Problem Set 7

Non-Financial Incentives

Main Points

- Power of Non-Financial Incentives: Non-financial incentives can improve performance even if pay is not tied to performance. Examples of non-financial incentives include intrinsic motivation, reciprocity, and social approval.
- Crowding Out: The explicit financial incentives may sometimes crowd out the impact of non-financial incentives and produce worse results than in the case of no financial incentives at all.

Main Concepts

Intrinsic motivation; Reciprocity; Social approval; Altruism; Motivated agents; Conditional social preferences; Gift-exchange contract; Management of beliefs; Social norms; Crowding out.

Problems

(1) Nurses in general care not only about their pay, but also about their patients' wellbeing. Specifically, the expected payoff for a nurse can be represented as $\alpha E[q]+E[w]-c(e)$, where α represents the extent of nurse's altruism, q is the patient well-being, and e is nurse's action that her manager cannot observe or verify. Assume that the expected patient well-being is given by $E[q]=e$ and the cost of nurse's action is given by $0.5e^2$. Assume that the manager can only offer a fixed payment contract to the nurse (i.e. salary). What is the expected patient well-being when the nurse's action can be observed? What is the expected patient well-being when the action cannot be observed, but the nurse is altruistic ($0 < \alpha < 1$)?

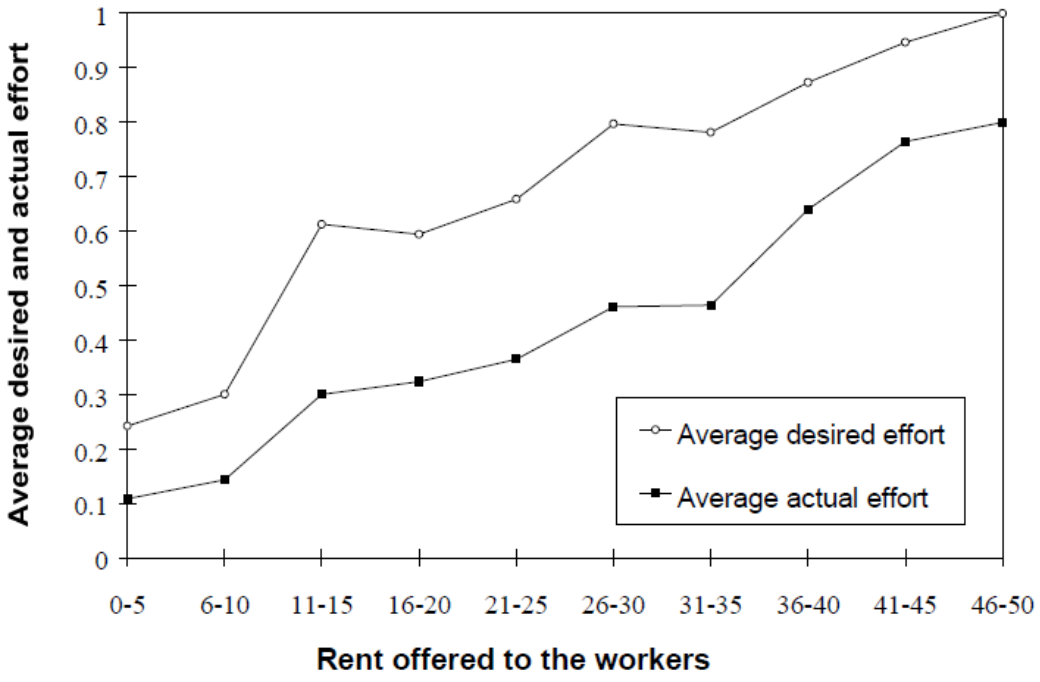
(2) A hospital manager has to design a contract for a new pharmacist. The patient satisfaction stochastically on the pharmacist's actions according to $q=e+u$, where u is a random variable with a mean of zero and a variance of 1. The pharmacist's cost of action function is $0.5e^2$. The manager cannot observe the pharmacist's effort. Further, measuring the patient satisfaction is prohibitively costly so that the contract based on it cannot be enforced. If the pharmacist is trustworthy, when she signs the contract she will take the efficient action, even if this action cannot be verified. On the other hand, if the pharmacist is not trustworthy, she will take only actions that can be verified. The manager knows only that λ of pharmacists in the market are trustworthy. Assume that the manager and all pharmacists in the market are risk neutral and have an outside option of 0. Show that the manager will find it beneficial to hire a pharmacist only if $\lambda > 0.5$. Show further that in this case, the expected payoff for a trustworthy pharmacist is just equal to her outside option, while the expected payoff for the untrustworthy pharmacist is strictly greater than her outside option.

(3) Winning a battle depends on each soldier's action according to $q=e+u$, where q is the winning probability, e is the soldier's action, and u is a random variable with a mean of

zero. Each soldier receives a fixed payment for participating in the battle and the cost of his action is given by $0.5e^2$. However, the military training can affect each soldier's expected payoff by intrinsically rewarding the soldier's actions that go over and above the required actions (e.g. pride). Specifically, the intrinsic reward function is given by ke, where k is the parameter that can be shaped by the military training. What level of k should the military choose if it wants each soldier to take the efficient action?

(4) Can you explain the following two puzzles:
   a. After introducing a fine for parents who are late in picking up their kids from the daycare, the number of late parents actually increased!
   b. After introducing a small reward based on the donation collected, the actual amount of donation decreased!

(5) Fehr et al. (1997) examined in a laboratory experiment whether offering agents a payment that is over and above their outside option (i.e. rent) and stipulating desired action can provide incentives for agents even if their action cannot be verified to a third party. The following figure summarizes their main findings. What can you learn from this figure?



Suggested Solutions

(These solutions are intended to be accurate and as complete as possible. Please report any remaining errors to jasmin.kantarevic@oma.org).

(1) When the nurse's action can be observed, the contract can specify that the nurse takes the efficient action e*, which is defined implicitly by the MB=MC condition. In the problem, the expected MB is 1 and the marginal cost is e. Therefore, e*=1. This is also the expected patient well-being since E[q]=e. When the nurse's action cannot be observed, she will maximize her expected payoff by choosing her action. The first-order condition for this problem gives us e=α. When the nurse is altruistic ($0 < \alpha < 1$), this implies that the expected patient well-being will be positive even with a fixed payment contract. However, without further modification to her payment method, the expected patient well-being will be below the socially optimal level of 1, unless the nurse is fully benevolent (α=1).

(2) The hospital manager will offer a contract of the form (w,e), where w is a fixed payment and e is a desired action. The action is desired rather than required because the problem states that the action cannot be verified. The manager can specify the desired action to be the socially efficient one, i.e. the one that satisfies the MB=MC condition. In this problem, this action is e*=1. Now, if the agent is trustworthy, he will supply e=1, and if he is not trustworthy, he will supply e=0 since his payment is independent of e. Therefore, the manager's expected payoff is $E[V] = \lambda E[q|e=1]+(1-\lambda)E[q|e=0]-w = \lambda-w$. Now, w must satisfy the pharmacist's participation constraint, i.e. $w - 0.5e^2 \geq R=0$. For the trustworthy agent, this translates into $w \geq 0.5$ and for the untrustworthy agent, this becomes $w \geq 0$. Since the manager wants to employ the trustworthy agent, he will pay w=0.5. Therefore, the manager's payoff is λ-0.5. This is greater than his outside option of 0 if and only if $\lambda \geq 0.5$. In this case, the expected payoff for the trustworthy pharmacist is $w - 0.5e^2 = 0.5-0.5=0=R$ and for the untrustworthy pharmacist $w - 0.5e^2 = 0.5-0=0.5 > R$.

(3) The efficient level of soldier's action satisfies the MB=MC condition, or e*=1. Now, the soldier's expected payoff is $E[U] = w - 0.5e^2 + ke$. The first-order condition with respect to e is $-e+k=0$, or e=k. To induce the efficient level of soldier's action (e*=1), the military training should therefore set k=1.

(4) See Fehr and Falk (2002), pages 29-31 and the class notes.

(5) There are two main points illustrated in this figure. First, given that the actual effort increases with the rent, it implies the existence of reciprocal agents. To see this, note that since the effort cannot be verified, the agents have no reason to increase their actual effort below the minimum unless they care about other things besides their payment. Second, given that the actual effort is smaller than the desired effort, the figure also implies that not all agents are reciprocal (otherwise, all agents would reciprocate by supplying the desired level of effort). These two findings suggest that reciprocity can be a powerful motivator, but only in situations in which the proportion of agents who are reciprocal is sufficiently high.