Performance Regulation, Efficiency Salary and Compensation Incentive for Executives of State-owned Enterprises

Hua ZHANG
School of Economics and Management, Zhaoqing University
City Zhaoqing, Guangdong Province, China
sonicme@foxmail.com

Keywords: State-owned Enterprises, Executives, Compensation Incentive, Performance Appraisal.

Abstract. The relationship between salary and performance is a controversial and inevitable problem in the study of executives’ compensation incentive of state-owned enterprises. A compensation incentive framework with rated performance is designed in this paper to discuss the optimal compensation incentive decisions for executives of state-owned enterprises, based on a two-stage game. Study found that high salary could motivate the executives to work hard, and the effect of compensation incentive would be reduced when there are uncertain factors impact executives’ performance; if executives’ performance could be measured effectively, increasing the rated performance standard is more conducive to motivate executives to work hard than high compensation. Finally, some suggestions are presented to improve the effect of compensation incentive for executives of state-owned enterprises in the matters of industry particularity, performance appraisal standard and the relationship between government and enterprise.

Introduction

The state-owned enterprises under Chinese circumstance have special historical accumulation and external environment. The reform of state-owned enterprises in China is always the core essence of establishing socialist market economy system. The practices of improving corporate governance structure and innovating professional manager system had played a positive role in enhancing the vitality of state-owned enterprises and improving the business performance. However, the “power rent-seeking” and “moral hazard” of state-owned enterprises’ executives are still ubiquitous. The problem of compensation incentive is under the spotlight of the whole society when standardizing the management model of state-owned enterprises. The focus of this problem is how executives’ compensation can design the income distribution mechanism according to the market rule and fully demonstrate the “participation constraint” and “incentive compatibility” of executives under the circumstance that government still has a decisive impact in the human resource and strategic decisions of state-owned enterprise, so as to quell the questions from all shareholders on the equity and efficiency of executives’ compensation. Incentive theory shows that the external competitiveness of salary can motivate executives to work hard, so as to improve the business performance and management efficiency. In the long term, deconstructing and defining the factors that impact the executive compensation and designing and building a compensation incentive system are the keys to the reform of the salary system of state-owned enterprise in China. Most existing literature analyzed this problem in aspects of the relativity of performance appraisal and compensation structure. Few of them included the complexity of executives’ performance and compensation incentive system in the unified analytic framework of economics. Therefore, this paper aims at designing a compensation incentive system based on the classification of rated performance and analyzing the optimal choice when executive is under the motivation of efficiency salary by a two-stage game, to provide a theoretical explanation for government to improve the compensation system.
Theoretical Analysis and Assumptions

1. Government intervention and executives’ compensation of state-owned enterprises

The theory of principal-agent has always been a mainstream pattern of the study on compensation incentive for executives. [1] Due to the differences of asymmetric information and target interest among enterprises and executives, “moral hazard” caused by the self-interest motivation of executives can be inhibited by compensation incentive to some extent under the circumstance that executives’ efforts cannot be measured and that the cost on supervision is too high. [2] But there is an inevitable prerequisite for institution when using the theory of principal-agent to analyze the compensation incentive for executives of state-owned enterprise in China, and that is government’s strict regulation on executive salary of state-owned enterprise. There exists a three-level principal agent chain composed by “people-government-executive” in the relationships among the principal agents of state-owned enterprise in China. In theory, all people are the owners of state-owned enterprise. But in fact, government plays a dual role as the agent and client. On one hand, it takes charge of assuring all people of inflation-proofing and appreciation of state-owned assets; on the other hand, it supervises and controls the operation of state-owned assets. This complicated relation is not based on voluntary contracts, but depends on state power. Government need not be authorized by the original clients. It obtains its distributorship by declaring laws and creates mandatory agency relationships based on administrative power. [3] The compensation system is produced in the management system of state-owned assets and government administrative intervention, which caused that government must strictly regulate the executive compensation of state-owned enterprise. [4] Based on the above analysis, the following assumption is proposed first of all.

Hypothesis 1: The relationship between government departments and executives of state-owned enterprise is principal-agent relationship. Government decides the compensation incentive system, whose goal is to maximize the performance of state-owned enterprise. The expectation of executive is to get more individual income.

To be sure, government’s regulation on executive’s compensation of state-owned enterprise is not only decided by the supply and demand of human resource market. [5] However, it is based on the average salary of employees and the salary range is controlled by the restriction on executive’s compensation. [6] This kind of compensation incentive decided by clients is in accordance with the theory of efficiency salary. [7] Here, the following assumptions are added.

Hypothesis 2: The purpose of government’s compensation incentive is to design a filtering mechanism which motivates executives to work hard for high compensation. Executives are sensitive to the variation of salary. When salary fails to achieve the executives’ expected income, they are more unlikely to work hard.

2. Correlation of performance and compensation incentive for executives of state-owned enterprises

Enterprise performance and supervision cost are the key factors in deciding the feasible boundary and incentive efficiency of compensation incentive for executives. Early studies thought that deciding executive compensation by enterprise performance can decrease agency cost, motivate executives to work hard and at the same time, salary can play its role as constraint. [8] But subsequent studies have found that the discussion about correlation between enterprise performance and executive compensation still cannot reach a conclusion. Jensen and Murphy thought that if executives’ working cannot be measured, executive compensation cannot play a significant role as incentive when it is designed by enterprise performance, not by shareholder’s income. [9] Merchant [10], Conyon [11], Zhou Baicheng [12], Liu Zhe [13] also thought that there are no obvious correlations between executive compensation and enterprise performance. But Zhao Yansheng [14], Tong Aiqing [15] and Liu Shaowei [16] thought that there exists significant positive correlation between executive compensation and both enterprise performance and enterprise scale. Except the distinction of sample
data and model variable, another reason caused these different conclusions might be that external environment, internal corporate governance structure and individual behavior of executives have an effect on the correlation between executive compensation and enterprise performance, [17] which caused equity theory, tournament theory and contingency theory to offer new explanations on correlation between executive compensation and enterprise performance. Executives of state-owned enterprise in China are not actually professional managers due to government’s appointment and administrative intervention. [18] Government has more inseparable impact on enterprise performance. Therefore, when supervision is hard to put into practice, designing compensation incentive system by relative performance appraisal of executives’ marginal output is more beneficial than by absolute performance appraisal of marginal output. Based on the above analysis, the following assumption is proposed.

Hypothesis 3: Executives of state-owned enterprise are rational. Hard work is asymmetric information. Government cannot supervise executives’ working, but enterprise performance can be measured. Government determines the income of executives of state-owned enterprise by relative performance appraisal.

Model

Assume that the production function of executive is \( y = e + \epsilon \), where, \( e \) stands for the effort degree and belongs to personal information, \( y \) is the executive’s performance output which cannot be observed but identified by the government, \( \epsilon \) refers to the uncertainty of performance and the probability density function is \( \phi(\epsilon) \in N(0, \sigma^2) \). The executive’s work has disutility, \( g(e) \), and \( g'(e) > 0, \ g''(e) > 0 \), which means that disutility is the convex function of effort degree. Then design a two-stage game process. Firstly, the government decides the compensation incentive system \( C(y) \) and \( y_0 \) is the rated performance level, also determines two kind of incentive forms, high salary \( C_h \) and low salary \( C_0 \). When \( y > y_0 \), executive will get \( C_h \); when \( y \leq y_0 \), executive will get \( C_0 \). Secondly, executives decide their own effort degree, \( e \), after they learn about the compensation incentive system designed by the government, and are eager to maximize the personal gain.

1. Game behavior of executives

Analyze the executive behavioral decision during the second stage of the game with backward induction. When the government determines the compensation incentive system, executives determine their own effort level and the revenue function is \( U_a = C(y) - g(e) \). The existence of \( \epsilon \) provides the performance \( y \) with uncertainty, so the probability that executive’s performance is lower than the rated performance \( y_0 \) can be expressed as \( p(y \leq y_0) = \int_{-\infty}^{y_0-\epsilon} \phi(\epsilon) d\epsilon \). Then the expected revenue of executives is

\[
E(U_a) = C_0 \cdot p(y \leq y_0) + C_h \cdot p(y > y_0) - g(e) \\
= C_0 \int_{-\infty}^{y_0-\epsilon} \phi(\epsilon) d\epsilon + C_h \int_{y_0-\epsilon}^{\infty} \phi(\epsilon) d\epsilon - g(e)
\]

The condition of incentive compatibility of executives is

\[
\max_{\epsilon \geq 0} \{ C_h \cdot p(y > y_0) + C_0 \cdot p(y \leq y_0) - g(e) \} = \max_{\epsilon \geq 0} \{ (C_h - C_0) \cdot p(y > y_0) + C_0 - g(e) \}
\]

Because of \( \epsilon \in N(0, \sigma^2) \), the following can be obtained according to the first order condition of extremum problem.
\[ (C_h - C_0) \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(y_h - y_0)^2}{2\sigma^2}} = g'(e) \]  

(1)

Its economic significance is that the marginal revenue must equal the marginal disutility of executive’s effort. Further, on one hand, since \( g'(e) > 0 \), Eq. 1 explains that the greater difference of reward of executive’s compensation, the easier to improve executive’s effort level \( e \). On the other hand, when the difference of reward \((C_h - C_0)\) keeps constant, executive will reduce his work effort. Therefore, the proposition can be obtained as follows.

Proposition 1: High compensation can motivate executive to work hard. However, if the formation of executive’s performance is uncertain to a large degree, executive will reduce his work effort and incentive effect of high compensation will be lowered.

It should be noted that with some relationship between expected revenue and hardwork or with the substitution effect of power rent-seeking of executives, actual effort of executives may also be \( e = 0 \).

In other words, if compensation incentive level is low while the disutility of effort is great (there may be higher opportunity cost like power rent-seeking), executives may not accept the compensation decided by the government. Therefore, validity conditions of participation constraint of compensation system of the government must be analyzed further.

2. Compensation Decision of Government

Analyze the first stage of the game. If it is not sure that executives accept the compensation system, then they will increase their personal gain by power rent-seeking, insider control, etc. Thus, guaranteeing the participation of executives is the sufficient condition of effective compensation incentive of the government. Assume that the income of power rent-seeking of executives is \( V \), then the participation constraint condition that makes executives accept the compensation system is

\[ C_h \cdot p(y > y_0) + C_0 \cdot p(y \leq y_0) - g(e) \geq V \]  

(2)

Proposition 1 analyzes the effect that the performance uncertainty \( \sigma \) has on \((C_h - C_0)\). In order to further explain the diversity of compensation incentive, assume \( C_h = C_0 + \alpha + \beta y \). There into, \( \alpha + \beta y \) stands for performance compensation, \( \alpha \) is fixed part (like post welfare and duty consumption) and \( \beta \) refers to the coefficient of performance award. In this case, revenue function of the government is \( U_p = e - C(y) \) and what the government is faced with is how to maximize the expected revenue with compensation system, as shown in Eq. 3.

\[
\begin{align*}
\text{max } & E(U_p) = e - C_0 \cdot p(y \leq y_0) - (C_0 + \alpha + \beta y) \cdot p(y > y_0) \\
\text{s.t. (PC)} & C_h \cdot p(y > y_0) + C_0 \cdot p(y \leq y_0) - g(e) \geq V \\
\text{(IC)} & \arg \max_{\epsilon \geq 0} \{ C_h \cdot P(y > y_0) + C_0 \cdot P(y \leq y_0) - g(e) \} \\
\end{align*}
\]  

(3)

Apply Lagrange Multiplier Method with respect to Eq. 3:

\[
L = e - C_0 \cdot p(y \leq y_0) - (C_0 + \alpha + \beta y) \cdot p(y > y_0) \\
+ \lambda [C_h \cdot p(y > y_0) + C_0 \cdot p(y \leq y_0) - g(e) - V] \\
+ \eta [C_h \cdot P(y > y_0) + C_0 \cdot P(y \leq y_0) - g(e)]
\]
\[ L = e - C_0 - \int_{y_0 - e}^{\infty} (\alpha + \beta y) \phi(e)d\varepsilon \\
+ \lambda \int_{y_0 - e}^{\infty} (C_0 + \alpha + \beta y) \phi(e)d\varepsilon + C_0 \cdot \int_{\infty}^{y_0 - e} \phi(e)d\varepsilon - g(e) - V \] (4)

\[ + \eta [\beta \int_{y_0 - e}^{\infty} \phi(e)d\varepsilon + (\alpha + \beta y_0) \phi(y_0 - e) - g'(e)] \]

First, analyze the effect which the rated performance \(y_0\) has on compensation system and calculate \(\partial L/\partial y_0\) with respect to Eq. 4.

\[ \frac{\partial L}{\partial y_0} = (1 - \lambda)(\alpha + \beta y_0)\phi(y_0 - e) + \eta(\alpha + \beta y_0)\phi'(y_0 - e) \] (5)

Since \(\phi'(y_0 - e) = \frac{(e - y_0)\phi(y_0 - e)}{\sigma^2}\), substitute it into Eq. 5 and we find that

\[ \frac{\partial L}{\partial y_0} = (\alpha + \beta y_0) \cdot \phi(y_0 - e) \cdot [1 - (\lambda - \eta \frac{e - y_0}{\sigma^2})] \]

According to the principle of optimality of first-order condition about extremum problem, since \((\alpha + \beta y_0) > 0, \phi(y_0 - e) > 0, \lambda - \eta \frac{e - y_0}{\sigma^2} > 0\), that is to say \(y_0 > e - \frac{\lambda \sigma^2}{\eta}\). When \(\sigma \to 0\), \(y_0 \to e\).

Therefore, put forward the following proposition.

Proposition 2: If the effect of performance uncertainty can be ignored, that is to say the government can identify the effort level of executives efficiently, expected revenue of the government will be maximized by a higher appraisal standard of rated performance.

Take the first partial derivatives of \(\alpha\) and \(\beta\) with respect to Eq. 4.

\[ \frac{\partial L}{\partial \alpha} = -\int_{y_0 - e}^{\infty} \phi(e)d\varepsilon + \lambda \int_{y_0 - e}^{\infty} \phi(e)d\varepsilon + \eta \phi(y_0 - e) \] (6)

\[ \frac{\partial L}{\partial \alpha} = -\int_{y_0 - e}^{\infty} \phi(e)d\varepsilon + \lambda \int_{y_0 - e}^{\infty} \phi(e)d\varepsilon + \eta \phi(y_0 - e) \] (7)

According to Proposition 2, when \(\sigma \to 0\), \(y_0 \to e\). Therefore, Eq. 7 can be rewritten as

\[ \frac{\partial L}{\partial \beta} = -e \int_{y_0 - e}^{\infty} \phi(e)d\varepsilon + \lambda e \int_{y_0 - e}^{\infty} \phi(e)d\varepsilon + \eta e \phi(y_0 - e) + \eta \int_{y_0 - e}^{\infty} \phi(e)d\varepsilon \] (8)

Rearranging Eq. 6 and Eq. 8, we obtain that

\[ \frac{\partial L}{\partial \beta} = e \frac{\partial L}{\partial \alpha} + \eta \int_{y_0 - e}^{\infty} \phi(e)d\varepsilon \]

When \(\partial L/\partial \beta \leq 0\) and the optimal solution is reached, \(\partial L/\partial \alpha < 0\), that is to say when \(\sigma \to 0\), \(\alpha \to 0\).

Make \(\partial L/\partial e = 0\) with respect to Eq. 4 and figure out the condition for optimal solution of Eq. 4 by combining Eq. 5, Eq. 6 and Eq. 7. Thereinto,

\[ \eta = \frac{1 - \beta \int_{y_0 - e}^{\infty} \phi(e)d\varepsilon - (\alpha + \beta y_0)\phi(y_0 - e)}{g''(e) - \beta \phi(y_0 - e) - (\alpha + \beta y_0)\phi'(y_0 - e)} \]
When there exists optimal solution of Eq. 4, if $\sigma \to 0$ and $y_0 \to e$, then $(\alpha + \beta y_0)\phi(y_0 - e) < 1$, $\beta \to 0$. Based on the above, when $\sigma \to 0$, $\alpha, \beta \to 0$. Therefore, put forward the following proposition.

Proposition 3: When performance appraisal can identify the effort level of executives accurately, a rated performance standard for incentive mechanism of the executives can take the place of high performance compensation incentive. Compared to the latter, if executive’s performance can be measured accurately, the incentive mechanism of rated performance is more helpful to reduce principal-agent cost.

**Conclusion**

Relationship between compensation and performance is always the difficulty which is controversial and unavoidable in the study on executives’ compensation incentive. The solutions to it of this paper are taking the effectiveness of performance appraisal into account and designing a classified compensation incentive system based on rated performance. Study has found that high pay can encourage executives to work hard. If the formation of executives’ performance is uncertain to a large degree, the effectiveness of high compensation incentive will decrease; if the government can identify the degree of executives hardwork efficiently, expected revenue of the government will be maximized by a higher appraisal standard of rated performance; if executives’ performance can be measured, government can supervise the executives by improving rated performance criteria, which is more helpful to reduce principal-agent cost and motivate the executives to work hard than high compensation incentive.

**References**


