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Relational Contracts and Inequity Aversion

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Abstract

We study the effects of envy on the feasibility of relational contracts in a standard moral hazard setup with two agents. Performance is evaluated via an observable, but non-contractible signal which reflects the agent's individual contribution to firm value. Both agents exhibit disadvantageous inequity aversion. In contrast to the literature, we find that inequity aversion may be beneficial: In the presence of envy, for a certain range of interest rates relational contracts may be more profitable. Furthermore, for some interest rates reputational equilibria exist only with inequity averse agents.

Keywords: principal-agent, relational contract, inequity aversion, envy

JEL classification: D63 , D82, M52, M54

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"Implicit contracts can be effective only in a social atmosphere that incorporates a sense of mutual respect and a consensus on principles of fair play and good faith."

ARTHUR M. OKUN[1]

1 Introduction

The present paper investigates how concerns for fairness among agents affect the optimal provision of incentives in a one-task framework with only subjective performance measures. In particular, we analyze the impact of horizontal inequity aversion on the principal's credibility in a relational contract. We find that there are cases where the principal prefers to employ inequity averse rather than inequity neutral agents.

Frequently, if not typically, the agent's true contribution to firm value cannot be objectively assessed. In this case, the use of contractible but imperfect performance measures creates distortions with respect to the agent's effort decision.[2] In many cases, the agent's true contribution to firm value can, nonetheless, be observed by both contracting parties. The observed subjective performance may be used in implicit agreements (relational contracts). As subjective assessments are not verifiable by third parties, contracts are not court-enforceable and, thus, have to be self-enforcing. They may be implemented in long-term relationships as reputational equilibria.[3]

Furthermore, agents' contributions are not necessarily perfectly correlated to their efforts. Thus, agents undertaking the same effort could receive different rewards. This might provoke envy, empathy or spiteful behavior

[1] Okun (1980), p. 8.

[2] There is a vast literature on pay for performance. See e.g. Kerr (1975), Baker (1992), Milgrom and Roberts (1992), and Holmström and Milgrom (1994). For congruency problems see e.g. Holmström and Milgrom (1991) and Baker (2002).

[3] Reputational equilibria may exist if one party cares about her reputation in future relationships. See e.g. Holmström (1981), Bull (1987), and Baker, Gibbons, and Murphy (1994).

among agents, especially if they work on similar tasks.[4] Taking into account the presence of inequity averse preferences, we investigate the feasibility of relational contracts.

We consider a relationship between one principal and two risk-neutral, not financially constrained agents who exhibit disadvantageous inequity aversion. We have in mind employees working on similar tasks in small or medium-size firms. Since workers tend to compare their payoffs with those of their colleagues, we believe the assumption of inequity aversion to be reasonable. Specifically, we model preferences as "self-centered inequity aversion", as proposed by Fehr and Schmidt (1999), abstracting from empathy.[5] Neither agent's effort is directly observable by the principal, albeit imperfectly correlated with individual performance. The principal seeks to mitigate the resulting moral hazard problem by offering each agent an incentive contract contingent on their respective performances.[6] As observed performance is not verifiable, the contract has to be self-enforcing. In modeling the game structure, we follow Bull (1987).

We replicate some results established in the literature. Grund and Sliwka (2005) and Demougin and Fluet (2006) show that more envious agents exert more effort than less envious ones, when being offered identical incentive contracts. However, to ensure participation, the principal has to pay the inequity averse agents a premium to compensate them for the faced risk of unequal payoffs (inequity premium). In this kind of framework, agency costs increase in the presence of inequity aversion, as reported by e.g. Bartling and Siemens (2005) and Grund and Sliwka (2005).[7] Hence, the principal would rather employ inequity neutral than inequity averse agents.

[4] See for experimental evidence of other-regarding preferences e.g. Goranson and Berkowitz (1966), Fehr, Gächter, and Kirchsteiger (1997), Fehr, Kirchsteiger, and Riedl (1995), and Berg, Dickhaut, and McCabe (1995). For the importance of reference groups, see Loewenstein, Thompson, and Bazerman (1989), Falk and Fischbacher (2006), Bolton and Ockenfels (2000), and Bartling and Siemens (2006).

[5] For alternative approaches regarding the formalization of fairness concerns see e.g. Rabin (1993), Bolton and Ockenfels (2000), and Falk and Fischbacher (2006).

[6] We consider agents' tasks to be independent such that there is no inherent advantage in team production. Therefore we focus on individual bonus payments as a natural compensation scheme.

[7] This holds under unlimited liability what is the case we consider. Under limited liability, this might not be true; efficiency may increase under inequity aversion as long as agents receive rents. See e.g. Demougin and Fluet (2003) and Demougin and Fluet (2006).

The present paper analyzes how this conclusion is affected under a relational contract. The principal's credibility constraint requires that her gains from reneging fall short of the discounted gains from continuing the relational contract.[8] We find that this constraint is ambiguously affected by the presence of envy: On the one hand, the incentive for the principal to deviate from the relational contract in order to save bonus expenses decreases in the propensity for inequity aversion. Intuitively, this is due to the fact that envious agents work harder given the same incentive in order to avoid ending up with a lower payoff than their colleagues. This facilitates credible commitment on the principal's side. On the other hand, as agents have to be compensated for their disutility incurred by envy, the principal's long-run profits out of the contract decrease as agents become more envious. Consequently, commitment to paying the offered bonus is more difficult.

The sum of these two counteracting effects determines whether credibility is either more or less easily obtained by the principal as agents become more envious. Whenever the savings due to lower bonus payments exceed the loss of profits via the inequity premium payments, the principal prefers to employ more envious agents.

We identify a necessary and sufficient condition under which, for a certain range of the principal's discount rate, relational contracts are less profitable or even infeasible when agents do not exhibit inequity aversion. In that case, inequity aversion becomes an advantageous factor in principal-agent relationships in the sense that more reputational equilibria can be sustained with envious agents.

Before proceeding with the analysis a few caveat are in order. First, we limit attention to individual bonus schemes. Other contracts would be possible. For example, to align incentives the principal could use tournaments. Here, the principal would not face any credibility problem. However, this reward scheme would exacerbate problems related to inequity aversion. The principal could also use a team bonus structure solely for the purpose of avoiding inequity. This would introduce an alternative trade-off. Specifically, a team bonus implies a weaker relationship between individual effort

[8] We derive this rationality (credibility) constraint analogously to Baker, Gibbons, and Murphy (1994).

and the marginal likelihood of obtaining the bonus. This requires raising the bonus level, making the relational contract less likely.

Second, one has to be aware of the fact that for an individual's perception of fairness and equity many determinants beside the colleague's payoff may play a role; e.g. effort, ability, education, gender, status etc. Cognition of inequity is presumably affected by mutual comparisons regarding all the mentioned characteristics. In our model, due to the agents' homogeneity in both preferences and characteristics, differences in payoffs are the sole source of inequity. Hence, payoff inequality accords with inequity.

The next section describes our basic framework. Subsection 2.1 addresses the agency problem in the single-period game. Subsection 2.2 develops the reputation game and thereby the relational contract. In section 3, we examine the impact of the agent's propensity for envy on the feasibility of the relational contract and derive our main result concerning the principal's credibility problem. Section 4 discusses the implications and concludes.

2 The Model

We consider a repeated game between a principal (the firm) and two agents homogeneous in preferences and characteristics. In each period, each agent chooses an unobservable effort level e_i that stochastically determines the agent's contribution to firm value Y_i. That contribution is either high or low; for simplicity $Y_i \in \{0, 1\}$. It is observable by all three contracting parties, but not verifiable, and can therefore only be used as a performance measure in a self-enforcing relational contract.

By exerting effort agent i $(i = 1, 2)$ affects the probability of $Y_i = 1$:

$$\Pr[Y_i = 1|e_i] = p(e_i), \tag{1}$$

where $p(e_i) \in [0, 1)$, $p(0) = 0$, $p'(e_i) > 0$, and $p''(e_i) < 0$. Agents' outputs are independent.

The principal offers each agent an explicit compensation contract specifying a guaranteed fixed wage w. In addition, the principal announces to pay each agent a bonus b according to his respective contribution to firm value. As the principal's profit is assumed to be additive in the considered task, the principal prefers employing more agents over less. However, taking into account that there are other tasks that are not explicitely captured by the contract investigated, overall she employs just two agents.[9] The principal offers identical compensation contracts.

Provided that the principal keeps her promise, the bonus is paid whenever she observes $Y_i = 1$. Thus, the agent's net monetary payoff $\pi_i - c(e_i)$ is:

$$\pi_i - c(e_i) = w + bY_i - c(e_i), \tag{2}$$

where $c(e_i)$ denotes each agent's costs of effort with $c(0) = 0$, $c'(0) = 0$, $c'(e_i) > 0$, and $c''(e_i) \geq 0$.

Following Fehr and Schmidt (1999), both agents exhibit inequity aversion. In particular, we assume them only to suffer from disadvantageous inequity, i.e. they dislike outcomes where they are worse off than the respective other agent. Each agent observes the other agent's gross monetary payoff. All parties are risk neutral and not financially constrained. For simplicity, the agents' utilities are assumed to be linear in money.

Agent i's utility is given by

$$U_i(\pi_i, \pi_j) = \pi_i - c(e_i) - \alpha \max\{\pi_j - \pi_i, 0\}, \quad \alpha > 0 \tag{3}$$

where α denotes his propensity for envy. The third term thus captures the disutility derived from being worse off than agent j.[10]

[9] Alternatively, we could assume the principal to employ many agents and approach the problem from the perspective of one agent, whereas all the others form his reference group.

[10] Abstracting from costs, Fehr and Schmidt (1999) propose the following utility function: $U_i = \pi_i - \alpha \max\{\pi_j - \pi_i, 0\} - \beta \max\{\pi_i - \pi_j, 0\}$. Incorporating empathy via the parameter β would not significantly affect our results, as it is established to assume $\alpha > \beta$. Moreover, Demougin and Fluet (2006) take costs into account when investigating inequity: $U_i = \pi_i - c(e_i) - \alpha \max\{\pi_j - c(e_j) - \pi_i + c(e_i), 0\}$. This would not change our results. However, an inconvenient discontinuity at the symmetric Nash-equilibrium would be introduced.

The timing of events within each period is as follows. At the beginning of the period, the principal offers each agent the above specified compensation contract. Second, the agents either accept the contract or reject it in favor of an alternative employment opportunity that provides utility U_0. Third, if the agents accept the contract, agents choose simultaneously respective effort levels e_i. Fourth, Y_i is realized and observed by all parties. Finally, the agents receive the explicit fixed wage, and if $Y_i = 1$ the principal decides whether to pay the implicit bonus or not.

2.1 The Single-Period Game

To derive the relational contract, we initially consider the single-period game where we assume performance to be objectively assessable, i.e. there is no credibility problem on the principal's side.

Agent i suffers from disadvantageous inequity amounting to the difference in payoffs,whenever agent j receives the bonus, but agent i does not. Thus, given that agent j exerts effort e_j agent i's expected utility is

$$E[U_i|e_i, e_j] = w + p(e_i)\, b - c(e_i) - \alpha(1 - p(e_i))p(e_j)\, b, \quad i = 1, 2 \wedge i \neq j \quad (4)$$

We focus on the symmetric Nash-equilibrium, where agents exert identical effort levels; $e_i = e_j = e$. The equilibrium is characterized by

$$e = \arg\max_{\widehat{e}} E[U_i|\widehat{e}, e]. \quad (5)$$

The first-order condition yields

$$bp'(e) - c'(e) + \alpha p'(e)\, p(e)\, b = 0. \quad \text{(IC)}$$

Thus, given that the agents exhibit inequity aversion and are faced with a contract with bonus b, they will undertake effort e, implicitely defined by

$$\frac{c'(e)}{(1 + \alpha p(e))\, p'(e)}. \quad (6)$$

To put it differently, when agents are characterized by inequity aversion α and the principal wants to induce effort e, she has to offer a bonus

$b(e;\alpha)$ defined by (6). Holding e constant and implicitely differentiating (6) with respect to α yields the effect of a variation of the degree of inequity aversion on the workers' willingness to undertake effort for a given bonus level.

Proposition 1 *With an increasing propensity for envy, the agents exert more effort for any given bonus.*

Proof. $\frac{\partial b(e;\alpha)}{\partial \alpha} = -\frac{p(e)}{p'(e)} \frac{c'(e)}{(p(e)\alpha+1)^2} < 0$ ■

Intuitively, as envious agents suffer from being worse off than their co-workers to a larger extent than standard agents, they exert relatively higher levels of effort in order to decrease the probability of not getting the bonus. This incentive-strengthening effect is in line with Demougin and Fluet (2006).[11] In the remainder of the paper, we will refer to it as the *bonus effect*.

The principal's profit per agent i is $V(e_i;\alpha) = (1 - b(e_i;\alpha)) Y_i - w$. Hence, she solves

$$\max_{e} \quad (1 - b(e;\alpha)) p(e) - w \tag{7}$$

$$s.t. \quad E[U_i|e,e] \geq U_0, \tag{PC}$$

$$bp'(e) - c'(e) + \alpha p'(e) p(e) b = 0, \tag{IC}$$

where (PC) ensures participation. Since we assume unlimited liability, the participation constraint binds, leading to zero rent for the agents in the optimal contract. In equilibrium, for each agent holds

$$w + p(e) b = c(e) + \alpha(1 - p(e)) p(e) b + U_0. \tag{8}$$

The second term on the right-hand side in equation (8) is the inequity premium. Hence, expected wage costs per agent are equal to the sum of his costs of effort, his reservation utility, and the inequity premium.

[11] In the context of tournaments, Grund and Sliwka (2005) and Demougin and Fluet (2003) report the same result.

Substituting w and b in the principal's objective function by using (8) and (6), her problem simplifies to

$$\max_{e} \; p(e) - c(e) - \alpha p(e)(1-p(e)) \frac{c'(e)}{(1+\alpha p(e)) p'(e)} - U_0. \tag{9}$$

Let the effort level that maximizes the principal's profit (9) be denoted e^*. In the subsequent sections, e^* will serve as a benchmark.

Proposition 2 *For any given e, with verifiable performance, total agency costs increase in the propensity for envy, α.*

Proof. The derivative of (9) w.r.t. α is negative, as $-\frac{c'(e)}{p'(e)} \frac{p(e)(1-p(e))}{(p(e)\alpha+1)^2} < 0$.

■

Despite the bonus effect the principal faces higher costs when agents are inequity averse. This result is due to the fact that the principal needs to compensate the agent for his expected disutility from inequity in order to ensure participation. We refer to this wage cost-augmenting effect as *inequity premium effect*. This result is in line with the agency literature, see e.g. Bartling and Siemens (2005) and Grund and Sliwka (2005).

2.2 The Repeated Game

To model the relational contract, we embed the foregoing stage game into an infinitely repeated game, considering trigger strategy equilibria. Following Bull (1987), we assume that each agent has a finite working life, whereas the firm is assumed to be infinitely-long lived. If the principal reneges on the promised bonus once, no agent will ever again believe the firm to fulfill the contract, as the information on the principal's deviation from the relational contract is rapidly transmitted to the labor market.

As effort is not contractible, agents will exert zero effort if relational contracts are infeasible, corresponding to a closure of the firm and resulting in a fallback profit of zero: $V^F = 0$. If relational contracts are feasible, the principal realizes a continuation profit from the long-term relationship, denoted $V^C(e;\alpha)$, corresponding to expected profit defined in (9).

For the relational contract to be self-enforcing, the gains from reneging must fall short of the gains from continuing the relational contract. This is required to hold for all realizations of performance. If both agents perform successfully, $Y_i = Y_j = 1$, the principal's incentive to renege on the relational contract is strongest, as her resulting one-time benefit from deviation amounts to twice the bonus. Concerning her reputation, it does not make any difference whether she refuses to pay just one or both bonuses. Thus,

$$b\left(e;\alpha\right) \leq \frac{V^C\left(e;\alpha\right)}{r} \tag{RC}$$

constitutes the reneging constraint of the principal (RC). Whether condition (RC) can be satisfied or not, depends on the firm's interest rate r.

3 The Optimal Relational Contract

In the following, we investigate whether an increase in the propensity for envy facilitates the feasibility of relational contracts, i.e. whether the principal may commit herself for higher levels of r, provided that agents are envious, compared to the case of non-envious agents.

The different effects of envy on the feasibility of relational contracts can be understood by closer examination of condition (RC). The impact of α is twofold. On the one hand, as shown in Proposition 1, we observe the *bonus effect*; $\frac{\partial b}{\partial \alpha} < 0$. Consequently, the incentive of a one-time-deviation from the relational contract in order to save bonus expenses decreases. On the other hand, the *inequity premium effect* lowers the principal's profit from contract continuation; $\frac{\partial V^C}{\partial \alpha} < 0$, as shown in Proposition 2. Thus, fulfilling the relational contract is less attractive to the principal.

Hence, depending on the overall effect of α on (RC) commitment power of the principal may either become stronger or weaker as agents become more envious. In the former case, more reputational equilibria can be sustained with envious agents. In the following, we analyze condition (RC) and the relative impact of the described effects in greater detail.

To illustrate the issue we use an example represented in Figure 1. Specifically, we assume $\alpha = 0.2$, $p\left(e\right) = 1 - \exp\left(-e\right)$, $c\left(e\right) = \frac{1}{8}e^2$, and $U_0 = 0.1$.

The figure plots the principal's expected profit $V^C(e;\alpha)$. The convex curves depict $rb(e;\alpha)$ for various discount rates.

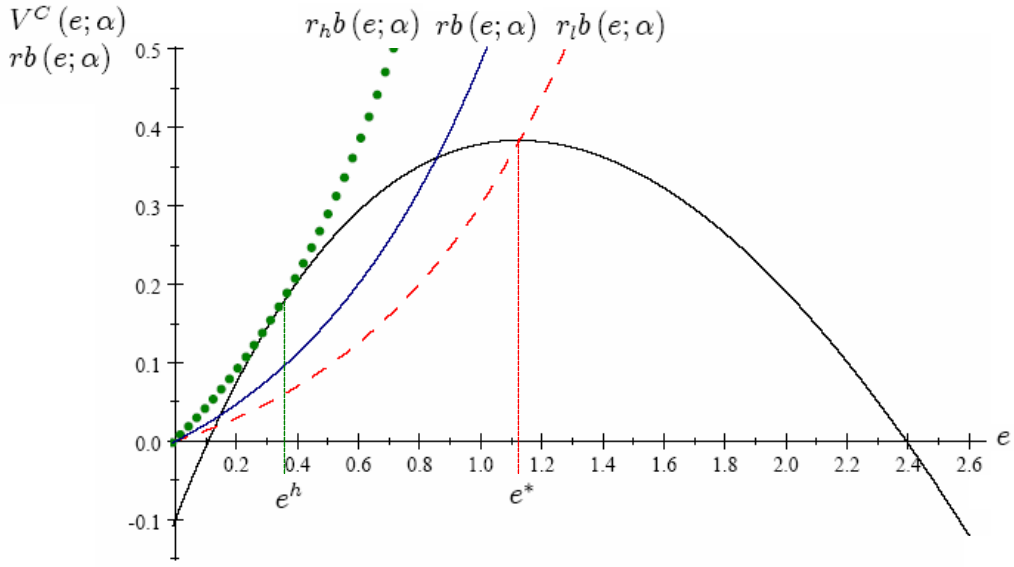

Figure 1: Reneging Constraint for $p(e) = 1 - \exp(-e)$, $\alpha = 0.2$, $c(e) = \frac{1}{8}e^2$, and $U_0 = 0.1$.

For a sufficiently *low interest rate* the (RC) does not bind. The principal implements the profit-maximizing benchmark effort level e^* (equivalent to the case of verifiable performance). We denote the threshold interest rate where the (RC) just becomes binding for any higher interest rate r_l. The dashed line illustrates $r_lb(e;\alpha)$.

The solid curve depicts $rb(e;\alpha)$ for a *medium interest rate* where the (RC) binds. To ensure credibility on the one hand and to maximize profits on the other hand, the principal will always choose to implement the maximum effort that just satisfies the (RC), i.e. the effort where $V^C(e;\alpha)$ and $rb(e;\alpha)$ intersect at the highest possible e. The figure illustrates that the optimal effort declines as the principal's discount rate or the agents' alternative utilities increase.[12]

[12] This result has also been shown by Baker, Gibbons, and Murphy (1994).

For a sufficiently *high interest rate* condition (RC) cannot be satisfied. The interest rate r_h where the (RC) can just be fulfilled via adjustment of e, is characterized by $r_h b(e;\alpha)$ being tangent to $V^C(e;\alpha)$. The effort level implemented at this threshold is denoted e^h. Relational contracts are infeasible for any interest rate higher than the threshold interest rate r_h. The dotted line, $r_h b(e;\alpha)$, represents this marginal case.

r_h and e^h are implicitely defined as the solution of the following $2 \times 2-$ system consisting of the binding reneging constraint and the tangency condition:

$$\begin{aligned} r &= \frac{V^C(e;\alpha)}{b(e;\alpha)} \\ r\frac{\partial b(e;\alpha)}{\partial e} &= \frac{\partial V^C(e;\alpha)}{\partial e} \end{aligned} \tag{10}$$

The higher the marginal interest rate r_h is, the greater is the range of interest rates the principal may credibly commit for. The value of r_h is determined by the agents' propensity for envy. By investigating the impact of α on r_h we derive the following result.

Proposition 3 *An increasing propensity for envy enhances the feasibility of the relational contract, iff the following condition holds:*

$$p\left(e^h\right) > \frac{\left(c\left(e^h\right) + U_0\right) p'\left(e^h\right) + c'\left(e^h\right)}{p'\left(e^h\right) + c'\left(e^h\right)} \tag{11}$$

Proof. See Appendix. ■

The necessary and sufficient condition (11) assures that the bonus effect outweighs the inequity premium effect. The principal's incentive to renege on the bonus payments is sufficiently low such that the negative impact of envy on the continuation profit is overcompensated. Whether condition (11) holds, depends on the particular way the performance measure is affected by effort in relation to the costs of effort and the alternative utility. The condition can only be fulfilled, if the sum of effort costs and alternative utility is smaller than unity. Further, if the marginal probability of generating a favorable outcome is high relative to the marginal costs of effort, the condition is more easily fulfilled.

Thus, we find that in the reputation game a high propensity for envy may be advantageous for the principal regarding her commitment power. There exist cases, where the principal can build up a long-term contractual relationship with inequity averse agents, whereas with inequity neutral agents she cannot. Hence, under the above condition (11) reputational equilibria can be sustained for a greater range of interest rates with inequity averse agents.

Figure 2 illustrates our result for the example functions introduced on page 11. It plots the principal's profit under the optimal contract for any level of r; $V^*(r,\alpha) = \max V^C(e;\alpha)$, s.t. $b \leq V^C/r$. The solid curve depicts her profit under the relational contract, if α takes a high value ($\alpha = 0.8$). The dashed curve depicts her profit, if agents do not exhibit any propensity for envy ($\alpha = 0$). The example function satisfies condition (11), i.e. $r_h(0.8) > r_h(0)$.

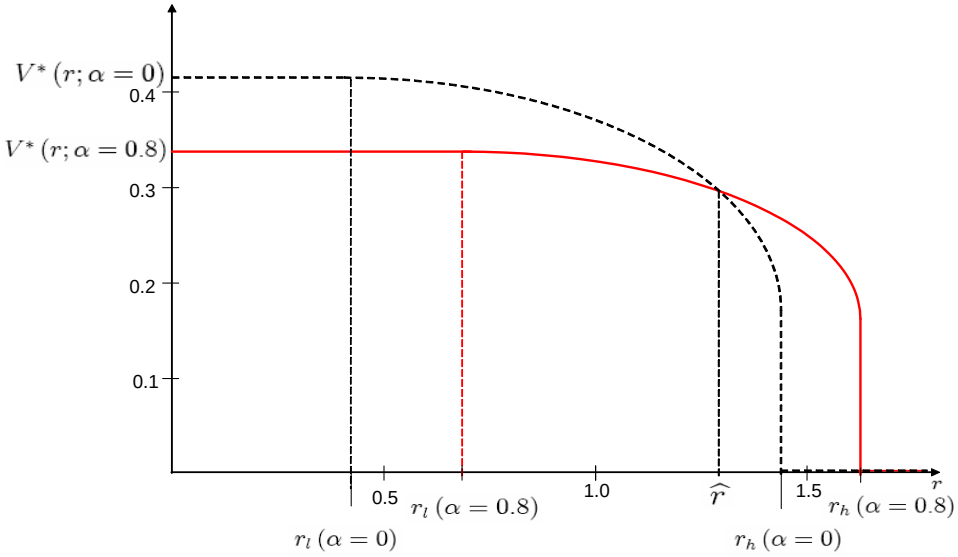

Figure 2: Profits with inequity neutral and inequity averse agents for $p(e) = 1 - \exp(-e)$, $c(e) = \frac{1}{8}e^2$, and $U_0 = 0.1$.

For any functions satisfying condition (11), the following considerations hold. For sufficiently low interest rates r, i.e. interest rates below the respective lower interest thresholds, $r \leq r_l(\alpha)$, a relational contract is feasible and the optimal effort level e^* can be induced by the principal. $V^*(e^*;\alpha)$ is

realized.

For any interest rate r inbetween the respective lower and upper threshold levels, i.e. $r_l(\alpha) < r \leq r_h(\alpha)$, effort e has to be adapted such that (RC) is fulfilled. Profits, $V^*(e;\alpha)$, decrease in this range as interest rates increase. However, depending on the value of α, profits decrease at different rates.

When r takes a value higher than the critical value $\widehat{r}$, continuation profits from employing envious agents exceed those from employing non-envious ones. Even more importantly, there exist some r inbetween the upper thresholds, i.e. $r_h(\alpha_{low}) < r \leq r_h(\alpha_{high})$, for which relational contracts are feasible with more inequity averse agents, whereas the principal cannot credibly commit herself when dealing with less inequity averse agents. Reputational equilibria can be sustained for a greater range of interest rates in the presence of inequity aversion on the agents' sides.

4 Concluding Remarks

We consider optimal individual incentive schemes in a principal-agent relationship with two identical agents who exhibit horizontal disadvantageous inequity aversion. As there are only subjective performance measures available to evaluate the agents' performances, the bonus contracts are enforced in a reputational equilibrium.

The analysis focuses on the impact of the agents' propensity for envy on the principal's commitment power that determines the feasibility of the relational contract. There are two countervailing effects at work: As agency costs increase due to inequity aversion, the principal's profits from the contract decrease as agents become more envious. Thus, continuation of the relational contract becomes less attractive. On the other hand, inequity aversion serves as an incentive-strengthening device. This implies that the principal has to pay a lower bonus to implement the same effort given that agents are envious, thereby reducing her benefit from a one-time deviation. We identify a necessary and sufficient condition assuring that the principal's ability to commit increases as agents become more envious.

This result has several implications. The implementation of a relational contract might not be possible with inequity neutral agents, when the return on the principal's alternative investment possibilities is relatively high. Thus, this could lead her to displace production to countries, where people generally exhibit a greater degree of inequity aversion due to cultural differences.[13]

Further, one could expect a more frequent implementation of relational contracts in countries whose populations are more sensitive to inequity aversion. This hypothesis is in line with the findings of Moriguchi (2003), who explains differences in institutional arrangements in the U.S. and Japan, pointing out that the U.S. was hit harder by the Great Depression compared to Japan. This goes along with lower continuation profits and, thus results in the less frequent use of relational contracts in the U.S. According to our analysis, a depreciation of future profits has a less severe impact on the feasibility of relational contracts if employees are inequity averse. Hence, these countries' differences in the propensity for inequity aversion could also play a role for the explanation of differences in institutional arrangements in this context.[14]

Appendix

Proof of Proposition 3. Differentiation of r^h yields

$$\frac{\partial r^h}{\partial \alpha} = \frac{\left(\frac{\partial V^C}{\partial e}\Big|_{e=e^h} b - V^C \, \frac{\partial b}{\partial e}\Big|_{e=e^h} \right) \frac{\partial e}{\partial \alpha} + \frac{\partial V^C}{\partial \alpha}\Big|_{e=e^h} b - V^C \, \frac{\partial b}{\partial \alpha}\Big|_{e=e^h}}{b^2}. \quad (12)$$

The system (10) implies

$$\frac{\partial V^C}{\partial e}\bigg|_{e=e^h} b\left(e^h;\alpha\right) - V^C(e^h;\alpha)\, \frac{\partial b}{\partial e}\bigg|_{e=e^h} = 0. \quad (13)$$

With (13), (12) simplifies to

[13] Alesina, Di Tella, and MacCulloch (2004) and Corneo (2001) find Europeans to exhibit a higher propensity for inequity aversion in comparison to U.S. Americans.

[14] Empirical evidence suggests that the Japanese exhibit stronger inequity aversion than e.g. U.S. Americans.

$$\frac{\partial r_h}{\partial \alpha} = \frac{\frac{\partial V^C}{\partial \alpha}\Big|_{e=e^h} b - V^C \left.\frac{\partial b}{\partial \alpha}\right|_{e=e^h}}{b^2}. \tag{14}$$

To decide upon the effect of α on r_h the sign of equation (14) is crucial:

$$sign\left(\frac{\partial r_h}{\partial \alpha}\right) = sign\left(\left.\frac{\partial V^C}{\partial \alpha}\right|_{e=e^h} b - V^C \left.\frac{\partial b}{\partial \alpha}\right|_{e=e^h}\right) \tag{15}$$

Substituting V^C as given in (9) and with

$$\frac{\partial V^C\left(e^h;\alpha\right)}{\partial \alpha} = -b\left(1-p\left(e^h\right)\right)p\left(e^h\right) - \alpha\left(1-p\left(e^h\right)\right)p\left(e^h\right)\left.\frac{\partial b}{\partial \alpha}\right|_{e=e^h}$$

equation (15) further simplifies to

$$sign\left(\frac{\partial r_h}{\partial \alpha}\right) = sign\left(-b^2\left(1-p\left(e^h\right)\right)p\left(e^h\right) - \left(p\left(e^h\right) - c\left(e^h\right) - U_0\right)\frac{\partial b}{\partial \alpha}\right). \tag{16}$$

With $b\left(e^h;\alpha\right) = \frac{c'\left(e^h\right)}{\left(1+\alpha p\left(e^h\right)\right)p'\left(e^h\right)}$ as given in (6) and

$$\frac{\partial b\left(e^h;\alpha\right)}{\partial \alpha} = -\frac{c'\left(e^h\right)p\left(e^h\right)p'\left(e^h\right)}{\left(\left(1+\alpha p\left(e^h\right)\right)p'\left(e^h\right)\right)^2}$$

equation (16) results in

$$sign\left(\frac{\partial r_h}{\partial \alpha}\right) = sign\left(-c'\left(e^h\right)\left(1-p\left(e^h\right)\right) + \left(p\left(e^h\right) - c\left(e^h\right) - U_0\right)p'\left(e^h\right)\right). \tag{17}$$

Thus,

$$\frac{\partial r_h}{\partial \alpha} > 0 \quad \text{iff} \quad p\left(e^h\right) > \frac{\left(c\left(e^h\right)+U_0\right)p'\left(e^h\right)+c'\left(e^h\right)}{p'\left(e^h\right)+c'\left(e^h\right)}.$$

■

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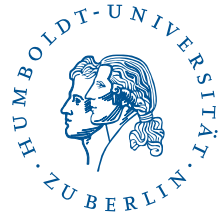

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