Reciprocity and Incentive Pay in the Workplace*

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Abstract

We study optimal incentive contracts for workers who are reciprocal to management attention. When neither worker's effort nor manager's attention can be contracted, a double moral-hazard problem arises, implying that reciprocal workers should be given weak financial incentives. In a multiple-agent setting, this problem can be resolved using promotion incentives. We test these predictions using German Socio-Economic Panel data. We find that workers who are more reciprocal are significantly more likely to receive promotion incentives, while there is no such relation for individual bonus pay.

Keywords: reciprocity, social exchange, incentive contracts, double moral hazard, GSOEP.

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1 Introduction

The birth of modern management theory is often related to the Hawthorne studies (Roethlisberger and Dickson 1939). A well-known case among social scientists, in the Hawthorne plant researchers experimented with light intensity and examined its effect on worker's productivity. To their surprise, workers reacted favorably to both increases and decreases of light intensity. The conclusion of the researchers was that workers simply liked the attention of management and responded by increasing effort. This may come as no surprise to most organizational scholars today, but in the times of Taylorian scientific management with its job specialization and monetary incentives, such findings caused heated debate.

To a large extent, the debate on the importance of monetary incentives and other, non-monetary tools of management in motivating workers continues today. In economics, agency theory is characterized by a strong emphasis on monetary incentives. This is not without reason: the importance of monetary incentives for workers' motivation is confirmed in many empirical studies, see Prendergast (1999) for an overview. Strong motivational effects of monetary incentives are also found in recent field experiments (see, among others, Lazear 2000, Shearer 2004, and Bandiera et al. 2005).

However, monetary incentives are often not considered as the most important motivator by workers and managers. Many workers consider task enjoyment and moral concerns as stronger motivators than monetary incentives (Minkler 2004). In a study on managers' use of motivational tools, Agell (2004) reports that more than 60% of managers in Sweden use 'good management-worker relations' to a great or fairly great extent. In contrast, even in the sector where performance-related pay is most common (skilled services), only 17% of managers use performance pay as a motivational tool to a great or fairly great extent. Likewise, Campbell and Kamlani (1997) find that compensation executives in the US rank good management-worker relationships much higher than wages, working conditions, and supervision as determinants of workers' effort.

In line with these surveys, studies in organizational behavior (OB) stress the importance of so-called leader-member exchange relationships (LMX) and perceived supervisor support (PSS) for workers' motivation. A large number of empirical studies find a positive effect of the perceived quality of the management-employee relation on employee's performance, e.g. Nagin et al. (2002), Graafland and Rutten (2004), Pazy and Ganzach (2008), Freeman

et al. (2007), Kamdar and Van Dyne (2007) and Shanock and Eisenberger (2006). Moreover, several studies find that better relations between managers and employees lead to higher job satisfaction and/or reduced turnover intentions, see e.g. Gagnon and Michael (2004), Babin and Boles (1996), and Wayne et al. (1997). In line with these findings, empirical work also suggests that firms with bad management-worker relationships are penalized in that they need to pay higher wages to attract and retain workers (Pfeffer 1998, Gittell 2003, Borzaga and Depedri 2005).

This paper reconciles these two views on workers' motivation by developing a formal agency model that incorporates the OB tools of management and monetary incentives. We picture a firm where workers exert effort and managers, in addition to incentive pay, use non-monetary tools of management (attention, praise, recognition, et cetera). We make two important assumptions about these non-monetary tools, which are inspired by the empirical studies mentioned above. First, applying these tools of management – which we call manager's attention – raises worker's well-being but comes at a cost for the manager. Second, we assume that management attention reduces worker's marginal cost of effort, implying that effort increases with attention. In our model, the reason is worker's reciprocity: workers reciprocate management attention by providing effort. In this setting, we study the optimal provision of incentive pay for workers, the manager's incentive to apply non-monetary tools of management, and the resulting worker's behavior and productivity.

One of our key objects of study is the issue of 'congruence', important in management science, but not often studied in organizational economics. The idea is that the set up of one element of organization affects the working of other parts (see, e.g., Nadler and Tushman 1997). We argue that the strength of monetary incentives given to workers affects the extent to which managers use their other motivational tools. In particular, we will show that, when neither worker's effort nor management activities are contractible, incentive pay for workers weakens the incentive for managers to motivate workers through attention. The reason is that, by paying a larger share of output to the worker, there is less output at stake for the manager, which dilutes his incentives to support the worker. Optimal performance pay for the worker therefore strikes a balance between motivating the worker to exert effort and preserving incentives for the manager to apply his non-monetary management tools. Our analysis thus predicts that managers will be careful with introducing or raising incentive pay for workers, and particularly so for

workers who are most responsive to management attention. In equilibrium, worker's effort and manager's attention are both suboptimally low compared to the first-best.

These results change when the manager employs multiple workers doing comparable tasks. Following Carmichael (1983)'s analysis of the 'agent-agents problem,' we show that first-best profits can then be achieved through promotion incentives for workers. The reason is that, in contrast to individual performance pay, promotion incentives do not interfere with the manager's incentive to give attention. This benefit of promotion incentives is particularly large when workers are highly responsive to manager's attention.

The main predictions of our theoretical analysis are thus twofold: workers who are more responsive to manager's attention are less likely to receive individual performance pay and more likely to receive promotion incentives. We test both these predictions using the German Socio-Economic Panel (GSOEP), which contains data on compensation schemes and reciprocity for more than 2700 German workers. While we find no support for the former hypothesis, there is strong support for the latter: Worker's reciprocity significantly increases the likelihood of receiving promotion incentives. Moreover, this only holds for nonunion workers and for workers with sufficiently high income, which – as we shall see – is well in line with our theory.

We proceed as follows. The following section gives a brief overview of related literature. Next we introduce in section 3 our basic model. Section 4, 5, and 6 analyze optimal contracts and the resulting manager's and worker's behavior in the first-best, the second-best with full rent extraction, and the second-best with limited-liability protection, respectively. Section 7 extends the analysis to allow for multiple agents and promotion incentives. Section 8 describes the results of our empirical analysis. Section 9 concludes.

2 Related literature

The economic literature on manager-subordinate reciprocity has so far been confined to monetary gift-exchange. Starting with Akerlof (1982), economists have argued that paying generous wages may trigger effort and loyalty as workers feel a need to reciprocate the employer's gift. Numerous laboratory experiments have provided support for this monetary gift-exchange relation (an early study is Fehr, Kirchsteiger, and Riedl 1993; Fehr and Gächter 2000 provide an overview of the voluminous literature). Recent field studies, how-

ever, are less supportive. In various natural workplace settings, Gneezy and List (2006), List (2006), Kube et al. (2006, 2008), Al-Ubaydli et al. (2007), and Hennig-Schmidt et al. (2008) find only limited support for monetary gift-exchange.

Scholars in management science and organizational sociology have stressed the importance of non-monetary or social gift-exchange between managers and workers. A rich body of empirical research in organizational behavior (OB) has investigated the effect of social exchange between managers and workers on workers' performance. In addition to the studies already mentioned in the introduction, many studies have found that a higher quality of so-called 'leader-member exchange relationships' (LMX) and 'perceived supervisor support' (PSS) are associated with better performance of the worker, both in required duties as well as in those beyond the formal employment contract (see e.g. Settoon et al. 1996, Wayne et al. 1997, and Dabos and Rousseau 2004).

The main contribution of our paper is to incorporate social exchange as a management tool into an otherwise standard agency model, which allows us to study social exchange and several forms of incentive pay in one unifying framework. Compared to agency theory and motivation in organizational economics, we extend existing models by enriching the action space of the principal/manager to include the OB tools of management and by adding a non-monetary motivation of the agent/worker to exert effort. While the former innovation is a unique feature of our analysis,[1] there are by now many other economic studies allowing workers to care about more than just money and effort, see e.g. Francois (2000, 2007), Benabou and Tirole (2003), Akerlof and Kranton (2005), Besley and Ghatak (2005), Ellingsen and Johannesson (2008), Delfgaauw and Dur (2008), and Dur and Glazer (2008).

Closest to our paper is Englmaier and Leider (2008)'s recent study on the implications of reciprocity for the employment relation. Their key result is that reciprocal motivations and performance-based pay are substitutes, as in section 5 and 6 of this paper. Their analysis strongly differs from ours, however. One crucial difference is that they confine their analysis to monetary gift-exchange, whereas we focus on social gift-exchange. Specifically, in their model, the principal is a passive contract-writer, inducing reciprocity by leaving a rent for the agent. In our model, feelings of reciprocity are engendered

[1] In a related paper, we study social exchange and incentive provision in a common agency context, see Dur and Roelfsema (2007).

by the principal's attention. Another difference is that in Englmaier and Leider, the agent is risk-averse and has a discrete action space, whereas we consider a risk-neutral agent and continuous effort choices. Finally, we have a different approach in the empirical verification of our results. They provide empirical support by comparing the organizational form and pay structure between firms who supposedly select workers on reciprocity and those that do not. By contrast, we use the individual worker as the unit of analysis, using a direct measure of an individual's reciprocity.

Our paper builds on a rich body of literature that studies optimal contracts in the presence of double moral-hazard (e.g. Carmichael 1983, Demski and Sappington 1991, Gupta and Romano 1998, and Agrawal 2002), with applications in the context of agriculture (Eswaran and Kotwal 1985), resale price maintenance (Romano 1994), product warranties (Kambhu 1982, Cooper and Ross 1985, Mann and Wissink 1988), and franchising (Lal 1990, Bhattacharyya and Lafontaine 1995). The latter application is especially interesting, because some serious efforts have been made to empirically verify the theoretical predictions. Lafontaine (1992) finds that franchising contracts "are most consistent with a model based on two sided-moral hazard" (p. 263). Agrawal and Lal (1995) find "support for the hypothesis that royalty rate balances the incentives to the franchisor to invest in brand name with those to the franchisees to invest in retail service" (p. 213). Similar findings are reported by Sen (1993) and Wimmer and Garen (1997). Other empirical studies on double moral-hazard include Allen and Lueck (1992) in the field of agricultural contracts, Golosinski and West (1995) in the context of shopping center development, and Hainz and Kleimeier (2004) on project finance. We differ from this literature in our focus on social exchange and workers' motivation. Further, we are the first to provide some evidence for the relevance of double moral-hazard in the workplace.

3 The model

We consider a risk-neutral principal employing a risk-neutral agent. The principal's expected payoff $E(\pi)$ is described by:

$$E(\pi) = eH + (1-e)L - (w + eb) - \frac{1}{2}\rho a^2, \tag{1}$$

where e is effort exerted by the agent, H and L are the two possible output values (high and low; $H > L$), w is the agent's base salary, b is a bonus paid

to the agent in case output is high, $\rho > 0$ is a cost parameter, and a denotes the principal's attention given to the agent. The probability that output is high is increasing in the agent's effort and, for simplicity, given by e where $e \in [0, 1]$. Throughout, we shall impose restrictions on the parameter values such that we can rule out solutions where $e < 0$ or $e > 1$. Besides offering a contract describing the agent's base salary and bonus pay, the principal engages in giving attention to the agent. We assume that giving attention is costly for the principal. Allowing for some intrinsic benefits from giving attention would not change the results qualitatively.

The agent's expected utility $E(U)$ is:

$$E(U) = w + eb + \gamma ea - \frac{1}{2}\theta e^2, \tag{2}$$

where the first two terms are the agent's expected wage income and the last term represents the agent's cost of effort, $\theta > 0$. A distinguishing feature of our model is the interaction term γea, where $\gamma \geq 0$. This term captures the observations discussed in the introduction that the agent's marginal costs of effort are decreasing and the worker's well-being is increasing in the attention given by the principal. Attention can be interpreted as kindness that evokes feelings of reciprocity, but can also be interpreted as support by the principal which helps the agent to perform his tasks. We shall call γ the agent's reciprocity parameter.

The timing of the game is as follows. First, the principal writes a contract which the agent accepts if his expected utility is equal to or exceeds his reservation utility $\overline{U}$. In the second stage the principal decides on his attention level. Finally, the agent chooses his effort level, after observing the attention provided by the principal. The implications of some alternative time structures and richer action sets are briefly discussed in the concluding remarks.

4 First-best contract

Let us first consider the case where both attention and effort are contractible. Full contractibility implies that there is no reason to pay a bonus conditional on output on top of the base salary, and so we impose $b = 0$ in this section. Thus, the principal designs a contract consisting of attention a, effort e, and base salary w, that maximizes his expected payoff given by (1), and takes

into account the agent's participation constraint $E(U) \geq \overline{U}$, where $E(U)$ is given by (2).[2] The first-order conditions are:

$$\begin{aligned} -\rho a + \lambda\gamma e &= 0, \quad (3) \\ H - L + \lambda(\gamma a - \theta e) &= 0, \quad (4) \\ -1 + \lambda &= 0, \\ w + \gamma e a - \frac{1}{2}\theta e^2 &= \overline{U}, \end{aligned}$$

where λ is the Lagrange-multiplier and the last equality follows from the third first-order condition which implies that $\lambda > 0$. The first-best contract simply equates the marginal benefits and costs of attention, and likewise for effort. Further, the principal pays a base salary such that the agent is just willing to accept the contract. The second-order conditions are satisfied if $\theta\rho - \gamma^2 > 0$, or $\gamma < \sqrt{\theta\rho}$. In the remainder of this paper, we will assume that this condition holds. If it is violated, first-best effort and attention are infinite.

Solving for λ we can rewrite the first-order conditions for attention and effort into:

$$a = \frac{\gamma e}{\rho}, \quad (5)$$

$$e = \frac{H - L + \gamma a}{\theta}. \quad (6)$$

Note that attention is increasing in effort and vice versa. In other words, attention and effort are complements. Solving by substitution we obtain the first-best levels of attention and effort:

$$a^{FB} = \frac{\gamma}{\theta\rho - \gamma^2}(H - L), \quad (7)$$

$$e^{FB} = \frac{\rho}{\theta\rho - \gamma^2}(H - L). \quad (8)$$

For an interior solution $e \in [0, 1]$ it must hold that $\theta\rho - \gamma^2 \geq \rho(H - L)$. As can be seen from (7) and (8), a change in ρ, θ, $(H - L)$, or γ affects the optimal values of both attention and effort. This stems from the complementarity between attention and effort. Obviously, both attention and effort increase

[2] Clearly, in this case of full contractibility, maximizing the joint surplus would give identical results.

with the marginal product of effort, $H - L$. It is also clear that attention decreases with the principal's cost of giving attention, reflected by ρ, and increases with the reciprocity of the agent, γ. Likewise, effort decreases with the agent's cost of providing effort, θ, and increases with his reciprocity, γ. The principal's cost of giving attention ρ affects the agent's effort through its effect on attention provided by the principal: When ρ becomes larger, less attention is paid to the worker and as a consequence of the higher marginal cost of effort, effort decreases. In a similar way, the cost of effort θ negatively affects the principal's attention by decreasing the agent's effort.

5 Incomplete contract with full rent extraction

Next consider the situation where neither attention nor effort are contractible. Hence, in order to induce the agent to exert effort, the principal may find it optimal to offer bonus pay conditional on high output in addition to the base salary. This section abstracts from limited-liability protection of the agent, which is studied in the next section. Here we allow the base salary and the bonus to take any value, provided that the agent's participation constraint, $E(U) \geq \overline{U}$, is satisfied. We solve for a subgame perfect equilibrium by backward induction. So, we start with the agent's effort choice, next we study the principal's choice of attention, and finally we consider optimal contract design.

The agent's optimal effort given the level of attention and the wage contract solves

$$\max_{e} \quad w + eb + \gamma ea - \frac{1}{2}\theta e^2.$$

The first-order condition for optimal effort implies:

$$e = \frac{b + \gamma a}{\theta}. \tag{9}$$

Obviously, the higher the bonus and the lower the costs of exerting effort, the higher the agent's effort. Comparing (9) with (6) gives the usual result that, for a given a, the agent chooses first-best effort when the bonus equals the full marginal product ($b = H - L$). Note also that the agent's effort increases with the principal's attention, and the more so, the more reciprocal the agent is.

The principal takes this relationship between e and a into account when choosing his level of attention. His problem is to solve

$$\max_{a} \quad eH + (1-e)L - (w + eb) - \frac{1}{2}\rho a^2, \tag{10}$$

where e is described by (9). The first-order condition is:

$$\frac{de}{da}(H - L - b) - \rho a = 0. \tag{11}$$

Rewriting using (9) gives optimal attention:

$$a = \frac{\gamma}{\theta\rho}(H - L - b), \tag{12}$$

which increases with the marginal product and with the agent's reciprocity, and decreases with the cost parameters. Moreover, equation (12) shows a clear negative relation between attention and the agent's bonus pay. The intuition for this result can be seen from the first-order condition (11). In the second stage of the game, the principal's only reason for giving attention is to stimulate effort. An increase in the bonus b reduces the principal's marginal payoff from the agent's effort. In the extreme case that $b = H - L$, the full marginal product from effort accrues to the agent. In this case, no attention will be given, because there is nothing at stake for the principal. Another extreme case is $b = 0$, in which case all gains from extra effort accrue to the principal, and so giving attention is very attractive. Still, however, attention is below the first-best level, which is easily verified by comparing (7) and (12). The reason is that, after the contract has been signed, the principal only takes his own welfare into account and does not care about the positive effect his attention has on the agent's utility. To reach first-best attention, the bonus should actually be negative.[3] By means of a negative bonus, the agent's welfare is fully internalized by the principal in the second stage of the game.

Anticipating the behavior of the principal and the agent in stage two and three of the game as defined by equations (9) and (12), the principal writes a

[3]Specifically, using (7) and (12), it follows that $a = a^{FB}$ if

$$b = \frac{-(H - L)\gamma^2}{(\theta\rho - \gamma^2)} < 0.$$

profit-maximizing contract in the first stage by choosing w and b, taking into account the agent's participation constraint $E(U) \geq \overline{U}$. The maximization problem is

$$\max_{b,w} \quad eH + (1-e)L - (w + eb) - \frac{1}{2}\rho a^2 \tag{13}$$
$$\text{s.t. } E(U) \geq \overline{U}$$

which leads to the following first-order conditions:

$$-e + \left(\frac{de}{db} + \frac{de}{da}\frac{da}{db}\right)(H - L - b) - \frac{da}{db}\rho a$$
$$+\lambda\left(e + \left(\frac{de}{db} + \frac{de}{da}\frac{da}{db}\right)(b + \gamma a - \theta e) + \frac{da}{db}\gamma e\right) = 0, \tag{14}$$

$$-1 + \lambda = 0, \tag{15}$$

$$w + eb + \gamma e a - \frac{1}{2}\theta e^2 = \overline{U}, \tag{16}$$

where the equality in (16) follows from (15) which implies that $\lambda > 0$. Solving for λ, we can simplify (14) into:

$$\left(\frac{de}{db} + \frac{de}{da}\frac{da}{db}\right)(H - L + \gamma a - \theta e) - \frac{da}{db}(\rho a - \gamma e) = 0. \tag{17}$$

Compared to (14), the terms related to the payment of the bonus have disappeared, as changes in the expected bonus payment are fully compensated by a change in the base salary the agent receives. Hence, the optimal level of the bonus is completely determined by its effects on behavior, both of the principal and of the agent. As we have seen, a higher bonus implies higher effort for a given level of attention (see equation (9)), but leads to a reduction in attention (see equation (12)), which in turn reduces effort. Overall, effort increases in the bonus,[4] while attention decreases. Hence, incentivizing the agent to exert effort diminishes the principal's own incentives to give attention: the double moral-hazard problem bites.

[4] This can be easily verified by substituting (12) into (9) which results in:

$$e = \frac{b(\theta\rho - \gamma^2) + \gamma^2(H - L)}{\theta^2\rho}. \tag{18}$$

Taking into account the restriction that $\gamma < \sqrt{\theta\rho}$ (which ensures finite attention and effort in the first-best), it follows that $\frac{de}{db} + \frac{de}{da}\frac{da}{db} > 0$.

Applying the envelop theorem using (9) and (11), we can rewrite condition (17) into:

$$\frac{de}{db}(H - L - b) + \frac{da}{db}\gamma e = 0. \tag{19}$$

This expression clearly reveals the trade-off the principal faces when writing the contract. The bonus has a positive effect on effort, which increases profits as long as $b < H - L$. On the other hand, the bonus reduces the amount of attention provided, which reduces the agent's utility by γe. In the contracting stage, the principal cares about agent's utility because it is ultimately reflected in the base salary. Thus, when choosing the bonus, the principal trades off effort and agent's happiness.[5]

Substituting the expressions for effort and attention (equations (9) and (12), respectively) into the first-order condition (19) and noting that $de/db = 1/\theta$ and $da/db = -\gamma/\theta\rho$, we obtain the following expression for the optimal bonus:

$$b^* = \frac{\left(\theta^2\rho^2 - \gamma^4\right)(H - L)}{\theta^2\rho^2 - \gamma^4 + \gamma^2\theta\rho}. \tag{20}$$

First it should be noted that in order to satisfy the second-order condition, the denominator must be positive. Given our condition that $\gamma < \sqrt{\theta\rho}$, this condition is always satisfied. Inspection of (20) reveals that this also implies that the optimal bonus is smaller than the marginal product of effort, except when $\gamma = 0$. The intuition behind this result follows from our previous discussion. For positive γ, it is optimal to set the bonus smaller than the marginal product, because the principal wants to commit himself to give at least some attention. The reason is that attention increases agent's happiness, and therefore enables the principal to reduce the base salary. This increase in agent's happiness comes at the cost of lower effort, because effort is increasing in the bonus. Thus, the optimal bonus is a compromise between the agent's incentives to put in effort and the principal's incentive to give attention.

It can easily be verified using (20) that the optimal bonus decreases in the agent's reciprocity γ. There are three reasons for this. First, the larger the

[5]Note that the principal's costs of attention and the effect of attention on the agent's effort do not directly affect the level of the optimal bonus which follows from applying the envelop theorem. The reason is that the principal equates these marginal benefits and costs of attention in the second stage of the game.

agent's reciprocity parameter γ, the larger the marginal effect of attention on agent's utility, and hence the more attractive to increase attention at the cost of effort. Second, the larger γ , the more responsive the agent's effort is to attention (see equation (9)), which in turn makes the principal's attention more responsive to the bonus (see equation (12)). The third reason is more subtle: the larger γ, the higher is effort for given bonus. Because the value of attention is increasing in effort, it is attractive to increase attention in order to profit from the larger marginal effect of attention on the agent's utility.

By inserting equation (20) into equations (9) and (12), we obtain the levels of attention and effort that result under the optimal contract:

$$a^* = \frac{\gamma^3(H-L)}{\gamma^2\theta\rho - \gamma^4 + \theta^2\rho^2}, \tag{21}$$

$$e^* = \frac{\theta\rho^2(H-L)}{\gamma^2\theta\rho - \gamma^4 + \theta^2\rho^2}. \tag{22}$$

Comparing a^* with a^{FB} described by equation (7), it is clear that $a^* < a^{FB}$ when $\gamma > 0$. Likewise, comparing e^* with e^{FB} described by equation (8), it follows that effort is lower than first-best for positive values of γ, i.e. $e^* < e^{FB}$. Clearly, the problem of having only one instrument (the bonus) for two conflicting goals (incentivizing the agent and the principal) implies that both attention and effort are suboptimally low. In the specific case where $\gamma = 0$, providing attention is of no avail, and so there is one instrument (the bonus) for one goal (optimizing effort), implying that the first-best can be reached.

It is also interesting to make a comparison between the comparative statics of the first-best case and the incomplete contract case. We saw in the previous section that in the first-best, both attention and effort rise with the agent's reciprocity. While this still holds for attention, the effect of a change in γ on optimal effort is no longer always positive:

$$\frac{de^*}{d\gamma} = \frac{2\gamma\theta\rho^2\left(2\gamma^2 - \theta\rho\right)(H-L)}{\left(\theta^2\rho^2 - \gamma^4 + \gamma^2\theta\rho\right)^2} \lesseqgtr 0, \tag{23}$$

which is negative for $\gamma < \sqrt{\frac{1}{2}\rho\theta}$ and positive for $\gamma > \sqrt{\frac{1}{2}\rho\theta}$. As can be easily verified, optimal behavior in the third and second stage implies that effort increases in γ, but for small values of γ this is offset by a reduction in the bonus specified in the first stage.

To summarize, we have seen that there is a trade-off between monetary incentives and attention provision by the principal, stemming from a double moral-hazard problem. The trade-off implies that agents who are more reciprocal should be given weaker individual performance incentives. By doing so, the principal commits to provide attention, which raises the agent's happiness, and hence allows the principal to lower the base salary.

6 Incomplete contract with limited liability

In this section we consider the case where the agent is protected by limited liability: the agent's compensation must at least be equal to $\overline{w}$. As we shall see, the optimal bonus b is never negative, and so the limited-liability constraint is only binding in case of low output; that is, when the worker only receives his base salary. Hence, the limited-liability constraint implies a constraint on the base salary only: $w \geq \overline{w}$. We shall assume that the minimum compensation $\overline{w}$ is sufficiently high so that the agent's participation constraint $E(U) \geq \overline{U}$ is not binding.[6]

Solving the game proceeds in a similar way as in the full-rent-extraction case. The results for the third and second stage are identical. Hence, effort and attention are described by (9) and (12), respectively. The outcome of the contracting stage under limited-liability differs, however, from the full-rent-extraction case. Consequently, the equilibrium values of effort and attention are different as well. The problem in the first stage is:

$$\begin{aligned} \max_{b,w} \quad & eH + (1-e)L - (w + eb) - \frac{1}{2}\rho a^2 \\ & \text{s.t. } w \geq \overline{w}. \end{aligned} \tag{24}$$

The following first-order conditions describe the optimal contract:

$$\begin{aligned} -e + \left(\frac{de}{db} + \frac{de}{da}\frac{da}{db}\right)(H - L - b) - \frac{da}{db}\rho a = 0, \\ -1 + \lambda = 0, \\ w = \overline{w}. \end{aligned}$$

[6]For brevity, we abstract from the case where both the participation constraint and the limited-liability constraint are binding. The main results of this section carry over to this case, however.

Combining these conditions gives (after applying the envelop theorem):

$$\frac{de}{db}(H - L - b) - e = 0. \tag{25}$$

Comparing this condition with the full-rent-extraction case (19) provides us with some important insights into how the trade-offs differ between the two cases. In the full-rent-extraction case, the principal trades off agent's utility and incentives to provide effort. The binding participation constraint makes it optimal for the principal to take the agent's welfare into account, because the agent's welfare is reflected in the base salary. In contrast, when the limited-liability constraint is binding, bonus pay and attention do not reduce the base salary (which is fixed at $\overline{w}$), but increase the agent's rent. From first-order condition (25), we see that the bonus stimulates effort, but giving a bonus is costly because the principal cannot reduce the base salary. The principal therefore trades off giving incentives to the agent and leaving a rent to the agent. The principal optimally increases financial incentives until the marginal benefits of stimulating effort do no longer outweigh the marginal costs. Note that attention does not play a role in the determination of the optimal bonus. The reason is that increases in attention resulting from decreases in the bonus not only stimulate effort, but also increase the costs of giving attention. Because the principal equates the marginal costs and benefits of giving attention in the second stage, these effects exactly cancel in the contract design stage.

Solving the first-order conditions leads to the following expressions for bonus, attention, and effort:

$$b^* = \frac{\theta\rho - \gamma^2}{2\theta\rho - \gamma^2}(H - L), \tag{26}$$

$$a^* = \frac{\gamma}{2\theta\rho - \gamma^2}(H - L), \tag{27}$$

$$e^* = \frac{\rho}{2\theta\rho - \gamma^2}(H - L). \tag{28}$$

The second-order condition requires that $\gamma < \sqrt{2\theta\rho}$, which always holds given our restriction that $\gamma < \sqrt{\theta\rho}$. The bonus is always lower than the marginal product $(H - L)$, because of the trade-off between effort and rents discussed above. Note that when $\gamma = 0$, the optimal bonus is exactly half of the marginal product. Again, the bonus is decreasing in the agent's reciprocity γ, but

for a completely different reason than in the full-rent-extraction case. When the agent is more reciprocally inclined, effort increases for given values of attention and bonus pay. Therefore, the probability that the bonus actually has to be paid is higher, implying that providing a bonus is a more costly instrument when workers are more reciprocal (see Besley and Ghatak 2005 for a similar argument in the context of motivated workers). Hence, the optimal bonus decreases in agent's reciprocity. Compared to the first-best levels, attention and effort are always suboptimally low. Attention is suboptimally low because the principal only provides attention to stimulate effort and does not take the beneficial effects of attention on the agent's utility into account when deciding on the bonus. Combining the observations that the bonus is at most half of the marginal product and that attention is suboptimally low, it is clear that effort is also below first-best.

It is interesting to compare the levels of attention, effort, and bonus pay in the limited-liability case with those in the full-rent-extraction case. As explained above, the crucial difference between the two cases is that the bonus is not any longer a costless instrument because the base salary cannot be adjusted when expected bonus pay changes. Therefore, for $\gamma = 0$, the bonus is only half of what the bonus would be in the full-rent-extraction case, and is smaller for all relevant values of γ, i.e. $0 \leq \gamma < \sqrt{\theta\rho}$. Given the negative relation between the bonus and attention, the relatively small bonus in the limited-liability case implies that more attention is provided than in the full-rent-extraction case. Effort is nevertheless smaller than in the full-rent-extraction case, because of the lower bonus. Lastly, it is interesting to note that the relation between effort and agent's reciprocity γ changes qualitatively: instead of the U-shape in the full-rent-extraction case, effort is now strictly increasing in γ. This results from the smaller bonus in the limited-liability case, which implies that attention and effort react more strongly to changes in γ.

7 Promotion incentives

This section examines the possibility of overcoming the double moral-hazard problem identified in the previous sections through provision of promotion incentives (or relative performance pay). Clearly, for this to be feasible, the principal must employ at least two agents. For convenience, suppose the principal hires two identical agents, denoted by index numbers 1 and

2, who perform identical tasks. The agents compete for a single promotion prize, which is denoted by P. We assume that the agent who achieves highest output wins the prize P. In case of equal outputs, a random draw determines the winner. Thus, the probability of winning the prize for agent 1 is given by $\frac{1}{2}(1 + e_1 - e_2)$.[7] Expected utility for agent 1 is described by:

$$E(U_1) = w + e_1 b + \frac{1}{2}(1 + e_1 - e_2) P + \gamma e_1 a_1 - \frac{1}{2}\theta e_1^2, \tag{29}$$

where the subscripts denote attention given to and effort provided by the indicated agent. The principal's payoff is described by

$$E(\pi) = (H - L - b)(e_1 + e_2) + 2L - (2w + P) - \frac{1}{2}\rho(a_1 + a_2)^2. \tag{30}$$

Note that the cost of the promotion prize does not depend on effort, because the principal awards the prize to one of the agents independent of the levels of output.

First consider the case where the participation constraint is binding. The analysis proceeds in the same way as in the two previous sections. Optimal third-stage behavior follows from the maximization of the agent's utility function (29) which results in:

$$e_1 = \frac{b + \frac{1}{2}P + \gamma a_1}{\theta}; \quad e_2 = \frac{b + \frac{1}{2}P + \gamma a_2}{\theta}. \tag{31}$$

These expressions are similar to our earlier findings (see equation (9)); the difference is that the agent is now also motivated by the possibility of winning the promotion prize P.

Optimal behavior in the second stage follows from maximization of the principal's payoff function (30) with respect to a_1 and a_2. Assuming that the principal gives the same level of attention to each of the two agents,[8] optimal

[7] Note that the chance of winning the prize for agent 1 is:

$$e_1(1 - e_2) + \frac{1}{2}e_1 e_2 + \frac{1}{2}(1 - e_1)(1 - e_2)$$

which can be simplified to the expression in the main text.

[8] It is easy to verify that in our set-up the distribution of a given level of attention over the agents does not influence agents' total effort and, hence, the principal's profits in the second stage of the game. Obviously, if agent's responsiveness to attention would decrease in the level of attention, it would be profit-maximizing to distribute attention evenly, as we assume.

attention provision is given by:

$$a_1 = a_2 = \frac{\gamma}{2\theta\rho}\left(H - L - b\right). \tag{32}$$

Equations (31) and (32) already make clear that the double moral-hazard problem can be solved by using relative performance pay. The promotion prize P incentivizes the agents, but does not impair the principal's incentives to give attention. Therefore, it is possible to set the bonus b such that the principal's incentives to provide attention are optimal, whereas the promotion prize P provides the agents with monetary incentives to put in effort. Since the participation constraint is binding, and using that $e_1 = e_2 = e$ and $a_1 = a_2 = a$ in equilibrium, the principal's problem can be written as follows:

$$\begin{gathered}\max_{b,P,w} 2\left(H - L - b\right)e + 2L - (2w + P) - \frac{1}{2}\rho(2a)^2 \\ \text{s.t. } U \geq \overline{U}.\end{gathered} \tag{33}$$

The first-order conditions are:

$$\begin{gathered}-2e + 2\left(\frac{de}{db} + \frac{de}{da}\frac{da}{db}\right)(H - L - b) - \frac{da}{db}\rho 4a \\ +\lambda\left(e + \left(\frac{de}{db} + \frac{de}{da}\frac{da}{db}\right)(b + \gamma a - \theta e) + \frac{da}{db}\gamma e\right) = 0,\end{gathered}$$

$$\frac{de}{dP}2\left(H - L - b\right) - 1 + \lambda\left(\frac{de}{dP}(b + \gamma a - \theta e) + \frac{1}{2}\right) = 0,$$

$$-2 + \lambda = 0,$$

$$w + \frac{1}{2}P + eb + \gamma ea - \frac{1}{2}\theta e^2 = \overline{U},$$

where the last equality follows from the third first-order condition, implying $\lambda > 0$. Solving for λ and applying the envelop theorem using (31) and (32), we can solve for the optimal bonus and promotion prize:

$$b^* = \left(1 - \frac{2\theta\rho}{2\theta\rho - \gamma^2}\right)(H - L),$$

$$P^* = \frac{4\theta\rho}{2\theta\rho - \gamma^2}(H - L).$$

Clearly, when $\gamma > 0$, it is optimal for the principal to offer promotion incentives to the agents along with negative individual incentive pay. Given our previous discussion in section 5 on what bonus level leads to first-best attention, this result is not surprising. In the second stage, the principal does not take the agent's welfare into account. Therefore, in order to internalize this externality, the principal sets a negative bonus. This obviously gives perverse monetary incentives to the agents, but this is corrected for by offering the promotion prize. By substituting the expressions for the optimal bonus and promotion prize into the equations for effort and attention (equations (31) and (32) respectively), it is easily verified that the first-best is reached.[9] As before, the bonus is decreasing in γ. The reason is that the size of the externality increases in γ, requiring a lower bonus to reach first-best attention. Consequently, promotion incentives are also increasing in the agent's reciprocity so as to restore incentives to exert effort.

Next consider the case where the limited-liability constraint is binding. It is easy to verify that, in this case, the principal optimally sets the same bonus as in section 6 (corrected for the number of agents) and does not use relative performance pay. The reason is twofold. First, the problem that relative performance pay resolves in case the agent's participation constraint is binding is non-existent when the limited-liability constraint binds. While relative performance pay enables the principal to credibly commit to high attention and hence reduce the agent's base salary when the participation constraint binds, the principal clearly cannot gain by such a commitment when the limited-liability constraint binds. Second, under limited-liability, relative performance pay is a more expensive incentive instrument than bonus pay. The reason is that in contrast to individual bonus pay, under relative performance pay the principal always rewards one of the agents (even when both produce low output), which is costly when the limited-liability constraint binds.

[9] It should be taken into account that with two agents, first-best attention per worker is given by:

$$a^{FB} = \frac{(H-L)\,\gamma}{2\theta\rho - \gamma^2}.$$

As before, first-best effort is described by:

$$e^{FB} = \frac{H - L + \gamma a^{FB}}{\theta}.$$

To summarize this section, the possibility of rewarding agents by relative performance overcomes the double moral-hazard problem in the full-rent-extraction case. Because relative performance pay leaves the principal's incentives to provide attention unaffected, a mix of promotion incentives and individual incentives results in first-best attention and effort. In contrast, in case a limited-liability constraint is binding, the use of promotion incentives cannot increase profits because the principal cannot recoup the agent's happiness gains from increased attention and the promotion prize is less cost-efficient in motivating agents than individual bonus pay.

8 Empirical analysis

This section tests our theoretical predictions on the relationship between an employee's reciprocity and the type of incentive pay offered by his employer. Unfortunately, our data do not allow us to observe the strength of incentives workers receive. All that we know is *whether* workers receive a particular type of incentive. Therefore, we use our theoretical framework to derive predictions regarding an individual's likelihood of receiving a certain type of incentive scheme.

Our theory makes a clear prediction regarding promotion incentives: All else equal, workers who are more reciprocal should be more likely to receive promotion incentives. The reason is that promotion incentives do not dilute the principal's incentives to provide attention, and this advantage is particularly important for workers who are more reciprocal. We expect this relation to be particularly strong for workers in small firms, since then the manager is more likely to be residual claimant.[10] Further, our analysis suggests that when the limited-liability constraint is binding, the relation will be weaker because the principal has less reason to care about agent's welfare. We proxy for limited-liability in two ways: by union-membership and by low income.

Our theoretical predictions regarding individual bonus incentives are less clear. On the one hand, bonus pay dilutes the principal's incentive to provide attention, implying a negative relation between reciprocity and the likelihood

[10] If the manager is not a residual claimant, we would still expect some effect as long as the manager's income depends on his unit's profits. In large organizations, a lack of attention provision at the highest levels (from CEO to middle managers) may trickle-down to lower levels (from middle managers to workers). Shanock and Eisenberger (2006) find evidence for such effects.

of receiving bonus incentives. On the other hand, in our model individual bonus pay helps to fine-tune promotion incentives, implying that the introduction of a bonus is particularly attractive for reciprocal workers. Therefore, although a negative relation between reciprocity and bonus incentives would be most in line with our theory, we cannot rule out a positive relation. All we can say is that, among workers who do not receive promotion incentives, workers who are more reciprocally inclined should be less likely to receive bonus pay, and particularly so in small firms. We do not have a clear prediction on whether this relation is different for unionized or low-income workers: As we have seen in sections 5 and 6, our theory predicts a negative relation between bonus pay and a worker's reciprocity both when the limited-liability constraint is binding and when it is non-binding.

We thus test the following hypotheses:

1. Workers who are more reciprocal are more likely to receive promotion incentives.

2. The relationship in hypothesis 1 is particularly strong for workers in small firms.

3. The relationship in hypothesis 1 is weaker for unionized workers and for workers with low income.

4. Among workers who do not receive promotion incentives, workers who are more reciprocal are less likely to receive bonus incentives.

5. The relationship in hypothesis 4 is particularly strong for workers in small firms.

For this analysis we make use of the 2004 and 2005 waves of the German Socio-Economic Panel (GSOEP), a survey representative for the German population.[11] This dataset is unique in that it contains data on both worker's performance pay and worker's reciprocity. Reciprocity is measured by asking how well each of the three following statements applies: (1) If someone does me a favor, I am prepared to return it; (2) I go out of my way to help somebody who has been kind to me before; (3) I am ready to undergo personal costs to help somebody who helped me before. The extent of agreement with these statements is indicated on a 7-point scale, where

[11] Detailed information about the GSOEP can be found at www.diw.de/gsoep/.

1 indicates profound disagreement and 7 means that the statement applies perfectly. Following Dohmen et al. (2006), we construct a measure of reciprocity by taking the average score on the three statements.[12] Our dependent variable (the worker's performance pay) is measured by asking whether people's job performance is regularly assessed by a supervisor and whether this performance evaluation has consequences for promotion and/or for receiving a yearly bonus. A value of 1 indicates a positive answer. In our analysis, we leave out those individuals who indicate that they do not get performance evaluation by their supervisor. The reason is that some of these individuals, although lacking a formal performance evaluation, in fact may receive bonus or promotion incentives, which we cannot observe in the data.[13] We provide some summary statistics of the two key variables in figure 1 and table 1.

We test the first hypothesis by estimating two Probit-equations, as shown in the first two columns of table 2.[14] The difference between the two equations is that in the second column, we do not control for firm size, industry, and job status. In line with hypothesis 1, the coefficient for reciprocity is positive and statistically significant at the 1% level. Also, the effect of reciprocity is economically significant: a 1-point increase on the scale of reciprocity increases

[12] Dohmen et al. (2006) distinguish between positive reciprocity and negative reciprocity, where the former refers to the inclination to reciprocate kind acts and the latter to reciprocation of unkind acts. Because we consider attention as a gift to the agent, we focus on positive reciprocity. For further discussion of these measures of reciprocity, see Dohmen et al. (2006).

[13] The main conclusions are qualitatively robust for inclusion of individuals who do not get a performance evaluation. However, the picture often becomes blurred in the sense that the t-values of the coefficient for the reciprocity variable fall, which is not surprising if, indeed, some workers who do not get a performance evaluation do receive performance pay.

[14] Except for the inclusion of the reciprocity variable, the specification is similar to Grund and Sliwka (2006), who use the GSOEP data to estimate the effect of worker's risk attitude on the likelihood of receiving performance pay. Although the definition of most control variables will be intuitively clear, some deserve further description. "Risk attitude" is defined as the willingness to take risks on a scale 0-10, where 0 is extremely risk averse. "East-Germany" is a dummy taking a value 1 if the place of work is in East-Germany or East-Berlin, and 0 if the place of work is in West-Germany or West-Berlin. "Firm size" is the number of employees n, categorized as follows: (1) $n < 5$ (2) $5 \leq n < 20$, (3) $20 \leq n < 100$, (4) $100 \leq n < 200$, (5) $200 \leq n < 2000$, (6) $n \geq 2000$. "Industry" is classified by one-digit industry code: 1=Agriculture, 2=Energy, 3=Mining, 4=Manufacturing, 5=Construction, 6=Trade, 7=Transport, 8=Bank and Insurance, 9=Services, 10=Other. Lastly, "Job status" indicates an individual's occupation and occupational level: Blue collar worker (5 levels), white collar worker (6 levels) or civil servant (4 levels).

the probability of getting promotion incentives by more than 5 percentage points on average (the mean marginal effect follows from multiplying the coefficient with the appropriate reduction factor). Taking into account the fact that about 45% of the sample used in the regression gets promotion incentives, this is quite a large effect. The size of the effect remains highly significant but reduces somewhat in size when we do not control for firm size, industry, and job status. This suggests that if sorting mechanisms are present, they are rather subtle: reciprocal workers do not sort on the basis of job levels, industries or firm size.

We test the second hypothesis by re-estimating the equations for a sample of small and large firms. A firm is considered 'small' if it has less than 100 employees and 'large' if it has 100 employees or more. The results are shown in columns (3) and (4) of table 2. Clearly, reciprocity has a larger effect on the probability of receiving promotion incentives in small firms than in large firms, which is supportive of hypothesis 2. However, the difference between the coefficients is not statistically significant. A similar picture arises when we leave out some of the controls and when we replicate the regression for firms with less than 20 employees (approximately 260 observations).

The third hypothesis is that an individual's reciprocity has a weaker effect on the likelihood of receiving promotion incentives if the limited-liability constraint binds. To test this, we replicate the regressions shown in columns (1) and (2) of table 2 for the subsample of union members.[15] As can be seen from the first two columns of table 3, the effect of reciprocity is insignificant, independent of whether we control for firm size, industry, and job status. Similarly, we also proxy for limited-liability by limiting the sample to full-time workers earning a low income. The third column of table 3 shows regression results for full-time workers earning a gross monthly labour

[15] A potential problem is that approximately 70% of workers in Germany is covered by union bargaining, despite low membership rates. The correlation between membership and limited-liability may therefore be low. However, union membership may also affect wages in more subtle ways, specifically through the employees council. Addison et al. (2007) show that employees councils increase wages, and our data suggest that this effect may be stronger for union members. Replicating the regressions in table 3 for the sample of union members in firms where an employees council is present (approximately 500 observations), we find that the coefficient becomes zero (p-level around 0.9). However, the same regression for the sample of all workers in firms where an employees council is present replicates the estimates obtained in table 2. This suggests that unions exert influence through the employees council, but further research is needed to examine this conjecture.

income of less than 1500 euro; the fourth column replicates the regression for full-time workers earning more. The results are in line with our theoretical prediction. To prevent multicollinearity, we only correct for firm-size, but adding or dropping controls does not affect the results in any important way. Moreover, our results are robust for changes in the income categories considered, although these changes obviously cannot be too large: the standard error of the reciprocity coefficient decreases in the size of the income category.[16]

The fourth hypothesis is that among workers who do not receive promotion incentives, workers who are more reciprocal are less likely to receive bonus incentives. In the first two columns of table 4, we regress the likelihood of receiving bonus pay on reciprocity for these workers. Controlling for firm size, industry, and job status, the coefficient for reciprocity has the predicted sign but is highly insignificant (see the first column). The significance does not improve if we drop the controls, as can be seen from the second column of table 4. Worse still, the coefficient also has the wrong sign. We learn two things from these regressions. First, just as in the regression of promotion incentives on reciprocity, sorting seems to play no role. Second, we find no evidence in favor of hypothesis 4. This somewhat disappointing result may be attributed to the fifth hypothesis, namely that the negative relationship between reciprocity and the likelihood of receiving bonus pay is especially strong in small firms. To examine this possibility, we split the sample into small and large firms, where 100 employees is again taken as the cut-off point. The third and fourth column of table 4 show the results. The reciprocity coefficients are insignificant and the signs are opposite to our prediction. These findings are robust for dropping (sets of) controls or considering firms with less than 20 employees. However, if we include those individuals who get promotion incentives, the (positive) coefficient for the small firms becomes significant at the 5% level. This is in line with our theory, because fine-tuning

[16] Some caution is warranted in drawing inferences from the third column of table 3: the insignificant coefficient may be due to the limited number of observations included in the sample, which is even more concerning considering the negative relation between income and promotion incentives (see table 1). This criticism is not valid for the regression using the sample of union workers, because they receive promotion incentives even more frequently than non-union workers, see table 1. Also, any random sample we took of the population containing approximately 600 observations yields significant results. Therefore, our results suggest that when a limited-liability constraint binds, the relation between reciprocity and the likelihood of receiving promotion incentives becomes weaker.

the incentive structure using individual bonus pay is particularly attractive when workers are reciprocal.

To conclude this section, we found evidence in line with hypotheses 1-3 concerning the likelihood of receiving promotion incentives. Our empirical findings for hypotheses 4 and 5 regarding the probability of receiving bonus pay do not support our theoretical predictions.

9 Concluding remarks

We have analyzed how incentives for a worker and his superior interact using a gift-exchange model where the worker is reciprocal to attention of his superior. In our model, attention is the superior's input in the exchange relation, whereas the worker reciprocates with higher effort. This reciprocity directly links the inputs of a manager to that of his worker, so that production becomes a joint effort. We have studied a common trade-off in models of double moral-hazard, where stronger incentives for one of the partners may weaken those for the other. The central result is that bonus pay for the worker weakens the incentives for his superior to provide attention. We have seen that promotion incentives are particularly helpful when workers are reciprocal, since it takes away the commitment problem for the superior in providing attention. This last result is supported by data from the German Socio-Economic Panel.

Clearly, our model is highly stylized so as to zoom in on what we think are key mechanisms of social exchange at the work floor. However, in doing so, we have abstracted from some important features of reality. A first issue is the 'attribution effect', implying that only true kindness of superiors motivates workers. We feel confident that a Levine (1998)-type of model in which workers update their beliefs about true feelings of their manager will produce results that are close to the ones we present in this paper. A second issue is that the current three-stage set-up does not fully reflect the dynamic nature of the employment relation, where building reputation, the option to quit or to fire, and other common themes in dynamic analyses may play a role. None of these avenues is likely to affect the key results of this paper qualitatively. Third, we have considered reciprocity on the side of the worker only. Although not an uncommon assumption, we could also consider a case where superiors too have reciprocal feelings. Lastly, we have presented a simple and highly tractable model, which may hide several subtle second-order

effects that show up in a more general set up. An example of such an effect is that stronger incentives for the worker make the manager more lenient, since attention is less effective in stimulating worker's effort.

What are the lessons of our model for management practice? Well, first is that designers of organizations and stake holders should realize that giving stronger incentives to workers is costly not only in that it potentially takes away profits from the shareholders, but also in that it weakens the incentives for senior management to put in sufficient effort. In practice, people management by superiors may be a cheap way of motivating workers when compared to monetary incentives. Hence, in times when managers' bonus pay makes them residual claimant on the workers' output, reducing the bonus pay to them and giving stronger incentives to the worker may be a very costly way of achieving higher overall output. This may call for a strategy that incentives should be increased in tandem throughout the organization and for both workers and managers, as this circumvents the problems highlighted in this paper.

Further, we have seen that promotion incentives can be a more efficient instrument to induce effort when compared to bonus pay. The good thing about committing to upward mobility within the organization is that these incentives for workers do not impair the monetary incentives for their superiors – under the assumption that the latter do not create their own competitors. Hence, the costs of flat organizations such as high-powered teams and (excessive use of) project management is that they force the organization to use incentive schemes that are not only costly in terms of transferring a potentially large share of the profits to workers, but also distort the incentives of managers to provide knowledge transfer, coaching and, yes, attention.

10 Tables and figures

Figure 1: Frequency distribution of reciprocity for those individuals who get performance appraisal.

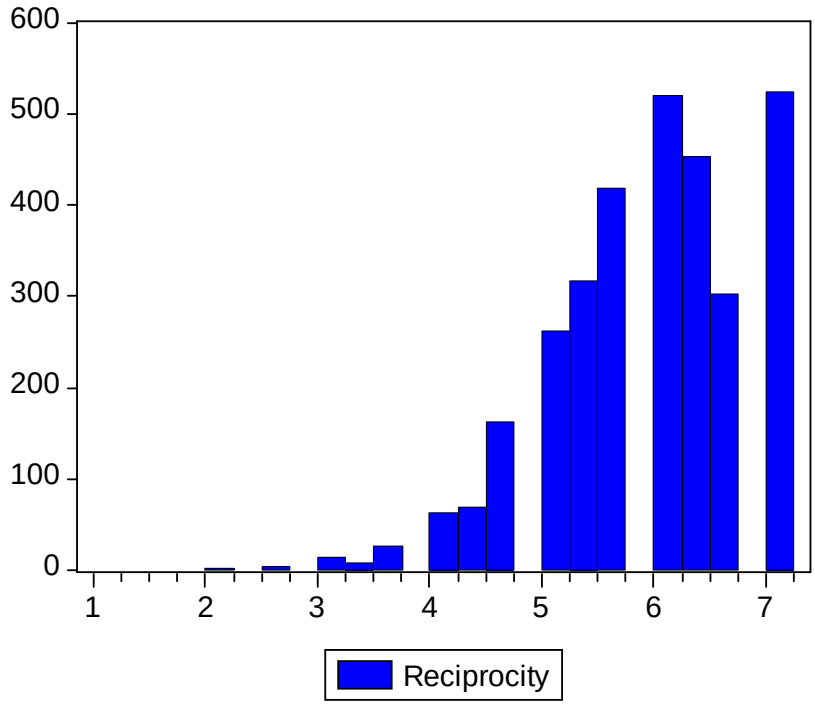

Table 1: Summary statistics

Subgroup	Frequency				Subtotal
No performance appraisal	72% (8179)				
Performance appraisal	28% (3159)				
Appraisal has consequences for:	Bonus only	Promotion only	Bonus and Promotion	Neither	
Total	14% (452)	25% (803)	19% (586)	42% (1318)	100% (3159)
Small firms (<100 employees)	14% (102)	17% (123)	12% (84)	57% (405)	100% (714)
Large firms ($\geq$100 employees)	14% (316)	29% (634)	22% (481)	35% (769)	100% (2200)
Union members	15% (96)	31% (206)	18% (120)	36% (239)	100% (661)
Non-union members	14% (337)	24% (552)	19% (435)	43% (1015)	100% (2339)
Income $\leq$1500 euro, fulltime workers	9% (32)	11% (40)	6% (22)	75% (282)	100% (376)
Income >1500 euro, fulltime workers	16% (358)	29% (624)	23% (510)	32% (696)	100% (2188)

Table 2: Effect of reciprocity on the probability of receiving promotion incentives. (Robust standard errors in parentheses)

Dependent variable:	Promotion incentives		Promotion incentives Sample: Firm size<100	Promotion incentives Sample: Firm size≥100
	(1)	(2)	(3)	(4)
Reciprocity	0.154***	0.100***	0.227***	0.139***
	(0.032)	(0.029)	(0.072)	(0.037)
Risk attitude	-0.013	-0.005	-0.045*	-0.002
	(0.013)	(0.012)	(0.027)	(0.016)
Female	-0.117*	-0.197***	-0.190	-0.105
	(0.068)	(0.057)	(0.152)	(0.076)
Age	0.057***	0.093***	0.048	0.063**
	(0.021)	(0.015)	(0.041)	(0.025)
Age squared	-0.001***	-0.001***	-0.001*	-0.001***
	(0.000)	(0.000)	(0.001)	(0.000)
Years of education	0.005	0.111***	-0.026	0.012
	(0.013)	(0.009)	(0.032)	(0.015)
Tenure	0.002	0.025***	-0.013	0.004
	(0.004)	(0.003)	(0.009)	(0.004)
Part-time	-0.178*	-0.208**	-0.106	-0.175
	(0.092)	(0.081)	(0.189)	(0.107)
East-Germany	-0.392***	-0.533***	-0.505***	-0.364***
	(0.072)	(0.065)	(0.143)	(0.085)
Constant	-2.499***	-3.557***	-2.227**	-2.601***
	(0.513)	(0.365)	(0.895)	(0.560)
Firm size dummies	Yes	No	Yes	Yes
Industry dummies	Yes	No	Yes	Yes
Job status dummies	Yes	No	Yes	Yes
Observations	2726	2829	631	2088
Pseudo R^2	0.228	0.097	0.246	0.207
Log likelihood	-1452.96	-1761.42	-291.25	-1146.39
Reduction factor	0.369	0.362	0.372	0.372

***,**,* indicate significance at 1%, 5% and 10% level respectively.

Table 3: Effect of reciprocity on the probability of receiving promotion incentives when a limited-liability constraint binds. (Robust standard errors in parentheses)

Dependent variable:	Promotion incentives Sample: Union members		Promotion incentives Sample: Income≤ 1500 euro	Sample: Income> 1500 euro
	(1)	(2)	(3)	(4)
Reciprocity	0.093	0.065	0.073	0.107***
	(0.073)	(0.064)	(0.093)	(0.035)
Risk attitude	-0.007	0.007	-0.091**	0.011
	(0.029)	(0.026)	(0.039)	(0.014)
Female	-0.050*	-0.227	0.028	-0.162**
	(0.174)	(0.139)	(0.185)	(0.066)
Age	0.131***	0.109**	0.102**	0.025
	(0.050)	(0.043)	(0.049)	(0.022)
Age squared	-0.002***	-0.002***	-0.001**	-0.001**
	(0.001)	(0.000)	(0.001)	(0.000)
Years of education	0.002	0.0982***	0.005	0.092***
	(0.032)	(0.023)	(0.042)	(0.011)
Tenure	0.005	0.026***	-0.010	0.015***
	(0.008)	(0.007)	(0.021)	(0.004)
Part-time	-0.168	-0.152		
	(0.228)	(0.190)		
East-Germany	-0.489***	-0.706***	-0.447**	-0.380***
	(0.160)	(0.148)	(0.200)	(0.078)
Constant	-2.321***	-3.247***	-2.600**	-2.789***
	(1.459)	(1.007)	(1.054)	(0.641)
Firm size dummies	Yes	No	Yes	Yes
Industry dummies	Yes	No	No	No
Job status dummies	Yes	No	No	No
Observations	606	620	319	2087
Pseudo R^2	0.267	0.096	0.084	0.082
Log likelihood	-307.78	-388.49	-129.97	-1326.61
Reduction factor	0.364	0.358	0.389	0.364

***,**,* indicate significance at the 1%, 5% and 10% level respectively

Table 4: Effect of reciprocity on the probability of receiving bonus pay. (Robust standard errors in parentheses)

Dependent variable:	Bonus pay		Bonus pay Sample: Firm size<100	Sample: Firm size≥100
	(1)	(2)	(3)	(4)
Reciprocity	-0.011	0.001	0.102	-0.056
	(0.044)	(0.042)	(0.092)	(0.053)
Risk attitude	0.015	0.021	-0.031	0.003
	(0.019)	(0.018)	(0.035)	(0.023)
Female	-0.193**	-0.362***	-0.226	-0.159
	(0.094)	(0.082)	(0.186)	(0.111)
Age	0.074***	0.110***	0.097**	0.058*
	(0.027)	(0.02)	(0.048)	(0.034)
Age squared	-0.001**	-0.001***	-0.001**	-0.001
	(0.000)	(0.000)	(0.001)	(0.000)
Years of education	0.043**	0.058***	0.060	0.029
	(0.019)	(0.013)	(0.041)	(0.023)
Tenure	0.007	0.008*	0.013	0.003
	(0.005)	(0.004)	(0.010)	(0.006)
Part-time	-0.182	-0.345***	0.001	-0.276*
	(0.127)	(0.119)	(0.231)	(0.156)
East-Germany	-0.094	-0.176**	-0.216	-0.017
	(0.094)	(0.086)	(0.161)	(0.120)
Constant	-2.993***	-3.761***	-4.230***	-2.930***
	(0.649)	(0.512)	(1.145)	(0.794)
Firm size dummies	Yes	No	Yes	Yes
Industry dummies	Yes	No	Yes	Yes
Job status dummies	Yes	No	Yes	Yes
Observations	1461	1474	448	1013
Pseudo R^2	0.160	0.078	0.196	0.165
Log likelihood	-714.88	-793.83	-186.17	-512.29
Reduction factor	0.3766	0.3785	0.3698	0.3883

***,**,* indicate significance at the 1%, 5% and 10% level respectively.

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