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# Incentive-Restricted Mechanism to Department Manager in the Process of Knowledge Transfer in the Guarantee Enterprise Under Condition of Asymmetric Information

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## Abstract
Guarantee industry is recognized as the high-risk industry in the world, and business risks and personnel risks are two main risks that guarantee enterprises face. Nowadays, guarantee enterprises in China, have great requirements for high quality and ability of the business personnel, but the labor market cannot supply enough talented guarantee people, and this phenomenon highlights the importance and urgency for the guarantee enterprises to provide business personnel training programs. This paper uses the principal-agent theory to explain the incentive-restricted mechanism of preventing department managers' moral hazard under the real condition of information asymmetry, and verify the validity of theory model of mathematical analysis through an empirical research.

**Key words:** Moral risk; Incentive and restraint mechanisms; Knowledge transfer; Guarantee company

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## INTRODUCTION
To solve the financing difficulties of medium and small enterprises, credit guarantee is a kind of financial support mode used around the world generally. Credit guarantee is the acknowledged high-risk industry in the world, and the first priority of it is risk prevention and control. Preventing personnel risk is highly demanded in the guarantee enterprise, and guarantee enterprise lacks business backbone in this condition, thus putting forward higher requirements for the personnel training work. It is very important for assuring the enterprise personnel's stability, personnel risk prevention, and even the entire guarantee enterprise's risk control.

Presently, most scholars are engaged in research on "knowledge sharing" (Siemsen, Balasubramanian, & Roth, 2007; Wang & Shao, 2012), and the pure knowledge transfer research is relatively few. There is a fraction of knowledge transfer research under the framework of knowledge sharing (Lin, Zhang, & Pu, 2008; Luo & Yin, 2009; Mu & Zhang, 2011). Some research is dedicated to studying the process and mechanism of knowledge transfer (Zhou, Zhang, & Zhang, 2008). Some focuses more on the way and approach to knowledge transfer and efficiency of the model (Osterloh & Frey, 2000; Marino, 2011). This paper will discuss that the high-risk guarantee enterprises, by using principal-agent theory and divided the business manager into two kinds of cases such as

risk neutral and risk aversion, impel department manager (agent) to offer security knowledge and experience as much as possible, thus making subordinates (especially the new employees) become mature faster in business, and finally the enterprise will achieve the aim of controlling guarantee risk by preventing personnel risk.

## 1. INCENTIVE-RESTRICTED MECHANISM OF DEPARTMENT MANAGER'S MORAL HAZARD PREVENTION AND CONTROL IN GUARANTEE ENTERPRISE

In relationships between agents and principals, agents take the behavior that the principals dislike, and the moral risk behavior emerges after they have signed a contract. For example, agents hide their information or action, this behavior belongs to moral hazard problems (Chen, 2010). Department manager imparting guarantee knowledge and experience will lower rareness and value of his knowledge in the organization. It will also threaten his career living space. So department manager will retain his guarantee knowledge and experience, after weighing the pros and cons, and this action cannot be observed by the executives. It is introduced according to the insiders, the personnel risks of guarantee enterprise mainly include: personnel vocational moral risk, personnel risk results from insufficient quality and ability and lack of responsibility. Among three types of risks, professional ethics and responsibility problem occur after signing the principal-agent contract, they are not easy for the principal to observe and control, these behaviors belong to the typical problems of moral risks in the principal-agent theory. For the quality ability shortage problem of department managers, in most cases, the formation of quality and ability is before signing a contract, but the behavior resulted from quality takes place after signing it. This happens like that the poor quality of department manager makes training ineffective, or cannot help to improve the quality of trainee significantly. The employees' operation risks in the follow-up work of the guarantee business will increase with this, and this complex training process is hard to be seen and controlled by executives. Therefore, the problem, the poor quality ability of department manager can regard as a kind of moral risks. So, the paper argues that these three risks possible to happen all belong to moral risk category in economics. Moral risk in classic principal-agent theory should be generalized, but not be confined to profession ethics risk.

### 1.1 Basic Incentive Model Building

#### 1.1.1 Guarantee Knowledge Output Function

According to Griliches (1979) knowledge production model, and on the base of the reality of business department manager's moral risk in guarantee enterprise analyzed above, this paper assumes the department manager's guarantee knowledge output is a linear function of its effort represented as $e$. In addition, other exterior and random factors also have an effect on this function. We can suppose that random factors belong to normal distribution with expect 0 and variance $\sigma^2$, then the guarantee knowledge output function can be expressed as:

$$\pi(e,\theta) = kdmpe + \theta \quad (1)$$

Among this function, $\pi(e,\theta)$ means the department manager guarantee knowledge output; k, the output coefficient of guarantee knowledge, it is constant and greater than zero; inspired by the study of Stevens and Thevaranjan (2010), this article adds the responsibility factor d to the above model, $d \subset [0,1]$, when d=0, it means that department manager is of no responsibility completely; when d=1, it means the department manager is the most responsible. Moral sensitive factor, m is also added to the model, m is constant and $0 \le m \le 1$, when m is equal to zero, it says that the department manager is opportunity egoism, and absolutely with no moral sense, no desire to take any responsibility for training employees, when m=1, it says that the department manager is of the strongest moral sense, and positive to assume the obligations for training employees. p is the ability coefficient of department manager imparting guarantee knowledge, it's constant and p>0, closer p tend to zero, more insufficient his quality ability is; e is the effort level of department manager; it is variable and $e \ge 1$ ("1" says the department manager does not make any effort) (Hsu, 2006). θ is the other random factors which influence the output of guarantee knowledge, and $\theta \sim (0, \sigma^2)$, $E(\theta)=0$, $D(\theta)=\sigma^2$. Guarantee knowledge output function has the following conclusion, with the increasing of effort, output of guarantee knowledge is increasing, and the added rate is increasing, too, so the output difficulty is also incremental.

#### 1.1.2 Managers' Effort Cost Function

In the process of training new employees, the department manager needs effort, such as training stuff members, course preparation, answering question, etc. His effort needs cost, analyzing in brief, this paper will not consider the influence of random factors. This paper uses the study of Hsu (2006), and assumes that the effort cost of department manager like:

$$c(e) = \frac{\gamma e^2}{2} \quad (2)$$

$c(e)$ is the effort cost of department manager, and can be equivalent to the monetary cost; e is the effort level of him, and $e \ge 1$; γ is the effort cost coefficient, and $\gamma > 0$. Seeing this function, we can say, with the increasing of effort, the effort cost is rising, and the increasing rate of cost is rising, too.

### 1.1.3 Incentive Contract Function

The guarantee enterprises need to give the department manager some incentive compensation, in order to encourage him to impart knowledge positively. Presently, the study of incentive mechanism uses the linear contract (Siemsen, 2007), which proved to have Robust by Holmstrom & Milgrom(1987). So this paper also uses this type:

$$s(\pi) = \alpha + \beta\pi \tag{3}$$

Among this model, π denotes the output of department manager's guarantee knowledge, $\pi(e,\theta)$, $\alpha$ is his fixed salary and has nothing to do with π; β is the incentive coefficient of guarantee knowledge of department manager, and 0≤β≤1, namely, it is about the extent of department manager taking risks. When β=0, it means that department manager does not take any risk and knowledge output, and when β=1, it says he assumes all the risks and knowledge output.

### 1.1.4 The Expected Utility Function

The actual benefit of employee is $w_1 = \pi - s(\pi) = (1-\beta)kdmpqe - \beta\theta + \theta - \alpha$. Suppose that the employee is risk neutral, and the expected utility is the same with the expected income. The expected utility function is $Ev(w_1) = Ew_1 = (1-\beta)kdmpe - \beta - \alpha$, in this function, $w_1$ is the real benefit. The real profit of department manager is $w_2 = s(\pi) - c(e) = \alpha + \beta(kdmpe + \theta) - \frac{\gamma e^2}{2}$, when the department manager is also risk neutral, his expected utility is equal to his expected income, i.e., $Eu(w_2) = Ew_2 = \alpha + \beta kdmpe - \frac{\gamma e^2}{2}$. When the department manager is risk aversion, according to the conclusion of Hsu (2006) research, risk cost is $F = \frac{\rho\beta^2\sigma^2}{2}$, then the department manager's utility function is $Ew_2 - F = \alpha + \beta kdmpe - \frac{\gamma e^2}{2} - \frac{\rho\beta^2\sigma^2}{2}$.

### 1.2 Basic Incentive Model

According to the assumption above, when the employee maximize the expected utility, the individual rational constraint IR and harmonic control IC will restrict him. IR means the expected utility when the department manager accepts the employee contract is not less than that when the department manager refuses it; IC means the department manager always considers from the angle of personal benefit maximization, and chooses the effort level which can maximizes the expected utility. $\overline{u}$ is the reservation utility of department manager.

$$\max_{\alpha,\beta,a}[(1-\beta)kdmpe - \beta - \alpha] \tag{4}$$

$$\text{s.t.} \quad \text{(IR)} \begin{cases} \alpha + \beta kdmpe - \frac{\gamma e^2}{2} \geq \overline{u}, \text{ (risk neutral)} \\ \alpha + \beta kdmpe - \frac{\gamma e^2}{2} - \frac{\rho\beta^2\sigma^2}{2} \geq \overline{u}, \text{ (risk aversion)} \end{cases} \tag{5}$$

$$\text{(IC)} \begin{cases} e \in \arg\max(\alpha + \beta kdmpe - \frac{\gamma e^2}{2}), \text{ (risk neutral)} \\ e \in \arg\max(\alpha + \beta kdmpe - \frac{\gamma e^2}{2} - \frac{\rho\beta^2\sigma^2}{2}), \text{ (risk aversion)} \end{cases} \tag{6}$$

## 2. INCENTIVE-RESTRICTED MECHANISM UNDER THE CONDITION OF ASYMMETRIC INFORMATION

In the real and most cases, the information between principle and agent is asymmetry. So this paper mainly studies the incentive and restraint mechanism of department manager transferring knowledge under the condition of information asymmetry. We will study by dividing the manager's attitude towards risk into two occasions, "risk neutral" and "risk aversion". The guarantee enterprises cannot observe the effort level of department manager, when the information is asymmetric. And the guarantee corporation cannot force the manager to dedicate his knowledge out, but can induce the manager to do this through incentive contraction s(π). In the best cases, the IR constraint equation is established, IC conditions can be replaced by optimize first-order partial derivative of e (Mirrlees, 1976; Holmstrom, 1979), $e = \frac{\beta kdmp}{\gamma}$.

### 2.1 Incentive and Restraint Mechanism When the Department Manager Is Risk-Neutral

When the department manager is risk-neutral, the optimization problem can be transformed into this:

$$\max_{\alpha,\beta,a}[(1-\beta)kdmpe - \beta - \alpha] \tag{7}$$

$$\alpha + \beta kdmpe - \frac{\gamma e^2}{2} = \overline{u} \text{ (IR)} \tag{8}$$

$$e = \frac{\beta kdmp}{\gamma} \text{ (IC)} \tag{9}$$

We can generate the individual rational conditions (15) and incentive compatibility condition (16) into the objective function (14), and his first order derivative is equal to zero( partial derivative of β)

$$\beta = \frac{(kdmp)^2 - \lambda}{(kdmp)^2} = 1 - \frac{\gamma}{(kdmp)^2} \tag{10}$$

$$e = \frac{(kdmp)^2 - \gamma}{\gamma kdmp}, \quad \alpha = \overline{u} + \frac{(kdmp)^2 - \gamma}{2kdmp} - \frac{[(kdmp)^2 - \gamma]^2}{\gamma(kdmp)^2}$$

We can see from type (10), the guarantee enterprises provide incentives in accordance with the excitation intensity of β, offer effort level of e, if we want to get the best incentive effect, that is β→1, there exist two patterns: on the one hand, it just needs γ→0( the effort cost coefficient of department manager approaches to zero), and $d\neq 0$, $m\neq 0$, apparently, this is inconsistent logically; on the other hand, if γ is a constant number, it needs $(kdmp)^2\to\infty$, that is to say, $d$, $m\to 1$ and $k$, $p\to\infty$ (the guarantee knowledge quantity department manager owned, knowledge imparting ability, capacity of new employees absorbing knowledge, the value of these factors is the bigger, the better). In addition, when $\gamma>(kdmp)^2$, $\frac{\gamma}{(kdmp)^2}>1$, then, β<0, but actually 0≤β≤1, so the incentive mechanism will lose effectiveness.

### 2.2 Incentive-Restricted Mechanism Under the Condition of Risk Aversion of Department Manager

When department manager is risk-aversion, optimization problem can be transformed into:

$$\max_{\alpha,\beta,a}[(1-\beta)kdmpe-\beta-\alpha] \tag{11}$$

$$\alpha+\beta kdmpe-\frac{\gamma e^2}{2}-\frac{\rho\beta^2\sigma^2}{2}\geq\overline{u}\ \text{(IR)} \tag{12}$$

$$e=\frac{\beta kdmp}{\gamma}\ \text{(IC)} \tag{13}$$

We can generate individual rational conditions (12) and incentive compatibility condition (13) into the objective function (11), and make its first order derivative be zero (partial derivative of β)

$$\beta=\frac{\gamma-(kdmp)^2}{kdmp+\gamma\rho\sigma^2} \tag{14}$$

$$e=\frac{kdmp[\gamma-(kdmp)^2]}{\gamma kdmp-\gamma^2\rho\sigma^2} \tag{15}$$

### 2.3 Affect Trend of Influence Factors on the Department Manager's Excitation Intensity

The influence factors are involved in the expressions (10) and (14) about excitation intensity β. This paper focuses on studying the influence of department manager effort-cost coefficient γ, coefficient k of guarantee knowledge level owned by the enterprise, the department manager responsibility coefficient d, the department manager moral sensitivity m, the department manager's risk aversion degree ρ and guarantee business risk stability $\sigma^2$ on the excitation intensity β.

#### 2.3.1 Conditions of the Department Manager for Risk Neutral

Use the excitation intensity $\beta=1-\frac{\gamma}{(kdmp)^2}$ of expression (10) to take the derivative of γ, k, d, m, p respectively, and judge positive and negative.

$\frac{\partial\beta}{\partial\gamma}=-\frac{1}{(kdmp)^2}<0$, this value means that when department manager is in risk neutral, his excitation intensity will decrease with the increase of effort-cost coefficient. $\frac{\partial\beta}{\partial k}=\frac{2\gamma 2k(dmp)^2}{(kdmp)^3}=\frac{4\gamma}{dmpk^2}>0$, this value means that when department manager is in risk neutral, his incentive strength should increase with the guarantee knowledge level of security company adding. $\frac{\partial\beta}{\partial d}=\frac{2\gamma 2d(kmp)^2}{(kdmp)^3}=\frac{4\gamma}{kmpd^2}>0$, this value means that when department manager is in risk neutral, his excitation intensity will increase with the department manager's sense of responsibility fortifying. $\frac{\partial\beta}{\partial m}=\frac{4\gamma}{dkpm^2}>0$, this value means that if the department manager is in risk neutral and his moral sensitivity is improving, his incentive strength should increase. $\frac{\partial\beta}{\partial p}=\frac{4\gamma}{dkmp^2}>0$, this value shows that if the department manager is in risk neutral and his ability of imparting guarantee knowledge is enhancing, his excitation intensity will increased.

#### 2.3.2 Conditions of the Department Manager for Risk Aversion

Use the excitation intensity $\beta=\frac{(kdmp)^2-\gamma}{(kdmp)^2+\gamma\rho\sigma^2}$ of expression (14) to take the derivative of γ, k, d, m, p, $\sigma^2$ respectively, and judge positive and negative.

$\frac{\partial\beta}{\partial\gamma}=-\frac{(kdmp)^2(1+\rho\sigma^2)}{[(kdmp)^2+\gamma\rho\sigma^2]^2}<0$, this value means that when department manager is in risk aversion, his excitation intensity will decrease with the increasing of effort-cost coefficient. $\frac{\partial\beta}{\partial k}=\frac{2k\gamma(dmp)^2(\rho\sigma^2+1)}{[(kdmp)^2+\gamma\rho\sigma^2]^2}>0$, this value means that when department manager is in risk aversion, his incentive strength should increase with the guarantee knowledge level of security company adding. $\frac{\partial\beta}{\partial d}=\frac{2d\gamma(kmp)^2(\rho\sigma^2+1)}{[(kdmp)^2+\gamma\rho\sigma^2]^2}>0$, this value means that when department manager is in risk aversion, his excitation intensity will increase with the department manager's sense of responsibility fortifying. $\frac{\partial\beta}{\partial m}=\frac{2m\gamma(kdp)^2(\rho\sigma^2+1)}{[(kdmp)^2+\gamma\rho\sigma^2]^2}>0$, this value means that if the department manager is in risk aversion and his moral

sensitivity is improving, his incentive strength should increase. $\frac{\partial\beta}{\partial p}=\frac{2p\gamma(kdm)^2(\rho\sigma^2+1)}{[(kdmp)^2+\gamma\rho\sigma^2]^2}>0$, this value shows that if the department manager is in risk aversion and his ability of imparting guarantee knowledge is enhancing, his excitation intensity should be increased. $\frac{\partial\beta}{\partial\rho}=\frac{[\gamma-(kdmp)^2]\gamma\sigma^2}{[(kdmp)^2+\gamma\rho\sigma^2]^2}$, its sign symbol is not sure, when $\gamma-(kdmp)^2>0$, $\frac{\partial\beta}{\partial\sigma^2}>0$, this indicates that when the department manager is in risk aversion, his excitation intensity should increase with his risk-aversion degree adding. $\frac{\partial\beta}{\partial\sigma^2}=\frac{[\gamma-(kdmp)^2]\gamma\rho}{[(kdmp)^2+\gamma\rho\sigma^2]^2}$, its sign symbol is not sure, when $\gamma-(kdmp)^2>0$, $\frac{\partial\beta}{\partial\sigma^2}>0$, it shows that when department manager is in risk aversion, and guarantee business risk changes violently, the manager's motive force will increase.

## 3. RESEARCH CONCLUSIONS AND POLICY RECOMMENDATIONS

Under the condition of information asymmetry, according to mathematical analysis on the incentive-restricted mechanism of department manager transferring knowledge, this paper may draw the conclusions: (a) No matter department managers are risk-aversion or risk-neutral, the excitation intensity will decrease with their effort-cost coefficient increasing. (b) No matter department managers are risk-aversion or risk-neutral, the excitation intensity will add if coefficient of guarantee knowledge level, department manager's responsibility and ability of imparting knowledge increase. (c) When department manager is risk-aversion, with the increase of risk-aversion degree, the changing extent of security risk is aggravating, and the excitation intensity cannot be sure. (d) Through the empirical test, on the one hand, it verified the study results above; on the other hand, it showed the excitation intensity risk attitude (risk neutral or risk aversion) is irrelevant with department manager's attitude towards risk (risk neutral or risk aversion).

The above research conclusion can use for reference in the management practice of guarantee enterprise as follows: (a) Not all of the department managers' effort can transfer into results effectively in their transferring guarantee knowledge. In this paper, the increasing of effort-cost coefficient means that the efficiency of department manager's effort transferring into effective labor results is lowering, and effort cost is rising, so the net utility value of department manager is decreasing, the excitation intensity reduces correspondingly, this encourage him to improve the transferring efficiency, reduce unnecessary invalid labor. (b) Knowledge level coefficient of guarantee enterprise increases, it means the ability of enterprise owning knowledge and operating guarantee business is enhancing, and this aspect is the outcome of their own efforts of business personnel, also inseparable with his efforts of department manager imparting knowledge, therefore, we should increase the excitation intensity to department manager. But the increasing of their responsibility and moral sensitivity and imparting knowledge ability need to enhance the excitation intensity, which conforms with the actual situation. (c) Risk-aversion degree adding indicates that manager imparting knowledge tends to be conservative, this paper says this conservation results from concerning on their own interests. So this paper thinks that, if financial capability is good enough to give managers some benefit compensation, we should do it to encourage them to devote their guarantee knowledge voluntarily. (d) Guarantee-risk variance increasing means that the changing degree of guarantee business risk adds, rate of risk appearing will fortify. In order to improve their ability to identify guarantee risk, it is essential to increase the excitation intensity to department managers, encouraging them to impart more guarantee knowledge.

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