

The Impact of R&D Investment on Enterprise Performance: A Perspective on Executive Motivation

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Abstract: R&D investment serves as the primary driver for corporate value enhancement, while executive incentives modulate the efficiency of translating innovation into performance. Utilizing data from China's A-share listed companies between 2013 and 2022, this study empirically examines the impact of R&D investment on corporate performance and the moderating role of executive incentives. The findings reveal that R&D investment significantly boosts corporate performance. However, compensation incentives exert a negative moderating effect, whereas equity incentives show no significant influence. Notably, R&D investment demonstrates a more pronounced effect on enhancing the performance of state-owned enterprises. To foster innovation, the government should augment fiscal and tax support for corporate R&D, implement differentiated support policies, and invigorate innovation vitality in non-state-owned enterprises. Additionally, corporations should strive to balance long-term and short-term incentive structures to optimize performance outcomes.

Keywords: Research and development investment, Enterprise performance, Executive motivation, Regulating effect

1. Introduction

As China's economy transitions towards high-quality development, the optimization and upgrading of industrial structures have emerged as pivotal issues in enhancing corporate global competitiveness. In this context, R&D investment, recognized as a crucial driver for technological innovation and strengthening core corporate competencies, has garnered significant attention regarding its impact on corporate performance. The 2024 Government Work Report outlined a series of measures to stabilize the economy and promote development, including maintaining industrial economic stability, supporting advanced manufacturing, and enhancing the additional deduction ratio for R&D expenses in key industries to foster high-quality development in critical industrial chains. These policy implementations have positively influenced corporate innovation capabilities and profitability, facilitating a transition from decline to growth in industrial enterprise profits.

Within the corporate innovation ecosystem, executive incentive mechanisms play a vital role in determining the effectiveness of R&D investment and the ultimate manifestation of corporate performance. Executive compensation, equity incentives, and promotion systems not only influence managerial risk preferences but also directly shape long-term corporate commitment to R&D. Therefore, examining how R&D investment affects corporate performance from the perspective of executive incentives not only aids in understanding the micro-decision logic of corporate innovation

behavior but also provides theoretical support for policymakers to optimize incentive mechanisms and improve corporate innovation efficiency.

2. Literature review

R&D investment encompasses the allocation of various human and material resources by enterprises to develop new products or enhance technological capabilities. By adjusting the scale of R&D investment, companies can significantly influence their performance outcomes [1]. Corporate performance refers to the achievements and effects realized through business operations within a specific period, reflecting multiple dimensions such as operational efficiency, profitability, market competitiveness, and sustainable development capacity. Current research related to corporate performance primarily focuses on financial performance, innovation capabilities, industry disparities, and policy support.

2.1. R&D investment and enterprise performance

Existing literature has explored the relationship between R&D investment and corporate performance from various perspectives, with most studies suggesting a positive correlation. Domestic scholars Zheng and Zhou argue that increasing the proportion of R&D in total assets within a reasonable timeframe can maximize corporate performance and optimize resource efficiency [2]. International researchers Katila and Ahuja posit that R&D investment serves as a pathway for innovation, which can either strengthen existing product market positions or provide opportunities to enter new product markets, thereby enhancing corporate performance [3]. Qiu and Wei acknowledge the performance-enhancing effect of R&D investment but note that its intensity varies across industries, being more pronounced in capital- and technology-intensive enterprises compared to labor-intensive ones [4]. Conversely, some studies indicate no significant correlation between R&D investment and corporate performance. Qiu's empirical analysis of 1998 listed companies found that technological and R&D investments did not yield substantial effects under existing conditions [5].

Building upon this foundation, further research has investigated the relationship between corporate performance and executive incentives. Numerous scholars have identified a positive correlation between executive incentives and corporate performance. Lu and Liang found significant positive relationships between both executive compensation incentives and equity incentives with corporate performance [6]. International scholar Kayani also observed a positive correlation between CEO compensation and company performance [7]. However, some studies have identified a negative correlation in the implementation of equity incentives in Chinese enterprises, where executive income growth was inversely related to corporate performance improvement [8].

2.2. Executive incentive and R&D investment

Scholars from both China and abroad have conducted research on the relationship between executive incentives and R&D investment. The issue of executive incentives has long been a focal point in both theoretical and practical circles. Currently, incentives for corporate executives mainly include two complementary mechanisms: first, financial incentives, which primarily consist of salary incentives and equity incentives; second, promotion incentives for executives [9].

Existing literature explores the impact of executive incentives on R&D investment from two main perspectives. On one hand, from the perspective of financial incentives, domestic scholar Wang found a significant positive correlation between equity incentives and R&D investment, meaning that the higher the proportion of executive shareholding, the greater the R&D investment. Additionally, short-term compensation incentives for executives also showed a significant positive correlation with R&D investment, where higher short-term compensation led to greater R&D investment [10]. Zhang's

research also indicated that both long-term equity incentives and short-term salary incentives for executives had a significant positive effect on the intensity of corporate R&D funding. However, the impact of long-term equity incentives and short-term salary incentives on the intensity of R&D personnel investment was not significant [11]. On the other hand, the impact of executive promotion incentives on R&D investment has also garnered attention from scholars. Foreign scholars, in order to better verify that executive promotion incentives positively promote corporate R&D investment, compared promotion incentives with salary incentives and found that promotion incentives had a more significant positive effect on R&D investment [12]. However, some scholars have suggested that executive promotion incentives might inhibit corporate R&D investment. Ying-Fen Lin, focusing on the high-tech industry, found that significant salary increases for some promoted executives led to a negative attitude among non-promoted executives towards increasing R&D investment, thereby inhibiting corporate R&D investment [13].

Existing literature has conducted extensive research on R&D investment, corporate performance, and executive incentives from various angles, but the relationship among the three still lacks in-depth exploration. Building on previous studies, this paper integrates R&D investment, corporate performance, and executive incentives into a single research framework. Using a moderated regression model, it explores the nonlinear impact of R&D investment on corporate performance from the perspective of executive incentives.

3. Theoretical model and research hypotheses

R&D investment has emerged as a critical driver for enhancing corporate competitiveness and achieving sustainable growth. According to endogenous growth theory, R&D fosters technological innovation, improves production efficiency, and enhances product differentiation, thereby increasing market share and profitability. Through R&D investment, companies can continuously elevate product value, optimize production processes, and secure a more advantageous competitive position. Additionally, signaling theory suggests that R&D investment conveys positive signals to the market, boosting investor confidence and consequently elevating stock prices and market value. Based on this, Hypothesis 1 is proposed.

H1: Corporate R&D investment positively enhances firm performance.

In corporate governance, executive incentives are regarded as a vital tool for influencing strategic decisions and performance outcomes. Principal-agent theory highlights that due to misaligned interests and information asymmetry between owners and management, the design of executive incentive mechanisms significantly impacts managerial behavior. Incentive compatibility theory further posits that while cash-based incentives exhibit a “ceiling effect,” where marginal utility diminishes beyond market benchmarks, equity-based incentives create aligned interests. Accordingly, Hypothesis 2 is formulated.

H2: Executive incentives play a moderating role in the process of R&D investment enhancing performance, with salary-based and equity-based incentives exerting distinct effects.

Resource-based theory emphasizes that firms differ significantly in resource endowments, innovation capabilities, market environments, and institutional constraints, leading to heterogeneous impacts of R&D investment on performance. Specifically, mature firms with ample cash flow can absorb R&D failure risks, fostering trial-and-error learning effects. In contrast, resource-constrained small and medium-sized enterprises may face innovation resource displacement, falling into an R&D investment trap. Thus, Hypothesis 3 is proposed.

H3: The impact of R&D investment on firm performance exhibits heterogeneity across different types of enterprises.

4. Model setting and description of variables

4.1. Research design

To examine the relationship between R&D investment and firm performance, this study employs a fixed-effects regression model to analyze the impact of R&D investment on corporate performance. The following model is established:

$$ROE_{it} = \alpha_0 + \alpha_1 RD_{it} + \alpha_2 debttoasset_{it} + \alpha_3 cash_{it} + \alpha_4 ind_i + \omega_t + \varepsilon_{it} \quad (1)$$

Here, i represents the stock code, t denotes the year, ind accounts for industry fixed effects, and ω captures time fixed effects. Definitions of other variables are provided in Table 1.

To further investigate the moderating role of executive incentives in the relationship between R&D investment and firm performance, executive incentives are categorized into salary-based and equity-based incentives. By incorporating these incentives and their interaction terms as moderating variables into the baseline model, the following model is constructed:

$$ROE_{it} = \alpha_0 + \alpha_1 RD_{it} + \alpha_2 salary_{it} + \alpha_3 RD_{it} * salary_{it} + \alpha_4 debttoasset_{it} + \alpha_5 cash_{it} + \alpha_6 ind_i + \omega_t + \varepsilon_{it} \quad (2)$$

$$ROE_{it} = \alpha_0 + \alpha_1 RD_{it} + \alpha_2 shares_{it} + \alpha_3 RD_{it} * shares_{it} + \alpha_4 debttoasset_{it} + \alpha_5 cash_{it} + \alpha_6 ind_i + \omega_t + \varepsilon_{it} \quad (3)$$

4.2. Variable selection and data source

This study focuses on all A-share listed companies from 2013 to 2022, applying the following criteria for sample selection: (1) Excluding ST and PT stocks, as outliers may adversely affect statistical results; (2) Removing financial firms, as their compensation evaluation and performance metrics differ from those of non-financial enterprises; (3) Excluding companies with incomplete R&D investment or other relevant data during the sample period; (4) Omitting firms that underwent significant changes in corporate nature within the sample period. Data is selected based on the 2012 industry classification standards of the China Securities Regulatory Commission, resulting in a final sample of 18,280 observations. The data is sourced from the CSMAR database, with detailed variable definitions and descriptive statistics provided in Tables 1 and 2.

Table 1: Variable definition and description

Variable type	Variable code	Variable name (unit)	Definition and measurement method
Dependent Variable	ROE	Return on Equity (%)	Net Profit / Shareholders' Equity
Core Variable	RD	R&D Intensity (Billion)	R&D Investment / Operating Revenue
Moderating Variable	shares	Executive Shareholding (Million Shares)	Executive Shareholding / Total Shares Outstanding
	salary	Top 3 Executive Compensation (Million Yuan)	Total Compensation of Top 3 Executives
Control Variable	debttoasset	Debt-to-Asset Ratio (%)	Logarithm of Total Liabilities / Total Assets

Table 1: (continued)

cash	Cash Flow (Billion Yuan)	Net Cash Flow from Operating Activities
year	Year Effect	9 Annual Dummy Variables for 10 Study Years
ind	Industry Effect	Industry Dummy Variables Based on CSRC Classification

Table 2: Descriptive statistics of variables (N=18280)

Variable	Mean	Std Dev	Max	Min
ROE	0.034	2.005	-186.557	16.889
RD	0.003	0.013	0.000	0.738
debttoasset	-1.079	0.603	-4.505	0.296
cash	0.947	5.676	-43.457	314.764
shares	41.379	98.794	0.000	2507.255
salary	3.125	3.610	0.000	117.509

5. Analysis of empirical results

5.1. Benchmark regression

Table 3 presents the empirical analysis results of the relationship between R&D investment and corporate performance. Columns (1) to (3) display the regression outcomes, starting with R&D investment as the sole core explanatory variable and progressively incorporating control variables. The analysis reveals that a 1% increase in R&D investment leads to a 58.7% rise in ROE (Return on Equity), thereby validating Hypothesis 1. As control variables are sequentially added, although the coefficient of R&D investment's impact on corporate performance decreases, it still passes the 5% significance test. This indicates that R&D investment positively contributes to corporate performance growth, confirming the validity of Hypothesis 1. Regarding the control variables, higher debt-to-asset ratios are associated with lower corporate performance, while increased cash flow correlates with enhanced corporate performance.

Table 3: Regression results

	(1)	(2)	(3)
Variable	ROE	ROE	ROE
RD	0.433**(0.194)	1.144*** (0.406)	0.587** (0.240)
debttoasset		-0.159*** (0.058)	-0.160*** (0.059)
cash			0.003** (0.001)
Constant	0.035 (0.046)	-0.134** (0.067)	-0.136** (0.067)
Industry, year fixed		Yes	
R ²	0.010	0.014	0.014

Note: Robust standard errors are in parentheses; ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively, as in the table below.

5.2. Robustness test analysis

To ensure the robustness of the research findings and mitigate the influence of model specifications, sample selection, and potential errors, a series of robustness checks were conducted. First, given that 2020 was the initial year of the pandemic, which significantly disrupted economic activities, data from this exceptional year were excluded from the regression analysis. Second, considering the substantial disparities in development levels and economic conditions between remote regions and other areas, listed companies from Xinjiang and Tibet were also removed for a separate regression analysis. The results consistently demonstrated that R&D investment positively contributes to corporate performance growth, thereby affirming the reliability of the regression outcomes presented in this study.

Table 4: Robustness test results

	(1)	(2)
Variable	Exclude special year	Exclude remote areas
RD	0.735***(0.283)	0.594**(0.241)
debttoasset	-0.148***(0.049)	-0.162***(0.059)
cash	0.003**(0.001)	0.003**(0.001)
Constant	-0.129**(0.065)	-0.139**(0.069)
Industry, year fixed		Yes
Observations	16,149	18,023
R ²	0.014	0.014

5.3. Mediating effect test analysis

The regression results indicate that the coefficient of RD*salary is -0.202, which passes the 5% significance test, suggesting that compensation incentives exert a significant negative moderating effect on the relationship between R&D intensity and corporate performance. Excessive compensation incentives may trigger managerial short-termism, leading to a focus on immediate financial metrics rather than long-term technological accumulation, thereby adversely affecting the effectiveness of R&D investments. Conversely, the coefficient of RD*shares is -0.004, failing to meet the significance threshold, indicating that equity incentives do not significantly moderate the relationship between R&D intensity and corporate performance. This lack of impact may stem from the intrinsic alignment of equity incentives with the firm's long-term value; managers, holding equity, are more inclined to support enduring innovation projects as their returns are tied to the company's overall value. Consequently, Hypothesis 2 is validated.

Table 5: Mediating effect test results

Variable	(1)	(2)
	Salary motivation	Shares motivation
RD	1.706***(0.622)	0.646**(0.273)
salary	0.014***(0.005)	
salary*RD	-0.202**(0.083)	
shares		0.001*(0.001)
shares*RD		-0.004(0.003)
debttoasset	-0.164***(0.060)	-0.160***(0.058)
cash	0.003**(0.001)	0.003**(0.001)
Constant	-0.158**(0.072)	-0.150**(0.072)

Table 5: (continued)

Industry, year fixed		Yes	
Observations	18,280		18,280
R ²	0.014		0.014

5.4. Heterogeneity analysis

Given the diverse development conditions of different types of enterprises, this study selects two of the most common categories in China-state-owned enterprises (SOEs) and non-state-owned enterprises (non-SOEs)-to ensure the accuracy of the experimental results and explore the differential impact of R&D investment. The findings reveal that the R&D investment coefficient for SOEs is 0.685, which passes the 5% significance test, indicating that a 1% increase in R&D investment leads to a 68.5% improvement in corporate performance. In contrast, the coefficient for non-SOEs is negative and fails to meet the significance threshold. This demonstrates that R&D investment has a more pronounced effect on performance enhancement in SOEs, thereby validating Hypothesis 3. This phenomenon may be attributed to the advantages of SOEs in organizational structure, core technologies, operational models, and employee quality, which facilitate the effective utilization of R&D investments. The hierarchical governance structure ensures the coordinated allocation of R&D resources, while the stable operational model supports the transformation of R&D outcomes.

Table 6: Heterogeneity analysis

Variable	(1) State-owned	(2) Non-state-owned
RD	0.685**(0.335)	-0.057(0.318)
debttoasset	-0.129*** (0.042)	-0.164** (0.071)
cash	0.002** (0.001)	0.016** (0.007)
Constant	-0.182* (0.108)	-0.117 (0.079)
Industry, year fixed		Yes
Observations	5,310	12,970
R ²	0.008	0.019

6. Conclusion and recommendation

6.1. Conclusion

This study, utilizing panel data from A-share listed companies in China from 2013 to 2022, investigates the relationship between R&D investment and corporate performance from the perspective of executive incentives, yielding the following conclusions: First, R&D investment exerts a robust positive effect on corporate performance. Second, executive incentive mechanisms play a moderating role, with compensation incentives significantly and negatively moderating the impact of R&D investment on corporate performance, while equity incentives show no significant moderating effect. Third, substantial R&D investment significantly enhances the performance of state-owned enterprises (SOEs) but does not exhibit a notable effect on the performance of non-state-owned enterprises (non-SOEs).

6.2. Recommendation

Firstly, the government should enhance fiscal and tax incentives for corporate R&D investments, including policies such as additional deductions for R&D expenses and tax reductions. Simultaneously, a comprehensive innovation incentive mechanism should be established, covering financial support in the initial R&D phase, technology transfer in the mid-term, and market promotion in the later stages. This ensures that enterprises receive the necessary resources and incentives at each stage, fostering continuous innovation.

Secondly, the executive incentive system should be restructured to balance long-term and short-term incentives. Companies can introduce long-term incentive plans based on R&D achievements, reducing short-term performance-driven compensation. This encourages executives to focus on the long-term value of R&D investments, thereby enhancing the company's innovation capabilities and overall performance.

Lastly, differentiated support policies should be implemented to invigorate the innovation vitality of non-state-owned enterprises (non-SOEs). In terms of fiscal support, private enterprises should be allowed to use patent rights as collateral to obtain special R&D loans, and non-SOEs with continuous growth in R&D investment should be granted loan subsidies. In terms of resource sharing, the government should encourage state-owned enterprises (SOEs) and non-SOEs to establish joint laboratories, technology alliances, and other collaborative platforms to share technological, human, and equipment resources, achieving complementary advantages and coordinated development.

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