

Impact of Supplier Concentration on R&D Investment

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Abstract. This paper constructs a multiple regression model to study the relationship between supplier concentration, financial flexibility and corporate R&D investment using the data of A-share manufacturing listed companies in China from 2014-2022 as the research sample. The research results show that: supplier concentration is negatively related to corporate R&D investment; financial flexibility can mitigate the negative effect of supplier concentration on R&D investment to a certain extent, and cash flexibility has a better moderating effect than debt flexibility. Further study finds that supplier concentration has a stronger negative relationship with corporate R&D investment in state-owned enterprises and durable goods industry. This paper has some insights for supplier relationship management and financial resource management in manufacturing industry.

Keywords: Concentration of Suppliers, Financial flexibility, R&D.

1. Introduction

Nowadays, there are a variety of products and services in the market, and competition is gradually increasing. Therefore, various industries have gradually started to pay attention to how to improve their own innovation ability, so as to obtain the active position in the fierce market competition. The report of the 19th National Congress pointed out that in order to improve the country's position in the world market competition and accelerate the construction of a country with a modern economic system, innovation must be an important strategy to promote national development. 2023 government work report again stressed the importance of scientific and technological innovation, to further promote the research and development of key core technologies, and promote the optimization and upgrading of industrial structure. In order to achieve this goal, it is necessary to give full play to the main role of enterprises in promoting national technological innovation and facilitating the country's economic development. Enterprises in all industries accelerate the innovation process to promote industrial upgrading is the key to the country's modernization and transformation.

For a company, its R&D and innovation activities are influenced not only by its internal governance structure and external macro environment, but also to some extent by its suppliers or customers who are closely related to the company's daily transactions. The suppliers provide the raw materials needed for the company's production and have a pivotal role in the whole production process of the company, which will have a greater impact on the company's business risks and capital status, thus affecting the R&D innovation activities of the company [1]. At present, scholars at home and abroad have been relatively mature in their research on the factors influencing corporate R&D investment. However, most of the studies are from macro environment perspectives such as technology environment, economic development, politics and law, and enterprise micro perspectives such as property rights nature, equity concentration, and executive incentives. Fewer scholars have studied how suppliers or customers, which are closely related to the daily production and operation of enterprises, would affect the R&D activities of enterprises. Therefore, it is necessary to investigate whether and how corporate R&D investment is affected by the concentration of suppliers. In order to mitigate the adverse impact of the external environment, many companies are beginning to realize the importance of financial flexibility reserves. Adequately funded enterprises are more likely to adjust their business to environmental changes in a timely manner when facing sudden changes in the future production and operation environment, and are less adversely affected; they are also conducive to grasp future investment opportunities in a timely manner when facing them. Therefore, companies

with higher financial flexibility reserves may also be more aggressive in the face of R&D activities that are beneficial to their long-term development. In view of this, this paper investigates the impact of supplier concentration on R&D expenses and analyzes whether financial flexibility can regulate the relationship between the two to a certain extent, which can better help companies develop supplier relationship management strategies and financial resource management strategies to promote corporate innovation and development.

2. Literature Review

2.1. Supplier Concentration and Corporate R&D Investment

From the existing literature, there are few studies on the impact of supplier concentration on R&D investment and there are different views. On the one hand, it is argued that an increase in supplier concentration negatively affects R&D investment, and scholars who hold this view analyze it from three main perspectives. One is from the perspective of resource heterogeneity: Wuyts and Dutta (2014) take external heterogeneous resources as a research perspective and argue that firms can obtain external heterogeneous resources needed for innovation from suppliers, and if firms have cooperative relationships with a larger number of purposeful suppliers, it is easier for firms to obtain external resources in different fields, thus increasing their motivation for R&D innovation. Second, from the perspective of bargaining power: Zhang et al. (2020) found that a higher concentration of suppliers brings about a weakening of the firm's bargaining power, which undermines the firm's profitability and exacerbates financial constraints. Firms have to increase their cash holdings to cope with the worsening financial constraints, and therefore firms limit their R&D and innovation activities. Zhou Xueru (2017) finds that a smaller number of suppliers with whom a firm mainly cooperates increases the firm's dependence on large suppliers, which leads to a weaker bargaining power of the firm during the transaction between the two parties, on the one hand, the supplier may refuse the firm to purchase on credit or refuse to pay in installments to reduce the commercial credit offered to the firm, and on the other hand, the supplier may also impose On the other hand, the supplier may also adopt a more stringent payment method to the enterprise. And companies can only be forced to accept it, so they must maintain a certain level of cash holdings to cope with this risk, and will be more cautious in the face of investment opportunities, and will appropriately curtail investments in R&D innovation with uncertain payback times to avoid further financing pressure. Third, from the perspective of dedicated assets: according to Ren Lili and Zhang Ruijun (2019), when a company mainly relies on fewer suppliers to purchase raw materials, it has a supplier relationship at this time, and the company has a strong incentive to make relationship-specific investments; once the supplier is changed, the relationship-specific assets will depreciate significantly, and the business risk of the company increases, and the management may reduce going to invest in some Management may be less likely to invest in riskier projects, such as R&D, to control overall risk levels.

On the other hand, a few scholars argue that increased supplier concentration positively affects R&D investment. Yang and Wang (2021) study from the perspective of commercial credit and argue that firms can increase their supplier concentration by increasing their purchasing volume and improving their purchasing concentration to enhance their friendly and cooperative relationship with suppliers, thus gaining more commercial credit, which in turn allows them to make deferred payments. Commercial credit can alleviate their financing difficulties and allow firms to have more idle funds for daily operations and R&D activities.

2.2. Financial Flexibility and Corporate R&D Investment

There are two main views in the existing literature on the impact of financial flexibility on R&D investment. One view is that a firm with a relatively high reserve of financial flexibility makes it easier for management to engage in risk-averse decision making behavior. If a firm has more cash holdings and residual debt capacity, then decision makers will perceive changes in the external environment as having a relatively weak impact on the firm, and the firm will be less negatively

affected by adverse shocks, and thus will be more willing to invest in things such as R&D innovation. For example, Steensma and Corley (2001) and Wayne et al. (2003) found that enhancing firms' financial flexibility reserves and maintaining a certain level of financial flexibility is conducive to increasing firms' R&D investment. The empirical results of Xiao et al. (2013) show that firms with higher levels of financial flexibility invest more in R&D in the next two to three years and their better corporate performance. Another view is that financial flexibility reserves do not necessarily increase firms' R&D investment. A study by Xu Ling and Feng Qiaogen (2015) found that if firms just rely on lower debt levels to maintain financial flexibility, it is instead detrimental to R&D investment. Yang Ting (2017) studied two different sources of financial flexibility separately and found that cash flexibility and debt flexibility only significantly play their role in promoting R&D investment when firms face economic downward pressure. Cui Yeguang and Yu Xiaowei (2019) also conducted a study based on the perspective of financial flexibility policy selection and found that if a firm only relies on a lower gearing ratio to maintain a certain level of external financing ability does not promote R&D investment, and only through a certain level of cash reserves or both will it significantly promote R&D investment.

In summary, there are still few studies on the influence of supplier concentration on R&D investment, and the views are not yet unified; while the studies on the influence of financial flexibility on R&D investment are still divergent and the views are not yet unified, and it is necessary to conduct an in-depth study on whether financial flexibility can play a moderating role in the relationship between supplier concentration and R&D investment.

3. Theoretical Analysis and Hypothesis Development

3.1. Supplier Concentration and Corporate R&D Investment

Supplier concentration may have an impact on the R&D investment of enterprises in the following aspects. First, supplier bargaining power: when the suppliers of an enterprise are relatively concentrated, the enterprise purchases most of the raw materials needed for production from a few suppliers, when the suppliers will have a higher voice in the negotiation process between the two parties and a higher bargaining power, which is more likely to encroach on the enterprise's profits [13]. This will inevitably have a very negative impact on the profitability and operating conditions of the enterprise, thus worsening the internal financial situation of the enterprise. Therefore, corporate management will be more cautious when faced with investments, and R&D innovation being a high-risk activity, companies need to invest in it for a long period of time, when they may appropriately reduce their R&D investments. In addition, due to the increased bargaining power of suppliers, suppliers may require companies to provide guarantees for the stability of their own earnings, thus limiting companies to invest in some high-risk projects. Second, resource heterogeneity perspective: innovation comes from the recombination of different resources, and when a firm has more heterogeneous resources, the firm can make more innovations. The resources of each enterprise are accumulated over a long period of time and are irreplaceable and different, regardless of whether they belong to the same industry or technology field [14]. Companies can obtain such heterogeneous resources internally or externally, and when they have abundant heterogeneous resources, they can provide motivation for their R&D activities [15]. When the number of suppliers is small, firms can obtain less heterogeneous resources from their suppliers, which is not conducive to firm innovation. Third, from the perspective of relationship-specific investment: when the number of major cooperative suppliers is small and the importance is relatively high, enterprises have a strong incentive to make relationship-specific investments to maintain a stable and long-lasting cooperative relationship between the two parties, and the change of suppliers will cause a rapid depreciation of relationship-specific assets, which will result in huge sunk costs for enterprises and will also generate switching costs to find new suppliers, which will furthermore have a negative impact on enterprises' The change of suppliers will cause rapid depreciation of relationship-specific assets, resulting in significant sunk costs and switching costs to find new suppliers. The management of a company will

tend to hold more capital and control risks, and will be more cautious about investment activities such as R&D, and will tend to limit such investments. Therefore, the following hypotheses are proposed in this paper:

Hypothesis 1: Supplier concentration is negatively related to corporate R&D investment.

3.2. The Moderating Role of Financial Flexibility

The small number of suppliers with whom the firm mainly cooperates increases the bargaining power of suppliers and thus increases the business risk of the firm. Financial flexibility, on the other hand, helps firms to respond to adverse shocks from external environments and to mobilize resources in a timely manner when faced with investment opportunities [5]. Therefore, firms with higher financial flexibility are likely to be less affected by the adverse effects of higher supplier concentration. First, if a firm has a low gearing ratio and has some debt flexibility, it indicates that the firm has some advantage in debt financing and can raise funds through exogenous means. Then, when the improvement of the bargaining power of suppliers and the requirement of the enterprise to reduce the investment in R&D, the enterprise will play a certain buffer role in this relationship because it faces less capital pressure and can grasp the investment opportunity in time. In addition, a large amount of capital investment is an important guarantee for a company to carry out R&D activities, and a company with cash flexibility means that it can finance its R&D activities from internal financing. When the concentration of suppliers is relatively high, it means that the raw materials provided by suppliers are important to the production process of the company, and the company will make more relationship-specific investments at this time. Relationship-specific investments can bring more risk to the firm because of the specificity of its assets, when the firm needs to reserve more discretionary cash to deal with the negative effects of this risk [5]. If a firm has less cash reserves, the firm does not have too much money to invest in R&D, while if a firm has more cash reserves, it can still invest in R&D after cushioning against adverse shocks. Therefore, we propose the following hypothesis:

Hypothesis 2: Financial flexibility can mitigate the negative effect of supplier concentration on firms' R&D investment.

4. Research Design

4.1. Sample Selection and Data Sources

This paper uses the data of China's A-share listed manufacturing companies from 2014-2022 as the research sample. Some observations were excluded according to the following criteria: (1) excluding the sample of companies that were ST/PT during the sample period; (2) excluding the data of insolvent samples; (3) excluding the data of the year of company IPO; (4) excluding the samples with missing relevant variables and abnormal data, and finally obtaining 7494 valid samples; (5) applying the upper and lower 1% tail reduction to the continuous variables at the company level to eliminate the effect of extreme values.

4.2. Variable Definitions

4.2.1 Explanatory variable R&D investment

In this paper, we refer to the studies of Shi Hao et al. (2005), Yunguo Liu and Wen Liu (2007), and Weimin Xie and Hongxing Fang (2011) to measure the explanatory variable R&D investment (RDI) by the ratio of firms' R&D expenditure to operating revenue, and the robustness indicator is R&D expenditure/total assets (RDI2).

4.2.2 Variables supplier concentration

Referring to the studies of Tang Yuejun (2009), Ren Lili and Zhang Ruijun (2019) and others, this paper adopts the purchasing ratio of the top five suppliers to measure supplier concentration (SC).

The robustness index uses the purchasing ratio of the first largest supplier (SC_1) and the supplier concentration Herfindahl index (SC_HHI) [5].

4.2.3 Reconciling variable financial flexibility

In the existing literature, the measures of financial flexibility basically combine the level of cash holdings and the level of debt of the firm. Zeng Aimin et al. (2011) used cash reserve level and gearing ratio compared with the average value of the same industry to measure corporate financial flexibility, and most scholars also largely adopted this approach. Chen Hongbing and Lian Yujun (2013) use cash estimation model and leverage estimation model to estimate the level of cash holdings and financial leverage of firms and compare them with the actual values to measure whether firms are financially flexible. This paper draws on Zeng Aimin et al.'s (2011) measure of financial flexibility, which is financial flexibility (FF) = cash flexibility (CF) + debt flexibility (DFF). Cash flexibility (CF) = corporate cash holding ratio - average cash holding ratio of the same industry, reflecting the level of excess cash holding, where cash refers to cash and cash equivalents; debt flexibility (DFF) = MAX (industry average gearing ratio - corporate gearing ratio, 0), reflecting the residual debt raising capacity of the company.

4.2.4 Control variables

Referring to the studies of Zeng Aimin (2011), Ren Lili and Zhang Ruijun (2019) and others, other factors that may have an impact on firms' R&D investment are taken into account. In this paper, we select Size (natural logarithm of total assets), Age (ln (1 + time to market)), Lev (total liabilities/total assets), RGA (increase in operating income in the current period/operating income in the previous year), ROA (net profit/average net assets), Cfo (operating cash flow net/total assets), SOE (1 state-owned enterprises, 0 non-state-owned enterprises), and TQ (total assets + market value of equity - book value of equity)/total assets are used as control variables. In addition, this paper controls for Industry and Year.

4.3. Model Design

To test the effect of supplier concentration on R&D investment, model (1) is constructed in this paper:

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

To examine the moderating role of financial flexibility in the relationship between supplier concentration and R&D investment, model (2) is constructed by adding the cross product term of financial flexibility and supplier concentration (SC*FF) to model (1):

$$RDI_{i,t} = \gamma_0 + \gamma_1 SC_{i,t} + \gamma_2 FF_{i,t} + \gamma_3 SC_{i,t} \times FF_{i,t} + \gamma_4 Controls_{i,t} + \sum Industry_{i,t} + \sum Year_{i,t} + \mu_{i,t} \quad (2)$$

5. Empirical Results and Analysis

5.1. Descriptive Statistics

Table 1 provides the results of descriptive statistics for each variable. The mean and median values of R&D investment (RDI) are 4.383% and 3.710%. Overall, the share of R&D investment in China's manufacturing industry is relatively low, and the enthusiasm of R&D innovation is not high. The mean value of purchasing ratio (SC) of enterprises to the top five suppliers is above 30%, which indicates that for the whole manufacturing industry, enterprises purchase from one or a few less suppliers in a high proportion, and there is a problem of relying on major suppliers. The mean value of financial flexibility (FF) is 10.23% and the standard deviation is 19.08%, which shows that for Chinese manufacturing enterprises, they have gradually realized the importance of maintaining a certain level of financial flexibility. The maximum value of financial flexibility (FF) is as high as 72.25%, while the minimum value is only -18.23%, which is a large difference in the level of financial flexibility reserves for different companies. Looking at the two different sources of financial

flexibility separately: with a mean value of -0.889%, firms' cash flexibility (CF) is, on average, a relatively insufficient reserve of cash flexibility. From the perspective of the average value of debt flexibility (DFF), on average, the enterprise gearing ratio is lower than the average value of the same industry by about 11.12%, and on the whole, China's manufacturing enterprises have a certain amount of debt flexibility in reserve.

Table 1. Descriptive statistics

Variables	N	Mean	SD	Min	Median	Max
RDI	7,494	4.383	3.244	0.070	3.710	18.77
SC	7,494	33.26	17.70	6.550	29.35	87.33
FF	7,494	10.23	19.08	-18.23	5.767	72.25
CF	7,494	-0.889	11.39	-19.17	-3.399	38.52
DFF	7,494	11.12	12.11	0	7.374	42.66
SIZE	7,494	21.93	1.037	20.06	21.80	25.09
Age	7,494	1.969	0.712	0.693	1.946	3.219
Lev	7,494	37.63	18.09	5.048	36.89	79.89
RGA	7,494	17.53	34.77	-42.79	11.56	207.4
ROA	7,494	6.947	9.727	-38.30	6.772	33.50
Cfo	7,494	5.013	6.256	-12.36	4.761	22.52
SOE	7,494	0.232	0.422	0	0	1
TQ	7,494	2.872	1.935	0.887	2.247	10.99

5.2. Correlation Analysis

Table 2 shows the results of the Pearson correlation test between the variables. From the results of the specific correlation test, the correlation coefficient between firms' R&D investment (RDI) and supplier concentration (SC) is -0.06 with a significance level of 0.01. This is a preliminary indication that to a certain extent high supplier concentration reduces firms' R&D investment, which is a preliminary proof of Hypothesis1.

Table 2. Correlations

	RDI	SC	FF	SIZE	Age	Lev	RGA	ROA	Cfo	SOE	TQ
RDI	1										
SC	-0.06***	1									
FF	0.19***	0.13***	1								
SIZE	-0.22***	-0.21***	-0.34***	1							
Age	-0.21***	-0.09***	-0.29***	0.48***	1						
Lev	-0.25***	-0.12***	-0.70***	0.48***	0.32***	1					
RGA	-0.02	0.00	-0.05***	0.07***	-0.08***	0.04***	1				
ROA	-0.05***	-0.07***	0.13***	0.12***	-0.09***	-0.18***	0.31***	1			
Cfo	-0.07***	-0.02*	0.15***	0.06***	0.03***	-0.15***	-0.02**	0.39***	1		
SOE	-0.10***	-0.04***	-0.15***	0.31***	0.46***	0.27***	-0.09***	-0.07***	-0.02*	1	
TQ	0.24***	0.08***	0.22***	-0.39***	-0.23***	-0.35***	0.14***	0.17***	0.10***	-0.19***	1

5.3. Analysis of Regression Results

The results of the empirical test of supplier concentration on R&D investment are shown in column (1) in Table 3, the correlation coefficient between the firm's R&D investment (RDI) and supplier concentration (SC) is -0.0076, the significance level is 0.01, and Hypothesis 1 passes the validation. When the supplier concentration of an enterprise is relatively high, it means that the enterprise mainly carries out large-scale centralized purchasing, and the enterprise will also have a high degree of dependence on its suppliers. Therefore, in the process of transactions between the two parties, suppliers have an advantage in bargaining power, and suppliers may encroach on the profits of the enterprise by reducing the commercial discounts given to the enterprise, prolonging the delivery time, increasing the price of materials, etc., and transferring risks, which will have a negative impact on the production and operation of the enterprise, and then weaken the enterprise's motivation to carry out R&D activities. Secondly, the specialized attributes of relationship-specific assets mean that the

rupture of the trading relationship will significantly depreciate the value of the asset, increasing the risk of the enterprise, which is unfavorable to the enterprise's R&D. In addition, suppliers are an important source of knowledge and technological information for firms, and high supplier concentration means that firms have less access to heterogeneous resources, which also reduces their R&D activities.

Regarding the control variables, the coefficient of gearing ratio (Lev) is significantly negative, indicating that if the proportion of external borrowing in the total assets of an enterprise is high, it may be limited in external financing and the enterprise does not have too much money to invest in R&D. The coefficients of R&D investment (RDI) and enterprise age (Age) are also significantly negative, indicating that those enterprises that have been listed for a long time and are large in size lack vitality in their development after entering the maturity period, and their development thinking may tend to be conservative, blindly indulging in the results of previous research, which will have a negative impact on enterprise innovation. While those smaller and lighter enterprises may pay more attention to enterprise R&D innovation in order to make the enterprise develop better and occupy the market position. There is a negative correlation between cash flow from operations (Cfo) and R&D investment (RDI) at the level of 0.01. Firms with good operating conditions are in a period of growth, and the firms need to make large additional investments in other business development to capture more market share, which may lead to a reduction in R&D investment. The coefficient of the nature of ownership (SOE) is significantly positive, indicating that the intensity of R&D investment is higher in state-owned enterprises relative to non-state-owned enterprises. The coefficient of Tobin's Q (TQ) is significantly positive at the 0.01 level, indicating that those firms with better growth are more active in R&D and innovation activities.

The results of the empirical test of the moderating effect of financial flexibility are shown in column (2) of Table 3, and the correlation coefficient between R&D investment (RDI) and the cross-multiplier term ($SC*FF$) is 0.0005, which is significant at the 0.01 level. It indicates that the reserve of financial flexibility can effectively mitigate the negative impact of excessive supplier concentration on firms' R&D investment, proving Hypothesis 2.

Further, we examine financial flexibility by dividing it into cash flexibility and liability flexibility. Firms can obtain financial flexibility in terms of cash flexibility by holding excess cash, or in terms of liability flexibility by reducing the level of gearing. Both of them reflect the ability of enterprises to obtain funds from endogenous and exogenous aspects respectively, and it is necessary to do further research on how the effects of cash flexibility and liability flexibility are different. Replacing the financial flexibility indicator (FF) in model (2) with cash flexibility (CF) and debt flexibility (DFF), the regression results are shown in columns (3) and (4) of Table 3. The results show that the coefficients of both $SC*CF$ and $SC*DFF$ are positive at the level of 0.01, but the regression coefficient of the former is larger, which indicates that both cash flexibility and liability flexibility can effectively mitigate the negative correlation between supplier concentration and R&D intensity, but the moderating effect of cash flexibility is better than that of liability flexibility.

Table 3. Supplier Concentration, Financial Flexibility and R&D

Variables	(1) RDI	(2) RDI	(3) RDI	(4) RDI
SC	-0.0076*** (-2.97)	-0.0093*** (-3.63)	-0.0085*** (-3.34)	-0.0086*** (-3.36)
FF		0.0137*** (4.17)		
SC*FF		0.0005*** (4.58)		
CF			0.0153*** (3.98)	
SC*CF			0.0010*** (5.30)	
DFF				0.0128 (1.63)
SC*DFF				0.0005*** (2.64)
SIZE	-0.0522 (-0.94)	-0.0762 (-1.38)	-0.0636 (-1.15)	-0.0664 (-1.19)
Age	-0.6386*** (-8.43)	-0.6183*** (-8.16)	-0.6142*** (-8.11)	-0.6392*** (-8.43)
Lev	-0.0330*** (-11.67)	-0.0206*** (-5.36)	-0.0293*** (-10.08)	-0.0241*** (-4.31)
RGA	0.0001 (1.29)	0.0001 (1.15)	0.0001 (1.25)	0.0001 (1.20)
ROA	-0.0184*** (-6.00)	-0.0174*** (-5.68)	-0.0185*** (-6.05)	-0.0173*** (-5.51)
Cfo	-0.0229*** (-3.38)	-0.0259*** (-3.82)	-0.0267*** (-3.94)	-0.0227*** (-3.35)
SOE	0.3627*** (3.12)	0.3225*** (2.77)	0.3265*** (2.81)	0.3521*** (3.02)
TQ	0.2054*** (8.22)	0.1995*** (8.00)	0.2025*** (8.13)	0.2022*** (8.09)
Industry	YES	YES	YES	YES
Year	YES	YES	YES	YES
_cons	4.5313*** (3.21)	4.0180*** (2.88)	4.1616*** (2.99)	4.1168*** (2.92)
N	7494	7494	7494	7494
F	46.48	45.81	45.96	44.93
R ²	0.2343	0.2389	0.2395	0.2354

5.4. Robustness Tests

This paper uses several methods to conduct robustness tests. (1) Replacing the explanatory variables and measuring R&D investment by the ratio of R&D investment to total assets, the regression results are shown in column (1) (2) of Table 4, and the regression results are consistent with the results of the previous study. (2) Replace the explanatory variables and re-measure supplier concentration with the ratio of purchasing from the first largest supplier (SC_1) and supplier concentration Herfindahl index (SC_HHI). The regression results are shown in columns (3) (4) of Table 4, with correlation coefficients of -0.0074 and -0.0002, which are significantly negative at the 0.05 and 0.01 levels, respectively. All the above robustness test results indicate that the findings are reliable.

Table 4. Robustness Tests

Variables	(1) RDI2	(2) RDI2	(3) RDI	(4) RDI
SC	-0.0118*** (-3.52)	-0.0130*** (-3.83)		
FF		0.0210** (2.02)		
SC*FF		0.0005* (1.96)		
SC_1			-0.0074** (-2.07)	
SC_HHI				-0.0002*** (-3.35)
Controls	YES	YES	YES	YES
Industry	YES	YES	YES	YES
Year	YES	YES	YES	YES
N	7494	7494	7494	7494
F	28.80	27.87	46.36	46.55
R ²	0.1593	0.1604	0.2338	0.2345

6. Conclusion

This paper focuses on how supplier concentration affects the R&D investment of listed companies in China's manufacturing industry, and analyzes how financial flexibility has a moderating effect on the relationship between the two. It is found that the R&D investment of manufacturing companies decreases with the increase of supplier concentration. The reserve of financial flexibility can mitigate the negative impact of higher supplier concentration on R&D investment to some extent. Further, both cash flexibility and liability flexibility can significantly contribute to firms' R&D investment intensity and mitigate the negative impact of supplier concentration on firms' R&D investment, but cash flexibility is more effective than liability flexibility. Based on the findings of the study, the following recommendations are made: (1) Enterprises can increase the number of suppliers they can choose from and maintain an appropriate level of supplier concentration by looking for more suppliers, so as to improve their bargaining power and diversify risks. Enterprises cooperating with a larger number of suppliers can effectively reduce the business risks brought by higher supplier concentration, and also help enterprises to obtain more heterogeneous resources from the outside and fully absorb the heterogeneous resources brought by suppliers. Diversified suppliers are more conducive to the development of enterprise R&D and innovation activities than a single concentrated supplier. (2) Enterprises can better adapt to the complexity of the environment by maintaining an appropriate level of financial flexibility. For enterprises, reserving too high a level of financial flexibility may bring a certain opportunity cost, resulting in financial redundancy; however, maintaining an appropriate level of financial flexibility can help enterprises to adjust their business in a timely manner to better cope with negative shocks in the event of unfavorable changes in the operating environment in the future, which is also conducive to grasping the investment opportunities in a timely manner in the face of the investment opportunities, and to a certain extent can alleviate the operational risks brought by the higher supplier concentration to the enterprise, which has a certain degree of flexibility. It can also help enterprises grasp investment opportunities in a timely manner, and to a certain extent mitigate the business risks brought by higher supplier concentration, which has certain positive impacts.

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