



# Environmental Uncertainty, Financial Investment and Corporate Innovation

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**Abstract.** Innovation is the core driving force for national development. However, with the increasingly prominent issue of corporate financialization in recent years, especially after the US financial crisis, the corporate innovation system is more open than universities and research institutions and more sensitive to environmental uncertainty. Both corporate financial investment and corporate innovation are characterized by high investment and high risk, and the role of environmental uncertainty between them cannot be ignored. This article studies non-financial enterprises listed on China's A-share market and finds that corporate financial investment has a negative impact on innovation input and output, and environmental uncertainty will exacerbate this impact. The effect of capital reserve and short-term financial gain masks the impact of financial investment on technological innovation input, while the resource competition effect mediates the relationship between financial investment and technological innovation output. This study is of great significance for understanding the impact of financial investment on corporate innovation under environmental uncertainty, and provides a reference for the government and enterprises to address issues of financialization and the economy shifting from the real to the virtual.

**Keywords:** Environmental uncertainty; financial investment; corporate innovation; de-realization and deflation

## 1 Introduction

Enterprise innovation and definancialization are crucial to sustainable economic development. As China's economy enters a new normal, enterprises need to seize innovation opportunities, adapt to the volatile market environment, and aim for stable growth and sustainable development. Innovation has become the core of enterprises' survival and competition. The development of the real economy and the prevention of "shifting from the real to the virtual" are the foundations for high-quality economic development. Studying the impact and mechanisms of corporate financial investment on technological innovation is conducive to addressing the issue of the economy shifting from the real to the virtual, which is crucial to the long-term development of enterprises. Environmental uncertainty is a non-negligible factor in studying this impact. In the new era, enterprises must adapt to the new environment, undergo transformational development,

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and innovation has become the key. Only by continuously improving their innovation capabilities can enterprises emerge in the new era and cope with rapidly changing environments.

Distinguishing from the theoretical perspectives of other literature, this paper considers financial investment and environmental uncertainty as internal and external factors of enterprises, exploring the roles played by various factors in enterprise innovation when they jointly affect it. It identifies the effects of environmental uncertainty in financial investment and enterprise innovation and conducts further analysis. Past research often overlooked the mediating role of financial investment in the process of enterprise innovation. This paper delves deeply into the interaction mechanisms between financial investment and enterprise innovation, revealing the existence of the effects of capital reserve, short-term financial gain, and resource competition, further clarifying the actual correlation between financial investment and enterprise innovation. In terms of the impact of environmental uncertainty on enterprise innovation, this paper explores the influence of different enterprise attributes on the relationship between the two through heterogeneity analysis, aiming to provide richer and deeper insights for research in this field.

## 2 Theoretical Analysis and Hypothesis

Due to the high financing constraints of innovation activities and the limited capital of enterprises, some enterprises prefer short-term financial investment with high returns, thus crowding out innovation investment<sup>1</sup>. In addition, due to the high risk of innovation transformation and the close correlation between managers' compensation and performance, managers may choose short-term financial investment to obtain better short-term performance, thus inhibiting enterprise innovation activities. Based on this, hypothesis H1 is proposed in this paper.

H1: Enterprise financial investment behavior can inhibit enterprise innovation input and output.

In a highly uncertain environment, risk-averse investors may reduce or delay their investments, exacerbating financing constraints for enterprises and thereby affecting the financial support for their innovation activities. In such circumstances, enterprises may reduce their investment and output in innovation<sup>2</sup>. In summary, this paper believes that environmental uncertainty has an inhibitory effect on enterprise innovation activities. Management alertness triggered by fluctuations in corporate performance may lead enterprises to reduce research and development innovation activities, which in turn reduce innovation inputs and outputs<sup>3</sup>. Based on this, this paper proposes Hypothesis H2.

H2: There is a negative correlation between the environment and enterprise innovation. The greater the environmental uncertainty, the more it will inhibit enterprise innovation.

Environmental uncertainty exposes enterprises to complex and changing external situations, directly affecting their financial investment behaviors. This uncertainty makes managers more cautious, considering the adequacy of funds and the possibility

of profitability, which may lead investors to reduce investment, increase information asymmetry, and trigger agency problems due to performance fluctuations<sup>5</sup>. These effects, acting together, exacerbate financing constraints, reduce investment and innovation desires, and weaken the human and material support needed for enterprise innovation. Therefore, environmental uncertainty not only increases the risks of investment and innovation for enterprises<sup>4</sup>, but also exacerbates the negative relationship between financial investment and enterprise innovation, leading enterprises to reduce investment and output in technological innovation in order to mitigate risks, this paper proposes Hypothesis H3:

H3: Environmental uncertainty enhances the negative relationship between financial investment and enterprise innovation.

### 3 Empirical Research

#### 3.1 Sample Selection and Data Sources

This study selects non-financial industry listed companies in China's A-share market from 2009 to 2020 as the research subjects. The data mainly comes from two databases: Wind and Cnrds. Through the screening and collation of the above data, panel data of 2488 non-financial industry listed companies from 2009 to 2020 are finally obtained, with a total of 15,602 observations.

#### 3.2 Variable Indicator Construction

Paper takes technological innovation input and output as the explained variables, adopts the proportion of financial asset investment as the core explanatory variable, and quantifies environmental uncertainty as a moderating variable using the standard deviation of sales revenue adjusted by the industry over the past five years. At the same time, control variables such as enterprise size, financial leverage, growth potential, equity concentration, and board structure are considered to ensure the reliability of the research. The main variables are defined and explained in table 1.

**Table 1.** Main variable definition and description

Variable type	Variable name	symbol	description
Explained variable	Technological innovation input	<i>rd</i>	ln (R&D expenses)
	Technological innovation output	<i>rda</i>	R&d investment/total assets
		<i>inv</i>	ln (Number of invention patents)
Explanatory variable		<i>pat</i>	ln (Total patents)
	Proportion of investment in financial assets	<i>fin</i>	Corporate financial assets/total assets
Regulating variable	Industry-adjusted environmental uncertainty	<i>EU</i>	Unadjusted environmental uncertainty/Industry environmental

		uncertainty	
Control variable	Enterprise scale	<i>size</i>	ln (Total assets)
	Financial leverage	<i>lev</i>	Liabilities/owner's equity
	Enterprise growth	<i>grow</i>	Revenue growth rate
	Ownership concentration	<i>share</i>	The proportion of the largest shareholder
	Board structure	<i>board</i>	Proportion of independent directors

### 3.3 Model Establishment

To demonstrate a negative correlation between financial investment and corporate innovation, the regression results for  $\alpha_1$  and  $\beta_1$  should be negative and significant. This would indicate that financial investment reduces the innovation output of enterprises and has a negative impact on corporate innovation, thereby supporting Hypothesis H1.

$$rd_{it} = \alpha_0 + \alpha_1 fin_{it} + \alpha_j control_{it} + year_t + cp_i + \varepsilon_{it} \quad (1)$$

$$inv_{it} = \beta_0 + \beta_1 fin_{it} + \beta_j control_{it} + year_t + cp_i + \varepsilon_{it} \quad (2)$$

If environmental uncertainty and enterprise innovation are as expected, the regression results of  $\alpha_1$  and  $\beta_1$  should be negative and significant, indicating that environmental uncertainty reduces the innovation output of enterprises and has a negative impact on enterprise innovation. In this case, Hypothesis H2 would be validated.

$$rd_{it} = \alpha_0 + \alpha_1 EU_{it} + \alpha_j control_{it} + year_t + cp_i + \varepsilon_{it} \quad (3)$$

$$inv_{it} = \alpha_0 + \alpha_1 EU_{it} + \alpha_j control_{it} + year_t + cp_i + \varepsilon_{it} \quad (4)$$

By establishing model (3), we aim to investigate the moderating role of environmental uncertainty in the relationship between financial investment and enterprise innovation among companies exhibiting innovative behaviors, thus validating Hypothesis H3. If the interaction term regression results are significant and negative, it would indicate that environmental uncertainty can indeed play a moderating role, significantly strengthening the negative relationship between corporate financial investment, innovation input, and output, resulting in a superimposed effect. In such a scenario, Hypothesis H3 would be deemed valid.

$$rd_{it} = \alpha_0 + \alpha_1 fin_{it} + \alpha_2 EU_{it} + \alpha_3 EU_{it} * fin_{it} + \alpha_j control_{it} + \varepsilon_{it} \quad (5)$$

$$inv_{it} = \beta_0 + \beta_1 fin_{it} + \beta_2 EU_{it} + \beta_3 EU_{it} * fin_{it} + \beta_j control_{it} + \varepsilon_{it} \quad (6)$$

## 4 Result Analysis

### 4.1 Regression Results and Analysis

In this paper, multiple regression method is used to verify the correlation between environmental uncertainty, financial investment and firm innovation through an empirical model. Other variables that may affect firm innovation are controlled in the model. The final regression results are shown in table 2. The coefficient of financial asset investment proportion is negative and significant, indicating that financial investment behavior inhibits innovation input and output of enterprises, that is, H1 is established. The correlation coefficient of environmental uncertainty (EU) is negative and significant, indicating that environmental uncertainty will reduce the innovation willingness of enterprises, that is, assuming H2 is true.  $EU*fin$  is significantly negative, which means that environmental uncertainty can significantly enhance the negative impact of financial investment on enterprise innovation, and play a role between the two, producing a superposition effect, that is, hypothesis 3 is valid.

**Table 2.** regression model estimation results

	<i>Panel A</i>			<i>Panel B</i>		
	(1) <i>rd</i>	(2) <i>rd</i>	(3) <i>rd</i>	(1) <i>inv</i>	(2) <i>inv</i>	(3) <i>inv</i>
<i>fin</i>	-	-	-	-	-	-
	0.2301*** (-2.65)		0.2327*** (-3.44)	0.3754*** (-2.64)		0.6185*** (-3.13)
<i>EU</i>		-	-		-	-
		0.1002*** (-8.66)	0.1478*** (-6.95)		0.0474*** (-2.96)	-0.0832** (-3.05)
<i>EU*fin</i>			-0.1990** (-2.31)			-0.1887** (-2.03)
<i>Control variable</i>	<i>Control</i>	<i>Control</i>	<i>Control</i>	<i>Control</i>	<i>Control</i>	<i>Control</i>
<i>Individual effect</i>	<i>Control</i>	<i>Control</i>	<i>Control</i>	<i>Control</i>	<i>Control</i>	<i>Control</i>
<i>Time effect</i>	<i>Control</i>	<i>Control</i>	<i>Control</i>	<i>Control</i>	<i>Control</i>	<i>Control</i>
<i>N</i>	15602	15602	15602	15602	15602	15602
<i>R-squared</i>	0.4122	0.3028	0.4655	0.1345	0.3033	0.3142

### 4.2 Robustness Test

In order to confirm the authenticity and reliability of the empirical regression results, this paper reduced the sample interval (excluding the data before and after the 2008 financial crisis and the novel coronavirus epidemic at the end of 2019) for regression, and found that the model estimation results were consistent with the previous conclusions, which reflected the robustness of the research conclusions.

### 4.3 Intermediate Effect Test

In order to verify the internal mechanism between financial investment and firm innovation, this paper further analyzes the action path between the two based on the previous research hypothesis. This paper holds that financial investment may affect the innovation activities of enterprises through the fund reserve effect and short-term financial gain effect. In order to specifically test these mechanisms, this paper built a corresponding mediation effect model. Through this model, we clearly reveal that financial investment influences firm innovation through the intermediary variables of liquidity supply (*ocf*) and financial performance (using *roe* as an indicator), thus deepening our understanding of the relationship between the two. The regression results are shown in the **table 3**.

$$y_{it} = \alpha_0 + \alpha_1 x_{it} + \alpha_j \text{control}_{it} + \text{year}_t + \text{cp}_i + \varepsilon_{it} \quad (7)$$

$$m_{it} = b_0 + b_1 x_{it} + b_j \text{control}_{it} + \text{year}_t + \text{cp}_i + \varepsilon_{it} \quad (8)$$

**Table 3.** Intermediate effect test

Fund reserve intermediation effect			Intermediation effect of short-term financial gain				
	<i>rd</i>	<i>ocf</i>	<i>rd</i>	<i>rd</i>	<i>roe</i>	<i>rd</i>	
<i>fin</i>	-	0.0552***	-	<i>fin</i>	-0.2310***	0.1125***	-0.2327***
	0.2310***	(7.81)	0.2539***		(-3.42)	(4.89)	(-3.44)
	(-3.42)		(-3.74)				
<i>ocf</i>			0.3969***	<i>roe</i>			0.0171**
			(3.71)				(2.04)

To sum up, the fund reserve effect and short-term financial gain effect have a masking effect between corporate financial investment and technological innovation input, but these positive effects cannot offset the crowding out effect of financial investment on innovation resources, which is generally not conducive to the investment of corporate innovation resources.

## 5 Research Conclusions

This paper comprehensively explores the correlation between corporate financial investment, environmental uncertainty and corporate innovation. The results are as follows:

Corporate financial investment behavior is negatively correlated with corporate innovation, which inhibits technological innovation input and output. Fund reserve effect and short-term financial gain effect have a masking effect between financial investment and technological innovation input, which indicates that corporate financial investment is more manifested as short-sighted and speculative behavior of managers, rather than

liquidity reserve or risk smoothing means, which is not conducive to corporate innovation.

Performance fluctuations alert management and reduce R&D and innovation activities; Investors avoid risks, intensifying corporate financing constraints; High uncertainty leads to agency problems, weakens internal control, affects innovation support, and ultimately reduces innovation input and output.

Increased environmental uncertainty leads to reduced investment by investors, information asymmetry and agency problems, aggravating financing constraints and decreasing innovation desire of enterprises, and ultimately inhibiting enterprise innovation.

## Reference

1. PENG, Y.C., NI,X.R., SHEN, J.(2018) Firm "Moving from Real to Virtual" and Financial Market Stability: from the Perspective of Stock Price Crash Risk. *J.Economic Research.*, 53(10):50-66.
2. Caggese, A.(2012) Entrepreneurial risk, investment, and innovation.*J.Journal of Financial Economics*, 106(2):287-307.
3. LIU, B., LI ,Z.S., WANG, H.L.(2017) Cash Flow Uncertainty and Firm Innovation. *J. Economic Research Journal.*, 52(03):166-180.
4. WANG, J.X.(2023)Environmental Uncertainty, Risk Taking and Firm Innovation .*J. Business Research*, 02:127-134.
5. Chen, L., Meng, X. (2022)Green finance reform and corporate innovation: Evidence from China.*J.Finance Research Letters*,48

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