

# Research on the Implicit Incentive Mechanisms of the Management of Mixed Ownership Enterprises based on Ability

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**Abstract**—The promotion of mixed ownership enterprises has been carried out by various domestic enterprises in various ways. The exploration on incentive mechanisms of the management of mixed ownership enterprises urgently calls for the theoretical guidance of related researches on new incentive mechanism design. Although there have been many management documents for enterprises on the explicit incentive mechanisms, few have focused on the implicit incentive mechanisms, especially the implicit incentive mechanisms of the management based on the ability. This paper attempts to, with a theoretical model established, research the optimal incentive intensity, the choice of management actions and the increase of management ability under the implicit incentive mechanisms of the management of mixed ownership enterprises, which enriches the relevant documents concerning the incentive mechanisms of the management while providing improvement suggestions for incentive mechanism design of the management of mixed ownership enterprises.

**Keywords**-mixed ownership enterprises; management; implicit incentive

## 1 INTRODUCTION

It is believed by the principal-agent theory that given the information asymmetry between the principal and the agent, the principal shall pay the agent in light of the work performance to motivate the agent. Only in this way will the agent work harder [1].

As the management serves as the highest-level agent of the company, its incentive mechanism design shares particular importance. Compared with private enterprises, the ultimate principal of state-owned enterprises remains ambiguous, and the dual goals of state-owned enterprises diversify the objectives of the agent, worsening the agency issues while complicating incentive problems for the management of state-owned enterprises [2-3]. The Third Plenary Session of the Eighteenth Central Committee of the Communist Party of China proposed to “actively develop the mixed ownership economy”, which pointed out a new direction for the reform of the current state-owned enterprise systems. With the advancement of the mixed ownership reform, the Central Committee of the Communist Party of China and the State Council, regarding the lack of incentive constraints and insufficient vitality in some state-owned enterprises, stipulated in “Opinions on Deepening Reform in State-owned Enterprises” on August 2015 that “the professional manager system should be promoted, the internal training and external introduction be combined and the identity conversion channel between existing business managers and professional managers be unblocked. It is also imperative for the board of directors to select and

manage professional managers in a market-based manner, reasonably increase the market-based selection ratio, and accelerate the establishment of an exit mechanism. Meanwhile, the market-based salary distribution mechanism should be implemented for professional managers selected from the market. Various methods can be adopted to explore and improve the medium- and long-term incentive mechanisms.” Li believes that the introduction of mixed ownership into the reform of state-owned enterprises will combine the capital advantages of state-owned capital with the flexibility of private capital, thus resulting in a governance effect of “1+1>2” [4]. Yang regards that the reform of state-owned enterprises with mixed economy as a breakthrough requires the overall arrangement of measures such as the classified reform strategy of state-owned enterprises, the management and operation system of state-owned assets, the exit path of state-owned capital, the governance structure of mixed-ownership enterprises, and the professional manager system to achieve substantial results [5]. And the property right structure and enterprise governance system faced by the management of market-based selection is a completely different one. The mixed ownership of enterprises refers to both state-owned property rights and non-state-owned ones, forming an equity structure in which state-owned and non-state-owned capitals remain “cross-shareholding” and “mutually-integrated”, that is, state-owned enterprises allow private capital to participate in shares, and private enterprises allow state-owned capital to participate in shares with both state-owned controlling shareholders, while non-state-owned controlling shareholders included within the enterprise governance system[6-7]. Compared with traditional state-owned enterprises and private enterprises, mixed ownership enterprises boast bigger resources and capital advantages as well as greater choice and freedom in the selection and combination of incentive mechanisms for the management. Only when the new property right structure and enterprise governance structure of mixed ownership enterprises match with a suitable incentive mechanism, can the management be motivated to the maximum while the mixed ownership reform takes effect as soon as possible to obtain reform dividends. This paper, starting from the background of mixed ownership reform, discusses the optimal choice of implicit incentive mechanism of the management to perfect the incentive and governance mechanisms of mixed ownership enterprises.

## **2 LITERATURE REVIEW**

The traditional simple principal-agent model assumes the agent’s effort choices to be one-dimensional [8]. Many scholars have conducted researches from different aspects on the optimal design of the incentive mechanisms in the simple principal-agent relationship. Among them, Holmstrom and Milgrom put forward the principle of incentive intensity and pointed out that the optimal incentive intensity depends on four factors, namely, the incremental profit created by extra effort, the evaluation accuracy of the desired activity, the agent’s tolerance towards risks, and the agent’s sensitivity to incentives [9]. But in many practical cases where the agent is engaged in more than one assignment entrusted by the principal, or even one assignment involves multiple dimensions, the agent’s effort choices tend to be multi-dimensional rather than one-dimensional, thus invalidating the incentive methods that are effective for one-dimensional effort [10]. Therefore, it is necessary to reflect on the incentive mechanisms under the assumption of one-dimensional effort choices. Holmstrom and Milgrom also proposed a multi-task principal-agent model, which proved that the conclusions obtained from the simple principal-agent model may not be applicable when the agent is engaged in multiple assignments [11]. Baker and Baker,

Gibbons, and Murphy studied the impact of performance evaluation on the multi-task principal-agent incentive mechanism [12-13]. Laffont and Martimort delved into the question of how the nature of the assignment affects the agent's agency behavior with multiple assignments involved [14]. Lin conducted research on optimization design problems in multi-objective R & D activities, and reached some research conclusions different from single-assignment situations [15]. Zhang and Wu regarded managerial behavior as a combination of productive effort and distributive effort, based on which the profit-sharing mechanisms were further discussed [16]. What these documents discuss are explicit payment incentives for the management, discussion on implicit incentive mechanisms is included in other documents. Fama believed that in a competitive manager market, the manager's market value (income) depends on his past business performance [17]. It is Holmstrom's agent market-reputation model that directly displayed the market reputation to be a substitute for explicit incentive contracts [18]. Harris and Raviv pointed out that the utility of operators not only comes from monetary payment but also management decisions. The utility from management decisions can be regarded to be exogenous but not the result of reputation influence within the system [19-20]. Lin and Fu proposed that the reputation evaluation system and mechanism established for the internal executives and external independent directors of mixed ownership enterprises are equipped with the incentive and constraint effect of third-party supervision [21]. Wang, Fu, Huang, and Wang discussed the incentive mechanisms design and income distribution strategy for state-owned enterprise executives from the unique career considerations (political promotion) of state-owned enterprise executives [22]. Kong and Zhang established a combination model of state-owned enterprise managers' dual reputation incentives and stock option incentives. Under the form of stock option compensation, the long-term incentive effects of dual reputations (political reputation and market reputation) on managers were researched, that is, the manager's reputation influences the optimal level of both the coefficient and profit-sharing ratio [23]. Zhang and Zhang improved the manager's payment contract from the perspective that business performance exerts implicit incentive effects on the managers [24]. In China, the growth of the business performance of mixed ownership enterprises will bring not only explicit payment incentives to the management, but also additional implicit incentives. For example, it is likely that the growth of business performance may lead to the promotion of the management, which in turn increases the future income of the management; it is also likely that the growth of business performance may gain the management awards outside the enterprise system like the expensive material rewards from governments at all levels. This paper intends to respond to the question that why the business performance of the management of mixed ownership enterprises, especially the long-term performance, would bring additional utility to the management. All these existing documents share a common hypothesis, that is, with the ability assumed as the constant quantity, the output of enterprises is regarded as the function of efforts, aiming to understand the multi-dimensionality of efforts from the perspective of multitasking. It is believed in this paper that the role of the management as senior human capital in enterprise output is mainly reflected in two aspects, namely ability and effort. The contribution of the management to the output of enterprises, namely the performance of the management, is jointly determined by ability and effort of the management. The ability of the management is composed of the initial stock of human capital and the increase in human capital ability. While the effort of the management can be divided into two aspects, one is the effort level for working, referred to as productive effort; the other is the effort level to improve one's own abilities, referred to as ability effort. The productive effort of the management refers to the efforts directly applied to the operation and decision-making of the

enterprises. Such an effort will directly affect the short-term performance of the management, and the length of time is often used to measure the size of the effort. While the ability effort of the management represents the efforts to improve one's own abilities either through learning by doing, practicing and learning in other enterprises or participating in on-the-job training. Instead of directly producing work performance, such an effort is proved to upgrade the ability of the management, resulting in greater long-term performance. As the ability of the management exists as implicit information, which can be more truly reflected by long-term business performance than short-term performance. The extra utility of long-term performance to the management is essentially a reward for the growth of the ability of the management by the external market based on the observed long-term performance, thereby generating implicit incentives for the growth of the ability of the management. Such an implicitly incentive effect can be adopted by owners of mixed ownership enterprises to improve the payment contract for the management and thus maximize their utility.

This paper, starting from the clue that the growth of the management's ability will bring implicit incentives to the management, discusses the implementation of the ability-based implicit incentive mechanisms for the management, enriches the relevant research on the incentive mechanisms of the management, and provides new methods and theoretical basis for improving the incentive mechanism design of the management of mixed ownership enterprises.

### 3 THEORETICAL MODEL

#### 3.1 Model Hypothesis

Hypothesis 1: The total effort level  $m$  of the management of mixed ownership enterprises can be divided into two aspects. One is the effort level for working, referred to productive effort, symbolized by  $m_1$ . While the other is the effort level for improving one's own ability, referred to ability effort, symbolized by  $m_2$ . What the management will select is the action combination of productive effort  $m_1$  and ability effort  $m_2$ , denoted as  $m = (m_1, m_2) \in N_1 \times N_2$ , in which  $N_1 \times N_2$  represents the effort choice space for the management. The cost functions of these two effort levels are respectively  $c(m_i) = \frac{b_i}{2} m_i^2$  ( $b_i > 0, i = 1, 2$ ).

Hypothesis 2: The ability of the management  $a$  consists of the initial stock of human capital and the ability increment of human capital. The initial stock of human capital is denoted as  $a_0$  and the ability increment of human capital is denoted as  $\Delta_a$ , then the ability of the management can be displayed as  $a = a_0 + \Delta_a$ .  $\Delta_a$  refers to a function of ability effort, denoted as  $\Delta_a = r_2 m_2$ , where  $r_2$  represents the learning ability of the management. The greater the  $r_2$  is, the stronger the learning ability of the management will be and the greater improvement in the ability will achieve with the same  $m_2$  devoted.

Hypothesis 3: Mixed ownership enterprise performance brought by the efforts of the management is a two-dimensional vector  $\pi = \begin{pmatrix} \pi_1 \\ \pi_2 \end{pmatrix} = \begin{pmatrix} r_1 m_1 + \varepsilon_1 \\ r_3 a + \varepsilon_2 \end{pmatrix} = \begin{pmatrix} r_1 m_1 + \varepsilon_1 \\ r_3 (a_0 + r_2 m_2) + \varepsilon_2 \end{pmatrix}$ , where  $\pi_1 = r_1 m_1 + \varepsilon_1$  refers to the short-term performance of the enterprise,  $r_1$  represents the marginal impact of productive effort  $m_1$  of the management on the short-term performance, that is, the greater the  $r_1$  is, the greater the short-term performance will be with the same  $m_1$ , while  $\varepsilon_1$  represents the normally distributed random variable with zero mean and  $\sigma_1^2$  variance, that is, the

exogenous uncertainty factors faced by the productive effort of the management to create short-term performance;  $\pi_2 = r_3 a + \varepsilon_2 = r_3(a_0 + r_2 m_2) + \varepsilon_2$  refers to the long-term performance of the enterprise,  $r_3$  represents the marginal impact of the ability of the management  $a$  on long-term performance, that is, the greater the  $r_3$  is, the greater the long-term performance will be with the same  $a$ , while  $\varepsilon_2$  represents the normally distributed random variable with zero mean and  $\sigma_1^2$  variance, that is, the exogenous uncertainty factors faced by the ability of the management to create long-term performance;  $\sigma_1^2$  and  $\sigma_2^2$  are independent from each other.

Hypothesis 4: While the productive effort  $m_1$ , ability effort  $m_2$ , and exogenous uncertainty factors  $\varepsilon_1$  and  $\varepsilon_2$  of the management cannot be observed by the principal of mixed ownership enterprises, the enterprise performance with the information of productive effort  $m_1$  and ability effort  $m_2$  of the management, namely short-term performance  $\pi_1$  and long-term performance  $\pi_2$ , can be detected respectively.

Hypothesis 5: The principal of a mixed ownership enterprise signs a linear payment contract with the management  $s(\pi) = \alpha + \beta_1 \pi_1 + \beta_2 \pi_2$ , where  $\alpha$  refers to the fixed salary of the management (irrelevant from  $\pi_1$  and  $\pi_2$ );  $\beta = (\beta_1, \beta_2)$  refers to the two performance output shares shared by the management;  $\beta_1$  represents the short-term performance share shared by the management, that is the short-term explicit incentive intensity of the principal to the management; while  $\beta_2$  refers to the long-term performance share shared by the management, that is the long-term explicit incentive intensity of the principal to the management.

Hypothesis 6: The principal of mixed ownership enterprise is risk-neutral, and the expected income of the principal can be displayed as:

$$E v = E(\pi_1 - \alpha - \beta_1 \pi_1) + \delta E(\pi_2 - \beta_2 \pi_2) = -\alpha + (1 - \beta_1)r_1 m_1 + \delta(1 - \beta_2)r_3(a_0 + r_2 m_2). \quad (1)$$

Where,  $\delta$  refers to the discount factor,  $0 \leq \delta \leq 1$ .

Hypothesis 7: As the management of mixed ownership enterprises is risk-averse, the total utility function of the management is displayed as  $u = -e^{-\rho \omega_1} - \delta e^{-\rho \omega_2}$ , where  $\rho$  refers to the absolute risk aversion measurement,  $\omega_1$  denotes the actual income for the short-term performance of the management and  $\omega_2$  represents the actual income for the long-term performance of the management. It is assumed that the equivalent currency income of the implicit incentive brought by the ability of the management to the management is  $i(\pi_2) = \gamma \pi_2$  ( $0 < \gamma < 1$ ), where  $\gamma$  represents the marginal impact of the increase in unit long-term performance reflecting the growth of the ability of the management on the equivalent currency incentives of the management, referred to the implicit incentive coefficient of the ability of the management. The larger the  $\gamma$ , the greater implicit incentive effect will be exerted on the management with the same long-term performance.

The actual Income of short-term performance sharing by the management can be displayed as:

$$\Omega_1 = \alpha + \beta_1 \pi_1 - c(m_1) = \alpha + \beta_1(r_1 m_1 + \varepsilon_1) - \frac{b_1}{2} m_1^2. \quad (2)$$

The certainty equivalence of short-term performance sharing by the management can be displayed as:

$$\omega_{q_1} = E\omega_1 - \frac{1}{2}\rho\beta_1^2\sigma_1^2 = \alpha + \beta_1r_1m_1 - \frac{b_1}{2}m_1^2 - \frac{1}{2}\rho\beta_1^2\sigma_1^2. \quad (3)$$

Similarly, the actual income shared by the management in the long-term performance can be displayed as:

$$\omega_2 = (\beta_2 + \gamma)\pi_2 - c(m_2) = (\beta_2 + \gamma)(r_3(a_0 + r_2m_2) + \varepsilon_2) - \frac{b_2}{2}m_2^2. \quad (4)$$

The certainty equivalence of long-term performance sharing by the management can be displayed as:

$$\omega_{q_2} = E\omega_2 - \frac{1}{2}\rho(\beta_2 + \gamma)^2\sigma_2^2 = (\beta_2 + \gamma)r_3(a_0 + r_2m_2) - \frac{b_2}{2}m_2^2 - \frac{1}{2}\rho(\beta_2 + \gamma)^2\sigma_2^2. \quad (5)$$

The total certainty equivalence of the management can be displayed as:

$$\omega_q = \omega_{q_1} + \delta\omega_{q_2} = \alpha + \beta_1r_1m_1 + \delta(\beta_2 + \gamma)r_3(a_0 + r_2m_2) - \frac{b_1}{2}m_1^2 - \delta\frac{b_2}{2}m_2^2 - \frac{1}{2}\rho\beta_1^2\sigma_1^2 - \delta\frac{1}{2}\rho(\beta_2 + \gamma)^2\sigma_2^2. \quad (6)$$

The total expected utility to the maximum of the management is equivalent to the maximization of the total certainty equivalence through the function  $Eu = -E(e^{-\rho\omega_1} + \delta e^{-\rho\omega_2})$ .

### 3.2 Model Construction

Through the above hypotheses and analysis and given the information asymmetry situation that the principal of mixed ownership enterprises fail to observe the productive effort  $m_1$  and the ability effort  $m_2$  of the management, but can detect the short-term performance  $\pi_1$  and long-term performance  $\pi_2$  respectively with the information concerning the productive effort and ability effort of the management, the model the principal chooses  $(\alpha, \beta_1, \beta_2)$  to maximize his total expected income  $Ev$  is as follows:

$$\max_{\alpha, \beta_1, \beta_2} Ev = -\alpha + (1 - \beta_1)r_1m_1 + \delta(1 - \beta_2)r_3(a_0 + r_2m_2) \quad (7)$$

$$\text{s.t. (IR)} \quad \alpha + \beta_1r_1m_1 + \delta(\beta_2 + \gamma)r_3(a_0 + r_2m_2) - \frac{b_1}{2}m_1^2 - \delta\frac{b_2}{2}m_2^2 - \frac{1}{2}\rho\beta_1^2\sigma_1^2 - \delta\frac{1}{2}\rho(\beta_2 + \gamma)^2\sigma_2^2 \geq \bar{\omega}$$

$$\text{(IC)} \quad (m_1, m_2) \in \operatorname{argmax} \alpha + \beta_1r_1m_1 + \delta(\beta_2 + \gamma)r_3(a_0 + r_2m_2) - \frac{b_1}{2}m_1^2 - \delta\frac{b_2}{2}m_2^2 - \frac{1}{2}\rho\beta_1^2\sigma_1^2 - \delta\frac{1}{2}\rho(\beta_2 + \gamma)^2\sigma_2^2, \forall (m_1, m_2) \in N_1 \times N_2.$$

$\bar{\omega}$  represents the revenue reserve of the management.

By solving the above model, the optimal shares of these two kinds of performance outputs shared by the management, namely, the optimal short-term performance share of the management and the optimal long-term performance share of the management, can be displayed as:

$$\beta_1^* = \frac{r_1^2}{r_1^2 + b_1\rho\sigma_1^2}. \quad (8)$$

$$B_2^* = \frac{r_3^2r_2^2 - \gamma b_2\rho\sigma_2^2}{r_3^2r_2^2 + b_2\rho\sigma_2^2}. \quad (9)$$

The optimal combination of the productive effort and ability effort of the management can be displayed as:

$$m^* = (m_1^*, m_2^*) = \left( \frac{\beta_1^* r_1}{b_1}, \frac{(\beta_2^* + \gamma) r_3 r_2}{b_2} \right). \quad (10)$$

The optimal ability of the management can be displayed as:

$$A^* = a_0 + \Delta_a = a_0 + r_2 m_2^* = a_0 + \frac{(\beta_2^* + \gamma) r_3 r_2^2}{b_2}. \quad (11)$$

### 3.3 Model Analysis

#### 3.3.1 The Optimal Incentive Intensity of the Implicit Incentive Mechanisms of the Management of Mixed Ownership Enterprises

It can be seen from (8) and (9) that the optimal short-term explicit incentive intensity under the implicit incentive mechanisms is jointly determined by parameters including  $r_1$ ,  $b_1$ ,  $\rho$  and  $\sigma_1^2$ , while the optimal long-term explicit incentive intensity by parameters including  $r_2$ ,  $r_3$ ,  $b_2$ ,  $\rho$  and  $\sigma_2^2$ , from which Propositions 1 and 2 can be obtained.

Proposition 1:  $\frac{\partial \beta_1^*}{\partial r_1} > 0$ ,  $\frac{\partial \beta_1^*}{\partial b_1} < 0$ ,  $\frac{\partial \beta_1^*}{\partial \rho} < 0$ ,  $\frac{\partial \beta_1^*}{\partial \sigma_1^2} < 0$ , that is, the optimal short-term explicit incentive intensity of the management increases with the increase of the marginal impact of productive effort of the management to short-term performance, but decreases with the increases of the cost coefficient of productive effort of the management, absolute risk aversion measurements of the management and exogenous uncertainty faced by productive effort of the management to create short-term performance.

Proposition 2:  $\frac{\partial \beta_2^*}{\partial r_2} > 0$ ,  $\frac{\partial \beta_2^*}{\partial r_3} > 0$ ,  $\frac{\partial \beta_2^*}{\partial b_2} < 0$ ,  $\frac{\partial \beta_2^*}{\partial \rho} < 0$ ,  $\frac{\partial \beta_2^*}{\partial \sigma_2^2} < 0$ ,  $\frac{\partial \beta_2^*}{\partial \gamma} < 0$ , that is, the optimal long-term explicit incentive intensity of the management increases with the increases of the learning ability of the management and the marginal impact of the ability of the management on long-term performance, but decreases with the increases of the cost coefficient of productive effort of the management, absolute risk aversion measurements of the management, exogenous uncertainty faced by productive effort of the management to create long-term performance and implicit incentive coefficient of the ability of the management.

#### 3.3.2 The Action Choices of the Management of the Implicit Incentive Mechanisms of the Management of Mixed Ownership Enterprises

It can be seen from (10) that when the parameters  $r_1$ ,  $r_2$ ,  $r_3$ ,  $b_1$ ,  $b_2$  and  $\gamma$  remain unchanged, the optimal combination  $(m_1^*, m_2^*)$  of management actions under the implicit incentive mechanisms is uniquely determined by the optimal short-term  $\beta_1^*$  and long-term explicit incentive intensity  $\beta_2^*$ , from which Proposition 3 can be reached.

Proposition 3:  $\frac{\partial m_1^*}{\partial \beta_1^*} > 0$ ,  $\frac{\partial m_2^*}{\partial \beta_2^*} > 0$ , that is, productive effort of the management increases with the increase of short-term explicit incentive intensity of the management; while ability effort of the management increases with the increase of the long-term explicit incentive intensity.

It can also be seen from (10) that the moment when payment contract of the management takes effect, that is,  $\alpha^*$ ,  $\beta_1^*$ ,  $\beta_2^*$  remain unchanged, the optimal combination  $(m_1^*, m_2^*)$  of management actions under the implicit incentive mechanisms is jointly determined by  $r_1$ ,  $r_2$ ,  $r_3$ ,  $b_1$ ,  $b_2$  and  $\gamma$ . By changing these factors can the principal upgrade the effort level of the management, from which Propositions 4 and 5 can be reached.

Proposition 4: The moment the contract becomes effective,  $m_1^*$  will increase and  $m_2^*$  remains unchanged with increase in  $r_1$ ; while  $m_1^*$  will increase and  $m_2^*$  remains unchanged with decrease in  $b_1$ , that is, when the payment contract of the management comes into force, productive effort of the management will increase with the increase of marginal impact of productive effort of the management to short-term performance and increase with the decrease of cost coefficient of productive effort of the management, while the ability effort of the management remains unchanged. In other words, the management will experience an increase in productive effort without the reduction in ability effort.

Proposition 5: The moment the contract becomes effective,  $m_2^*$  will increase and  $m_1^*$  remains unchanged with increase in  $r_2$ ;  $m_2^*$  will increase and  $m_1^*$  remains unchanged with increase in  $r_3$ ;  $m_2^*$  will increase and  $m_1^*$  remains unchanged with decrease in  $b_2$ ; while  $m_2^*$  will increase and  $m_1^*$  remains unchanged with increase in  $\gamma$ , that is, when the payment contract of the management comes into force, ability effort of the management will increase with increases of the learning ability of the management, marginal impact of ability of the management to long-term performance and implicit incentive coefficient of the ability of the management, and increase with the decrease of cost coefficient of ability effort of the management, while the productive effort of the management remains unchanged. In other words, the management will experience an increase in ability effort without the reduction in productive effort.

### 3.3.3 The Ability of the Management of the Implicit Incentive Mechanisms of the Management of Mixed Ownership Enterprises

The ability of the management consists of initial stock of human capital and ability increment in human capital, namely,  $a^* = a_0 + \Delta_a$ . It can also be seen from (11) that  $\Delta_a = r_2 m_2^* = \frac{(\beta_2^* + \gamma) r_3 r_2^2}{b_2}$ . When parameters including  $r_2$ ,  $r_3$ ,  $b_2$  and  $\gamma$  remain unchanged, the ability increment  $\Delta_a$  of the management under the implicit incentive mechanisms is solely determined by the optimal long-term explicit incentive intensity  $\beta_2^*$ , from which Proposition 6 can be reached.

Proposition 6:  $\frac{\partial \Delta_a}{\partial \beta_2^*} > 0$ , that is, the ability increment of the management increases with the increase of long-term explicit incentive intensity. The ability of the management can be enhanced in practice with more long-term performance shares given to the management from the principal.

It can also be seen from (11) that the moment when payment contract of the management takes effect, that is,  $\alpha^*$ ,  $\beta_1^*$ ,  $\beta_2^*$  remain unchanged, the ability increment of the management  $\Delta_a$  under the implicit incentive mechanisms is jointly determined by  $r_2$ ,  $r_3$ ,  $b_2$  and  $\gamma$ . By changing these factors can the principal upgrade the ability of the management, from which Propositions 7, 8, 9 and 10 can be reached.

Proposition 7: The moment the contract becomes effective,  $\frac{\partial \Delta_a}{\partial r_2} > 0$ , that is, when the payment contract of the management comes into force, the ability increment will increase with the increase



in the learning ability of the management. Such a changing trend can be utilized by the principal in practice to upgrade the ability of the management. For example, the principal can grant the management more business decision-making power or locate the management in a more complex and challenging work environment so as to improve the learning ability of the management, leading to the improvement in the ability of the management.

Proposition 8: The moment the contract becomes effective,  $\frac{\partial \Delta_a}{\partial r_3} > 0$ , that is, when the payment contract of the management comes into force, the ability increment will increase with the increase of its marginal impact on long-term performance. Such a changing trend can be utilized by the principal in practice to improve the ability of the management. For example, the principal can assign the management with more demanding jobs.

Proposition 9: The moment the contract becomes effective,  $\frac{\partial \Delta_a}{\partial b_2} < 0$ , that is, when the payment contract of the management comes into force, the ability increment will increase with the decrease of the cost coefficient of productive effort of the management. Such a changing trend can be utilized by the principal in practice to enhance the ability of the management. For example, the principal can increase the sense of accomplishment of the management or endow the assignments of the management with more attractiveness.

Proposition 10: The moment the contract becomes effective,  $\frac{\partial \Delta_a}{\partial \gamma} > 0$ , that is, when the payment contract of the management comes into force, the ability increment will increase with the increase of the implicit incentive coefficient of the ability of the management.

#### 4 CONCLUSION AND SUGGESTION

With a theoretical model established, the implicit incentive mechanisms of the management of mixed ownership enterprises are researched in this paper from three aspects, namely the optimal incentive intensity, the action choices of the management and the increment in the ability of the management, the conclusions of which enrich the relevant documents concerning incentive mechanisms of the management and provide improvement suggestions for incentive mechanism design of the management of mixed ownership enterprises.

1. The optimal long-term explicit incentive intensity (the optimal long-term performance share) of the management of mixed ownership enterprises decreases with the increase of the implicit incentive coefficient of the ability of the management, which indicates that a substitutability exists between the implicit incentives and the long-term explicit incentives of the ability of the management in mixed ownership enterprises. In addition, it can be seen from (9) that the greater exogenous uncertainty faced by the cost coefficient of ability effort of the management, the degree of risk aversion and the ability to create long-term performance are, the stronger the substitutability will be; and the greater the marginal impact of ability effort of the management exerts on the long-term performance of mixed ownership enterprises, the weaker the substitution will be. Such an implicit incentive effect can be adopted by owners of mixed ownership enterprises to optimize the payment contract for the management.

2. With the increase of the implicit incentive coefficient of the ability of the management, the ability efforts of the management of mixed ownership enterprises will experience an increase,

which in turn leads to the improvement in the ability of the management with productive efforts remain unchanged.

This conclusion confirms the effectiveness of the implicit incentives of the ability of the management of mixed ownership enterprises. In addition, it can be seen from (10) and (11) that the greater the marginal impact of the learning ability and ability effort of the management exerts on the long-term performance of mixed ownership enterprises, the stronger the effectiveness will be; the greater the cost coefficient of the ability effort of the management is, the weaker the effectiveness will be. In addition, according to (10), even if  $\beta^* = (\beta_1^*, \beta_2^*) = 0$ ,  $m^* \neq 0$ ,  $\Delta_a \neq 0$ . That is to say, even if explicit incentives  $\alpha^*$  and  $\beta^*$  have not been exerted on the management, the management will work hard under the effect of implicit incentive  $\gamma$ , especially with more time spent in improving their own abilities to obtain implicit incentive effect, which validates the conclusion that “the effect of explicit incentives has been exaggerated” obtained from Fama’s reputation model.

3. The moment when the payment contract of the management of a mixed ownership enterprise takes effect, the increment of the ability of the management begins to increase with the increase of the learning ability of the management, the marginal impact of the ability of the management on long-term performance, and the reduction of the cost coefficient of the ability effort of the management. By changing these factors in practice, the principal can improve the ability of the management.

Based on the analysis of the substitutability between the implicit incentives and long-term explicit incentives of the ability of the management of mixed ownership enterprises and the implicit incentive effectiveness, this paper concluded the implicit incentive mechanisms based on the ability to be the substitution of explicit incentive mechanisms, which proves to be conducive to more comprehensively measuring the contribution of the management of mixed ownership enterprises to enterprise value increment, improving the existing incentive and constraint mechanisms for the managers, reducing agency cost, solving the long-term incentive problems of the management of mixed ownership enterprises, and finally realizing the “win-win” between the management and the enterprise owners.

**Acknowledgement.** This work was supported by the Humanities and Social Sciences Programs of the Ministry of Education of China [17YJA630088].

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