Standard Wages, Incentive Contracts, and Employment: The Role of Envy Among Unequals*

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August 24, 2023

Abstract

In many countries, wages are set by collective agreements, which tend to impose standard wages across workers in the same sector and job. We analyze the impact of imposing such standard wages on labor market outcomes. We set the labor relationship in a moral-hazard environment where two inferiority averse workers who differ only in their productive abilities may be hired by an employer. The latter offers the workers incentive contracts with identical fixed wages and potentially individualized bonuses. In this environment, we highlight the interaction between worker characteristics, optimal incentive contracts, and employment. We find that, absent any further restrictions on the incentive contracts, fixed-wage equality implies bonus equality. However, once the workers' aversion to inferiority becomes sufficiently high, the optimal contract deters the low-ability worker from accepting it, thereby generating unemployment even if productivity differences between the workers are small. Finally, in the more realistic case of limited liability, bonus pay is tailored to the workers' productivities as long as rents are paid. In that case, the presence of social preferences makes unemployment less likely due to the intrinsic incentives arising from the workers' social preferences.

JEL Classifications: D63, D82, M52, M54

Keywords: incentive contracts, wage equality, heterogeneous agents, social preferences, inequality, inferiority aversion, unemployment

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*We thank Peymaneh Safaynikoo for the input provided to the first part of this article in the context of her Doctoral research at the EBS Universität für Wirtschaft und Recht, Wiesbaden. All remaining errors are ours.

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1 Introduction

In many countries, wages are set through collective bargaining (Bhuller et al. (2022)). Such agreements are typically sectoral, whereby employers and labor unions agree on wage scales that may depend on occupational category, professional attributes, skill levels, and the like. While in many cases the agreed-upon standard wage serves as a lower bound, actual wages often exceed that lower bound, thereby creating a "wage cushion" (Cardoso and Portugal (2005), Card and Cardoso (2022)). Nevertheless, in the majority of European countries, actual wages closely adhere to the standard wage across all workers subject to the agreement (see Fig. 4 in Schulten and the WSI Collective Agreement Archive (2022) and Figs. 1, 3 in Delahaie et al. (2015)). Moreover, according to Card and Cardoso (2022:7), in the US, "a union contract specifies a grid of wages for different jobs, and *all workers in the same job receive the same pay*" (italics in the original). According to an OECD study, such wage-setting practices account for the fact that wage inequality is generated mostly by differences in average wages between firms whereas within-firm differences are much smaller (see OECD (2021), Ch. 2).

In the given paper, we study the impact of standardized wage agreements on labor market outcomes. More specifically, we analyze the structure of optimal incentive contracts offered to heterogenous workers when employers need to adhere to exogenously given standard-wage constraints. For that purpose, we devise a moral-hazard environment with teams consisting of two workers who differ in their productive abilities but are identical otherwise. These ability differences are commonly known and manifest themselves in the production function.[1] Furthermore, employees work in close proximity to one another and have social preferences. More specifically, they have a distaste for earning less than their co-worker, i.e., they are *inferiority averse* with respect to monetary payoffs.[2] Accordingly, the employer aligns objectives by means of individual incentive (bonus) contracts under an equal-fixed wage constraint. The employer may also decide to refrain from employing the lower-ability worker, thereby avoiding the potential cost related to the workers' other-

[1] As our focus is on the effects of the exogenous standard-wage restriction, we abstract from productive synergies within the team. In a complementary paper, we consider a setting with social preferences that encompasses productive synergies (see Kragl et al. (2022)).

[2] The related literature commonly uses the notions of "envy". This concept invokes an emotional interpretation. We prefer to use the more neutral notion of "inferiority" aversion instead.

regarding preferences.

We separately consider two scenarios, a benchmark where the employer can extract rents from workers and a more realistic case where this is impossible because workers are protected by a limited-liability constraint. In the first case, constraining employers to pay equal fixed wages compels them to offer identical incentive contracts notwithstanding the workers' ability differences. In particular, the *same* fixed wage must be used to extract *both* workers' information rents. Consequently, the optimal contract offered when both workers are employed entails costs arising from the fact that it elicits suboptimal effort from the higher-ability workers which is not fully compensated by the lower-ability worker's supra-optimal effort. As a result, the employer may find it beneficial to design the optimal contract that entices only the high-ability worker to participate, leaving the lower-ability one unemployed. This is the case when the ability differences between these workers are substantial or when the intensity of their other-regarding preferences is sufficiently large. Accordingly, the emergence of unemployment in this environment depends on the interaction between these two worker characteristics. In particular, if inferiority aversion plays a significant role, imposing fixed-wage equality may generate unemployment even when productivity differences are relatively minor.

Under limited liability, the picture changes dramatically as long as at least one of the two workers receives an informational rent. When both workers earn a rent, fixed-wage equality is endogenously attained. However, in this case, bonuses generally differ across workers in correspondence with their different productivities. This enables the employer to exploit the *incentive effect of envy* to elicit higher efforts from both workers. The employer's ability to exploit envy disappears once ability differences or the intensity of inferiority aversion become sufficiently high to dissipate rents. In that case, the scenario reverts to the one under unlimited liability. Bonuses again become equalized and, depending on the extent of productivity differences and inferiority aversion, unemployment may emerge.

Theoretically, the impact of other-regarding preferences in the firm context has been investigated in agency models, yet their focus is on homogeneous workers (see, e.g., Bartling (2011), Bartling and von Siemens (2010), Demougin and Fluet (2006), Demougin et al. (2006), Englmaier and Wambach (2010), Grund and Sliwka (2005), Kragl and Schmid

(2009), or Neilson and Stowe (2010)). Agency models that consider productivity differences among workers and within teams typically disregard social preferences and peer effects other than productive synergies. Empirically, the relevance of other-regarding preferences has been manifested in many studies specifically through the emergence of peer effects which have been shown to have a positive impact on productive efforts and outcomes in various environments. Particularly pronounced are such effects under circumstances that are consistent with the presence of inferiority aversion.[3] It is the combination of social preferences with productivity differences that allows us to highlight how these features interact and how this interaction affects optimal incentive contracts and employment.

The remainder of the paper is organized as follows. in the next section, we present the model. In Section 3, we first consider the workers' problems, derive the optimal incentive contracts, and discuss the employer's optimal hiring decision. In Section 4, we turn to the case where workers are protected by limited liability. Section 5 concludes.

2 The Model

Consider a one-period environment in which a risk neutral employer (she) may hire one or two risk neutral workers (he) to perform a productive task. The workers $i = L, H$ differ only in their commonly known ability θ_i, whereby $\theta_H > \theta_L$. If hired, a worker's output depends on his ability as well as his productive effort $e_i \in [0, \bar{e}]$ as follows:

$$Y_i = \theta_i e_i \tag{1}$$

For both workers', effort cost is equally represented by an increasing and strictly convex function, $c(e)$, with $c(0) = 0$, $c'(e) > 0$, $c''(e) > 0$. By imposing identical effort-cost functions, here we take the stand that attitudes towards hard work are universal and thereby independent of ability.[4]

A remark is in order. Another common way to formalize ability differences agency

[3] For a detailed discussion of this literature, see our complementary paper Kragl et al. (2022).

[4] In line with this, the term "effort cost" is commonly used in the context of project costing and is measured in terms of human labor hours (see, e.g. https://ec.europa.eu/newsroom/just/items/643967). In terms of our model, it is the quality of the deliverables that may vary rather than the effort that is required to produce them.

models is through differences in effort-cost functions (see, e.g., Holmström and Milgrom (1991)). Absent further constraints, this strategy is observationally equivalent to a modeling of ability differences through productivity. However, as it turns out, in our setting, the two specifications are no longer equivalent.[5]

If employed, workers are in general other-regarding, as represented by the following utility function:

$$U_i(W_i, W_j, e_i) = W_i - c(e_i) - \alpha \max\{W_j - W_i, 0\}, \quad i = L, H;\ i \neq j, \tag{2}$$

where W_i and W_j denote the workers' publicly known ex-post wage payments and $\alpha \geqslant 0$ represents a worker's sensitivity to (disadvantageous) inequality. Accordingly, the last term of the utility function reflects that worker's disutility associated with learning that his wage is lower than his co-worker's. We refer to this attitude as *inferiority aversion* and to α as the *intensity* thereof.[6] If unemployed, a worker's utility is set to be zero and no social comparison takes place. This reflects our focus on social comparisons that arise within organizational units where co-workers are the relevant reference group.[7]

Total output accrues to the employer and is given by:

$$Y = \delta_L Y_L + \delta_H Y_H = \delta_L \theta_L e_L + \delta_H \theta_H e_H, \tag{3}$$

where $\delta_i \in \{0, 1\}$ indicates whether worker i is employed ($\delta_i = 1$) or not ($\delta_i = 0$). Individual efforts and output as well as total outputs are not verifiable. However, the employer observes a contractible effort-related signal for each worker $s_i \in \{0, 1\}$, where:

$$\Pr[s_i = 1 | e_i] = p(e_i), \tag{4}$$

[5] In fact, the consequences of this subtle difference on the optimal contracts in our setting implies that the usual observational equivalence does not hold under any circumstance (see Proposition 1).

[6] In our formulation of the utility function, income comparisons involve gross-of-effort-cost wages. This represents the idea that comparisons are based on observables rather than private information or beliefs. Moreover, as we show later, under this circumstance, effort cost would anyway play no role in the comparison as they turn out to be equal in equilibrium.

[7] There is plenty of evidence regarding the importance of social and physical proximity for the formation of reference groups. As noted by Obloj and Zenger (2017:1), "the more proximate socially, structurally, or geographically are those to whom one socially compares, the larger the behavioral response (p.1)." For an alternative specification in a different context, where social comparision occurs within a societal context, see Bental and Kragl (2021).

with $p(e) \in [0,1]$, $p(0) = 0$, $p(\bar{e}) = 1$, $p'(e) > 0$, $p''(e) \leqslant 0$. The employer uses this signal to align incentives. We assume that workers must be paid the same fixed wage. Accordingly, each worker is offered an incentive contract (w,b_i), consisting of a fixed wage, w, and a bonus, b_i, paid when $s_i = 1$.

The timeline of the model is as follows. First, the employer proposes each worker i a take-it-or-leave-it contract, (w, b_i). Then the workers decide whether to reject the contract and obtain an alternative utility of zero, or to accept it and choose an effort e_i. Finally, the employer obtains the output and pays the wages according to the contract.

A remark is in order. In our model, we focus on individual bonus contracts. Notice that offering group bonuses, whereby contingent bonuses are always identical for both workers, would avoid the realization of inferiority aversion altogether.[8] We disregard such contracts because it is the behavioral response due to envy which we are interested in. In fact, we show below that, under limited liability, the employer benefits precisely from this behavioral response under individual incentive pay. Moreover, individual incentives are the norm rather than the exception in real-world incentive contracts.

3 Optimal Incentive Contracts with Unlimited Liability

In this section, we consider the scenario where the employer can extract rents from workers, i.e., there is no lower bound to the workers' wage payment. We first consider the workers' problem, then solve for the optimal incentive contracts when both workers are employed, and subsequently analyze the employer's optimal hiring decision.

3.1 Workers' Problems

Provided both workers $i = L, H$ accept their respective contracts (w, b_i), they face the following contingent payoff matrix:

	$s_H = 0$	$s_H = 1$
$s_L = 0$	w, w	$w, w + b_H$
$s_L = 1$	$w + b_L, w$	$w + b_L, w + b_H$

[8]See our companion paper for the tradeoffs arising when also group bonuses are allowed (Kragl et al. (2022)).

Accordingly, each worker chooses effort to maximize his expected utility:

$$\max_{e_i} w + p(e_i)\, b_i - c(e_i) - \alpha \left[p(e_j) \left(1 - p(e_i)\right) b_j - p(e_i)\, p(e_j) \max\{(b_j - b_i), 0\} \right], \ i \neq j \tag{5}$$

Given the constraint on the fixed wage, the maximization problem (5) reflects two possible realizations of the signal pair (s_i, s_j) where the inferiority aversion element of worker i becomes (potentially) effective. First, when $(s_i = 0, s_j = 1)$ so that worker j obtains the bonus but worker i does not. Second, when $(s_i = 1, s_j = 1)$, i.e. both workers obtain the bonus, provided that $b_j > b_i$.

The corresponding first-order condition associated with problem (5) is:

$$p'(e_i)\, b_i - c'(e_i) - \alpha \left[-p(e_j) p'(e_i)\, b_j - p'(e_i)\, p(e_j) \max\{(b_j - b_i), 0\} \right] = 0 \tag{IC}$$

Finally, worker i participates if the contacts (w, b_i) and (w, b_j) together with the effort levels (e_i, e_j) satisfy:

$$w + p(e_i)\, b_i - c(e_i) - \alpha \left[p(e_j) \left(1 - p(e_i)\right) b_j - p(e_i)\, p(e_j) \max\{(b_j - b_i), 0\} \right] \geq 0, \ i \neq j \tag{PC}$$

3.2 Incentive Contracts

The employer chooses (w, b_H, b_L) in order to maximize expected profit subject to (IC):

$$\Pi(e_H, e_L, w, b_H, b_L, \delta_H, \delta_L) = \delta_H \theta_H e_H + \delta_L \theta_L e_H - \delta_H \left(w + p(e_H) b_H\right) - \delta_L (w + p(e_L) b_L) \tag{6}$$

Note that the employer may find it optimal to choose a contract structure that induces only worker H to participate, a case to which we turn below. In the sequel, we focus on the case where both workers are employed, i.e., $\delta_L = \delta_H = 1$.

To explore the optimal contract, we assume without loss of generality that $b_j\,(e_i, e_j) >$

$b_i\left(e_i, e_j\right)$, thereby obtaining from (IC):

$$\begin{aligned} b_i\left(e_i, e_j\right) &= \frac{c'(e_i)}{p'(e_i)(1+\alpha p(e_j))} \\ b_j\left(e_i, e_j\right) &= \frac{c'(e_j)}{p'(e_j)} - \alpha p(e_i) b_i\left(e_i, e_j\right) \end{aligned} \tag{7}$$

We start the analysis by stating the following observation:

Observation 1 *The function*

$$f\left(e\right) \mathrel{\hat{=}} p\left(e\right) \frac{c'(e)}{p'(e)} - 2c\left(e\right)$$

is monotone increasing.

Proof. All proofs are relegated to the Appendix. ■

Using this observation, we can also establish the following:

Claim 1 *If $b_j \geq b_i$, then (PC) implies:*

$$\begin{aligned} p\left(e_j\right) b_j - c(e_j) - \alpha p(e_i)\left(1 - p\left(e_j\right)\right) b_i\left(e_i, e_j\right) &\geq p\left(e_i\right) b_i\left(e_i, e_j\right) - c(e_i) \\ -\alpha\left[p(e_j)\left(1 - p\left(e_i\right)\right) b_j\left(e_i, e_j\right) + p\left(e_i\right) p\left(e_j\right)\left(b_j\left(e_i, e_j\right) - b_i\left(e_i, e_j\right)\right)\right] \end{aligned} \tag{8}$$

The claim implies that the employer sets the wage w sufficiently high to just induce the participation of worker i, i.e.:

$$w = -\left[p\left(e_i\right) b_i\left(e_i, e_j\right) - c(e_i) - \alpha\left(p(e_j) b_j\left(e_i, e_j\right) - p\left(e_j\right) p\left(e_i\right) b_i\left(e_i, e_j\right)\right)\right] \tag{9}$$

Using (9), the employer faces the following maximization problem:

$$\begin{aligned} \max_{e_i, e_j} \quad & \theta_i e_i + \theta_j e_j - p\left(e_i\right) b_i\left(e_i, e_j\right) - p(e_j) b_j\left(e_i, e_j\right) \\ & -2\left[c(e_i) - p\left(e_i\right) b_i\left(e_i, e_j\right) + \alpha\left(p(e_j) b_j\left(e_i, e_j\right) + p\left(e_j\right) p\left(e_i\right) b_i\left(e_i, e_j\right)\right)\right] \\ & s.t. \quad (7), (A.II) \end{aligned} \tag{I}$$

The next proposition states this section's key result.

Proposition 1 *Consider the case of unlimited liability. Let the employer be faced by the triplet* $(\alpha, \theta_H, \theta_L)$ *and suppose that inducing both workers to participate is optimal. Then i) neither worker earns a rent and ii) the employer offers both of them the same incentive contact* $\left(w^U, b^U\right) = \left(w\left(\alpha, \theta_H, \theta_L\right), b\left(\alpha, \theta_H, \theta_L\right)\right)$.

The foregoing result shows that an employer who finds it optimal to hire both workers offers them the same incentive contract despite their different ability levels. Notably, the result is independent of the workers' other-regarding preference. Due to the restriction on the fixed payment, the employer cannot attain the first-best outcome even when $\alpha = 0$. Moreover, any attempt to extract the rent of one worker implies that, at the optimum, also the other worker's rent is extracted. Given that the workers' effort-cost functions and preferences are identical, extracting both rents requires the employer to offer identical bonus schemes too. Accordingly, instead of inducing different efforts reflecting the workers' *marginal* productivities, the employer implements a uniform effort level associated with the workers' *average* productivity. In that case, the low-ability worker works "too much" while the high-ability worker's effort is "too small". As a matter of fact, if the productivity differences or the inequality premium are large, the employer may find it optimal to forgo the services of the low-ability worker altogether. This is analyzed in the next subsection.

3.3 Hiring Decision

Above we have considered the case where hiring both workers ($\delta_L = 1$ and $\delta_H = 1$) is optimal. We now analyze whether, from the employer's viewpoint, hiring one or both workers is optimal in the first place. Notice that, in the latter case, to induce participation, the employer needs to compensate the workers for the prospects of pay inequality, known as the *inequality premium*. As is well known, this premium increases in the workers' inferiority aversion, thereby leading to lower optimal efforts and profits (see, e.g., Grund and Sliwka (2005), Demougin and Fluet (2006), Kragl and Schmid (2009)). Clearly, by hiring just one worker, the employer avoids these agency costs. This becomes optimal when either α is sufficiently large or the ability advantage of worker H is sufficiently pronounced. In this case, the employer's problems reduces to the generic moral-hazard problem with one (possibly inferiority averse) worker.

The hiring decision is illustrated in Figure 1 where the solid curves depict the optimal profits, $\Pi^U(\theta_H, \theta_L)$, incorporating the optimal hiring decision, as functions of α for $\theta_H = 1.5$ (the lower curve) and $\theta_H = 4$. The dashed curves represent the respective sub-optimal profits, resulting from the non-optimal hiring decision, holding $\theta_L = 1$ in all cases.[9] As can be seen, for the lower value of θ_H the employer finds it optimal to keep both workers as long as $\alpha < \alpha^c(1.5, 1)$. Once the intensity of inferiority aversion exceeds that value, it is better for the employer to forgo the services of the L-worker. For the higher value of θ_H the critical intensity is reduced to $\alpha^c(4, 1)$ since the benefit of employing only the H-worker has increased.[10]

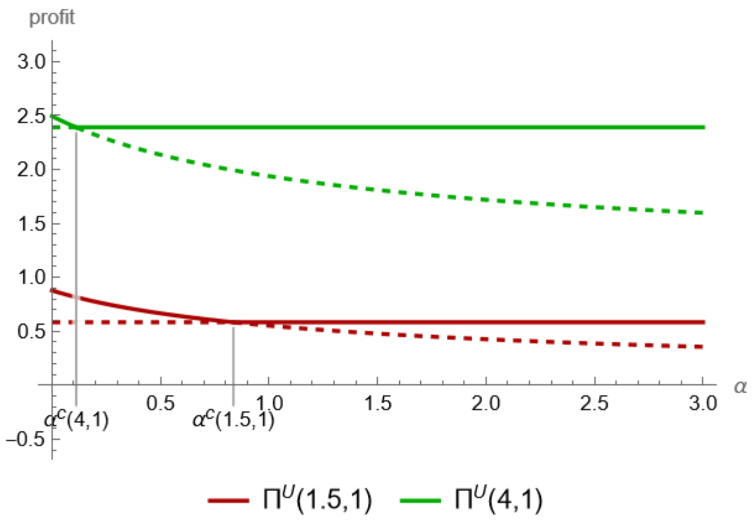

Figure 1: Optimal Hiring Policy under Unlimited Liability

4 Optimal Incentive Contracts with Limited Liability

In this section, we reconsider all results from the foregoing section for the more realistic scenario where workers are protected a limited-liability constraint. For simplicity, we impose a lower wage bound of zero for both workers, that is, their wages must be non-negative for any realization of the signal s_i. As will be shown below, whether or not

[9]This and all subsequent figures are based on a parametric example setting $c(e) = -(\ln(e) + e)$ and $p(e) = e$, $e \in [0, 1]$.

[10]The values are $\alpha^c(1.5, 1) = 0.84$ and $\alpha^c(4, 1) = 0.11$.

the respective constraints bind, critically depends on the workers' intensity of inferiority aversion, α.

Notice that the workers' problems are unaffected by the non-negativity constraint. In line with the reasoning presented in the preceding section, first assume that α is sufficiently low so that the employer finds it optimal to hire both workers ($\delta_L = 1$ and $\delta_H = 1$). In that case, the employer's problem is given by:

$$
\begin{aligned}
&\max_{w,b_i,b_j,e_i,e_j} \quad \theta_i e_i + \theta_j e_j - 2w - p\left(e_i\right) b_i - p\left(e_j\right) b_j && \text{(II)}\\
&\quad s.t.\\
&\quad p'\left(e_i\right) b_i - c'(e_i) - \alpha\left[p(e_j)\left(1 - p'\left(e_i\right)\right) b_j - p'\left(e_i\right) p\left(e_j\right) \max\{\left(b_j - b_i\right), 0\}\right] = 0 && (\text{IC}_i)\\
&\quad p'\left(e_j\right) b_j - c'(e_j) - \alpha\left[p(e_i)\left(1 - p'\left(e_j\right)\right) b_i - p'\left(e_j\right) p\left(e_i\right) \max\{\left(b_i - b_j\right), 0\}\right] = 0 && (\text{IC}_j)\\
&\quad w + p\left(e_i\right) b_i - c(e_i) - \alpha\left[p(e_j)\left(1 - p\left(e_i\right)\right) b_j - p\left(e_i\right) p\left(e_j\right) \max\{\left(b_j - b_i\right), 0\}\right] \geq 0 && (\text{PC}_i)\\
&\quad w + p\left(e_j\right) b_j - c(e_j) - \alpha\left[p(e_i)\left(1 - p\left(e_j\right)\right) b_i - p\left(e_j\right) p\left(e_i\right) \max\{\left(b_i - b_j\right), 0\}\right] \geq 0 && (\text{PC}_j)\\
&\quad b_i, b_j \geq 0 && \text{(NNB)}\\
&\quad w \geq 0 && \text{(NNW)}
\end{aligned}
$$

In problem (II), (IC_i) and (IC_j) represent the incentive-compatibility constraints of the workers while (PC_i) and (PC_j) ensure that workers participate. The last constraints (NNB) and (NNW) reflect the non-negativity requirements of wage payments.

When $\alpha = 0$, the problem is equivalent to a scenario with two separate independent workers. As is well-known, then workers are hired with a fixed payment of zero and earn a positive information rent. Technically, in that case, (PC_i) and (PC_j) are slack while (NNW) is binding. When workers are however inferiority averse, they interact via their other-regarding preferences. The optimal bonuses depend on the workers' specific abilities. As α increases, the emerging inequality premium reduces workers' utility, thereby gradually lowering the rent until they completely disappear (see Kragl et al. (2022)). To meet both workers' participation constraint for any α, the employer is forced to adjust both workers' effort even if just one of them earns a rent. As long as any rents are earned, fixed wages are equalized at zero. Once rents are dissipated, the fixed wages become positive and the problem reverts to that presented in the foregoing section, where bonuses are equalized as well. The worker rents are illustrated in Figure 2.

In the following, we illustrate our results in two figures. In both, we use the functional specification of Footnote 9 and the corresponding parameters underlying Figure 1. Figure 2 illustrates how parameter changes affect the emergence and dissipation of rents when both workers are employed, thereby impacting on the profits shown in Figure 3 and on the optimal hiring decision accordingly.[11]

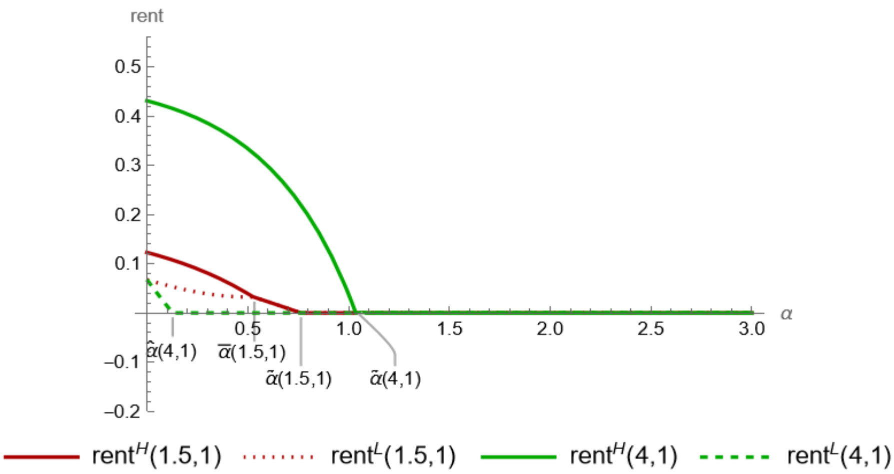

Figure 2: Worker Rents under Limited Liability

In Figure 2, the green curves show worker rents for the case of large ability differences. The red curves represent the case when abilities are more similar. Recall that θ_L is set at 1 in both scenarios. The solid curves represent the rents for the respective high-ability worker and the dotted/dashed curves those of the low-ability worker. Notice that these curves are different although they concern the same worker. Specifically, this worker is worse off when paired with a worker characterized by a much higher ability. In the figure, the low-ability worker's rent is much smaller when paired with a $\theta_H = 4$ worker (green dashed curve) as compared to being paired with a $\theta_H = 1.5$-worker (red dotted curve), and it is moreover exhausted for a lower value of α, denoted by $\hat{\alpha}\,(4,1)$. Eventually, once inferiority aversion becomes sufficiently high, the rent of the high-ability worker is also exhausted at $\tilde{\alpha}\,(4,1)$. For the case $\theta_H = 1.5$, the figure depicts $\bar{\alpha}(1.5,1)$ where the rent for both workers becomes equal. The point denoted by $\tilde{\alpha}\,(1.5,1)$ is the one where the rents of

[11] The parametric analysis already verifies that, depending on the workers' inferiority aversion and their abilitiy differences, a multitude of different optimal contractual payment structures can emerge. A generalized analysis would not entail further insights.

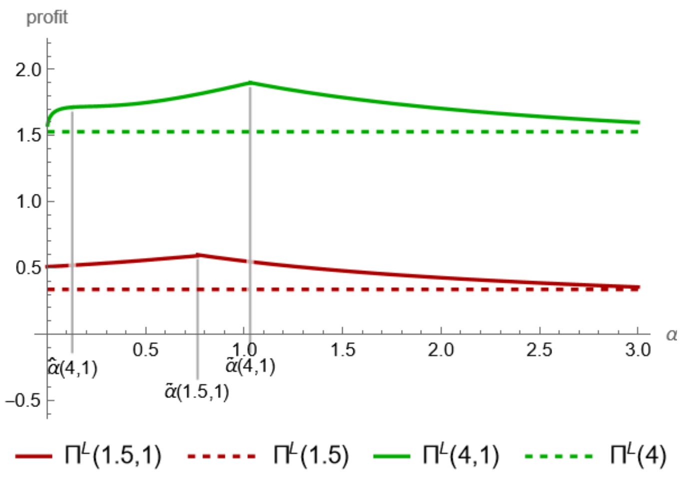

Figure 3: Optimal Hiring Policy under Limited Liability

both workers are simultaneously exhausted.[12] Generically, letting $\tilde{\alpha}(\theta_H, \theta_L)$ denote the point at which both rents are exhausted, the fixed wage is, of course, zero for both workers as long as $\alpha \leq \tilde{\alpha}(\theta_H, \theta_L)$ and becomes positive (and equal) for larger values of α. Letting $\bar{\alpha}(\theta_H, \theta_L)$ stand for the value at which rents for both workers become positive and equal (if it exists), the bonus of the high-ability worker is larger as long as $0 \leq \alpha < \bar{\alpha}(\theta_H, \theta_L)$. For higher values of α, specifically for $\bar{\alpha}(\theta_H, \theta_L) \leq \alpha < \tilde{\alpha}(\theta_H, \theta_L)$, the bonus of both workers is equalized.

The profits under the limited-liability constraint are illustrated in Figure 3. The solid curves depict the optimal profits, $\Pi^L(\theta_H, \theta_L)$, when both workers are engaged as functions of α for $\theta_H = 1.5$ (the lower curve) and $\theta_H = 4$, keeping $\theta_L = 1$. The dashed curves represent the respective profits generated when only the high-productivity worker is employed. The figure shows the dramatic impact the presence of rents has on profits, which is the case as long as $\alpha < \tilde{\alpha}(\theta_H, 1)$. For this range, higher intensities of inferiority aversion are associated with higher profits, reflecting the employer's ability to induce higher effort at the expense of the workers' rents (see also Kragl et al. (2022)). Intuitively, to decrease the chances of falling behind, inferiority-averse individuals work harder for any payment (*incentive effect of envy*). While, for $\theta_H = 1.5$, *both* workers earn a rent throughout the respective range, when $\theta_H = 4$, only the high-ability worker earns a rent for $\alpha \in (\hat{\alpha}(4,1), \tilde{\alpha}(4,1))$. Along this range, the employer continues to exploit the inferi-

[12] The respective values are: $\bar{\alpha}(1.5,1) = 0.56$, $\tilde{\alpha}(1.5,1) = 0.76$, $\hat{\alpha}(4,1) = 0.13$, $\tilde{\alpha}(4,1) = 1.00$.

ority aversion of the high-ability worker who still earns a rent but, in contrast, has to pay an additional inequality premium to the low-ability worker. This results in the inflection point at $\hat{\alpha}(4,1)$. Once rents have been exhausted at the respective $\tilde{\alpha}(\theta_H, 1)$, inferiority aversion is associated with ever increasing inequality premia, as already depicted in Figure 1. Eventually, the inequality premium becomes so high as to annul the advantage of having both workers engaged. As expected, the critical inferiority-aversion intensity at which the employer is better off when hiring only the high-ability worker ($\alpha^c(\theta_H, \theta_L)$, not shown) rises when θ_H increases. It is noteworthy that these critical α^c-values are significantly higher than the corresponding ones under unlimited liability.[13]

5 Conclusion

This paper shows that standard wage agreements applied to a worker population that may be heterogeneous with respect to productivity may have significant implications when it comes to incentive contracts. We demonstrate this by analyzing an employment relationship characterized by moral hazard and inferiority-averse workers. Within that setting, forcing employers to offer "standardized" contracts characterized by the same fixed-wage across workers who differ only in their productivities may force employers to also equalize bonuses. As a result, higher-ability workers are induced to exert "too little" effort, which is moreover not fully compensated by their lower-ability peers' "too high" effort, even in the absence of social preferences. In the presence of inferiority aversion, to avoid paying the inequality premium, employers forced to pay equal fixed wages may find it worthwhile to forgo the services of low-ability workers even when their contribution to output is close to that of their high-ability peers, thereby generating unemployment. We also show that, in the more realistic scenario of limited liability, the impact of social preferences is very different. In fact, employers benefit from the workers' inferiority aversion by exploiting the incentive effect of envy and inducing workers to increase effort at the expense of their informational rents. As a result, the presence of social preferences makes unemployment less likely to arise.

[13] These values are $\alpha^c(1.5, 1) = 3.35$ and $\alpha^c(4, 1) = 3.91$.

Appendix

Proof of Observation 1. The derivative of $f(e)$ can be written as:

$$f'(e) = \frac{p(e)\left(p'(e)c''(e) - p''(e)c'(e)\right) - \left(p'(e)\right)^2 c'(e)}{\left(p'(e)\right)^2} \tag{A.I.1}$$

$$= \frac{p(e)\,p'(e)c'(e)}{e\left(p'(e)\right)^2}\left(\frac{c''(e)e}{c'(e)} - \frac{p'(e)e}{p(e)}\right) - \frac{p(e)\,p''(e)c'(e)}{\left(p'(e)\right)^2} \tag{A.I.2}$$

The first expression in line (A.I.2) is positive because $c(e)$ is strictly convex and $p(e)$ is concave. The second expression is non-negative. ■

Proof of Claim 1. By some manipulation, (8) becomes:

$$(1+\alpha)\,p(e_j)\,b_j(e_i, e_j) - c(e_j) \geq (1+\alpha)\,p(e_i)\,b_i(e_i, e_j) - c(e_i) \tag{A.II}$$

Using (7) and simplifying, we obtain:

$$(1+\alpha)\,p(e_j)\,\frac{c'(e_j)}{p'(e_j)} - c(e_j) \geq (1+\alpha)\,p(e_i)\,\frac{c'(e_i)}{p'(e_i)} - c(e_i) \tag{A.III}$$

The result follows directly from Observation 1. ■

Proof of Proposition 1. i) Suppose that, at the optimal contract, condition (A.II) does not bind. Then the employer maximizes (I) s.t. (7) only. Substituting the latter into the objective function, simplifying, and taking the derivative with respect to e_i yields:

$$\theta_i + \frac{1+\alpha(3+2\alpha)\,p(e_j)}{1+\alpha p(e_j)}\frac{\partial}{\partial e_i}\left[p(e_i)\,\frac{c'(e_i)}{p'(e_i)}\right] - 2c'(e_i) \tag{A.IV}$$

As the coefficient of the derivative in the second term is larger than 1, Observation 1 implies that the expression in (A.IV) is positive. Accordingly, e_i should be as large as possible, implying by equation (9) that the wage becomes negative and large in absolute value. At some point, the rent of worker j gets annulled, a contradiction to the assumption that worker j earns a rent.

ii) As condition (A.II) is binding, we can conclude from (A.III) and Observation 1 that at the optimal contract $e_i = e_j = e := e(\alpha, \theta_H, \theta_L)$, and hence $b_i(e,e) = b_j(e,e)$,for $i, j \in \{H, L\}, i \neq j$. ■

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