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# Linear Incentive Contract with Different Types of Agents

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**Abstract**

If inefficient agents have a positive morale for their productivity, their optimal efforts are larger than those of efficient agents, which satisfy the single-crossing property in the linear wage scheme. Moreover, we show that more efficient agents receive a real high piece rate and obtain information rent with less exertion at the optimum. This result stands in contrast to the standard agency models in which agents receive a higher piece rate with more effort.

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# 1 Introduction

Much of the theory concentrates on incentive pay, in which pay for performance relates to the effects of monetary incentives on output, and the prevalent model used in analyzing these incentive issues is the principal-agent model. However, some conclusions are unambiguous, and the evidence allows a somewhat broader interpretation in which contracts based on pay-for performance evidence are less overwhelming. For example, using data from the National Longitudinal Survey of Youth in the United States, Lazear (2000, p.1359, Table 7) reports that, in a subexample of 7,448 workers, 3.3% reported being on piece rates, but, for the Safelife Glass Corporation as a whole, moving to a piece-rate regime is associated with a 44% increase in productivity. If we restrict our attention to linear contract wages, the empirical evidence on this point is hardly supportive (MacLeod and Parent, 1999). Parent (2001) surveys that, at most, one quarter of all employees receives some form of compensation based on piece rates, according to different samples from the United States.

The object of this article is to focus on and to classify the theoretical relationship between the optimal piece rate and the fixed wage compensation in linear incentive schemes under the assumption of screening and different types of agents. We argue that the choice of compensation schemes depends upon the firm's expected cost and its expected profit with two types of agents. Agents are classified into efficient or inefficient according to their productivity. To do this, we extend a simple standard principal-agent model as follows. We introduce the possibility that a certain fraction of agents in the population is inefficient. Such agents have larger disutility but may be motivated agents, i.e., they have a morale for inefficient productivity even if their level of effort is not verifiable. For inefficient agents, a contract consists of a performance objective specifying the effort level that the inefficient agent chooses. In contrast to inefficient agents, efficient agents are purely mission-oriented payoff, i.e., such agents care about their own material payoff and may have smaller disutility for themselves. Such agents may be self-oriented but are of the good type.

To cover broader cases of morale preferences, we follow Stowe (2002)'s morale cost function to extend the model of Sliwka (2003) by allowing agents to be competitive or state-seeking: efficient agents dislike being fair, but inefficient agents love to catch up with efficient agents. We show that more efficient agents receive a real high piece rate and obtain information rent with less exertion at the optimum. This result stands in contrast to the standard agency models in which agents receive a higher piece rate with more effort[1]. Moreover, regardless of the fraction of inefficient agents

[1] Using a general setting of both moral hazard and adverse selection, Theilen (2003) has proved that more efficient agents receive a higher piece rate and exert more effort at the optimum.

in the population, when the expected cost is larger than the expected profit, the fixed wage scheme naturally leads to be optimal and vice versa.

The rest of the paper is organized as follows. In Section 2, we present the simple principal-agent model. In Section 3 optimal compensation schemes are analyzed in this model. Finally, Section 4 provides a brief conclusion.

## 2 The Model

Consider a firm whose owner employs agents for one period. A principal employs agents to perform a certain task. Production takes place according to the production function $y = a + \epsilon$, where $\epsilon$ is a normally distributed random variable with zero mean and variance $\sigma^2$ and $a$ measures the agent's effort level. These distributions are common knowledge for the principal and the agent. As in a standard Holmstrom and Milgrom (1987)'s case, the principal offers the agent a linear contract

$$w = \alpha + \beta y,$$

where $\alpha$ and $\beta$ are constants, $\beta$ representing the contract's pay-performance sensitivity.

To express the simple closed-form expression of the optimum, we assume that the agent can exert an effort level $a$ at costs $c(a)$, where $c(a) = a^2/2$. In the first step, we assume that there are two types of agents, efficient and inefficient. All agents maximize their individual utility, but inefficient agents have a higher morale at the workplace level because they either have lower productivity than efficient agents or preferences for reciprocity of the production process. Morale can be thought of in the following simple way: Once a principal can specify a performance commitment in the contract, which we denote by $\underline{a}$. In other words, if the fixed requested effort, $\underline{a}$, is not attained, the meaning is also that the principal does not set up the pay performance sensitivity of the linear wage more than zero. Fixed requested effort levels go along with low wage offers, and inefficient agents will then indeed respond with low effort levels; however, those who pursue goals are willing to perform assigned tasks because they perceive intrinsic benefits from doing so. The idea is that morale is a factor in how hard agents are willing to work for a promotion or competitiveness against rivals.

When morale and ethics are included in the cost function, the cost of effort increases at the effort level but decreases at morale level. Consequently, for an inefficient agent, the cost of effort is now $c(\underline{a})$, where $c(\underline{a})/m = \underline{a}^2/2m$ with morale $m$. Hence as morale with an inefficient agent increases, the disutility from exerting any given level of effort decreases. For simplicity of analysis, we assume that morale in the cost function is observable; that with the efficient agent is $m = 1$; and that with an inefficient agent is given by $1 < m < 2$. Finally, the principal does not know whether the agent is efficient or inefficient, but she has a prior belief that the agent is inefficient with probability $p$.

The principal is risk-neutral, and the agent is risk-averse with constant absolute risk aversion. Let the efficient agent's utility be $u(w - c(a)) = -\exp[-r(w - c(a))]$, where $r > 0$ is the constant absolute risk aversion coefficient. The utility function of the inefficient agent additionally depends on an specified effort $\underline{a}$. If $c(\underline{a}) = c(a)$, he has the same utility function as an efficient agent. If $c(\underline{a}) \neq c(a)$, his utility function has more morale for a contract. In other words, when increasing cost from having higher morale increases as morale increases, the inefficient agent have the mental contribution to effort. Thus, the principal can specify a performance commitment into the contract, which has already been denoted $\underline{a}$, in the sense that the principal offers a menu of contract $\{(\underline{a}, \underline{w}) : (a, w)\}$ with a positive value of $\beta$.

The timing of the game is as follows: nature determines the type of agent. The principal then designs the contract. The agent either accepts or rejects the contract. In the latter case the game ends. If the agent accepts the contract, he chooses an effort. At the next point, nature plays again and determines the output. The output is publicly observed and, according to the wage scheme, the agent is paid by the principal.

In contrast to Sliwka (2003)'s model, we assume that the principal can screen the agents and can, therefore, provide a menu of contract $\{(\underline{a}, \underline{w}) : (a, w)\}$ if it satisfies both incentive and participation constraints[2].

## 3 Optimal Contract Schemes

Suppose the principal offers a menu of contract $\{(\underline{a}, \underline{w}) : (a, w)\}$ with a positive value of $\beta$. If the agent is inefficient, he will always choose $\underline{a}$ after having accepted the contract. However, it now must be taken into account that, even though $\beta$ does not affect this inefficient agent's motivation, it is important for his expected utility in accepting the contract that he receives an additional share of the profits. On the other hand, his income will become risky as the performance measure becomes noisy. The contract must guarantee at least his reservation utility, taken here to be zero for simplicity. Hence, an inefficient agent will accept the contract and choose $\underline{a}$

[2] Alger and Renault (2003) analyze the optimal screening in an adverse selection framework. Their results are based on honest and dishonest agents who are willing to misrepresent their ethics without hidden actions.

if

$$\alpha + \beta\underline{a} - \frac{\underline{a}^2}{2m} - \frac{1}{2}r\sigma^2\beta^2 \geq 0. \tag{1}$$

Note that the contract will be accepted by an efficient agent

$$\alpha + \beta\underline{a} - \frac{\underline{a}^2}{2} - \frac{1}{2}r\sigma^2\beta^2 \geq 0 \tag{2}$$

if the inequality is satisfied. The ability of the efficient agent to mimic the inefficient agent implies that the efficient agent's participation constraint (2) is always strictly satisfied. Given that the participation constraint for the inefficient agent is binding and that for the efficient agent is non-binding, any contract will be accepted by inefficient agents, and they will afterwards choose $\underline{a}$ by simply maximizing his utility. The incentive compatible effort level $\underline{a}$ is chosen by the inefficient agent. Thus, the incentive compatibility constraint of an efficient agent is given by

$$a \in \arg\max_{\hat{a}} \alpha + \beta\hat{a} - \frac{\hat{a}^2}{2} - \frac{1}{2}r\sigma^2\beta^2, \tag{3}$$

where the first-order condition of an efficient agent's objective function yields

$$a = \beta, \tag{4}$$

since the principal is at least weakly better off when the incentive compatibility constraint is satisfied by the efficient agent because she can always set $a = \beta$. As a result,

$$\alpha + \beta\underline{a} - \frac{\underline{a}^2}{2m} - \frac{1}{2}r\sigma^2\beta^2 = 0 \tag{5}$$

must be satisfied for an inefficient agent, and the incentive constraint condition $a = \beta$ must be satisfied for an efficient agent. Those constraints are both binding at the second-best optimum, which leads to the following expression of the principal's expected profit when she offers the menu of contract $\{(\underline{a}, \underline{w}) : (a, w)\}$. As in the standard principal-agency theory, the principal selects the optimal pay-performance sensitivity to maximize the total certainty equivalent (TCE), which is given in program P:

$$\max_{\alpha,\beta,a,\underline{a}} (1-\beta)[(1-p)a + p\underline{a}] - \alpha \tag{P}$$

$$\text{s.t.} \quad (4) \quad \text{and} \quad (5) \tag{6}$$

Hence, she always wants both the inefficient and efficient agents to accept the contract. However, as we have seen, the menu of contract is incentive-feasible. Substituting (4) and (5) for maximization program P yields

$$\max_{\beta,\underline{a}} (1-\beta)[(1-p)\beta + p\underline{a}] + \beta\underline{a} - \frac{\underline{a}^2}{2m} - \frac{1}{2}r\sigma^2\beta^2. \tag{7}$$

The optimal pay-performance sensitivity parameter is defined as $\beta^\star$, and the optimal costs are denoted as $\underline{a}^\star$ for an inefficient agent and $a^\star$ for an efficient agent. The optimum is characterized by the following two first-order conditions;

$$\frac{\partial TCE}{\partial \underline{a}} = (1-\beta)p + \beta - \frac{\underline{a}}{m} = 0 \Leftrightarrow m[(1-\beta)p+\beta] = \underline{a}^\star \tag{8}$$

$$\frac{\partial TCE}{\partial \beta} = (1-p)(1-2\beta) - p\underline{a} + \underline{a} - r\sigma^2\beta = 0 \Leftrightarrow \beta^\star = \frac{(1-p)(1+\underline{a})}{r\sigma^2 + 2(1-p)} \tag{9}$$

By inserting this expression for $\underline{a}^\star$ into Equation (9) and solving for $\beta$, we obtain

$$\beta^\star = \frac{(1-p)(1+mp)}{r\sigma^2 + (1-p)[2-m(1-p)]}. \tag{10}$$

The value of $a$ is simply $a^\star = \beta^\star$, that of $\underline{a}^\star$ is directly obtained by inserting (10) into (8):

$$\underline{a}^\star = mp\left(\frac{r\sigma^2 + (1-p)[2-m(1-p)] - (1-p)(1+mp)}{r\sigma^2 + (1-p)[2-m(1-p)]}\right) + m\left(\frac{(1-p)(1+mp)}{r\sigma^2 + (1-p)[2-m(1-p)]}\right) \tag{11}$$

Before the comparison of the optimal cost, we immediately obtain the following lemma: The relationship between $\beta$ and $m$ is given by

**Lemma** *The higher morale is an inefficient agent, the higher pay-performance sensitivity, i.e.,* $\frac{\partial \beta^\star}{\partial m} > 0$.

Proof; Differentiating (10) with respect to $m$,

$$\frac{\partial \beta^\star}{\partial m} = \frac{(p-p^2)[r\sigma^2 + (1-p)(2-m(1-p))] - [(1-p)(1+mp)(2p-p^2-1)]}{[r\sigma^2 + (1-p)(2-m(1-p))]^2}. \tag{12}$$

It is sufficient to show that the second bracketed numerator on the right-hand side of (12) is negative:

$$(1-p)(1+mp)(2p-p^2-1) = -(1-p)^2(1-p)(1+mp) < 0. \quad \text{Q.E.D.}$$

The lemma says that a higher-morale inefficient agent receives a higher optimal pay-performance sensitivity because the marginal cost of supplying another unit of efforts is less costly, and consequently, an efficient agent's optimal pay-performance sensitivity should be tied more to his performance. Hence, as the morale with an inefficient agent increases, the disutility from the exertion of any given level of effort decreases. This decreasing disutility induces the inefficient agent to receive higher pay-performance sensitivity.

By comparing the optimal effort levels given by (10) and (11), we can obtain proposition 1, the result of which stands in contrast to that from standard agency models, in which an efficient agent receives a higher pay-performance sensitivity and exerts a higher effort at the optimum.

**Proposition 1** *The optimal incentive contract has the following properties: the effort of the inefficient agent is higher than that of the efficient agent:* $\underline{a}^\star > a^\star$ *while* $\beta^\star$ *is equivalent for both types. The fixed wage of an efficient agent is larger than that of an inefficient agent.*
Proof: It is also sufficient to show that the numerator in (11) is larger than that in (10). By direct calculation, we have

$$\begin{aligned}
&\leftrightarrow mp[2-m(1-p)] - mp(1+mp) + m(1+mp) > 1+mp \\
&\leftrightarrow mp[2-m(1-p)] + (1+mp)m(1-p) - (1+mp) > 0 \\
&\leftrightarrow mp + m(1-p) - 1 > 0 \\
&\leftrightarrow m - 1 > 0.
\end{aligned} \tag{13}$$

Note that Equation (13) yields that $\underline{a}^\star > a^\star$ from the assumption $1 < m < 2$. Next, the fixed wage of an inefficient agent $\underline{\alpha}$ can solve the binding participation constraint (5) for $\underline{\alpha}$ and that of the efficient can solve the non-binding participation constraint (2) for $\alpha$:$\alpha > \underline{\alpha}$. Q.E.D.

Given the effort levels, $\underline{a}^\star > a^\star$, proposition 1 means that the agent has a positive and increasing marginal disutility of effort, and the disutility of effort is smaller for agents with an efficient agent. Therefore, an efficient agent can be interpreted as a parameter indicating the efficiency of effort in our model. This result in propostion 1 stands in contrast to Slikwa's (2003) model, in which a single-crossing property is not satisfied. Note that, for $m = 1$, the solution is exactly Sliwka's (2003) solution, in which the linear contract model is given by $\beta^\star = \frac{1-p^2}{r\sigma^2+1-p^2}$.

To see what is going on, it is useful to take any menu of incentive contracts. Consider the utility level that an efficient agent would obtain by the inefficient agent's higher exertion. By doing so, the efficient agent would obtain a more real pay-performance sensitivity that is denoted by

$$\underline{a}^\star - \beta^\star = \Delta > 0, \tag{14}$$

which is an information rent for the efficient agent: as long as the information rent is positive, the principal will more often call for inducing a low effort at optimum. Even if the inefficient agent utility level is reduced to its lowest utility level fixed at zero, the efficient agent benefits from an information rent $\Delta$ coming from the inefficient agent to exert effort more than efficient agent's. Therefore, as long as the principal insists on a positive performance for the inefficient agent[3], the principal must give up an information rent to an efficient agent. This information rent is generated by the informational advantage of the agent over the principal.

The second-best productions are easily defined by $y(a^\star)$ and $y(\underline{a}^\star)$. However, the second-best production schedule, $y(\underline{a}^\star) > y(a^\star)$ in proposition 1 does not puts further constraint on the mechanisms that the principal can use: this is what the literature usually refers to as the "monotonicity constraint." In standard adverse selection models, this condition yields the property that $\beta$ and $a$ must be increasing in the agent's type. The second-best production schedule, $y(\underline{a}^\star) > y(a^\star)$ in proposition 1 can cause difficulties in the maximization problem.

In this case, there exists different contracts between the principal's desire to have the inefficient agent produce more than the efficient one and monotonicity constraint. This menu of contract forces the principal to use a pooling allocation of $\beta^\star$ for different productions and the inefficient agent to accept a lower fixed wage (i.e., $\alpha > \underline{\alpha}$). In contrast to a pure adverse selection problem, if the inefficient agent can earn a rent of $\Delta$ by mimicking the efficient agent's production $y(a^\star)$, the principal then concludes from being $y(a^\star) = y(\underline{a}^\star)$ that the inefficient agent's requested task does not go along with his motivation: Otherwise, he would not haven chosen the contract. Thus, the principal can set the linear wage contract, $\underline{w} = \underline{\alpha} + (0 \cdot y(a^\star))$, which would decrease the inefficient agent's fixed wage while preserving the incentive compatibility for the efficient type alone. By this principal's commitment to performance, we would obtain a pooling allocation of $\beta^\star$ and different linear wages $w = \alpha + \beta y(a)$ and $\underline{w} = \underline{\alpha} + \beta y(\underline{a})$[4].

This proposition 1 yields a different possible explanation. The information rent makes production by the efficient agents comparatively more expensive, and production by the inefficient agents comparatively cheaper. The principal reacts this difference in real cost functions by increasing the production by the inefficient agents while decreasing production by the efficient agents.

Using (10), one can examine which fraction of agents is more responsive to incentives. In other words, it is also interesting to analyze the relationship between the fraction of inefficient agents and $\beta^\star$. By differentiating the optimal pay-performance sensitivity given by (10), the following proposition is obtained.

[3] In our model, the contract with shutdown never exists since $(1-\beta^\star)[(1-p)a^\star + p\underline{a}^\star] - \alpha > (1-\beta^\star)(1-p)a^\star - \alpha$.

[4] Using a general setting of adverse selection with inequity averse agents, Siemens (2004) shows that an inequity aversion causes income compression. When all workers are inequity aversion (i.e., they compare themselves with others), in order to make a bad worker participate he must be compensated for some rents. Furthermore, if the good agent of fraction is sufficiently small and the degree of inequity aversion is above cut-off level, the principal offers a pooling contract.

**Proposition 2** *The higher fraction of inefficient agents, the higher $\beta^\star$ in the incentive contract if and only if $p$ exists $\sqrt{\frac{m-1}{2m}} < p < \frac{m-1}{2m}$.*
Proof: Using the envelope theorem, differentiating $\beta^\star$ with respect to $p$ yields

$$\frac{\partial \beta^\star}{\partial p} = \frac{[r\sigma^2 + (1-p)(2-m(1-p))](m-1-2mp) - 2(1-p)(1+mp)(m-1-mp)}{[r\sigma^2 + (1-p)(2-m(1-p))]^2}$$

After a few manipulations, it can be rearranged to

$$\frac{\partial \beta^\star}{\partial p} = \frac{r\sigma^2(m-1-2mp) - m(1-p)(m-1-2mp^2)}{[r\sigma^2 + (1-p)(2-m(1-p))]^2}. \tag{15}$$

We can easily check the numerator on the right-hand side of (15). Using (15) above, this can be positive if and only if $(m-1-2mp) > 0$ and $(m-1-2mp^2) < 0$. It must be the case that $\sqrt{\frac{m-1}{2m}} < p < \frac{m-1}{2m}$. On the other hand, we must have negative numerator if and only if $(m-1-2mp) < 0$ and $(m-1-2mp^2) > 0$. Hence it must be the case that $p < \sqrt{\frac{m-1}{2m}}$ and $p > \frac{m-1}{2m}$. However, $p$ cannot be satisfied that $\partial\beta^\star/\partial p < 0$. Q.E.D.

Proposition 2 means that, when the fraction of inefficient agents increases in $\beta^\star$, it results in the increase of $\beta$ for both types of agentsin some interval. On the other hand, suppose the the morale is fixed. It causes a more important implication is obtained. When the fraction of inefficient agents is sufficiently high or sufficiently low, the pay-performance sensitivity of inefficient and efficient agents is either $\partial\beta^\star/\partial p < 0$ or $\partial\beta^\star/\partial p > 0$.

If all agents are efficient ($p = 0$), then the solution is exactly the standard second-best solution in the linear incentive contract model. On the other hand, if all agents are inefficient, the pay-performance sensitivity $\beta$ for $p = 1$ is zero. Only the inefficient agent will accept the contract if his participating constraint condition

$$\alpha - \frac{\underline{a}^2}{2m} \geq 0$$

holds and will always choose $\underline{a}$. This participation constraint must binding to minimize the payments, $\alpha$ made to agents, i.e., $\alpha = c(\underline{a})/m$. The principal maximizes her expected payoff by taking into account

$$\max_{\underline{a}} \underline{a} - \frac{\underline{a}^2}{2m}. \tag{16}$$

The optimal requested effort level is given by

$$1 - \frac{\underline{a}}{m} = 0,$$

which gives us the first-best level of effort. Thus, the principal's first-best profit is set to $\frac{m(2-m)}{2}$.

If any efficient agents are existed (i.e., $1-p>0$), the first-best solution is never attained as a contract is chosen where the marginal costs of the requested effort are equal to the marginal return to the principal which is equal to $p$. The principal's second-best profit is, therefore, $\frac{mp(2-p)}{2}$.

Thus, the efficient agent earns a rent of size $\alpha$. The principal will offer a positive wage level as long as $p>0$ as she earns strictly positive profits from the inefficient agents. The higher the effort $\underline{a}$ that the principal requires from the inefficient agents is, the higher the wage to compensate them for their effort will have to be. However, the loss will be larger when the agent is efficient. The larger is the fraction of efficient agents in the population, the smaller the expected return for a given wage payment. Hence, the wages and the requested effort levels increase with the fraction $p$ of inefficient agents. Hence, when all agent are inefficient (i.e., $p=1$), fixed wage is zero for the efficient agent but there is only a fixed wage for the inefficient agent.

As we have seen, if some agents are efficient, the principal need to set up an incentive contract in order to induce them to exert their optimal effort and to participate in the contract. However, even if when $\sqrt{\frac{m-1}{2m}}<p<\frac{m-1}{2m}$ is hold (i.e., $\partial\beta^{\star}/\partial p>0$) in the proposition 2, the principal will choose if fixed wage scheme's profit is larger than the incentive contract's profit. We can compare both contract types.

With a pure fixed wage, the principal's profit is simply given by (7), and, when she chooses the optimal incentive contract, her profit is given by (16), respectively.

More generally, such a fixed wage contract policy is optimal when

$$\begin{aligned} p\underline{a}^{\star}-\frac{\underline{a}^{\star 2}}{2m} &> (1-\beta^{\star})[(1-p)\beta^{\star}+p\underline{a}^{\star}]+\beta^{\star}\underline{a}^{\star}-\frac{\underline{a}^{\star 2}}{2m}-\frac{1}{2}r\sigma^{2}\beta^{2} \\ \leftrightarrow \beta^{\star}(\beta^{\star}(1-p)+\underline{a}^{\star}p+\frac{1}{2}r\sigma^{2}\beta^{\star}) &> \beta^{\star}(1-p+\underline{a}^{\star}). \end{aligned} \tag{17}$$

The left-hand side of (17) represents the expected cost of the fixed wage scheme and the right-hand side of (17) represents instead the expected profit from using the incentive contract. The fixed wage scheme is optimal even though $\partial\beta^{\star}/\partial p>0$ holds in proposition 2. On the other hand, when this expected profit is larger than the expected cost, the incentive contract design can also be interpreted as saying that the principal has another option to induce the efficient agent to exert a more effort when inefficient agents are sufficiently large as the fraction of inefficient agent in the population. Hence, for a value of $p$ in the interval in proposition 2, both contract types are determined by both the expected cost and the profit.

However, even though $p$ is not in the interval, the choice of compensation is also determined by both expected values. In order to make the efficient agent participate, the principal must provide a menu of contract that is as incentive-feasible as possible. Therefore, she must leave an information rent and provide to an efficient agent linear wage contract. On the other hand, when the expected cost is larger than the expected profit, the fixed wage is optimal. If there are some inefficient agents, then the efficient agent earns a rent of size $\alpha$ by mimicking inefficient agent's effort. The principal will offer a positive the fixed wage level as long as $p > 0$ as she earns strictly positive profits from the inefficient agents. This proves the next proposition[5].

**Proposition 3** *Suppose $0 < p < 1$. Regardless of the sign of $\partial\beta^\star/\partial p$, when the expected cost is larger than the expected profit, the fixed wage is optimal, and vice versa.*

Coming back to the agents' problems, a direct implication is that incentive contracts for efficient agents are completely useful when the expected profit is larger than the expected cost and the condition with $\partial\beta^\star/\partial p > 0$ holds. This effect indicates that the model in our paper can provide high-powered incentives as the efficient agent earns information rent and the inefficient agent receives a higher $\beta^\star$. If that is the case, choosing an incentive contract imposes useful risks on either the risk-averse efficient or risk-averse inefficient agent.

However, the higher the increasing of expected cost for all agents, the lower powered the incentive as long as all agent and the principal earn a positive rent and profit, respectively[6].

Proposition 3 also sheds light on the effects that cause different population of agent's type to value contract differently, making this model quite novel in the endogenous explanation of choice of method of pay[7]. An empirical consequence of incentive contract is that if the optimal pay-performance sensitivity increase with the expected payoff of the principal and decreases with expected cost, and in a test one were lump both sources of expected values together, the resulting relationship may come out as ambiguous and insignificant as in Lazear's or Parent's test.

[5]If this is case of team production, one interpretation is that the most able agents leave, as they prefer incentive schemes elsewhere, while the least able agents also leave because the peer pressure makes their jobs unpleasant. See Hansen (1997).

[6]Using inequity aversion with risk-averse agent, Englemaier and Wambach (2002) analyzed that the pay performance sensitivity of first-best level is strictly below 1/2 since the risk aversion demands call for the fixed wage in order to reduce a risky wage scheme while inequity aversion pushes towards equitable piece rate.

[7]Sliwka (2003) analyze the optimal compensation in which the principal compares the choice of payment schemes between a pure fixed contract and pay for performance. In his model, however, the choosing the menu contract follows exogenous changes of the fraction of agents.

# 4 Conclusion

Incorporating morale into the inefficient agent's cost function yields results that deviate from those of known from the standard principal agency literature. If the inefficient agents have the positive morale for their productivity, optimal efforts are larger than the efficient which satisfy the single-crossing property. Therefore, the principal can offer that different agents choose distinct contracts due to the information rent. However, the menu of contract can be enriched by choosing between an incentive contract and a fixed wage scheme when the principal compares the expected profit with the expected cost. In contrast to the standard agency theory, even though the pay performance sensitivity decreases in the fraction of the inefficient agent of the population the principal can offer the incentive contract while it increases in that of inefficient, the principal also can provide the fixed wage.

There are several ways in which the model could be extended. The extent to which introducing inequity aversion will alter the results could be explored. A logical next step is an application of our model to team production problems and multi-tasking aspect problems, as the linear wage contract should be more important when agents have to interact with either jobs or peers.

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