

# The Influence of Executive Incentives on Corporate Innovation

## -- Considering the Securities Margin Trading

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### Abstract

**This article takes A-share listed companies in China from 2010 to 2017 as the research object, analyzes the impact of executive compensation incentives and equity incentives on corporate innovation, and also studies the interaction of the two incentive mechanisms and its integrated effects on corporate innovation. Besides, this article tests the difference in the impact of the executive incentives of the target company and the non-target company under the securities margin trading on corporate innovation. In addition, this article also studies the external environmental factors of the impact of executive incentives on corporate innovation. The results show that both executive compensation incentives and equity incentives can increase the innovation output of enterprises; compensation incentives and equity incentives have a complementary relationship, and the integrated effect of the two significantly promotes enterprise innovation output; the securities margin trading will inhibit the promotion effect of compensation incentives on corporate innovation output, but will not significantly affect the promotion effect of equity incentive on corporate innovation output.**

### Keywords

**Compensation incentive; equity incentive; securities margin trading; corporate innovation.**

## 1. INTRODUCTION

Our country is a big manufacturing country, but most of our export products are labor-intensive products. Because these products lack core competitiveness, they can easily be substituted in today's increasingly fierce international competition. As the main body of product production, if an enterprise wants to produce products with core competitiveness, it must undergo transformation and upgrading, and innovation is the key to the success of enterprise transformation. At the same time, as countries around the world pay more attention to innovation, if we want to improve our country's competitiveness and strengthen our country's overall strength, we must increase innovation input, increase innovation output, and improve innovation efficiency.

The introduction of the securities margin trading ended the history of no short selling mechanism since the establishment of my country's stock market. From the perspective of theoretical exploration, unlike foreign developed capital markets, my country's margin trading and securities has undergone a special process of piloting and then promoting, and the underlying stocks are gradually expanding. From the practical enlightenment, after the implementation of my country's securities margin trading, with the opening of refinancing business and the improvement of related systems, the scale of the securities margin trading has increased significantly. The market transaction scale was not 700,000 yuan when it was implemented in March 2010. By May 2015, the transaction scale of the market has reached a

high of 2079.547 billion yuan. After that, the scale of the securities margin trading began to decline, but it was still high. At the same time, with the continuous development of manager's market in China, the degree of separation of ownership and control has become greater and greater, and the ensuing principal-agent problem has become more and more prominent. The target interests of executives and shareholders are inconsistent, resulting that they make opportunistic behaviors that are not conducive to the enterprise, such as abandoning high-risk and long-term innovative projects for short-term performance. In order to promote executives to carry out corporate innovation, executive incentives are essential.

The existing research on the influencing factors of corporate innovation generally starts from three aspects, namely the company level, the market level and the macroeconomic level. The company level mainly includes: Jin Yonghong et al. [1] took GEM listed companies in China as research objects and found that the proportion of venture capital holdings and innovation investment have a significant positive relationship. Therefore, companies with the background in venture capital have a higher level of risk-taking and are more active in innovation activities. Liu et al. [2] found that the M&A has a positive relationship with their subsequent innovation output. In addition, Xiao Liping [3] proposed that equity incentives can help increase corporate innovation investment, but Chen Xiude et al. [4] pointed out that executive currency compensation is significantly positively correlated with R&D efficiency, and equity incentives have an inverted U-shaped relationship with R&D efficiency. At the market level, Tang Qingquan et al. [5] took A-share listed companies in China as research objects and proposed that the competitive structure of banks has a positive effect on corporate innovation investment. However, based on the background of entry deregulation, Zhang Jie et al. [6] found that only when the level of structural competition among banks reaches a certain level will it promote corporate innovation. At the macroeconomic level, Fang et al. [7] took enterprises in China as research objects and found that the innovation level of state-owned enterprises has increased after privatization, and the effect is more obvious when the degree of intellectual property protection is higher. Jia Junsheng et al. [8] took my country's listed companies as research objects and found that corporate innovation is significantly affected by the development of the credit market, and its role is affected by the imperfect financing function.

Existing research on executive compensation incentives, equity incentives and corporate innovation is mainly carried out from the following aspects: Coles et al. [9] found that compensation incentives can effectively inhibit the risk aversion trend of executives and alleviate principal-agent conflicts, and enhance the enthusiasm of executives in innovation. Liu Tingting et al. [10] pointed out that the board of directors usually fully consider the risks of corporate innovation and the lagging nature of corporate innovation. At the same time, in order to promote executives to innovate, the board of directors will not reduce executive compensation even if the short-term performance of company is poor. But some scholars have put forward different views. Amabile [11] found that this method of paying compensation based on performance can motivate repetitive work, but it cannot motivate innovative work. Xie Weimin [12] found that paying salary based on performance easily induces executives to obtain high salaries and improve short-term performance of the company through various methods, thereby abandoning high-risk innovative projects, which in turn leads to damage to the company's long-term value. To sum up, the existing literature basically supports that executive compensation incentives can effectively promote corporate innovation, and most scholars believe that payment based on performance is unfavorable for corporate innovation. Equity incentives have always been called the golden handcuffs for companies to retain talents. Scholars at home and abroad have also conducted many studies on the relationship between equity incentives and corporate innovation, but their conclusions are not the same. Armstrong [13] found that equity incentives link executive compensation to the fluctuation of the company's stock price, which makes executives have a strong motivation to take risks and

make decisions to carry out innovative activities. If executives do not hold shares in the company or hold fewer shares, they will be less affected by the company's long-term value, which will make them inclined to invest in projects that can improve the company's short-term performance. Therefore, increasing the proportion of executives' shareholding can be effective to promote enterprise innovation. Zhao Guoyu [14] shows that under the effect of equity incentives, executives will be more active in developing innovative activities based on their own long-term interests. However, contrary to the above conclusions, Lu Changjiang et al. [15] proposed that equity incentive plans in China may have welfare effects, that is, the equity incentive plans of some listed companies in China may provide benefits to executives in a disguised form. Such equity incentive plans cannot effectively promote corporate innovation. In addition to the above two opposing views, some scholars believe that there is a nonlinear relationship between equity incentives and corporate innovation. Ghosh [16] found that when the shareholding ratio of executives is between 0-5%, the shareholding level is positively correlated with innovation input, when the shareholding ratio is between 5%-25%, the shareholding level is negatively correlated with innovation input, but when the shareholding ratio exceeds 25%, the shareholding level is positively correlated with innovation input. Chen Wenqiang [17] pointed out that there is a turning point in equity incentives. When the intensity of equity incentives is controlled within an appropriate range, it can promote corporate innovation, but once it exceeds this range, the role of equity incentives in promoting corporate innovation gradually weakens.

Most of the above-mentioned studies only study a single incentive mechanism. Few literature studies the interaction between incentive mechanisms and the integration effect on corporate innovation. In addition, it can also be seen that less literature considers the securities margin trading. Finally, this article also studies the external environmental factors of the impact of executive incentives on corporate innovation.

## 2. RESEARCH HYPOTHESIS

### 2.1. Analysis of the impact of Executive Compensation Incentives on Corporate Innovation Output

According to the principal-agent theory, managers tend to pursue short-term economic benefits based on their own interests, avoiding projects with high risks, long cycles and short-term gains. And compensation incentives can effectively alleviate the principal-agent problem in the short term. Gao Wenliang [18] pointed out that this will inevitably reduce the enthusiasm of executives on innovation because the benefits of innovation projects can only be obtained for a long time in the future and most of the benefits will be attributed to shareholders, but the company's innovation activities can be passed on to the outside world. The signal of the company's aggressiveness will cause the company to increase its attention to executives and help them promote. Therefore, compensation incentives can encourage executives to carry out more innovative activities. Yin Meiqun et al. [19] pointed out that the development of innovative activities will inevitably weaken the short-term performance of the enterprise because the income of executives mainly comes from salary and the performance of executives determines executive compensation. Compensation incentives can increase the risk-taking of executives. Compensation incentives can to a large extent make up for the loss of short-term stable gains for executives to carry out innovative activities. In addition, under the background of the Chinese system, the executives of listed companies in our country are still in the stage of wealth accumulation, and their salary is less risky and stable. Therefore, they are more inclined to choose compensation incentives with stable returns [20]. Therefore, this article proposes the following assumptions:

H1: Executive compensation incentives can effectively promote corporate innovation output.

## **2.2. Analysis of the Impact of Executive Equity Incentives on Corporate Innovation Output**

Equity incentives link the interests of executives with the long-term value of the company by granting a certain amount of equity to executives. It is very attractive to executives who prefer risk and can encourage them to actively carry out corporate innovation. Existing studies have shown that the increase in the proportion of shares held by executives makes executives pay more attention to the long-term value of the company, which is conducive to improving the initiative of executives on innovation [21]. Zahra [22] has also reached a similar conclusion. It is believed that given the appropriate equity, executives will be more motivated to work hard to maintain the company's ability. Wang Yanni [23] believed that equity incentives will have two opposite effects on corporate performance, namely convergence of interests and defensive effects. When the shareholding ratio of executives is within an appropriate range, they will pay attention to the long-term interests of the company and actively carry out corporate innovation activities. This is the stage of convergence of interests. When the shareholding ratio of executives exceeds the appropriate range, due to the increase in the power of executives, it may even harm the interests of shareholders. This is the stage of defensive effect. But at present, the shareholding ratio of executives of most listed companies in China is generally low and even some corporate executives do not hold shares, and they are still in the stage of benefit convergence. Therefore, this article proposes the following assumptions:

H2: Executive equity incentives can effectively promote corporate innovation output.

## **2.3. Analysis of the Interaction of Incentive Mechanisms and Its Integrated Effects on Corporate Innovation Output**

There is often more than one incentive mechanism for executives, and how to choose and combine different incentive mechanisms is a problem that needs to be solved urgently. Therefore, shareholders need to choose the optimal combination of incentives to make the executive incentive effect and corporate benefits are maximized. Studies have pointed out that incentive mechanisms do not exist independently, and the effectiveness of a single incentive mechanism will definitely be affected by other incentive mechanisms[24]. Therefore, with the continuous optimization of corporate internal governance mechanisms, my country's listed companies have gradually changed the practice of only using a single incentive mechanism, and began to pay attention to governance methods where multiple incentive mechanisms coexist, and in-depth explore of the integrated effect of multiple incentive mechanisms on corporate innovation. Among them, equity incentives are long-term incentives, and compensation incentives are medium and short term incentives. The organic combination of the two can meet the material and spiritual needs of executives, just making up for the other party's shortcomings, and can avoid the short-sighted behavior of executives. It also can avoid executives from overly pursuing long-term value and ignoring short-term benefits [25]. The crossover of the two promotes corporate innovation. It is inferred that there may be complementary effects between the two. Therefore, this article proposes the following assumptions:

H3: salary incentives and equity incentives have a complementary relationship on corporate innovation output.

## **2.4. Analysis of the Relationship Between Executive Incentives and Corporate Innovation under the Securities Margin Trading**

Regarding financing transactions, most researchers believe that financing purchases of stocks is closely related to speculative behavior, so they are more inclined to regard financing transactions as uninformed transactions [26]. As far as my country's stock market is concerned, existing researches generally believe that financing transactions are more likely to be uninformed transactions [27-29]. In practice, the participants in financing transactions in my country are mostly individual investors [30], and individual investors are usually noise traders,

and they are prone to herding effect [31]. In this case, the more frequent financing transactions, the higher the noise in the stock price, and the lower the information on stock price characteristics. The reduction of information on stock price characteristics will not only exacerbate information asymmetry, but will further interfere with executive decision-making through feedback effects. Since financing transactions are usually not related to information, the continued rise of stock prices will mislead executives, making them mistakenly believe that the current innovations carried out by companies are of high quality, and thus increase similar innovation investments. At the same time, during the period when the stock price continues to rise, shareholders hope that executives can maintain or even further increase the stock price by providing more good news. However, executives cannot always provide good news in a short period of time. Therefore, executives are suffering from pressure and it is likely to adopt opportunistic behavior and sacrifice the long-term value of the company to improve the short-term performance of the company. At the same time, the stock price rise due to financing transactions is also beneficial to executives themselves, so executives themselves also have the motivation to increase the stock price as much as possible. The pressure exerted by shareholders and the motivation of individuals to maximize profits will lead to executive short-sighted behavior. Therefore, executives are likely to abandon innovation projects and devote themselves to rapid improvement of short-term performance, which will eventually damage the role of executive incentives in promoting corporate innovation.

For securities lending, most existing studies believe that Chinese securities lending traders are informed traders and can obtain private information through multiple channels [30] [32]. In addition, Diamond et al. [33] found that considering securities lending costs, only those informed traders who firmly believe that the stock price will fall soon will short the stocks, and those uninformed traders are likely to give up trading and exit the market. In this way, my country's higher securities lending fee rate will further increase the probability that securities lending transactions are informed transactions and reduce information asymmetry, then promoting corporate innovation. At the same time, since the executives promotion and compensation are generally closely related to the company's stock price and securities lending usually leads to the formation of expectations of stock price decline, the interests of executives are likely to be harmed. Therefore, executives have the motivation to reduce short-sighted behavior and improve the long-term value of the enterprise, thereby promoting enterprise innovation.

In summary, both financing transactions and securities lending transactions can affect the promotion of executive incentives on corporate innovation. But the impact of the two on corporate innovation is almost opposite. Moreover, in China's practice, the scale of development of financing transactions exceeds the scale of development of securities lending transactions. Therefore, the impact of financing on corporate innovation is likely to exceed the impact of securities lending on corporate innovation. The securities margin trading will inhibit the promotion of executive incentives on corporate innovation. Therefore, this article proposes the following assumptions:

H4: The securities margin trading will inhibit the promotion of executive incentives on corporate innovation.

### **3. RESEARCH DESIGN**

#### **3.1. Sample Selection**

The research object of this article is A-share listed companies in China. Since the "Salary Limit Order" was issued in 2009, and considering the availability and standardization of data, the 2010-2017 period was used as the research interval, and the samples were processed as follows: (1) Compared with other companies, the financial industry applies different accounting

standards and operating methods, so excluding the financial industry. At the same time, the accommodation, catering and education industries are also excluded; (2) ST listed companies are excluded. Such companies are often in abnormal operating conditions and their financial and accounting data are often easily distorted, so they are not representative; (3) Exclude companies with missing financial data, missing innovation output data, or other missing data. Finally, 9950 observations are obtained. In order to control the influence of extreme values, we perform Winsorize on individual continuous variables according to the 1% standard. The data in this article comes from CSMAR database and Wind database.

### 3.2. Variable Description

#### 3.2.1 Explained variable

Considering that the patent data is count data and the patent data in the sample is in a right-skewed distribution, in order to reduce the skewness of the measurement of corporate innovation output indicators, this article has two main methods for the measurement of innovation output: The natural logarithm of the total number of applications for invention patents, utility model patents and design patents lagging one period plus one (Patent1); The natural logarithm of the total number of weighted applications for invention patents, utility model patents and design patents lagging one period plus one (Patent2), and the weights of three patents are calculated according to 3:2:1.

#### 3.2.2 Main explanatory variable

The main explanatory variables of this article are compensation incentives and equity incentives, which are represented by the natural logarithm (lnsalary\_a) of the average salary of top three executives and the proportion of executive shares (exsharehold).

**Table 1.** Variable description

variable name	variable definitions
Patent1	The natural logarithm of the total number of applications for invention patents, utility model patents and design patents lagging one period plus one.
Patent2	The natural logarithm of the total number of weighted applications for invention patents, utility model patents and design patents lagging one period plus one, and the weights of three patents are calculated according to 3:2:1.
Ln_salary_a	The natural logarithm of the average salary of top three executives.
Exsharehold	Executive shareholding ratio
Ln_size	Natural logarithm of total assets
Lev	Ratio of assets to liabilities
Roa	Return on total assets
Competition	Herfindahl-Hirschman index
Protection	Using the secondary indicator "The Development of Market Intermediary Organizations and Legal System Environment" in "Report on Marketization Indexes by Provinces in China" compiled by Fan Gang et al. to replace the degree of investor protection in the region.
$\sum$ Industry	Control industry factors
$\sum$ Year	Control year factors

### 3.2.3 Control variable

The control variables in this article are mainly the size of company (Size), asset-liability ratio (Lev), return on total assets (Roa), and control year factors and industry factors.

### 3.2.4 Other variables

There are mainly two other variables in this article. The first is the degree of industry competition (Competition), which is expressed by the Herfindahl-Hirschman index; The second is the degree of investor protection (Protection), which uses the secondary indicator "The Development of Market Intermediary Organizations and Legal System Environment" in "Report on Marketization Indexes by Provinces in China" compiled by Fan Gang et al. to replace the degree of investor protection in the region. The larger the index, the higher the degree of investor protection in the region.

## 3.3. Model Building

In order to analyze the impact of executive incentives on corporate innovation output, this article constructs the following regression model 1 based on the variables involved in hypotheses H1 and H2:

$$\text{patent}_{i,t+1} = a_0 + a_1 \ln \text{salary\_a}_{it} + a_2 \text{cv}_{it} + \sum \text{industry} + \sum \text{year}$$

$$\text{patent}_{i,t+1} = b_0 + b_1 \text{exsharehold}_{it} + b_2 \text{exsharehold}_{it}^2 + b_3 \text{cv}_{it} + \sum \text{industry} + \sum \text{year}$$

Among them, patent is divided into patent1 and patent2, patent1<sub>i, t+1</sub> is the number of applications of company i in t+1 year, and patent2<sub>i, t+1</sub> is the weighted number of applications of company i in t+1 year. Lnsalary<sub>a<sub>it</sub></sub> is the natural logarithm of the average salary of top three executives of company i in t year, that is, compensation incentives. Exsharehold<sub>it</sub> is the shareholding ratio of executives of company i in t year, which is equity incentives. Exsharehold<sub>it</sub><sup>2</sup> is the square of the shareholding ratio of company i in year t. CV is the control variable, which is the size of company, the ratio of assets to liabilities and the return on total assets.  $\sum$  industry represents the control industry factor, and  $\sum$  year represents the control year factor. a1 measures the impact of compensation incentives on corporate innovation, and b1 and b2 respectively measure the impact of equity incentives and the square of equity incentives on corporate innovation output.

In order to analyze the interaction of incentive mechanism and its integration effect on corporate innovation output, this article constructs the following regression model 2 based on the variables involved in hypothesis H3:

$$\text{patent}_{i,t+1} = c_0 + c_1 \text{exsharehold}_{it} + c_2 \text{exsharehold}_{it}^2 + c_3 \ln \text{salary\_a}_{it} \times \text{exsharehold}_{it} + c_4 \text{cv}_{it} + \sum \text{industry} + \sum \text{year}$$

Among them, patent is divided into patent1 and patent2, patent1<sub>i, t+1</sub> is the number of applications of company i in t+1 year, and patent2<sub>i, t+1</sub> is the weighted number of applications of company i in t+1 year. Lnsalary<sub>a<sub>it</sub></sub> is the natural logarithm of the average salary of top three executives of company i in t year, that is, compensation incentives. Exsharehold<sub>it</sub> is the shareholding ratio of executives of company i in t year, which is equity incentives. Exsharehold<sub>it</sub><sup>2</sup> is the square of the shareholding ratio of company i in year t. Lnsalary<sub>a<sub>it</sub></sub> × exsharehold<sub>it</sub> is the interactive item of incentive mechanism. CV is the control variable, which is the size of company, the ratio of assets to liabilities and the return on total assets.  $\sum$  industry represents the control industry factor, and  $\sum$  year represents the control year factor. c3 measures the integration effect of incentive mechanism on corporate innovation output.

In order to analyze the difference between the executive incentives of the target company and the non-target company on corporate innovation under the securities margin trading, this article uses regression model 1 to verify the hypothesis H4.

### 3.4. Descriptive Statistics and Correlation Analysis

Table 2 shows the descriptive statistical results of the initial sample. During the period 2010-2017, the maximum value of patent1 is 6.25575 and the minimum value is 0.6931472, and the maximum value of patent2 is 7.130098 and the minimum value is 0.6931472, and there is a large gap between the maximum value and the minimum value. Both the mean is greater than the median, indicating that Chinese listed companies have begun to pay attention to innovation and the number of patent applications is increasing, and the level of innovation is higher than the mean. The mean of lnsalary\_a is much larger than the median, and the gap between the maximum and minimum is small, indicating that the level of executive compensation in China is relatively high but the gap is not large. The mean of exsharehold is much larger than the median, but the gap between the maximum and minimum is large, indicating that the level of executive stake in China is relatively high but is seriously unbalanced. The mean and the median of lnsizes are relatively close, and the gap between the maximum and minimum is small. From the perspective of capital structure, the mean of lev is 33.81703, the capital structure is relatively reasonable, the standard deviation is 19.81533, and the maximum and minimum are quite different. From the perspective of operating capacity, the mean of roa is far greater than the median, indicating that the profitability of Chinese enterprises is improving as a whole, but it can also be seen that there is a serious polarization.

**Table 2.** Descriptive statistics

Variable	Sample size	Mean	median	Standard deviation	Minimum	maximum
patent1	7818	2.676205	2.564949	1.250617	0.6931472	6.25575
patent2	7818	3.444436	3.401197	1.303209	0.6931472	7.130098
lnsalary_a	9950	13.12689	13.10894	0.6633935	11.35119	14.99928
exsharehold	9712	9.137829	0.575534	15.50752	0.0001992	81.00173
lnsize	9950	21.67074	21.52005	1.059549	19.52262	24.9413
lev	9950	33.81703	31.80747	19.81533	0.0413029	110.2139
roa	9907	631.8002	3.737846	18282.76	-102.3956	111.2798

As shown in Table 3, in order to prevent the possible correlation between explanatory variables from having an impact on the final empirical results, this article does correlation analysis on the selected main explanatory variables to preliminarily test the relationship between the explanatory variable. The above table shows the correlation between the explanatory variables in the initial sample. It can be seen that the correlation between the explanatory variables is weak or completely uncorrelated. Therefore, it can be considered that there is no multicollinearity between the main explanatory variables in this article.

**Table 3.** Results of correlation analysis

	patent1	patent2	lnsalary_a	exsharehold	lnsize	lev	roa
patent1	1.000						
patent2	0.986***	1.000					
lnsalary_a	0.255***	0.263***	1.000				
exsharehold	0.020**	0.024**	0.072***	1.000			
lnsize	0.342***	0.344***	0.190***	-0.291***	1.000		
lev	0.146***	0.146***	0.024**	-0.239***	0.266***	1.000	
roa	0.082***	0.080***	0.202***	0.117***	0.060***	-0.324***	1.000

Note: \*\*\*, \*\*, \* indicate significant at the level of 1%, 5%, and 10% respectively.

### 3.5. Empirical Analysis

3.5.1 Analysis of the impact of executive compensation and equity incentives on corporate innovation output

Table 4 shows the regression results of executive incentives and corporate innovation, where the explained variable of models (1), (2), (3) and (4) is expressed by patent1, and the explained variable of models (5), (6), (7) and (8) is pateht2. It can be seen from the results in the table that after controlling the year and industry effects, the regression coefficient of Insalary\_a is significantly positive at the 1% level whether in models (1), (2) or in models (5), (6). It indicates that higher salaries can make up for the loss of income that executives may bring from innovative activities in the short term, thereby effectively promoting the development of corporate innovation activities. After controlling year and industry effects, through models (3), (4) and models (7), (8), it can be seen that the regression coefficients of exsharehold and exsharehold2 are not significant before the relevant control variables are added. After adding the relevant control variables, the regression coefficient of exsharehold is significantly positive at the level of 10%, but the regression coefficient of exsharehold2 is still not significant, which shows that increasing the proportion of executive's shareholding can induce managers to start from the long-term interests of company and correct its inherent short-term behavior, which also shows that there is no significantly non-linear relationship between the proportion of executive's shareholding and corporate innovation output. In summary, the above results verify H1 and H2. At the same time, it can be seen from the table that the control variables have an impact on corporate innovation. For example, the size of company and innovation output show a significantly positive correlation. Ratio of assets to liabilities has no significant relationship with innovation output. Return on total assets significantly promotes corporate innovation output.

**Table 4.** Estimation results of the impact of compensation incentives and equity incentives on corporate innovation

Explained variable	Patent1				Patent2			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Insalary_a	0.315*** (11.96)	0.179*** (6.60)			0.350*** (12.58)	0.206*** (7.20)		
exsharehold			0.000668 (0.22)	0.00684* (2.29)			0.000607 (0.19)	0.00752* (2.39)
exsharehold2			-	-			-	-
			0.0000118 (-0.21)	0.0000899 (-1.66)			0.0000201 (-0.34)	-0.000106 (-1.84)
lnsize		0.322*** (14.79)		0.385*** (18.02)		0.337*** (14.68)		0.407*** (18.05)
lev		0.000945 (1.09)		0.00104 (1.18)		0.00111 (1.21)		0.00119 (1.28)
roa		0.0141*** (6.23)		0.0174*** (7.59)		0.0145*** (6.06)		0.0181*** (7.41)
_cons	-2.519*** (-5.26)	-7.733*** (-13.44)	1.458*** (4.07)	-6.857*** (-12.33)	-2.174*** (-4.30)	-7.622*** (-12.56)	2.235*** (5.91)	-6.555*** (-11.17)
Year	control	control	control	control	control	control	control	control
Industry	control	control	control	control	control	control	control	control
R2	0.1751	0.2711	0.1096	0.2612	0.1686	0.2642	0.0982	0.2518
N	7818	7818	7630	7630	7818	7818	7630	7630

t statistics in parentheses

\*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001

3.5.2 Analysis of the interaction between incentive mechanisms and the integration effect on corporate innovation output

In order to test the integration effect of the two incentive mechanisms on corporate innovation output, a crossover item between compensation incentives and equity incentives is introduced. The explained variable of models (9) and (10) is patent1, and the explained variable of models (11) and (12) is patent2. The regression results are shown in Table 5. It can be seen from models (10) and (12) that the regression coefficient of  $\ln\text{salary\_a} \times \text{exsharehold}$  is significantly positive at the level of 10%, indicating that  $\ln\text{salary\_a} \times \text{exsharehold}$  can promote corporate innovation and compensation incentives in promoting corporate innovation will enhance with equity incentives. At the same time, equity incentives in promoting corporate innovation will enhance with compensation incentives, indicating that compensation incentives and equity incentives have an integrated effect on corporate innovation output. In summary, the above results verify H3.

**Table 5.** Estimation results of the integration effect of compensation incentives and equity incentives on corporate innovation

Explained variable	Patent1		Patent2	
	(9)	(10)	(11)	(12)
$\ln\text{salary\_a}$	0.302*** (10.44)	0.154*** (5.18)	0.338*** (11.05)	0.182*** (5.82)
$\text{exsharehold}$	-0.0376 (-1.73)	-0.0387 (-1.82)	-0.0345 (-1.50)	-0.0354 (-1.58)
$\text{exsharehold2}$	0.00000281 (0.05)	-0.0000719 (-1.33)	-0.00000649 (-0.11)	-0.0000871 (-1.52)
$\ln\text{salary\_a} \times \text{exsharehold}$	0.00284 (1.73)	0.00344* (2.15)	0.00261 (1.50)	0.00324* (1.91)
$\ln\text{size}$		0.341*** (15.20)		0.356*** (15.02)
$\text{lev}$		0.00116 (1.31)		0.00135 (1.45)
$\text{roa}$		0.0154*** (6.63)		0.0156*** (6.37)
$\_cons$	-2.361*** (-4.68)	-7.848*** (-13.06)	-2.037*** (-3.82)	-7.755*** (-12.24)
Year	control	control	control	control
Industry	control	control	control	control
R2	0.1726	0.2722	0.1657	0.2642
N	7630	7630	7630	7630

t statistics in parentheses

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

### 3.5.3 Analysis of the impact of securities margin trading on the relationship between executive incentives and corporate innovation

Table 6 shows the regression results of target company's executive incentives and corporate innovation, where the explained variable of models (13) and (14) is patent1 but the explained variable of models (15) and (16) is patent2. It can be seen from the results in the table that after controlling year and industry effects, the regression coefficients of  $\ln\text{salary\_a}$  in model (13) and model (15) are not significant. At the same time, after controlling year and industry effects, the regression coefficients of  $\text{exsharehold}$  and  $\text{exsharehold2}$  are not significant in either model (14)

or model (16). The above results show that the executive compensation incentives and executive equity incentives in the target company have no significant impact on corporate innovation.

**Table 6.** Estimation results of the impact of target company's executive incentives on corporate innovation

Explained variable	Patent1		Patent2	
	(13)	(14)	(15)	(16)
lnsalary_a	0.0366 (0.53)		0.0321 (0.45)	
exsharehold		0.0211 (1.79)		0.0221 (1.79)
exsharehold2		-0.000308 (-1.38)		-0.000310 (-1.32)
lnsize	0.392*** (6.84)	0.427*** (7.85)	0.408*** (6.81)	0.442*** (7.75)
lev	0.00409 (1.64)	0.00512* (2.02)	0.00450 (1.73)	0.00561* (2.13)
roa	0.00603 (0.84)	0.00735 (1.02)	0.00527 (0.71)	0.00666 (0.89)
_cons	-7.817*** (-5.74)	-8.165*** (-6.27)	-7.359*** (-5.16)	-7.741*** (-5.67)
Year	control	control	control	control
Industry	control	control	control	control
R2	0.3462	0.3595	0.3428	0.3565
N	1982	1910	1982	1910

t statistics in parentheses

\*p< 0.05, \*\*p< 0.01, \*\*\*p< 0.001

Table 7 shows the regression results of non-target companies' executive incentives and corporate innovation. The explained variable of models (17) and (18) is patent1 and the explained variable of models (19) and (20) is patent2. It can be seen from the results in the table that after controlling year and industry effects, the regression coefficients of lnsalary\_a in models (17) and (19) are significantly positive at the 1% level. At the same time, after controlling year and industry effects, the regression coefficients of exsharehold and exsharehold2 are not significant in either model (18) or model (20). The above results show that in non-target companies, executive compensation incentives can promote corporate innovation output, while executive equity incentives have no significant impact on corporate innovation output.

At the same time, compared with the results in Table 6, it can be seen that compensation incentives of target companies have less promotion effect on corporate innovation than compensation incentives of non-target companies. That is, the securities margin trading inhibits the promotion of compensation incentives on corporate innovation to a certain extent. But for equity incentives, whether it is a target company or a non-target company, the impact on corporate innovation is not significant. In summary, the above results verify H4.

**Table 7.** Estimation results of the impact of non-target companies' executive incentives on corporate innovation

Explained variable	Patent1		Patent2	
	(17)	(18)	(19)	(20)
lnsalary_a	0.140*** (3.76)		0.146*** (3.72)	
exsharehold		-0.00314 (-0.89)		-0.00256 (-0.69)
exsharehold2		0.0000863 (1.34)		0.0000761 (1.12)
lnsize	0.208*** (7.59)	0.238*** (8.84)	0.224*** (7.75)	0.255*** (8.96)
lev	0.000714 (0.56)	0.000690 (0.53)	0.000523 (0.39)	0.000525 (0.38)
roa	0.0153*** (3.84)	0.0168*** (4.19)	0.0169*** (4.02)	0.0185*** (4.36)
_cons	-3.928*** (-5.00)	-2.699*** (-3.49)	-3.630*** (-4.39)	-2.315** (-2.83)
Year	control	control	control	control
Industry	control	control	control	control
R2	0.0976	0.0933	0.0941	0.0896
N	3772	3721	3772	3721

t statistics in parentheses

\*p< 0.05, \*\*p< 0.01, \*\*\*p< 0.001

## 4. EXECUTIVE INCENTIVES AND CORPORATE INNOVATION: ANALYSIS OF EXTERNAL ENVIRONMENTAL FACTORS

### 4.1. Investor Protection

This article uses Using the secondary indicator "The Development of Market Intermediary Organizations and Legal System Environment" in "Report on Marketization Indexes by Provinces in China" compiled by Fan Gang et al. to replace the degree of investor protection in the region. The larger the index, the higher the degree of investor protection in the region. The sample is divided into two groups, namely the high degree of investor protection and the low degree of investor protection. The explained variable of models (21), (22), (23) and (24) is patent1 and the explained variable of models (25), (26), (27) and (28) is patent2. The regression results are shown in Table 8. It can be seen from the results that regardless of the degree of investor protection, the regression coefficient of lnsalary\_a is significantly positive at the 1% level. But by comparing models (21) and (25) with models (23) and (27), when the degree of investor protection is high, the regression coefficient of lnsalary\_a is obviously larger than when the degree of investor protection is low, which shows that the degree of investor protection affects the relationship between compensation incentives and corporate innovation output. At the same time, comparing models (22) and (26) with models (24) and (28), no matter whether it is exsharehold or exsharehold2, their regression coefficients are not significant. This shows that the degree of investor protection has not effect on the relationship between equity incentives and corporate innovation.

**Table 8.** Estimated results of investor protection on the relationship between executive incentives and corporate innovation

Explained variable	Patent1				Patent2			
	High degree of investor protection		Low degree of investor protection		High degree of investor protection		Low degree of investor protection	
	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)
lnsalary_a	0.213*** (4.67)		0.150*** (3.62)		0.232** *		0.184** *	
exsharehold		0.00861 (1.72)		0.00851 (1.62)		0.00870 (1.65)		0.00920 (1.67)
exsharehold2		0.0000632 (-0.69)		-0.000122 (-1.22)		0.0000648 (-0.67)		-0.000140 (-1.34)
lnsize	0.442*** (11.81)	0.543*** (15.04)	0.432*** (12.74)	0.493*** (15.14)	0.454** *	0.560*** (14.71)	0.458** *	0.529*** (15.54)
lev	0.00148 (0.92)	0.00143 (0.88)	-0.000801 (-0.57)	-0.000542 (-0.37)	0.00178 (1.05)	0.00175 (1.01)	0.00081 8 (-0.56)	-0.000602 (-0.40)
roa	0.0158*** (3.55)	0.0173*** (3.80)	0.0139*** (3.60)	0.0194*** (4.86)	0.0157* **	0.0172*** (3.58)	0.0144* **	0.0200*** (4.73)
_cons	-10.70*** (-11.64)	-10.37*** (-11.11)	-9.720*** (-12.22)	-9.148*** (-11.86)	10.42** *	-9.967*** (-10.13)	9.926** *	-9.142*** (-11.35)
Year	control	control	control	control	control	control	control	control
Industry	control	control	control	control	control	control	control	control
R <sup>2</sup>	0.3007	0.2889	0.2781	0.2762	0.2888	0.2741	0.2780	0.2745
N	2546	2477	2721	2647	2546	2477	2721	2647

t statistics in parentheses

\*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001

#### 4.2. Industry Competition

Based on Herfindahl-Hirschman index, this article divides the samples into two groups, namely the high degree of industry competition and the low degree of industry competition. Among them, the explained variable of models (29), (30), (31) and (32) is patent1, the explained variable of models (33), (34), (35) and (36) is patent2. The regression results of innovation output are shown in Table 9. It can be seen from the results that regardless of the degree of industry competition, the regression coefficient of lnsalary\_a is significantly positive at the 1% level. But by comparing models (29) and (33) with models (31) and (35), when the degree of industry competition is high, namely model (29) and model (33), it can be seen that the regression coefficient of lnsalary\_a is obviously smaller than when the degree of industry competition is low. This indicates that the degree of industry competition will affect the relationship between compensation incentives and corporate innovation output. At the same time, comparing models (30) and (34) with models (32) and (36), whether it is exsharehold or exsharehold2, their regression coefficients are not significant. This shows that the degree of industry competition has little effect on the relationship between equity incentives and corporate innovation output.

**Table 9.** Estimation results of industry competition on the relationship between executive incentives and corporate innovation

Explained variable	Patent1				Patent2			
	High degree of industry competition		Low degree of industry competition		High degree of industry competition		Low degree of industry competition	
	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)
lnsalary_a	0.161** *		0.194** *		0.188** *		0.219** *	
	(4.25)		(5.68)		(4.74)		(6.07)	
exsharehol d		0.00527 (1.23)		0.00625 (1.66)		0.00558 (1.24)		0.00723 (1.81)
exsharehol d2		0.00001 88 (-0.23)		0.00008 85 (-1.29)		0.00002 25 (-0.27)		0.00011 2 (-1.55)
lnsize	0.433** *	0.494***	0.361** *	0.436***	0.445** *	0.516***	0.381** *	0.463** *
	(14.62)	(17.20)	(13.40)	(16.73)	(14.35)	(17.11)	(13.43)	(16.82)
lev	0.00055 2	0.00049 7	0.00160	0.00155	0.00050 8	0.00043 5	0.00178	0.00164
	(-0.45)	(-0.39)	(1.39)	(1.32)	(-0.39)	(-0.33)	(1.46)	(1.31)
roa	0.0211* **	0.0241** *	0.0138* **	0.0178** *	0.0216* **	0.0250** *	0.0144* **	0.0185* **
	(5.45)	(6.18)	(4.71)	(5.93)	(5.29)	(6.11)	(4.64)	(5.79)
_cons	10.26** *	9.641***	8.492** *	7.623***	10.12** *	9.363***	8.480** *	7.429** *
	(-13.84)	(-13.28)	(-11.85)	(-10.95)	(-13.04)	(-12.31)	(-11.23)	(-10.11)
Year	control	control	control	control	control	control	control	control
Industry	control	control	control	control	control	control	control	control
R <sup>2</sup>	0.2911	0.2863	0.2749	0.2639	0.2858	0.2796	0.2668	0.2530
N	3488	3401	4330	4229	3488	3401	4330	4229

t statistics in parentheses

\*p< 0.05, \*\*p< 0.01, \*\*\*p< 0.001

## 5. CONCLUSION AND SUGGESTION

### 5.1. Conclusion

As an important source of corporate and national competitiveness, innovation has always received extensive attention from entrepreneurs, scholars and governments. This article takes 9,950 samples of A-share listed companies in China from 2010 to 2017 as research objects, based on technological innovation theory, principal-agent theory, incentive theory and information asymmetry theory, empirically analyze the relationship between executive incentives and corporate innovation under the securities margin trading. The research conclusions of this article are as follows:

First, both executive compensation incentives and equity incentives can improve corporate innovation output, and the effect of compensation incentives on corporate innovation output is more significant than that of equity incentives. Higher salaries can make up for the loss of income that executives may bring from innovating activities in the short term, thereby effectively promoting the development of corporate innovation activities. The equity incentive is to grant executives certain stock income rights, thereby binding the benefits of executives with the long-term value of company, then prompting executives to attach importance to

innovative activities from the perspective of sustainable development and correct their opportunistic behavior.

Second, in the process of influencing corporate innovation output, compensation incentives and equity incentives have a complementary relationship, and the integration effect on corporate innovation output is positive. Incentive mechanisms do not exist independently. The effectiveness of a single incentive mechanism will inevitably be affected by other incentive mechanisms. Its internal correlation or trade-offs may affect the overall incentive effect and will also affect the convergence of the interests of shareholders and executives. Among them, equity incentives are long-term incentives, and salary incentives are medium and short-term incentives. The organic combination of the two meets the material and spiritual needs of executives, and just makes up for the other party's shortcomings, which can avoid the short-sighted behavior of executives. It can also prevent executives from excessively pursuing long-term benefits while ignoring short-term benefits. The overall synergy promotes corporate innovation output.

Third, the securities margin trading will inhibit the role of compensation incentives in promoting corporate innovation output, but will not significantly affect the role of equity incentives in promoting corporate innovation output. Both financing and securities lending can affect the role of executive incentives in promoting corporate innovation output, but the effects of the two on corporate innovation output are almost opposite. In our country's practice, the development scale of financing obviously exceeds the development scale of securities lending. Therefore, the negative impact of financing on corporate innovation output is likely to exceed the positive impact of securities lending on corporate innovation output. Therefore, the securities margin trading will be negatively affect the role of compensation incentives in promoting corporate innovation output.

Fourth, after further research, it found that: (1) The degree of investor protection affects the relationship between compensation incentives and corporate innovation output, but the degree of investor protection has little effect on the relationship between equity incentives and corporate innovation output; (2) The degree of industry competition will affect the relationship between compensation incentives and corporate innovation output, but the degree of industry competition has little effect on the relationship between equity incentives and corporate innovation output.

## 5.2. Suggestion

The research conclusions of this article provide certain theoretical guidance for listed companies to improve their innovation level. The design of incentive mechanisms and the improvement of the external environment are important ways to promote corporate innovation. Based on the above conclusions, this section will propose corresponding suggestions for the design of executive incentive mechanisms and the improvement of the external environment, as follows:

First, steadily increasing the remuneration of executives and the proportion of executives holdings. Traditional compensation incentives can easily lead to short-term compensation incentives. Therefore, we need to establish a more scientific and standardized compensation evaluation mechanism. We should fully consider the role of innovation achievement indicators, that is, link innovation results and compensation evaluations to mobilize executives to carry out innovative activities positively. Equity incentives are also an important factor affecting corporate innovation. In the sample studied in this article, there are still some corporate executives who do not hold equity. Even if they hold equity, their proportion is relatively low. Therefore, company in China should further increase the shareholding ratio of executives under the appropriate degree of corporate equity concentration, especially focus on motivating those

executives who contribute to independent innovation, and continuously optimize the ownership structure and perfect the equity incentive plan.

Second, adopting diversified executive incentive methods and designing a reasonable and effective executive incentive combination. Compensation incentive is a short and medium-term incentive, but equity incentive is a long-term incentive. The effective cooperation of the two can exert a synergistic effect, prompting executives to better serve shareholders while increasing their wealth. The above two types of incentives are both explicit incentives, and we can also consider implicit incentives, such as on-the-job consumption. The incentives for on-the-job consumption are more flexible, and moderate on-the-job consumption can effectively supplement the lack of compensation incentives. Therefore, diversified incentive methods can make up for the shortcomings of a single incentive method. While paying attention to explicit incentives, it can also increase the importance of implicit incentives. At the same time, different incentive mechanisms should be organically combined and rationally configured based on company's own situation, so as to better promote corporate innovation.

Third, it is necessary to strengthen the supervision of financing speculative transactions in order to maximize the positive role of financing and limit its adverse effects on corporate innovation, which provides a good market environment for innovation. At the same time, it is necessary to improve securities lending as soon as possible and play the positive role of securities lending. Securities lending is generally conducive to corporate innovation, but the current securities lending costs are too high and it faces very strict supervision. In this case, securities lending traders are more inclined to complete transactions within a day, rather than long-term holding. This makes it difficult for securities lending to promote corporate innovation through information mechanisms and corporate governance mechanisms. In short, it is important of improving the securities margin trading to improve the information efficiency of my country's stock market, and it will also be more conducive to the active role of securities margin trading in corporate governance, thereby providing a better market environment for listed companies to innovate. Because many listed companies are leading companies in various industries and their stocks are likely to be the underlying stocks, the improvement of securities margin trading to their innovation may drive the innovation of the entire industry to a certain extent, and have a positive effect on the transformation and upgrading of China's industrial structures.

Fourth, we must create a good external environment. The company's business activities are inevitably inseparable from the external environment, which will inevitably affect the effectiveness of corporate governance. From the empirical results of this article, the degree of investor protection and the degree of industry competition will affect the role of compensation incentives in promoting corporate innovation output. In order to promote corporate innovation, it is necessary to create a fair and open market competition environment, vigorously promote the development of the financial market, and improve the economic level. At the same time, it is also necessary to further strengthen the improvement of relevant laws and regulations and enhance the degree of protection for investors.

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