0.761

Note: The value on the diagonal is the square root of AVE, * means $p < 0.05$, ** means $p < 0.01$, *** means $p < 0.001$

This paper uses confirmatory factor analysis (CFA) to test the reliability and validity (results in Table 2). The total correlation coefficient CITC of the IT1 item is much less than 0.5 and the Cronbach's α value after removing IT1 is 0.825, which is greater than 0.761 (the Cronbach's α value before removing IT1), we deleted IT1. After deleting IT1, the Cronbach's α value of each variable is greater than 0.7, and the Cronbach's α value of each individual item is less than the overall Cronbach's α value of the variables. Therefore, we believe that the overall reliability of the scale is great and can be used for subsequent validity tests. Besides, AVE of are all greater than or close to 0.5, indicating that scale has good polymerization validity. The square root of AVE of is greater than correlation coefficient between each latent variable, indicating that the measurement scale has good discrimination validity (Fornell and Larker, 1981).^[18]

5.2 Results

The results shown in Table 3 and Table 4.

Test of direct effect. The path coefficients in Table 3 show that 3 of the 4 paths are significant ($p < 0.05$), providing support for H1, H4 and H5. However, H1b is not supported. As seen from

the structural equation model, because the coefficients of "relationship commitment → information sharing" and "information sharing → financing performance" are significant, relationship commitment may indirectly affect financing performance through information sharing.

Table 3. Hypothesis Testing Results

Paths		Standardized Regression Coefficient	S.E.	C.R.	P	Corresponding Hypothesis	Testing Result
Information Sharing	< --- Relationship Commitment	0.556	0.067	5.029	***	H4	Valid
Financing Performance	< --- Trust	0.412	0.071	3.92	***	H1	valid
Financing Performance	< --- Information Sharing	0.418	0.163	3.048	**	H5	Valid
Financing Performance	< --- Relationship Commitment	0.14	0.081	1,231	0.218	H2	Not Valid

Table 4. Model Testing after Introducing the Application of Information Technology

Independent Variable	Dependent Variable: Financing Performance			Dependent Variable: Financing Performance		
	coeff	se	T	coeff	se	t
Constant	4.515	0.143	31.5696***	4.574	0.146	31.4032***
Number of Workers	0.027	0.034	0.783	0.033	0.034	0.970
Annual Sales	-0.003	0.060	-0.051	0.003	0.062	0.049
Total Assets	-0.046	0.049	-0.952	-0.071	0.050	-1.441
Trust	0.356	0.058	6.1035***			
Relationship Commitment				0.350	0.063	5.511***
Application of Information Technology	0.190	0.063	3.0196**	0.182	0.068	2,6977**
Trust x Application of Information Technology	0.159	0.101	1.576			
Relationship Commitment x Application of Information Technology				0.200	0.095	2.0993*
R-sq	0.355			0.326		
F	10.553			9.267		

Note: * means $p < 0.05$, ** means $p < 0.01$, *** means $p < 0.001$

Test of mediating effect. When we revise the initial model, the P value of the path of "trust → information sharing" is not significant, H2a is not supported and trust cannot indirectly affect financing performance through information sharing. We verify the mediating role on another path. According to bootstrapping test results, the mediating effect is significant. Because direct effect of relationship commitment on financing performance is not significant, information sharing has a complete mediating effect on the relationship between relationship commitment and financing performance.

Test of moderating effect. The results in Table 4 show that the product of trust and information technology has no significant effect on financing performance ($p = 0.1177 > 0.05$), and product of

relationship commitment and information technology has a significant effect on financing performance ($p=0.038<0.05$), H4a is supported, H4b is not supported. The application of information technology has a significant moderating effect in the path of "relational commitment → financing performance".

6 Discussion and managerial implications

6.1 Conclusions

1) Trust can improve the financing performance of SME. Compared to traditional financing mode, supply chain finance lies in not simply selecting loan objects based on corporate statements but focusing more on real transaction scenarios. It requires SME to transmit real and reliable transaction signals to financial institutions. The more SME and core companies trust each other, the more frequent their business transactions, the longer the cooperation time, and the closer the cooperation relationship (Ye and Xu, 2009). Therefore, the authenticity and credibility of their trading scenarios are stronger, the risk of adverse selection of financial institutions providing loans to them is smaller, and the financing performance of SME is better.

2) Relationship commitment can positively affect financing performance through information sharing. In network, the closer the links between organizations are, the better the resources can circulate among enterprises. High-level information sharing between SME and core enterprises can help SME obtain more accurate and timely market demand and forecast information from core enterprises and arrange and adjust their own production schedules and inventory levels accordingly. Orders are delivered on time, and payments are received on time; then, the solvency is improved. At the same time, through information sharing, financial institutions can grasp the production status and capital flow status of upstream SME in real time, thereby reducing the huge risks of information asymmetry.

3)The application of information technology plays a moderating role in relationship between relationship commitment and financing performance. The informatization and digitization of business processes between SME and supply chain partners can greatly enhance business transparency, and the application of information technology is a powerful means to achieve informatization and digitization (Song et al., 2019). ^[14]The application of information technology can reduce information asymmetry in supply chain financing.

6.2 Managerial implications

SME should actively establish cooperative relationships with core enterprises, which not only helps solve capital problems, but also improves the credit line. SME need to pay attention to certain issues when establishing a cooperative relationship with core enterprises. First, they must establish a equality concept and make clear that they play an irreplaceable role in the supply chain. Second, they should actively communicate with core companies and strive to maintain and promote cooperative relationships.

SME should focus on using information technology to increase information sharing with core companies. SME should actively introduce ERP, MRP and other operational management systems to optimize operational process so that they can be standardized, digitized and visualized. As a result, when loan is needed, core enterprise can quickly and accurately

understand SME production and operation status and cash flow status. After obtaining supply chain financing, SME should improve their own information systems and connect them with core enterprise systems.

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