

The Impact of Executive Compensation Incentives on Corporate Innovation Investment

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ABSTRACT

Using panel regression models with data from Chinese A-share listed companies from 2010 to 2020, this paper empirically examines the impact of executive compensation incentives on corporate innovation investment, and further investigates the moderating effects of government subsidies and financing constraints, as well as the mediating role of risk-taking. The findings indicate that executive compensation incentives significantly promote corporate innovation investment. Government subsidies strengthen this promotional effect, whereas financing constraints weaken it. Risk-taking plays a partially mediating role between the two. Heterogeneity analysis reveals that the promoting effect of executive compensation incentives on innovation investment is more pronounced in non-state-owned enterprises and high-tech enterprises. This study provides insights for optimizing incentive mechanisms and enhancing innovation motivation from a corporate governance perspective.

KEYWORDS

Executive compensation incentive; Innovation investment; Government subsidy; Financing constraint; Risk-taking

1 Introduction

Executive compensation incentive, as a crucial governance tool for alleviating principal-agent problems and aligning the interests of management and shareholders, has garnered significant attention. Based on principal-agent theory and incentive compatibility principles, a well-designed executive compensation mechanism can motivate long-term managerial behavior, particularly in driving high-risk, long-cycle innovation activities. Existing literature predominantly focuses on the impact of executive compensation on corporate performance, R&D investment, investment efficiency, among others, while systematic research on how it influences innovation investment through moderating and mediating pathways remains insufficient.

The potential contributions of this paper are as follows: First, using data from A-share listed companies from 2010 to 2020, it empirically tests the direct impact of executive compensation incentives on innovation investment. Second, it introduces government subsidies and financing constraints as moderating variables, analyzing their strengthening and weakening effects on the aforementioned relationship. Third, it explores the mediating mechanism of risk-taking, revealing the transmission path of "compensation incentive → risk-taking → innovation investment". Fourth, it examines the heterogeneous manifestation of this incentive effect based on property rights and industry attributes.

2 Theoretical Analysis and Research Hypotheses

2.1 Executive Compensation Incentive and Corporate Innovation Investment

Innovation activities are characterized by substantial investment, long cycles, and uncertain outcomes. Managers, often risk-averse, tend to avoid innovation projects. By aligning executive interests with the firm's long-term value through compensation incentives, their willingness to take risks and motivation for innovation can be enhanced, thereby promoting the allocation of resources to innovation. Accordingly, the following hypothesis is proposed:

H1: Executive compensation incentives will promote corporate innovation investment.

2.2 The Moderating Role of Government Subsidies

Government subsidies not only directly alleviate the financial pressure faced by corporate innovation but also send positive signals to the market, boosting external investor confidence. Both the resource-based view and signaling theory support that government subsidies can strengthen managers' willingness and ability to drive innovation after receiving incentives. Therefore, the following hypothesis is proposed:

H2: Government subsidies strengthen the promoting effect of executive compensation incentive on corporate

innovation investment.

2.3 The Moderating Role of Financing Constraints

Financing constraints inhibit corporate innovation investment by increasing the cost of external financing and exacerbating information asymmetry. Even in the presence of compensation incentives, severe financing constraints can limit managers' confidence and ability to allocate resources to innovation projects. Therefore, the following hypothesis is proposed:

H3: Financing constraints weaken the promoting effect of executive compensation incentive on corporate innovation investment.

2.4 Intermediary Role of Risk Taking

Compensation incentives can fulfill executives' material and self-actualization needs, enhancing their risk appetite and subsequently influencing innovation decisions. Existing research suggests that executive personal characteristics and corporate experience can influence firm value through risk-taking. Therefore, the following hypothesis is proposed:

H4: Risk-taking plays a partially mediating role in the relationship between executive compensation incentive and corporate innovation investment.

3 Research Design

3.1 Sample Selection and Data Sources

This paper selects data from Chinese A-share listed companies from 2010 to 2020 as the initial research sample. The data is processed as follows: samples from financial industry listed companies are excluded; samples from ST and *ST specially treated listed companies are excluded; and samples with missing key variable data are excluded. The final sample comprises 19,811 observations. To mitigate the influence of outliers, continuous variables are winsorized at the 1% and 99% levels. Data is sourced from the CSMAR database, supplemented and cross-checked using the WIND database to ensure authenticity and validity to the greatest extent possible. STATA 17.0 and Excel are used for data processing.

3.2 Variable Selection and Definition

3.2.1 Dependent Variable

Corporate innovation investment (RD). This paper measures it as the ratio of R&D expenditure to total assets.

3.2.2 Independent Variable

Executive compensation incentive (ECI). This paper measures it as the natural logarithm of the total compensation of the top three executives.

3.2.3 Moderating Variables

Government subsidy (SUB). This paper measures it as the ratio of government subsidies received in the current year to total assets.

Financing constraint (FC). This paper measures it using the SA index, which has strong exogeneity. The SA index calculation formula is:

$$SA = -0.737 \times \text{Size} + 0.043 \times \text{Size}^2 - 0.04 \times \text{Age} \quad (1)$$

where Size is the natural logarithm of total assets, and Age is the firm's listing age.

3.2.4 Mediating Variable

Risk-taking (RT). This paper measures it as the volatility of firm profitability. Specifically, the ROA for each year is adjusted by the industry mean, and then the standard deviation of the adjusted ROA over the observation period is calculated. The RiskTi indicator calculation formula is:

$$\text{Risk}T_i = \sqrt{\frac{1}{N-1} \sum_{n=1}^N (\text{ADJ_ROA}_{in} - \frac{1}{N} \sum_{n=1}^N \text{ADJ_ROA}_{in})^2 | N=3,} \quad (2)$$

$$\text{ADJ_ROA}_{in} = \frac{\text{EBITDA}_{in}}{\text{ASSETS}_{in}} - \frac{1}{X} \sum_{k=1}^X \frac{\text{EBITDA}_{kn}}{\text{ASSETS}_{kn}}$$

where ROAi is the ratio of earnings before interest, taxes, depreciation, and amortization (EBITDA) to total assets for firm i in year t.

3.2.5 Control Variables

The following control variables are selected: firm size (SIZE, natural logarithm of total assets), CEO duality (DUALITY, equals 1 if the chairman and CEO are the same person, 0 otherwise), leverage ratio (LEV, total liabilities/total assets), ownership concentration (TOP1, shareholding ratio of the largest shareholder), return on assets (ROA, net profit/total assets), Tobin's Q (TQ, market value/replacement cost of assets). Year and industry dummy variables are also included.

3.2.6 Heterogeneous Variables

Property rights (SOE). Classified by property rights, equals 1 if the enterprise is state-owned, 0 otherwise.
Industry nature (NHT). Classified by industry nature, equals 1 if the enterprise is a high-tech enterprise, 0 otherwise.

3.3 Regression Model Design

To test hypothesis H1, the following baseline model is constructed:

$$\text{RD}_{i,t} = \alpha_0 + \alpha_1 \text{ECI}_{i,t} + \alpha_2 \text{SIZE}_{i,t} + \alpha_3 \text{DUALITY}_{i,t} + \alpha_4 \text{LEV}_{i,t} + \alpha_5 \text{TOP1}_{i,t} + \alpha_6 \text{ROAI}_{i,t} + \alpha_7 \text{TQ}_{i,t} + \alpha_8 \text{YEAR}_t + \alpha_9 \text{INDUSTRY}_i + \epsilon_{i,t} \quad (3)$$

To test hypothesis H2, the following model with interaction term is constructed:

$$\text{RD}_{i,t} = \alpha_0 + \alpha_1 \text{ECI}_{i,t} + \alpha_2 \text{SUB}_{i,t} + \alpha_3 \text{ECI}_{i,t} \times \text{SUB}_{i,t} + \alpha_4 \text{SIZE}_{i,t} + \alpha_5 \text{DUALITY}_{i,t} + \alpha_6 \text{LEV}_{i,t} + \alpha_7 \text{TOP1}_{i,t} + \alpha_8 \text{ROAI}_{i,t} + \alpha_9 \text{TQ}_{i,t} + \alpha_{10} \text{YEAR}_t + \alpha_{11} \text{INDUSTRY}_i + \epsilon_{i,t} \quad (4)$$

To test hypothesis H3, the following model with interaction term is constructed:

$$\text{RD}_{i,t} = \alpha_0 + \alpha_1 \text{ECI}_{i,t} + \alpha_2 \text{FCI}_{i,t} + \alpha_3 \text{ECI}_{i,t} \times \text{FCI}_{i,t} + \alpha_4 \text{SIZE}_{i,t} + \alpha_5 \text{DUALITY}_{i,t} + \alpha_6 \text{LEV}_{i,t} + \alpha_7 \text{TOP1}_{i,t} + \alpha_8 \text{ROAI}_{i,t} + \alpha_9 \text{TQ}_{i,t} + \alpha_{10} \text{YEAR}_t + \alpha_{11} \text{INDUSTRY}_i + \epsilon_{i,t} \quad (5)$$

To test hypothesis H4, the path "executive compensation incentive → risk-taking → innovation investment" is examined. The following models are constructed to test the mediating effect:

$$\text{RT}_{i,t} = \beta_0 + \beta_1 \text{ECI}_{i,t} + \beta_2 \text{SIZE}_{i,t} + \beta_3 \text{DUALITY}_{i,t} + \beta_4 \text{LEV}_{i,t} + \beta_5 \text{TOP1}_{i,t} + \beta_6 \text{ROAI}_{i,t} + \beta_7 \text{TQ}_{i,t} + \beta_8 \text{YEAR}_t + \beta_9 \text{INDUSTRY}_i + \epsilon_{i,t} \quad (6)$$

$$\text{RD}_{i,t} = \gamma_0 + \gamma_1 \text{ECI}_{i,t} + \gamma_2 \text{RT}_{i,t} + \gamma_3 \text{SIZE}_{i,t} + \gamma_4 \text{DUALITY}_{i,t} + \gamma_5 \text{LEV}_{i,t} + \gamma_6 \text{TOP1}_{i,t} + \gamma_7 \text{ROAI}_{i,t} + \gamma_8 \text{TQ}_{i,t} + \gamma_9 \text{YEAR}_t + \gamma_{10} \text{INDUSTRY}_i + \epsilon_{i,t} \quad (7)$$

4 Empirical Results and Robustness Tests

4.1 Descriptive Statistics

The mean value of corporate innovation investment (RD) for the sample firms is 1.444%, with some firms reporting zero investment, indicating an overall low level. The distribution of executive compensation incentive (ECI) is relatively even. The proportion of government subsidies (SUB) is small. Financing constraints (FC) are prevalent. The overall risk-taking (RT) capability is relatively weak.

4.2 Correlation Analysis

ECI is significantly positively correlated with RD and negatively correlated with RT, providing preliminary support for the hypotheses. The mean VIF for all variables is below 2, indicating no severe multicollinearity.

4.3 Regression Results Analysis

4.3.1 Baseline Model Test

Column (1) of Table 4 shows that the coefficient for executive compensation incentive (ECI) is 0.181, significant at the 1% level, indicating that executive compensation incentive promotes corporate innovation investment. Hypothesis H1 is

supported.

4.3.2 Analysis of the Moderating Effect of Government Subsidies

Column (2) of Table 4 shows that the coefficient for the interaction term between executive compensation incentive and government subsidy (ECI×SUB) is 11.365, significant at the 1% level. This indicates that government subsidies play a positive moderating role in the relationship between executive compensation incentive and corporate innovation investment. Hypothesis H2 is supported.

4.3.3 Analysis of the Moderating Effect of Financing Constraints

Column (3) of Table 4 shows that the coefficient for the interaction term between executive compensation incentive and financing constraints (ECI×FC) is -0.159, significant at the 5% level. This indicates that financing constraints play a negative moderating role in the relationship between executive compensation incentive and corporate innovation investment. Hypothesis H3 is supported.

4.3.4 Analysis of the Mediating Effect of Risk-Taking

Column (4) of Table 4 shows that the coefficient for executive compensation incentive (ECI) on risk-taking (RT) is 0.004, significant at the 1% level, indicating that executive compensation incentive significantly enhances the level of risk-taking. Column (5) shows that the coefficient for ECI on RD is 0.178 (significant at 1%), and the coefficient for RT on RD is 0.843 (significant at 5%). This indicates that executive compensation incentive promotes corporate innovation investment by significantly enhancing the level of risk-taking. Risk-taking plays a partially mediating role in their relationship. Hypothesis H4 is supported.

The regression results of heterogeneity tests show that the promoting effect of executive compensation incentive on

Table 4 Baseline Model Test, Moderating Effects, and Mediating Effects Results

	(1)	(2)	(3)	(4)	(5)
	RD	RD	RD	RT	RD
ECI	0.181*** (6.151)	0.131*** (4.319)	-0.432 (-1.507)	0.004*** (3.117)	0.178*** (6.121)
SUB		-145.917*** (-3.501)			
ECI_SUB		11.365*** (3.754)			
FC			1.830* (1.760)		
ECI_FC			-0.159** (-2.141)		
RT					0.843** (2.534)
SIZE	-0.099*** (-3.084)	-0.092*** (-2.843)	-0.094*** (-2.910)	-0.006*** (-5.186)	-0.094*** (-2.881)
DUALITY	0.023 (0.697)	0.020 (0.605)	0.027 (0.811)	0.001 (0.830)	0.022 (0.670)
LEV	-0.121 (-1.175)	-0.145 (-1.417)	-0.110 (-1.074)	0.018*** (3.569)	-0.137 (-1.308)
TOP1	-0.290 (-1.321)	-0.295 (-1.345)	-0.312 (-1.429)	-0.025*** (-3.631)	-0.268 (-1.226)
ROA	0.073 (0.364)	0.032 (0.162)	0.038 (0.190)	-0.101*** (-8.226)	0.158 (0.807)
TQ	0.023** (2.134)	0.022** (2.015)	0.030*** (2.658)	0.004*** (8.987)	0.019* (1.829)
_cons	1.173 (1.545)	1.664** (2.250)	8.121** (2.039)	0.117*** (3.946)	1.075 (1.394)
Individuals	Control	Control	Control	Control	Control
Year	Control	Control	Control	Control	Control
Industry	Control	Control	Control	Control	Control
N	19811	19811	19811	19811	19811
R ²	0.810	0.812	0.811	0.415	0.811

* represents $p < 0.1$, ** represents $p < 0.05$, *** represents $p < 0.01$, same below.4.3.5 Heterogeneity Analysis

innovation investment is stronger in non-state-owned enterprises and in high-tech enterprises.

4.4 Robustness tests

To ensure the reliability of the conclusions, three robustness tests were conducted: First, replacing the dependent variable with the ratio of R&D investment to operating revenue still yields a significantly positive correlation. Second, excluding the potential impact of the 2014 executive compensation reform policy and using data from 2015–2020 yields consistent conclusions. Third, restricting the sample to manufacturing firms still yields robust results. All tests support the original conclusions.

5 Conclusions and Recommendations

This study employs panel regression models to empirically examine the impact of executive compensation incentives on corporate innovation investment, along with their moderating and mediating effects. The findings indicate that: First, executive compensation incentives promote corporate innovation investment. Second, government subsidies play a positive moderating role in the relationship between executive compensation incentives and innovation investment, while stronger financing constraints exert a negative moderating effect. Third, risk-taking serves as a partial mediator in this relationship. Executive compensation incentives can enhance innovation investment by increasing risk-taking. Fourth, due to heterogeneity in ownership and industry characteristics, the promoting effect of executive compensation incentives is more pronounced in non-state-owned enterprises and high-tech enterprises.

Based on the above conclusions, this paper offers the following insights and recommendations: First, in corporate governance, enterprises can enhance executives' innovation motivation by optimizing and improving executive compensation mechanisms, incorporating diversified incentives to influence managerial decision-making dynamics. This aligns the interests of management and owners, improves the level of corporate innovation, and maximizes firm value. Second, enterprises should pay attention to the moderating role of government subsidies. They should proactively maintain relationships with the government, actively establish technology innovation platforms and innovation networks within a broader strategic framework, integrate internal and external resources, and leverage the public policy impetus and capital infusion from government subsidies to enhance executives' sense of responsibility and corporate innovation capability. Simultaneously, attention should be given to the moderating role of financing constraints. A higher degree of financing constraints exacerbates situations where innovation activities are suspended or plans are hindered due to funding shortages. Therefore, enterprises need to combine building internal funding mechanisms with expanding external financing channels to mitigate the adverse effects of financing constraints. Third, enterprises should recognize the mediating role of risk-taking. Emphasis should be placed on how compensation incentives boost the level of risk-taking, thereby increasing the scale of innovation investment. Fourth, enterprises should consider the marginal benefits of incentive mechanisms in promoting innovation investment. When designing incentive systems, firms with different ownership structures and industry characteristics should formulate appropriate mechanisms based on their specific attributes to achieve an optimal state of innovation investment.

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