

Financing Decision Analysis of Small and Medium-sized Transportation Enterprises Based on Freight Factoring and Centralized Procurement

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ABSTRACT. *In the modern logistics environment, small and medium-sized transport enterprises are easily constrained by capital because of their short, frequent and fast cash flow demand and the occupation of funds resulting from the purchase of transport vehicles. However, small and medium-sized transport enterprises can not provide enough fixed assets for pledge, resulting in banks or other financial institutions reluctant to lend, prudent or even not to lend. Multi-level principal-agent relationship is formed in the middle-level subcontracting business model of transport supply chain. At the same time, the uneven distribution of resources in the multi-level makes the bargaining power of the main body decline step by step. However, freight factoring and centralized procurement, as the common financing mode in the transport supply chain, can alleviate the financial pressure of small and medium-sized transport enterprises. Based on the supply chain composed of suppliers, retailers, transportation enterprises and transportation platforms, this paper establishes a financing decision model under freight factoring and centralized procurement mode. Through numerical simulation, it is found that under the same freight level, small and medium-sized transportation enterprises prefer to choose centralized procurement financing mode.*

KEYWORDS: *freight factoring; centralized procurement; supply chain finance; financing of small and medium-sized enterprises; factoring discount rate*

1. Introduction

At present, scholars focus their research on factoring financing mainly in commodity supply chain, while there is still a lot of research space for factoring financing based on transport supply chain, especially for centralized procurement. Therefore, this paper takes the small and medium-sized transport enterprises which have financing needs in the transport supply chain while facing financing difficulties as the starting point. Based on the supply chain composed of suppliers, retailers, transport enterprises and transport platforms, this paper constructs a financing decision model under the mode of freight factoring and centralized purchasing. On this basis, the optimal profits of small and medium-sized transport enterprises are

given and compared. The expected profit of the two financing modes at the same freight level is verified by numerical simulation.

2. Model Description and Basic Hypothesis

(1) Model description

Small and medium-sized transport enterprises get freight revenue after completing the freight transportation, but because of the existence of account period, they can not achieve immediate income, resulting in small and medium-sized transport enterprises can not rely on their own funds to solve the pressure of capital flow caused by transportation cost advancement in the short term. Therefore, small and medium-sized transport enterprises can transfer freight receivables to the transport factoring platform in the form of security, timely cash income, ease the pressure of capital flow, and bring convenience to the follow-up business.

Freight factoring financing refers to the financing mode of small and medium-sized transport enterprises in the transport supply chain by transferring freight receivables before the end of the account period. The operation process is shown in Figure 1. After completing the purchase agreement, the supplier and the retailer are responsible for the transportation of goods by small and medium-sized transport enterprises. After obtaining accounts receivable, small and medium-sized transport enterprises apply for factoring financing from the transport factoring platform with supplier's credit guarantee for transportation cost expenditure. After the end of the transport link, the supplier obtains the purchase receivables of the retailer. At the end of the account period, the supplier settles the account with the freight factoring platform.

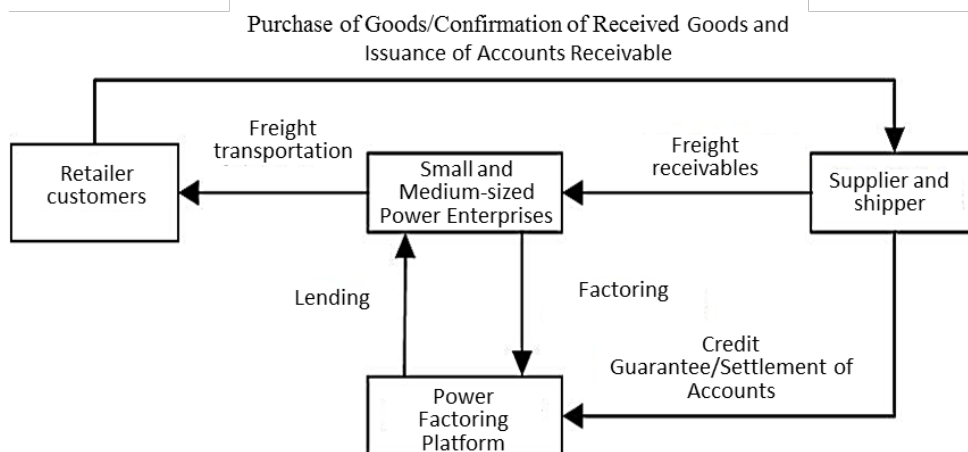


Figure 1 Flow chart of freight factoring financing model

Small and medium-sized transport enterprises need to pay a large amount of

transportation costs such as high-speed toll, fuel, vehicle maintenance and insurance in the process of carrying out transport services. Therefore, the transport factoring platform can use centralized procurement mode to obtain operational resources in advance, and help small and medium-sized transport enterprises to finance by credit lines (such as ETC cards, fuel cards, passenger and vehicle consumption credit cards, etc.).

Centralized purchasing financing refers to the cooperation of transportation factoring platform with ETC issuing agencies, expressway management companies, oil products sales companies, insurance companies, automotive parts suppliers and maintenance providers and other operation resources suppliers, and advance funds to help small and medium-sized transportation enterprises to achieve financing mode by means of quota credit. The operation process is shown in Figure 2. The freight factoring platform completes bulk purchasing at a discount price. According to the application credit quota of small and medium-sized transport enterprises, it realizes the deferred payment form of consumption before payment.

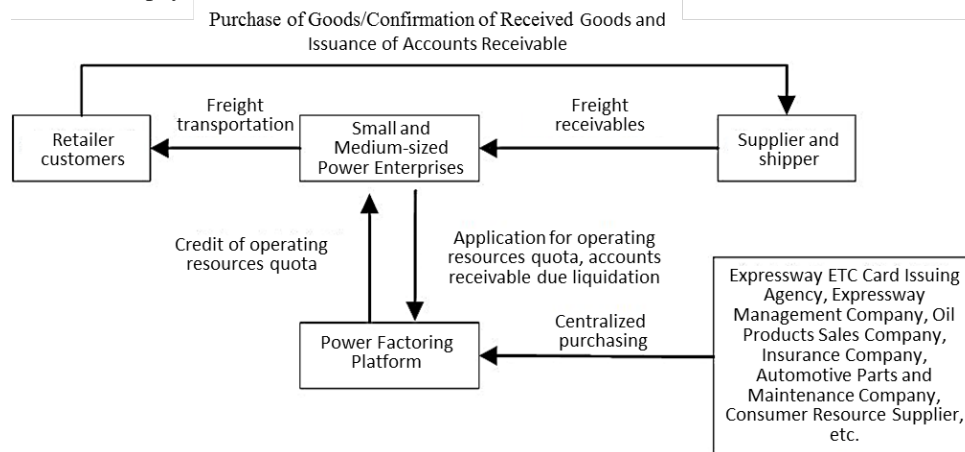


Figure 2 Flow chart of centralized procurement financing model

3. The comparative analysis of two financing models

(1) Analysis of the optimal decision-making of small and medium-sized enterprises

The simultaneous (8) and (14) comparisons of the optimal profit surcharges of the two financing modes, when $i + 1 < \frac{1}{k}$, the unit profit under the freight factoring financing mode was high, that is, the freight unit price was high; when $i + 1 > \frac{1}{k}$, the unit profit under the centralized procurement financing model was

selected. Therefore, the expected profit size of the two financing modes under the same freight rate is discussed.

After substituting $i + 1 = \frac{1}{k}$ to formula (15), the simultaneous (10) is obtained:

$$\pi_2^*(k) = \frac{\left[a - \frac{bV}{k} \right]^2}{8b} \quad (1)$$

$$\Delta\pi^* = \pi_1^* - \pi_2^* = \frac{[ak - bV]^2}{8bk} + (k - 1)F - \frac{\left[a - \frac{bV}{k} \right]^2}{8b} \quad (2)$$

Proposition: Under the same freight level, small and medium-capacity enterprises have a large profit through the centralized procurement financing model, that is, enterprises are more inclined to choose a centralized procurement financing model to solve question of financial constraints.

Prove:

From formula (16) and (8), respectively: Under the centralized procurement financing mode, the profit of medium and small-capacity enterprises obtains the minimum value of 0 when $k = \frac{bV}{a}$, and the maximum value is $\frac{(a - bV)^2}{8b}$ when $k = 1$; Under the freight factoring financing mode, the profit of small and medium-sized enterprises is at a minimum $\left(\frac{bV}{a} - 1 \right) F < 0$ at $k = \frac{bV}{a}$, and the maximum value is $\frac{(a - bV)^2}{8b}$ when $k = 1$.

It can be known from Proposition 1 that π_1^* and π_2^* monotonous increments within the limits of $\frac{bV}{a} \leq k \leq 1$, and $\Delta\pi^*(k = 1) = 0$, $\Delta\pi^*(k = \frac{bV}{a}) < 0$

Therefore, only need to prove that $\frac{d\pi_1^*}{dk} \geq \frac{d\pi_2^*}{dk}$ is established when $k = 1$, it can be proved that $\Delta\pi^* = 0$ is only a unique solution in within the limits of $\frac{bV}{a} \leq k \leq 1$, ie. $k = 1$

$$\frac{d\Delta\pi^*(k = 1)}{dk} = \frac{(a - bV)^2}{8b} + F > 0 \quad (3)$$

The certificate is completed.

(2) Analysis of examples

The following is a numerical analysis of the propositions obtained in the previous examples, with the values:

$$a = 150; b = 10; V = 2; F = 20$$

The bolded part in Table 1 shows the changes in the profit of the two financing modes at the same freight level. From Table 1, we can get the following conclusions :

(1) In the two financing modes, the larger the factoring discount rate or the lower the commission rate, the greater the maximum expected profit of small and medium-sized enterprises, which is consistent with Proposition 1 and Proposition

(2) When the freight rates of the two financing modes are the same, the centralized procurement model can provide more profits to the enterprise, which is in line with the proposition three-phase;

(3) Small and medium-capacity enterprises need to determine which financing mode to choose according to the factoring discount rate and the collection and processing rate given by the factoring platform, while the capacity factoring platform is more inclined to finance small and medium-sized enterprises in the form of freight factoring.

4. Conclusion

This paper studies two modes for SMEs to solve financing problems when facing capital constraints in the supply chain: freight factoring and centralized procurement. In the process of modeling, customer retailers use newsboy model as the prototype to determine the order volume considering freight expenditure, which ultimately affects the profit level of small and medium-sized transport enterprises. Through numerical simulation, it is found that under different factoring discount rates and collection fee rates, SMEs ultimately get different maximum profits; under the same freight level, SMEs prefer to choose centralized purchasing financing mode, while factoring platforms tend to provide financing in the form of freight factoring under any circumstances.

This paper considers the decision-making of transport supply chain caused by the operation of commodity supply chain under the condition of complete symmetry of market information. Further research can focus on how small and medium-sized transport enterprises, suppliers and retailers play games under the condition of asymmetric market information.

References

- [1] Chen Xiaohong, Xie Xiaoguang. Applicability of factoring to small and medium-sized enterprises in China and Discussion on its operation mode [J]. Journal of Central University of Finance and Economics, 2004 (10): 32-36+75.
- [2] Gu Chaoheng, Deng Shiming, Li Coastal. Optimal factoring financing strategy

- under deterministic demand continuous production model [J]. *Operational research and management*, 2017, 26 (10): 121-128.
- [3] Lin Qiang, Hao Lin, He Yong. Design of supplier-manufacturer contract parameters under asymmetric information and factoring financing mode [J]. *Systems Engineering*, 2014, 32 (08): 67-73.
- [4] Wang Ye, Tang Weiyao, Lu Yi. Research on the Importance of Enterprises in Supply Chain Finance [J]. *Financial Theory and Practice*, 2018 (06): 59-66.
- [5] Yang Bin, Liu Bin. Factorial Financing and Risk Control of Small and Medium-sized Enterprises [J]. *Financial Theory and Practice*, 2004 (09): 19-21.