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Inequity Aversion in Multi-Task Agency Problems

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Preliminary

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Inequity Aversion in Multi-Task Agency Problems

Abstract

This paper studies how inequity aversion affects the optimal incentive contract in a multi-task principal–agent model with a non-congruent performance measure.

We assume that the agent is inequity averse relative to the principal. The agent is envious if he/she expects to get less than the principal and feels guilty, if he/she expects to be paid more. The agent performs two equally productive tasks, but the contractible performance measure is more sensitive to one task than the other, generating a congruity problem.

We find that it is never optimal to offer a contract, which leaves the agent envious. Rather, in equilibrium the principal offers either an equal-pay contract or a contract that leaves the agent feeling guilty. For a lower range of the agent's reservation utility, the only feasible contract is an equal-pay contract. It requires a distortion of incentives and thus results in agency costs from avoiding inequity in addition to agency costs from incongruity. It follows that the principal would prefer to hire a purely self-interested agent as opposed to an inequity averse one. For an upper range of reservation utilities, a contract that leaves the agent feeling guilty is feasible and preferred to an equal-pay contract. This contract results in costs from inequity, but also reduces costs from incongruity. If the first effect dominates the second, hiring an inequity averse agent again turns out to be detrimental. However, we identify scenarios in which the second effect dominates and hiring an inequity averse agent benefits the principal.

Acknowledging that an agent might derive extra utility from being paid more than the principal, rather than to feel guilty, we extend our analysis to capture a status-seeking agent. We find that an agent with such preferences requires less pay but his/her effort choice amplifies the congruity problem. Depending on which of the two effects dominates, the principal either prefers to hire a self-interested or a status-seeking agent.

Keywords: moral hazard problem, multi task, social preferences, inequity aversion

1. Introduction

Decentralization and the delegation of tasks is advisable if not inevitable in many corporate settings. It helps to put diverse knowledge and qualifications to good use, but also creates so called agency problems due to asymmetric information and a conflict of interest. A broad literature has shown that incentive contracts can serve as a means to mitigate these problems. They link performance measurement to compensation and thus allow to motivate and control employee behavior.

Most of the literature assumes that the agent's focus is entirely on his/her own payoff. In other words, the agent's utility increases in his/her compensation but decreases in effort, due to a disutility from working hard. More recently, several studies have broadened this view by including so called social preferences into the utility function of the agent. Doing so considerably helped to explain results from experimental research that suggests that employees not only care about compensation itself, but also about issues such as fairness and equality.[1]

In this paper, we follow this notion and consider a multi-task principal-agent problem assuming that the agent is not only compensation affine and effort averse, but also inequity averse[2] relative to the principal in the sense of Fehr and Schmidt (1999).

The strategic interaction of the principal (he) and the agent (she) can be regarded as a start-up in which the principal has the financial means to start a business, but needs an agent who provides the expertise and the effort to successfully implement the business idea. The agent's utility increases in compensation and decreases in effort. It also decreases, whenever her compensation differs from the payoff the principal receives. In order to incentivize the agent, the principal offers an incentive contract. As firm value is not contractible by assumption, he has to revert to a contractible performance measure. Throughout the game, the agent performs two tasks that are equally productive, implying that the marginal increase in firm value is identical in both efforts. In contrast, the performance measure available for contracting is similarly sensitive to one effort, but less sensitive to the other, which creates a congruity problem. E.g. we can think of the contractible performance measure as accounting profit, which adequately reflects current effects of effort, such as effort to increase sales of the period, but fails to reflect long term effects such as effort in R&D.

The principal offers a contract that considers the congruity problem but also the inequity aversion of the agent. We find that it is never optimal to offer a contract, that pays the agent less than the principal in expectation. It might be optimal, however, to offer an equal-pay contract or to offer one that pays the agent more (in expectation) than what the principal gets.

We contrast the principal's payoff to a setting in which the agent is purely self-interested. Doing so, we investigate whether employing an inequity averse agent as opposed to a self-interested one benefits or harms the principal.

We find that an equal-pay contract almost always results in a payoff below the one obtained with a self-interested agent. In fact, ensuring equal pay in order to save on inequality costs, requires a distortion in incentives that increases costs for the principal and in turn reduces his payoff.

If, in contrast, it is optimal to offer a contract that leaves the agent better off than the principal, the results are less clear-cut. While such a contract results in costs from inequity, it also helps to reduce costs from incongruity. We show that the second effect potentially dominates the first. In that case

[1] See. E.g. Fehr/Schmidt (1999) and Bolton/Ockenfels (2000)

[2] Note that we use inequity averse and inequality averse synonymously in what follows.

the principal's payoff increases with an inequity averse agent. It therefore becomes beneficial to hire an inequity averse rather than a self-interested agent.

Having analyzed inequity aversion as defined above, we extend our analysis and acknowledge that an agent might prefer to be ahead, rather than to dread it. Following Charness and Rabin (2002), we define an agent who dislikes to be behind, but feels satisfaction if she is ahead as a status seeking agent. Given such preferences, it turns out that a contract that pays the agent more than the principal is always optimal. The principal saves some payment due to the extra utility the agent derives from inequity. At the same time, the status seeking agent's effort choice enhances the congruity problem. As in the previous setting, it can either be optimal to hire the self-interested agent or to hire the status-seeking one depending on the strengths of both countervailing effects.

Our paper builds on two streams of the literature. First, it is based on the multi-task agency literature that evolved from the seminal papers by Holmström and Milgrom (1991) and Feltham and Xie (1994). Importantly, this literature identifies the unavailability of a congruent performance measure in moral hazard problems as a source of agency costs that remain in the absence of any risk and incentive trade-off.

Second, we build on the behavioral economics literature that includes social preferences into utility functions and started with Fehr and Schmidt (1999) and Bolton and Ockenfels (2000).

Following up on their suggestions, Itoh (2004) is the first to examine a single-task moral hazard problem with an other-regarding agent. He shows that while other-regarding preferences interact with incentives in nontrivial ways, the net effect on the principal´s profit is generally negative. This finding is confirmed by several other studies, such as Englmaier and Wambach (2010), Dur and Glazer (2008), Bartling and von Siemens (2009), and Demougin and Fluet (2006).

Specifically, Englmaier and Wambach (2010) analyze a moral hazard problem with inequity averse agents in the sense of Fehr and Schmidt (1999). They show that the presence of inequality aversion alters the structure of optimal contracts. As the concern for equity becomes more important, there is convergence toward linear sharing rules, the sufficient statistics result identified in Holmström (1979) is violated, and contracts may become either overdetermined or incomplete. Dur and Glazer (2008) consider a setting in which the agent envies his boss and show that envy increases the cost of providing incentives. Bartling and von Siemens (2009) analyze moral hazard with multiple envious agents and find that envy renders incentive provision more expensive when agents are risk averse. In fact, noise in performance measures creates wage inequality that must be compensated.

While all of the above stated studies consider single-task agency problems, we extend the analysis to multiple tasks. Doing so, we show that the previous result that inequality aversion harms the principal does not unequivocally hold anymore.

Only a few other studies have combined multi-task principal-agent settings with social preferences. All of them differ from ours in various respects.

Bartling (2012) considers a two-task and two-agents model where agents are inequity averse relative to each other. In his model, each agent performs an individual task, where the output is measured separately, and a team task, where output is pooled. The main result shows that when tasks are substitutes in the agents' effort costs, the principal may optimally weaken incentives on the team task. Even though the team task itself does not generate wage inequality, strong incentives on that task can induce the agent to reallocate effort away from the individual task, thereby increasing payoff disparities at the individual level.

Moreover, Bartling (2011) and Itoh (2004) consider a multi-agent setting where agents again compare their payoffs to each other. They show that the principal can exploit inter-agent envy by designing interdependent contracts such as relative performance schemes or team contracts that use inequality as an incentive device. The mechanism at work relies on competition or cooperation among agents.

In contrast, in this paper, we analyze a multi-task principal-agent model with non-congruent performance measure in which the agent is inequality averse relative to the principal. Inequality aversion is defined over expected payoffs, such that the agent derives disutility from differences between his expected compensation and the principal´s expected payoff. This corresponds to pure ex ante fairness in the sense of Saito (2013), who distinguishes between fairness defined over expected allocations ("equality of opportunity") and fairness defined over realized outcomes ("equality of outcome").[3,4] Using the first approach is reasonable in our setting, as the principal's payoff depends on firm value, which, by assumption, is realized only after the game ends.

The paper is structured as follows. Section 2 introduces the model. Section 3 derives a first best setting in which agency costs are absent and a setting in which the principal employs a self-interested agent. In the latter setting, agency costs arise from a congruity problem only. This setting serves as a benchmark setting for latter reference. Section 4 characterizes the optimal contract under inequality aversion, analyzing two regimes separately. We call them the envy regime and the guilt regime. Section 5 compares the principal's payoff when hiring an inequity averse agent rather than a self-interested one and identifies conditions for one or the other being optimal. Section 6 extends the analysis to status-seeking preferences. Section 7 concludes.

2. Model

We consider a one shot two-task principal-agent problem. The principal aims at maximizing long term firm value x and employs an agent to perform two tasks or efforts e_i with $i = 1,2$. Both tasks affect firm value equally. We normalize the marginal productivities of both efforts to one without loss of generality, such that

$$x = e_1 + e_2 + \varepsilon_x,$$

where $\varepsilon_x \sim N(0, \sigma_x^2)$ is a noise term that reflects all random effects on firm value that are out of the agent's control.

We assume that firm value in non-contractible. This might be due to measurement problems if shares of the firm are not traded in an active market. Even if a market price exists, it might reflect the effect of managerial effort on firm value with too much of a time lag, which in turn renders it infeasible for contracting.[5]

[3] Our approach is also backed up by recent empirical evidence. The study by Beaud, Sun, and Willinger (2026) suggests that decisions under risk align with ex ante fairness concerns (assuming zero-mean background risk) rather than ex post inequality aversion.

[4] A related approach is discussed by Takanashi (2025), who allows for heterogeneous weighting of ex ante and ex post concerns across agents.

[5] A similar assumption is made in Feltham/Xie (1994) and Baker (1992). See also . Feltham/Xie (1994) or Goldman/Slezak (2006).

Accordingly, the principal needs to revert to a contractible performance measure we denote y, where

$$y = e_1 + \theta_2 e_2 + \varepsilon_y.$$

While the marginal sensitivity of the performance measure and marginal productivity are equal with regard to the first task, we assume $\theta_2 \in (0,1)$. Accordingly, the second task affects firm value more severely than performance measure y. $\varepsilon_y \sim N\left(0, \sigma_y^2\right)$ is another random noise term. Both are assumed to be mutually independent.

Note that the above assumptions imply that a congruity problem is present as the ratio of marginal productivities is not equal to the one of marginal sensitivities.

$$\frac{1}{1} \neq \frac{1}{\theta_2}. \quad (1)$$

The larger the r.h.s. of (1), the stronger the incongruency in the performance measure.

We restrict our analysis to linear contracts of the form

$$s(y) = w + vy,$$

where w is a fixed transfer and v is the incentive rate. The agent is risk neutral. Her utility increases in compensation and decreases in disutility from effort. We assume symmetric quadratic effort costs

$$c(e_1, e_2) = \frac{1}{2} c(e_1^2 + e_2^2).$$

Additionally, the agent experiences disutility from inequality relative to the principal.

As described above, we define inequality aversion over expected payoffs. Thus, we assume that the agent compares her own expected compensation to the principal's expected net payoff. Doing so is natural in our setting as we assume that firm value materializes only in the distant future and thus can neither be observed at the end of the period nor compared to actual compensation. Focusing on expected payoffs, can be interpreted as "equality of opportunities" concerns with regard to the division of surplus as opposed to "equality of outcomes" concerns.

Using the Fehr–Schmidt (1999) framework and adapting it to an "equal opportunities" formulation of inequality aversion, the agent's utility function has the following form.

$$U_a = E[s(y)] - c(e_1, e_2) - \alpha \max\{E[\Pi] - E[s(y)], 0\} - \beta \max\{E[s(y)] - E[\Pi], 0\}.$$

Here $\Pi = x - s(y)$ denotes the principal´s payoff, $\alpha \geq 0$ captures marginal disutility from disadvantageous inequality (envy) and $\beta \in (0; \frac{1}{2})$ captures marginal disutility from advantageous inequality (guilt). Restricting β to be below $\frac{1}{2}$ is necessary to ensure that the agent´s marginal utility of her own compensation is positive.[6] For later reference we define

$$\Delta \equiv E[\Pi] - E[s(y)] = E[x] - 2E[s(y)] = (e_1 + e_2) - 2w - 2v(e_1 + \theta_2 e_2).$$

If $\Delta > 0$, the principal is expected to earn more than the agent resulting in envy. If $\Delta < 0$, the agent expects to earn more and feels guilty. Finally, at $\Delta = 0$, no inequality arises and the agent's utility equals the one of a purely self-interested individual.

Whenever a self-interested agent is present, $\alpha = \beta = 0$ holds such that U_a reduces to $U_a = E[s(y)] - c(e_1, e_2)$.

[6] See Rey-Biel (2008) or Englmaier & Wambach (2010) for a similar assumption.

3. Benchmark Settings

We consider two simplified settings in what follows. In the next section we assume that both potential sources for agency costs, inequity aversion and performance measure incongruity, are absent. In 3.2 incongruity arises with a self-interested agent.

3.1. First Best Setting

As a first step, we briefly present a setting in which we assume that the agent is self-interested and that firm value x is available for contracting.

We state the principal's optimization problem as follows.

$$\max_{w,v} \Pi = E[x] - E[s(x)]$$

s.t.

$$E[s(x)] - c(e_1, e_2) \geq U_{res} \quad \text{(PC)}$$

$$e_i \in \arg\max_{e_i} E[s(x)] - c(e_1, e_2) \quad \text{(IC)}$$

Where (PC) denotes the participation constraint and (IC) the incentive compatibility constraint. Solutions are presented in lemma 1 below. All proofs are relegated to the appendix.

Lemma 1. If firm value is contractible the principal offers a contract containing $v^{FB} = 1$ and $w^{FB} = -1 + U_{res}$. The agent optimally picks $e_1^{FB} = e_2^{FB} = 1$.

While the agent is kept at her reservation utility U_{res}, the principal's payoff equals $\Pi^{FB} = -w^{FB} = 1 - U_{res}$.

Given the contract derived above, the principal essentially "sells the firm to the agent", which is a well known result in previous literature. He receives a constant payment $\Pi^{FB} = 1 - U_{res}$ and transfers all the risk to the agent. Doing so is optimal as a) it aligns the agent's interests with the principal's and b) can be done without costs due to the agent's risk neutrality.

3.2. Congruity Problem with a self-interested Agent

As a next step, we consider a setting in which firm value is no longer contractible, but the agent is still purely self-interested. Doing so we identify distortions arising solely from a non-congruent performance measure.

The optimization problem of the principal now becomes

$$\max_{w,v} \Pi = E[x] - E[s(y)]$$

s.t.

$$E[s(y)] - c(e_1, e_2) \geq U_{res} \tag{PC}$$

$$e_i \in \arg\max_{e_i} E[s(y)] - c(e_1, e_2) \tag{IC}$$

Lemma 2 presents solutions.

Lemma 2. If firm value is non-contractible and the agent is self-interested, the optimal contract parameters and the resulting payoff are given by:

$$v^{SB} = \frac{1+\theta_2}{1+\theta_2^2},$$

$$e_1^{SB} = \frac{1+\theta_2}{1+\theta_2^2}, \tag{2}$$

$$e_2^{SB} = \frac{\theta_2(1+\theta_2)}{1+\theta_2^2}, \tag{3}$$

$$w^{SB} = U_{res} - \frac{(1+\theta_2)^2}{2(1+\theta_2^2)},$$

$$\Pi^{SB} = \frac{(1+\theta_2)^2}{2(1+\theta_2^2)} - U_{res}.$$

Comparing the results from lemma 1 and lemma 2, it turns out that incongruity leads to an increased incentive rate as compared to the first best setting. This goes along with an increase in the first effort. The second effort is now smaller than the first, as the agent shifts effort towards the more sensitive task and away from the less sensitive one. As a result the effort ratio that equals $\frac{e_1^{FB}}{e_2^{FB}} = 1$ in the first best setting now becomes $\frac{e_1^{SB}}{e_2^{SB}} = \frac{1}{\theta_2}$. Obviously, it is not possible to prevent this suboptimal effort allocation via the choice of v^{SB}.

For further reference, it should be noted at this point, that overall compensation critically depends on the agent's reservation utility and so does the net payoff that remains with the principal. In our simplified setting the agent's compensation equals

$$E[s(y)]^{SB} = \frac{(1+\theta_2)^2}{2(1+\theta_2^2)} + U_{res}.$$

This implies equal payoffs to the principal and the agent if, and only if, the agent's reservation utility is zero. Whenever the reservation utility is positive, the agent's payoff exceeds the one of the principal[7].

Agency costs, in contrast, are independent from U_{res} and are depicted in the corollary below.

[7] This result is robust to assuming asymmetric quadratic effort costs and to any task productivities and sensitivities. It does not affect the results derived below qualitatively.

Corollary 1.

Agency costs from incongruity are equal to

$$\Pi^{FB} - \Pi^{SB} = 1 - \frac{(1+\theta_2^2)^2}{2(1+\theta_2^2)} > 0\ \forall\ \theta_2 \in (0,1).$$

It follows directly, that the presence of a congruity problem, tantamount to $\theta_2 \neq 1$, always results in a loss from distorted incentives.

4. Congruity Problem with an Inequality Averse Agent

In this section, we finally introduce an inequity averse agent as described in section two. The agent evaluates her contract, comparing her expected monetary compensation to the investor´s expected net profit.

In order to deal with the agent´s piecewise utility function, we distinguish two cases. In the first case, we derive the optimal solution to the principal´s contracting problem, under the additional constraint that $\Delta = E[\Pi] - E[s(y)] \geq 0$, implying that the agent never feels guilty, but becomes envious if the constraint is non-binding at the optimum (the envy regime). In the second case, we assume that $-\Delta = E[s(y)] - E[\Pi] \geq 0$ holds, which results in a non- envious agent who feels guilty if the constraint is non-binding (the guilt regime).

4.1 The Envy Regime

In the first case, we derive the optimal solution to the agency problem, restricting ourselves to the envy region of the agent's utility function.[8] Accordingly, we assume

$U_a^E = E[s(y)] - c(e_1, e_2) - \alpha \max\{\Delta, 0\} = w + v(e_1 + \theta_2 e_2) - \frac{e_1^2}{2} - \frac{e_2^2}{2} - \alpha \max\{[(e_1 + e_2) - 2w - 2v(e_1 + \theta_2 e_2)], 0\}$.

The principal's optimization problem can be stated as follows

$$\max_{w,v} \Pi = e_1 + e_2 - w - v(e_1 + \theta_2 e_2)$$

s. t.

$$U_a^E \geq U_{res} \qquad \text{(PC)}$$

$$e_i \in \arg\max_{e_i} U_a^E \qquad \text{(IC)}$$

$$\Delta \geq 0 \qquad \text{(EC)}$$

EC is the additional restriction that ensures the solution obtained is in the envy region. Solving the above problem, we obtain the results presented in proposition 1.

[8] Superscript E refers to the envy regime in what follows.

Proposition 1. A feasible solution to the above problem exists if, and only if, the reservation utility of the agent is sufficiently small

$$U_{res} \leq \frac{(1+\theta_2)^2}{8(1+\theta_2^2)}. \tag{4}$$

If (4) holds, the optimal contract implements equal payoffs to the agent and the principal, implying that $\Delta = 0$. Optimal effort choices are

$$e_1^E = v^E,\; e_2^E = v^E\theta_2,$$

and optimal contracting parameters equal

$$v^E = \frac{1+\theta_2+\sqrt{(1+\theta_2)^2-8U_{res}(1+\theta_2^2)}}{2(1+\theta_2^2)},$$

$$w^E = -\frac{1-8U_{res}+\sqrt{(1+\theta_2)^2-8U_{res}\,(1+\theta_2^2)}+\theta_2(2+\theta_2-8\theta_2U_{res}+\sqrt{(1+\theta_2)^2-8U_{res}\,(1+\theta_2^2)}}{4(1+\theta_2^2)}$$

$$\Pi^E = \frac{1+\theta_2+\sqrt{(1+\theta_2)^2-8U_{res}(1+\theta_2^2)}}{4(1+\theta_2^2)}(1+\theta_2)$$

Proposition 1 shows that an optimal contract contains equal pay such that the agent does not suffer any disutility from envy. Comparing the results to the ones derived for a purely self-interested agent in lemma 2, we observe that they are identical if $U_{res} = 0$. Whenever $U_{res} > 0$ holds, the incentive rate is lower and so are the efforts. We summarize these observations in corollary 2.

Corollary 2.

(i) If $U_{res} = 0$, the optimal equal-pay contract coincides with the optimal contract offered to a purely-self-interested agent.

(ii) If $0 < U_{res} \leq \frac{(1+\theta_2)^2}{8(1+\theta_2^2)}$ holds, we obtain $v^E < v^{SB}$ and in turn $e_i^E < e_i^{SB}$.

The intuition is quite straightforward. With regard to (i), we observe from lemma 2 that with $U_{res} = 0$ it is optimal to pay a purely self-interested agent as much as the principal. It follows that this contract avoids any disutility from inequality. Therefore, there is no need to adapt this contract if the agent is inequity averse.

If, in contrast, U_{res} is strictly positive, the second best contract pays the agent more than the principal in equilibrium. It therefore violates the EC and cannot be implemented. To ensure that $\Delta \geq 0$, the principal needs to adapt the agent's compensation as well as his own payoff. In order to do so, he downward distorts the incentive rate as stated in (ii.) This reduces his own payoff, but also the agent's variable pay, her effort, and her disutility from effort. As a consequence, the EC condition holds at the optimum, implying that there is (again) no disutility from envy in equilibrium. Moreover, the PC is binding as well, keeping the agent at her reservation utility. However, this solution can only be implemented, if the agent's reservation utility is not too high. With $U_{res} > \frac{(1+\theta_2)^2}{8(1+\theta_2^2)}$, in contrast, it becomes impossible to satisfy the PC and EC simultaneously, and no feasible solution exist as established in proposition 1.

4.2 The Guilt Regime

With the insights from the analysis of the envy regime in place, we now consider the guilt regime in what follows. Doing so, we exogenously restrict feasible solutions to the guilt region of the agent's utility function implying that

$$U_a^G = E[s(y)] - c(e_1, e_2) - \beta \max\{-\Delta, 0\} = w + v(e_1 + \theta_2 e_2) - \frac{e_1^2}{2} - \frac{e_2^2}{2} - \beta \max\{[2w + 2v(e_1 + \theta_2 e_2) - (e_1 + e_2)], 0\}. \tag{5}$$

[9]

Accordingly, we can state the optimization problem of the principal as

$$\max_{w,v} \Pi = e_1 + e_2 - w - v(e_1 + \theta_2 e_2)$$

s.t.

$$U_a^G \geq U_{res} \tag{PC}$$

$$e_i \in \arg\max_{e_i} U_a^G \tag{IC}$$

$$-\Delta \geq 0 \tag{GC}$$

GC now ensures that the solution obtained is (weakly) in the guilt region.

Solutions to the principal's problem are presented in proposition 2.

Proposition 2.

(i) If the agent's reservation utility is sufficiently high, $U_{res} > \beta(1-\beta)$, the optimal contract pays the agent more than the principal receives and compensates the agent for her disutility from feeling guilty.

Optimal efforts and contracting parameters are as follows

$$e_1^G = \frac{1+\theta_2}{1+\theta_2^2}(1-2\beta) + \beta, \qquad e_2^G = \frac{\theta_2(1+\theta_2)}{1+\theta_2^2}(1-2\beta) + \beta$$

$$v^G = \frac{1+\theta_2}{1+\theta_2^2}$$

$$w^G = \frac{U_{res} - \beta^2}{1-2\beta} - \frac{1}{2} \cdot \frac{(1+\theta_2)^2}{1+\theta_2^2}$$

$$\Pi^G = \left[\frac{(1+\theta_2)^2}{2(1+\theta_2^2)} - U_{res} - \beta^2 - \frac{8\beta\theta_2(1-\beta)}{2(1+\theta_2^2)}\right]\frac{1}{1-2\beta}.$$

[9] Now superscript G indicates that the guilt regime is analyzed.

(ii) If the agent's reservation utility is below the threshold of $\beta(1-\beta)$, a feasible solution exists only if $U_{res} \leq \frac{(1+\theta_2)^2}{8(1+\theta_2^2)}$. In that case, the optimal contract is the equal-pay contract derived in proposition 1.

Confining the agent's utility to the guilt regime shows that deviating from the equal-pay contract becomes optimal, if the agent's reservation utility is sufficiently high. From proposition 2 (i) we observe, that in this case the optimal incentive rate equals the one derived for a purely self-interested agent (v^{SB}). Optimal efforts, in contrast, differ from second best efforts and so does the relation of efforts as is specified in corollary 3.

Corollary 3. If the contract derived in proposition 2 (i) is implemented

(i) Inequity related agency costs arise as the principal needs to compensate the agent for her disutility from feeling guilty
(ii) agency costs related to the congruity problem decrease as compared to the second best setting as $\frac{e_1^G}{e_2^G} < \frac{e_1^{SB}}{e_2^{SB}}$ holds true.

(i) results directly from proposition 2 where we demonstrate that the GC is slack in equilibrium.

In order to understand (ii), recall that the first best effort relation derived in lemma 1 is $\frac{e_1^{FB}}{e_2^{FB}} = 1$. Introducing a congruity problem in the second best setting, the ratio increases as $\frac{e_1^{SB}}{e_2^{SB}} = \frac{1}{\theta_2}$. This relation shows the extent to which incongruity of the performance measure results in a relative shift in efforts. In fact, the congruity problem becomes more severe, the stronger the relative shift in effort, i.e. the larger the effort ratio as defined above. Calculating this ratio for the guilt inducing contract, however, we obtain $1 < \frac{e_1^G}{e_2^G} < \frac{1}{\theta_2}$. Accordingly, the agent's effort ratio shifts towards the first best ratio if the agent is inequity averse and feels guilty. As a result, agency costs from incongruity decline.

To get the intuition, note that, given the GC is slack, we can write (5) as follows

$$U_a^G = (1-2\beta)E[s(y)] - c(e_1, e_2) + \beta E[x]. \quad (6)$$

Comparing (6) to the utility function of a purely self-interested agent from section 3.2,

$$U_a^{SB} = E[s(y)] - c(e_1, e_2),$$

reveals two effects of inequity aversion. First, inequity aversion reduces the agent's utility from personal compensation. Basically, the weight put on $E[s(y)]$ goes down from being 1 to $(1-2\beta)$. Second, she derives positive utility from firm value, as she somewhat internalizes the principal´s best interest. Accordingly, the agent's optimal effort choice is distorted from one that is solely focused on maximizing net compensation towards one that balances her interest in personal compensation and in firm value. As the second task has a large effect on firm value, but a moderate one on compensation, balancing implies that the agent spends relatively more effort on the second task and less on the first, such that the effort ratio decreases. The effect is stronger, the larger β, such that stronger the inequity aversion results in a smaller the effort ratio $\frac{e_1^G}{e_2^G}$.[10] If β converges to its upper limit, the effort ratio converges to its first best level as $\lim_{\beta \to \frac{1}{2}} \frac{e_1^G}{e_2^G} = 1 = \frac{e_1^{FB}}{e_2^{FB}}$.This is shown in figure 1 for several values of θ_2.

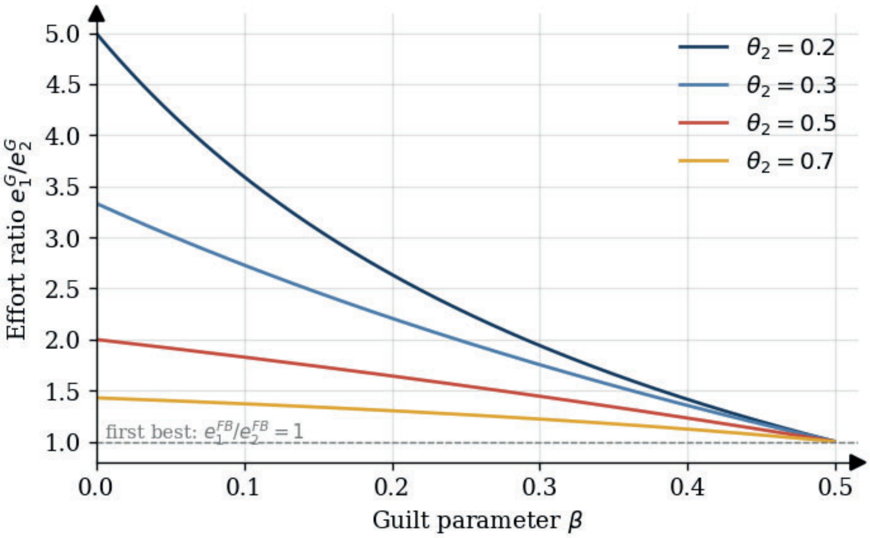

Figure 1: Effect of inequity aversion on the agent's effort ratio $\frac{e_1^G}{e_2^G}$ in the guilt regime.

To summarize, the analysis of the two cases has shown that it is never optimal for the principal to offer a contract to an inequity averse agent, that leaves her envious in equilibrium. It might be optimal, in contrast, to leave her feeling guilty. Alternatively, an equal-pay contract might be optimal.

5. Effects of Inequity Aversion on the Principal's Payoff

In this section, we build on the results derived in section 4. In particular, we derive conditions under which the contracts presented above are feasible and optimal. Moreover, we contrast the (linear) contract optimally offered to an inequity averse agent to the one offered to a self-interested agent. We demonstrate that hiring an inequity averse agent potentially benefits the principal.

The results from the previous section have shown that the size of the reservation utility, U_{res}, has a crucial role in determining which contract is feasible and optimal.

Therefore, we start our analysis considering the special case of $U_{res} = 0$. We have already established, that for $U_{res} = 0$, the optimal second best contract in our model constitutes equal pay. Accordingly, this contract can also be implemented in the presence of an inequity averse agent without additional costs. It follows that in this specific case, inequity-aversion does not make any difference and the

[10] Formally, we obtain $\frac{\partial}{\partial \beta}\left(\frac{e_1^G}{e_2^G}\right) = \frac{\left(\beta(\theta_2^2 - 2\theta_2 - 1) + \theta_2 + 1\right)^2}{(1-\theta_2^4)(1+\theta_2^2)^2} < 0.$

principal is indifferent between hiring a self-interested and an inequity averse agent. Agency costs, however, arise from the congruity problem.

With this result in place, we assume that $U_{res} > 0$ from now on.

Recall that from proposition 1 an equal-pay contract exists if, and only if, $U_{res} \leq \frac{(1+\theta_2)^2}{8(1+\theta_2^2)}$ holds. Proposition 2 stated that the optimal contract induces guilt if $U_{res} > \beta(1-\beta)$.

Given our restrictions of $0 < \beta < \frac{1}{2}$ and $0 < \theta_2 < 1$ we obtain $\beta(1-\beta)\epsilon(0, \frac{1}{4})$ and $\frac{(1+\theta_2)^2}{8(1+\theta_2^2)}\epsilon(\frac{1}{8}, \frac{1}{4})$. As a consequence, $\beta(1-\beta) \lesseqgtr \frac{(1+\theta_2)^2}{8(1+\theta_2^2)}$ holds. It follows that depending on parameter values all of the cases depicted in corollary 4 exist.

Corollary 4.

(i) If $\frac{(1+\theta_2)^2}{8(1+\theta_2^2)} < U_{res} < \beta(1-\beta)$ a feasible incentive contract does not exist.

(ii) If $\beta(1-\beta) < U_{res} < \frac{(1+\theta_2)^2}{8(1+\theta_2^2)}$ the optimal contract induces the agent to feel guilty.

(iii) If $\beta(1-\beta) < U_{res}$ and $\frac{(1+\theta_2)^2}{8(1+\theta_2^2)} < U_{res}$ the optimal contract induces the agent to feel guilty.

(iv) If $\beta(1-\beta) > U_{res}$ and $\frac{(1+\theta_2)^2}{8(1+\theta_2^2)} > U_{res}$ the optimal contract is an equal-pay contract.

Given (i), the reservation utility is too high for an equal-pay contract to exist but also too low for the GC to be slack at the optimum. Accordingly, no feasible incentive contract exists. If (ii) holds true, both contracts are feasible but the guilt inducing contract is preferable. In (iii) only the guilt inducing contract is feasible and in (iv) the agent's reservation utility is too small for the GC to be slack and sufficiently small, that an equal-pay contract exists. Therefore, the latter is optimal.

As both types of contracts can be optimal, we need to compare both to the second best solution derived in lemma 2.

Our results are presented in proposition 3.

Proposition 3.

(i) Comparing the second best contract to the equal-pay contract we obtain $\Pi^{SB} > \Pi^{E}$.

(ii) Comparing the second best contract to the guilt inducing contract we obtain

$$\Pi^{SB} > \Pi^{G} \text{ if } U_{res} > \frac{1-\beta}{2} - \frac{(1-2\beta)\theta_2}{1+\theta_2^2}$$

$$\Pi^{SB} < \Pi^{G} \text{ if } U_{res} < \frac{1-\beta}{2} - \frac{(1-2\beta)\theta_2}{1+\theta_2^2} \tag{7}$$

(iii) There exist sets of parameter values $\left\{(\theta_2, \beta) \middle| 0 < \theta_2 < 1, 0 < \beta < \frac{1}{2}\right\}$ for which $U_{res} > \beta(1-\beta)$ and (7) are simultaneously satisfied. This is the case if

$$\beta < \frac{(1-\theta_2)^2}{1+\theta_2^2}. \tag{8}$$

Most of the intuition for (i) has already been provided along with proposition 1. As described above, with $U_{res} > 0$, the second best contract derived in lemma 2 is characterized by inequality, where the principal gets less than the agent. Implementing such a contract with an inequity averse agent, would subject the agent to disutility from guilt and in turn require additional compensation. The equal-pay contract avoids this effect. However, to achieve equal pay the principal needs to downward distort the agent's incentives, which in turn reduces effort below the second best level. This comes at a cost and while the agent is kept at her reservation utility, the principal's payoff decreases. It follows that the principal would prefer to hire a purely self-interested agent over one that is inequity averse in this setting.

If, in contrast, a guilt inducing contract is optimal, the principal potentially benefits from inequity-aversion as is stated in (ii). While the guilt inducing contract leads to costs from inequity, it also reduces costs from incongruity. If the first effect dominates, the principal's second best payoff is larger. This happens if the agent's reservation utility is sufficiently large. Intuitively, a large reservation utility inevitably requires a large payment to the agent and causes high costs from inequity. At some point, these costs from inequality dominate the reduction in congruency costs. With not too high reservation utility, however, inequity costs are rather low such that the congruity effect dominates and the principal's payoff is larger if he hires an inequity averse agent.

Given that we identified a lower reservation utility limit for the guilt inducing contract to exist, we state in (iii), that there indeed exists a range of U_{res}, for which inequity aversion is beneficial. From condition (8), this range is non empty when θ_2 is sufficiently small for a given β. Inequity aversion is therefore most likely to benefit the principal when the performance measure is severely non-congruent. In that case, the inequity-induced shift in effort is most valuable.

We also provide a numerical example in which $\beta = 0.15$ and $\theta_2 = 0.2$. As this implies that $\beta(1-\beta) < \frac{(1+\theta_2)^2}{8(1+\theta_2^2)}$ a feasible contract always exists in the example. As figure 2 shows, the equal- pay contract is always inferior to the second best one in line with proposition 3 (i). It exists up to an upper bound of $U_{res} \leq 0.173$ in the example. While the principal's payoff decreases in the agent's reservation utility in all regimes, the slopes are different. Comparing the guilt inducing contract to second best, we observe, that the guilt inducing contract exists if $U_{res} > \beta(1-\beta) = 0.128$. It beats the second best setting up to $U_{res} = 0.290$. The green shaded area reflects the payoff differences within the region in which inequity aversion benefits the principal. For $U_{res} > 0.290$, the costs from inequity dominate the benefits from a less severe congruity problem. While the guilt inducing contract is still optimal with an inequity averse agent, the principal would prefer to hire a self-interested one.

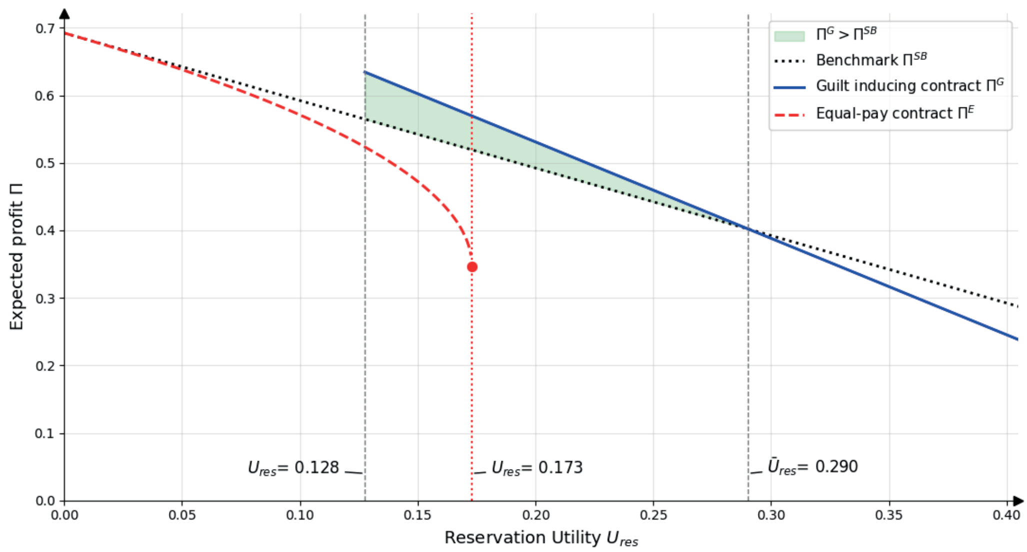

Figure 2: Payoffs from equal-pay and guilt inducing contracts as opposed to the second best contract for varying levels of reservation utility.

From the analysis above, it turns out that potential benefits from inequity aversion in a multi-task setting critically depend on the agent's reservation utility. In particular, there is an intermediate region of reservation utilities in which the principal benefits from hiring an inequity averse agent. In this region, inequity aversion helps to reduce the congruity problem without causing too many costs from non-equal pay. If the reservation utility is below this intermediate region, the optimal contract prevents non-equal pay and, compared to the second best contract, distorts incentives, which comes at a cost. If the reservation utility is above the intermediate region, costs from non-equal pay dominate benefits from improved congruity.

6. Extension: Status-Seeking Agent

In sections 4 and 5 we considered an agent who is inequity averse in the sense of Fehr–Schmidt (1999) and therefore experiences disutility from being either behind or ahead of the principal. While it seems quite natural that the agent is envious if she is behind, it is less straightforward to assume that she also dislikes to be ahead. Rather, part of the literature assumes that agents' utility increases when they are ahead such that inequality becomes valuable. In order to capture such alternative preferences, we extend our analysis and allow for a status-seeking agent.

Her utility function can be characterized as follows

$$U_a^S = E[s(y)] - c(e_1, e_2) - \alpha \max\{E[\Pi] - E[s(y)], 0\} + \gamma \max[E[s(y)] - E[\Pi], 0\},$$

with $\alpha > 0$ and $\gamma > 0$. Now γ captures the strengths of the agent's preference for being ahead. As the envy regime remains identical to section 4, we restrict the following analysis to the case in which the agent is (weakly) ahead and call this the satisfaction regime. Superscript S refers to this regime.

The agent´s utility simplifies to

$$U_a^S = E[s(y)] - c(e_1, e_2) + \gamma \max[E[s(y)] - E[\Pi], 0\}$$

We can characterize the principal´s optimization problem as follows:

$$\max_{w,v} \Pi = e_1 + e_2 - w - v(e_1 + \theta_2 e_2)$$

s.t.

$$U_a^S \geq U_{res} \tag{PC}$$

$$e_i \in \arg\max_{e_i} U_a^S \tag{IC}$$

$$-\Delta \geq 0 \tag{SC}$$

Similar to the guilt case, SC now ensures that the agent is weakly ahead. Solutions are presented in proposition 4 below.

Proposition 4.

For any $U_{res} \geq 0$, the optimal contract pays the agent more than the principal receives. Optimal contracting parameters and resulting payoffs are given by:

$$e_1^S = \frac{1+\theta_2}{1+\theta_2^2}(1+2\gamma) - \gamma, \qquad e_2^S = \frac{\theta_2(1+\theta_2)}{1+\theta_2^2}(1+2\gamma) - \gamma,$$

$$v^S = \frac{1+\theta_2}{1+\theta_2^2},$$

$$w^S = \frac{U_{res} - \gamma^2}{1+2\gamma} - \frac{(1+\theta_2)^2}{2(1+\theta_2^2)},$$

$$\Pi^S = \frac{(1+\theta_2)^2(1+2\gamma)}{2(1+\theta_2^2)} - 2\gamma - \frac{U_{res} - \gamma^2}{1+2\gamma}.$$

Again, the incentive rate equals the one derived in the second best setting, while optimal efforts and their relation are sensitive to the change in preferences. Details are stated in corollary 5.

Corollary 5.

If the optimal incentive contract for a status-seeking agent as derived in proposition 4 is implemented,

(i) the agent derives positive utility from being ahead, which allows the principal to save on compensation,

(ii) agency costs from incongruity increase as compared to the second best setting as $\frac{e_1^S}{e_2^S} > \frac{e_1^{SB}}{e_2^{SB}}$ holds true for $e_2^S \geq 0$,

(iii) the less sensitive task becomes negative for sufficiently strong status preferences, $\gamma > \frac{\theta_2(1+\theta_2)}{1-2\theta_2-\theta_2^2}$.

With a status-seeking agent, the principal benefits from a negative pay gap, $\Delta < 0$, as is stated in (i). As the agent derives extra utility from being ahead, less monetary compensation is required in order to ensure participation. However, there is a larger relative shift of effort towards the more sensitive task, which increases agency costs from incongruity. In the extreme, strong status-seeking preferences reflected in a large γ may result in no, or, if possible, negative, effort in the less sensitive task.

To provide intuition for the result in (ii) of corollary 5, we rewrite the agent's utility function in similar fashion as in section 4.2. Given the SC is slack we obtain

$$U_a^S = (1 + 2\gamma)E[s(y)] - c(e_1, e_2) - \gamma E[x]. \quad (9)$$

In contrast to the guilt regime, we observe that status preferences increase the agent's utility from personal compensation, as the weight put on $E[s(y)]$ is now up to $(1 + 2\gamma)$. Simultaneously, her utility decreases in firm value, as is reflected in the last term of (9).

Accordingly, the agent aims at increasing personal compensation but also wants to decrease firm value in order to maximize the pay gap. To achieve both goals as best as possible, she spends relatively less effort on the second task, that has a small effect on her compensation but a strong one on firm value, and more on the first one, that affects compensation and firm value equally.

Proposition 4 has shown that it is always optimal to pay a status-seeking agent more than what the principal gets. However, employing an agent with such preferences, the principal trades-off benefits from reduced compensation and costs from a more severe congruity problem. Which effect dominates depends on parameter values as demonstrated in proposition 5.

Proposition 5. The principal's expected profit satisfies $\Pi^S > \Pi^{SB}$ if and only if:

$$U_{res} > \frac{(1+2\gamma)(1-\theta_2)^2}{2(1+\theta_2^2)} - \frac{\gamma}{2} \quad (10)$$

Proposition 5 shows that it becomes beneficial for the principal to hire a status seeking agent if her reservation utility is sufficiently large. The intuition for this result is quite straightforward. If the reservation utility is high, a large compensation needs to be paid to the agent to fulfill the PC. Compensating the agent, however, is "cheaper" if the agent is status-seeking and part of her utility comes from the pay gap, $-\Delta$. This gap, however, increases in reservation utility and so does its effect on the status-seeking agent's utility.

Moreover, we observe from (10) that the reservation utility sufficient to render a status seeking agent preferable depends on θ_2 and γ. Analyzing the r.h.s. of (10), we observe that it becomes small if incongruity in the performance measure is small (θ_2 close to one) and the agent's status preferences are strong (γ is large). If both conditions are simultaneously satisfied, the minimal reservation utility that satisfies (10) is small, too. Interestingly, if incongruity in the performance measure is strong (θ_2 close to zero), the r.h.s. of (10) increases in γ. It follows that in the presence of severe incongruity, low status-seeking preferences help to relax (10). The result reflects that a larger γ in the presence of severe incongruity not only allows the principal to save on payment but further amplifies the congruity problem.[11] If incongruity in the performance measure is sufficiently large, costs from the congruity problem dominate benefits from reduced payments such that a higher reservation utility is required for a status-seeking agent to become preferable.

Summarizing the above results, we observe that status-seeking preferences have fundamentally different effects on the agent's effort choice than inequity aversion. While an inequality averse agent

[11] Note that $\frac{\partial\left(\frac{e_1^S}{e_2^S}\right)}{\partial\gamma} > 0$ for θ sufficiently low.

in the guilt regime spends relatively more effort on the less sensitive task and less on the more sensitive one in order to reduce the pay gap, $-\Delta$, the status-seeking agent does the opposite and enhances the congruity problem further. Accordingly, the principal prefers an inequality averse agent, if the reduction in agency costs from the congruity problem dominates the extra cost from guilt. He prefers a status-seeking agent, if the savings in pay exceed the additional costs from the congruity problem. In both settings, the principal might prefer an other-regarding agent to a purely self-interested one, but for different reasons.

6. Conclusion

This paper investigates costs and benefits from inequality aversion in a multi-task principal–agent setting.

Assuming that the agent is inequity averse relative to the principal, we find that it is never optimal to pay the agent less than what the principal receives. Rather, it can be optimal to offer an equal-pay contract or one where the agent is ahead and feels guilty. Which type of contract is optimal, critically depends on the agent's reservation utility in relation to the assumed inequality and incongruity parameters.

We compare the linear contract optimally offered to an inequity averse agent to the one a purely self-interested one would receive. We find that it is always beneficial for the principal to hire a self-interested agent if the optimal contract with inequity-aversion is an equal-pay contract. If, in contrast, the optimal contract is a guilt inducing contract, it can be optimal to hire a self-interested or an inequity averse agent. In fact, there exists a range of intermediate reservation utilities for which a guilt inducing contract is feasible and turns out beneficial for the principal as compared to the optimal contract of a self-interested agent.

Intuitively, the guilt inducing contract leads to increased costs of inequality but allows to reduce costs from incongruity. If the second effect is dominant, hiring an inequity averse agent increases the principal's payoff. For this to arise, the agent's reservation utility needs to be sufficiently high, for a guilt inducing contract to be feasible, but sufficiently low for the costs from inequality to be lower than the benefits from reduced inequity.

Acknowledging that some agents might have a preference for being ahead of the principal, rather than to feel guilty, we extend our analysis to status-seeking agents.

It turns out that an optimal contract for a status-seeking agent always pays that agent more than what the principal receives. In contrast to an inequity averse agent, a status-seeking one picks effort such that it enforces the congruity problem. The agent seeks not only to maximize her personal payoff, but also to maximize the difference between her payoff and the one received by the principal. In order to achieve both goals, she spends relatively more effort on the incongruent task than a self-interested agent would. At the same time, however, she receives extra utility from being ahead, which allows the principal to cut some of her payoff. Again, if the latter effect dominates, the principal benefits from hiring a status-seeking agent as compared to a self-interested one. This arises when the agent's reservation utility is sufficiently large.

Overall, our results show that social preferences can possibly mitigate agency problems and in turn agency costs. The result that inequity aversion can benefit the principal is particularly interesting as it is in sharp contrast to previous literature. Considering single task agency problems, this literature unequivocally finds that inequity aversion is harmful. Extending the setting to the, probably more realistic, multi-task case, we show that this result is not robust.

Note, however, that we restricted our analysis to payoff comparisons based on gross payoffs. Alternatively, one could assume that agents evaluate inequality in terms of net payoffs. In that case, effort costs become part of the comparison and potentially alter the results. We consider investigations on how different notions of fairness affect the results as one direction for future research. Moreover, we assume (at least implicitly), that the principal is aware of the agent's preferences and can pick an agent he considers most beneficial. This might not be the case in reality. Rather, the type of the agent might be her private knowledge, such that an adverse selection problem arises. Identifying possible screening mechanisms in order to identify types and tailor compensation on types is another avenue for future research.

Appendix

Proof of Lemma 1

If the principal can contract on firm value, the self-interested agent picks efforts e_1 and e_2 in order to maximize.

$$U_a = w + v(e_1 + e_2) - \frac{1}{2}(e_1^2 + e_2^2)$$

Which results in $e_1 = e_2 = v$.

Inserting the binding PC and the agent's effort choice into the principal's objective function, we obtain the following unconstraint optimization problem.

$$\max_v \Pi = E[x] - E[s(x)] = e_1 + e_2 - \frac{e_1^2}{2} - \frac{e_2^2}{2} = 2v - v^2$$

Maximizing w.r.t. v, we obtain

$$v^{FB} = 1$$

and in turn

$$e_1^{FB} = e_2^{FB} = 1.$$

Taking the binding participation constraint into account and inserting into Π, we obtain the results presented in lemma 1.

■

Proof of Lemma 2

When firm value is not contractible, the agent chooses e_i to maximize her expected utility

$$U_a = w + v(e_1 + \theta_2 e_2) - \frac{1}{2}(e_1^2 + e_2^2).$$

The first-order conditions for the agent´s problem are

$$\frac{\partial U_a}{\partial e_1} = v - e_1 = 0, \qquad \frac{\partial U_a}{\partial e_2} = v\theta_2 - e_2 = 0,$$

yielding incentive compatible effort choices

$$e_1\ (v) = v, \qquad e_2\ (v) = v\theta_2. \tag{A.1}$$

The second-order conditions $\frac{\partial^2 U_a}{\partial e_i^2} = -1 < 0$ confirm these are maxima.

Substituting (A.1) and the binding participation constraint into the principal´s objective function results in

$$\max_v \Pi = v(1 + \theta_2) - \frac{1}{2}v^2(1 + \theta_2^2) - U_{res}. \tag{A.2}$$

Optimizing (A.2) with respect to v we get

$$\frac{\partial \Pi}{\partial v} = (1 + \theta_2) - v(1 + \theta_2^2) = 0,$$

and

$$v^{SB} = \frac{1+\theta_2}{1+\theta_2^2}. \tag{A.3}$$

The second-order condition $\frac{\partial^2 \Pi}{\partial v^2} = -(1+\theta_2^2) < 0$ confirms this is a maximum.

Substituting (A.3) into (A.1) yields (2) and (3). The optimal fixed wage w^{SB} follows directly from the binding participation constraint

$$w^{SB} = U_{res} - v^{SB}\left(e_1^{SB} + \theta_2 e_2^{SB}\right) + \frac{1}{2}\left(\left(e_1^{SB}\right)^2 + \left(e_2^{SB}\right)^2\right) = U_{res} - \frac{(1+\theta_2)^2}{2(1+\theta_2^2)}. \tag{A.4}$$

Substituting (A.3) into (A.2) gives

$$\Pi^{SB} = \frac{(1+\theta_2)^2}{2(1+\theta_2^2)} - U_{res}. \tag{A.5}$$

■

Proof of Proposition 1

Note that envy arises if, and only if, EC is slack. In that case, the principal's optimization problem becomes

$$\max_{w,v} \Pi = e_1 + e_2 - w - v(e_1 + \theta_2 e_2)$$

s.t.

$$E[s(y)] - c(e_1, e_2) - \alpha\Delta \geq U_{res} \tag{PC}$$

$$e_i \in \arg\max_{e_i} U_a^E \tag{IC}$$

The agent picks her effort to maximize

$$U_a^E = w + v(e_1 + \theta_2 e_2) - \frac{1}{2}(e_1^2 + e_2^2) - \alpha[e_1 + e_2 - 2w - 2v(e_1 + \theta_2 e_2)],$$

Which results in $e_1 = v(1+2\alpha) - \alpha$ and $e_2 = v\theta_2(1+2\alpha) - \alpha$.

Assuming that the PC is binding at the optimum and inserting PC, e_1, and e_2 into the principal's objective function and rearranging terms, we obtain

$$\max_{v} \Pi = -\frac{\alpha(2+3\alpha)+U_{res}}{1+2\alpha} + (1+2\alpha)(1+\theta)v - \frac{1}{2}(1+2\alpha)(1+\theta^2)v^2.$$

Optimizing w.r.t. v results in $v^* = \frac{1+\theta}{1+\theta^2}$ and $w^* = -\frac{1}{2} - \frac{\theta}{1+\theta^2} + \frac{-\alpha^2+U_{res}}{1+2\alpha}$.

Checking for slackness of the EC, however, we obtain

$$\Delta = -\frac{2(\alpha+\alpha^2+U_{res})}{1+2\alpha} < 0$$

which is a contradiction.

It follows directly, that the EC must be binding at the optimum, which implies that the final term in brackets in U_a^E becomes zero and the agent optimally picks $e_1 \; = v$ and $e_2 \; = v\theta_2$. Taking both into account we check whether the only binding constraint at the optimum is the EC, while the PC is slack.

The principal's optimization problem in this case equals:

$$\max_{w,v} \Pi = e_1 + e_2 - w - v(e_1 + \theta_2 e_2)$$

s.t.

$$\Delta = 0 \qquad \text{(EC)}$$

$$e_1 \; = v \qquad \text{(IC)}$$

$$e_2 \; = v\theta_2.$$

Solving the EC for w and inserting into the principal's objective function we obtain

$$\max_{v,w} \Pi = \frac{1}{2} v(1 + \theta_2)$$

Taking the first derivative w.r.t. v reveals that Π is strictly increasing in v, as

$\frac{\partial \Pi}{\partial v} = 2(1 + \theta_2) > 0$

It follows, that it is optimal to chose v as large as possible. However, checking the PC for slackness, we get

$\lim_{v \to \infty} PC = \theta_2 - \frac{3}{2}\theta_2^2 - \frac{1}{2} - U_{res} < 0 \quad \forall\, \theta_2 \in (0,1)$ and $U_{res} > 0$.

Thus, we obtain another contradiction.

As a consequence, the only feasible solution is one, in which both conditions hold with equality. In that case the principal solves

$$\max_{w,v} \Pi = e_1 + e_2 - w - v(e_1 + \theta_2 e_2)$$

s.t.

$$w + v(e_1 + \theta_2 e_2) - c(e_1, e_2) = U_{res} \qquad \text{(PC)}$$

$$\Delta = 0 \qquad \text{(EC)}$$

$$e_1 \; = v \qquad \text{(IC)}$$

$$e_2 \; = v\theta_2.$$

Inserting for e_1 and e_2 and forming the Lagrangian, we get

$$\mathcal{L}(w, v, \lambda, \mu) = v + v\theta_2 - w - v(v + \theta_2^2 v) - \lambda\left(w + v(v + \theta_2^2 v) - \frac{v^2}{2} - \frac{v^2\theta_2^2}{2} - U_{res}\right) - \mu(v + v\theta_2 - 2(w + v(v + \theta_2^2 v))$$

Taking first derivatives, we get the optimality conditions:

$$\frac{\partial \mathcal{L}}{\partial w} = -1 - \lambda + 2\mu = 0$$
$$\frac{\partial \mathcal{L}}{\partial v} = (1-\mu)(1+\theta_2) - (2+\lambda-4\mu)(1+\theta_2^2)v = 0$$
$$\frac{\partial \mathcal{L}}{\partial \lambda} = U_{res} - \frac{1}{2}(1+\theta_2^2)v^2 - w = 0$$
$$\frac{\partial \mathcal{L}}{\partial \mu} = 2(1+\theta_2^2)v^2 + 2w - (1+\theta_2)v = 0$$

The feasible solution that maximizes Π is presented below:

$$\lambda = -\frac{1+\theta_2}{\sqrt{(1+\theta_2)^2 - 8(1+\theta_2)U_{res}}}$$

$$\mu = \frac{1}{2}(1 - \frac{1+\theta_2}{\sqrt{(1+\theta_2)^2 - 8(1+\theta_2^2)U_{res}}})$$

$$w = -\frac{1 - 8U_{res} + \sqrt{(1+\theta_2)^2 - 8U_{res}\,(1+\theta_2^2)} + \theta_2(2+\theta_2 - 8\theta_2 U_{res} + \sqrt{(1+\theta_2)^2 - 8U_{res}\,(1+\theta_2^2)}}{4(1+\theta_2^2)}$$

$$v = \frac{1+\theta_2 + \sqrt{(1+\theta_2)^2 - 8(1+\theta_2^2)U_{res}}}{2(1+\theta_2^2)}$$

We observe, that an admissible solution exists if, and only if

$U_{res} \leq \frac{(1+\theta_2)^2}{8(1+\theta_2^2)}$ such that $\sqrt{(1+\theta_2)^2 - 8(1+\theta_2^2)U_{res}} \geq 0$. (A.6)

Inserting into the principal's objective function, we obtain the expression in proposition 1.

■

Proof of Proposition 2

(i) In this case, guilt arises if, and only if, the GC is slack. If this is true, the principal's optimization problem becomes

$$\max_{w,v} \Pi = e_1 + e_2 - w - v(e_1 + \theta_2 e_2)$$

s.t.

$$U_a^G \geq U_{res} \qquad \text{(PC)}$$

$$e_i \in \arg\max_{e_i} U_a^E \qquad \text{(IC)}$$

The agent picks her effort to maximize

$$U_a^G = w + v(e_1 + \theta_2 e_2) - \frac{1}{2}(e_1^2 + e_2^2) - \beta[2w + 2v(e_1 + \theta_2 e_2) - e_1 - e_2],$$

Which results in $e_1 = v(1-2\beta) + \beta$ and $e_2 = v\theta_2(1-2\beta) + \beta$.

Assuming that the PC is binding at the optimum and inserting PC, e_1, and e_2 into the principal's objective function and rearranging terms, we obtain

$$\max_v \Pi = \frac{\beta(3\beta - 2) + U_{res}}{2\beta - 1} + v + (\theta - 2\beta(1+\theta))v + \frac{1}{2}(2\beta - 1)(1+\theta^2)v^2$$

Optimizing w.r.t. v results in $v^G = \frac{1+\theta}{1+\theta^2}$ and $w^G = \frac{(1+\theta)^2 - 2\beta(1+\theta)^2 + 2\beta^2(1+\theta^2) - 2(1+\theta^2)U_{res}}{2(2\beta-1)(1+\theta^2)}$.

Checking for slackness of the GC, however, we obtain

$$\Delta = \frac{2}{1-2\beta}[(\beta - 1)\beta - U_{res}] \tag{A.7}$$

Note that $\beta < \frac{1}{2}$ holds by assumption such that the first term in A.7 is positive. For the GC to be slack we require

$$(\beta - 1)\beta - U_{res} < 0$$

$$\Leftrightarrow U_{res} > \beta(1-\beta)$$

Accordingly, a feasible solution exists in which the PC is binding and the GC is slack, if the reservation utility of the agent is sufficiently high.

(ii) Two additional settings are potentially relevant. First, the GC can be binding, while the PC is slack. Second, the GC and the PC can be binding. In both settings, there is no disutility from guilt by construction and the principal's problems coincide with the ones analyzed in case 1 above.

■

Proof of Corollary 3

(ii) Comparing the effort relations $\frac{e_1^{SB}}{e_2^{SB}}$ and $\frac{e_1^G}{e_2^G}$ we need to show that

$$\frac{e_1^{SB}}{e_2^{SB}} = \frac{1}{\theta_2} > \frac{\frac{1+\theta_2}{1+\theta_2^2}(1-2\beta) + \beta}{\frac{\theta_2(1+\theta_2)}{1+\theta_2^2}(1-2\beta) + \beta} = \frac{e_1^G}{e_2^G}.$$

Note that

$$\frac{1}{\theta_2} > \frac{\frac{1+\theta_2}{1+\theta_2^2}(1-2\beta) + \beta}{\frac{\theta_2(1+\theta_2)}{1+\theta_2^2}(1-2\beta) + \beta}$$

$$\Leftrightarrow \frac{\theta_2(1+\theta_2)}{1+\theta_2^2}(1-2\beta) + \beta > \theta_2[\frac{1+\theta_2}{1+\theta_2^2}(1-2\beta) + \beta]$$

$$\Leftrightarrow \beta > \theta_2 \beta,$$

which holds true for $\theta_2 < 1$.

■

Proof of Proposition 3

(i) From lemma 2 and proposition 1 we derived

$\Pi^{SB} = \frac{(1+\theta_2)^2}{2(1+\theta_2^2)} - U_{res}$ and $\Pi^E = \frac{1+\theta_2+\sqrt{(1+\theta_2)^2-8U_{res}(1+\theta_2^2)}}{4(1+\theta_2^2)}(1+\theta_2)$. In order to ensure that the equal-pay contract exists we assume that $U_{res} \leq \frac{(1+\theta)^2}{8(1+\theta^{2})}$.

$$\Pi^{SB} > \Pi^E$$

$$\Leftrightarrow \frac{(1+\theta_2)^2}{2(1+\theta_2^2)} - U_{res} > \frac{1+\theta_2+\sqrt{(1+\theta_2)^2-8U_{res}(1+\theta_2^2)}}{4(1+\theta_2^2)}(1+\theta_2)$$

can be restated to

$$(1+\theta_2^2) - 4(1+\theta_2^2)U_{res} > -(1+\theta_2)\sqrt{(1+\theta_2)^2 - 8(1+\theta_2^2)U_{res}}. \quad \text{(A.8)}$$

As the l.h.s of (A.8) is strictly positive for $U_{res} \leq \frac{(1+\theta)^2}{8(1+\theta^{2})}$ and the r.h.s. is negative, (A.8) is a true statement.

(ii) From lemma 2 and proposition 2 we derived

$\Pi^{SB} = \frac{(1+\theta_2)^2}{2(1+\theta_2^2)} - U_{res}$ and $\Pi^G = \left[\frac{(1+\theta_2)^2}{2(1+\theta_2^2)} - U_{res} - \beta^2 - \frac{8\beta\theta(1-\beta)}{2(1+\theta_2^2)}\right]\frac{1}{1-2\beta}$.

Calculating the difference we define

$$\Delta_{G,SB} \equiv \Pi^G - \Pi^{SB} = \frac{\beta((1-\theta_2)^2+\beta(4-\theta_2)\theta_2-\beta-2(1+\theta_2^2)U_{res})}{(1-2\beta)(1+\theta_2^2)}. \quad \text{(A.9)}$$

Taking the first derivative of $\Delta_{G,SB}$ w.r.t. U_{res} we obtain $\frac{\partial \Delta_{G,SB}}{\partial U_{res}} = 1 - \frac{1}{1-2\beta} < 0.$

It follows that $\Delta_{G,SB}$ is strictly decreasing in U_{res} and $\Delta_{G,SB}$ can only be positive if U_{res} is not too large. Solving the r.h.s. of (A.9) for U_{res} we obtain

$U_{res}^c = \frac{1-\beta}{2} - \frac{(1-2\beta)\theta_2}{1+\theta_2^2}$.

(iii) It remains to be shown, that there exist parameter values such that $\Delta_{G,SB}$ is indeed positive. Recalling that for the guilt inducing contract to exist we require $U_{res} > \beta(1-\beta)$, we need to show that there exist parameter values θ_2 and β such that

$\beta(1-\beta) < \frac{1-\beta}{2} - \frac{(1-2\beta)\theta_2}{1+\theta_2^2}$ holds.

Multiplying by 2 and rearranging yields

$$(1-\beta)(2\beta-1) < \frac{-2(1-2\beta)\theta_2}{1+\theta_2^2},$$

And using $2\beta - 1 = -(1-2\beta)$,

$(1-\beta)(1-2\beta) > \frac{2(1-2\beta)\theta_2}{1+\theta_2^2}$.

Since $\beta < 1/2$ implies $(1-2\beta) > 0$, we can divide by $(1-2\beta)$:

$$(1-\beta) > \frac{2\theta_2}{1+\theta_2^2} \Rightarrow (1-\beta)(1+\theta_2^2) > 2\theta_2.$$

Expanding the l.h.s. and rearranging yields:

$$\beta(1+\theta_2^2) < 1+\theta_2^2 - 2\theta_2.$$

Now recognize $1+\theta_2^2-2\theta_2 = (1-\theta_2)^2$, So:

$$\beta(1+\theta_2^2) < (1-\theta_2)^2$$

Leading to $\beta < \frac{(1-\theta_2)^2}{1+\theta_2^2}$, which holds for a large set of values of β and θ_2.

■

Proof of Proposition 4.

We assume that the SC is slack, i.e. $-\Delta > 0$. If that is the case, the PC must be binding at the optimum. Having derived the optimal contract under these assumptions, we verify slackness of the SC in the optimum.

Given the assumptions above, the principal´s optimization problem equals:

$$\max_{w,v} \Pi^S = e_1 + e_2 - w - v(e_1 + \theta_2 e_2)$$

s.t.

$$U_a^S = U_{res} \qquad (PC)$$

$$e_i \in \arg\max_{e_i} U_a^S \qquad (IC)$$

The agent picks her effort to maximize

$$U_a^S = w + v(e_1+\theta_2 e_2) - \frac{1}{2}(e_1^2+e_2^2) + \gamma[2w + 2v(e_1+\theta_2 e_2) - e_1 - e_2]$$

Optimizing U_a^S w.r.t. e_1 and e_2, we obtain the agent´s incentive compatible choices

$$e_1^S(v) = v(1+2\gamma) - \gamma, \qquad e_2^S(v) = v\theta_2(1+2\gamma) - \gamma. \qquad \text{(A.10)}$$

Assuming that the PC is binding at the optimum and inserting the results from (A.10), the PC reduces to

$$(1+2\gamma)w + \frac{(1+2\gamma)^2 v^2 (1+\theta_2^2)}{2} - \gamma(1+2\gamma)v(1+\theta_2) + \gamma^2 = U_{res}.$$

Solving for w yields

$$w = \frac{U_{res} - \gamma^2}{1+2\gamma} - \frac{(1+2\gamma)v^2(1+\theta_2^2)}{2} + \gamma v(1+\theta_2).$$

Inserting this expression and the ones from (A.10) into the principal´s objective and rearranging terms we obtain:

$$\max_{v} \Pi^S = (1+2\gamma)v(1+\theta_2) - \frac{(1+2\gamma)v^2(1+\theta_2^2)}{2} - 2\gamma - \frac{U_{res}-\gamma^2}{1+2\gamma}.$$

Optimizing w.r.t. v results in:

$$v^S = \frac{1+\theta_2}{1+\theta_2^2}.$$

and we get

$$w^S = \frac{U_{res}-\gamma^2}{1+2\gamma} - \frac{(1+\theta_2)^2}{2(1+\theta_2^2)},$$

and

$$e_1^S = \frac{1+\theta_2}{1+\theta_2^2}(1+2\gamma) - \gamma, \qquad e_2^S = \frac{\theta_2(1+\theta_2)}{1+\theta_2^2}(1+2\gamma) - \gamma$$

Substituting into the principal's objective function results in

$$\Pi^S = \frac{(1+\theta_2)^2(1+2\gamma)}{2(1+\theta_2^2)} - 2\gamma - \frac{U_{res}-\gamma^2}{1+2\gamma}$$

Checking for slackness of the SC, we obtain:

$$-\Delta = \frac{2(U_{res}+\gamma(1+\gamma))}{1+2\gamma} > 0,$$

implying that the SC is always slack.

■

Proof of Proposition 5

$$\Pi^S - \Pi^{SB} = \frac{(1+\theta_2)^2(1+2\gamma)}{2(1+\theta_2^2)} - 2\gamma - \frac{U_{res}-\gamma^2}{1+2\gamma} - \frac{(1+\theta_2)^2}{2(1+\theta_2^2)} + U_{res}$$

Rearranging terms yields:

$$\Pi^S - \Pi^{SB} = \frac{\gamma}{1+2\gamma}\left[2U_{res} + \gamma - \frac{(1+2\gamma)(1-\theta_2)^2}{1+\theta_2^2}\right] \quad \text{(A11)}$$

As $\gamma > 0$, the sign of (A11) depends on the term in brackets such that $\Pi^S - \Pi^{SB} > 0$ if

$U_{res} > \frac{(1+2\gamma)(1-\theta_2)^2}{2(1+\theta_2^2)} - \frac{\gamma}{2}$.

■

Literature Review

Baker, G. (2002). Distortion and Risk in Optimal Incentive Contracts. *The Journal of Human Resources, 37*(4), 728-751. doi:10.2307/3069615

Bartling , B., & von Siemens, F. A. (2010). The intensity of incentives in firms and markets: Moral hazard with envious agents. *Labour Economics, 17*(3), 598-607. doi:https://doi.org/10.1016/j.labeco.2009.10.002

Bartling, B. (2011). Relative performance or team evaluation? Optimal contracts for other-regarding agents. *Journal of Economic Behavior & Organization, 79*(3), 183-193. doi:https://doi.org/10.1016/j.jebo.2011.01.029

Bartling, B. (2012). Multi-tasking and inequity aversion in the linear–exponential–normal moral hazard model. *Economics Letters, 116*(3), 523-525. doi:https://doi.org/10.1016/j.econlet.2012.04.010

Beaud, M., Sun, Y., & Willinger, M. (2026). No effect of endowment risk on dictator giving in the lab. *Economics Letters*. doi:https://doi.org/10.1016/j.econlet.2025.112774

Bolton, G., & Ockenfels, A. (2000). ERC: A Theory of Equity, Reciprocity, and Competition. *American Economic Review, 90*(1), 163-193. doi:10.1257/aer.90.1.166

Charness, G., & Rabin, M. (2002). Understanding Social Preferences with Simple Tests. *The Quarterly Journal of Economics, 117*(3), 817-869. Retrieved from https://www.jstor.org/stable/4132490

Datar, S., Kulp , S. C., & Lambert, R. A. (2001). Balancing Performance Measures. *Journal of Accounting Research, 39*(1), 75-92. doi:https://doi.org/10.1111/1475-679X.00004

Demougin, D., Fluet, C., & Helm, C. (2006). Output and Wages with Inequality Averse Agents. *The Canadian Journal of Economics / Revue canadienne d'Economique, 39*(2), 399-413. Retrieved from https://www.jstor.org/stable/3696161

Dur, R., & Glazer , A. (2008). Optimal Contracts When a Worker Envies His Boss. *Journal of Law, Economics, & Organization, 24*(1), 120-137. Retrieved from https://www.jstor.org/stable/40058159

Englmaier, F., & Wambach, A. (2010). Optimal incentive contracts under inequity aversion. *Games and Economic Behavior, 69*(2), 312-328. doi:https://doi.org/10.1016/j.geb.2009.12.007

Fehr, E., & Schmidt, K. M. (1999). A Theory of Fairness, Competition, and Cooperation. *The Quarterly Journal of Economics, 114*(3), 817-868. Retrieved from https://www.jstor.org/stable/2586885

Fehr, E., & Schmidt, K. M. (2004). Fairness and Incentives in a Multi-Task Principal-Agent Model. *The Scandinavian Journal of Economics, 3*(106), 453-474. Retrieved from https://www.jstor.org/stable/3441119

Feltham, G. A., & Xie, J. (1994). Performance Measure Congruity and Diversity in Multi-Task Principal/Agent Relations. *The Accounting Review, 69*(3), 429-453. Retrieved from https://www.jstor.org/stable/248233

Goldman, E., & Slezak, L. S. (2006). An equilibrium model of incentive contracts in the presence of information manipulation. *Journal of Financial Economics, 80*(3), 603-626. doi:https://doi.org/10.1016/j.jfineco.2005.05.007

Holmstrom , B., & Milgrom, P. (1991). Multitask Principal-Agent Analyses: Incentive Contracts, Asset Ownership, and Job Design. *Journal of Law, Economics, & Organization, 7*, 24-52. Retrieved from https://www.jstor.org/stable/764957

Holmstrom, B. (1979). Moral Hazard and Observability. *The Bell Journal of Economic, 10*(1), 74-91. doi:https://doi.org/10.2307/3003320

Itoh, H. (2004). Moral Hazard and Other-Regarding Preferences. *The Japanese Economic Review*, 18-45. doi:https://doi.org/10.1111/j.1468-5876.2004.00273.x

Rey-Biel, P. (2008). Inequity Aversion and Team Incentives. *The Scandinavian Journal of Economics, 110*(2), 297-320. doi:https://doi.org/10.1111/j.1467-9442.2008.00540.x

Saito, K. (2013). Social Preferences under Risk: Equality of Opportunity versus Equality of Outcome. *American Economic Review, 103*(7), 3084-3101. doi:10.1257/aer.103.7.3084

Takanashi, S. (2025). Heterogeneity of ex post fairness and ex ante fairness. *Economic Theory, 80*, 1085-1118. doi:https://doi.org/10.1007/s00199-025-01651-7

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