Supplier Concentration, Commercial Credit Financing And Corporate Research And Development

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Abstract: This paper takes China's manufacturing boss company as the research object, from the perspective of external stakeholder suppliers to study the impact of enterprise innovation factors. The results show that supplier concentration inhibits the level of research and development expenditure, and supplier concentration reduces the enterprise's research and development expenditure by curbing the scale of commercial credit financing. This paper clarifies the mechanism of supply chain concentration to restrain the investment of enterprise research and development, which is beneficial to the management of supplier relationship.

1. Introduction

Most studies have only been conducted from within the company on the factors of enterprise research and development investment, such as the characteristics of the executive team or from the perspective of equity structure, or from the perspective of external stakeholder government. There is currently less research from the perspective of suppliers from outside stakeholders. Suppliers as the enterprise's raw materials, but also the enterprise's commercial credit financing providers, there is no doubt that its innovative activities have a certain impact. Based on the above logic, this paper will focus on the relationship between supplier concentration, commercial credit financing, and enterprise research and development investment. The contribution of this paper is: (1) to explore the factors influencing the enterprise's innovation input from the supply chain perspective, enrich the research on the enterprise's innovation, and (2) to verify the supplier concentration by suppressing commercial credit financing to influence the enterprise's innovation input.

2. Theory and Hypothesis

(1) Supplier concentration and enterprise innovation input

Suppliers are important partners in raw material procurement, and supplier concentration as a quantifiable indicator represents the degree to which enterprises rely on upstream suppliers. "When supplier concentration is high, firms can only get the resources they need to produce from a small number of suppliers, i.e. they are more dependent on a small number of suppliers." This degree of dependence has a certain influence on the enterprise's gross margin, management expense rate, sales expense rate, financial expense rate and other financial performance indicators (Wang Lirong, etc., 2017).[1] Zhou Xueru (2017) through the study of China's manufacturing listed companies, found that supplier concentration and enterprise performance negative correlation. "[2] When the supplier concentration is high, the buyer is at a disadvantage, while the seller has a strong bargaining power." Shepherd (2004) believes that companies can influence trading prices, contracts, distribution rights, etc. through market forces until they affect profits [3]. The so-called transaction price reached by buyers and sellers is the result of the game of market forces between the two sides. When the supplier concentration is high, that is, the buyer is in a weak position, at this time the seller's bargaining power is strong, tend to sell at a high price or even to sub-charge, reduce product quality. As a result, the production costs of the buyer's enterprise are increased, and the profit margins are forced to decrease. In other words, supplier concentration reduces the financial

performance of the purchasing firm by reducing the buyer's bargaining power and increasing transaction costs.

Research and development activities are accompanied by long cycle, large expenditure, high risk and so on, when the profitability of enterprises is reduced, research and development activities must be affected by the expenditure. In addition, according to Bear Beatle's theory of innovation, "innovation is the recombination of different elements, resources and knowledge". When the suppliers of enterprises are more dispersed, the probability of obtaining heterogeneous resources is greater, which is conducive to enterprises using different resources for technological innovation. On the contrary, when the supplier of the enterprise is a small number of large customers, the probability of the enterprise acquiring heterogeneous resources is less, which is not convenient for innovation activities. Ren Lili et al. (2019) through empirical research found that supplier concentration by increasing the financing constraints of enterprises to reduce the enterprise's research and development investment.[4] From the perspective of external governance effects, when the concentration of suppliers is high, the enterprise's research and development expenditure will be restricted by suppliers. The innovation activities of enterprises need to invest a lot of money, once the research and development failure of enterprises are likely to face financial difficulties, the stable income of suppliers will be affected, if the success of research and development, suppliers get a very limited share of the "share." In this case, the supplier, based on a close economic relationship with the enterprise, will require the enterprise to reduce research and development expenditure. At the same time, enterprises with higher supplier concentration, because of the frequent relationship proprietary investment, brought about the cost of financial hardship. To cope with the cost of financial distress, companies need to reduce the use of debt while holding large amounts of liquid assets. As a result, companies need to reduce research and development spending to hold large amounts of liquid assets. Based on the above analysis, the hypothesis 1 of this paper is put forward: supplier concentration and enterprise research and development investment negative correlation of strength.

$$RD=\alpha0+\alpha1SC+\alpha2Size+\alpha3Lev+\alpha4TOP1+\alpha5ROA+\alpha6Cash+\alpha7Growth+\alpha8MP+\alpha9Age+\alpha10FI+\alpha11Soe+\alpha12Year+\varepsilon$$

(2) Supplier concentration and commercial credit financing of enterprises

According to the theory of product market competition, in order to obtain more customers and seize market share, suppliers usually provide customers with a certain degree of commercial credit, delay the speed of collection. Such a formation of commercial credit, for procurement enterprises, is also a way of financing. When the customer has a high bargaining power, the supplier will provide the customer with more commercial credit, and when the supplier bargaining ability is strong, the customer will get less commercial credit. "When suppliers are more concentrated, a small number of suppliers have a high bargaining power, they are less willing to provide commercial credit to their customers, and at this time they have less commercial credit financing." And when commercial credit financing is gradually replaced by other financing methods such as bank borrowing, the negative correlation between supplier concentration and commercial credit financing of enterprises will be weakened. Li Rensi et al. (2016) believe that in the dual relationship between enterprises and suppliers, supplier concentration is negatively related to commercial credit financing. [5]

Based on the above analysis, the hypothesis 2 of this paper is put forward: supplier concentration is negatively correlated with the commercial credit financing of enterprises.

$$TC=\beta0+\beta1SC+\beta2Size+\beta3Lev+\beta4TOP1+\beta5ROA+\beta6Cash+\beta7Growth+\beta8MP+\beta9Age+\beta10FI+\beta11Soe+\beta12Year+\varepsilon$$

From the perspective of the bargaining power of industrial organizations, when the concentration of suppliers is high, it means that enterprises purchase raw materials from a few suppliers, then the bargaining power of enterprises is weak. In order to reduce the risk of bad debts, suppliers usually take a more "strong" way of collecting money, that is, require enterprises to advance accounts, while providing enterprises with less commercial credit financing. Based on the previous analysis, commercial credit financing has promoted the research and development expenditure of enterprises

to a certain extent. And when the larger suppliers that companies rely on are willing to give them less business credit, less commercial credit financing will negatively affect the company's research and development investment. According to the Power Matrix of Supply and Demand (Dowlatshahi 1999), if an enterprise purchases raw materials from a few suppliers, suppliers may increase commodity prices and reduce product quality in order to maximize their own interests, thus inevitably reducing the profit margin of the enterprise itself, and when the profitability of the enterprise decreases, based on the "signal" transmission theory, the supplier is willing to provide less commercial credit to the purchasing enterprise for their own benefit. "[6] Finally, dependence on a few large suppliers may lead to increased costs of supplier replacement, coupled with the inertia of the organisation itself, which can reduce the incentive for firms to innovate and therefore reduce research and development spending."

Based on the above analysis, hypothesis 3 is put forward: commercial credit financing plays an intermediary role in the relationship between supplier concentration and enterprise's research and development expenditure. $RD=\delta_0+\delta_1SC+\delta_2TC+\delta_3Size+\delta_4Lev+\delta_5TOP1+\delta_6ROA+\delta_7Cash+\delta_8Growth+\delta_9MP+\delta_{10}Age+\delta_{11}FI+\delta_{12}Soe+\delta_{13}Year+\varepsilon$

3. Research Design

3.1 Sample selection And Data Sources

In this paper, the relevant data of 993 listed companies in China's A-share manufacturing industry from 2015 to 2019 are selected as research samples, the supplier concentration data is derived from the CSMAR database supply chain research database, and the other data also comes from the CSMAR database-related sub-library. After manual finishing, the listed companies with missing key variables were eliminated, and the observations of st and ST listed companies were excluded. To control the effects of individual extreme values, Winsorize is processed at the upper and lower 1% levels for all continuous variables. Finally, 3372 observations were obtained from 993 listed companies.

3.2 Variable definition And Modeling

(1) The variable being interpreted:
The intensity of research and development expenditure, the current domestic scholars of enterprise research and development R and D measurement, mostly by the ratio of research and development expenditure to operating income to measure, or by the ratio of research and development expenditure to the total assets of enterprises. Taking into account the difference in the size of china's manufacturing listed companies, in order to more accurately measure the enterprise's research and development expenditure, the ratio of research and development expenditure to the total assets of the enterprise is used to eliminate the impact of enterprise size on research and development expenditure.

(2) Explain variables
Supplier concentration this paper refers to the practice of most scholars in China, and measures the relationship between enterprises and suppliers by the ratio of the purchase amount of the top five suppliers to the total purchase amount. In the robustness test, the sum of the squares of the top five supplier purchases as a percentage of total purchases was used: the Supplier Concentration Heffindahl Index to replace the Supplier Concentration SC.

(3) Mediation variables
Commercial credit financing includes commercial credit financing provided by suppliers to enterprises, and commercial credit financing provided by enterprises to customers. Because this paper studies the commercial credit financing provided by the supplier to the enterprise, it is used (accounts payable and notes payable - advance accounts) to measure the scale of commercial credit financing of enterprises, in order to eliminate the impact of enterprise size on commercial credit financing, this paper finally adopts (accounts payable and notes payable - advance accounts) / total assets to measure the commercial credit financing given by suppliers to enterprises

(4) Control variables

In order to measure the size of the enterprise, this paper takes the natural scale of the total assets of the enterprise to measure. The financial situation of an enterprise is measured by the ratio of assets and liabilities, the concentration of equity of the enterprise is measured by the proportion of the largest shareholder, and the annual net profit/average total assets of the enterprise are used to measure the profitability of the enterprise. At the same time, the cash holdings and operating income growth rate of enterprises are also used as control variables.

Table 1. The variable table

Variable Type	Variable Nameand definition	Variable Symbol	Variable Description
Explained variable	Intensity of research and development investment	RD	Research and development expenditure/total assets
	Supplier concentration	SC	The sum of the sales of the top five suppliers as a percentage of total sales
The mediation variable	Take up the vendor's commercial credit	TC	(Accounts Payable and Notes Payable - Prepaid Accounts) / Total assets
	The size of the company	Size	ln(Total assets)
	Financial leverage	Lev	Asset-liability ratio
	Equity concentration	Top1	The proportion of shares held by the largest shareholder
	Return on total assets	ROA	Annual net profit/total assets of the company
	Cash holdings	Cash	Money funds/total assets at the end of the year
	Ability to grow	Growth	(Operating income for the current year - operating income for the previous year) / Operating income for the previous year
	Corporate market position	MP	(Operating income - operating costs - sales expenses - administrative expenses) / operating income
	Years of listing	Age	ln(Year of processing - year of listing)
	Feature density	F1	Dumb variables
	The nature of the property rights	Soe	Dumb variables
	The virtual variable of the year	Year	Dumb variables

4. Empirical Analysis

4.1Descriptive Statistics

The descriptive statistical table of the main variables in this article is shown in Table 2.

Table 2. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
RD	3732	0.048	0.034	0.001	0.196
TC	3732	0.128	0.094	-0.03	0.419
SC	3732	0.321	0.171	0.065	0.842
Size	3732	22.104	1.059	20.166	25.342
Lev	3732	0.401	0.176	0.073	0.839
Top1	3732	0.317	0.132	0.087	0.68
ROA	3732	0.04	0.06	-0.225	0.198
Cash	3732	0.157	0.097	0.023	0.51
Growth	3732	0.188	0.364	-0.441	2.028
MP	3732	0.109	0.098	-0.223	0.407
Age	3732	2.444	0.473	1.386	3.332

4.2 Correlation Analysis

The correlation analysis results are shown in Table

Table 3. Relevance analysis

	RD	SC	TC	Size	Lev	Top1	ROA	Cash
RD	1.000							
SC	-0.063***	1.000						
TC	0.222***	-0.116***	1.000					
Size	-0.109***	-0.176***	0.202***	1.000				
Lev	-0. 082***	-0.089***	0.489***	0.512***	1.000			
Top1	-0.031*	0.006	0.060***	0.092***	0.006	1.000		
ROA	0.116***	-0.026	-0.092***	0.014	-0.315***	0.148***	1.000	
Cash	0.106***	-0.001	-0.074***	-0.114***	-0.248***	0.032**	0.206***	1.000

***. Significant correlation on the .01 level (both sides).

From the table, we can draw the following conclusions:

(1) The research and development investment intensity of an enterprise has a correlation coefficient of 0.222 with commercial credit financing provided by the supplier, and is significantly positively correlated at the level of 1%, indicating that commercial credit financing has promoted the intensity of the enterprise's research and development investment to a certain extent.

(2) The correlation coefficient between supplier concentration and the intensity of the enterprise's research and development investment is -0.063%, and it is significantly negatively correlated at the level of 1%, indicating that the concentration of supplier restricts the intensity of the enterprise's research and development investment to a certain extent.

(3) The correlation coefficient between commercial credit financing and supplier concentration is -0.116, and it is significantly negatively correlated at 1%, indicating that the higher the supplier concentration, the less commercial credit is provided.

(4) In addition, the asset-liability ratio of the enterprise, the proportion of the largest shareholder's shareholding is significantly negatively correlated with the enterprise's research and development investment, the total asset return rate of the enterprise, the level of cash holding and the intensity of the factors are significantly positive with the strength of the enterprise's research and development

4.3 Regression Analysis

From the regression results of, it can be seen that column (1) supplier concentration SC and the enterprise's research and development investment intensity RD at the level of 1% significantly negative correlation, indicating that the higher the supplier concentration will inhibit the enterprise's innovation investment, hypothesis 1 is verified. As can be seen from column (2), the supplier concentration SC is negatively correlated with the enterprise's commercial credit financing TC at

the level of 1%, indicating that the higher the supplier concentration, the less commercial credit financing the enterprise can obtain. Hypothesis 2 is proven. As can be seen from column (3), commercial credit financing is significantly positively correlated with the intensity of research and development investment of enterprises at the level of 1%, indicating that commercial credit financing promotes the research and development expenditure of enterprises to a certain extent. Hypothesis 3 is proven. Column (4) reports the intermediary role of commercial credit financing, the absolute value of SC's regression coefficient has decreased, and at the level of 1%, indicating that commercial credit financing plays a part of the intermediary role in the negative correlation between supplier concentration and enterprise research and development expenditure.

The impact of supplier concentration on corporate research and development investment and the intermediary role of commercial credit financing. Limited to the length of the article, the regression result form is omitted. If necessary, please contact the author for it.

In order to test the true reliability of the regression results, SHHI (the sum of the total purchase volume of the top five suppliers accounted for the square of the total purchase amount), to replace the explanatory variable SC (the top five supplier procurement volume as the annual total purchase volume ratio), into the regression model, the regression results compared with the previous, there has been no substantial change, indicating that the regression model is still sound.

5. Conclusions and Revelations

Based on the theory of financing constraints, this paper examines the impact of supplier concentration on commercial credit financing and research and development investment through the study of 3732 observations of 993 manufacturing listed companies. The main conclusions include: (1) the concentration of suppliers on the enterprise's research and development investment at the level of 1% significantly negative correlation. (2) The higher the concentration of suppliers, the less commercial credit financing can be provided to purchasing enterprises. (3) The scale of commercial credit financing is positively related to the intensity of research and development investment of enterprises to a certain extent. (4) Supplier concentration reduces the intensity of research and development investment by suppressing commercial financing provided to enterprises.

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