Corporate Financialization and Corporate Innovation: Promotion or Inhibition-Base on Data Analysis

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Abstract. Facing the new situation of complex changes at home and abroad, innovation plays an important role in the process of enterprise development. Due to the rise of financial investment activities, enterprises are becoming more and more financialized, how does corporate financialization affect corporate innovation? This paper selects data of non-financial listed companies in China's Shanghai and Shenzhen A-shares from 2007–2019 as a sample to investigate what impact exists between corporate financialization and corporate innovation and the variability of this impact among different types of companies. The results of the study find that corporate financialization inhibits the level of innovation, and the inhibitory effect of financialization on the level of innovation is more pronounced among firms with poor internal control quality, non-eastern regions, and weak growth. The results of this paper enrich the research on the impact of corporate innovation and provide a reasonable reference for managers to make business decisions.

Keywords: Corporate Financialization · Corporate Innovation · Smoothing Effect · Crowding Out Effect · A-Share Listed Companies · Data Analysis

1 Introduction

As China's economic development enters a new normal and a new stage, and in the face of the new situation of complex changes at home and abroad, innovation plays an important role in the process of enterprise development. In the report of the 19th Party Congress, it is pointed out that "China's economy has shifted from the stage of high-speed growth to the stage of high-quality development, and innovation is the first driving force leading development and the strategic support for building a modern economic system." In this critical stage, enterprises, as the most basic subject of market activities, contribute the main force for the realization of R&D innovation and transformation of achievements [14]. Since the innovation development strategy was officially written into the "Opinions of the State Council of the Central Committee of the Communist Party of China on Deepening the Reform of Institutional Mechanisms to Accelerate the Implementation of the Innovation-driven Development Strategy" (later referred to as "Opinions") in 2015, the level of corporate innovation investment in the country has shown an obvious

D. Qiu et al. (Eds.): ICBBEM 2022, AHIS 5, pp. 1218–1239, 2023.
https://doi.org/10.2991/978-94-6463-030-5_122

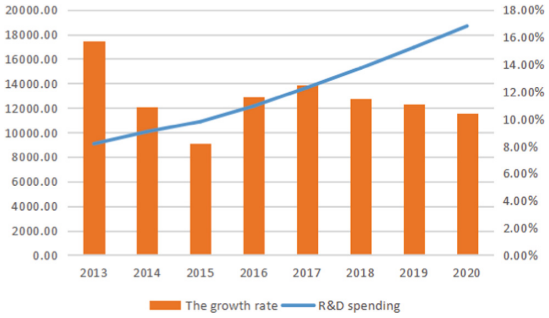

Fig. 1. Evolution of R&D funding growth rate. (Author's self-painting)

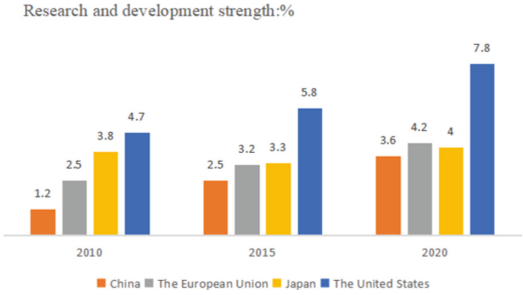

Fig. 2. Comparison of R&D intensity by country (Author's self-painting)

growth trend. According to the data, the level of enterprise innovation investment from 2013 to 2015 showed a decreasing trend, while R&D funding achieved rapid growth in the short term after the introduction of the Opinions in 2015, and showed a steady growth in the long term, with the growth rate of R&D funding basically maintained at 11% (Fig. 1).

Although the innovation level of domestic enterprises is steadily improving, there is still a distance compared with developed countries. According to Wind database and relevant data released by the World Bank, the R&D intensity of Chinese enterprises has grown from 1.2% in 2010 to 3.6% in 2020 (R&D intensity refers to the ratio of R&D expenditure to sales revenue), but it is still less than the R&D intensity of developed countries, and the R&D intensity of American enterprises today is as high as 7.8%, which is still more than twice of China's. Compared with the enterprises in developed countries Compared with the level of innovation in developed countries, there is still a certain gap in China (Fig. 2).

With the development of capital market, the phenomenon of insufficient willingness of enterprises to innovate and increased willingness of financial investment is becoming more and more obvious. Corporate financial investment activities are more active, and the phenomenon of financialization is common among listed companies. On the one hand, due to the rapid development of China's financial industry since the reform and opening up, the banking industry and the real estate industry have developed rapidly and become two profitable industries [18]; On the other hand, the development of China's enterprises

has faced the problems of overcapacity and products at the bottom of the industrial value chain, which directly leads to the compression of the profits of the enterprises' real business activities and the profits is much lower than the excess returns of investment in the financial market, thus leading to the The imbalance between the real economy and the virtual economy [2]. At the macro level, this phenomenon is reflected in the deepening of finance and the increase in the influence of the financial sector, which is called "de-realisation of the economy to the virtual". At the micro level, this phenomenon is reflected in the increasing activity of real enterprises in financial investments and the tendency of non-financial enterprises to financialize [16, 32]. Therefore, driven by the excess return rate, the allocation of financial assets by listed companies in China has shown a rising trend year by year, and financialization has become a common trend among listed companies [22].

The economic consequences of financialization on enterprises are richly researched, and most of the existing literature is analyzed from the theories of "reservoir" effect and "crowding out" effect. Based on the theory of "reservoir effect", enterprises use idle funds to make short-term financial investment in the capital market and increase the liquidity of their assets, so as to maintain and increase the value of their capital. To a certain extent, enterprises can revitalize their capital and prevent the capital chain breakage in their main businesses in the future. Almeida & Wolfenzon found that the degree of financial development is significantly and positively related to the efficiency of capital allocation, and the higher the degree of financial development, the higher the efficiency of capital allocation [1]. Liu Guanchun found that financial development under the financial system reform can alleviate the financing constraints of enterprises and promote the economic growth of real enterprises [8]. Yu Nutao et al. believe that short-term financial investment can improve the investment efficiency of enterprises in the future and truly realize financial services for entities, which is a concrete embodiment of the "reservoir" effect [30]. Theurillat (2010) believes that financialization is conducive to spatial utilization of resources, expansion of financing channels of enterprises and improvement of balance sheets [21].

Based on the theory of "crowding out" effect, in the case of limited resources, there is cash flow competition between different operating activities and investment activities, and the financial investment of enterprises will definitely crowd out the R&D and innovation investment of enterprises, so the investment in financial assets will show "crowding out" effect on R&D and innovation investment. Therefore, investment in financial assets will show a "crowding out" effect on R&D innovation investment. Sun et al. confirmed the "crowding out" effect of financial investment based on arbitrage motive from the perspective of cost stickiness [19]. Liu et al.found that financialization in the banking industry would exhibit a "crowding out" effect, thus inhibiting firms' innovation investment [9]. Zhang Zhao et al. concluded that the investment efficiency of real enterprises would be reduced by the crowding-out effect of corporate financialization [33]. Therefore, corporate financialization is like a virus that [12], on the one hand, reduces the productivity of enterprises and crowds out the real economy [5, 7], resulting in the hollowing out of the real industries of enterprises [13]. On the other hand, the crowding out of the main business by excessive financialization can increase the risk of

corporate share price, inhibit the sustained increase of share price, and even lead to the decline of share price [15].

It can be seen that financialization is a double-edged sword, which can have certain drawbacks while activating corporate capital, mobilizing corporate investment enthusiasm and reducing the degree of financing constraints. So, under the new situation, what kind of impact will financialization have on corporate innovation? The existing theories on the impact of financialization on corporate innovation are not conclusive, but scholars such as Shan Xu believe that financialization will boost corporate innovation investment and innovation performance, and the promotion effect will be more obvious in non-state enterprises [26]. Liu et al. suggest that the share of financial assets held is a "reservoir" effect, which helps to alleviate financing constraints and promote R&D innovation in the future [8]. Another view is that the financialization of enterprises will inhibit the technological innovation of enterprises, and the inhibiting effect on different types of technological innovation is different [34]. Wang and other scholars argue that firms are driven by the arbitrage motive to over-crowd their R&D investment, and there is a significant positive correlation between the two [22].

Although the above research on enterprise financialization and enterprise innovation has theoretical significance, it has not formed a unified view, so it still needs to be improved and studied in depth. Therefore, this paper takes the data of Chinese non-financial listed companies in Shanghai and Shenzhen A-shares from 2007–2019 as a sample to study what kind of relationship exists between corporate financialization and corporate innovation, and further analyzes, under the consideration of internal control, geographical distribution, and differences in corporate growth factors, the relationship between corporate financialization and corporate innovation, so as to enrich the research on the economic consequences brought by corporate financialization and also draw the industry's attention to the level of corporate innovation.

The main contributions of this paper are as follows: (1) Based on two opposing perspectives, this paper provides new empirical evidence for the debate on whether corporate financialization plays a "reservoir" effect or a "crowding out" effect on the level of corporate innovation; (2) The empirical analysis of this paper is based on the perspective of corporate financialization and enriches the literature on the factors affecting the level of corporate innovation. (3) This paper explores the role of corporate financialization on corporate innovation in different types of enterprises and the changes in the degree of the role, which helps to further clarify the relationship between financialization and the level of innovation and provides reference findings for the formulation of national financial policies.

The main structural arrangement of this paper: the first part is the introduction; the second part is the theoretical analysis and hypothesis formulation; the third part is the research design; the fourth part is the empirical analysis; the fifth part is further analysis; and the last part is the conclusion and recommendations.

2 Theoretical Analysis and Hypothesis Formulation

2.1 The "Smoothing" Effect of Corporate Financialization on Corporate Innovation

Corporate innovation is a long-term activity with high risk and uncertainty, and it is often constrained by a variety of factors. For example, the amount of a firm's own innovation investment, the technical level of its R&D team [17], the amount of innovation resource reserves, organizational system innovation [4], firm size, corporate culture, and equity structure [11]. However, these factors tend to be attributed to financing constraints. Ju et al. found that the financial distress of firms, namely high external financing costs and high adjustment costs can limit innovation activities, which is an important factor that hinders firms' innovation [6].

The financialization of enterprises has the function of reservoir [2], through the allocation of financial assets, enterprises can obtain excess return, broaden financing channels, alleviate financing constraints, and create a sufficient financial base for innovation activities. In addition, innovation activities are characterized by high adjustment costs and long return cycles [14]. In contrast to the "short-term" characteristics of financial investment, the financialization of enterprises is characterized by short return cycles and high rates of return. By allocating financial assets, enterprises can generate cost-of-capital effects, which can ensure the value of capital on the one hand, and achieve capital appreciation on the other hand to obtain more funds, thus reducing the external financing costs of enterprises and smoothing the defects of high adjustment costs of innovation activities. Ju and other scholars found that in order to mitigate risks, enterprises will choose innovation activities with low adjustment costs as much as possible to reduce adjustment cost losses [6]. In addition, cash is the guarantee for enterprises to achieve sustainable development, but cash itself cannot achieve capital appreciation [17]. Therefore, corporate financialization can smooth out the shortcomings of corporate innovation in terms of financing constraints, high adjustment costs, and high return cycles, thus promoting the level of corporate innovation.

2.2 The "Crowding Out" Effect of Financialization of Enterprises on Enterprise Innovation

The financialization of enterprises has a "crowding out" effect [2], and the large allocation of financial assets tends to crowd out the innovation level of enterprises. First, based on the theory of market arbitrage motive, financial investment by enterprises will take up a certain amount of innovation research and development funds in the case of limited resources [22]. Because financial investment has the advantages of high yield and high realizability, it will increase management's dependence on financial investment, thus reducing the willingness and motivation of corporate innovation activities and inducing management to over-crowd innovation R&D funds. The further development of financialization will lead to a strong short-term profit-seeking mentality of management, so that enterprises will rely more on gaining income through financial investment, allocating a large amount of assets to short-term financial investment activities and abandoning long-term innovation and R&D investment [29].

Second, Interest game theory suggests that enterprises are generally influenced by management, shareholder level, and investors in the process of business decision making. In the case of separation of ownership and operation of a firm, when executives are faced with the decision of whether they should maximize operating profits or shareholders' interests, they are often compelled by their principal-agent duties to value shareholders' interests and ignore the long-term development interests of the firm, resulting in less willingness to take the risks of innovative activities [3, 6]. As a result, management will be more willing to make a large number of high-yield financialized investments, thus crowding out investments in innovative activities with high costs and uncertain returns.

Finally, based on liquidity management theory, cash is the potential for continuous R&D and innovation of enterprises, but holding cash can hardly realize capital appreciation. If a company invests capital in innovation and R&D, the high sunk cost and irreversibility of capital increase the business risk of the company, and the success or failure of innovation is uncertain. The financial assets are considered to be "broad cash" and are managed in a comprehensive manner to achieve capital appreciation in the short term. Therefore, under liquidity management, companies will be more cautious in their innovation R&D activities, and financial investments will crowd out innovation investments.

Therefore, this paper argues that the financialization of firms may have a "crowding out" effect on firm innovation and thus inhibit firm innovation.

According to the previous discussion, it is shown that there are two opposing outcomes of the impact of corporate financialization on the level of corporate innovation. Based on this, the following competing hypotheses are proposed in this paper.

H1a: Other things being equal, the financialization of enterprises promotes the level of innovation of enterprises.

H1b: Other things being equal, the financialization of enterprises inhibits the level of innovation of enterprises.

3 Study Design

3.1 Sample Selection and Data Sources

This paper selects China's listed companies in Shanghai and Shenzhen A-shares as the research sample, and takes the data from 2007 to 2019 as the sample data. Screening was performed according to the following criteria: (1) Excluding data from ST and ST* category companies; (2) Excluding samples with missing variables and obvious errors; (3) Excluding listed companies in the financial industry and real estate industry. In order to prevent the influence of extreme values on the results, this paper takes Winsorize shrinkage of the sample variable values at 1% and 99% to ensure the stability of the results. All data in this paper are obtained from the CSMAR database, and stata16.0 software is used to conduct statistical and analysis on the sample data.

3.2 Variable Definition and Metrics

3.2.1 Explanatory Variables

Level of financialization *Fin*. This paper draws on Du, Yong et al. to express the level of financialization in terms of the proportion of financial assets held by firms [2]. In

this paper, financial assets for trading, derivative financial assets, net loans and advances granted, net available-for-sale financial assets, net held-to-maturity investments, and net investment properties are taken as the range of financial assets. The specific calculation formula is: $Fin1$ = (financial assets for trading + derivative financial assets + net loans and advances issued + net available-for-sale financial assets + net held-to-maturity investments + net investment in investment properties)/total assets. In order to ensure the accuracy of the results, this paper also adopts the second approach to measure the level of financialization by including trading financial assets, derivative financial assets, net short-term investments, net interest receivable, net dividends receivable, net available-for-sale financial assets, net held-to-maturity investments, net bought-back financial assets, other current assets, and net investment properties as the category of financial assets. The specific formula is as follows: $Fin2$ = (financial assets held for trading + derivative financial assets + net short-term investments + net interest receivable + net dividends receivable + net available-for-sale financial assets + net held-to-maturity investments + net bought-and-sold financial assets + other current assets + net investment properties) / total assets.

3.2.2 Explained Variables

Enterprise innovation *RD*. . According to the summary of existing studies, the current measurement of corporate innovation is mainly based on corporate innovation inputs and outputs. Innovation input is usually measured by the ratio of a company's annual R&D expenditure to its total assets, and innovation output is usually expressed by the total number of invention patents, utility models and design patents applied for or granted. Since corporate innovation investment is a long-lasting and long-term process, it is difficult to accurately measure the current innovation level of a company by only the number of invention, utility model and design patents applied for or granted. Therefore, this paper draws on Xiao study and adopts the proportion of R&D expenditures to total assets ($RD1$) as an indicator to measure the innovation investment of enterprises [28].

3.2.3 Control Variables

The control variables in this paper include eight indicators of firm age (*Age*), firm size (*Size*), gearing ratio (*Lev*), total assets return (*Roa*), board size (*Board*), independent director characteristics (Indir), operating cash flow (*CFO*), and equity concentration (Top10) as the control variables in this paper. In addition, this paper controls for the fixed effects of year (*Year*) and industry (*Ind*). Detailed definitions of specific variables are shown in Table 1.

3.3 Model Setting

To investigate the impact of corporate financialization on corporate innovation, the following model was developed for multiple regression analysis.

$$RD = \alpha_0 + \alpha_1 Fin + \lambda Control + IND + Year + \varepsilon \quad (1)$$

Table 1. Definition of variables.

Variable Type	Variable Name	Symbols	Variable Definition
Explained variables	Corporate Innovation	RD1	Enterprise innovation index, ratio of current R&D expenditure to total assets of enterprises
Explanatory variables	Corporate Financialization Indicators1	Fin1	Fin1 = (Trading financial assets + derivative financial assets + net loans and advances granted + net available-for-sale financial assets + net held-to-maturity investments + net investment properties)/total assets
	Corporate Financialization Indicator 2	Fin2	Fin2 = (Financial assets held for trading + derivative financial assets + net short-term investments + net interest receivable + net dividends receivable + net available-for-sale financial assets + net held-to-maturity investments + net bought-back financial assets + other current assets + net investment properties)/total assets
Control variables	Company Age	Age	The natural logarithm of the year of the sample minus the year of registration plus one
	Company Size	Size	Natural logarithm of the company's total assets at the end of the year
	Gearing ratio	Lev	Ratio of total liabilities to total assets
	Total Return on Assets	Roa	Amount of net profit after tax from financial investment income for the year as a percentage of total assets at the end of the year
	Board Size	Board	Natural logarithm of the number of board members
	Independent Director Characteristics	Indir	The proportion of the company's independent directors on the board of directors
	Operating cash flow	CFO	Operating cash flow/total assets
	Shareholding Concentration	Top10	Top 10 shareholders' shareholdings to total shares
	Year	Year	Virtual Variables
	Industry	Ind	Virtual Variables

In the above model, *RD* denotes the level of firm innovation, *Fin* denotes the level of firm financialization, and *Control* denotes the control variables selected for this paper. *IND* denotes industry fixed effects, *Year* denotes time fixed effects, and ε denotes residual terms. In addition, to ensure the robustness of the results, a series of robustness tests are conducted in this paper after the regression analysis.

4 Empirical Analysis

4.1 Descriptive Statistics

The results of descriptive statistics of the main variables in this paper are shown in Table 2. Their results show that: as can be seen from Table 2, the mean value of corporate innovation is 0.016, indicating that corporate R&D expenditures account for 1.6% of total assets. Some enterprises can reach the innovation level of 0.085, while there still exist enterprises with a level of 0, indicating that the level of corporate innovation varies somewhat among enterprises. The mean values of the two indicators measuring the financialization of enterprises *Fin*1 with *Fin*2 are 0.037 and 0.062, and the maximum values are 0.562 and 0.525, respectively, and the minimum values are both 0, indicating that there are large differences in the level of financialization among non-financial listed companies. Secondly, Table 2 shows that the highest level of financialization of enterprises reaches nearly 55%, which indicates that the tendency of financialization is more obvious in the strategic layout of enterprises.

4.2 Correlation Analysis

The correlation between the variables could not be seen through descriptive statistics, so this study conducted correlation analysis on the explanatory variables, explanatory

Table 2. Descriptive statistics

Variable Name	Sample size	Average value	Standard deviation	Median	Minimum value	Maximum value
*RD*1	10364	0.016	0.017	0.012	0.000	0.085
*Fin*1	10364	0.037	0.089	0.003	0.000	0.562
*Fin*2	10364	0.062	0.100	0.021	0.000	0.525
Lev	10364	0.438	0.225	0.427	0.046	0.945
Size	10364	22.024	1.388	21.808	19.370	27.001
Age	10364	16.704	4.891	16.000	7.000	31.000
Roa	10364	0.036	0.054	0.033	-0.185	0.196
Board	10364	2.261	0.180	2.303	1.792	2.773
Indir	10364	0.374	0.053	0.333	0.333	0.571
CFO	10364	0.040	0.073	0.040	-0.199	0.240
Top10	10364	57.949	15.882	59.080	21.680	91.110

variables, and control variables. The results in Table 3 show that the correlation coefficients of the indicators of financialization *Fin*1, *Fin*2 and the indicators *RD*1 of the level of corporate innovation are −0.194*** and −0.107***, both of which are significantly negatively correlated at the 1% level, which tentatively proves the research hypothesis H1b of this paper: all other things being equal, corporate financialization inhibits the level of corporate innovation.

4.3 Analysis of Multiple Regression Results

Table 4 presents the results of the multiple regressions of the indicators of firm financialization1 and the level of firm innovation. Column (1) reports the results of the multiple regression without the inclusion of control variables, where *Fin*1 the regression coefficient of corporate financialization is −0.038, which is significant at the 1% level. Column (2) indicates the results of the multiple regression with the inclusion of control variables, where *Fin*1 the regression coefficient of corporate financialization is −0.023, which is significant at the 1% level. Column (3) shows the results of the multiple regression after adding the control variables and considering the industry fixed effects and year fixed effects, in which *Fin*1 the regression coefficient of corporate financialization is −0.011, which is negative and significant at the 1% level, indicating that the level of financialization of non-financial enterprises has a negative moderating effect on corporate innovation, and as the level of financialization of non-financial enterprises increases, corporate innovation R&D investment will decrease. This further proves the hypothesis H1b that, all else being equal, the financialization of firms will inhibit the level of firm innovation.

Table 5 shows the results of the multiple regressions of firm financialization indicators2 and firm innovation level. Columns (1), (2), and (3) indicate the results without the inclusion of control variables, with the inclusion of all control variables, and with the inclusion of all control variables while considering industry fixed effects and year fixed effects, respectively, and the regression coefficients *Fin*2 of corporate financial indicators are −0.018, −0.016, and −0.008, in that order, and the results are all significantly negatively correlated at the 1% level, once again proving the hypothesis H1b. When we add variables, the increase of $adj.R^2$ index indicates that the variables selected in this study are appropriate.

4.4 Robustness Tests

In order to make the results more robust, this paper performs stability tests by both replacing the explanatory variables and replacing the samples.

4.4.1 Replace the Explanatory Variables

In this paper, drawing on Ju et al., the innovation input of enterprises does not only refer to *RD* expenditure, and *RD* expenditure as an input only reflects a small part of innovation activities, and human capital development, new technology introduction, digestion and absorption of enterprises are not reflected in *RD* [6]. Compared with RD, the increase of

Table 3. Correlation analysis.

	*RD*1	*Fin*1	*Fin2*	*Lev*	*Size*	*Age*	*Roa*	*Board*	*Indir*	*CFO*	*Top*10
*RD*1	1.000										
*Fin*1	−0.194***	1.000									
Fin2	−0.107***	0.721***	1.000								
Lev	−0.323***	0.141***	−0.045***	1.000							
Size	−0.234***	0.233***	0.093***	0.511***	1.000						
Age	−0.200***	0.196***	0.148***	0.238***	0.112***	1.000					
Roa	0.207***	−0.031***	0.053***	−0.404***	−0.031***	−0.098***	1.000				
Board	−0.097***	0.111***	0.007	0.209***	0.349***	0.059***	−0.027***	1.000			
Indir	0.017*	0.003	0.013	−0.025**	−0.013	−0.042***	−0.008	−0.497***	1.000		
CFO	0.121***	−0.057***	−0.012	−0.162***	0.063***	−0.032***	0.362***	0.028***	−0.021**	1.000	
*Top*10	0.066***	−0.083***	−0.057***	−0.135***	0.168***	−0.284***	0.235***	0.032***	0.034***	0.119***	1.000

Table 4. Multiple regression results1.

Variables	*RD*1	*RD*1	*RD*1
	(1)	(2)	(3)
*Fin*1	−0.038***	−0.023***	−0.011***
	(−32.162)	(−16.620)	(−7.779)
Lev		−0.014***	−0.007***
		(−14.927)	(−8.648)
Size		−0.001***	−0.001***
		(−8.709)	(−4.900)
Age		−0.000***	−0.000***
		(−12.501)	(−3.613)
Roa		0.032***	0.035***
		(8.509)	(10.165)
Board		0.000	0.002**
		(0.167)	(1.986)
Indir		0.003	0.003
		(0.962)	(1.163)
CFO		0.012***	0.017***
		(5.301)	(7.747)
*Top*10		−0.000	0.000
		(−1.535)	(1.260)
_cons	0.017***	0.054***	0.017***
	(95.026)	(15.239)	(4.896)
Industry	No	No	Yes
Year	No	No	Yes
N	10364	10364	10364
adj.R^2	0.038	0.153	0.410
F	1034.385	285.903	356.286

Note: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. The numbers in parentheses are t-statistic.

intangible assets may contain more information about firms' innovation inputs. Therefore, to exclude this limitation, this paper replaces the explanatory variables *RD* with *Patent*_Award1 and *Patent*_Award2 respectively re-measures the level of enterprise innovation, where *Patent*_Award1 denotes the total number of invention patents, utility models and design patents granted plus the natural logarithm of 1, *Patent*_Award2 denotes the total number of invention patents, utility models and design patents granted plus the natural logarithm of 1, and the weights of the three types of patents are taken according to 3:2:1. From the results in Table 6, column (1) shows the regression results

Table 5. Multiple regression results2.

Variables	*RD*1	*RD*1	*RD*1
	(1)	(2)	(3)
*Fin*2	−0.018***	−0.016***	−0.008***
	(−11.198)	(−10.540)	(−5.210)
Lev		−0.015***	−0.008***
		(−15.655)	(−8.875)
Size		−0.001***	−0.001***
		(−9.742)	(−4.995)
Age		−0.000***	−0.000***
		(−12.894)	(−3.822)
Roa		0.033***	0.035***
		(8.521)	(10.267)
Board		−0.001	0.002*
		(−0.529)	(1.866)
Indir		0.002	0.003
		(0.601)	(1.061)
CFO		0.013***	0.017***
		(5.638)	(7.771)
*Top*10		−0.000	0.000
		(−1.184)	(1.518)
_cons	0.017***	0.060***	0.017***
	(85.539)	(17.523)	(5.120)
Industry	No	No	Yes
Year	No	No	Yes
N	10364	10364	10364
$adj.R^2$	0.011	0.149	0.409
F	125.402	249.654	361.758

*Fin*1 with *Patent*_Award1 the regression coefficient of enterprise financialization index 1 being −0.737. Column (2) shows the regression results *Fin*2 with *Patent*_Award1 the regression coefficient of enterprise financialization index 2 being −0.721. Column (3) shows the regression results *Fin*1 with *Patent*_Award2 the regression coefficient of enterprise financialization index 1 being −0.943. Column (4) shows *Fin*2 the regression results with the regression coefficient *Patent*_Award2 of enterprise financialization index 1 being −0.943. Column (5) shows the regression results with the regression coefficient of enterprise financialization index 1 being −0.721. All regressions are obtained by adding control variables and considering industry fixed effects and year fixed effects,

Table 6. Regression results for replacing the explanatory variables.

Variables	*Patent*_Award1	*Patent*_Award1	*Patent*_Award2	*Patent*_Award2
	(1)	(2)	(3)	(4)
*Fin*1	−0.737***		−0.943***	
	(−4.185)		(−4.544)	
*Fin*2		−0.721***		−0.929***
		(−5.329)		(−5.889)
Lev	−0.435***	−0.475***	−0.577***	−0.628***
	(−5.774)	(−6.247)	(−6.526)	(−7.051)
Size	0.483***	0.482***	0.546***	0.545***
	(35.780)	(35.770)	(36.205)	(36.194)
Age	−0.004	−0.004	−0.007**	−0.007**
	(−1.414)	(−1.485)	(−2.220)	(−2.305)
Roa	2.050***	2.088***	2.285***	2.333***
	(7.446)	(7.579)	(7.122)	(7.271)
Board	0.153*	0.141	0.232**	0.217**
	(1.704)	(1.572)	(2.282)	(2.131)
Indir	0.662**	0.641**	0.679**	0.652**
	(2.278)	(2.209)	(2.069)	(1.990)
CFO	0.117	0.121	0.012	0.017
	(0.645)	(0.669)	(0.055)	(0.081)
*Top*10	−0.002***	−0.002**	−0.003***	−0.003***
	(−2.604)	(−2.572)	(−2.713)	(−2.680)
_cons	−9.793***	−9.729***	−10.895***	−10.811***
	(−28.669)	(−28.456)	(−28.516)	(−28.283)
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
N	10364	10364	10364	10364
adj.R^2	0.428	0.428	0.442	0.442
F	242.900	244.540	276.256	277.869

and the results of all four regressions are negative and significant at the 1% level. Thus, after replacing the variables, the financialization of firms still has an inhibitory effect on the level of firm innovation.

4.4.2 Change of Sample Interval

In this paper, drawing on Xiao study [27], we take the data of 2009–2019 years for the stability test since the CSRC started to enforce intangible asset disclosure since 2007, and the implementation just started in 2007 and 2008, which may affect the quality of intangible asset disclosure due to some shortcomings in the implementation of accounting policies by listed companies. The results are shown in Table 7 below. The regression results of corporate financialization and corporate innovation are both

Table 7. Regression results of replacing the sample interval.

Variable Name	*RD*1	*RD*1
	(1)	(2)
*Fin*1	−0.011***	
	(−7.779)	
Lev	−0.007***	−0.008***
	(−8.648)	(−8.875)
Size	−0.001***	−0.001***
	(−4.900)	(−4.995)
Age	−0.000***	−0.000***
	(−3.613)	(−3.822)
Roa	0.035***	0.035***
	(10.165)	(10.267)
Board	0.002**	0.002*
	(1.986)	(1.866)
Indir	0.003	0.003
	(1.163)	(1.061)
CFO	0.017***	0.017***
	(7.747)	(7.771)
*Top*10	0.000	0.000
	(1.260)	(1.518)
*Fin*2		−0.008***
		(−5.210)
_cons	0.017***	0.017***
	(4.896)	(5.120)
Industry	Yes	Yes
Year	Yes	Yes
N	10364	10364
adj.R^2	0.410	0.409
F	356.286	361.758

negatively significant at the 1% level, and the conclusions obtained remain consistent, indicating that the conclusions drawn in the previous paper are still robust and reliable.

5 Further Analysis

In order to further understand the mechanism of the inhibitory effect of the degree of financialization on corporate innovation among different types of enterprises, three indicators of corporate internal control quality, corporate region and corporate growth are selected for group regression, and the specific moderation variables are measured as follows: When the corporate internal control index is greater than the median of the index, the internal control variable is assigned a value of 1, otherwise it is 0; When the corporate When the enterprise is located in the eastern region, the enterprise region variable is assigned a value of 1, otherwise it is 0; When the enterprise's Tobin *Q* value is greater than its median, the enterprise growth variable is assigned a value of 1, otherwise it is 0.

5.1 Internal Control

According to Lu, Rui et al., the basic objectives of internal control are to ensure the integrity and accuracy of company information and to reduce the probability of business risks [10]. Effective internal control can balance various stakeholders, monitor and restrain the behavior of management thus reducing the short-sighted tendency of corporate management, restraining the opportunistic behavior of corporate management, and mitigating the motivation of executives to seek self-interest. The core of internal control is risk assessment. If the quality of internal control is low, firms will be more inclined to make risky decisions and thus engage more in risky businesses such as financial investment and crowd out innovative activities. This paper refers to the study of Wang et al. who used the internal control index disclosed by Diebold to measure the internal quality of firms [23]. The results in Table 8 show that the absolute values of the regression coefficients in columns (2) and (4) are higher than those in columns (1) and (3), respectively, indicating that in firms with high internal control quality, management's decisions are constrained by stakeholders due to their well-developed internal control systems. In such a case, the decisions made by the management of the firm will be more considerate of the long-term development of the firm. In contrast, in companies with poor internal control quality, management has a tendency to speculate and arbitrage, and accordingly chooses to invest more funds in financial markets, thus crowding out funds for corporate innovation and R&D. Therefore, the inhibitory effect of corporate financialization on corporate innovation is stronger in firms with poorer quality internal controls.

5.2 The Region Where the Company is Located

There are certain differences in the economic development and industrial development levels in the eastern, central and western regions, and the economic development policies and measures in the eastern region will be more complete and comprehensive compared

Table 8. Results of heterogeneity analysis I

Variable Name	*RD*1	*RD*1	*RD*1	*RD*1	*RD*1	*RD*1	*RD*1	*RD*1
	High quality of internal control group (1)	Low quality of internal control group (2)	High quality of internal control group (3)	Low quality of internal control group (4)	Eastern Region (5)	Non-Eastern Region (6)	Eastern Region (7)	Non-Eastern Region (8)
*Fin*1	−0.008***	−0.013***			−0.011***	−0.014***		
	(−3.478)	(−7.658)			(−6.815)	(-4.932)		
*Fin*2			−0.007***	−0.008***			−0.008***	−0.009***
			(−3.370)	(−4.193)			(−4.674)	(−3.661)
Lev	−0.002	−0.010***	−0.002	−0.011***	−0.006***	−0.009***	−0.006***	−0.009***
	(−1.305)	(−10.022)	(−1.538)	(−10.172)	(−5.229)	(−6.842)	(−5.497)	(−6.973)
Size	−0.001***	−0.000	−0.001***	−0.000	−0.001***	−0.001***	−0.001***	−0.001***
	(−6.178)	(−1.569)	(−6.201)	(−1.610)	(−3.911)	(−3.636)	(−3.906)	(−3.670)
Age	−0.000	−0.000***	−0.000*	−0.000***	−0.000***	−0.000**	−0.000***	−0.000***
	(−1.585)	(−3.344)	(−1.661)	(−3.523)	(−2.992)	(−2.430)	(−3.130)	(−2.645)
Roa	0.067***	0.013***	0.068***	0.013***	0.039***	0.022***	0.039***	0.022***
	(9.480)	(3.216)	(9.613)	(3.219)	(8.993)	(4.285)	(9.029)	(4.419)
Board	0.003*	0.002	0.003*	0.002	0.002	0.004***	0.001	0.004***
	(1.885)	(1.286)	(1.796)	(1.194)	(1.312)	(2.671)	(1.197)	(2.736)
Indir	0.006	0.002	0.006	0.002	0.003	0.005	0.003	0.005
	(1.420)	(0.551)	(1.390)	(0.455)	(0.892)	(0.993)	(0.791)	(1.001)
CFO	0.014***	0.015***	0.014***	0.015***	0.016***	0.015***	0.017***	0.016***
	(4.485)	(5.063)	(4.488)	(5.088)	(6.379)	(4.148)	(6.414)	(4.199)
*Top*10	−0.000	0.000	−0.000	0.000	−0.000	0.000	−0.000	0.000
	(−0.510)	(1.235)	(−0.425)	(1.410)	(−0.373)	(0.862)	(−0.182)	(1.057)
_cons	0.021***	0.013***	0.022***	0.014***	0.018***	0.014**	0.019***	0.014***
	(4.328)	(2.719)	(4.464)	(2.863)	(4.114)	(2.568)	(4.247)	(2.606)
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	5441	4923	5441	4923	7328	3036	7328	3036
adj.R^2	0.419	0.400	0.419	0.399	0.431	0.321	0.431	0.319
F	207.924	.	208.381	.	294.126	82.287	299.166	80.518

with the non-eastern region. Wang Yong et al. argue that the regional mismatch of financial resources caused by the economic disparity between the eastern and western regions of China, the geographical division and the degree of marketization have led to huge differences in corporate innovation [24] so does regional differentiation also affect the Does regional differentiation also affect the relationship between financialization and corporate innovation? Therefore, based on the difference of regional economic development, the sample is divided into enterprises in the eastern region and enterprises in the non-eastern region, and the effect of financialization on the level of corporate innovation is studied. The regression results are shown in Table 8. The regression results

Table 9. Results of heterogeneity analysis II

Variable Name	*RD*1	*RD*1	*RD*1	*RD*1
	Strong growth (1)	Weak growth (2)	Strong growth (3)	Weak growth (4)
*Fin*1	−0.010***	−0.012***		
	(−4.793)	(−7.605)		
*Fin*2			−0.007***	−0.010***
			(−3.568)	(−5.189)
Lev	−0.008***	−0.005***	−0.008***	−0.006***
	(−7.581)	(−3.821)	(−7.794)	(−3.994)
Size	−0.000**	−0.001***	−0.000**	−0.001***
	(−2.312)	(−5.214)	(−2.383)	(−5.267)
Age	−0.000***	−0.000	−0.000***	−0.000
	(−3.253)	(−0.902)	(−3.394)	(−1.045)
Roa	0.031***	0.043***	0.031***	0.043***
	(7.713)	(6.753)	(7.784)	(6.792)
Board	0.002	0.003**	0.002	0.003**
	(1.226)	(2.230)	(1.197)	(1.998)
Indir	0.006	−0.002	0.006	−0.002
	(1.505)	(−0.464)	(1.480)	(−0.626)
CFO	0.022***	0.005*	0.022***	0.005*
	(7.681)	(1.835)	(7.709)	(1.746)
*Top*10	0.000	0.000	0.000	0.000
	(0.276)	(1.366)	(0.539)	(1.299)
_cons	0.013**	0.021***	0.013**	0.023***
	(2.431)	(4.605)	(2.522)	(4.869)
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
N	6488	3876	6488	3876
adj.R^2	0.397	0.400	0.397	0.399
F	224.276	.	224.454	.

in columns (5)–(8) show that the regression coefficients of corporate financialization are significantly negatively correlated at the 1% level, and the absolute values of the regression coefficients in columns (6) and (8) are larger than those in columns (5) and (7), indicating that corporate financialization has a greater inhibitory effect on the investment in corporate innovation R&D among non-financial listed companies located in the non-eastern region. Effect. Corporate innovation is a high-cost, high-risk, and long-cycle

corporate behavior, because firms in the eastern region have richer resources and more extensive financing channels, they are more willing and qualified to engage in corporate innovation, while for firms in non-eastern regions, due to insufficient resources, narrow financing channels, and fewer investment opportunities, firms in this region are less motivated to invest in innovation, and corporate financialization The degree of inhibition for innovation will be more serious.

5.3 Business Growth

In their study, Xiao and Lin showed that the investment opportunities faced by firms at different development stages of their life cycle change as they grow, and the economic decision-making behaviors they develop are bound to differ [27]. TobinQ's value applied to measure the growth of listed companies has undergone a long history of academic research and empirical testing. This paper draws on the approach of Wang et al. to use TobinQ's value to measure the growth of enterprises [25]. Firms with strong growth have more investment opportunities in their development process, and firms with weak growth are more lacking in investment opportunities and thus will be more inclined to make financial investments [20, 31]. According to the results in Table 9, the absolute values of the regression coefficients in columns (1) and (3) are smaller than those in columns (2) and (4), indicating that the inhibitory effect of corporate financialization on the level of corporate innovation is weakened among the more growing firms, while it is strengthened among the less growing firms. The main reason for this is that in normal business activities, low-growth firms do not earn as much profit as high-growth firms and tend to be at a disadvantage in the market competition process, which affects their decision-making process, i.e., weak-growth firms tend to invest in the securities market for arbitrage and avoid high-risk behaviors such as innovation and R&D to reduce their competitive position. Weak growth firms are less willing and motivated to innovate and are more likely to be inhibited by corporate financialization.

6 Conclusions and Management Implications

This paper selects a sample of Chinese non-financial listed companies in Shanghai and Shenzhen A-shares from 2007–2019 to investigate whether there is a facilitating or inhibiting effect between corporate financialization and corporate innovation and the differences in the impact mechanisms between corporate financialization and the level of innovation among different types of firms. The results of the empirical study show that there is an inhibitory effect of corporate financialization on firms' innovation level, and the conclusion still holds after a series of robustness tests. Further tests also find that the inhibitory effect of corporate financialization on innovation level is more pronounced among firms with poorer internal control quality, non-eastern regions, and weak growth. Based on the above findings, this paper makes the following policy recommendations.

For enterprise managers, they should correctly understand the "crowding out" effect of financialization, maintain the correct financial investment motivation in financial investment decisions, and fully understand that excessive financialization of enterprises will not only inhibit the level of innovation of enterprises, but also is not conducive to

the stable development of financial markets. Therefore, enterprises should reasonably arrange internal financial assets, not blindly follow the trend of investment, and make strategic planning according to the actual situation of enterprises. At the same time, enterprise managers should be good at seizing the policy support provided by the government and the innovation development opportunities given in the market, boldly carry out innovation research and development, and stimulate their own innovation spirit.

For regulators, the financialization of enterprises is a product of financial development, and regulators, as the key department in the process of financial development, should do a good job of supervision. Regulatory authorities should strengthen and perfect regulatory policies, improve the conditions for enterprises to enter the financial market for financing, strictly control the scale of financial investment by enterprises, avoid excessive blind financial investment by enterprises, so as to reduce the encroachment on enterprises' innovation activities and maintain the stability of the financial market.

For the government, it should create a good fundraising and financing environment, control the phenomenon of excessive profit monopoly in the financial industry, and guide enterprises to make reasonable financial investments, so as to promote the reform of the financial system and realize the function of financial service entities. In addition, the government should always adhere to the innovation-driven strategy, provide sufficient support and guarantee for enterprises to conduct innovative R&D activities in terms of policy, balance the difference between innovative financing and financial investment, and stimulate the endogenous power of entrepreneurial innovation.

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