

An Empirical Study On The Relationship Between Executive Compensation And Firm Performance In High-Tech Manufacturing Companies

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Abstract

This study takes firm performance as the dependent variable, selects Tobin's Q as the core performance indicator, and uses ROA and ROE as alternative indicators for robustness testing. Executive compensation and the proportion of management shareholdings are used to measure the levels of compensation incentives and equity incentives, respectively, while controlling for variables such as firm size, debt-to-asset ratio, growth potential, and the largest shareholder's stake. The results indicate that executive compensation incentives have a significant positive impact on firm performance; after incorporating the proportion of management shareholdings, both salary incentives and equity incentives significantly promote improvements in corporate performance, with equity incentives having a stronger effect; the core conclusions remain valid after applying a one-period lag, substituting performance indicators, and using 2SLS to address endogeneity issues. This paper concludes that improving executive compensation mechanisms and optimizing long-term equity incentives can help enhance the performance and long-term value creation capabilities of listed companies in the high-tech manufacturing sector.

Keywords: *High-tech manufacturing, executive compensation, equity incentives, corporate performance, two-stage least squares*

1. Introduction

Against the backdrop of the ongoing implementation of the high-quality development strategy and the strategy to build a manufacturing powerhouse, the high-tech manufacturing sector has become a core driver of industrial upgrading and high-quality economic development. Compared to general manufacturing, the high-tech manufacturing sector is typically characterized by high R&D intensity, rapid technological advancement, longer innovation cycles, and greater operational uncertainty. Consequently, a company's competitive advantage increasingly depends on its technological innovation capabilities, efficiency in resource integration, and strategic decision-making.

In corporate governance structures, the separation of ownership and management can easily lead to misalignment of objectives and agency conflicts between shareholders and management. As a key incentive tool in corporate governance, executive compensation can, to a certain extent, align managers' personal interests with the company's business performance, thereby motivating management to increase their efforts and improve operational performance. While there is a close relationship between executive compensation and corporate performance, this relationship is not simple, fixed, or universally consistent; it is often influenced by the corporate governance environment and external institutional constraints (Farooque et al., 2019).

The effectiveness of executive remuneration has long been regarded as an important mechanism for mitigating agency conflicts and improving corporate performance. By linking managerial rewards to firm outcomes, compensation contracts can encourage executives to act in the interests of shareholders and enhance organizational value. Empirical evidence from Pakistan suggests that executive remuneration is positively associated with market-based performance indicators, supporting the pay-performance framework proposed by agency theory (Aslam et al., 2019). Similarly, evidence from China indicates that profitable firms tend to provide higher levels of executive compensation, while effective corporate governance mechanisms further strengthen the relationship between executive remuneration and corporate performance (Rehman et al., 2021). In addition, research on Real Estate Investment Trusts (REITs) demonstrates that board composition and executive remuneration jointly influence firm performance, highlighting the importance of governance structures in determining the effectiveness of incentive schemes (Alshammari, 2004). These findings suggest that executive remuneration not only serves as a direct incentive mechanism but also operates within broader corporate governance frameworks to influence organizational performance.

Academic attention to executive compensation has gradually shifted from total compensation to incentive structures and long-term incentive mechanisms. Compared to purely monetary incentives, equity-based incentives are more effective in aligning management's interests with the firm's long-term value, thereby encouraging executives to prioritize continuous innovation, long-term investment, and future growth in their decision-making processes. Existing research indicates that executive incentives can further influence a firm's innovation performance by affecting risk-taking levels and management's willingness to innovate (Zhou et al., 2021). Previous studies have provided substantial evidence supporting the relationship between executive compensation and corporate performance. From the perspective of agency theory, performance-based remuneration serves as an effective governance mechanism that aligns managerial interests with shareholder objectives and motivates executives to enhance firm value. Evidence from U.S. firms indicates that executive compensation is positively associated with both accounting-based and market-based performance indicators, particularly in high-technology companies where compensation contracts tend to rely on more sophisticated performance measures (Shim et al., 2009). Similarly, research on high-tech businesses suggests that executive compensation can alleviate agency conflicts and improve organizational performance, while its effectiveness is influenced by the presence of other governance mechanisms such as institutional monitoring (Lin et al., 2011). Furthermore, incentive-based compensation schemes have been found to encourage strategic decision-making and innovation activities, particularly in technology-intensive industries where long-term growth depends heavily on research and development investment (Usman et al., 2018). These findings suggest that executive compensation not only functions as a motivational tool but also plays an important role in promoting innovation and enhancing firm performance within an effective corporate governance framework.

Although existing research has yielded a wealth of findings, there are still some shortcomings:

- 1) Much of the literature continues to use all listed companies or general manufacturing firms as samples, while dedicated research on the specific group of listed high-tech manufacturing companies remains relatively scarce.
- 2) Although existing research has gradually shifted its focus to compensation structures and equity incentives, there is still insufficient discussion regarding the differentiated roles of two core incentive indicators—the total compensation of the top three executives and the proportion of management shareholdings—within the high-tech manufacturing sector.
- 3) Regarding performance measurement, some studies rely heavily on traditional accounting metrics such as ROA and ROE, while reflecting market value and growth expectations remains relatively insufficient.
- 4) There may also be a certain degree of reverse causality between executive incentives and firm performance. Companies with better performance are often better able to afford higher levels of executive compensation and are more likely to establish stable management shareholding arrangements; conversely, executive incentives may influence firm performance by affecting management's decision-making behavior. Existing research indicates that the relationship between firm performance and executive compensation is not unidirectional but may involve a bidirectional feedback loop.

2. Objectives

The objectives of this study are to:

- 1) Examine the impact of the top three executives' compensation on the performance of high-tech enterprises.
- 2) Analyze the long-term incentive effects of management stock ownership and compare the differences between the two types of incentives.
- 3) Consider both market-based performance (Tobin's Q) and accounting-based performance (ROA, ROE).
- 4) Employ panel data models and address endogeneity to enhance the reliability of the findings.

3. Materials and Methods

3.1 Hypotheses development

Executive compensation generally refers to the total remuneration provided by a company to its senior leaders; it serves as a key mechanism for motivating managers and aligning the interests of management and shareholders. From a corporate governance perspective, executive compensation not only recognizes the effort

and achievements of executives but also serves to incentivize and discipline them, resolve agency problems, and guide managerial behavior.

Scholars have found that the relationship between executive compensation and corporate performance is not always simple, stable, or linear. To a certain extent, the performance effects of executive compensation are influenced by the specific compensation level; at lower compensation levels, it fails to serve as an effective incentive; conversely, at higher compensation levels, it can lead to over-incentivization, governance failures, or self-dealing by management. Therefore, a non-linear relationship exists between the two (Rijamampianina, 2019). This suggests that more executive compensation is not necessarily better; its effectiveness depends not only on the absolute level of compensation but also on whether the compensation design aligns with corporate governance requirements and the company's actual circumstances. Chatterjee et al. (2023) argue that, from the perspectives of a company's growth stage and financial crises, the relationship between CEO compensation and firm performance is more complex; meanwhile, Grey et al. (2024) contend that the distinct characteristics of the board chair and CEO influence executive compensation decisions and their impact on firm performance, meaning that the incentive effects of executive compensation do not follow a simple linear relationship. Kweh et al. (2022) argue that executive compensation exerts a more pronounced impact on firm performance under conditions of severe financial constraints, thus indicating that compensation incentives exhibit a certain degree of context dependence.

Research generally agrees that there is a close link between executive incentives and firm performance, though there remain some differences regarding the specific mechanisms and extent of this relationship. On the one hand, principal-agent theory posits that appropriate compensation arrangements can align management's interests with the firm's business outcomes, thereby mitigating agency conflicts and reducing opportunistic behavior. On the other hand, incentive theory argues that compensation levels and the intensity of incentives influence management's effort, risk-taking propensity, and decision-making orientation, which in turn affect firm performance. Kayani and Gan (2022) note that there is a significant link between executive compensation and firm performance, and that appropriate compensation arrangements help improve business performance. For high-tech manufacturing firms, the importance of executive compensation incentives is particularly pronounced. Appropriate compensation incentives help increase key executives' focus on business objectives and corporate value, enhance their managerial commitment and decision-making efficiency, and thereby promote improved corporate performance. Given that the top three executives typically constitute the core decision-making layer of a firm, their total compensation can more accurately reflect the firm's monetary incentive level for the core management team. Therefore, this paper proposes the following hypothesis:

H1: Executive compensation is significantly positively correlated with corporate performance.

Executive compensation is generally viewed as a form of incentive contract for companies, primarily serving to link managers' rewards to their company's performance, thereby encouraging them to focus more on value creation. Most studies indicate a positive correlation between executive compensation and corporate performance, suggesting that appropriate compensation can enhance corporate performance. Sheikh et al. (2018), using a sample of publicly listed companies in Pakistan, found a significant relationship among corporate performance, corporate governance, and executive compensation; Kweh et al. (2022) argue that under conditions of severe financing constraints, executive compensation exerts a greater influence on corporate performance, suggesting that compensation incentives exhibit a certain degree of context dependence. Kayani and Gan (2022) also contend that there is a close link between executive compensation and corporate performance. The above studies demonstrate that executive compensation is not merely a form of financial compensation but also serves as an incentive and constraint mechanism, playing a crucial role in corporate governance structures. Morri et al. (2023) conducted an empirical study on listed real estate companies and found that both corporate governance and executive compensation exert positive effects on firm performance and firm value.

With the continuous enrichment of research perspectives, scholars have gradually extended the exploration of the nexus between executive compensation and firm performance to emerging research contexts. For instance, Mou et al. (2025) analyzed the composition of CEO compensation and its deviation from ESG ratings, and argued that heterogeneous compensation structures exert adverse effects on firms' attainment of favorable ESG ratings. Nie et al. (2025) proposed that digital transformation influences the determination of CEO compensation, which in turn affects corporate ESG performance. Zhang et al. (2024) pointed out that there exists a close interrelationship among executive compensation, internal governance, and ESG performance.

Existing research suggests that there is typically a positive relationship between equity incentives and corporate performance. Aljughaiman et al. (2024) note that there is a significant correlation between CEO equity incentives and corporate financial performance. This logic is particularly applicable to high-tech manufacturing firms. Given that such enterprises are characterized by long innovation cycles, high technological risks, and delayed returns, if management is primarily driven by short-term compensation, they may be more inclined to pursue current performance while neglecting R&D investment and the execution of long-term strategies. In contrast, management share ownership can strengthen management's focus on the company's future growth and continuous innovation by aligning their long-term interests with the firm's, thereby better guiding them to make decisions regarding R&D investment, risk-taking, and strategic planning that are conducive to the company's long-term value. Therefore, in the high-risk, long-cycle high-tech manufacturing sector, long-term equity incentives may better align with corporate development needs and have a more significant positive impact on corporate performance compared to short-term monetary compensation incentives. Therefore, this paper proposes the following hypotheses:

H2: The proportion of management equity holdings is significantly positively correlated with corporate performance. Furthermore, compared to the monetary compensation incentives reflected by the total compensation of the top three executives, the long-term equity incentives reflected by the proportion of management equity holdings have a more significant positive impact on corporate performance.

Based on the above analysis, this paper argues that executive incentives influence the performance of high-tech manufacturing firms through different channels, with monetary compensation primarily serving as a short-term incentive, while long-term equity incentives place greater emphasis on aligning long-term interests and fostering innovation. To test these hypotheses, the following sections will first construct a baseline regression model with the total compensation of the top three executives as the core explanatory variable to examine the impact of monetary compensation for key executives on firm performance; Building on this foundation, we will then introduce the proportion of management shareholdings to construct an incentive structure analysis model, aiming to compare the differentiated effects of short-term monetary incentives and long-term equity incentives on firm performance. Through this research design, this paper aims to more systematically identify the causal relationship between executive incentive mechanisms and firm performance in the context of high-tech manufacturing.

3.2 Data collection and sampling

This study uses Chinese A-share listed companies in the high-tech manufacturing sector from 2018 to 2023 as the research sample, which was screened based on the following criteria:

First, an exclusion strategy was applied to samples with missing or outlier values for key variables; missing values exceeding the threshold range were handled using the direct deletion method; second, in accordance with the China Securities Regulatory Commission's (CSRC) ST system, we excluded all observations for companies subject to special treatment (ST, *ST) throughout the entire period. Since such companies face financial distress or significant regulatory violation risks, their abnormal financial conditions could distort the research conclusions regarding normally operating enterprises; third, we truncated continuous variables at the 1st and 99th percentiles. After screening, a total of 1,706 sample observations were obtained.

The core data used in this study were sourced from the Guotai-An database (CSMAR). This database covers balance sheets, income statements, cash flow statements, and other financial data, as well as non-financial indicators such as equity structure and audit information, providing a relatively comprehensive view of listed companies' operational management. The time span of the data fully aligns with the sample selection period. All data were processed and analyzed using Excel and Stata 17.0.

3.3 Research Variables

Dependent Variable

Corporate performance (Tobin's Q), is defined as the ratio of a firm's market value (the sum of its equity and debt market values) to the replacement cost of its assets. When a firm's market value exceeds its replacement cost, it indicates a higher rate of return on investment in new assets; firms tend to expand by issuing stock or increasing investment. This metric provides a relatively comprehensive reflection of a firm's performance level. Zhou et al. (2021), in their exploration of the link between executive incentives and corporate innovation, also indirectly suggest that the evaluation of high-tech and innovation-driven firms should not be based solely on short-term profitability. The corporate performance referred to in this paper is not merely the firm's current profit or loss situation, but also encompasses both its current performance and expected future outcomes.

Explanatory Variables

Total executive compensation (lnTop3Pay) is measured using the natural logarithm of the total compensation of the top three executives; a higher value indicates a higher level of executive compensation at the company. Management shareholding ratio (Share) is measured as the proportion of total shares held by executives relative to the listed company's total outstanding shares at the end of the period; a higher value for this indicator also indicates a higher intensity of equity incentives at the company.

Control Variable

Drawing on previous research on the relationship between executive compensation and corporate performance in listed companies, we select firm size (Size), debt-to-equity ratio (Lev), revenue growth rate (Growth), and the largest shareholder's ownership stake (Top1) as control variables in this study. The specific measurement methods for these variables are detailed in Table 1.

Table 1 Dimension Number

Variable types	Variable name	Variable symbol
dependent variable	corporate value	TobinQ
Explanatory variable	Executive compensation levels	lnTop3Pay
	Management Ownership Percentage	Share
	Company Size	size
	Debt-to-Equity Ratio	lev
Control variable	Revenue Growth Rate	Growth
	Concentration of Shareholding	Top1

3.4 Model Construction

1) Based on the theoretical analysis presented earlier, this study first examines the impact of the total compensation of the top three executives on firm performance. In line with the research objectives and variable specifications of this study, the baseline regression model is constructed as follows:

$$\text{TobinQ}_{i,t} = \alpha_0 + \alpha_1 \ln \text{Top3Pay}_{i,t} + \alpha_2 \text{Size}_{i,t} + \alpha_3 \text{Lev}_{i,t} + \alpha_4 \text{Growth}_{i,t} + \alpha_5 \text{Top1}_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (1)$$

2) To further examine the differential effects of different incentive structures on firm performance, we introduce the variable of management ownership as a control variable into the baseline model, resulting in the following incentive structure model:

$$\text{TobinQ}_{i,t} = \beta_0 + \beta_1 \ln \text{Top3Pay}_{i,t} + \beta_2 \text{Share}_{i,t} + \beta_3 \text{Size}_{i,t} + \beta_4 \text{Lev}_{i,t} + \beta_5 \text{Growth}_{i,t} + \beta_6 \text{Top1}_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (2)$$

3) Given that changes in firm performance often exhibit a certain degree of lag, the impact of executive incentives on firm performance may also take some time to materialize. At the same time, to mitigate potential reverse causality issues to some extent, this paper further lags both the main explanatory variables and the control variables by one period, constructing the lagged variable model as follows:

$$\text{TobinQ}_{i,t} = \delta_0 + \delta_1 \ln \text{Top3Pay}_{i,t-1} + \delta_2 \text{Share}_{i,t-1} + \delta_3 \text{Size}_{i,t-1} + \delta_4 \text{Lev}_{i,t-1} + \delta_5 \text{Growth}_{i,t-1} + \delta_6 \text{Top1}_{i,t-1} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (3)$$

4) Furthermore, given the potential for reverse causality between executive compensation and firm performance—that is, firms with better performance are more capable of paying higher levels of executive compensation—the model suffers from certain endogeneity issues. To enhance the reliability of the research findings, this study further employs two-stage least squares (2SLS) to test for endogeneity, using the first-order lagged values of the core explanatory variables as instrumental variables.

The first-stage model is specified as follows:

$$\ln \text{Top3Pay}_{i,t} = \theta_0 + \theta_1 \ln \text{Top3Pay}_{i,t-1} + \theta_2 \text{Size}_{i,t} + \theta_3 \text{Lev}_{i,t} + \theta_4 \text{Growth}_{i,t} + \theta_5 \text{Top1}_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (4)$$

The model for the second phase is defined as follows:

$$\text{TobinQ}_{i,t} = \eta_0 + \eta_1 \text{IV_LnTop3Pay}_{i,t} + \eta_2 \text{Size}_{i,t} + \eta_3 \text{Lev}_{i,t} + \eta_4 \text{Growth}_{i,t} + \eta_5 \text{Top1}_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (5)$$

Attention should be paid to: TobinQ_{i,t} represents the performance of firm *i* in year *t*, measured using the Tobin Q ratio; ln Top3Pay_{i,t} denotes the natural logarithm of the total compensation of the firm's top three executives; Share_{i,t} denotes the proportion of shares held by management; Size_{i,t} denotes firm size; Lev_{i,t} denotes the debt-to-asset ratio; Growth_{i,t} denotes the revenue growth rate; Top1_{i,t} denotes the ownership share of the largest shareholder; μ_i denotes the firm-specific fixed effect; λ_t denotes the year-specific fixed effect; and $\varepsilon_{i,t}$ denotes the random error term.

In the above model, ① is used to examine the overall impact of the total compensation of the top three executives on firm performance; ② is used to further analyze the differential effects of compensation incentives and equity incentives on firm performance; ③ is used to examine the lagged impact of executive incentives on firm performance and, to some extent, mitigate endogeneity issues; ④ and ⑤ are used to identify and address potential endogeneity issues through two-stage least squares, thereby enhancing the robustness and credibility of the empirical results.

4. Results and Discussion

As shown in Table 2, the mean of firm performance (Tobin's Q) is 2.24 and the median is 1.903, indicating a left-skewed distribution. The maximum value of 12.44 is significantly higher than the median, suggesting the presence of outliers or high-growth firms. The maximum value for total executive compensation is 17.663, and the minimum is 13.084, representing a significant difference between the two. The maximum value for management ownership is 81.11, and the minimum is 0, indicating a significant difference between the two, with the gap being even more pronounced than that observed in total executive compensation. In addition, the maximum and minimum values for firm size (Size), debt-to-equity ratio (Lev), revenue growth rate (Growth), and the largest shareholder's ownership ratio (Top1) also exhibit significant differences. This may be attributed to variations in the development stages of different firms and the differing business strategies they adopt, leading to these notable disparities.

Table 2 Descriptive statistics of variables in the model

VarName	Obs	Mean	SD	Median	Min	Max
TobinQ	1706	2.24	1.22	1.903	0.837	12.244
lnTop3Pay	1706	15.00	0.65	14.932	13.084	17.663
Share	1706	0.20	0.19	0.158	0.000	81.11
Size	1706	22.26	1.05	22.160	19.940	26.026
Lev	1706	0.35	0.16	0.346	0.030	0.858
Growth	1706	0.13	0.32	0.091	-0.807	5.394
Top1	1706	29.83	12.65	28.015	5.810	75.170

To conduct a preliminary analysis of whether there is a correlation among the variables and to identify the nature of such correlations, this study employs Pearson's correlation coefficient to examine the relationships among total executive compensation, management shareholding ratio, and firm performance. The results are shown in Table 3:

The correlation coefficients between total executive compensation and corporate performance are 0.064 and 0.111, respectively, and both are significantly positive at the 1% significance level. However, correlation analysis merely indicates a relationship between two variables and does not establish that one variable causes changes in the other; therefore, further empirical analysis is required to explore the relationships among these variables.

Table 3 Summary of Correlation analysis matrix

	TobinQ	lnTop3Pay	Share	Size	Lev	Growth	Top1
TobinQ	1						
lnTop3Pay	0.064***	1					
Share	0.111***	-0.237***	1				
Size	-0.107***	0.610***	-0.392***	1			
Lev	-0.274***	0.149***	-0.124***	0.370***	1		
Growth	0.158***	0.001	0.084***	0.006	0.055**	1	
Top1	0.061**	-0.010	0.042*	0.020	-0.049**	0.010	1

Multicollinearity Test

The multicollinearity test is primarily used to determine whether there are strong linear correlations among the explanatory variables in a regression model. If the correlation between variables is too high, it may lead to unstable estimates of regression coefficients, thereby affecting the reliability of the regression results. Therefore, it is necessary to conduct a multicollinearity test on the model variables before performing empirical regression analysis.

Typically, one can first make a preliminary assessment of the degree of correlation among variables using the correlation matrix, and then further conduct tests using the Variance Inflation Factor (VIF). It is generally accepted that when the VIF value exceeds 10, it indicates that the model may have a serious multicollinearity problem. The test results in Table 4.3 show that the VIF values for all major variables are below 10, and the Mean VIF value is 1.34, which is well below the critical threshold. This indicates that there are no significant multicollinearity issues among the variables in the model. Therefore, the variables selected in this study can be appropriately included in the subsequent regression analysis, and the model specification is reasonably sound.

Table 4 Summary table of Multicollinearity Test

	VIF	1/VIF
Size	2.030	0.493
lnTop3Pay	1.613	0.620
Share	1.196	0.836
Lev	1.181	0.847
Growth	1.012	0.988
Top1	1.008	0.992
Mean VIF	1.340	.

Hausman and F-Tests

The Hausman test uses the Hausman statistic to determine whether these differences are significant. If the differences are significant, this indicates that the fixed-effects model is superior; conversely, it indicates that the random-effects model is superior. According to the results in Table 6, the F-test (F-test that all $u_i=0$) yields a value of 6.30 with a p-value of 0.000; therefore, the OLS model is rejected. Furthermore, based on the results of the Hausman test, the Hausman statistic is 76.18, and the results also reject the null hypothesis at the 1% significance level. Therefore, this paper should use the fixed-effects model as the baseline regression.

Table 5 Summary of Hausman Test and the F-Test

dependent variable	F-test	Hausman test	Test Results
Corporate Value	6.30 ***	76.18***	We rejected the null hypothesis and ultimately chose to use a fixed-effects model.

To analyze the impact of total executive compensation on firm performance, a two-way fixed-effects regression was conducted, with the results presented in Table 6.

In the regression model, the regression coefficient for the relationship between total executive compensation and firm performance was 0.267, and it was significant at the 1% level. This indicates that a one-unit change in total executive compensation leads to a 0.267-unit increase in firm performance. An increase in total executive compensation has a positive and significant effect on corporate performance. This is because higher compensation serves as a strong affirmation of the value of executives' human capital, satisfying their economic and psychological needs, enhancing their work engagement and sense of responsibility, and motivating them to leverage their professional capabilities to create value for the firm.

At the same time, increased compensation establishes a strong incentive and accountability mechanism, closely aligning executives' interests with corporate performance. This drives them to actively optimize decision-making, innovate in management, and expand markets, thereby enhancing operational efficiency and competitiveness. Furthermore, generous compensation attracts industry elites, infusing the company with new vitality and wisdom, propelling strategic upgrades, and ultimately leading to a significant improvement in corporate performance. Hypothesis H1 is thus validated.

However, the model's Within R^2 is only 0.126, indicating a low level of model fit. This may be attributed to the fact that the data used in this study consists of micro-level data from listed companies. Most studies indicate that when conducting empirical tests using micro-level firm data, the R^2 values in regression models tend to be relatively low. Furthermore, Tobin's Q, used as a proxy variable for firm performance, may itself be significantly influenced by unobservable factors such as market sentiment, industry conditions, and investor expectations. These factors are difficult to incorporate into the model and may also lead to a lower overall explanatory power. However, this is merely a baseline regression model; subsequent analyses will introduce equity incentive variables to further refine the model.

Table 6 Summary of Benchmark Regression Results

Variable	TobinQ
lnTop3Pay	0.267*** (3.140)
Size	-0.323*** (-3.650)
Lev	0.540 (1.640)
Growth	0.266*** (3.800)
Top1	-0.025*** (-3.660)
_cons	5.973*** (3.050)
Company_FE	YES
Year_FE	YES
N	1706
Within R2	0.126

t statistics (t statistics), * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Extended Regression Analysis

To investigate the effects of both salary incentives and equity incentives on firm performance, as well as which of the two may have a stronger incentive effect in high-tech manufacturing firms, this paper incorporates equity incentive variables into the regression model for further testing. The results are presented in Table 7.

Table 7 Summary of the Incentive Structure Model

Variable	TobinQ
lnTop3Pay	0.301*** (5.020)
Share	0.438*** (2.680)
Size	-0.116*** (-2.690)
Lev	-1.956*** (-9.490)
Growth	0.620*** (3.630)
Top1	0.006*** (2.740)
_cons	0.177 (0.220)
Company_FE	YES
Year_FE	YES
N	1706
Within R2	0.185

t statistics (in parentheses) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The regression coefficients for monetary incentives and equity incentives relative to firm performance were 0.301 and 0.438, respectively, and both were significantly positive at the 1% significance level, indicating that equity incentives also play a significant positive role in improving firm performance. This is because equity incentives transform executives and key employees into important stakeholders by granting them a certain percentage of company equity. This not only helps mitigate conflicts of interest between owners and managers but also curbs short-sighted behavior and moral hazard to a certain extent. Under this mechanism, management and key employees, in pursuit of equity appreciation, will be more proactive in optimizing business decisions, driving technological innovation, and expanding market operations, thereby promoting a steady improvement in corporate performance. At the same time, equity incentives help increase management's focus on the company's future development and enhance their sense of long-term operational responsibility.

It is worth noting that the regression coefficient of 0.438 for the relationship between equity incentives and corporate performance is significantly higher than the 0.301 coefficient for the relationship between salary incentives and corporate performance. This indicates that long-term equity incentives have a more pronounced positive effect on corporate performance, suggesting that long-term incentive mechanisms may be more effective in high-tech manufacturing enterprises. This may be because equity incentives align employees' interests more deeply with the company's long-term value. Once employees become "partial owners" of the company, their returns depend directly on the company's stock price performance or profit growth. Consequently, they are more proactive in focusing on strategic execution, cost control, R&D investment, and long-term development, thereby reducing short-sighted behavior. In contrast, salary-based incentives primarily link employee income to current work performance; while they can generate some motivational effect, they struggle to establish a sustainable and stable mechanism for aligning long-term interests. Even with high salary levels, employees may still be inclined to pursue short-term returns due to a lack of sufficient sense of belonging and long-term commitment. They may even harm the company's interests due to information asymmetry or moral hazard, resulting in significant differences in the effectiveness of the two incentive approaches. In summary, Hypothesis H2 is confirmed.

Since the impact of executive incentives on firm performance may take some time to materialize, we conducted a regression with both the main explanatory variables and control variables lagged by one period:

Table 8 shows that in the baseline regression, the regression coefficient for executive compensation lagged by one period and firm performance is 0.261, and it is significant at the 1% level; In the incentive structure model, the regression coefficients for one-period lagged executive compensation and equity ownership ratio are both positive and significant. This indicates that both executive compensation and equity incentives have a certain lag effect on firm performance; they exert a positive influence on firm performance both in the current period and in the lagged period.

Table 8 Regression Results for the Lagging Model

Variable	(1) TobinQ	(2) TobinQ
L.lnTop3Pay	0.261*** (4.100)	0.256*** (4.060)
L.Share		0.694*** (3.490)
L.Size	-0.173*** (-4.100)	-0.116** (-2.550)
L.Lev	-1.906*** (-8.700)	-1.946*** (-8.810)
L.Growth	0.572*** (3.880)	0.537*** (3.730)
L.Top1	0.008*** (3.090)	0.007*** (3.010)
_cons	2.544*** (3.390)	1.238 (1.420)
Company_FE	YES	YES
Year_FE	YES	YES
N	1398	1398
Within R2	0.155	0.165

t statistics (parentheses) * p < 0.1, ** p < 0.05, *** p < 0.01

Robustness test

Robustness tests were conducted by substituting the dependent variable. Since return on assets (ROA) and return on equity (ROE) are key indicators for evaluating the operating performance of listed companies, they were used to replace firm performance (TobinQ), as shown in Table 9.

In both the baseline regression model and the incentive structure model, when the dependent variable firm performance (Tobin Q) is replaced with return on assets (ROA) and return on equity (ROE), the regression coefficients for both total executive compensation and equity incentives are positive and significant at the 1% level. This is consistent with the regression results presented earlier, demonstrating that those results are robust.

Table 9 Summary of Results for the robustness test

Variable	(1) ROA	(2) ROA	(3) ROE	(4) ROE
lnTop3Pay	0.022*** (3.420)	0.017*** (5.620)	0.040*** (4.040)	0.024*** (4.190)
Share		0.039*** (4.930)		0.059*** (4.670)
Size	0.023*** (2.820)	0.010*** (5.180)	0.052*** (4.560)	0.020*** (5.160)
Lev	-0.185*** (-6.990)	-0.164*** (-14.260)	-0.329*** (-8.910)	-0.219*** (-6.910)
Growth	0.051*** (4.480)	0.063*** (4.630)	0.091*** (11.220)	0.114*** (4.820)
Top1	0.001** (2.110)	0.0005*** (5.510)	0.003*** (3.680)	0.001*** (6.030)

	(1)	(2)	(3)	(4)
Variable	ROA	ROA	ROE	ROE
_cons	-0.770*** (-4.070)	-0.418*** (-11.680)	-1.673*** (-6.100)	-0.731*** (-10.840)
Company_FE	YES	YES	YES	YES
Year_FE	YES	YES	YES	YES
N	1706	1706	1706	1706
Within R2	0.226	0.316	0.184	0.237

The t statistics are in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01

There may be a reverse causal relationship between the core explanatory variable examined in this study—executive compensation—and the dependent variable—firm performance. Consequently, there is a certain degree of endogeneity between executive compensation and firm performance. To eliminate this effect and ensure the validity of the regression results, we employ two-stage least squares (2SLS) to conduct an endogeneity test. This study selects the first-order lagged term of the natural logarithm of the total compensation of the top three executives, i.e., $L.\ln\text{Top3Pay}$, as the instrumental variable. In the 2SLS test, Tobin's Q is retained as the dependent variable, consistent with the baseline regression. ROA and ROE serve only as alternative profitability indicators, which are substituted during robustness tests; however, the core dependent variable is not replaced in the endogeneity test to ensure consistency in the model specification and final conclusions.

The research results are presented in Table 10:

Column (1) presents the results of the first-order estimation. The regression coefficient for $L.\ln\text{Top3Pay}$ is 0.851 and is significant at the 1% level, indicating that there is a strong correlation between executive compensation in the previous year and executive compensation in the current year, which satisfies the correlation condition for instrumental variables; Furthermore, the Cragg-Donald Wald F-statistic is 3907.904, which is far greater than the commonly used critical value, indicating that the instrumental variable selected in this study does not suffer from the problem of weak instrumentality.

Column (2) presents the results of the second-stage regression. The regression coefficient for $IV_ln\text{Top3Pay}$ is 0.011 and is significant at the 1% level, indicating that after controlling for potential endogeneity via the instrumental variable, executive compensation still plays a significant role in promoting the firm's operating performance as measured by Tobin Q. This is consistent with the findings of the baseline regression and confirms the robustness of the main argument of this paper.

Table10 Results of the Endogeneity Test

	(1)	(2)
Variable	$\ln\text{Top3Pay}$	TobinQ
Size	0.054*** (6.040)	0.011*** (5.190)
Lev	-0.032 (-0.690)	-0.168*** (-16.380)
Growth	0.123*** (5.860)	0.070*** (15.300)
Top1	-0.000 (-0.200)	0.001*** (5.330)
$L.\ln\text{Top3Pay}$	0.851*** (62.510)	

	(1)	(2)
Variable	lnTop3Pay	TobinQ
IV_lnTop3Pay		0.011*** (3.160)
Constant	1.092*** (6.220)	-0.333*** (-8.210)
Company_FE	YES	YES
Year_FE	YES	YES
N	1,398	1,398
Withim R2	0.838	0.291
Cragg-Donald Wald F statistic	3907.904	

the t statistics (in parentheses), *p < 0.1, ** p < 0.05, *** p < 0.01

Based on the above analysis and extensive review of the relevant literature, we conducted empirical tests of the proposed hypotheses. All hypotheses were supported and proven to hold.

5. Conclusion

5.1 Summary of Research Findings

Empirical tests indicate that executive compensation incentives and equity-based incentives have a positive impact on corporate performance. The study found that both types of incentives are effective; moreover, equity-based incentives yield greater improvements in performance compared to compensation-based incentives, and both have lasting effects. These findings provide strong support for understanding the incentive strategies of Chinese enterprises.

Total executive compensation has a positive impact on corporate performance (Tobin' s Q);

This study proposes an “incentive structure model” that includes equity incentives, concluding that both equity and salary incentives have a positive effect on firm performance. Furthermore, the coefficient for equity incentives is greater than that for salary incentives, indicating that equity incentives are more effective than salary incentives in improving firm performance. In other words, due to their stronger alignment of interests and long-term effects, equity incentives are more effective in addressing agency problems, leading managers to place greater emphasis on the firm' s long-term development.

Tests of long-term effects and robustness analysis further examine the long-term impact of executive incentives;

The study conducted a regression analysis with the main independent variables lagged by one period and found that both one-period-lagged salary incentives and equity incentives still had a significant positive impact on firm performance. In other words, management incentives not only have short-term effects but also exhibit a certain degree of long-term persistence. To ensure the reliability of the findings, robustness tests were conducted using ROA and ROE as substitutes for firm performance, and the results were largely consistent with the previous findings. The regression results indicate that one-period lagged salary incentives and equity incentives still have a significant positive impact on firm performance, suggesting that both types of incentives have long-term effects rather than merely serving as one-time stimuli. To enhance the robustness of the results, the study reanalyzed the data using Return on Assets (ROA) and Return on Equity (ROE) as proxies for firm performance, and the basic conclusions remained consistent.

After controlling for endogeneity, both salary incentives and equity incentives have a significant positive impact on firm performance;

To address endogeneity issues—such as potential reverse causality—that could affect the accuracy of the study' s conclusions, this paper employs a firm' s “total compensation” as an instrumental variable and conducts a two-stage least squares (2SLS) estimation. The instrumental variable test results indicate that this instrumental variable is valid and meets the model specifications. After controlling for endogeneity, both salary incentives and equity incentives have a significant positive impact on firm performance, further substantiating the main argument of this paper.

5.2 Implications of the Study

Based on the above analysis, this paper argues that listed companies in the high-tech manufacturing sector should place greater emphasis on industry-specific characteristics and long-term objectives when designing and implementing executive incentive mechanisms, rather than blindly adopting practices used in the general manufacturing sector or traditional enterprises. Given the characteristics of the high-tech manufacturing sector—including high R&D investment rates, rapid technological progress, long time-to-market for innovation outcomes, and a complex and volatile market environment—this paper offers the following recommendations.

1) Establish executive compensation incentive mechanisms aligned with an innovation-oriented approach.

When formulating executive compensation plans, high-tech manufacturing companies should not base performance evaluations solely on operating revenue, net profit, or financial indicators for the current year. Instead, they should also include factors such as the proportion of R&D investment, breakthroughs in key technologies, progress on major projects, the development of new products, and the application of new technologies as components of compensation evaluations. In particular, enterprises with high R&D investment ratios and long-term technology development cycles should avoid an excessive focus on short-term profit and loss fluctuations, to prevent executives from reducing R&D investment or cutting support for innovation activities in pursuit of immediate gains. In other words, executive compensation design should shift from a “single performance-oriented” approach to one that combines “financial metrics with innovation metrics,” ensuring that compensation incentives better reflect the role of value creation in high-tech manufacturing enterprises.

2) Increase the proportion of long-term equity incentives within the overall incentive system.

Research findings indicate that equity incentives have a greater impact on corporate and individual executive performance than cash-based incentives. Therefore, high-tech manufacturing enterprises should strengthen institutional frameworks in this area. Implementation should not be limited to one-time grants; instead, rolling equity incentives can be structured based on corporate development strategies and R&D projects. This ensures the sustained effectiveness of equity incentives and prevents recipients from losing motivation or even becoming complacent after receiving a one-time incentive. Furthermore, the vesting conditions for equity incentives should not place excessive emphasis on short-term profitability. Instead, they should give greater consideration to long-term factors such as the proportion of R&D investment relative to operating revenue, the number of patent applications, progress in core technology development, the share of sales revenue from new products, or the commercialization status of major research projects. This approach ensures that equity incentive plans better align with the characteristics of R&D in the high-tech industry.

3) Design incentive mechanisms tailored to the characteristics of specific sub-sectors.

The high-tech manufacturing sector is not a homogeneous group of enterprises; different sub-sectors vary in terms of the pace of technological innovation, R&D cycles, and competitive environments. Therefore, when establishing incentive mechanisms, high-tech manufacturing enterprises must differentiate their approaches based on the specific characteristics of their sub-sector, the company’s stage of development, and its strategic objectives, rather than applying a one-size-fits-all approach.

4) Promote the combined use of short-term monetary incentives and long-term equity incentives.

Both monetary incentives and equity incentives have a positive impact on corporate performance, but they function differently. Cash compensation focuses on ensuring current levels of effort and management performance, while equity incentives primarily serve to curb short-sighted behavior and emphasize long-term interests. Therefore, companies should implement a hybrid incentive strategy where “short-term incentives ensure execution, while long-term incentives guide the company’s development direction.” In compensation design, a certain proportion of variable performance-based pay can be incorporated to promptly reflect the results of the current year’s work. At the same time, the adoption of equity incentives aligns management’s interests more closely with the company’s growth prospects, encouraging them to give greater consideration to the company’s future development when deciding whether to make substantial R&D investments, undertake long-term investment projects, or adjust the company’s strategic direction. Only through the integration of these two approaches can a more comprehensive incentive mechanism be established that aligns with the characteristics of the high-tech manufacturing sector.

5) Strengthening Corporate Governance and Information Disclosure

The effective implementation of executive incentive mechanisms is not solely dependent on the intensity of the incentives but is also closely tied to the level of corporate governance and the external regulatory

environment. For listed companies in the high-tech manufacturing sector, it is essential to further enhance the independence and professionalism of the Compensation and Evaluation Committee under the board of directors. When designing incentive plans, companies must ensure they are rigorous, reasonable, transparent, and fair, thereby avoiding excessive incentives, conflicts of interest, or situations where executives receive high salaries despite poor performance. Additionally, companies need to enhance the disclosure of information regarding executive compensation and equity incentives, particularly by providing detailed explanations of performance evaluation criteria, vesting conditions, the duration of incentive plans, and restrictive clauses, so that the market can better understand the rationality of the company's incentive plans. Regulatory authorities should also further promote the standardization of executive incentive disclosure for listed companies in the high-tech manufacturing sector, guiding companies to develop incentive mechanisms that are more transparent, long-term oriented, and aligned with the principles of innovation.

6. Limitations and future research directions

Although this paper has conducted a relatively comprehensive study and discussion of the relationship between executive compensation and corporate performance in listed high-tech manufacturing companies and has drawn certain conclusions, it still has some limitations due to factors such as research constraints, data availability, and model specifications:

1) The sample selection has certain limitations.

The sample selected for this study consists of A-share listed companies in the high-tech manufacturing sector from 2018 to 2023. While this sample adequately reflects the development status of high-tech manufacturing enterprises in China's capital market, it does not include unlisted companies or firms from other industries for comparative analysis. Therefore, further examination is needed to determine whether the findings of this study are generally applicable to different types of enterprises and different industries.

2) The measurement of variables is somewhat simplified.

This study primarily uses total executive compensation and executive stock ownership as indicators of executive incentives, and Tobin's Q, ROA, and ROE as indicators of corporate performance. While these metrics effectively capture key aspects of the issues at hand, they do not comprehensively cover all dimensions of executive incentives or corporate performance. For example, corporate performance encompasses not only profitability and market value but also innovation capacity, R&D investment, and long-term growth potential; similarly, executive incentives extend beyond compensation and equity to include motivation from promotions, the influence of personal reputation, and incentives related to corporate control.

3) There is room for improvement in addressing endogeneity

Although this study employs lagged variables and two-stage least squares to address endogeneity, the relationship between executive incentives and firm performance is complex, and there may be undiscovered endogenous factors. Future research could incorporate dynamic panel models, natural experiment methods, or better instrumental variables to enhance the effectiveness of causal inference. Improve the variable setup by incorporating the degree of product and service localization as a key independent variable into the model, and use multidimensional perceived value (i.e., functional and emotional value) to explain the underlying reasons.

4) Insufficient consideration of heterogeneity.

Given that high-tech manufacturing enterprises under different property rights systems vary in scale, stage of growth, and industry segment, the effects of executive incentives may differ significantly among them. Due to space constraints and the research objectives of this paper, this issue has not been explored in detail here. Future research could conduct comparative studies by grouping enterprises based on state-owned versus non-state-owned status, different life cycle stages, and industries with varying technological levels to identify the boundaries of executive incentives' effectiveness.

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